

ON Semiconductor®



SG388/D
Rev. 9, May-2007

Selection. Service. Support.
Power Solutions from ON Semiconductor

Master Components Selector Guide

Including Pb-Free Leadframe Options



Sheet Support

ON Semiconductor Master Components Selector Guide

Power Management, Amplifiers and Comparators, Analog Switches,
Thyristors, Diodes, Rectifiers, Bipolar Transistors, FETs, Circuit Protection,
Clock and Data Management, Interface, and Standard Logic Devices

SG388/D
Rev. 9, May-2007



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NOTE: The **Tape & Reel Specification** information has been moved to its own publication. Please see ON Semiconductor brochure, BRD8011/D, for information on Tape & Reel.

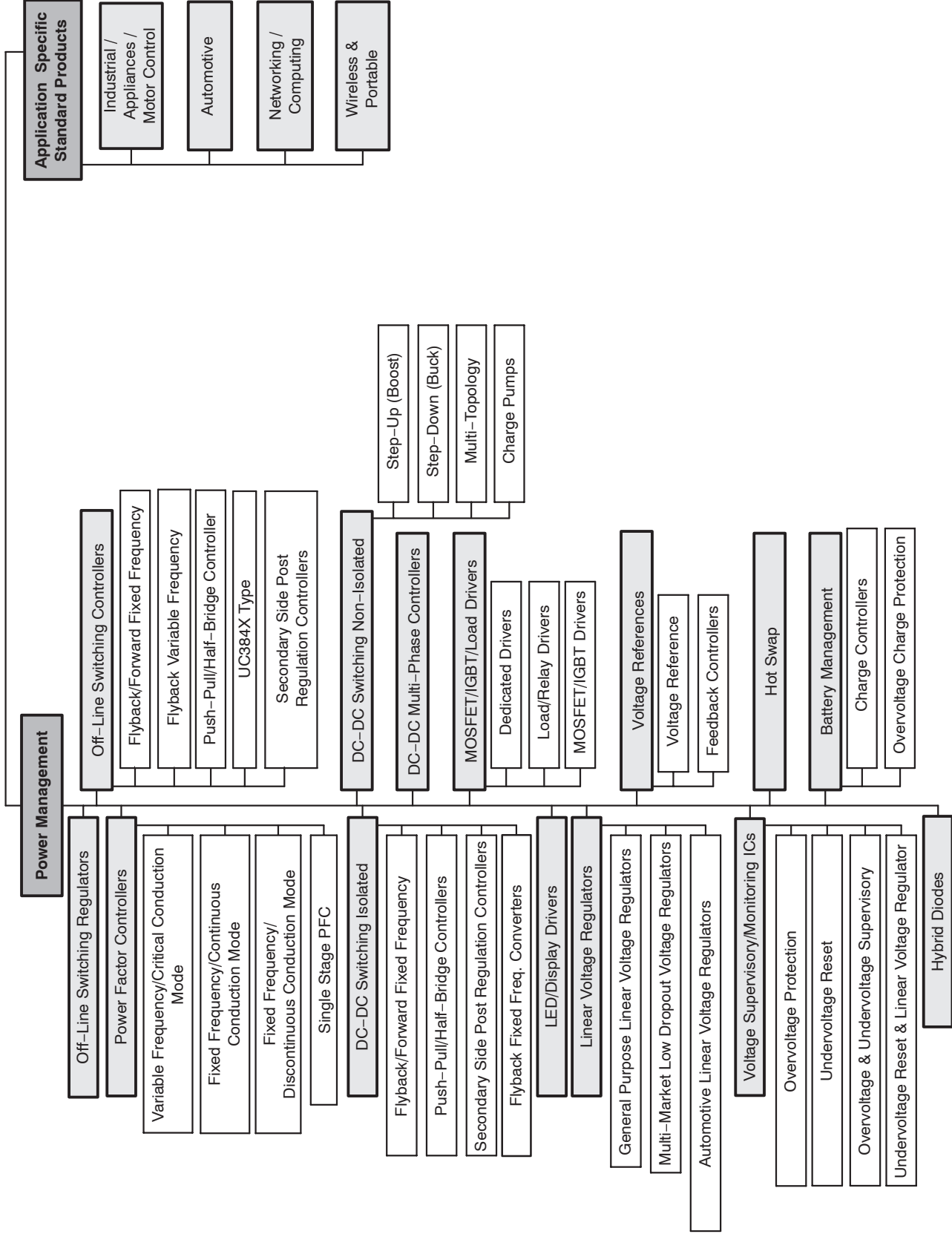
Power Management

Power Management

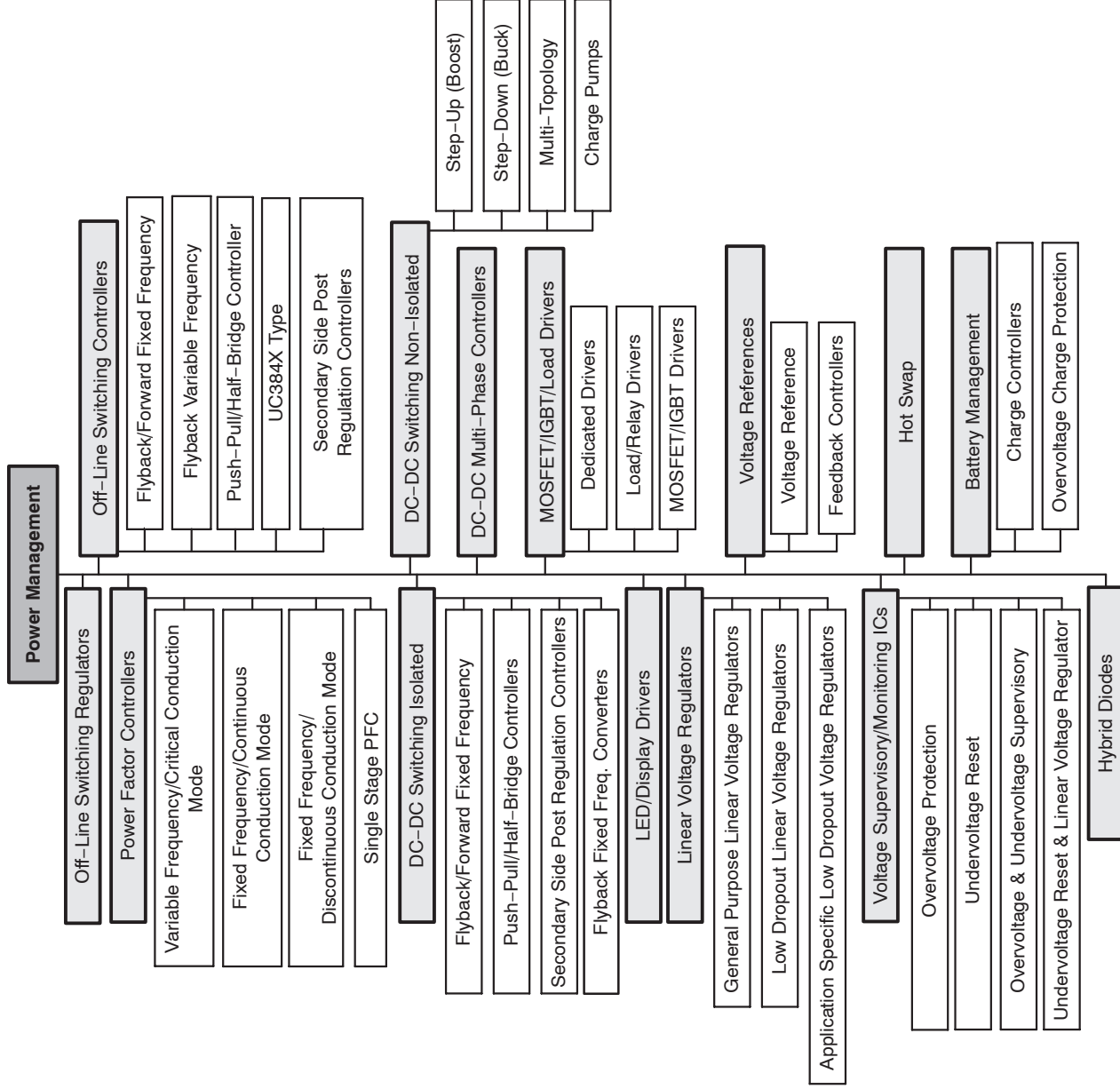
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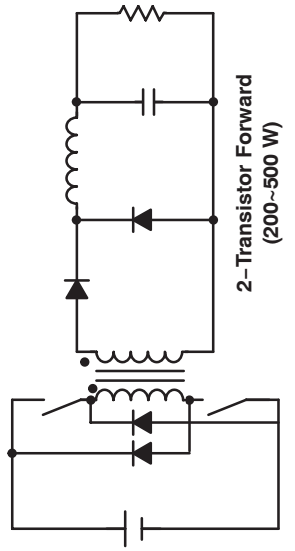
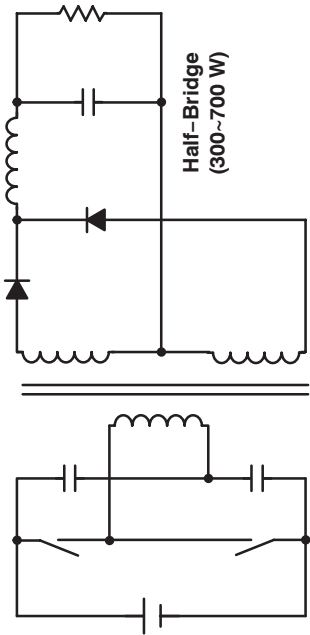
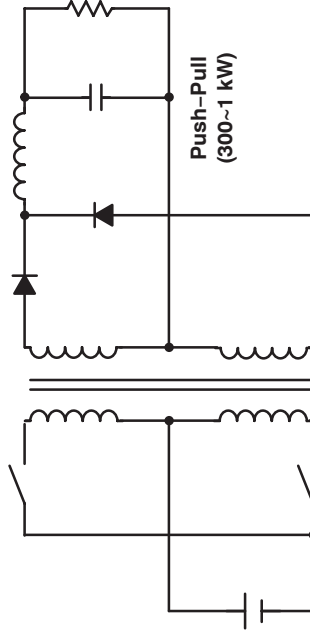
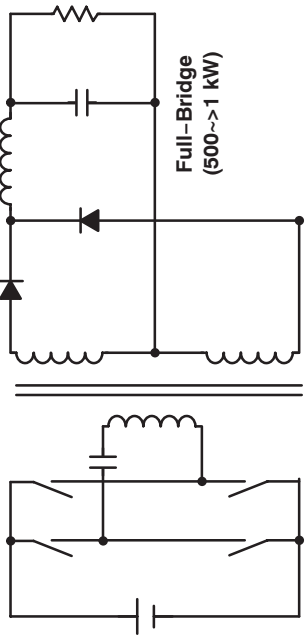
ON Semiconductor's Analog Integrated Circuits



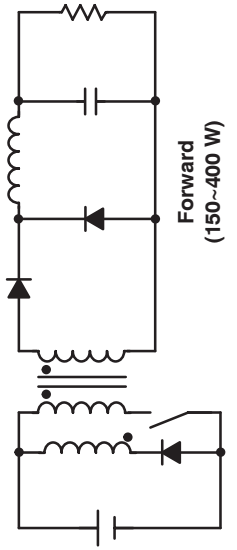
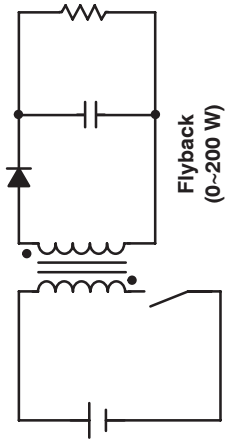
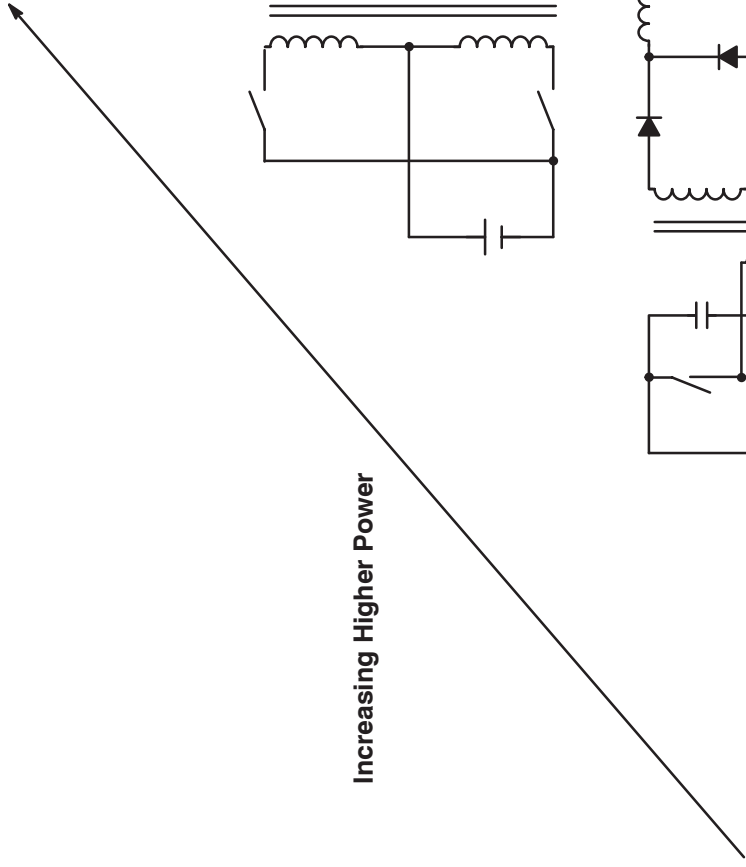
ON Semiconductor Selector Guide – Power Management



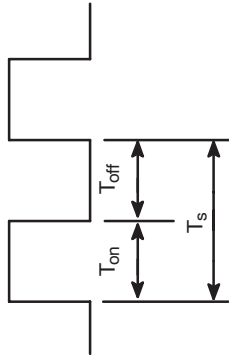
TOPOLOGIES OVERVIEW



Increasing Higher Power



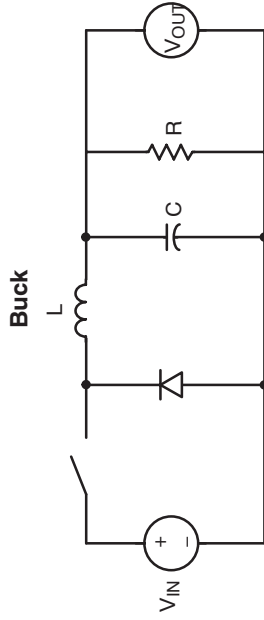
TOPOLOGIES OVERVIEW (continued)



$$\text{Duty Cycle} = D = \frac{T_{on}}{T_{on} + T_{off}} = \frac{T_{on}}{T_s}$$

$$D' = 1 - D = \frac{T_{off}}{T_{on} + T_{off}} = \frac{T_{off}}{T_s}$$

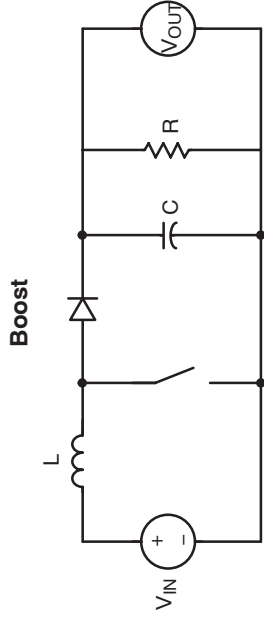
NOTE: In all circuits, equations for V_{OUT} apply to the continuous conduction case.



$$V_{out} = DV_{in}$$

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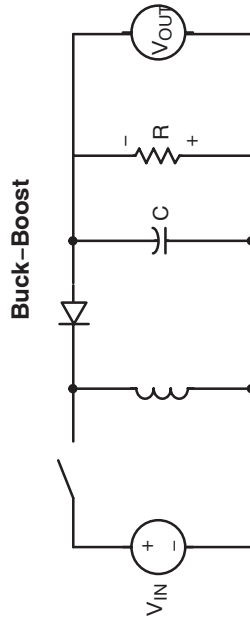
- Step down only
- MOSFET stress = V_{IN}



$$V_{out} = \frac{1}{D'} V_{in}$$

Attributes:

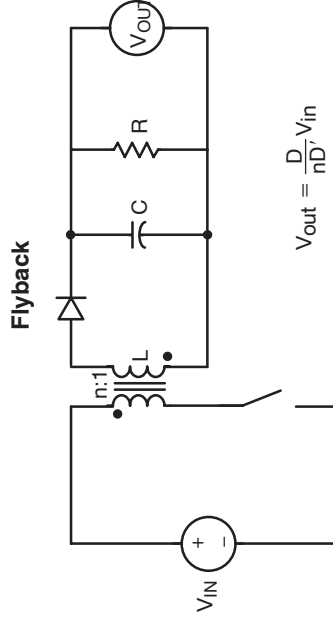
- Step up only
- Used for power factor correction
- MOSFET stress = V_{OUT}



$$V_{out} = -\frac{D}{D'} V_{in}$$

Attributes:

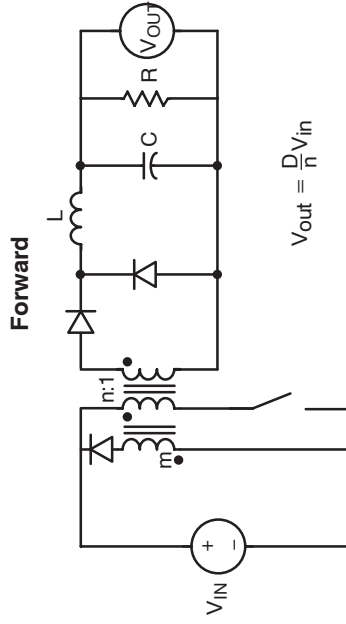
- Inverted output
- Step up or step down
- MOSFET stress = $V_{IN} - V_{OUT}$



$$V_{out} = \frac{D}{nD'} V_{in}$$

Attributes:

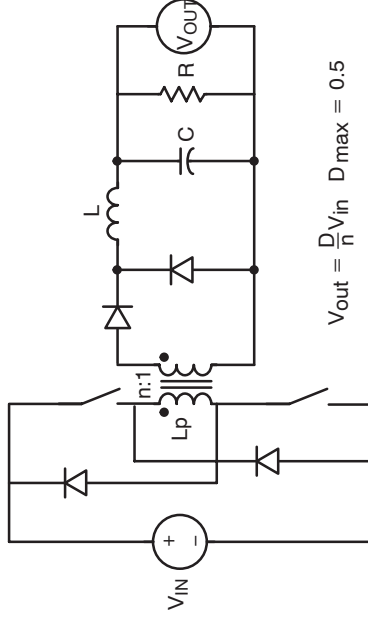
- Step up, step down, or inverting
- Up to 100 W power level
- MOSFET stress $> V_{IN}$



Attributes:

- Step up, step down, or inverting
- More complex transformer
- Reset winding is needed ($m < n$)
- Potentially more than 50% duty cycle
- Up to 200 W power level
- MOSFET stress $> V_{IN}$

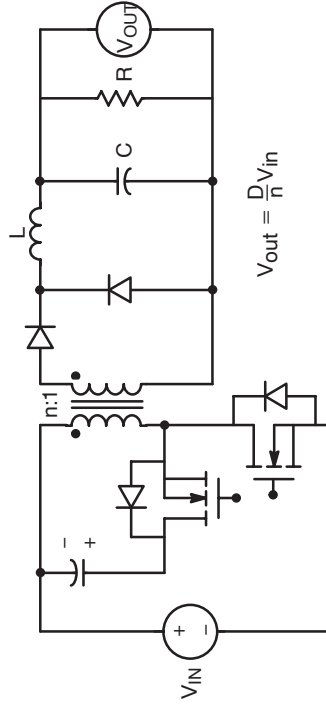
Two-Transistor Forward



Attributes:

- Step up, step down, or inverting
- Up to 500 W power level
- Simple transformer construction
- Primary winding is also the reset winding, so duty cycle $< 50\%$
- MOSFET stress = V_{IN}

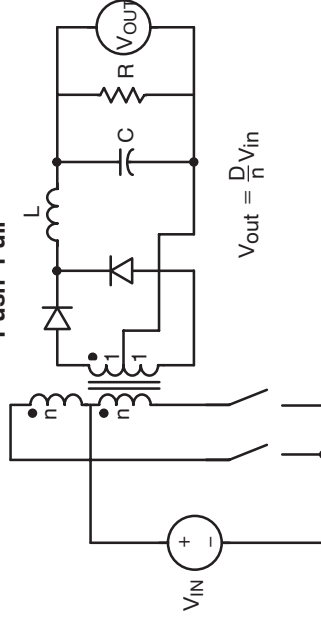
Active Clamp Forward



Attributes:

- Step up, step down, or inverting
- Simple transformer construction
- Potentially more than 50% duty cycle
- Up to 500 W power level
- MOSFET stress $> V_{IN}$

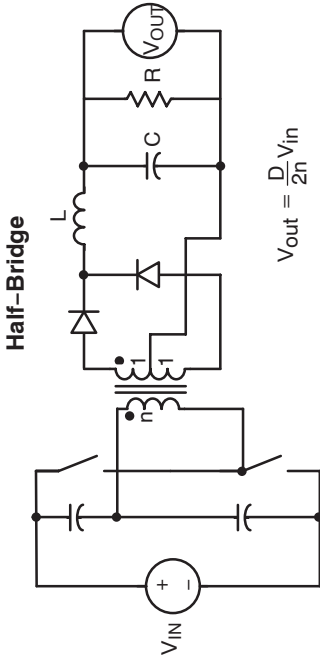
Push-Pull



Attributes:

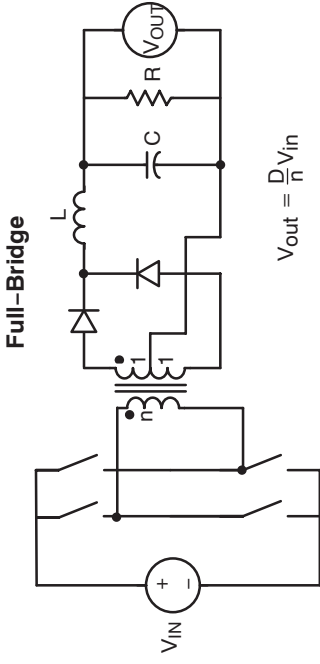
- Step up, step down, or inverting
- Useful for low input voltage applications
- Up to 1.0 kW power level
- More complex transformer
- Duty cycle $< 50\%$
- MOSFET stress = $2.0 V_{IN}$

TOPOLOGIES OVERVIEW (continued)



Attributes:

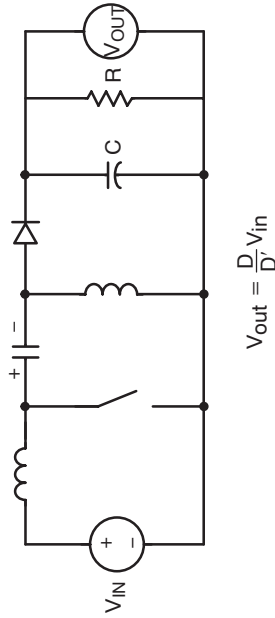
- Step up, step down, or inverting
- Alternative to 2-transistor forward
- Up to 500 W power level
- Duty cycle < 50%
- MOSFET stress = V_{IN}



Attributes:

- High power applications
- Step up, step down, or inverting
- Up to 2.0 kW power level
- Duty cycle < 50%
- Phase-shifted version possible for high density
- Current doubler version useful for very high output currents
- MOSFET stress = V_{IN}

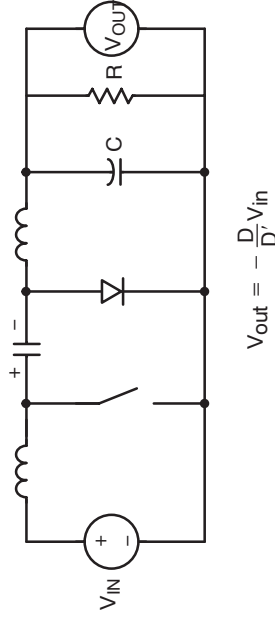
SEPIC (Single-Ended Primary Inductor Converter)



Attributes:

- Step up or step down
- MOSFET stress = $V_{IN} + V_{OUT}$

C'uk (By Slobodan C'uk)



Attributes:

- Inverted output
- Step up or step down
- MOSFET stress > V_{IN} and V_{OUT}

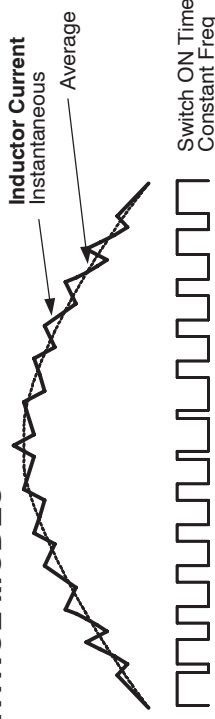
SUMMARY OF CHOOSING A TOPOLOGY

| Power | Topology | Conversion | Isolated | Multi-Output | Output Ripple | MOSFET Stress | Isolation |
|--------|----------------------|------------|----------|--------------|---------------|-----------------------|--------------|
| Low | Buck | Step-down | No | No | Small | V_{IN} | Non-Isolated |
| | Boost | Step-up | No | No | Large | V_{OUT} | |
| | Buck-Boost | Inverting | No | No | Large | $V_{IN} - V_{OUT}$ | |
| | Cuk | Inverting | No | No | Small | $V_{IN}, > V_{OUT}$ | |
| Medium | Sepic | Up or Down | No | No | Large | $> V_{IN}, > V_{OUT}$ | Isolated |
| | Flyback | Up or Down | Yes | Yes | Large | $< 2 V_{IN}$ | |
| | Forward | Up or Down | Yes | Yes | Small | $< 2 V_{IN}$ | |
| | 2-Transistor Forward | Up or Down | Yes | Yes | Small | V_{IN} | |
| High | Half-Bridge | Up or Down | Yes | Yes | Small | V_{IN} | Isolated |
| | Push-Pull | Up or Down | Yes | Yes | Small | $2 V_{IN}$ | |
| | Full-Bridge | Up or Down | Yes | Yes | Small | V_{IN} | |

POWER FACTOR CORRECTION CONTROL MODES

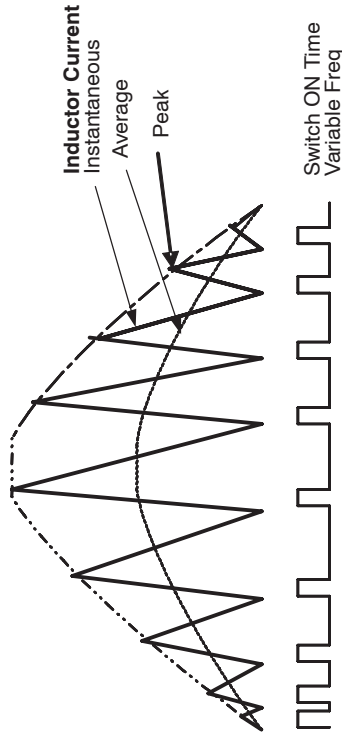
Continuous Conduction Mode (CCM)
 → e.g. NCP1653

- CCM Operation**
 Power Range: 300 W – 1 kW+
 + Constant Frequency
 + Lowest Peak Current
 – Turn-off Losses Because of Hard Switching
 – Inductor Value is Largest



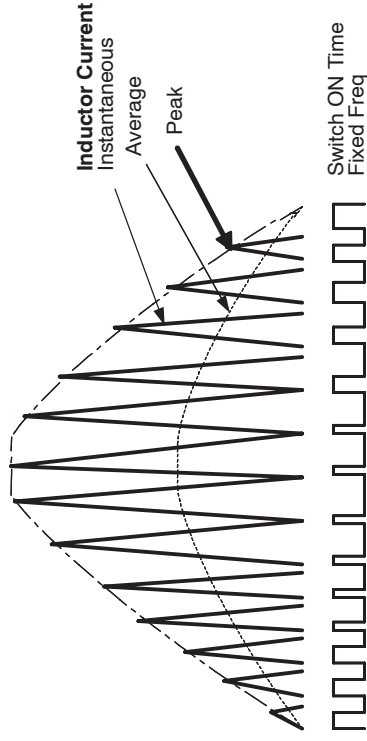
Critical Conduction Mode (CRM)
 → e.g. NCP1601

- CRM operation**
 Power Range: 75 W – 400 W
 + No Recovery Effect
 + Fewer External Components
 – High Peak Current
 – Variable Frequency

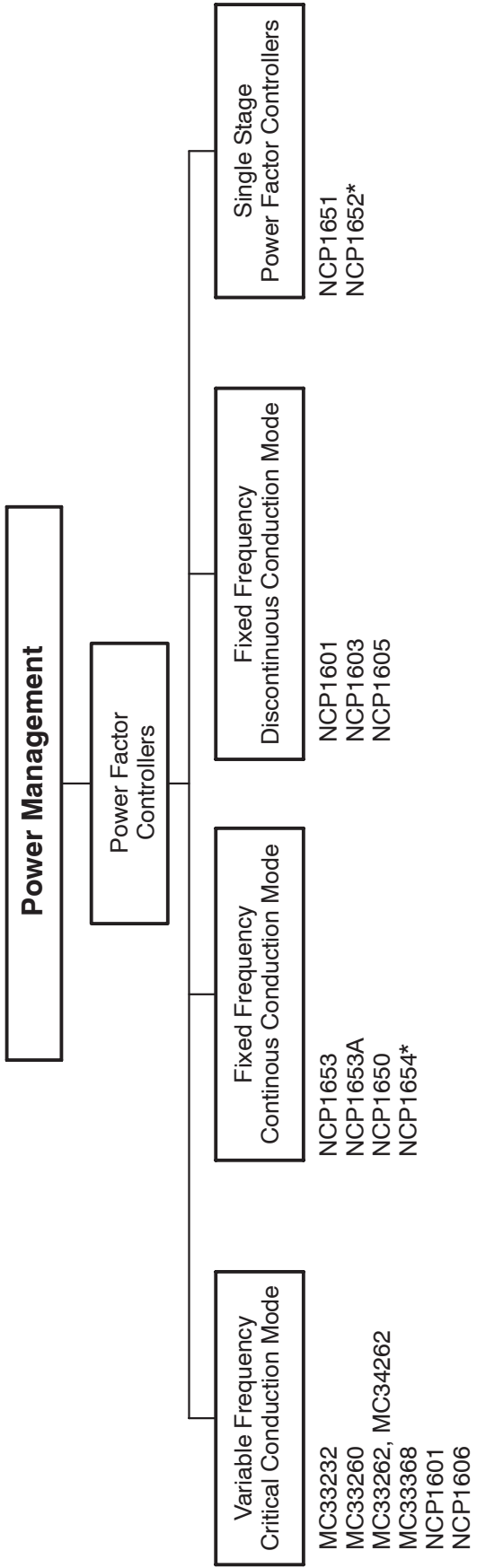


Discontinuous Conduction Mode (DCM)
 → e.g. NCP1601

- DCM operation**
 Power Range: 75 W – 400 W
 + Constant Frequency
 + No Recovery Effect
 + Best Stability
 – Highest Peak Current



ON Semiconductor Selector Guide – Power Management



*Coming Soon.

ON Semiconductor Selector Guide – Power Management VARIABLE FREQUENCY / CRITICAL CONDUCTION MODE

| Web Part | Control Mode | Topology | Freq Clamp Freq Max (kHz) | Min HV Startup Limit (V) | Under Voltage Lock-Out (V) | Max Startup Consumption (µA) | Current Limit Detection | Latch | Under Voltage Protection | In-Rush Detection | Enable Capability | Synchronization Capability | Max V _{CC} (V) | Drive Capability Source/Sink (mA) | Temp (°C) | Packages |
|----------|--------------|--------------------------|---------------------------|--------------------------|-----------------------------------|------------------------------|--------------------------|-------------------|--------------------------|-------------------|-------------------|----------------------------|-------------------------|-----------------------------------|-------------|----------------|
| MC33232 | Voltage Mode | Boost | NO | N/A | 10 to 16 Typ. | 50 | Current Sensing | NO | Fixed | NO | NO | NO | 16 | 300 / 300 | -20 to +85 | SO-8, PDIP-8 |
| MC33260 | Voltage Mode | Boost and Follower Boost | NO | N/A | 8.5 to 11 Typ. | 250 | Current Sensing | Fixed | Fixed | YES | YES | NO | 16 | 500 / 500 | -40 to +105 | SO-8, PDIP-8 |
| MC33262 | Current Mode | Boost | NO | N/A | 8 to 13 Typ. | 400 | Current Sensing | Fixed | NO | NO | YES | NO | 30 | 500 / 500 | -40 to +105 | SO-8, PDIP-8 |
| MC34262 | Current Mode | Boost | NO | N/A | 8 to 13 Typ. | 400 | Current Sensing | Fixed | NO | NO | YES | NO | 30 | 500 / 500 | 0 to +85 | SO-8, PDIP-8 |
| MC33368 | Current Mode | Boost | YES | YES | 8.5 to 13 Typ. | N/A | Current Sensing | Fixed | NO | NO | YES | NO | 16 | 1000 / 1000 | -25 to +125 | SO-16, PDIP-16 |
| NCP1601 | Voltage Mode | Boost | 405 | N/A | 9 to 13.75 Typ. 9 to 10.5 Typ. | 40 | Negative Current Sensing | Fixed | Fixed | YES | N/A | YES | 18 | 500 / 800 | -40 to +125 | SO-8, PDIP-8 |
| NCP1606 | Voltage Mode | Boost | 600 | N/A | 9.5 to 12 Typ. | 50 | Current Sensing | Program- mable | Fixed | NO | YES | NO | 20 | 500 / 800 | -40 to +125 | SO-8, PDIP-8 |

FIXED FREQUENCY / CONTINUOUS CONDUCTION MODE

| Web Part | Control Mode | Topology | Switching Freq (kHz) | Under Voltage Lock-Out (V) | Max Startup Consumption (µA) | Over Power Limitation | Current Limit Detection | Brown Out Protection | Latch | Under (Output) Voltage Protection | In-Rush Detection | Enable Capability | Max V _{CC} (V) | Drive Capability Source/Sink (mA) | Temp (°C) | Packages |
|----------|---|--------------------------|----------------------|----------------------------|------------------------------|-----------------------|--|----------------------|-------|-----------------------------------|-------------------|-------------------|-------------------------|-----------------------------------|-------------|--------------|
| NCP1653 | Average Current Mode or Peak Current Mode | Boost and Follower Boost | 67 | 8.7 to 13.25 Typ. | 50 | YES | Program- mable Negative Current Sensing | NO | Fixed | Fixed | YES | YES | 18 | 1000 / 1000 | -40 to +125 | SO-8, PDIP-8 |
| NCP1653A | Average Current Mode or Peak Current Mode | Boost and Follower Boost | 100 | 8.7 to 13.25 Typ. | 50 | YES | Program- mable Negative Current Sensing | NO | Fixed | Fixed | YES | YES | 18 | 1000 / 1000 | -40 to +125 | SO-8, PDIP-8 |
| NCP1650 | Average Current Mode | Boost | Adjustable 25 to 250 | 10 to 10.5 Typ. | 80 | NO | Negative Current Sensing | YES | Fixed | NO | NO | YES | 20 | 1500 / 1500 | -40 to +125 | SO-16 |
| NCP1654* | Average Current Mode | Boost | Adjustable 66 to 266 | 9 to 13.75 9 to 10.5 | 150 | YES | Current Sensing | YES | YES | YES | YES | YES | 25 | 1500 / 1500 | -40 to +125 | SO-8, PDIP-8 |

*Coming Soon.

FIXED FREQUENCY / DISCONTINUOUS CONDUCTION MODE

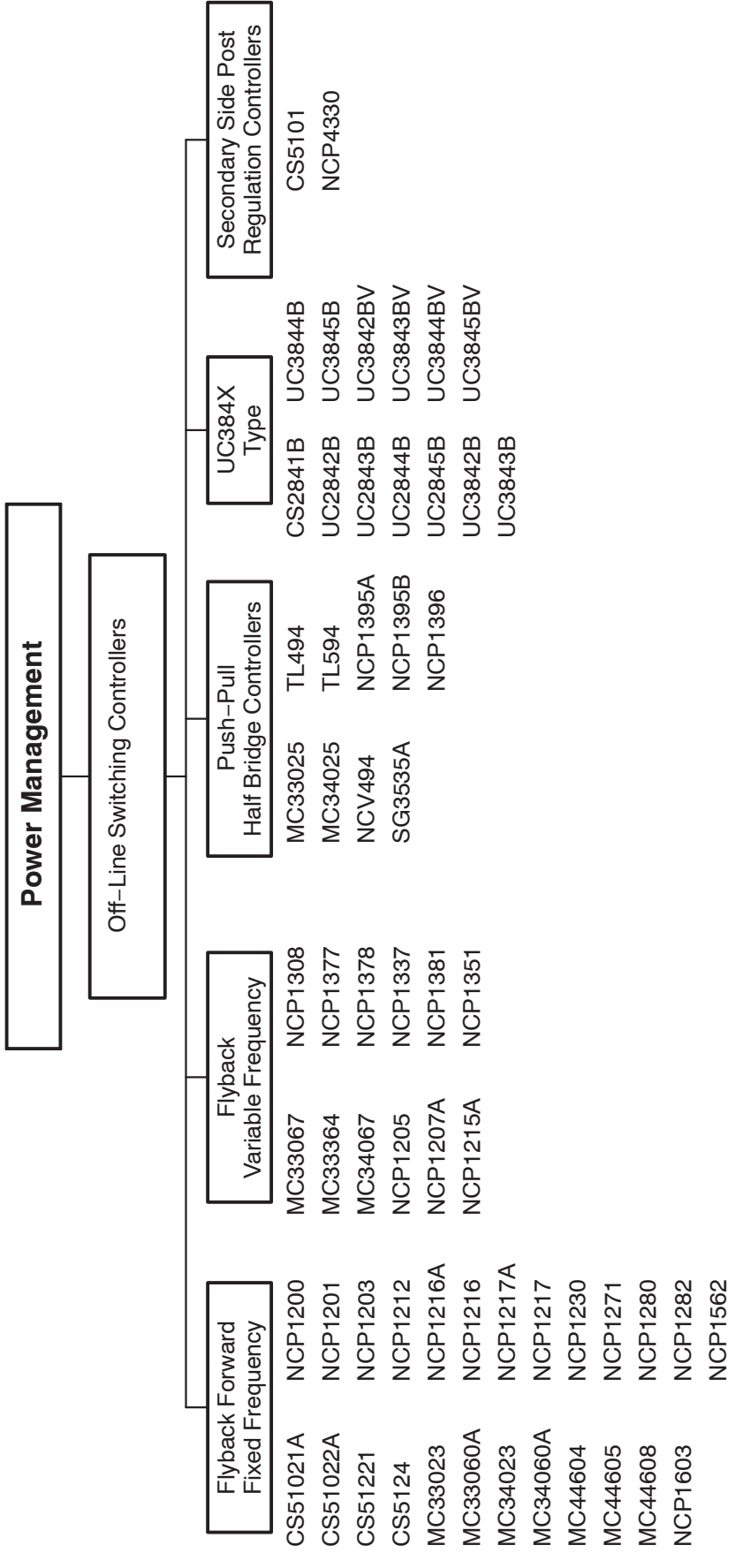
| Web Part | Control Mode | Topology | Switching Freq (kHz) | Min HV Startup Limit (V) | Under Voltage Lock-Out (V) | Startup Consumption (µA) | Current Limit Detection | Latch | Under (Output) Voltage Protection | In-Rush Detection | Main PWM Turn On Signal | Enable Capability | Max V _{CC} (V) | Drive Capability Source/Sink (mA) | Temp (°C) | Pack-ages |
|----------|--------------|----------|----------------------|--------------------------|-----------------------------------|--------------------------|--------------------------|-------|-----------------------------------|-------------------|-------------------------|-------------------|-------------------------|-----------------------------------|-------------|--------------|
| NCP1601 | Voltage Mode | Boost | 58 | N/A | 9 to 13.75 Typ. 9 to 10.5 Typ. | 40 | Negative Current Sensing | Fixed | Fixed | YES | N/A | YES | 18 | 500 / 800 | -40 to +125 | SO-8, PDIP-8 |
| NCP1603 | Voltage Mode | Boost | 100 | 30 | 9 to 13.75 Typ. | 80 | Negative Current Sensing | Fixed | Fixed | YES | N/A | YES | 18 | 500 / 800 | -40 to +125 | SO-16 |

SINGLE STAGE PFC

| Web Part | Control Mode | Topology | Switching Freq (kHz) | Standby Mode Technique | Min HV Startup Limit (V) | Under Voltage Lock-Out (V) | Max Startup Consumption (mA) | Current Limit Detection | Under (Output) Voltage Protection | Enable Capability | Max V _{CC} (V) | Drive Capability Source/Sink (mA) | In-Rush Detection | Temp (°C) | Pack-ages |
|----------|----------------------|----------|----------------------|------------------------|--------------------------|----------------------------|------------------------------|-------------------------|-----------------------------------|-------------------|-------------------------|-----------------------------------|-------------------|-------------|-----------|
| NCP1651 | Average Current Mode | Boost | Adjustable 25 to 250 | N/A | N/A | 9.8 to 10.8 Typ. | 5.5 | Current Sensing | YES | YES | 18 | 1500 / 1500 | N/A | -40 to +125 | SO-16 |
| NCP1652* | Average Current Mode | Boost | 100 | Adj Skip Mode | 40 | 11 to 14 Typ. | 100 | Current Sensing | YES | YES | 20 | 300 / 700 | N/A | -40 to +125 | SO-16 |

*Coming Soon.

ON Semiconductor Selector Guide – Power Management



FLYBACK / FORWARD FIXED FREQUENCY

| Web Part | Control Mode | Switching Freq (kHz) | Freq Jittering (%) | Standby Mode Technique | Min HV Startup Limit (V) | Dynamic Self Supply (mA) | Under-voltage Lock-Out (V) | Short Circuit Protection | Over Power Compensation | Brown-Out Protection | Latch | Soft-Start (ms) | Max V _{CC} (V) | Drive Capability Source/Sink (mA) | Temp (°C) | Packages | Additional Features |
|----------|--------------------|----------------------|--------------------|------------------------|--------------------------|--------------------------|----------------------------|--------------------------|-------------------------|----------------------|-----------------------|-----------------|-------------------------|-----------------------------------|-------------|-----------------|-------------------------------|
| CS51021A | Current Mode | Adjustable | N/A | NO | NO | NO | YES | YES | NO | NO | Via the Latch / Demag | Adj | 20 | 1,000 | -40 to +85 | SO-16 | Bidirectional Synchronization |
| CS51022A | Current Mode | Adjustable | N/A | NO | NO | NO | YES | YES | NO | NO | Via the Latch / Demag | Adj | 20 | 1,000 | -40 to +85 | TSSOP-16, SO-16 | 100 μ A Max Sleep Current |
| CS51221 | Voltage Mode | Adjustable | N/A | NO | NO | NO | YES | YES | NO | NO | Via the Latch / Demag | Adj | 15 | 1,000 | -40 to +85 | SO-16 | |
| CS5124 | Current Mode | 400 | N/A | NO | NO | NO | YES | YES | NO | NO | NO | Adj | 20 | 200 | -40 to +105 | SO-8 | |
| MC33023 | Voltage or Current | Adjustable | N/A | NO | NO | NO | YES | YES | NO | NO | NO | Adj | 30 | 200 | -40 to +105 | SO-16 WB | |
| MC34023 | Voltage or Current | Adjustable | N/A | NO | NO | NO | YES | YES | NO | NO | NO | Adj | 30 | 200 | 0 to +70 | PDIP-16 | |
| MC33060A | Voltage Mode | 200 | N/A | NO | NO | NO | YES | YES | NO | NO | NO | Adj | 42 | 200 | -40 to +85 | SO-14, PDIP-14 | |
| MC34060A | Voltage Mode | 200 | N/A | NO | NO | NO | YES | YES | NO | NO | NO | Adj | 42 | 200 | 0 to +70 | SO-14, PDIP-14 | |
| MC44604 | Current Mode | 250 | N/A | YES | 14.5 | NO | YES | NO | NO | NO | Via the Latch / Demag | Adj | 18 | 750 | -25 to +85 | PDIP-16 | |
| MC44605 | Current Mode | 250 | N/A | NO | 14.5 | NO | YES | NO | NO | NO | Via the Latch / Demag | Adj | 18 | 750 | -25 to +85 | PDIP-16 | |
| MC44608 | Voltage Mode | 100, 40, 75 | N/A | Secondary Reconfig. | 50 | NO | 10 to 13.1 Typ. | NO | YES | NO | Via the Latch / Demag | NO | 16 | 800 / 800 | -25 to +85 | PDIP-8 | |
| NCP1200 | Current Mode | 100, 40, 60 | ± 0.7 | Adj Skip Mode | 30 | 4 | N/A | When DSS is used | NO | NO | NO | NO | 16 | 250 / 250 | -25 to +125 | SO-8, PDIP-8 | |
| NCP1201 | Current Mode | 100, 60 | 0.82 | Adj Skip Mode | 30 | 5.3 | 10.5 to 12.5 Typ. | When DSS is used | NO | YES | NO | NO | 16 | 250 / 250 | -25 to +125 | SO-8, PDIP-8 | |
| NCP1203 | Current Mode | 100, 40, 60 | N/A | Adj Skip Mode | 30 | NO | 7.8 to 12.8 Typ. | NO | NO | NO | NO | NO | 16 | 250 | -40 to +125 | SO-8, PDIP-8 | |
| NCP1212 | Current Mode | Adj | N/A | Adj Skip Mode | NO | NO | 10 to 25 Typ. | YES | NO | YES | Via the Latch / Demag | NO | 28 | 100 / 300 | -25 to +125 | SO-8, PDIP-8 | |
| NCP1216A | Current Mode | 133, 100, 65 | ± 4 | Adj Skip Mode | 30 | 8 | NO | When DSS is used | NO | NO | NO | 1.00 | 16 | 500 | 0 to +125 | SO-8, PDIP-7 | Limited Duty Cycle to 50% |
| NCP1216 | Current Mode | 133, 100, 65 | ± 4 | Adj Skip Mode | 30 | 8 | NO | When DSS is used | NO | NO | NO | NO | 16 | 500 | 0 to +125 | SO-8, PDIP-7 | |

ON Semiconductor Selector Guide – Power Management

FLYBACK / FORWARD FIXED FREQUENCY (continued)

| Web Part | Control Mode | Switching Freq (kHz) | Freq Jittering (%) | Standby Mode Technique | Min HV Startup Limit (V) | Dynamic Self Supply (mA) | Under-voltage Lock-Out (V) | Short Circuit Protection | Over Power Compensation | Brown-Out Protection | Latch | Soft-Start (ms) | Max V _{CC} (V) | Drive Capability Source/Sink (mA) | Temp (°C) | Packages | Additional Features |
|----------|--------------|----------------------|--------------------|---|--------------------------|--------------------------|----------------------------|--------------------------|-------------------------|----------------------|-----------------------|-----------------|-------------------------|-----------------------------------|-------------|--------------|---------------------------|
| NCP1217A | Current Mode | 133, 100, 65 | N/A | Adj Skip Mode | 30 | NO | 7.6 to 12.8 Typ. | NO | NO | NO | Via the Latch / Demag | 1.00 | 16 | 500 | 0 to +125 | SO-8, PDIP-7 | Limited Duty-Cycle to 50% |
| NCP1217 | Current Mode | 133, 100, 65 | N/A | Adj Skip Mode | 30 | NO | 7.6 to 12.8 Typ. | NO | NO | NO | Via the Latch / Demag | NO | 16 | 500 | 0 to +125 | SO-8, PDIP-7 | |
| NCP1230 | Current Mode | 133, 100, 65 | ±6.4 | Adj Skip Mode | 20 | NO | 7.7 to 12.6 Typ. | YES | NO | NO | Via the Latch / Demag | 2.50 | 18 | 500 / 800 | -40 to +125 | SO-8, PDIP-7 | |
| NCP1280 | Voltage Mode | Adjustable | NO | NO | 25 | 13.8 | YES | NO | NO | NO | Via the Latch / Demag | Adj | 16 | 95 / 200 | -40 to +125 | SO-16 | |
| NCP1271 | Current Mode | 65, 100 | ±7.5 | Adj Skip Mode with Transient Load Detection | 20 | NO | 12.6 to 20 Typ. | YES | NO | NO | Via the Latch / Demag | 4 | 20 | 500 / 800 | -40 to +125 | SO-7 | |
| NCP1282 | Voltage Mode | 230 | N/A | NO | NO | NO | 8.5 to 11 Typ. | NO | NO | NO | Line UV/OV detectors | Adj | 20 | 1000 / 2000 | -40 to +125 | SO-16 | HV Startup up to 500V |
| NCP1603 | Voltage Mode | 100 | ±6.4 | Adj Skip Mode | 30 | NO | 9 to 10.5 Typ. | YES | NO | NO | Via the Latch / Demag | 2.5 | 18 | 100 / 100 | -40 to +125 | SO-16 | |
| NCP1562 | Voltage Mode | 230 | N/A | NO | NO | NO | 7 to 10.3 Typ. | NO | NO | NO | Line UV/OV detectors | Adj | 20 | 1000 / 2000 | -40 to +125 | SO-16 | HV Startup up to 100V |

FLYBACK VARIABLE FREQUENCY

| Web Part | Control Mode | Freq Clamp Max On Time (µs) | Freq Clamp Min Off Time (µs) | Standby Mode Technique | Min HV Start-Up Limit (V) | Dynamic Self Supply (mA) | Under-voltage Lock-Out (V) | Short Circuit Protection | Over Power Compensation | Brown-Out Protection | Latch | Soft-Start (ms) | Max Vcc (V) | Drive Capability Source/Sink (mA) | Temp (°C) | Packages |
|----------|-----------------|-----------------------------|------------------------------|------------------------|---------------------------|--------------------------|----------------------------|--------------------------|-------------------------|----------------------|-----------------------|-----------------|-------------|-----------------------------------|-------------|------------------------|
| MC33067 | Voltage Mode | Adj | Adj | NO | NO | NO | 9 to 16 Typ. | YES | NO | NO | NO | Adj | 20 | 200 / 200 | -40 to +85 | SO-16, PDIP-16 |
| MC34067 | Voltage Mode | Adj | Adj | NO | NO | NO | 9 to 16 Typ. | YES | NO | NO | NO | Adj | 20 | 200 / 200 | 0 to +70 | SO-16, PDIP-16 |
| MC33364 | Current Mode | NO | 6.9 | Freq Clamp | 40 | NO | 7.6 to 15 Typ. | NO | NO | NO | NO | NO | 16 | 220 / 600 | -25 to +125 | SO-8, SO-16 |
| NCP1205 | Current Mode | NO | NO | Frequency Foldback | 40 | NO | 7.2 to 15 Typ. | YES | NO | NO | Adj | NO | 30 | 300 / 300 | -25 to +125 | SO-16, PDIP-14, PDIP-8 |
| NCP1207A | Current Mode | NO | 8 | Adj Skip Mode | 40 | 7 | 9.8 to 10.4 Typ. | YES | NO | NO | Via the Latch / Demag | 1 | 16 | 500 / 500 | -40 to +125 | SO-8, PDIP-8 |
| NCP1215A | Quasi Fixed Ton | Fixed Ton | Variable Toff | Frequency Foldback | NO | NO | 9 to 15 Typ. | NO | NO | NO | NO | NO | 18 | 30 / 30 | 0 to +105 | SO-8, TSOP-6 |
| NCP1308 | Current Mode | NO | 10 | Adj Skip Mode | 40 | 7 | 9.8 to 12 Typ. | YES | NO | NO | Fixed on the Vcc | 1 | 16 | 500 / 500 | 0 to +125 | SO-8 |
| NCP1377 | Current Mode | NO | 3.8 | Adj Skip Mode | 40 | NO | 7.6 to 12.8 Typ. | NO | NO | NO | Via the Latch / Demag | 1 | 16 | 500 / 500 | 0 to +125 | SO-7, PDIP-7 |
| NCP1378 | Current Mode | NO | 8 | Adj Skip Mode | 40 | NO | 7.6 to 8.5 Typ. | NO | NO | NO | Via the Latch / Demag | 1 | 16 | 500 / 500 | 0 to +125 | SO-8, PDIP-7 |
| NCP1337 | Current Mode | 67 | 35 | Soft-Ripple Mode | 55 | 9.5 | 10 to 12 Typ. | YES | YES | YES | Via the Latch / Demag | 4 | 20 | 500 / 500 | 0 to +125 | SO-8, PDIP-7 |
| NCP1381 | Current Mode | 45 | 8 | Adj Skip Mode | NO | NO | 10 to 15 Typ. | YES | YES | YES | Via the Latch / Demag | 5 | 20 | 500 / 800 | 0 to +125 | SO-14 |
| NCP1351 | Current Mode | Fixed Ton | Variable Toff | Adj Skip Mode | NO | NO | 8.5 to 15 Typ. | YES | NO | NO | NO | NO | 20 | 300 / 150 | 0 to +125 | SO-8, PDIP-8 |

**ON Semiconductor Selector Guide – Power Management
PUSH-PULL / HALF-BRIDGE CONTROLLERS**

| Web Part | Control Mode | Switching Freq (kHz) | Standby Mode Technique | Max Duty Cycle (%) | Under-voltage Lock-Out (V) | Short Circuit Protection | Latch | Internal Ref Voltage (V) | Enable Capability | Soft-Start (ms) | Max V _{CC} (V) | Drive Capability Source/Sink (mA) | Temp (°C) | Packages | Additional Features |
|----------|------------------------|----------------------|------------------------|--------------------|----------------------------|--------------------------|-------|--------------------------|-------------------|-----------------|-------------------------|-----------------------------------|---------------------------------------|--------------------------|-------------------------|
| MC33025 | Voltage & Current mode | 1000 | NO | 45 | 9.2 & 4.2 | YES | NO | 5.1 | NO | Adj | 30 | 200 / 200 | -40 to +105 | SO-16, PDIP-16 | |
| MC34025 | Voltage & Current mode | 1000 | NO | 45 | 9.2 & 4.2 | YES | NO | 5.1 | NO | Adj | 30 | 200 / 200 | 0 to +70 | SO-16, PDIP-16 | |
| NCV494 | Voltage | 200 | NO | 48 | 6.43 | NO | NO | 5 | NO | Ad | 40 | 500 / 500 | -40 to +125 | SO-16 | Auto qualified |
| TL494 | Voltage | 200 | NO | 48 | 6.43 | NO | NO | 5 | NO | Adj | 40 | 500 / 500 | -40 to +125 0 to +70 -40 to +85 | SO-16, PDIP-16 | |
| SG3525A | Voltage | 400 | NO | 49 | 7 | NO | NO | 5.1 | YES | Adj | 40 | 400 / 400 | 0 to +70 | SO-16, PDIP-16 | |
| TL594 | Voltage | 300 | NO | 50 | 5.2 | NO | NO | 5 | NO | Adj | 42 | 500 / 500 | -40 to +85 | SO-16, PDIP-16, TSSOP-16 | |
| NCP1395A | Voltage | 1000 | Adj Skip Mode | 52 | 9.3 | NO | YES | 2 | YES | Adj | 20 | 180/180 | 0 to +125 | SO-16, PDIP-16 | Consumer Applications |
| NCP1395B | Voltage | 1000 | Adj Skip Mode | 52 | 9.3 | NO | YES | 2 | YES | Adj | 20 | 180/180 | 0 to +125 | SO-16, PDIP-16 | Industrial Applications |

ON Semiconductor Selector Guide – Power Management

UC384X TYPE

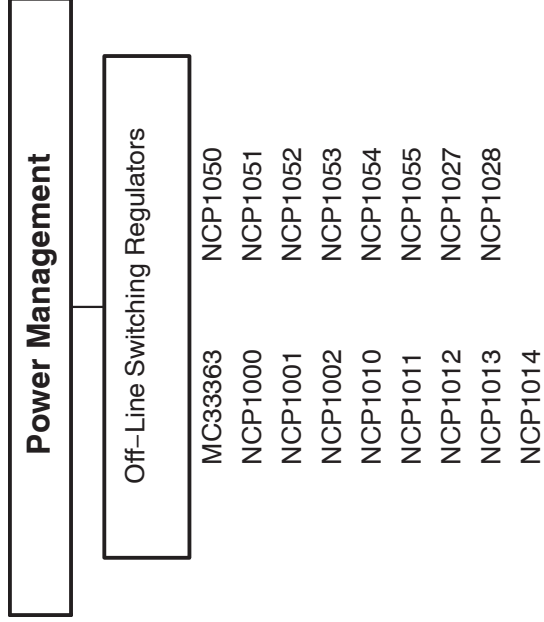
| Web Part | Control Mode | Switching Freq (kHz) | Standby Mode Technique | Max Duty Cycle (%) | Undervoltage Lock-out (V) | Short Circuit Protection | Latch | Internal Ref Voltage (V) | Soft-Start (ms) | Max V _{CC} (V) | Drive Capability Source/Sink (mA) | Temp (°C) | Packages |
|----------|--------------|----------------------|------------------------|--------------------|---------------------------|--------------------------|-------|--------------------------|-----------------|-------------------------|-----------------------------------|-------------|---------------------|
| CS2841B | Current Mode | 52 | NO | 50 | 7.4 to 8 Typ. | YES | N/A | 5 | NO | 40 | 200 / 200 | -40 to +85 | SO-14, PDIP-8 |
| UC2842B | Current Mode | 52 | NO | 96 | 10 to 16 Typ. | YES | N/A | 5 | NO | 30 | 200 / 200 | -25 to +85 | SO-14, SO-8, PDIP-8 |
| UC2843B | Current Mode | 52 | NO | 96 | 7.6 to 8.5 Typ. | YES | N/A | 5 | NO | 30 | 200 / 200 | -25 to +85 | SO-14, SO-8, PDIP-8 |
| UC2844B | Current Mode | 52 | NO | 48 | 10 to 16 Typ. | YES | N/A | 5 | NO | 30 | 200 / 200 | -25 to +85 | SO-14, SO-8, PDIP-8 |
| UC2845B | Current Mode | 52 | NO | 48 | 7.6 to 8.5 Typ. | YES | N/A | 5 | NO | 30 | 200 / 200 | -25 to +85 | SO-14, SO-8, PDIP-8 |
| UC3842B | Current Mode | 52 | NO | 96 | 10 to 16 Typ. | YES | N/A | 5 | NO | 30 | 200 / 200 | 0 to +70 | SO-14, SO-8, PDIP-8 |
| UC3843B | Current Mode | 52 | NO | 96 | 7.6 to 8.5 Typ. | YES | N/A | 5 | NO | 30 | 200 / 200 | 0 to +70 | SO-14, SO-8, PDIP-8 |
| UC3844B | Current Mode | 52 | NO | 50 | 10 to 16 Typ. | YES | N/A | 5 | NO | 25 | 200 / 200 | 0 to +70 | SO-14, SO-8, PDIP-8 |
| UC3845B | Current Mode | 52 | NO | 50 | 7.6 to 8.5 Typ. | YES | N/A | 5 | NO | 25 | 200 / 200 | 0 to +70 | SO-14, SO-8, PDIP-8 |
| UC3842BV | Current Mode | 52 | NO | 96 | 10 to 16 Typ. | YES | N/A | 5 | YES | 30 | 200 / 200 | -40 to +105 | SO-14, SO-8 |
| UC3843BV | Current Mode | 52 | NO | 96 | 7.6 to 8.5 Typ. | YES | N/A | 5 | YES | 30 | 200 / 200 | -40 to +105 | SO-14, SO-8 |
| UC3844BV | Current Mode | 52 | NO | 50 | 10 to 16 Typ. | YES | N/A | 5 | YES | 25 | 200 / 200 | -40 to +105 | SO-14, SO-8 |
| UC3845BV | Current Mode | 52 | NO | 50 | 7.6 to 8.5 Typ. | YES | N/A | 5 | YES | 25 | 200 / 200 | -40 to +105 | SO-14, SO-8 |

**ON Semiconductor Selector Guide – Power Management
SECONDARY SIDE POST REGULATION CONTROLLERS**

| IC Operating Voltage | Converter Input Voltage | Output Voltage | Output Driver | Freq. | Temp. (T _A) | Package | Part No. | Features |
|------------------------------|---------------------------------|-------------------------------|---------------|-------|-------------------------|---------|-------------|---|
| ULVO: 7.0/8.0 V Max: 45 V | V _{gate} max: 75 V) | (V _{REF} = 2.0 V) | 1.5 A | SYNC | -40 to +85°C | SO-16L | CS5101EDW16 | <ul style="list-style-type: none"> Voltage mode Configured as either buck or boost with external NFET Externally programmable overcurrent protection 5.0 V 2% reference pin |
| | | | | | | DIP-14 | CS5101EN14 | |

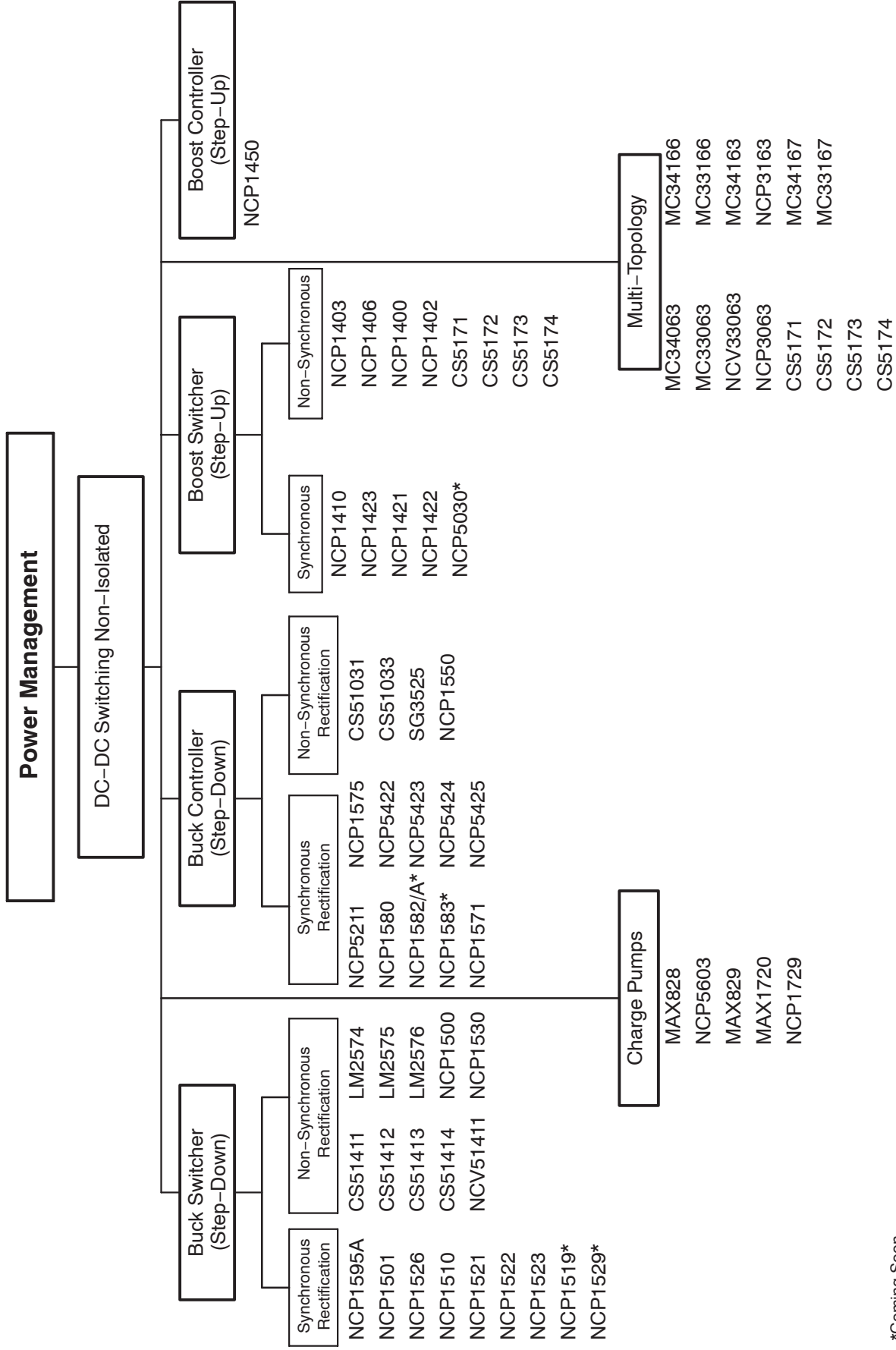
SYNCHRONOUS BUCK POST REGULATOR CONTROLLER – FORWARD TOPOLOGIES

| Temp. (T _J) | Package | Part No. |
|-------------------------|---------|------------|
| -40 to +125°C | SO-8 | NCP4330DR2 |



ON Semiconductor Selector Guide – Power Management OFF-LINE SWITCHING REGULATORS

| Web Part | Control Mode | Switching Freq (kHz) | Freq Jittering (%) | Standby Mode Tech- nique | R _{ps(on)} Typ (Ω) | Max Break- down Voltage (V) | Max Internal Current Set Point (mA) | Min HV Startup Limit (V) | Dynamic Self Supply (mA) | Under- voltage Lock- out (V) | Short Circuit Protec- tion | Over Power Com- pensation | Brown -Out Protec- tion | Latch | Temp (°C) | Pack- ages | Com- ments |
|----------|------------------|----------------------|--------------------|--------------------------|-----------------------------|-----------------------------|-------------------------------------|--------------------------|--------------------------|------------------------------|----------------------------|---------------------------|-------------------------|-------|-------------|-----------------------------|-------------------------------|
| MCS3363 | Voltage Mode | 285 | N/A | NO | 14 | 700 | 400 | 9 | NO | 9.5 to 15.2 Typ. | NO | NO | NO | NO | -25 to +150 | SO-16, PDIP-16 | |
| NCP1000 | Voltage Mode | 100 | N/A | Skip Mode | 18 | 700 | 500 | 20 | NO | 7.5 to 8.5 Typ. | NO | NO | NO | NO | -40 to +125 | PDIP-8 | |
| NCP1001 | Voltage Mode | 100 | N/A | Skip Mode | 9 | 700 | 1000 | 20 | NO | 7.5 to 8.5 Typ. | NO | NO | NO | NO | -40 to +125 | PDIP-8 | |
| NCP1002 | Voltage Mode | 100 | N/A | Skip Mode | 6 | 700 | 1500 | 20 | NO | 7.5 to 8.5 Typ. | NO | NO | NO | NO | -40 to +125 | PDIP-8 | |
| NCP1010 | Current Mode | 65, 100, 130 | ± 3.3 | Skip Mode | 22 | 700 | 100 | 30 | 8.5 | 7.5 to 8.5 Typ. | When DSS is used | NO | NO | YES | 0 to +125 | PDIP-7, SOT-223 | |
| NCP1011 | Current Mode | 65, 100, 130 | ± 3.3 | Skip Mode | 22 | 700 | 250, 450 | 30 | 8.5 | 7.5 to 8.5 Typ. | When DSS is used | NO | NO | YES | 0 to +125 | PDIP-7, PDIP-7 SMT, SOT-223 | |
| NCP1012 | Current Mode | 65, 100, 130 | ± 3.3 | Skip Mode | 11 | 700 | 250 | 30 | 8 | 7.5 to 8.5 Typ. | When DSS is used | NO | NO | YES | 0 to +125 | PDIP-7, PDIP-7 SMT, SOT-223 | |
| NCP1013 | Current Mode | 65, 100, 130 | ± 3.3 | Skip Mode | 11 | 700 | 350 | 30 | 8 | 7.5 to 8.5 Typ. | When DSS is used | NO | NO | YES | 0 to +125 | PDIP-7, SOT-223 | |
| NCP1014 | Current Mode | 65, 100, 130 | ± 3.3 | Skip Mode | 11 | 700 | 450 | 30 | 8 | 7.5 to 8.5 Typ. | When DSS is used | NO | NO | YES | 0 to +125 | PDIP-7, PDIP-7 SMT, SOT-223 | |
| NCP1050 | Gated Oscillator | 45.5, 103, 140 | ± 5.0 | Skip Mode | 30 | 700 | 100 | 20 | 6.3 | 7.5 to 8.5 Typ. | YES | NO | NO | YES | -40 to +150 | PDIP-7, SOT-223 | |
| NCP1051 | Gated Oscillator | 45.5, 103, 140 | ± 5.0 | Skip Mode | 30 | 700 | 200 | 20 | 6.3 | 7.5 to 8.5 Typ. | YES | NO | NO | YES | -40 to +150 | PDIP-7, SOT-223 | |
| NCP1052 | Gated Oscillator | 45.5, 103, 140 | ± 5.0 | Skip Mode | 30 | 700 | 300 | 20 | 6.3 | 7.5 to 8.5 Typ. | YES | NO | NO | YES | -40 to +150 | PDIP-7, SOT-223 | |
| NCP1053 | Gated Oscillator | 45.5, 103, 140 | ± 5.0 | Skip Mode | 15 | 700 | 400 | 20 | 6.3 | 7.5 to 8.5 Typ. | YES | NO | NO | YES | -40 to +150 | PDIP-7, SOT-223 | |
| NCP1054 | Gated Oscillator | 45.5, 103, 140 | ± 5.0 | Skip Mode | 15 | 700 | 530 | 20 | 6.3 | 7.5 to 8.5 Typ. | YES | NO | NO | YES | -40 to +150 | PDIP-7, SOT-223 | |
| NCP1055 | Gated Oscillator | 45.5, 103, 140 | ± 5.0 | Skip Mode | 15 | 700 | 680 | 20 | 6.3 | 7.5 to 8.5 Typ. | YES | NO | NO | YES | -40 to +150 | PDIP-7, SOT-223 | |
| NCP1027 | Current Mode | 65, 100 | ± 6.0 | Skip Mode | 5.6 | 700 | 800 | 30 | N/A | 7.2 to 8.5 Typ. | YES | YES | YES | YES | 0 to +125 | PDIP-7 | |
| NCP1028 | Current Mode | 65, 100 | ± 6.0 | Skip Mode | 5.6 | 700 | 800 | 30 | N/A | 7.2 to 8.5 Typ. | YES | YES | YES | YES | 0 to +125 | PDIP-7 | No OVP on V _{CC} Pin |



*Coming Soon.

ON Semiconductor Selector Guide – Power Management

BUCK SWITCHING REGULATOR – (INTERNAL SWITCH)

| Device | V _{IN} (V) | | V _{OUT} Options (Adj Range) | I _{OUT} (A) | F _{SW} (kHz) | Mode | Enable | Soft-Start | Comments | Temp Range (°C) | Package |
|----------|---------------------|-----|---|----------------------------|--------------------------|---------|--------|------------|---|--------------------|------------------------------|
| | Min | Max | | | | | | | | | |
| CS51411 | 4.5 | 40 | Down to 1.276 V | 1.5 A | 260 | Voltage | ✓ | ✓ | Sync capability; Pin-Compatible with LT1375 and LT1376 | -40 to +85 | SO-8 / DFN-8 |
| CS51412 | 4.5 | 40 | Down to 1.276 V | 1.5 A | 260 | Voltage | ✓ | ✓ | External Bias; Pin-Compatible with LT1375 and LT1376 | -40 to +85 | SO-8 / DFN-8 |
| CS51413 | 4.5 | 40 | Down to 1.276 V | 1.5 A | 520 | Voltage | ✓ | ✓ | Sync capability; Pin-Compatible with LT1375 and LT1376 | -40 to +85 | SO-8 / DFN-8 |
| CS51414 | 4.5 | 40 | Down to 1.276 V | 1.5 A | 520 | Voltage | ✓ | ✓ | External Bias; Pin-Compatible with LT1375 and LT1376 | -40 to +85 | SO-8 / DFN-8 |
| NCV51411 | 4.5 | 40 | Down to 1.276 V | 1.5 A | 260 | Voltage | ✓ | ✓ | Automotive version | -40 to +125 | SO-8 / DFN-8 |
| LM2574 | 4.75 | 40 | 3.3, 5, 12, 15, Adj(1.23 to 37 V) | 0.5 A | 52 | Voltage | ✓ | | No external compensation required | -40 to +125 | D2PAK / TO-220 |
| LM2575 | 4.75 | 40 | 3.3, 5, 12, 15, Adj(1.23 to 37 V) | 1.0 A | 52 | Voltage | ✓ | | No external compensation required | -40 to +125 | D2PAK / TO-220 |
| LM2576 | 4.75 | 40 | 3.3, 5, 12, 15, Adj(1.23 to 37 V) | 3.0 A | 52 | Voltage | ✓ | | No external compensation required | -40 to +125 | D2PAK / TO-220 |
| NCP1595A | 4.0 | 5.5 | Down to 0.8 V | 1.5 A | 1200 | Current | ✓ | ✓ | Internal compensation; Synchronous Rectification | 0 to +85 | DFN-6 |
| MC34166 | 7.5 | 40 | Down to 5.0 V | 3.0 A | 72 | Voltage | | | Cycle-by-Cycle current limit | 0 to +70 | D2PAK / TO-220 |
| MC33166 | 7.5 | 40 | Down to 5.0 V | 3.0 A | 72 | Voltage | | | Internal thermal shutdown | -40 to +85 | D2PAK / TO-220 |
| MC33167 | 7.0 | 40 | Down to 5.0 V | 5.0 A | 72 | Voltage | | | Large 5.0 A output capability | -40 to +85 | D2PAK / TO-220 |
| MC34167 | 7.0 | 40 | Down to 5.0 V | 5.0 A | 72 | Voltage | | | Standby Mode < 36 µA | 0 to +70 | D2PAK / TO-220 |
| NCP1500 | 2.7 | 5.4 | 1.0, 1.3, 1.5, 1.8 V | 300 mA | 270 – 630 | Voltage | | | PWM or Linear mode. Can be programmed to work in Linear LDO Regulator mode. External Sync. | -40 to +85 | Micro8™ |
| NCP1501 | 2.7 | 5.2 | 1.05, 1.35, 1.57, 1.8 V | 300 mA | 450–1000 | Voltage | | | Synchronous Rectification. Can be programmed to work in Linear LDO Regulator mode. External Sync. | -40 to +85 | Micro8™ |
| NCP1526 | 2.7 | 5.5 | PWM – 1.2V ; LDO – 2.8 V Other Options Available | PWM: 400 mA LDO: 150 mA | 3000 | Voltage | ✓ | ✓ | Dual output: PWM + LDO. Synchronous Rectification | -40 to +85 | Thin DFN-10 |
| NCP1510 | 2.5 | 5.2 | 1.05, 1.35, 1.57, 1.8 V | 500 mA | 450–1000 | Voltage | ✓ | ✓ | Synchronous Rectification. Can be programmed to work in Low Iq (14 µA) Pulsed mode at light loads. External Sync. | -40 to +85 | Micro-Bump-9 |
| NCP1590 | 2.7 | 5 | 2.5, 2.7, 3.0, 3.3 V | 600 mA | 600 – 1200 | Voltage | ✓ | ✓ | Automatic PWM/PFM mode. External Synchronization up to 1.2 MHz | -40 to +85 | Micro8™ |
| NCP1521 | 2.7 | 5.5 | 0.9 – 3.3 V | 600 mA | 1500 | Voltage | ✓ | ✓ | Auto PWM/ PFM mode. Synchronous Rectification | -40 to +85 | Thin SOT-23-5, Thin DFN-6 |
| NCP1522 | 2.7 | 5.5 | 0.9 – 3.3 V | 600 mA | 3000 | Voltage | ✓ | ✓ | Auto PWM/ PFM mode. Synchronous Rectification | -40 to +85 | Thin SOT-23-5 |
| NCP1523 | 2.7 | 5.5 | 0.9 – 3.3 V | 600 mA | 3000 | Voltage | ✓ | ✓ | Auto PWM/ PFM mode. Synchronous Rectification | -40 to +85 | Micro-Bump-8 |
| NCP1519* | 2.7 | 5.5 | 1.2, 1.5, 1.8, Adj(0.9–3.3 V) | 600 mA | 1700 | Voltage | ✓ | ✓ | Auto PWM/ PFM mode. Synchronous Rectification | -40 to +85 | Thin SOT-23-5 |
| NCP1529* | 2.7 | 5.5 | 1.2, 1.5, 1.8, Adj(0.9–3.3 V) | 1 A | 1700 | Voltage | ✓ | ✓ | Auto PWM/ PFM mode. Synchronous Rectification | -40 to +85 | Thin SOT-23-5 |

*Coming Soon.

BOOST SWITCHING REGULATOR – (INTERNAL SWITCH)

| Device | V _{IN} (V) | | V _{OUT} Options (Adj Range) | I _{OUT} (A) | F _{SW} (kHz) | Mode | Enable | Soft-Start | Comments | Temp Range (°C) | Package |
|----------|---------------------|-----|---|-------------------------|--------------------------|---------|--------|------------|---|--------------------|---------------|
| | Min | Max | | | | | | | | | |
| NCP1403 | 1.2 | 5.5 | up to 15 V | 50 mA | 300 | Voltage | ✓ | ✓ | PFM mode | -40 to +85 | Thin SOT-23-5 |
| NCP1406 | 1.4 | 5.5 | up to 25 V | 50 mA | 1000 | Voltage | ✓ | ✓ | PFM mode | -40 to +85 | Thin SOT-23-5 |
| NCP1400 | 0.8 | 5.5 | 1.8-5.0 V | 100 mA | 180 | Voltage | ✓ | ✓ | PWM mode | -40 to +85 | Thin SOT-23-5 |
| NCP1402 | 0.8 | 5.5 | 1.8-5.0 V | 200 mA | 180 | Voltage | ✓ | ✓ | PFM mode | -40 to +85 | Thin SOT-23-5 |
| NCP1410 | 1.0 | 5.5 | 1.5-5.5 V | 250 mA | 600 | Voltage | ✓ | | PFM mode. Synchronous Rectification, Low-battery detect | -40 to +85 | Micro8™ |
| NCP1423 | 0.8 | 5.5 | 1.8-5.5 V | 400 mA | 600 | Voltage | ✓ | ✓ | PFM mode. Synchronous Rectification, True-cutoff, Low-battery detect | -40 to +85 | Micro-10 |
| NCP1421 | 1.0 | 5.0 | 1.5-5.0 V | 600 mA | 1200 | Voltage | ✓ | ✓ | PFM Sync-rect, True-cutoff, Low-battery detect | -40 to +85 | Micro8™ |
| NCP1422 | 1.0 | 5.0 | 1.5-5.0 V | 800 mA | 1200 | Voltage | ✓ | ✓ | PFM mode. Synchronous Rectification, True-cutoff, Low-battery detect | -40 to +85 | DFN-10 |
| NCP5030* | 2.7 | 5.5 | 2.2-5.5 V | 1.2 A | 1000 | Current | ✓ | ✓ | Buck/ Boost Converter – can supply either regulated current or regulated output voltage | -40 to +85 | DFN-12 |
| CS5171 | 2.7 | 30 | 1.276 to 40 V | 1.5 A | 280 | Current | | ✓ | LT1372/1373 Compatible | -40 to +85 | SO-8 |
| CS5172 | 2.7 | 30 | -2.5 to 40 V | 1.5 A | 280 | Current | | ✓ | Flyback & SEPIC | -40 to +85 | SO-8 |
| CS5173 | 2.7 | 30 | 1.276 to 40 V | 1.5 A | 560 | Current | | ✓ | Easy External Synchronization | -40 to +85 | SO-8 |
| CS5174 | 2.7 | 30 | -2.5 to 40 V | 1.5 A | 560 | Current | | ✓ | Negative feedback polarity | -40 to +85 | SO-8 |

*Coming Soon.

ON Semiconductor Selector Guide – Power Management

MULTI-TOPOLOGY (STEP-UP, STEP-DOWN, INVERTING) SWITCHING REGULATOR – (INTERNAL SWITCH)

| Device | V _{IN} (V) | | V _{OUT} Options (Adj Range) | I _{OUT} (A) | F _{sw} (kHz) | Enable | Mode | Step- Up | Step- Down | Step-Up/ Step- Down | Inv | Comments | Temp Range (°C) | Package |
|----------|---------------------|-----|---|-------------------------|--------------------------|--------|------------|-------------|---------------|---------------------------|-----|--|--------------------|----------------|
| | Min | Max | | | | | | | | | | | | |
| MC34063 | 3.0 | 40 | Down to 2.5 V | 1.5 | up to 100 | ✓ | Hysteresis | ✓ | ✓ | ✓ | ✓ | Simple and flexible regulator | 0 to +70 | SO-8 / PDIP-8 |
| MC33063 | 3.0 | 40 | Down to 2.5 V | 1.5 | up to 100 | ✓ | Hysteresis | ✓ | ✓ | ✓ | ✓ | Minimal number of external components | -40 to +85 | SO-8 / PDIP-8 |
| NCV33063 | 3.0 | 40 | Down to 2.5 V | 1.5 | up to 100 | ✓ | Hysteresis | ✓ | ✓ | ✓ | ✓ | Automotive version | -40 to +125 | SO-8 |
| NCP3063 | 3.0 | 40 | Down to 2.5 V | 1.5 | up to 250 | ✓ | Hysteresis | ✓ | ✓ | ✓ | ✓ | Higher F _{sw} for optimized size and efficiency | 0 to +70 | PDIP/SO-8/DFN |
| NCP3063B | 3.0 | 40 | Down to 2.5 V | 1.5 | up to 250 | ✓ | Hysteresis | ✓ | ✓ | ✓ | ✓ | | -40 to +85 | PDIP/SO-8/DFN |
| CS5171 | 2.7 | 30 | 1.276 to 40 V | 1.5 | 280 | | Current | ✓ | | | ✓ | LT1372/1373 Compatible | -40 to +85 | SO-8 |
| CS5172 | 2.7 | 30 | -2.5 to 40 V | 1.5 | 280 | | Current | ✓ | | | ✓ | Flyback and SEPIC | -40 to +85 | SO-8 |
| CS5173 | 2.7 | 30 | 1.276 to 40 V | 1.5 | 560 | | Current | ✓ | | | ✓ | Easy External Synchronization | -40 to +85 | SO-8 |
| CS5174 | 2.7 | 30 | -2.5 to 40 V | 1.5 | 560 | | Current | ✓ | | | ✓ | Negative feedback polarity | -40 to +85 | SO-8 |
| MC34166 | 7.5 | 40 | Down to 5.0 V | 3.0 | 72 | | Voltage | | ✓ | ✓ | ✓ | Cycle-by-Cycle current limit | 0 to +70 | D2PAK / TO-220 |
| MC33166 | 7.5 | 40 | Down to 5.0 V | 3.0 | 72 | | Voltage | | ✓ | ✓ | ✓ | Internal thermal shutdown | -40 to +85 | D2PAK / TO-220 |
| MC34163 | 2.5 | 40 | Down to 1.25 V | 3.4 | up to 100 | ✓ | Hysteresis | ✓ | ✓ | ✓ | ✓ | Simple & Flexible regulator | 0 to +70 | SO-16W / PDIP |
| MC33163 | 2.5 | 40 | Down to 1.25 V | 3.4 | up to 100 | ✓ | Hysteresis | ✓ | ✓ | ✓ | ✓ | Minimal number of external components | -40 to +85 | SO-16W / PDIP |
| NCP3163 | 2.5 | 40 | Down to 1.25 V | 3.4 | up to 300 | ✓ | Hysteresis | ✓ | ✓ | ✓ | ✓ | Higher F _{sw} for optimized size and efficiency | 0 to +70 | SO-16WEP |
| NCP3163B | 2.5 | 40 | Down to 1.25 V | 3.4 | up to 300 | ✓ | Hysteresis | ✓ | ✓ | ✓ | ✓ | | -40 to +85 | SO-16WEP |
| MC34167 | 7.0 | 40 | Down to 5.0 V | 5.0 | 72 | | Voltage | | ✓ | ✓ | ✓ | Large 5.0A output capability | 0 to +70 | D2PAK/TO-220 |
| MC33167 | 7.0 | 40 | Down to 5.0 V | 5.0 | 72 | | Voltage | | ✓ | ✓ | ✓ | Standby Mode < 36 μ A | -40 to +85 | D2PAK/TO-220 |

BUCK SWITCHING CONTROLLERS (EXTERNAL SWITCH)

| Device | V _{IN} (V) | | V _{OUT} Options (Adj Range) | V _{OUT} Accuracy | F _{SW} (kHz) | Mode | Enable | Soft-Start | Synchronous | Comments | Temp Range (°C) | Package |
|-----------|---------------------|-----|--------------------------------------|---------------------------|-----------------------|------------|--------|------------|-------------|---|-----------------|---------------|
| | Min | Max | | | | | | | | | | |
| NCP5211 | 4.5 | 14 | Down to 1.0 V | 1.5% | 150 – 750 | Voltage | ✓ | ✓ | ✓ | 1.5 A drive capability | 0 to +70 | SO-14 |
| NCP5211B | 4.5 | 14 | Down to 1.0 V | 1.5% | 150 – 750 | Voltage | ✓ | ✓ | ✓ | 1.5 A drive capability | -40 to +85 | SO-14 |
| CS51031 | 4.5 | 16 | Down to 1.25 V | 2% | 200 – 700 | Hysteresis | | ✓ | | No compensation required ; PFET | -40 to +85 | SO-8 |
| CS51033 | 3.3 | 5.0 | Down to 1.25 V | 2% | 200 – 700 | Hysteresis | | ✓ | | No compensation required ; PFET | -40 to +85 | SO-8 |
| SG3525 | 8.0 | 35 | Down to 5.1 V | 1% | 100 – 400 | Voltage | ✓ | ✓ | | Flexible configurations; ST Compatible | 0 to +70 | SO-16W |
| NCP1580 | 4.5 | 15 | Down to 0.8 V | 1.5% | 350 | Voltage | | ✓ | ✓ | 1.5 A gate drive; 90% duty cycle | -40 to +85 | SO-8 |
| NCP1582/A | 4.5 | 15 | Down to 0.8 V | 1.5% | 350 | Voltage | ✓ | ✓ | ✓ | 0.7 A gate driver; Short Circuit Protection | -40 to +85 | SO-8 |
| NCP1583 | 4.5 | 15 | Down to 0.8 V | 1.5% | 300 | Voltage | ✓ | ✓ | ✓ | 0.7 A gate driver; Short Circuit Protection | -40 to +85 | SO-8 |
| NCP1571 | 2.0 | 12 | Down to 0.980 V | 1.0% | 200 | Voltage | ✓ | ✓ | ✓ | 12 V bias supply | 0 to +125 | SO-8 |
| NCP1575 | 2.0 | 12 | Down to 0.980 V | 1.0% | 200 – 500 | Voltage | | ✓ | ✓ | 12 V bias supply | 0 to +125 | SO-8 |
| NCP1550 | 2.5 | 5.5 | 1.8–3.3 V (factory prefixed) | 2.0% | 600 | Voltage | ✓ | ✓ | | Auto PWM/ PFM mode. | -40 to +85 | Thin SOT-23-5 |

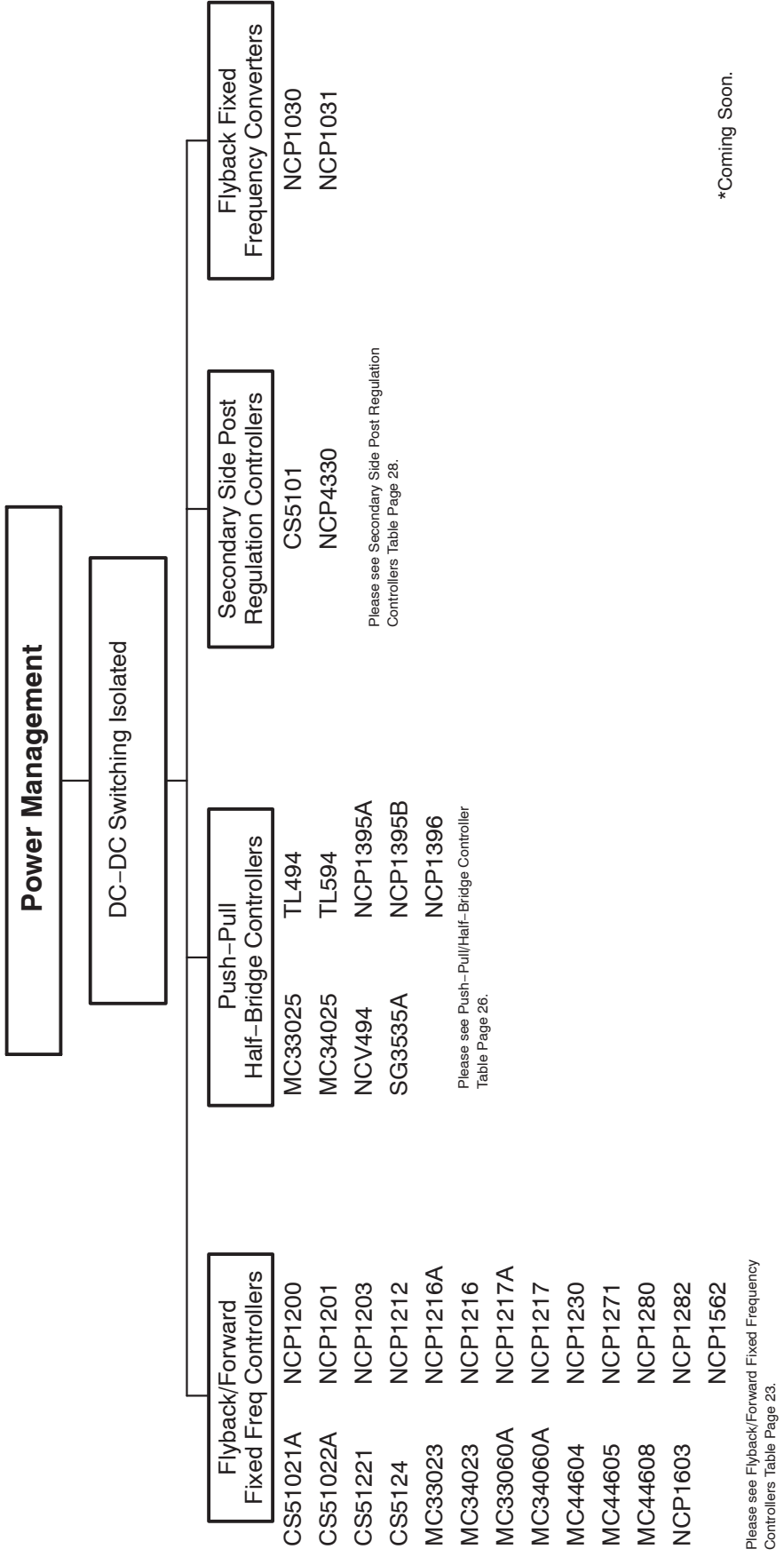
DUAL BUCK SWITCHING CONTROLLERS (EXTERNAL SWITCH)

| Device | V _{IN} (V) | | V _{OUT} Options (Adj Range) | V _{OUT} Accuracy | F _{SW} (kHz) | Mode | Enable | Soft-Start | Synchronous | Comments | Temp Range (°C) | Package |
|---------|---------------------|------|--------------------------------------|---------------------------|-----------------------|---------|--------|------------|-------------|-------------------------------------|-----------------|----------|
| | Min | Max | | | | | | | | | | |
| NCP5422 | 10.8 | 13.2 | Down to 1.0 V | 2.0% | 150 – 600 | Voltage | ✓ | ✓ | ✓ | Hiccup mode overcurrent protection | 0 to +70 | SO-16 |
| NCP5423 | 10.8 | 13.2 | Down to 1.0 V | 1.0% | 150 – 600 | Voltage | ✓ | ✓ | ✓ | 1% Voltage reference | 0 to +70 | SO-16 |
| NCP5424 | 10.8 | 13.2 | Down to 1.0 V | 2.0% | 150 – 600 | Voltage | ✓ | ✓ | ✓ | Hiccup & cycle-by-cycle overcurrent | 0 to +70 | SO-16 |
| NCP5425 | 4.6 | 13.2 | Down to 0.8 V | 1.0% | 150 – 750 | Voltage | ✓ | ✓ | ✓ | 1.5 A peak drive capability | 0 to +125 | TSSOP-20 |

BOOST SWITCHING CONTROLLERS (External Switch)

| Device | V _{IN} (V) | | V _{OUT} Options (Adj Range) | V _{OUT} Accuracy | F _{SW} (kHz) | Mode | Enable | Soft-Start | Synchronous | Comments | Temp Range (°C) | Package |
|---------|---------------------|-----|--------------------------------------|---------------------------|-----------------------|---------|--------|------------|-------------|----------|-----------------|---------------|
| | Min | Max | | | | | | | | | | |
| NCP1450 | 0.9 | 5.5 | 1.8–5.0 V (Factory Prefixed) | 2.5% | 180 | Voltage | ✓ | ✓ | | PFM mode | -40 to +85 | Thin SOT-23-5 |

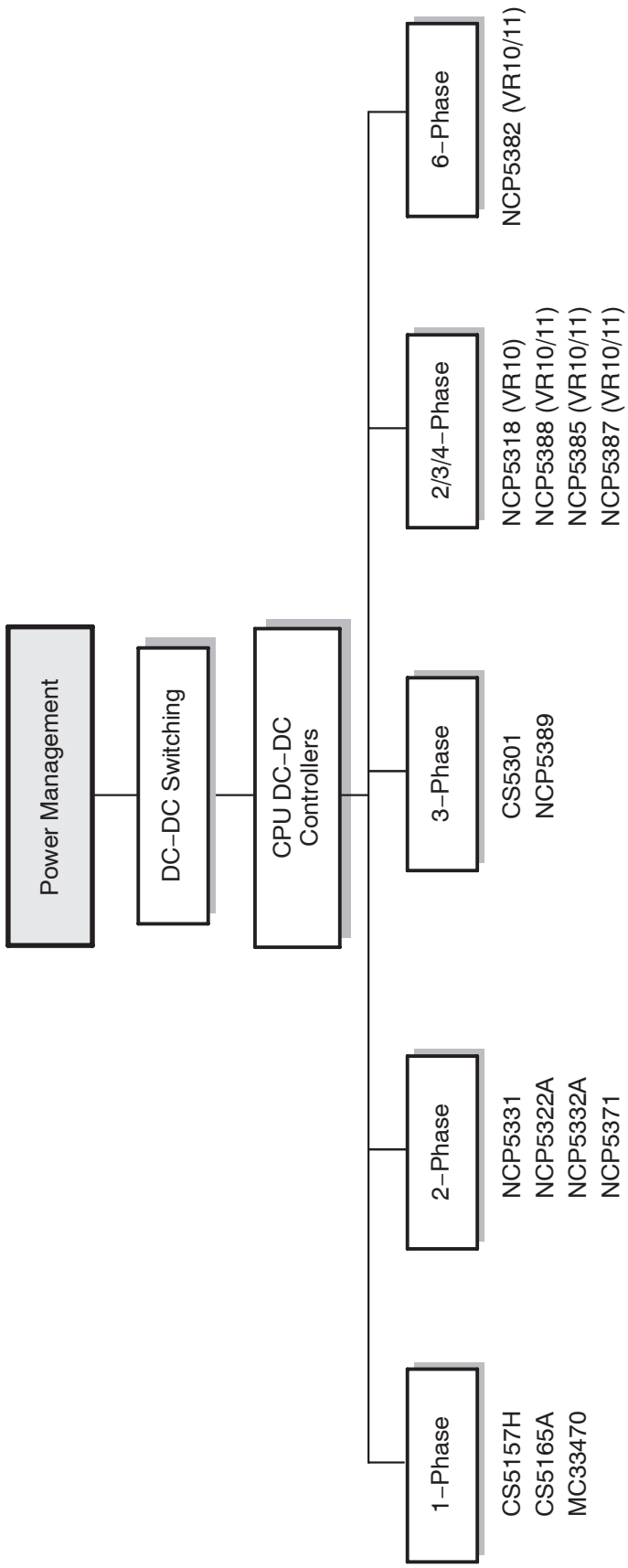
ON Semiconductor Selector Guide – Power Management

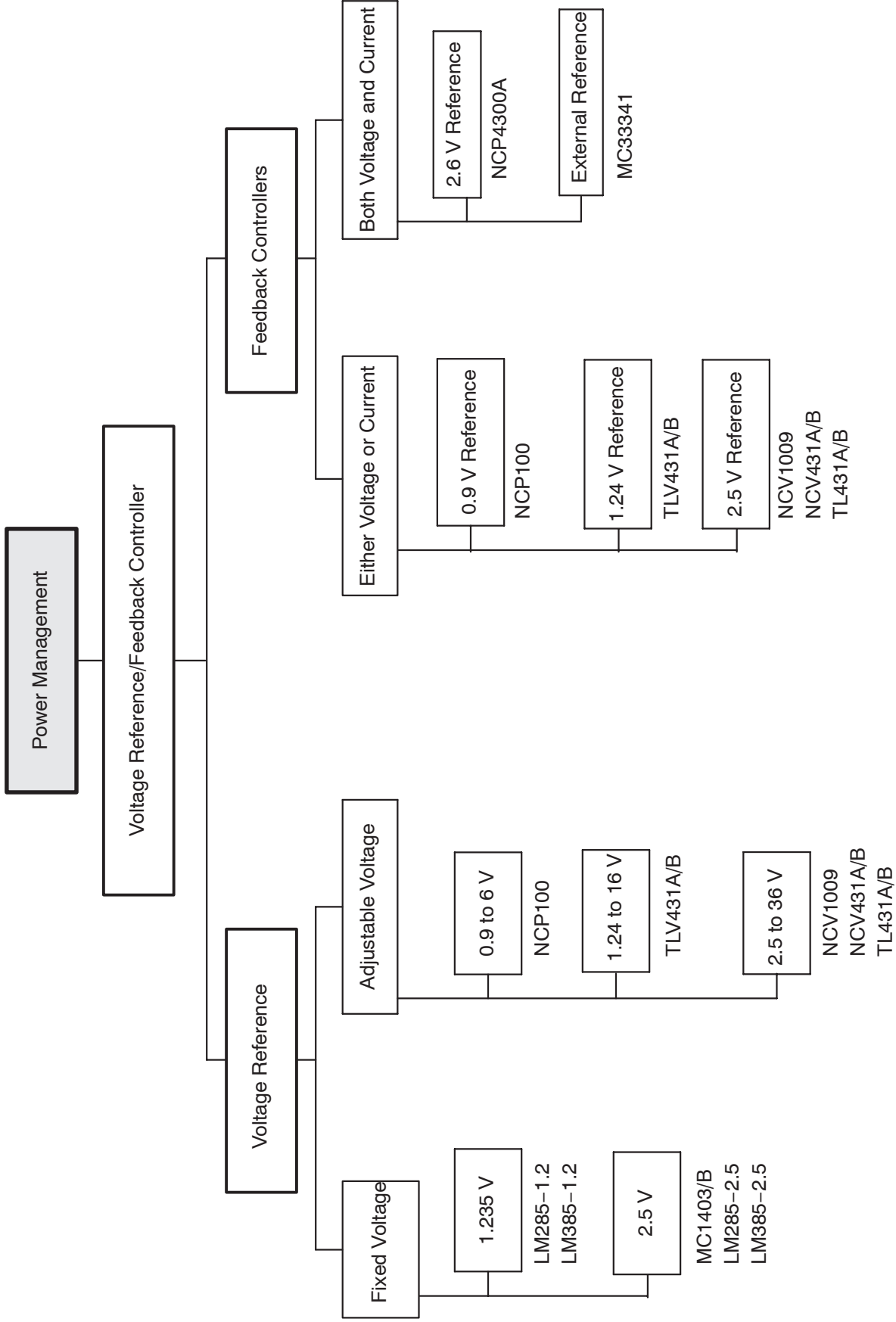


SWITCHING CONTROLLERS FOR STEP-DOWN ISOLATED TOPOLOGIES

| Device | V _{IN} (V) | | V _{OUT} Options (Adj Range) | V _{OUT} Accuracy | F _{sw} (kHz) | Mode | Enable | Soft-Start | Synchronous | Comments | Temp Range (°C) | Package |
|---------|---------------------|-----|---|------------------------------|--------------------------|-----------------|--------|------------|-------------|---|--------------------|----------------|
| | Min | Max | | | | | | | | | | |
| CS5124 | 7.7 | 75 | External | - | 400 | Current Mode | ✓ | ✓ | | Small PCB footprint; Bias for startup | -40 to +105 | SO-8 |
| CS51221 | 3.3 | 72 | Down to 1.26 V | 2% | up to 1000 | Voltage Mode | | ✓ | | Programmable features; Bias for startup | -40 to +85 | SO-16/TSSOP-16 |
| CS51021 | 3.3 | 72 | Down to 5.0 V | 1% | 200 – 1000 | Current Mode | | ✓ | | Synch; Bias for startup | -40 to +85 | SO-16/TSSOP-16 |
| CS51022 | 3.3 | 72 | Down to 5.0 V | 1% | 200 – 1000 | Current Mode | | ✓ | | Sleep mode; Bias for startup | -40 to +86 | SO-16/TSSOP-16 |
| NCP1030 | 10 | 200 | 2.5 up to V _{IN} | 2% | up to 1000 | Voltage Mode | ✓ | ✓ | | PoE applications; Integrated Switch | -40 to +125 | Micro8™ |
| NCP1031 | 10 | 200 | 2.5 up to V _{IN} | 2% | up to 1000 | Voltage Mode | ✓ | ✓ | | PoE applications; Integrated Switch | -40 to +125 | SO-8 |

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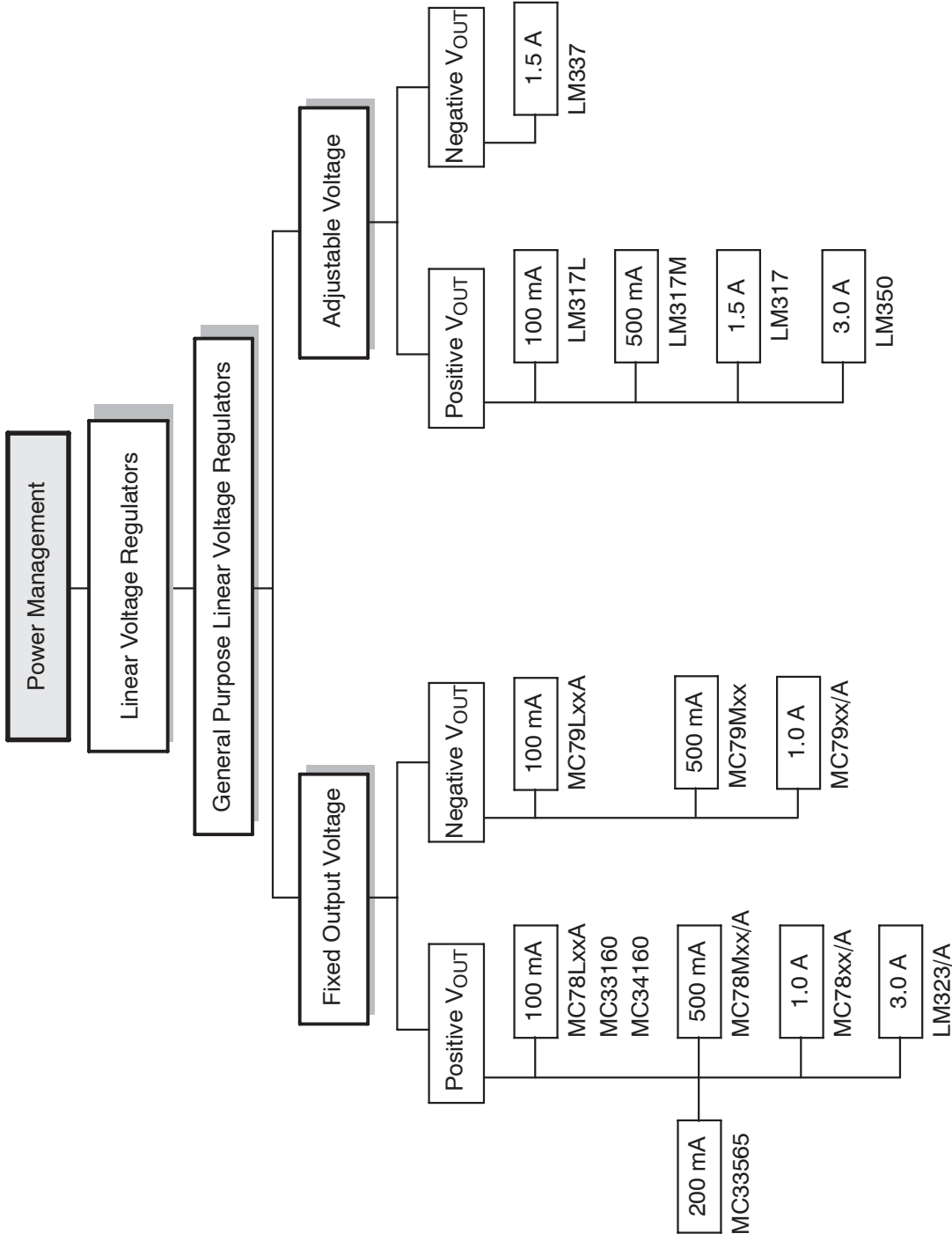
ON Semiconductor Selector Guide – Power Management
SERIES VOLTAGE REFERENCES

| Part Number | Reference Voltage (V) | Tolerance ± (%) | Typical Temperature Coefficient (ppm/°C) | Typical Quiescent Current (mA) | Package | | | Operating Temperature Range (°C) |
|-------------|-----------------------|-----------------|--|--------------------------------|---------|------|--|----------------------------------|
| | | | | | SO-8 | PDIP | | |
| MC1403 | 2.500 | 1.0 | 10 | 1.200 | ✓ | ✓ | | 0 to +70 |
| MC1403B | 2.500 | 1.0 | 10 | 1.200 | ✓ | ✓ | | -40 to +85 |

SHUNT VOLTAGE REFERENCES

| Part Number | Reference Voltage (V) | Tolerance ± (%) | Typical Temperature Coefficient (ppm/°C) | Minimum Operating Current (mA) | Package | | | | | Operating Temperature Range (°C) | |
|-------------|--------------------------|-----------------|--|--------------------------------|---------|-------|--------|---------|------|----------------------------------|-------------|
| | | | | | SO-8 | TO-92 | Micro8 | TSOP-5* | PDIP | | SOT23-3 |
| LM285-1.2 | 1.235 | 1.0 | 80 | 0.010 | ✓ | | | | | | -40 to +85 |
| LM385-1.2 | 1.235 | 2.0 | 80 | 0.015 | ✓ | | | | | | 0 to +70 |
| LM285-2.5 | 2.500 | 1.5 | 80 | 0.020 | ✓ | | | | | | 0 to +70 |
| LM385-2.5 | 2.500 | 3.0 | 80 | 0.020 | ✓ | | | | | | 0 to +70 |
| LM385B-1.2 | 1.235 | 1.0 | 80 | 0.020 | ✓ | | | | | | 0 to +70 |
| LM385B-2.5 | 2.500 | 1.5 | 80 | 0.020 | ✓ | | | | | | 0 to +70 |
| NCV1009 | 2.500 | 0.2 | - | - | ✓ | | | | | | -40 to +125 |
| NCP100 | Adjustable 0.9 to 6 V | 1.0 | 25 | 0.100 | | | | ✓ | | | -40 to +85 |
| TLV431A | Adjustable 1.24 to 16 V | 1.0 | - | 0.050 | | ✓ | | ✓ | | | -40 to +85 |
| TLV431B | Adjustable 1.24 to 16 V | 0.5 | - | 0.050 | | ✓ | | ✓ | | | -40 to +85 |
| TL431C | Adjustable 2.495 to 36 V | 2.2 | 50 | 0.500 | ✓ | ✓ | | ✓ | | | 0 to +70 |
| TL431I | Adjustable 2.495 to 36 V | 2.2 | 50 | 0.500 | ✓ | ✓ | | ✓ | | | -40 to +85 |
| TL431AC | Adjustable 2.495 to 36 V | 1.0 | 50 | 0.500 | ✓ | ✓ | | ✓ | | | 0 to +70 |
| TL431A | Adjustable 2.495 to 36 V | 1.0 | 50 | 0.500 | ✓ | ✓ | | ✓ | | | -40 to +85 |
| TL431BC | Adjustable 2.495 to 36 V | 0.4 | 50 | 0.500 | ✓ | ✓ | | ✓ | | | 0 to +70 |
| TL431BI | Adjustable 2.495 to 36 V | 0.4 | 50 | 0.500 | ✓ | ✓ | | ✓ | | | -40 to +85 |
| NCV431A | Adjustable 2.495 to 36 V | 1.0 | 50 | 0.500 | ✓ | | | | ✓ | | -40 to +125 |
| NCV431B | Adjustable 2.495 to 36 V | 0.4 | 50 | 0.500 | ✓ | | | | ✓ | | -40 to +125 |

*TSOP-5 – Also known as Thin SOT23-5.



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 GENERAL PURPOSE LINEAR VOLTAGE REGULATORS

| Output Current | Part Number | Nominal Output Voltage | | | | | | | | | | | Drop Out Voltage (Typical) | Maximum Input Voltage (V _{dc}) | Package | | | | | | | | | | | | | | | | |
|----------------|------------------|------------------------|----------|------------|-------|-------|-------|-------|-------|-------|------|------|----------------------------|--|---------|------|------|----------------|---|-------|------|-------|--------------------|---------|-------|--------|---------------------|---|---|--|--|
| | | Positive | Negative | Adjustable | 3.3 V | 5.0 V | 5.2 V | 6.0 V | 8.0 V | 9.0 V | 12 V | 15 V | | | 18 V | 20 V | 24 V | Tolerance (%) | SOP-8 | SO-16 | DPAK | DP-16 | D ² PAK | SOT-223 | TO-92 | TO-220 | Micro TM | | | | |
| 100 mA | MC78LxxA Series | ✓ | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 5.0 | 1.7 V @ 40 mA | 5.0 to 18 V Version = 30 V 12 to 18 V Version = 35 V 24 V Version = 40 V | ✓ | | | | | ✓ | ✓ | | | | | |
| 100 mA | MC79LxxA Series | | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 5.0 | 1.7 V @ 40 mA | -5.0 V Version = -30 V -12 to -18 V Version = -35 V -24 V Version = -40 V | ✓ | | | | | ✓ | | | | | | |
| 100 mA | LM317Lxx Series | ✓ | | ✓ | | | | | | | | | | | | | 4.0 | 1.9 V @ 100 mA | V _I – V _O = 40 V | ✓ | | | | | ✓ | | | | | | |
| 100 mA | MC33160 | ✓ | | | ✓ | | | | | | | | | | | | 5.0 | 2.0 V @ 100 mA | 40 V | | | | | | | | | | | | |
| 100 mA | MC34160 | ✓ | | | ✓ | | | | | | | | | | | | 5.0 | 2.0 V @ 100 mA | 40 V | | | | | | | | | | | | |
| 200 mA | MC33565 | ✓ | | | ✓ | | | | | | | | | | | | 2.0 | 2.3 V @ 100 mA | V _I – V _O = 7.0 V | ✓ | | | | | | | | | | | |
| 500 mA | MC78Mxx Series | ✓ | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 4.0 | 1.9 V @ 500 mA | 5.0 to 18 V Version = 35 V 20 to 24 V Version = 40 V | ✓ | | | | | | ✓ | ✓ | | | | |
| 500 mA | MC78MxxA Series | ✓ | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 2.0 | 1.9 V @ 500 mA | 5.0 to 18 V Version = 35 V 20 to 24 V Version = 40 V | ✓ | | | | | | ✓ | ✓ | | | | |
| 500 mA | MC79Mxx Series | | ✓ | | ✓ | | | | | | | | | | | | 4.0 | 1.1 V @ 500 mA | -35 V | ✓ | | | | | | | | | | | |
| 500 mA | LM317Mxx Series | ✓ | | ✓ | | | | | | | | | | | | | 4.0 | 2.1 V @ 500 mA | V _I – V _O = 40 V | | | | | | | | ✓ | | | | |
| 500 mA | LM317MxxA Series | ✓ | | ✓ | | | | | | | | | | | | | 2.0 | 2.1 V @ 500 mA | V _I – V _O = 40 V | | | | | | | | ✓ | | | | |
| 1.0 A | MC78xx Series | ✓ | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 4.0 | 2.0 V @ 500 mA | 5.0 to 18 V Version = 35 V 24 V Version = 40 V | ✓ | | | | | | | ✓ | ✓ | | | |
| 1.0 A | MC78xxA Series | ✓ | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 2.0 | 2.0 V @ 500 mA | 5.0 to 18 V Version = 35 V 24 V Version = 40 V | ✓ | | | | | | | ✓ | 4 | | | |
| 1.0 A | MC79xx Series | | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 4.0 | 2.0 V @ 1.0 A | -5.0 to -18 V Version = -35 V -24 V Version = -40 V | ✓ | | | | | | | | ✓ | | | |
| 1.0 A | MC79xxA Series | | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 2.0 | 2.0 V @ 1.0 A | -5.0 to -18 V Version = -35 V -24 V Version = -40 V | ✓ | | | | | | | | ✓ | 4 | | |

'xx' indicates nominal voltage

1. Available in select packages only; contact your local ON Semiconductor sales office for information.
2. Available for select voltage options only; contact your local ON Semiconductor sales office for information.

GENERAL PURPOSE LINEAR VOLTAGE REGULATORS (continued)

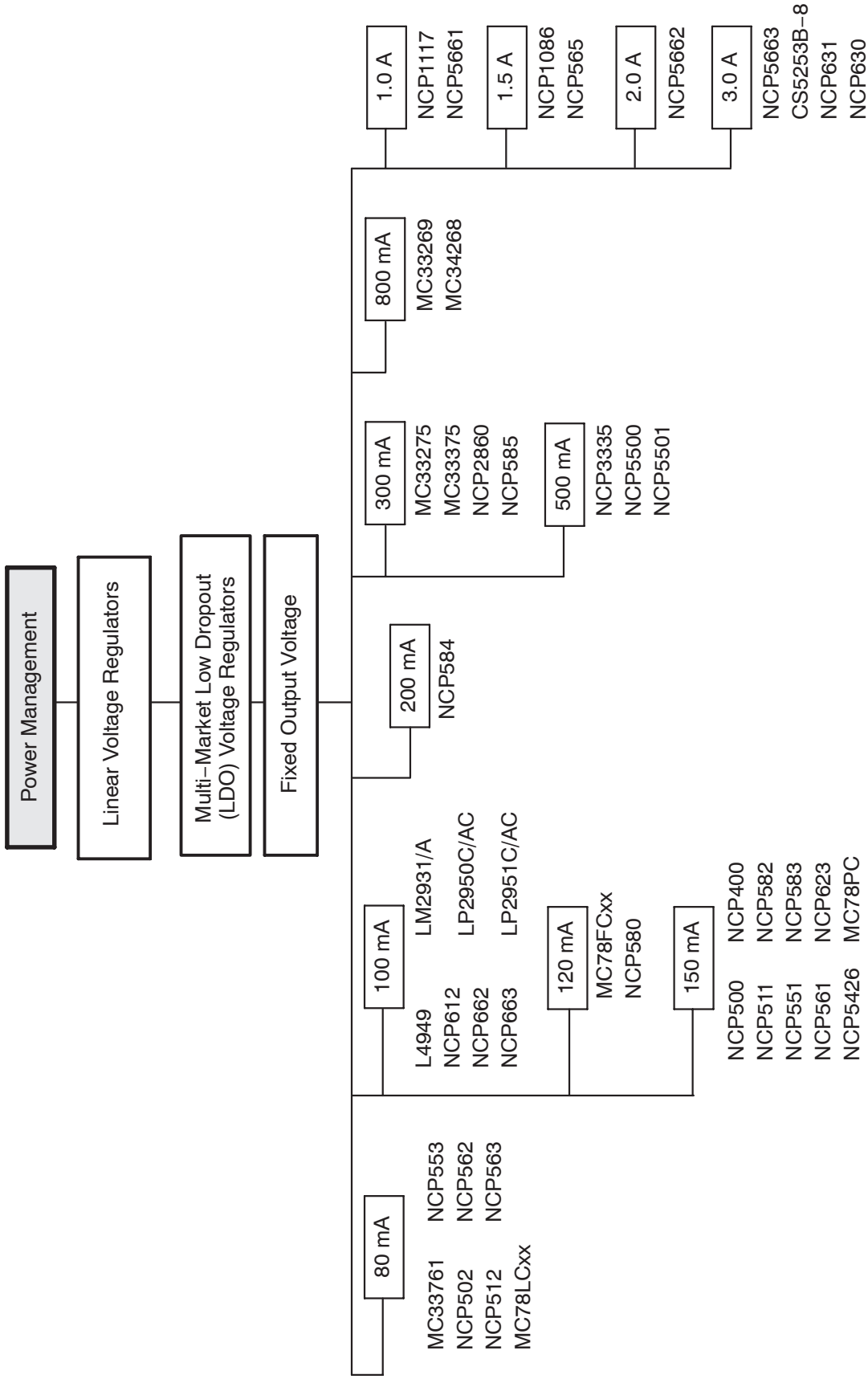
| Output Current | Part Number | Nominal Output Voltage | | | | | | | Tolerance (%) | Drop Out Voltage (Typical) | Maximum Input Voltage (V _{dc}) | Package | | | | | | | | | | | | | |
|----------------|-------------|------------------------|----------|------------|-------|------|-------|-------|---------------|----------------------------|--|---------|--------|----------------|--|--------|--------|-------|------|--------------------|---------|-------|--------|---|---|
| | | Positive | Negative | Adjustable | 5.0 V | 5.2V | 6.0 V | 8.0 V | | | | 9.0 V | 12.0 V | 15.0 V | 18.0 V | 20.0 V | 24.0 V | SOP-8 | DPAK | D ² PAK | SOT-223 | TO-92 | TO-220 | | |
| 1.5 A | LM317 | ✓ | | ✓ | | | | | | | | | 4.0 | 2.25 V @ 1.5 A | V _I - V _O = 40 V | | | | ✓ | | | | | ✓ | |
| 1.5 A | LM337 | | ✓ | | | | | | | | | | 4.0 | 2.2 V @ 1.5 A | V _I - V _O = 40 V | | | ✓ | | | | | | ✓ | |
| 3.0 A | LM323 | ✓ | | | ✓ | | | | | | | | 4.0 | 2.0 V @ 3.0 A | 20 V | | | | | | | | | | ✓ |
| 3.0 A | LM323A | ✓ | | | | ✓ | | | | | | | 2.0 | 2.0 V @ 3.0 A | 20 V | | | | | | | | | | ✓ |
| 3.0 A | LM350 | ✓ | | | | | | | | | | | 4.0 | 2.7 V @ 3.0 A | V _I - V _O = 35 V | | | | | | | | | | ✓ |

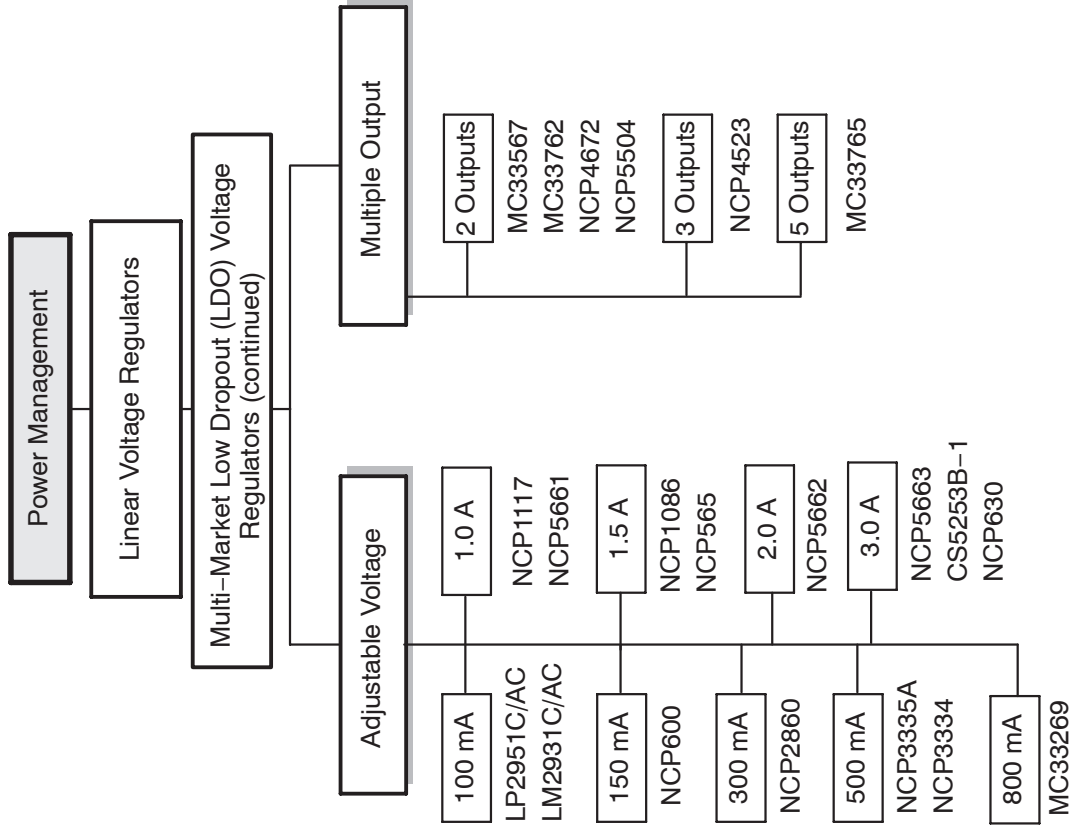
‘xx’ indicates nominal voltage

3. Available in select packages only; contact your local ON Semiconductor sales office for information.

4. Available for select voltage options only; contact your local ON Semiconductor sales office for information.

ON Semiconductor Selector Guide – Power Management





ON Semiconductor Selector Guide – Power Management
MULTI-MARKET LOW DROPOUT VOLTAGE REGULATORS

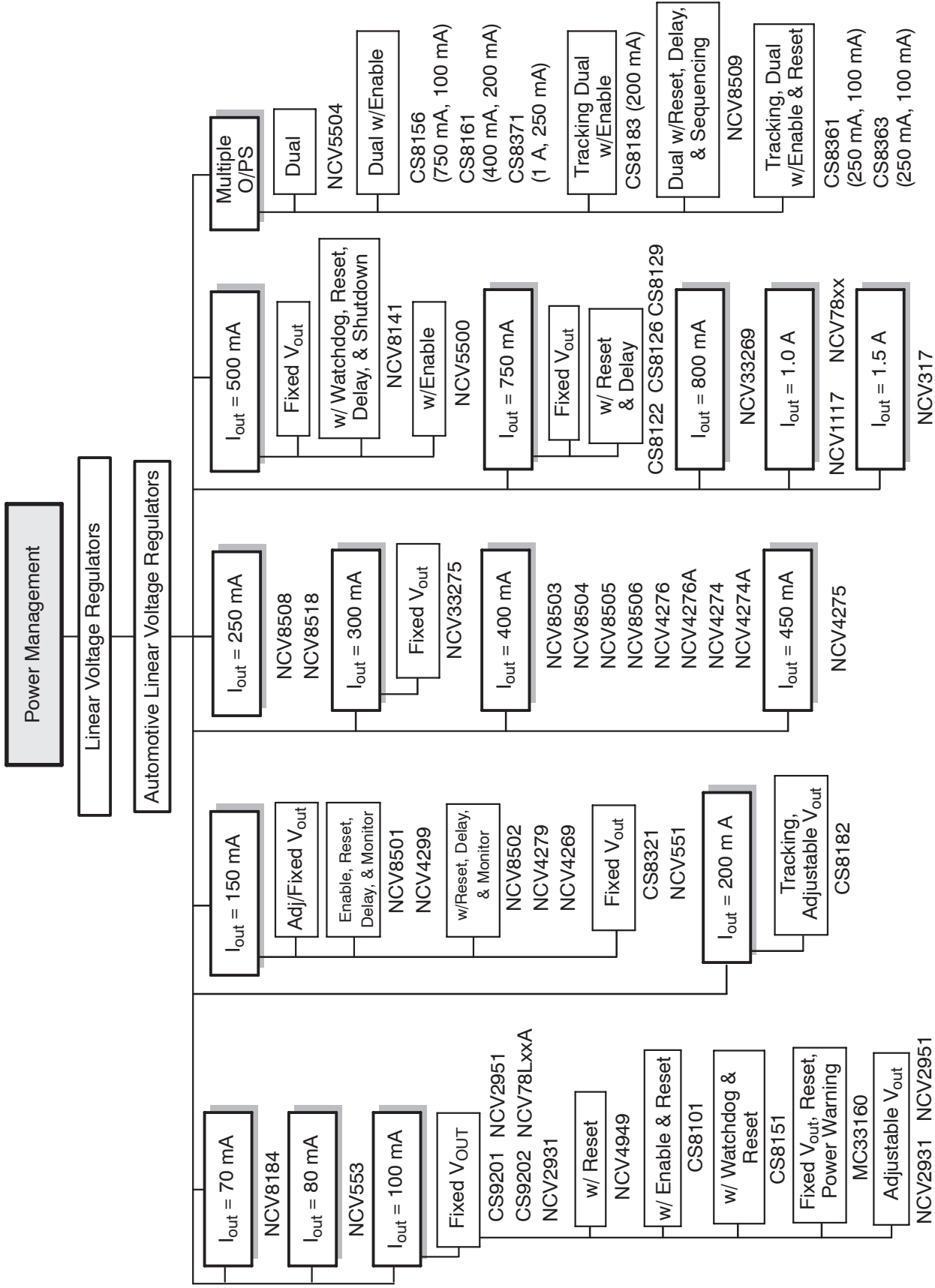
| Output Current | Part Number | Output Voltage | | | | | | | | | | | | | | | Input Voltage | | Package | | | | | | | | | | | | Additional Features | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------|-----------------|----------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|---------------|------|---------|------|------|-----|-----|----------|--------------------------------|------------------|------|------|-------|---------|---------------------|--------|--------|------|-------|-------|--------|------|-------|---------|-------|--------|-----|---------|------|--|--|--|--|----------------------------|----------------------------------|-------------------------------------|--|--|---|--|---|--|---|
| | | Adjustable | 1.3V | 1.5V | 1.8V | 2.2V | 2.5V | 2.6V | 2.7V | 2.8V | 2.9V | 3.0V | 3.2V | 3.3V | 3.5V | 3.6V | 3.8V | 4.0V | 4.75V | 5.0V | 8.0V | 10V | 12V | See Note | Tolerance (%) | Drop Out Voltage | Min. | Max. | SC-70 | SC-82AB | | SOT-23 | SOT-89 | SO-8 | SO(W) | DIP-8 | Micro8 | DPAK | D2PAK | SOT-223 | TO-92 | TO-220 | QFN | TSSOP16 | PDIP | | | | | | | | | | | | | | |
| 80 mA | MC33761 | | ✓ | | | | | | | | ✓ | | | | | | | | | ✓ | | | | 1.5 | 0.16 V @ 80 mA | - | 12 | | | ✓ | | | | | | | | | | | | | | | | | | | | w/ ENABLE, Ultra Low Noise | | | | | | | | | |
| 80 mA, 80 mA | MC33762 | | | | | ✓ | ✓ | | | | | | | | | | | | | ✓ | | | | - | 0.16 V @ 80 mA, 0.16 V @ 80 mA | - | 12 | | | | ✓ | | | | | | | | | | | | | | | | | | | | Dual, w/ ENABLE, Ultra Low Noise | | | | | | | | |
| 80 mA | NCP502 | | | | | | | ✓ | | | | | ✓ | | | | | | | | | | | 2.0 | 0.8 V @ 80 mA | - | 12 | | ✓ | | | | | | | | | | | | | | | | | | | | | Low Iq, High PSRR, ENABLE | | | | | | | | | |
| 80 mA | NCP512 | | ✓ | | | ✓ | | | | | | | ✓ | | | | | | | | | | | 2.0 | 0.25 V @ 80 mA | - | 6.0 | | | ✓ | | | | | | | | | | | | | | | | | | | | w/ ENABLE | | | | | | | | | |
| 80 mA | NCP562 | | | | | | | | | | | | | | | | | | | | | | | 2.0 | 0.25 V @ 80 mA | - | 6.0 | | | ✓ | | | | | | | | | | | | | | | | | | | | Ultra Low Iq, ENABLE | | | | | | | | | |
| 80 mA | NCP553 | | | | | | | | | | | | | | | | | | | | | | | 2.0 | 0.7 V @ 80 mA | - | 12 | | | ✓ | | | | | | | | | | | | | | | | | | | | Ultra Low Iq | | | | | | | | | |
| 80 mA | NCP563 | | | | | | | | | | | | | | | | | | | | | | | 2.0 | 0.25 V @ 80 mA | - | 6.0 | | | ✓ | | | | | | | | | | | | | | | | | | | | | Ultra Low Iq | | | | | | | | |
| 80 mA | MC78L0xx Series | | | | | | | | | | | | | | | | | | | | | | | 3.0 | 1.0 V @ 80 mA | 2.5 | 12 | | | ✓ | | | | | | | | | | | | | | | | | | | | | | Ultra Low Iq | | | | | | | |
| 100 mA | L4949 | | | | | | | | | | | | | | | | | | | | | | | 1.0 | 0.2 V @ 50 mA | 5.0 | 28 | | | ✓ | | | | | | | | | | | | | | | | | | | | | | Power-On Reset, Input Voltage Sense | | | | | | | |
| 100 mA | LM2931/A | | | | | | | | | | | | | | | | | | | | | | | 5.0, 3.8 | 0.16 V @ 100 mA | - | 40 | | | | ✓ | | | | | | | | | | | | | | | | | | | | | | | | - | | | | |
| 100 mA | LM2931C/AC | | | | | | | | | | | | | | | | | | | | | | | 5.0, 2.0 | 0.16 V @ 100 mA | - | 40 | | | | ✓ | | | | | | | | | | | | | | | | | | | | | | | | - | | | | |
| 100 mA | LP2950C/AC | | | | | | | | | | | | | | | | | | | | | | | 1.0/0.5 | 0.38 V @ 100 mA | - | 30 | | | | | ✓ | | | | | | | | | | | | | | | | | | | | | | | | | - | | |
| 100 mA | LP2951C/AC | | | | | | | | | | | | | | | | | | | | | | | 1.0/0.5 | 0.38 V @ 100 mA | - | 30 | | | | ✓ | | | | | | | | | | | | | | | | | | | | | | | | | | | | - |

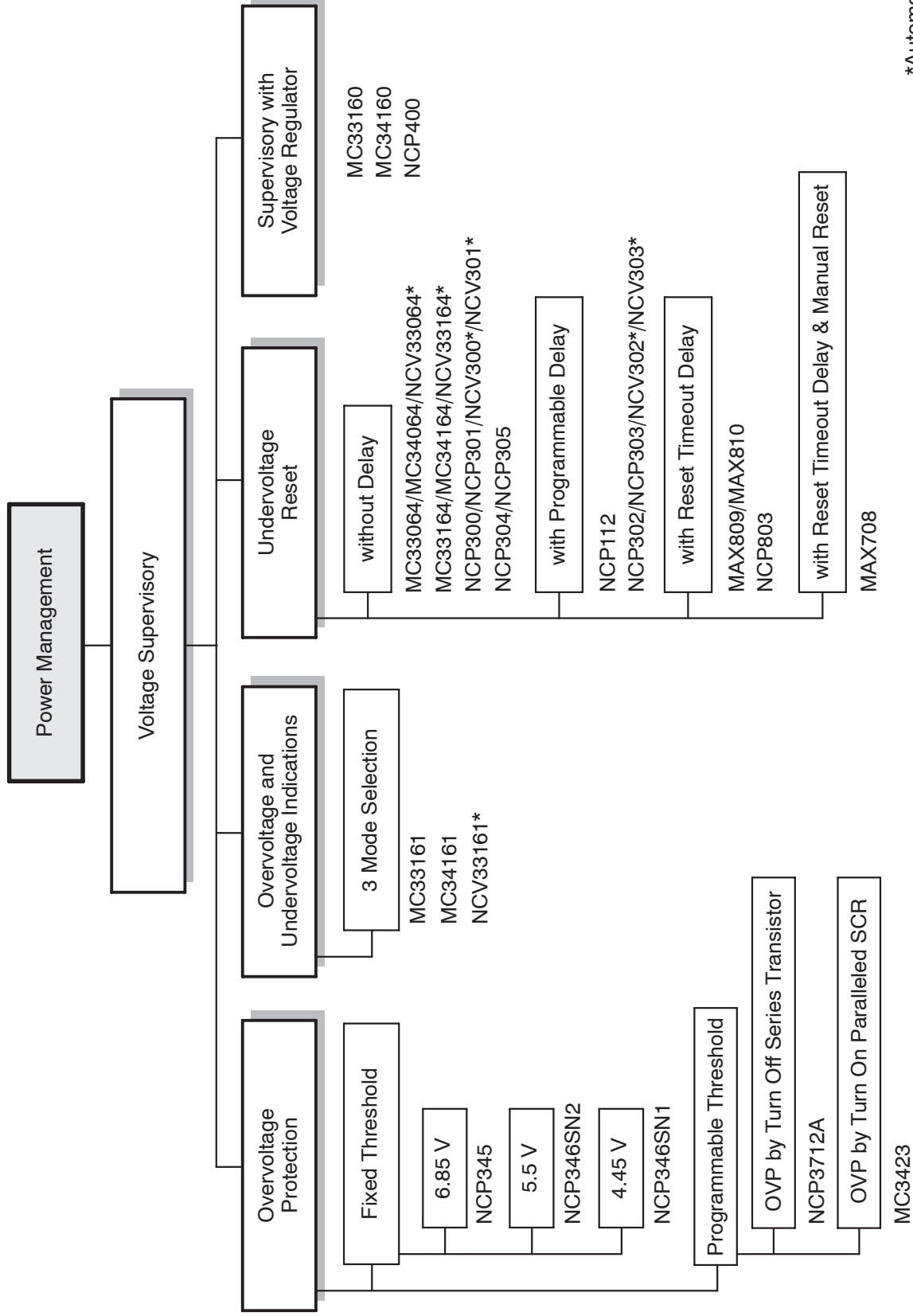
5. Output voltages from 2.0 V to 6.0 V, in 0.1 V increments, are available on request.

ON Semiconductor Selector Guide – Power Management
MULTI-MARKET LOW DROPOUT VOLTAGE REGULATORS (continued)

| Output Current | Part Number | Output Voltage | | | | | | | | | | | | | | | | | Tolerance (%) | Drop Out Voltage | Input Voltage | | Additional Features | | | | | |
|----------------|-------------|----------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------|---------------|------------------|---------------|-------|---------------------|------|------|---|------|------|
| | | Adjustable | 0.9 V | 1.2 V | 1.5 V | 1.8 V | 2.5 V | 2.6 V | 2.7 V | 2.8 V | 2.9 V | 3.0 V | 3.1 V | 3.2 V | 3.3 V | 3.8 V | 4.0 V | 4.75 V | | | 5.0 V | 8.0 V | | 10 V | 12 V | See Note | Min. | Max. |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 150 mA | NCP582 | | ✓ | ✓ | ✓ | ✓ | | | | ✓ | ✓ | | | | | | | | | | | | ✓ | 2.0 | 6.5 | ENABLE | | |
| 150 mA | NCP583 | | ✓ | ✓ | ✓ | ✓ | | | | ✓ | ✓ | | | | | | | | | | | | ✓ | 1.7 | 6.5 | ENABLE, Ultra Low Quiescent Current | | |
| 150 mA | NCP600 | ✓ | ✓ | ✓ | ✓ | ✓ | | | | ✓ | ✓ | | | | | | | | | | | | | 6.0 | 6.0 | ENABLE, Fast Turn-ON | | |
| 200 mA | NCP584 | | ✓ | ✓ | ✓ | ✓ | | | | ✓ | ✓ | | | | | | | | | | | | | 6.5 | 6.5 | ENABLE, Tri-Mode | | |
| 300 mA | MC333275 | | | | ✓ | | | | | ✓ | ✓ | | | | | | | | | | | | ✓ | - | 12 | - | - | |
| 300 mA | MC33375 | | | | ✓ | | | | | ✓ | ✓ | | | | | | | | | | | | ✓ | - | 12 | w/ ENABLE | | |
| 300 mA | NCP2860 | ✓ | | | | | ✓ | | | | | | | | | | | | | | | | | 6.0 | 6.0 | Low Noise 60 μV FAULT Indicator, ENABLE | | |
| 300 mA | NCP585 | | ✓ | ✓ | ✓ | ✓ | | | | ✓ | ✓ | | | | | | | | | | | | | 6.5 | 6.5 | ENABLE, Tri-Mode | | |
| 500 mA | NCP5501 | | | ✓ | | | | | | | | | | | | | | | | | | | | 18 | 18 | Low Noise | | |
| 500 mA | NCP3335A | ✓ | | | | ✓ | | | | | ✓ | | | | | | | | | | | | ✓ | -0.3 | 16 | ENABLE, High Accuracy | | |
| 500 mA | NCP3384 | ✓ | | | | | | | | | | | | | | | | | | | | | ✓ | -0.3 | 16 | ENABLE, High Accuracy | | |

7. Output voltages from 2.0 V to 6.0 V, in 0.1 V increments, are available on request.





*Automotive

ON Semiconductor Selector Guide – Power Management VOLTAGE SUPERVISORY

| Description | Typical Threshold Voltage (V_{th}) (V) | Supply Voltage Range (V) | Typical Supply Current (μ A) | Maximum Supply Current (μ A) | Threshold Hysteresis (Typ) (mV) | Operating Temp. Range ($^{\circ}$ C) | Package | Description | Time Delay (Typ) |
|-------------|--|--|-----------------------------------|-----------------------------------|--|---------------------------------------|---------------------|--|---|
| MAX809 | 4.90, 4.63, 4.55, 4.38, 4.00, 3.08, 2.93, 2.63, 2.32, 1.60 * | 1.0 to 5.5 | 0.5 | 2.0 | - | -40 to +105 | SOT23 | 3-Pin Microprocessor Reset Monitors | 240 msec |
| MAX810 | 4.63, 4.38, 3.08, 2.93, 2.63 * | 1.0 to 5.5 | 0.5 | 2.0 | - | -40 to +105 | SOT23 | 3-Pin Microprocessor Reset Monitors | 240 msec |
| MC33064 | 4.60 | 1.0 to 6.5 | 390 | 500 | 20 | -40 to +85 | SO-8, Micro8, TO-92 | Undervoltage Sensing Circuit | Ext. Capacitor Dependent |
| MC34064 | 4.60 | 1.0 to 6.5 | 390 | 500 | 20 | 0 to +70 | SO-8, Micro8, TO-92 | Undervoltage Sensing Circuit | Ext. Capacitor Dependent |
| MC33161 | 1.27 | 2.0 to 40 (Pos Sensing) 4.0 to 40 (Neg Sensing) | 560 | 900 | 25 | -40 to +85 | SO-8, DIP-8 | Universal Voltage Monitor | Ext. Capacitor Dependent |
| MC34161 | 1.27 | 2.0 to 40 (Pos Sensing) 4.0 to 40 (Neg Sensing) | 560 | 900 | 25 | 0 to +70 | SO-8, DIP-8 | Universal Voltage Monitor | Ext. Capacitor Dependent |
| MC33164 | 2.71 (V_{IN} Increasing) 2.65 (V_{IN} Decreasing) | 1.0 to 10 | 24 | 40 | 60 | -40 to +125 | SO-8, Micro8, TO-92 | Micropower Undervoltage Sensing Circuits | Ext. Capacitor Dependent |
| MC34164 | 2.71 (V_{IN} Increasing) 2.65 (V_{IN} Decreasing) | 1.0 to 10 | 24 | 40 | 60 | 0 to +70 | SO-8, Micro8, TO-92 | Micropower Undervoltage Sensing Circuits | Ext. Capacitor Dependent |
| MC3423 | 2.6 | 4.5 to 40 | 6.0 mA | 10 mA | - | 0 to +70 | SO-8, DIP-8 | Overvoltage Crowbar Sensing Circuit | 0.5 μ sec |
| NCP300/1 | 0.9, 1.8, 2.0, 2.7, 3.0, 4.5, 4.7 | 0.8 to 10 | 0.20 to 0.34** | 1.2 to 1.4** | 45 to 235 Depends on Threshold Voltage | -40 to +125 | Thin SOT23-5 | Voltage Detector Series NCP300-CMOS, NCP301-Open Drain | High to Low 45-97** μ sec Low to High 77-130** μ sec |

*Voltages from 1.6 to 4.9 V by steps of 0.1 V are available upon request.

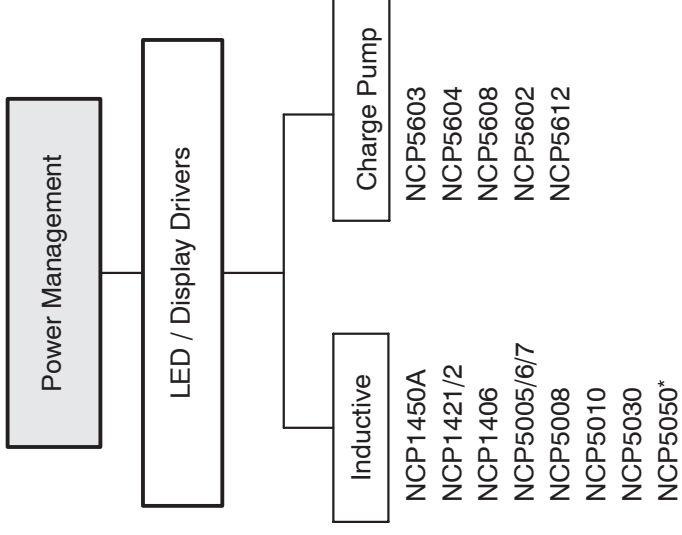
**Depends on the voltage threshold of the part.

VOLTAGE SUPERVISORY (continued)

| Description | Typical Threshold Voltage (V _{th}) (V) | Supply Voltage Range (V) | Typical Supply Current (μA) | Maximum Supply Current (μA) | Threshold Hysteresis (Typ) (mV) | Operating Temp. Range (°C) | Package | Description | Time Delay (Typ) |
|-------------|--|--------------------------|-----------------------------|-----------------------------|--|----------------------------|---------------|--|--|
| NCP302/3 | 0.9, 1.8, 2.0, 2.7, 3.0, 4.5, 4.7 | 0.8 to 10 | 0.20 to 0.34** | 1.2 to 1.4** | 45 to 235 Depends on Threshold Voltage | -40 to +125 | Thin SOT23-5 | Voltage Detector Series with Programmable Delay NCP302-CMOS, NCP303-Open Drain | Ext. Capacitor Dependent |
| NCP304/5 | 0.9, 1.8, 2.0, 2.7, 3.0, 4.5, 4.7 | 0.8 to 10 | 0.8 to 1.1** | 3.0 to 3.9** | 45 to 235 Depends on Threshold Voltage | -40 to +125 | SC-82AB | Voltage Detector Series NCP304-CMOS, NCP305-Open Drain | High to Low 10-18** μsec Low to High 6-21** μsec |
| NCP345 | 6.85 | 3.0 to 25 | 750 | 1000 | 100 | -40 to +85 | Thin SOT23-5 | Overvoltage Protection IC | 10 μsec |
| NCP346 | 4.45, 5.5 | 3.0 to 25 | 750 | 1000 | 50 | -40 to 85 | Thin SOT23-5 | Overvoltage Protection IC | 1.8 msec Turn-On 0.5 μsec Turn-Off |
| NCP803 | 4.63, 4.38, 3.08, 2.93, 2.63, 2.32, 1.60 | 1.0 to 5.5 | 0.5 | 2.0 | - | -40 to +105 | SOT-23 | 3 Pin Microprocessor, Reset Monitors | 240 ms |
| NCP112 | 3.3, 5.0, 12 | 4.5 to 16 | 3.0 mA | 5.0 mA | - | 0 to +85 | SO-14 PDIP-14 | Triple Supervisor for Desktop Power Supply Monitoring | Programmable ON/OFF, Power Good, Undervoltage Blocking |

**Depends on the voltage threshold of the part.

ON Semiconductor Selector Guide – Power Management



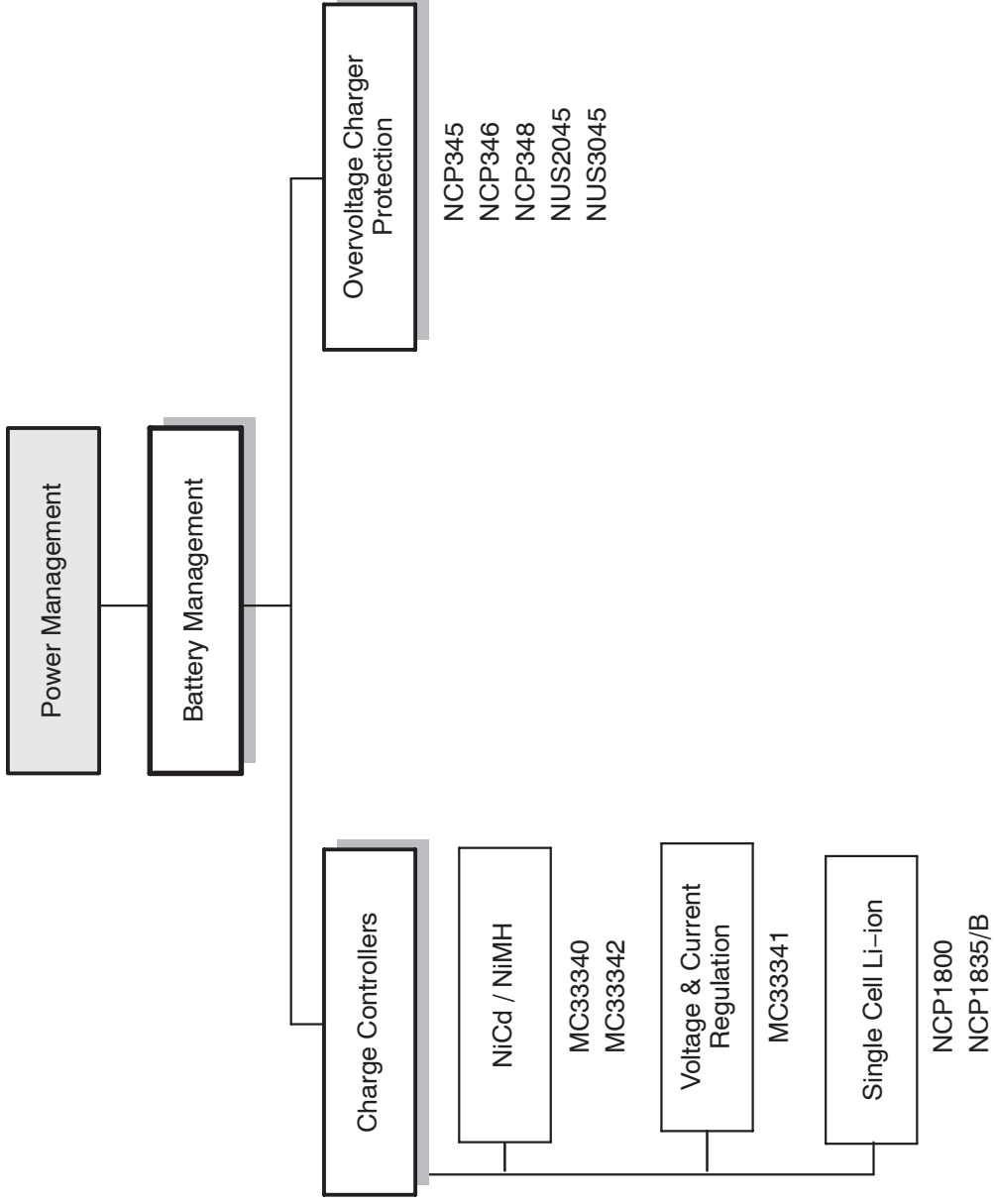
*Coming Soon.

LED/DISPLAY DRIVERS

| Application | WLED Type | Number of LED/ Connection | Converter Topology | ON Solution | Key Features |
|----------------------|---|----------------------------------|--------------------|---|--|
| Display Backlighting | | 2 – 5 LED/Series | Inductive | NCP5006/5007: Up to 92% efficiency, PFM, Boost, 21 V / 1 W output, Thin SOT23-5 | Simple |
| | | 3 – 5 LED/Series | Inductive | NCP5005: Enhanced version of NCP5006. High EMI immunity. | Simple |
| | | 4 – 5 LED/Series | Inductive | NCP5010: 1 MHz PWM Boost, 22 V/0.5 W output integrated rectifier and true-cutoff, Micro-Bump-8 (1.7 x 1.7 mm) | Highly Integrated Driver |
| | Standard, 10 mA – 25 mA | 2 LEDs/Parallel | Charge Pump | NCP5602: 90% peak efficiency, 2 outputs (25 mA each); 2% current matching, I2C, LGA 12 (2 x 2 mm) | ICON Model I2C Dimming Control |
| | | 2 LEDs/Parallel | Charge Pump | NCP5612: 2 outputs (25 mA each); I2C, LGA 12 (2 x 2 mm) | S-Wire Link Dimming Control |
| | | 2 – 6 LEDs/Series | Inductive | NCP1406: Up to 90% efficiency, PFM (up to 1 MHz), 25 V/0.5 W output, Thin SOT23-5 (3 x 3 mm) | Can Operate from 1 or 2 Alkaline or NI-based Cells |
| | | 3 or 4 LEDs/Parallel | Charge Pump | NCP5064A/B: Consistence 90% efficiency, 3 or 4 outputs (25 mA each); 0.5% current matching, TQFN16 (3 x 3 x 0.8 mm) | NCP5604A: Drives 4 LEDs NCP5604B: Drives 3 LEDs |
| | Low Current – Up to 50 mA for 1 Cell / 100 mA for 2 Cell | Single LED | Inductive | NCP1400ASN50: Fixed frequency PWM micropower boost converter, Thin SOT23-5 (3 x 3 mm) | Can Operate from 1 or 2 Alkaline or NI-based Cells |
| | Medium Current / Multi-die LED, 100 mA – 350 mA | Single or (Multiple in Parallel) | Charge Pump | NCP5603: 200 mA cont./350 mA pulsed, voltage regulated output, 4.5 V or 5 V, 75% eff., DFN (3 x 3 mm) | High-Current Single Output Charge Pump |
| | Medium Current Up to 50 mA for 2 Cells and 100 mA for 3 Cells | 2 – 6 LEDs/Series | Inductive | NCP1406: Up to 90% efficiency, PFM (up to 1 MHz) 25 V/0.5 W output, Thin SOT23-5 (3 x 3 mm) | Simple, Low Cost |
| Flash (Torch) | High Current LED, Up to 600 mA | Single or (Multiple in Parallel) | Inductive | NCP1421: PFM Boost (up to 1.2 MHz), Sync-rect, Output up to 5 V, 600 mA cont. 94% eff., true-cutoff, 50 nA shut-down current, Micro8 (3 x 4.9 mm) | Synchronous Rectification |
| | High Current LED, Up to 800 mA | Single or (Multiple in Parallel) | Inductive | NCP1422: PFM Boost (up to 1.2 MHz), Sync-rect, Output up to 5 V, 800 mA cont. 94% eff., true-cutoff, 50 nA shut-down current, DFN10 (3 x 3 mm) | Synchronous Rectification |
| | High Current LED, Up to 1 A | 2 – 5 LEDs/Series | Inductive | NCP5050*: 23 V/4.5 W output, PWM, 1.7 MHz, DFN-10 | Integrated Switch for 2 Adjustable Output Current Levels |
| | LED (10 mA – 25 mA), Flash LED (100 mA – 300 mA) | 4 LED + Flash LED | Charge Pump | NCP5608: Consistent 90% efficiency, 8 outputs (4 @ 25 mA each + 4 @ 100 mA each); 0.5% current matching, TQFN24 (4 x 4 mm) | One Chip Lighting Solution |
| OLED Driver Supply | – | – | Inductive | NCP1406: Up to 90% efficiency, PFM (up to 1 MHz), 25 V/0.5 W output, Thin SOT23-5 (3 x 3 mm) | Can Operate from 1 or 2 Alkaline or NI-based Cells |

*Coming Soon.

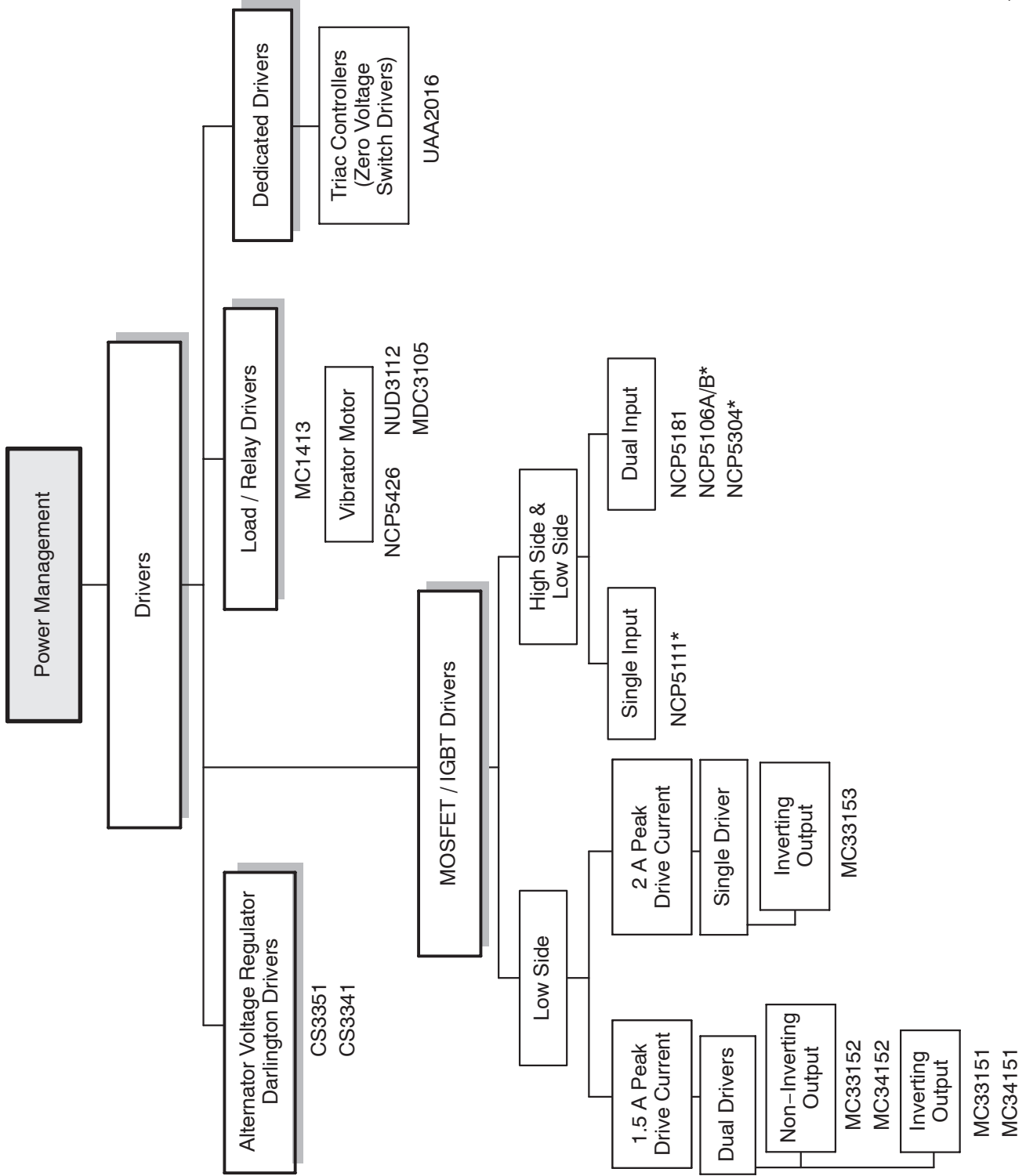
ON Semiconductor Selector Guide – Power Management



BATTERY MANAGEMENT

| Device | Description | Package | Key Features |
|-----------|---|---------------|--|
| NCP1800 | Single-Cell Lithium Ion CCCV Battery Charger | Micro8™ | <ul style="list-style-type: none"> Industry Leading Standby Current 0.5 μA Adjustable Charge Current Limit |
| MC33340/2 | Nickel Chemistry Battery Cradle Charger | SO-8 | <ul style="list-style-type: none"> Peak Voltage Detection |
| NCP345 | Overvoltage Protection IC | SOT23-5 | <ul style="list-style-type: none"> 30 V Capability, 6.85 V Detect Threshold 1 μS Overvoltage Disconnect Time |
| NCP346 | Adjustable Overvoltage Protection IC | SOT23-5 | <ul style="list-style-type: none"> 30 V Capability, 4.4 V and 5.5 V Detect Threshold 1 μS Overvoltage Disconnect Time |
| NCP348 | Positive overvoltage protection controller with internal low R_{ON} N-MOSFET and status flat. | DFN-10 | <ul style="list-style-type: none"> No External MOSFET |
| NCP1835 | Up to 1 A Single-Cell Lithium-ion/Polymer Integrated CCCV Battery Charger | DFN-10 | <ul style="list-style-type: none"> No External MOSFET |
| NCP1835B | Up to 300 mA Single-Cell Lithium-ion/Polymer Integrated CCCV Battery Charger | DFN-10 | <ul style="list-style-type: none"> No External MOSFET |
| NUS2045 | Overvoltage Protection IC with Integrated 20 V P-Channel Power MOSFET | DFN-8 | <ul style="list-style-type: none"> Integrated NCP345 + 20 V P-Channel MOSFET |
| NUS3045 | Overvoltage Protection IC with Integrated 30 V P-Channel Power MOSFET | DFN-8 | <ul style="list-style-type: none"> Integrated NCP345 + 30 V P-Channel MOSFET |
| MC33341 | Power Supply Battery Charger Regulation Control Unit | SO-8 DIP-8 | <ul style="list-style-type: none"> Operating Voltage Range of 2.3 V to 16 V |

ON Semiconductor Selector Guide – Power Management



*Coming Soon.

MOSFET/IGBT DRIVERS

| Part No. | Configuration | Peak Output Current | Typical Output Voltage Risettime (ns) (From 10% to 90% with 1 nF Load) | Typical Output Voltage Falltime (ns) (From 90% to 10% with 1 nF Load) | Typical Input/Output Delay (ns) | Typical Propagation Delay Matching @ 25°C (ns) | Maximum Bridge Voltage (V) | Maximum Supply Voltage (V) | Package |
|------------|---|-------------------------------|---|--|---------------------------------|--|----------------------------|----------------------------|------------------|
| NCP5111 | Single Input | 220 mA Source, 680 mA Sink | 150 (Note 1) | 50 (Note 1) | 750/100 | 20 | 600 | 20 | PDIP-8 SOIC-8 |
| NCP5181 | Dual Inputs | 1.1 A Source, 2.4 A Sink | 40 (Note 1) | 20 (Note 1) | 100/100 | 20 | 600 | 20 | PDIP-8 SOIC-8 |
| NCP5106A/B | Dual Inputs | 220 mA Source, 680 mA Sink | 150 (Note 1) | 50 (Note 1) | 100/100 | 20 | 600 | 20 | PDIP-8 SOIC-8 |
| NCP5304 | Dual Inputs | 220 mA Source, 680 mA Sink | 150 (Note 1) | 50 (Note 1) | 100/100 | 20 | 600 | 20 | PDIP-8 SOIC-8 |
| MC33153 | Single, Inverting Protection Circuits for IGBTs | 1.0 A Source, 2.0 A Sink | 17 (Note 1) | 17 (Note 1) | 80/120 | - | - | 20 | PDIP-8 SOIC-8 |
| MC33151 | Dual, Inverting Extended Operating Temperature | 1.5 A | 17 (Note 2) | 17 (Note 2) | 80/120 | - | - | 20 | PDIP-8 SOIC-8 |
| MC34151 | Dual, Inverting | 1.5 A | 17 (Note 2) | 17 (Note 2) | 80/120 | - | - | 20 | PDIP-8 SOIC-8 |
| MC33152 | Dual, Non-Inverting Extended Operating Temperature | 1.5 A | 14 (Note 2) | 15 (Note 2) | 55/40 | - | - | 20 | PDIP-8 SOIC-8 |
| MC34152 | Dual, Non-Inverting | 1.5 A | 14 (Note 2) | 15 (Note 2) | 55/40 | - | - | 20 | PDIP-8 SOIC-8 |

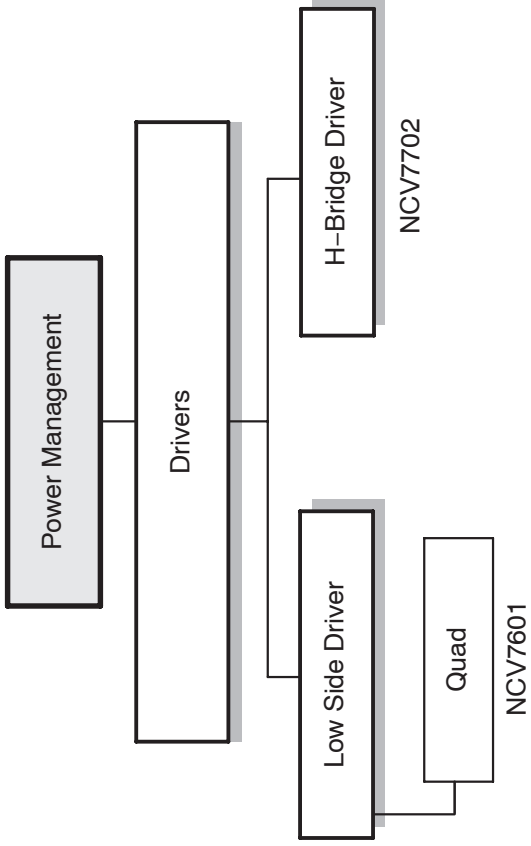
1. $V_{CC} = 15\text{ V}$
2. $V_{CC} = 12\text{ V}$

ALTERNATOR VOLTAGE REGULATOR DARLINGTON DRIVERS

| Part Number | Description | Features | | | | | Protection | | | | | |
|-------------|--|----------------------|----------------|--------------------------|--------------------------------|-----------------|------------|----------------|-----------------|-------------|---------------|---|
| | | Input Supply Voltage | Peak Transient | Supply Current (Enabled) | Compensated Regulation Voltage | Lamp Output Pin | Sense Pin | Stator Powerup | Overtemperature | Overvoltage | Short Circuit | |
| CS3341 | Alternator Voltage Regulator Darlington Driver | 27 V | 80 V | 25 mA | √ | √ | √ | √ | √ | √ | √ | √ |
| CS3351 | Alternator Voltage Regulator Darlington Driver | 8.0 V | 80 V | 25 mA | √ | √ | √ | √ | √ | √ | √ | √ |

**ON Semiconductor Selector Guide – Power Management
DEDICATED DRIVERS**

| Part Number | Description | Input Supply Voltage | | Supply Current | Features | | | | | | | | Package | |
|-------------|--------------------------------------|----------------------|--------|----------------|--------------------------------|--------------------------|-----------------------------|-----------------|----------------|-----------|--|----------------|---------|-------------------|
| | | -9.0 V | 1.5 mA | | Zero Voltage Switch for Triacs | Direct AC Line Operation | Programmable Temp Reduction | Sensor Failsafe | Adj Hysteresis | Sense Pin | Proportional Temp Reg Over $\pm 1^{\circ}\text{C}$ | Stator Powerup | | |
| UAA2016 | Zero Voltage Switch Power Controller | -9.0 V | 1.5 mA | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | SOIC-8, PDIP-8 |



**ON Semiconductor Selector Guide – Power Management
SMART DRIVERS (HIGH-SIDE, LOW-SIDE & H-BRIDGE)**

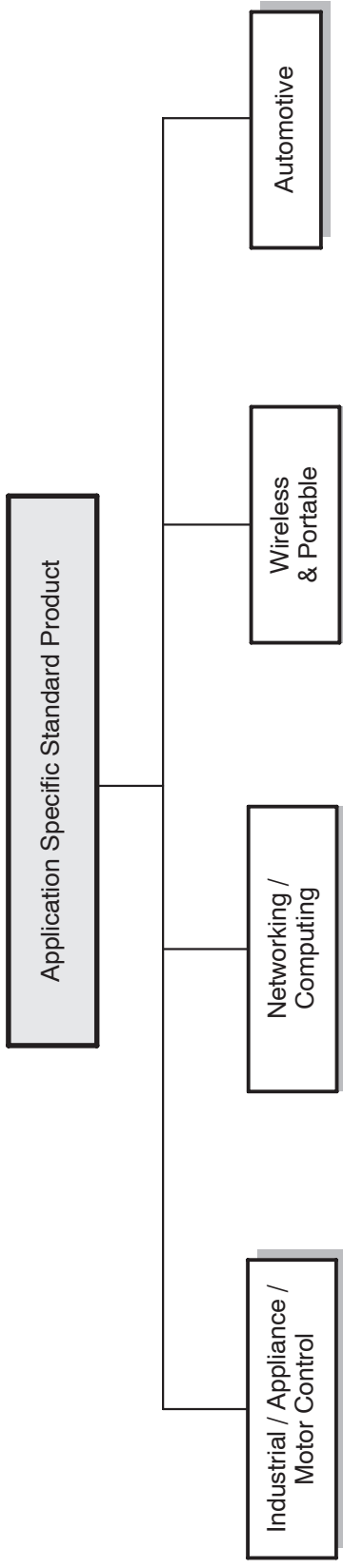
| Part | | Output | | Features | | | | | | | | | | Protection | | | | |
|----------|-----------------------------------|---------|------------------------|-----------------------|---------------------|-----------------|------------------|-----------------|----------------------|---------------------|----------------|---------------|-------------|------------------|----------------------------------|----------------|--|--|
| Number | Description | Current | $R_{DS(on)}$ @ 25°C | On-Chip Flyback Diode | Active Output Clamp | Parallel Inputs | Serial Interface | Fault Reporting | Undervoltage Lockout | Open Load Detection | Power On Reset | Current Limit | Overvoltage | Over Temperature | Low Duty Cycle Over Current Mode | Peak Transient | | |
| NCV7702B | Configurable Dual H-Bridge Driver | 750 mA | | √ | | √ | | √ | | | | √ | √ | √ | √ | 30 V | | |

LS QUAD DRIVER

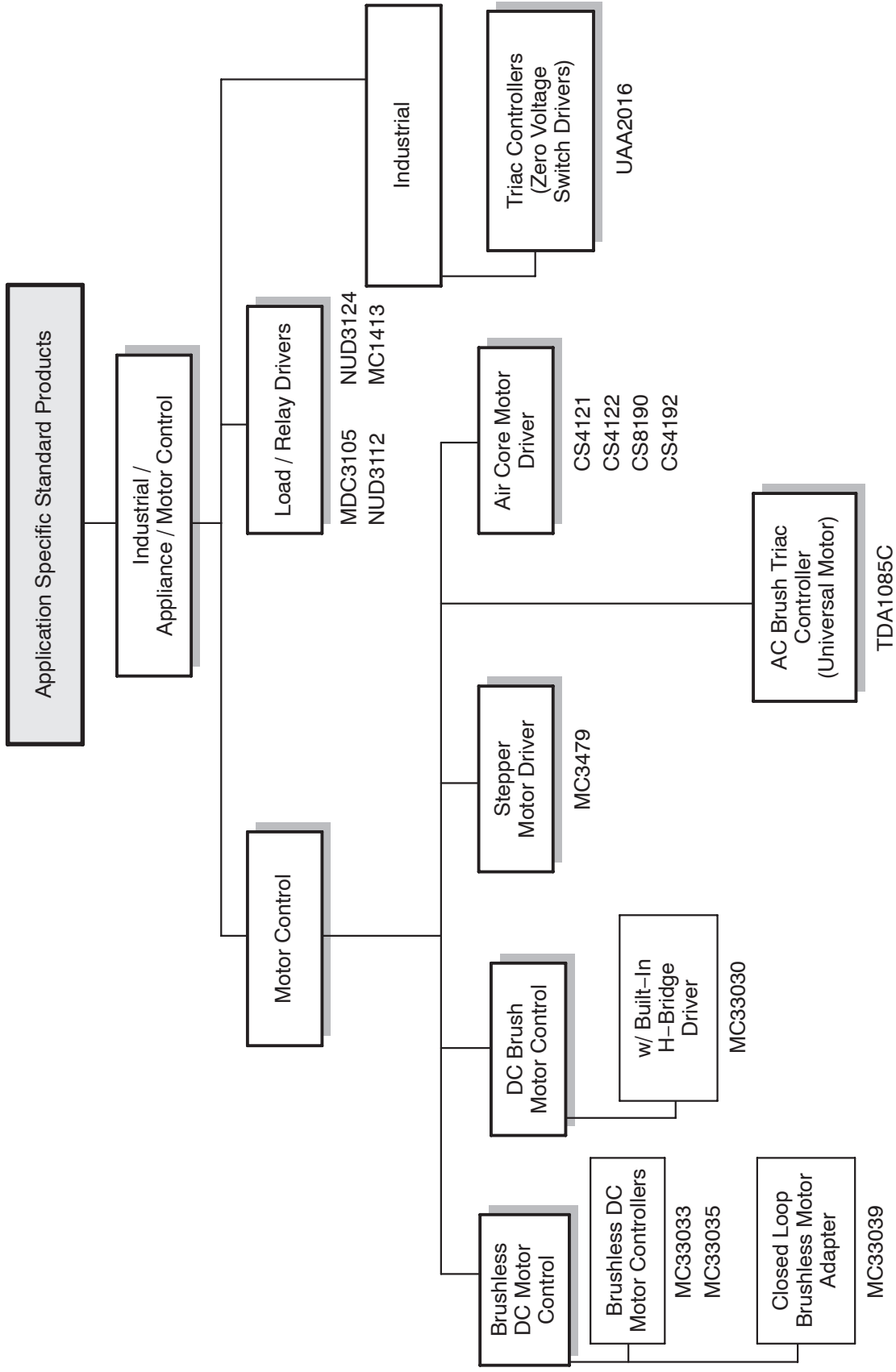
| Part Number | Description | Input Supply Voltage | Drivers: Sustaining | Saturation Voltage | Output Clamping Diodes | Compatible Inputs | Package |
|-------------|----------------|----------------------|---------------------|--------------------|------------------------|-------------------|---------|
| NCV7601 | LS Quad Driver | 7.0 V | 40 V | 650 mV (max) | √ | TTL/DTL/CMOS | DIP-16 |

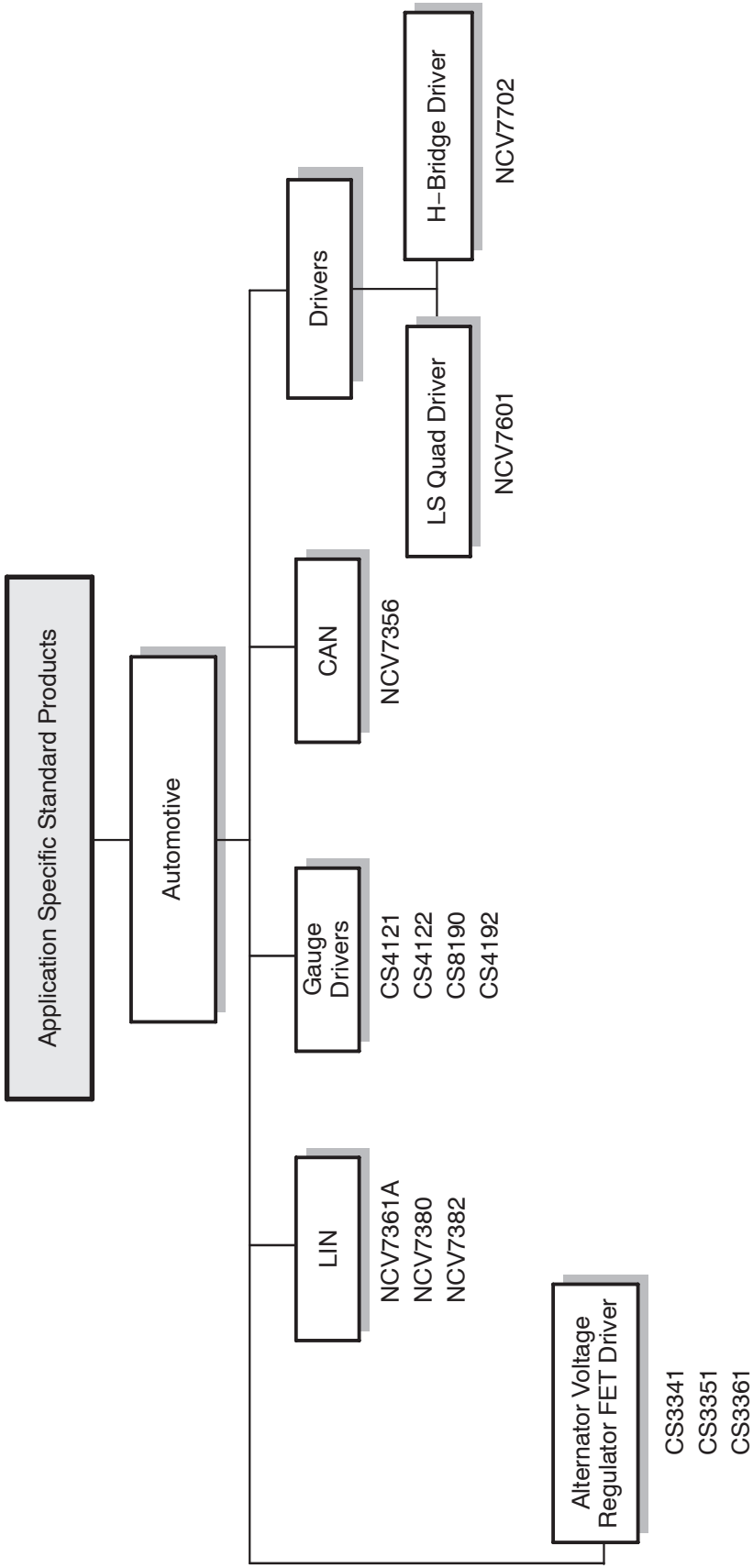
LS PRE-DRIVER

| Part Number | Description | Number of Channels | Output Current (mA) | Compatibility | Parallel Inputs | Serial Inputs | PowerOn Reset | Current Limit | Short to Ground | Open Load | Shorted to Load |
|-------------|-------------------------|--------------------|---------------------|---------------|-----------------|---------------|---------------|---------------|-----------------|-----------|-----------------|
| NCV7513 | Hex Low-Side Pre-Driver | 6 | 1.9 – 5.25 | 3.3 V/5 V | √ | √ | √ | √ | √ | √ | √ |



ON Semiconductor Selector Guide – Power Management





**ON Semiconductor Selector Guide – Power Management
SMART DRIVERS (HIGH-SIDE, LOW-SIDE & H-BRIDGE)**

| Part | | Output | | Features | | | | | | | | | | Protection | | | | |
|---------|-----------------------------------|---------|-------------------------------|-----------------|---------------------|-----------------|------------------|-----------------|----------------------|---------------------|----------------|---------------|---------------|------------------|----------------|-------------------|----------------|--|
| Number | Description | Current | R _{DS(on)} @ 25°C | On-Chip Flyback | Active Output Clamp | Parallel Inputs | Serial Interface | Fault Reporting | Undervoltage Lockout | Open Load Detection | Power On Reset | Current Limit | Overtolerance | Over Temperature | Low Duty Cycle | Over Current Mode | Peak Transient | |
| NCV7702 | Configurable Dual H-Bridge Driver | 750 mA | | ✓ | | ✓ | | ✓ | | | | ✓ | ✓ | ✓ | ✓ | ✓ | 30 V | |

LIN TRANSCEIVERS

| Part Number | Operating Range | | Supply Current (Recessive) | | | Supply Current (Dominant) | | | Supply Current (Sleep Mode) | BUS Short Ckt Current | LIN Compatibility |
|-------------|-----------------|------|----------------------------|-----------------|-----------------|---------------------------|-----------------|--------|-----------------------------|----------------------------|-------------------|
| | Min | Max | I _S | I _{CC} | I _{CC} | I _{CC} | I _{CC} | | | | |
| NCV7380 | 7.0 | 18 V | 10 µA | 14 µA | 1.0 mA | 0.8 mA | 0.8 mA | – | 120 mA | LIN 1.3/2.0 | |
| NCV7382 | 7.0 | 18 V | 25 µA | 50 µA | 0.9 mA | 0.6 mA | 0.6 mA | 6.5 µA | 120 mA | LIN 1.3/2.0 | |
| NCV7361A | 5.25 | 18 V | – | 110 µA (max) | – | – | – | 35 µA | 40 mA | LIN 1.3/2.0 & SAE J2602 | |

CAN TRANSCEIVERS

| Part Number | Description | Operating Range | | Supply Current (Recessive) | | | Supply Current (Dominant) | | | Supply Current (Sleep Mode) |
|-------------|-----------------------------|-----------------|------|----------------------------|-----------------|-----------------|---------------------------|-----------------|-------|-----------------------------|
| | | Min | Max | Normal Mode | High Speed Mode | High Speed Mode | Normal Mode | High Speed Mode | | |
| NCV7356 | Single Wire Can Transceiver | 5.0 | 27 V | 5.0 mA | 8.0 mA (max) | 5.0 mA | 8.0 mA (max) | 30 mA | 70 mA | 30 µA |

DC BRUSH MOTOR CONTROL

| Part Number | Description | Input Supply Voltage | | Power H-Switch | Features | | | | | | | | Protection | | | Package |
|-------------|----------------------------------|----------------------|-------|----------------|----------------|-------------------|--------------------------------|--|-------------------------------------|-----------------------------------|-----------------------------|-------------|------------|---|---|---------|
| | | 36 V | 1.0 A | | On-Chip Op Amp | Window Comparator | Self Centering Reference Input | Drive & Brake Logic w/Direction Memory | Temp Compensated Regulation Voltage | Programmable Overcurrent Detector | Programmable Shutdown Delay | Overvoltage | | | | |
| MC33030 | DC Servo Motor Controller/Driver | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | SO-14 |

LS QUAD DRIVER

| Part Number | Description | Input Supply Voltage | Drivers: Sustaining | Saturation Voltage | Output Clamping Diodes | Compatible Inputs | Package |
|-------------|----------------|----------------------|---------------------|--------------------|------------------------|-------------------|---------|
| NCV7601 | LS Quad Driver | 7.0 V | 40 V | 650 mV (max) | ✓ | TTL/DTL/CMOS | DIP-16 |

CLOSED LOOP BRUSHLESS MOTOR ADAPTER

| Part Number | Description | Input Supply Voltage | Supply Current | Constant Speed Operation | Internal Shunt Regulator | Features | | | | | | Package |
|-------------|--|----------------------|----------------|--------------------------|--------------------------|---------------------------|------------------------------------|-------------------------|------------------------|-----------------|---|-------------|
| | | | | | | Sensor Electrical Phasing | TTL Compatible Inputs w/Hysteresis | Programmable Monostable | Digital Edge Detectors | Inverter Output | | |
| MC33039 | Designed Primarily for use w/MC33035 Brushless Motor | 5.5 V | 5.0 mA | Down to 100 RPM | 8.25 V | 60°/300° and 120°/240° | ✓ | ✓ | ✓ | ✓ | ✓ | SO-8, DIP-8 |

ON Semiconductor Selector Guide – Power Management
ALTERNATOR VOLTAGE REGULATOR FET DRIVERS

| Part Number | Description | Input Supply Voltage | | | Peak Transient | Supply Current (Enabled) | Features | | | | | | Protection | | | Package | |
|-------------|--|----------------------|-------|-------|----------------|--------------------------|----------|------|------|------|-------|------|--------------------------------|-----------------|-----------|---------|----------------|
| | | 27 V | 8.0 V | 27 V | | | 80 V | 80 V | 80 V | 27 V | 8.0 V | 27 V | Compensated Regulation Voltage | Lamp Output Pin | Sense Pin | | Stator Powerup |
| CS3341 | Alternator Voltage Regulator Darlington Driver | 27 V | 80 V | 25 mA | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | SO-14 |
| CS3351 | Alternator Voltage Regulator Darlington Driver | 8.0 V | 80 V | 25 mA | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | SO-14 |
| CS3361 | Alternator Voltage Regulator FET Driver | 27 V | 80 V | 10 mA | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | SO-14 |

TRIAC CONTROLLERS

| Part Number | Description | Input Supply Voltage | Supply Current | Zero Voltage Switch for Triacs | Features | | | | | | | | | | Package | |
|-------------|--------------------------------------|----------------------|----------------|--------------------------------|--------------------------|-----------------------------|------------------|----------------|-----------|--|----------------|---|---|---|---------|----------------|
| | | | | | Direct AC Line Operation | Programmable Temp Reduction | Sensor Fail-safe | Adj Hysteresis | Sense Pin | Proportional Temp Reg Over $\pm 1^{\circ}\text{C}$ | Stator Powerup | | | | | |
| UAA2016 | Zero Voltage Switch Power Controller | -9.0 V | 1.5 mA | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | SO-8, PIP-8 |

STEPPER MOTOR DRIVER

| Part Number | Description | Input Supply Voltage | Drive Capability | Input Hysteresis | Output Driver | Features | | | | | | Package | | |
|-------------|--|----------------------|------------------|------------------|----------------|----------------------------|----------------------|--------------------------------------|--------------------------|------------------------------------|---|---------|---|---------|
| | | | | | | TTL/CMOS Compatible Inputs | Back-EMF Suppression | Selectable High/Low Output Impedance | Full/Half Step Operation | Allows Reversing Rotation of Motor | | | | |
| MC3479 | Drives a 2-Phase Stepper Motor in the Bipolar Mode | 7.2 to 16.5 V | 350 mA | 400 mV (min) | Open-Collector | √ | √ | √ | √ | √ | √ | √ | √ | PDIP-16 |

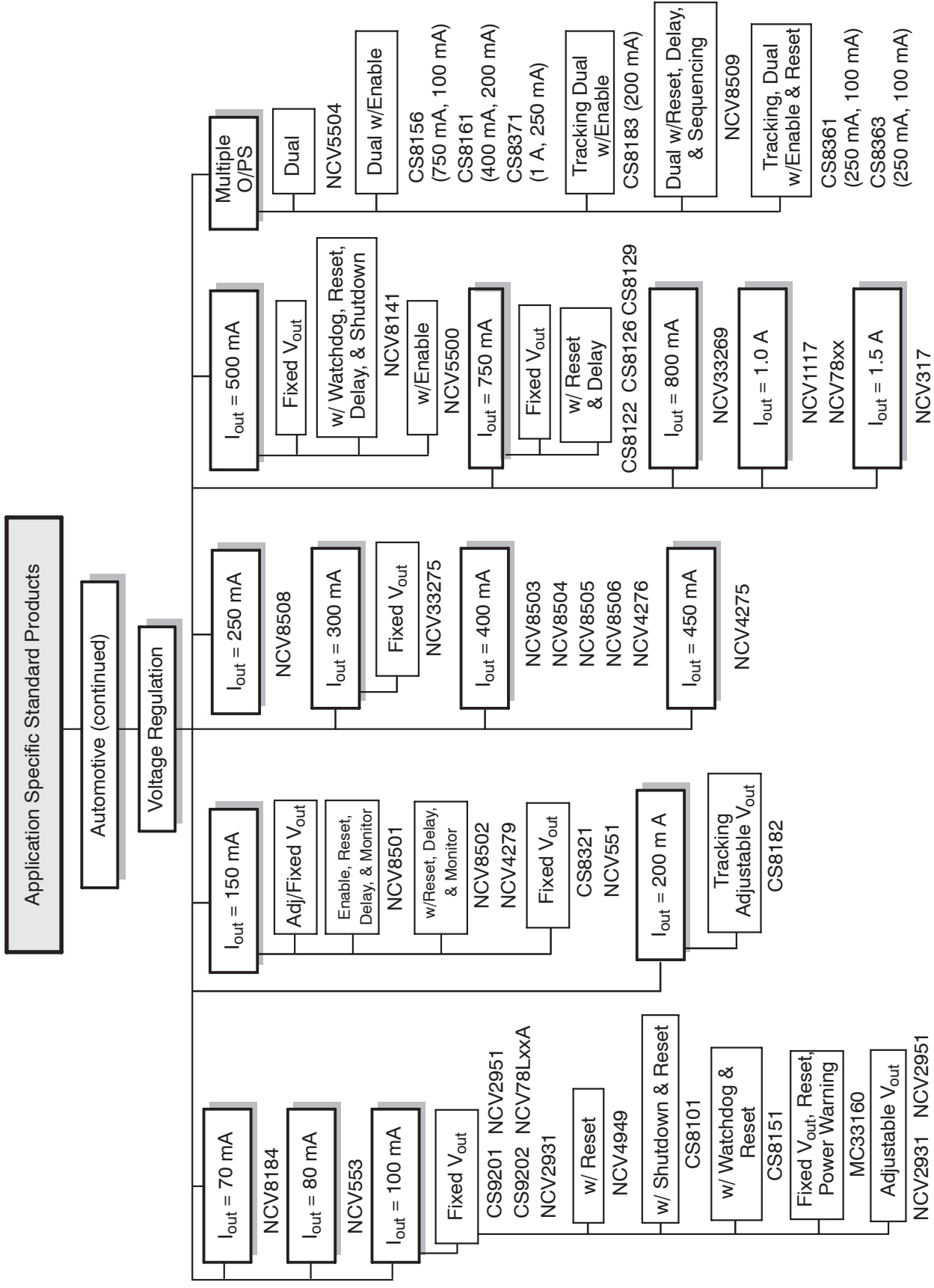
BRUSHLESS DC MOTOR CONTROLLERS

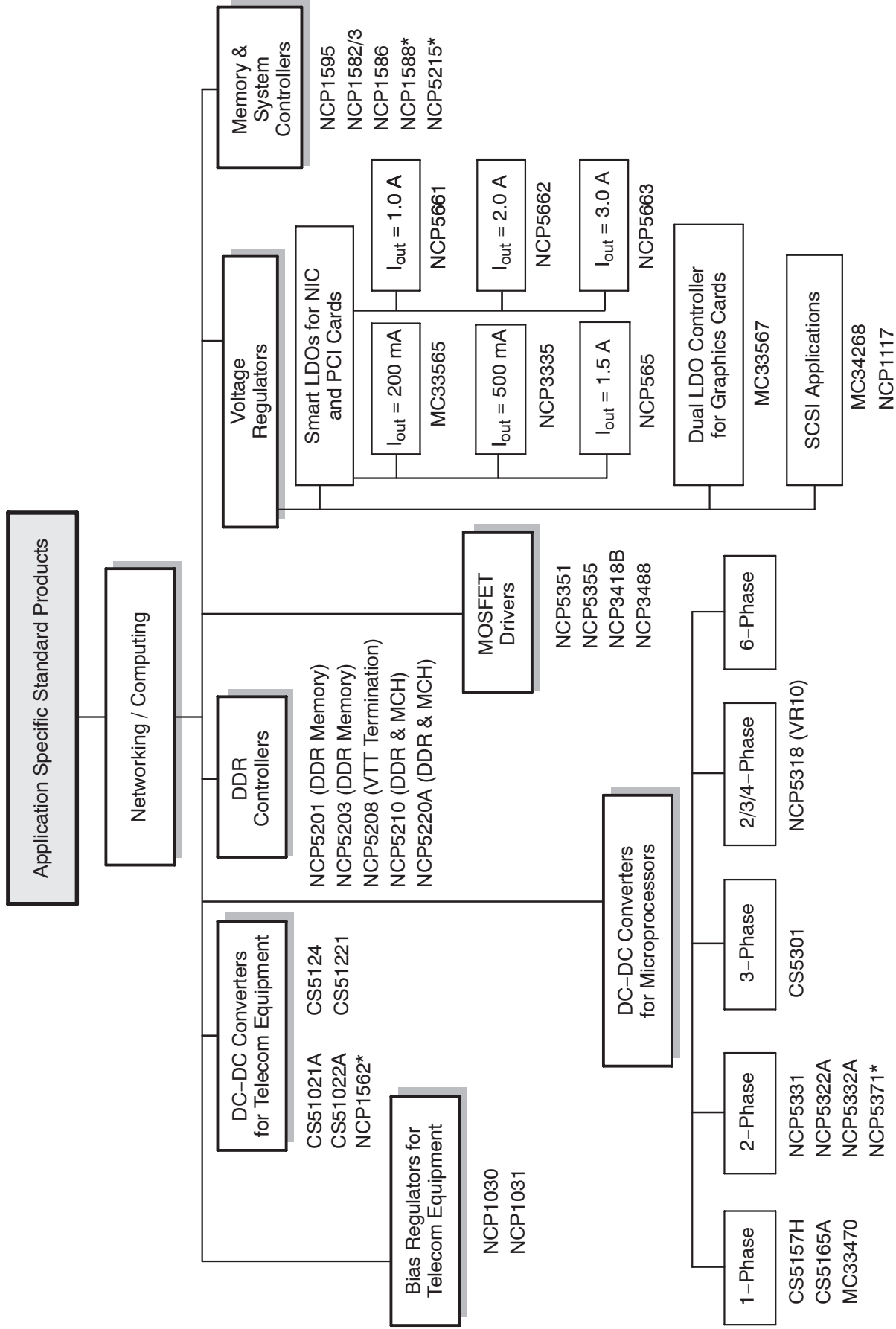
| Device | Operating Voltage Range (V) | | V _C | Under-voltage Lockout | Internal Thermal Shutdown | Fwd/Rev Control | Sensor Electrical Phasing | Output Enable | Output Drivers | | 6.25 V Reference Output | Current Sense Comparator Input(s) | Error Amplifier | FAULT Output | Separate Drive V _C Input | Brake Input | Package |
|---------|-----------------------------|----------------|----------------|-----------------------|---------------------------|-----------------|---------------------------|---------------|---------------------|----------------------|-------------------------|-----------------------------------|-----------------|--------------|-------------------------------------|----------------|---------|
| | V _{CC} | V _C | | | | | | | Totem Pole (Bottom) | Open Collector (Top) | | | | | | | |
| MC33033 | 10 – 30 | - | | ✓ | ✓ | ✓ | 60°/300° and 120°/240° | ✓ | ✓ | ✓ | ✓ | Noninv. Only | ✓ | - | - | DIP-20, SO-20L | |
| MC33035 | 10 – 40 | 10 – 30 | | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | Noninv. and Inv. | ✓ | ✓ | ✓ | DIP-24, SO-24L | |

AIR CORE MOTOR DRIVERS/GAUGE DRIVERS

| Part Number | Gauges Driven | | Input | | | Output | | | Features | | | Protection | | |
|-------------|---------------|-------|-------|-----|-----|---------|--------------|----------------|----------|------------------|---------------|--------------|------------|----------------|
| | Major | Minor | Freq. | PWM | SPI | Current | Method | Return to Zero | UVLO | Regulator Output | Current Limit | Over voltage | Over Temp. | Peak Transient |
| CS4121 | 1 | | ✓ | | | 33 mA | Differential | | | ✓ | | ✓ | | 60 V |
| CS4122 | 1 | 2 | ✓ | | ✓ | 80 mA | Differential | | | | ✓ | ✓ | ✓ | 18 V |
| CS8190 | 1 | | ✓ | | | 33 mA | Differential | ✓ | ✓ | | | ✓ | | 60 V |
| CS4192 | 1 | | ✓ | | ✓ | 70 mA | Differential | | | | ✓ | ✓ | ✓ | 16 V |

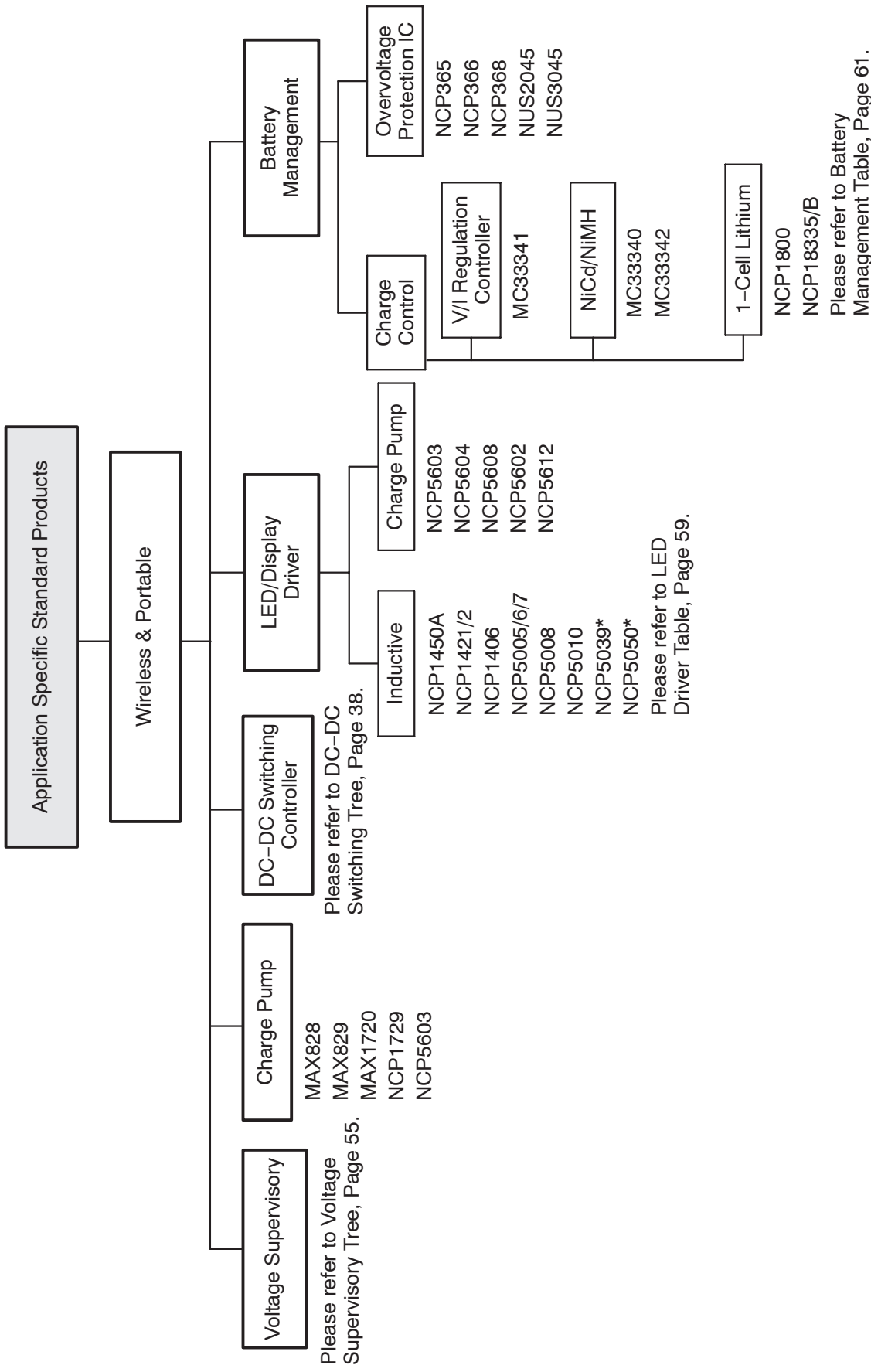
ON Semiconductor Selector Guide – Power Management





*Coming Soon.

ON Semiconductor Selector Guide – Power Management




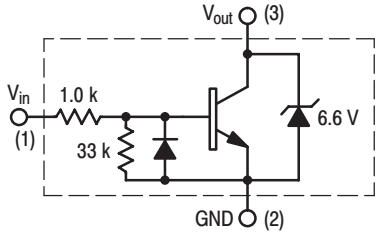
*Coming Soon.

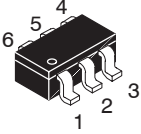
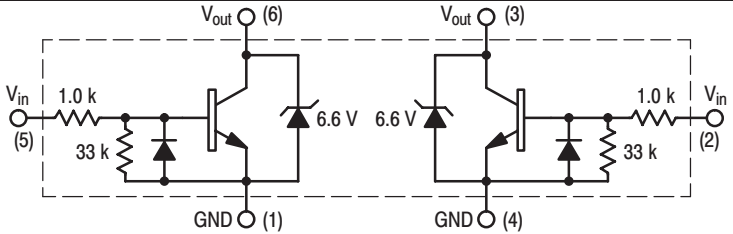
LED/DISPLAY DRIVERS


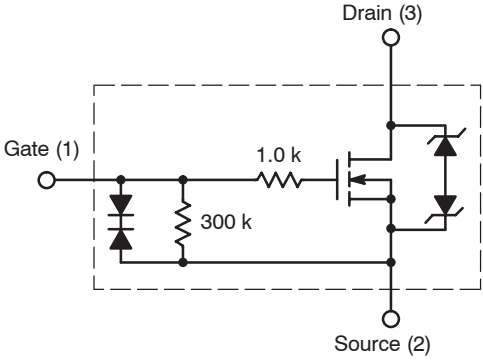
| Application | WLED Type | Number of LED/Connection | Converter Topology | ON Solution | Key Features | Availability | |
|----------------------|--------------------------------|--|----------------------------------|--|---|--|------|
| Display Backlighting | Standard, 10 mA – 25 mA | 2 – 5 LED/Series | Inductive | NCP5006/5007 : Up to 92% efficiency, PFM, Boost, 21 V / 1 W output, Thin SOT23–5 | Simple | Now | |
| | | 3 – 5 LED/Series | Inductive | NCP5005 : Enhanced version of NCP5006. High EMI immunity. | Simple | Now | |
| | | 4 – 5 LED/Series | Inductive | NCP5010 : 1 MHz PWM Boost, 22 V/0.5 W output integrated rectifier and true-cutoff, Micro-Bump–8 (1.7 x 1.7 mm) | Highly Integrated Driver | Now | |
| | | 2 LEDs/Parallel | Charge Pump | NCP5602 : 90% peak efficiency, 2 outputs (25 mA each); 2% current matching, I2C, LLGA 12 (2 x 2 mm) | ICON Model I2C Dimming Control | Now | |
| | Flash (Torch) | Low Current – Up to 50 mA for 1 Cell / 100 mA for 2 Cell | 2 LEDs/Parallel | Charge Pump | NCP5612 : 2 outputs (25 mA each); I2C, LLG 12 (2 x 2 mm) | S–Wire Link Dimming Control | 3Q06 |
| | | | 2 – 6 LEDs/Series | Inductive | NCP1406 : Up to 90% efficiency, PFM (up to 1 MHz), 25 V/0.5 W output, Thin SOT23–5 (3 x 3 mm) | Can Operate from 1 or 2 Alkaline or NI–based Cells | Now |
| | | Medium Current / Multi-die LED, 100 mA – 350 mA | 3 or 4 LEDs/Parallel | Charge Pump | NCP5064A/B : Consistence 90% efficiency, 3 or 4 outputs (25 mA each); 0.5% current matching, TQFN16 (3 x 3 x 0.8 mm) | NCP5604A : Drives 4 LEDs NCP5604B : Drives 3 LEDs | Now |
| | | | Single LED | Inductive | NCP1400ASN50 : Fixed frequency PWM micro-power boost converter, Thin SOT23–5 (3 x 3 mm) | Can Operate from 1 or 2 Alkaline or NI–based Cells | Now |
| | | | Single or (Multiple in Parallel) | Charge Pump | NCP5603 : 200 mA cont./350 mA pulsed, voltage regulated output, 4.5 V or 5 V, 75% eff., DFN (3 x 3 mm) | High-Current Single Output Charge Pump | Now |
| | | | 2 – 6 LEDs/Series | Inductive | NCP1406 : Up to 90% efficiency, PFM (up to 1 MHz) 25 V/0.5 W output, Thin SOT23–5 (3 x 3 mm) | Simple, Low Cost | Now |
| Flash (Torch) | High Current LED, Up to 600 mA | Single or (Multiple in Parallel) | Inductive | NCP1421 : PFM Boost (up to 1.2 MHz), Sync-rect, Output up to 5 V, 600 mA cont. 94% eff., true-cutoff, 50 nA shutdown current, Micro8 (3 x 4.9 mm) | Synchronous Rectification | Now | |
| | | Single or (Multiple in Parallel) | Inductive | NCP1422 : PFM Boost (up to 1.2 MHz), Sync-rect, Output up to 5 V, 800 mA cont. 94% eff., true-cutoff, 50 nA shutdown current, DFN10 (3 x 3 mm) | Synchronous Rectification | Now | |
| | High Current LED, Up to 1 A | 2 – 5 LEDs/Series | Inductive | NCP5050 : 23 V/4.5 W output, PWM, 1.7 MHz, DFN–10 | Integrated Switch for 2 Adjustable Output Current Levels | 4Q06 | |
| | | 4 LED + Flash LED | Charge Pump | NCP5608 : Consistent 90% efficiency, 8 outputs (4 @ 25 mA each + 4 @ 100 mA each); 0.5% current matching, TQFN24 (4 x 4 mm) | One Chip Lighting Solution | Now | |
| OLED Driver Supply | – | – | Inductive | NCP1406 : Up to 90% efficiency, PFM (up to 1 MHz), 25 V/0.5 W output, Thin SOT23–5 (3 x 3 mm) | Can Operate from 1 or 2 Alkaline or NI–based Cells | Now | |

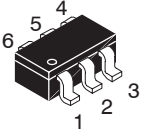
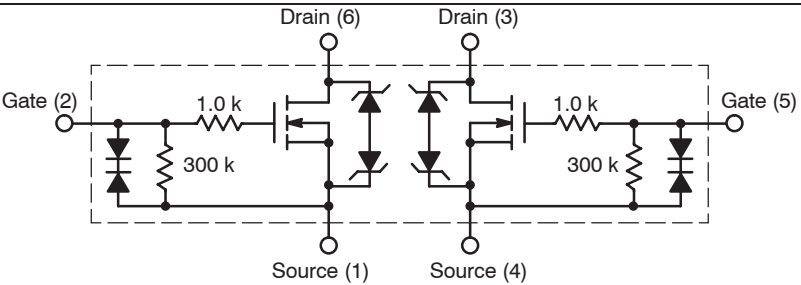
*BOLD denotes a new device.

Relay Drivers

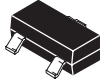
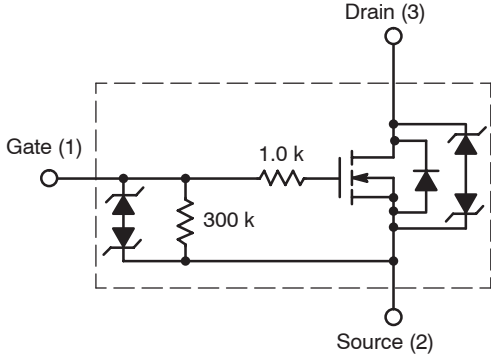
| Device | V_{BR} Max (V) | I_D (mA) | E_z (mJ) |
|---|------------------|------------|--|
|  <p>CASE 318 SOT-23</p> | | |  |
| MDC3105L | 6.0 | 500 | 50 |

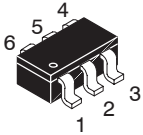
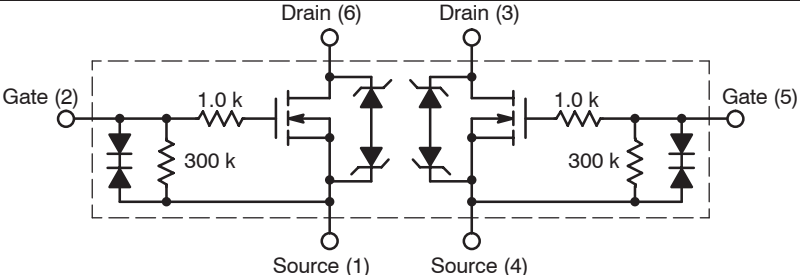
| | | | |
|---|-----|-----|--|
|  <p>CASE 318F SC-74</p> | | |  |
| MDC3105DM | 6.0 | 500 | 50 |

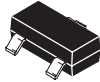
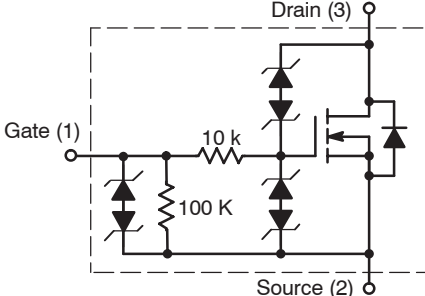
| | | | |
|---|-----|-----|---|
|  <p>CASE 318 SOT-23</p> | | |  |
| NUD3105L | 6.0 | 500 | 50 |

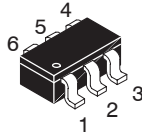
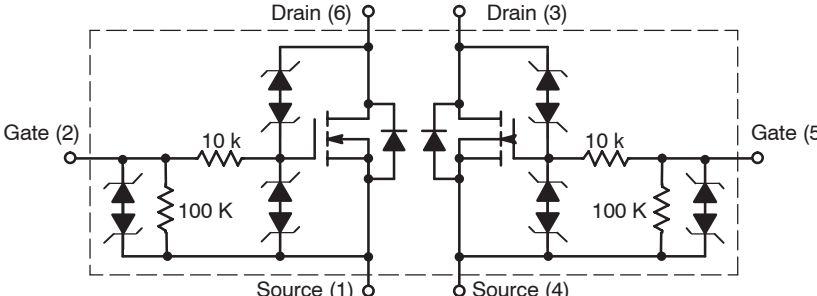
| | | | |
|---|-----|-----|--|
|  <p>CASE 318F SC-74</p> | | |  |
| NUD3105DM | 6.0 | 500 | 50 |

Relay Drivers (continued)

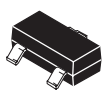
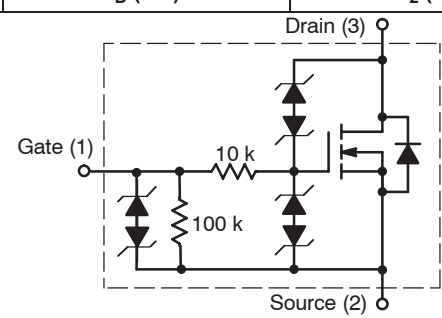
| Device | V_{DS} Max (V) | I_D (mA) | E_z (mJ) |
|--|------------------|------------|------------|
|  <p>CASE 318 SOT-23</p>  | 14 | 500 | 50 |
| NUD3112L | 14 | 500 | 50 |

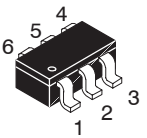
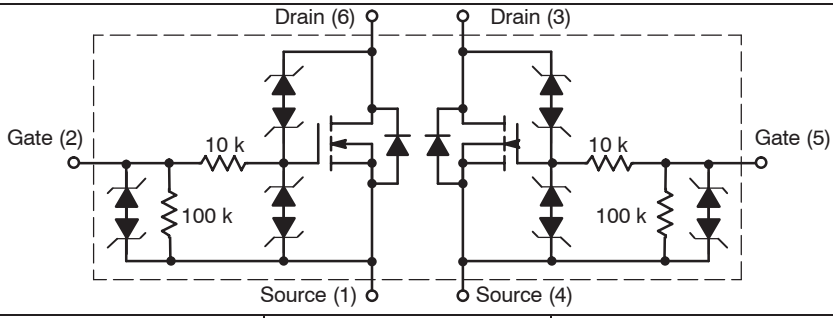
| | | | |
|--|----|-----|----|
|  <p>CASE 318F SC-74</p>  | 14 | 500 | 50 |
| NUD3112DM | 14 | 500 | 50 |

| | | | |
|--|----|-----|-----|
|  <p>CASE 318 SOT-23</p>  | 28 | 150 | 250 |
| NUD3124L | 28 | 150 | 250 |


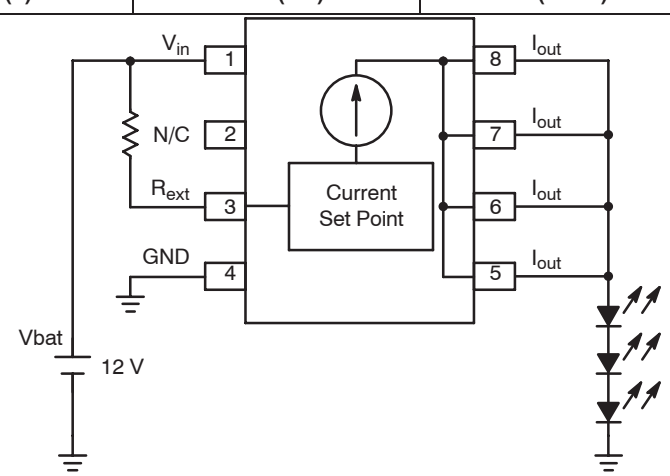
| | | | |
|--|----|-----|-----|
|  <p>CASE 318F SC-74</p>  | 28 | 150 | 250 |
| NUD3124DM | 28 | 150 | 250 |

Relay Drivers (continued)

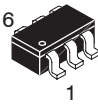
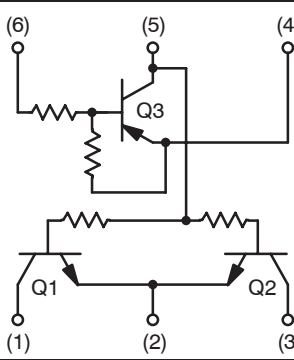
| Device | V_{DS} Max (V) | I_D (mA) | E_z (mJ) |
|---|------------------|------------|------------|
|  <p>CASE 318 SOT-23</p>  | 60 | 150 | 250 |
| NUD3160L | 60 | 150 | 250 |

| | | | |
|---|----|-----|-----|
|  <p>CASE 318F SC-74</p>  | 60 | 150 | 250 |
| NUD3160DM | 60 | 150 | 250 |

LED Drivers

| Device | V_{Max} (V) | I_{Max} (mA) | P (Watts) |
|---|---------------|----------------|-----------|
|  <p>CASE 751 SO-8</p>  | 30 | 500 | 1.13 |
| NUD4001DR2 | 30 | 500 | 1.13 |
| NUD4011DR2 | 200 | 70 | 1.13 |

Integrated PNP/NPN Digital Transistor Array

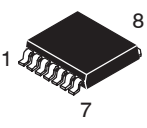
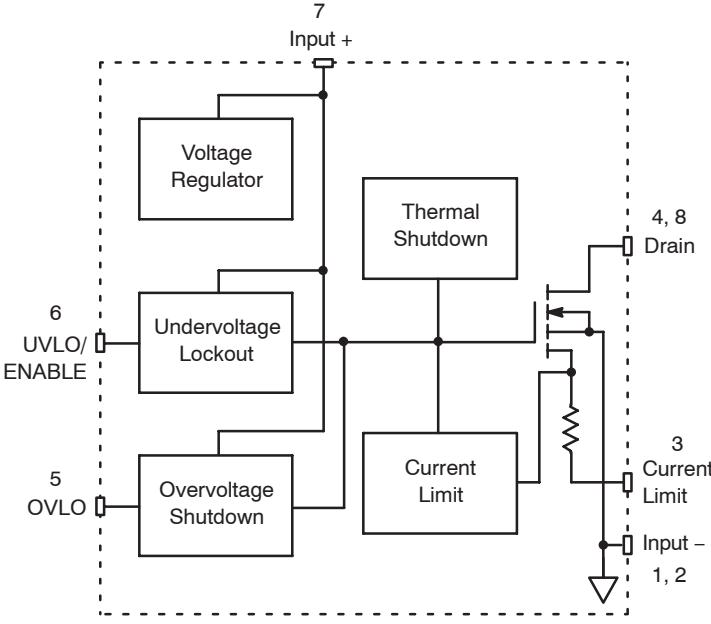
| Device | V _{CE} (V) | h _{fe} | V _{BR} (V) | P _D (mW) |
|---|---------------------|-----------------|--|---------------------|
|  CASE 318F SC-74 | | |  | |
| <i>NUS2401SN</i> | 0.25 | 60 & 350 | 50 | 350 |

Devices listed in **bold italic** are ON Semiconductor preferred devices.

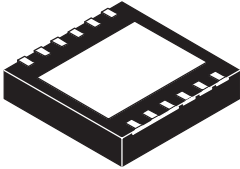
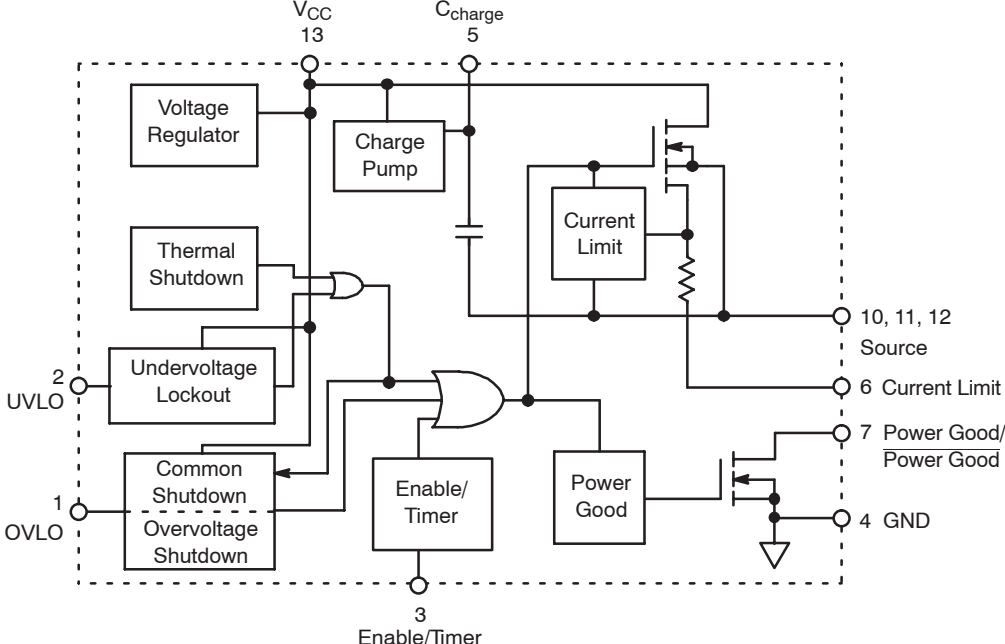
Inrush Current Limiter


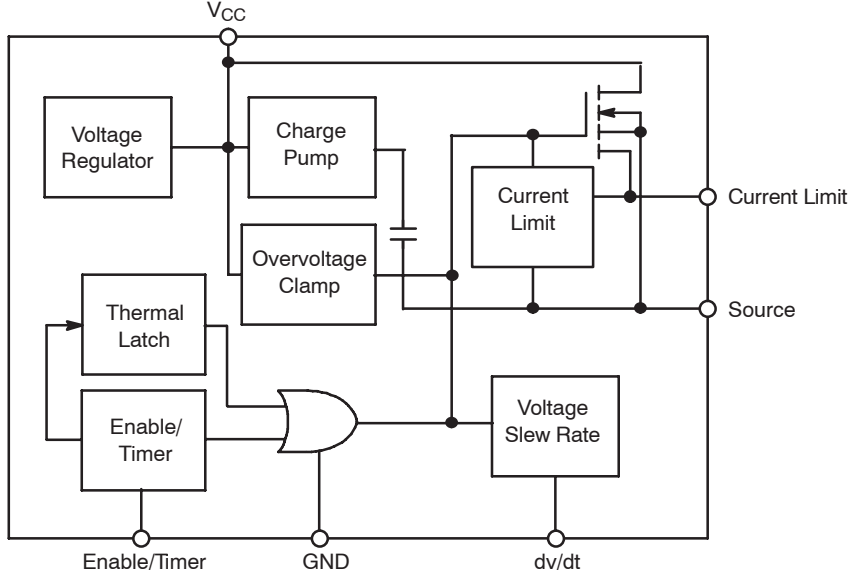
SMART HotPlug™ – Low Side

- Integrated Power Device
- Temperature Sensing Diode in Power MOSFET
- Adjustable Current Limit
- Adjustable UVLO and OVLO

| Package | Device | V _{in} (V) | | R _{DS(on)} (mΩ) | I _D Avg (A) | Thermal Option | Thermal Limit | Thermal Limit Hysteresis |
|--|--------------|---------------------|-----|--------------------------|------------------------|----------------|---------------|--------------------------|
| | | Min | Max | Typ | Max | | Typ °C | Typ °C |
|  CASE 553AA S-PAK EX SUFFIX | | | | | | | | |
|  | | | | | | | | |
| SPAK | NIS5101E1T1 | 18 | 110 | 43 | 6.5 | Latch Off | 135 | 40 |
| SPAK | NIS5101E2T1 | 18 | 110 | 43 | 6.5 | Auto-Retry | 135 | 40 |
| SPAK | NIS5101E1T1G | 18 | 110 | 43 | 6.5 | Latch Off | 135 | 40 |
| SPAK | NIS5101E2T1G | 18 | 110 | 43 | 6.5 | Auto-Retry | 135 | 40 |

SMART HotPlug™ – High Side


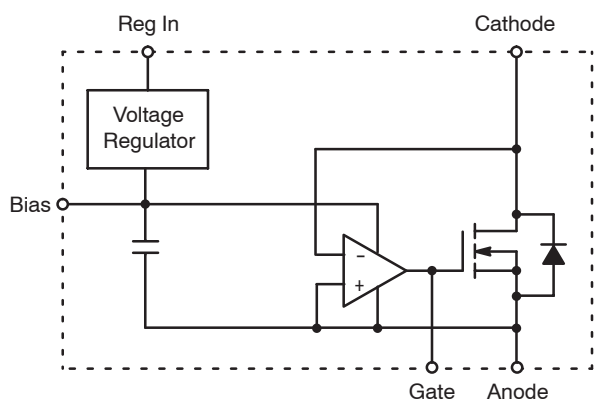
| Package | Device | V_{in} (V) | | $R_{DS(on)}$ (m Ω) | I_D Avg (A) | Thermal Option | Thermal Limit | Thermal Limit Hysteresis |
|---|--|--------------|-----|----------------------------|---------------|----------------|---------------|--------------------------|
| | | Min | Max | Typ | Max | | Typ °C | Typ °C |
|  <p>CASE 488AB 9x9 MM, 12 PIN PLLP</p> |  | | | | | | | |
| | QFN 9x9 | NIS5102QP1HG | 9 | 18 | 10 | 10 | Latch Off | 135 |
| QFN 9x9 | NIS5102QP2HG | 9 | 18 | 10 | 10 | Auto-Retry | 135 | 40 |

| | | | | | | | | |
|---|--|--------------|-----|----|-----|------------|-----------|-----|
|  <p>CASE 751 SOIC-8 NB</p> |  | | | | | | | |
| | SO-8 | NIS5112D1R2G | 9.0 | 18 | 30 | 3.0 | Latch Off | 135 |
| SO-8 | NIS5112D2R2G | 9.0 | 18 | 30 | 3.0 | Auto-Retry | 135 | 40 |


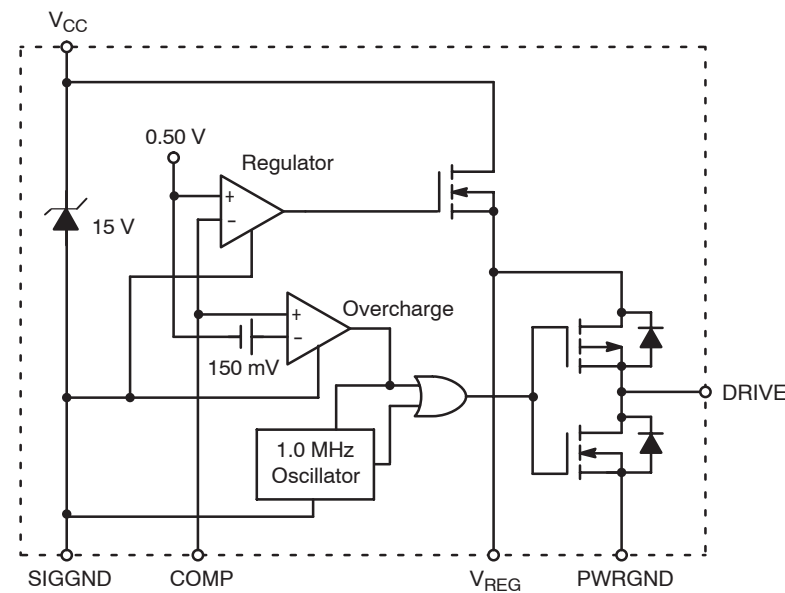
Hybrid Diode IC

Better Efficiency Rectification System, BERS™ IC

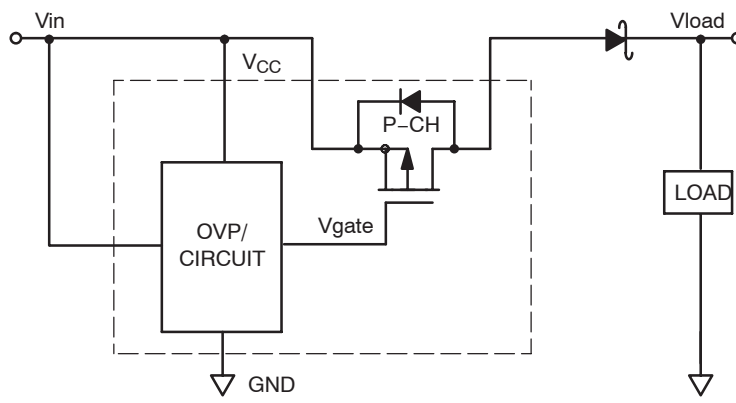
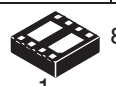


- Integrated Power Device
- Low Forward Drop
- Can be used in High Side and Low Side Configurations
- Gate Drive Available to Parallel Additional MOSFETs

| Device | V _{in} (V) | | IFAV Avg (A) Max | R _{DS(on)} V _{GS} = 5.0 V I _D = 10 A (mΩ) | Fet Turn-On Time I _{max} = 3.0 A, I _{rev} = 1.0 A, V _{rev} = 5.0 V Typ (nsec) | Turnoff Propagation Delay Time V _{DS} = V _{offset} to I _D = 0 A Typ (nsec) |
|--|---------------------|-----|---------------------|--|--|--|
| | Typ | Max | | | | |
| <p>MARKING DIAGRAM</p>  <p>1 ○ NIS6111 AWLYYWW</p> <p>CASE 488AC PLLP32</p> <p>1 32</p> <p>NIS6111 = Specific Device Code A = Assembly Location WL = Wafer Lot YY = Year WW = Work Week</p>  <p>Reg In Cathode Voltage Regulator Bias Gate Anode</p> | | | | | | |
| NIS6111QP | 0.8 | 24 | 30 | 3.7 | 45 | 35 |

Floating, Regulated Charge Pump

| Device | V _{CC} (V) | I _{davg} , Drive Current Max (A) | Oscillator Frequency f _{osc} Typ (MHz) | R _{DS(on)} High Side FET (Typ) Ω | R _{DS(on)} Low Side FET (Typ) Ω |
|--|---------------------|--|---|--|---|
| <p>MARKING DIAGRAM</p>  <p>8 NIS6201 ALYWX</p> <p>CASE 751 SOIC-8 NB</p> <p>1</p> <p>A = Assembly Location L = Wafer Lot Y = Year W = Work Week</p>  <p>V_{CC} 0.50 V Regulator 15 V Overcharge 150 mV 1.0 MHz Oscillator DRIVE SIGGND COMP V_{REG} PWRGND</p> | | | | | |
| NIS6201 | -0.3 to 18 | 0.05 | 1.0 | 20 | 20 |

Overvoltage Protection IC with Integrated P-Channel MOSFET

| Device | V _{CC} (V) | V _{DSS} (V) Max | I _D (A), Steady State | R _{DS(on)} (mΩ) Typ V _{GS} = -4.5 V I _D (Note 3) | V _{th} (V) Typ | Package and Dimensions | | | | | | |
|---|---|----------------------------|---|---|---|-----------------------------|---------------------------------|-----------|----|------|----|------|
|  |  | CASE 506AL DFN8 |  | CASE 517AH UDFN8 |  | CASE 506AN WDFN6 | | | | | | |
| | | | | | | | (Package Drawings Not to Scale) | | | | | |
| | | | | | | | NUS2045MN | 2.8 to 20 | 20 | -1.0 | 71 | 6.85 |
| NUS3045MN | 2.8 to 30 | 30 | -1.0 | 66 | 6.85 | DFN8 3.3x3.3x0.85 mm | | | | | | |
| NUS3046MN | 2.5 to 30 | 30 | -1.0 | 66 | 5.5 | DFN8 3.3x3.3x0.85 mm | | | | | | |
| NUS3055MN | 2.8 to 30 | 30 | -1.0 | 66 | 6.85 | TLLGA 2.5x3.0x0.55 mm | | | | | | |
| NUS1204MN | 12 | 12 | -0.6 | 75 | 4.725 | WDFN6 2.0x2.0x0.85 mm | | | | | | |

3. I_D = -1.0 A

Amplifiers and Comparators

Amplifiers and Comparators

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SINGLE OPERATIONAL AMPLIFIERS

| Device Name | V _{CC} (min) (V) | V _{CC} (max) (V) | GBW (typ) (MHz) | Slew Rate (typ) (V/μs) | V _{IO} (max @ 25°C, V _S = 5.0 V) (mV) | I _B (typ) (nA) | I _D (typ) (mA) | Temp Range (°C) | CMR (typ) (dB) | e _n (typical) (nV/√Hz) @ f = 1.0 kHz | Number of Channels | Supply Type | Package | Description |
|-------------|---------------------------|---------------------------|------------------------|------------------------|---|---------------------------|----------------------------|-----------------|----------------|---|--------------------|---------------|-------------|---|
| LM201A | ±3.0 | ±22 | 1.0 | 0.5 | 2.0 | 30 | 1.8 | -25 to +85 | 96 | - | 1 | Split | DIP-8, SO-8 | General Purpose, Precision Non Compensated |
| LM201AV | ±3.0 | ±22 | 1.0 | 0.5 | 2.0 | 30 | 1.8 | -40 to +105 | 96 | - | 1 | Split | DIP-8, SO-8 | General Purpose, Precision Non Compensated |
| LM301A | ±3.0 | ±18 | 1.0 | 0.5 | 7.5 | 70 | 1.8 | 0 to 70 | 90 | - | 1 | Split | DIP-8, SO-8 | General Purpose, Precision Non Compensated |
| MC33071 | 3.0 or ±1.5 | 44 | 4.5 | 13* | 5.0 | 100 | 1.6 | -40 to +85 | 97 | 32 | 1 | Single, Split | DIP-8, SO-8 | High SR, Wide BW, Single Supply, *Av = -1.0 |
| MC33071A | 3.0 or ±1.5 | 44 | 4.5 | 13* | 3.0 | 100 | 1.6 | -40 to +85 | 97 | 32 | 1 | Single, Split | DIP-8, SO-8 | High SR, Wide BW, Single Supply, *Av = -1.0 |
| MC33171 | 3.0 or ±1.5 | 44 or ±22 | 1.8 | 2.1 | 5.0 | 20 | 0.18 | -40 to +85 | 90 | 32 | 1 | Single, Split | DIP-8, SO-8 | Low Power, Single Supply, Two Voltage Ranges |
| MC33201 | 1.8 or ±0.9 | 12 | 2.2 | 1.0 | 6.0 | 80 | 0.9 | -40 to +105 | 90 | 20 | 1 | Single, Split | DIP-8, SO-8 | Low Voltage, Rail-to-Rail |
| MC33201V | 1.8 or ±0.9 | 12 | 2.2 | 1.0 | 6.0 | 80 | 0.9 | -55 to +125 | 90 | 20 | 1 | Single, Split | DIP-8, SO-8 | Low Voltage, Rail-to-Rail, Extended Temp. Range |
| MC33501 | 1.0 or ±0.5 | 7.0 or ±3.5 | 4 @ V _S = 5 | 3.0 | 5.0 | 0.04 pA | 1.2 @ V _S = 1 V | -40 to +105 | 75 | 30 | 1 | Single, Split | TSOP-5* | One Volt SMARTMOS™, Rail-to-Rail |
| MC33503 | 1.0 or ±0.5 | 7.0 or ±3.5 | 4 @ V _S = 5 | 3.0 | 5.0 | 0.04 pA | 1.2 @ V _S = 1 V | -40 to +105 | 75 | 30 | 1 | Single, Split | TSOP-5* | One Volt SMARTMOS, Rail-to-Rail |

*TSOP-5 – Also known as Thin SOT23-5.

SINGLE OPERATIONAL AMPLIFIERS (continued)

| Device Name | V _{cc} (min) (V) | V _{cc} (max) (V) | GBW (typ) (MHz) | Slew Rate (typ) (V/μs) | V _{io} (max @ 25°C, V _s = 5.0 V) (mV) | I _{IB} (typ) (nA) | I _B (typ) (mA) | Temp Range (°C) | CMR (typ) (dB) | e _n (typical) (nV/√Hz) @ f = 1.0 kHz | Number of Channels | Supply Type | Package | Description |
|-------------|---------------------------|---------------------------|-----------------|------------------------|---|----------------------------|---------------------------|-----------------|----------------|---|--------------------|---------------|-----------------|---|
| MC34071 | 3.0 or ±1.5 | 44 | 4.5 | 13* | 5.0 | 100 | 1.6 | 0 to 70 | 97 | 32 | 1 | Single, Split | DIP-8, SO-8 | High SR, Wide BW, Single Supply, *Av = -1.0 |
| MC34071A | 3.0 or ±1.5 | 44 | 4.5 | 13* | 3.0 | 100 | 1.6 | 0 to 70 | 97 | 32 | 1 | Single, Split | DIP-8, SO-8 | High SR, Wide BW, Single Supply, *Av = -1.0 |
| NCS2001 | 0.9 or ±0.45 | 7.0 or ±3.5 | 1.4 | 1.6 | 6.0 | 10 pA | .80 | -40 to +105 | 70 | 100 | 1 | Single, Split | TSOP-5*, SC70-5 | One Volt, CMOS Rail-to-Rail |
| NCS2002 | 0.9 or ±0.45 | 7.0 or ±3.5 | 0.8 | 1.2 | 6.0 | 10 pA | .80 | -40 to +105 | 82 | 100 | 1 | Single, Split | TSOP-6* | One Volt, CMOS Rail-to-Rail with Enable |
| NCS7101 | 1.8 or ±0.9 | 10 or ±5.0 | 1.0 | 1.2 | 7.0 | 1.0 pA | 1.1 | -40 to +85 | 65 (min) | 140 | 1 | Single, Split | TSOP-5* | Low Voltage, Rail-to-Rail |
| NCV2002 | 0.9 or ±0.45 | 7.0 or ±3.5 | 0.8 | 1.2 | 6.0 | 10 pA | .80 | -40 to +125 | 82 | 100 | 1 | Single, Split | TSOP-6* | One Volt, CMOS Rail-to-Rail with Enable |
| NE5230 | ±0.9 or 1.8 | ±7.5 or 15 | 0.6 | 0.25 | 3.0 | 40 | 0.6 | 0 to 70 | 95 | 30 | 1 | Single, Split | SO-8, PDIP-8 | Single Low Voltage Op Amp |
| NE5534 | ±3.0 | ±20 | 10 | 13 | 4.0* | 500 | 4.0 | 0 to 70 | 100 | 4.0 | 1 | Single, Split | SO-8, PDIP-8 | Single Low Noise Op Amp |
| NE5534A | ±3.0 | ±20 | 10 | 13 | 4.0* | 500 | 4.0 | 0 to 70 | 100 | 3.5 | 1 | Single, Split | SO-8, PDIP-8 | Single Low Noise Op Amp |
| SA5230 | ±0.9 or 1.8 | ±7.5 or 15 | 0.6 | 0.25 | 3.0 | 40 | 0.6 | -40 to 85 | 95 | 30 | 1 | Single, Split | SO-8, PDIP-8 | Single Low Voltage Op Amp |
| SA5534 | ±3.0 | ±20 | 10 | 13 | 4.0* | 500 | 4.0 | -40 to 85 | 100 | 4.0 | 1 | Single, Split | PDIP-8 | Single Low Noise Op Amp |
| SA5534A | ±3.0 | ±20 | 10 | 13 | 4.0* | 500 | 4.0 | -40 to 85 | 100 | 3.5 | 1 | Single, Split | SO-8, PDIP-8 | Single Low Noise Op Amp |
| SE5534 | ±3.0 | ±20 | 10 | 13 | 2.0* | 400 | 4.0 | -55 to 125 | 100 | 4.0 | 1 | Single, Split | PDIP-8 | Single Low Noise Op Amp |
| SE5534A | ±3.0 | ±20 | 10 | 13 | 2.0* | 400 | 4.0 | -55 to 125 | 100 | 3.5 | 1 | Single, Split | PDIP-8 | Single Low Noise Op Amp |

*TSOP-5 – Also known as Thin SOT23-5.

DUAL OPERATIONAL AMPLIFIERS

| Device Name | V _{CC} (min) (V) | V _{CC} (max) (V) | GBW (typ) (MHz) | Slew Rate (typ) (V/μs) | V _{IO} (max @ 25°C, V _S = 5.0 V) (mV) | I _{IB} (typ) (nA) | I _D * (typ) (mA) | Temp Range (°C) | CMR (typ) (dB) | e _n (typical) (nV/√Hz) @ f = 1.0 kHz | Number of Channels | Supply Type | Package | Description |
|-------------|---------------------------|---------------------------|-----------------|------------------------|---|----------------------------|-----------------------------|-----------------|----------------|---|--------------------|---------------|---------------------|--|
| LM258 | 3.0 or ±1.5 | 32 or ±18 | 1.0 | 0.6 | 5.0 | 45 | 0.7 | -25 to +85 | 85 | - | 2 | Single, Split | DIP-8, SO-8, Micro8 | Low Noise |
| LM358 | 3.0 or ±1.5 | 32 or ±18 | 1.0 | 0.6 | 7.0 | 45 | 0.7 | 0 to 70 | 70 | - | 2 | Single, Split | DIP-8, SO-8, Micro8 | Low Noise |
| LM833 | ±2.5 | 36 | 15 | 7.0 | 5.0 | 300 | 4.0 | -40 to +85 | 100 | 4.5 | 2 | Single, Split | DIP-8, SO-8 | Low Noise |
| LM2904 | 3.0 or ±1.5 | 26 or ±13 | 1.0 | 0.6 | 7.0 | 45 | 0.7 | -40 to +105 | 70 | - | 2 | Single, Split | DIP-8, SO-8, Micro8 | Low Power |
| LM2904V | 3.0 or ±1.5 | 26 or ±13 | 1.0 | 0.6 | 7.0 | 45 | 0.7 | -40 to +125 | 70 | - | 2 | Single, Split | DIP-8, SO-8, Micro8 | Low Power |
| MC33072 | 3.0 or ±1.5 | 44 or ±22 | 4.5 | 13* | 5.0 | 100 | 3.2 | -40 to +85 | 97 | 32 | 2 | Single, Split | DIP-8, SO-8 | High SR, Wide BW, Single Supply, *Av = -1.0 |
| MC33072A | 3.0 or ±1.5 | 44 or ±22 | 4.5 | 13* | 3.0 | 100 | 3.2 | -40 to +85 | 97 | 32 | 2 | Single, Split | DIP-8, SO-8 | High SR, Wide BW, Single Supply, *Av = -1.0 |
| MC33077 | ±2.5 | ±18 | 37 | 11 | 1 @ V _S = ±15 V | 280 | 3.5 | -40 to +85 | 107 | 4.4 | 2 | Split | DIP-8, SO-8 | Low Noise |
| MC33078 | ±5.0 | ±18 | 16 | 7.0 | 2.0 | 300 | 4.1 | -40 to +85 | 100 | 4.5 | 2 | Split | DIP-8, SO-8 | Low Noise |
| MC33172 | 3.0 or ±1.5 | 44 or ±22 | 1.8 | 2.1 | 5.0 | 20 | 0.36 | -40 to +85 | 90 | 32 | 2 | Single, Split | DIP-8, SO-8 | Low Power, Single Supply, Two Voltage Ranges |
| MC33172V | 3.0 or ±1.5 | 44 or ±22 | 1.8 | 2.1 | 5.0 | 20 | 0.36 | -40 to +105 | 90 | 32 | 2 | Single, Split | SO-8 | Low Power, Single Supply, Two Voltage Ranges, Extended Temp. Range |
| MC33178 | ±2.0 | ±18 | 5.0 | 2.0 | 3.0 | 100 | 0.85 | -40 to +85 | 110 | 7.5 | 2 | Split | DIP-8, SO-8 | High Output Current, Low Power, Low Noise |

*I_D typical for total device (all channels)

DUAL OPERATIONAL AMPLIFIERS (continued)

| Device Name | V _{CC} (min) (V) | V _{CC} (max) (V) | GBW (typ) (MHz) | Slew Rate (typ) (V/μs) | V _{IO} (max @ 25°C, V _S = 5.0 V) (mV) | I _B (typ) (nA) | I _B * (typ) (mA) | Temp Range (°C) | CMR (typ) (dB) | e _n (typical) (nV/√Hz) @ f = 1.0 kHz | Number of Channels | Supply Type | Package | Description |
|-------------|---------------------------|---------------------------|-----------------|------------------------|---|---------------------------|-----------------------------|-----------------|----------------|---|--------------------|---------------|----------------------------|---|
| MC33202 | 1.8 or ±0.9 | 12 or ±6 | 2.2 | 1.0 | 8.0 | 80 | 1.8 | -40 to +105 | 90 | 20 | 2 | Single, Split | DIP-8, SO-8, Micro8™ | Low Voltage, Rail-to-Rail |
| MC33202V | 1.8 or ±0.9 | 12 or ±6 | 2.2 | 1.0 | 8.0 | 80 | 1.8 | -55 to +125 | 90 | 20 | 2 | Single, Split | DIP-8, SO-8 | Low Voltage, Rail-to-Rail, Extended Temp. Range |
| MC33272A | 3.0 or ±1.5 | 36 or ±18 | 24 | 10 | 1 @ V _S = ±15 V 2 @ V _S = 5.0 V | 300 | 4.30 | -40 to +85 | 100 | 18 | 2 | Single, Split | DIP-8, SO-8 | Single Supply, High SR, Low Input Offset Voltage |
| MC33502 | 1.0 | 7.0 | 5.0 | 3.0 | 5.0 | 0.04 pA | 3.3 | -40 to +105 | 75 | 30 | 2 | Single, Split | DIP-8, SO-8 | One Volt SMARTMOS, Rail-to-Rail |
| MC34072 | 3.0 or ±1.5 | 44 or ±22 | 4.5 | 13* | 5.0 | 100 | 3.2 | 0 to 70 | 97 | 32 | 2 | Single, Split | DIP-8, SO-8 | High SR, Wide BW, Single Supply, *Av = -1.0 |
| MC34072A | 3.0 or ±1.5 | 44 or ±22 | 4.5 | 13* | 3.0 | 100 | 3.2 | 0 to 70 | 97 | 32 | 2 | Single, Split | DIP-8, SO-8 | High SR, Wide BW, Single Supply, *Av = -1.0 |
| MC34072V | 3.0 or ±1.5 | 44 or ±22 | 4.5 | 13* | 5.0 | 100 | 3.2 | -40 to +125 | 97 | 32 | 2 | Single, Split | DIP-8, SO-8 | High SR, Wide BW, Single Supply, Extended Temp. Range, *Av = -1.0 |
| NE592 | -8.0 | +8.0 | 90 | - | - | 9.0 μA | 18 | 0-70 | 86 | - | 2 | - | SO-8, 14 PDIP-8, 14 | Video Amplifier |
| NE5532/A | ±3.0 | ±20 | 10 | 9.0 | 4.0 @ ±15 V | 200 | 8.0 | 0 to 70 | 100 | 8.0 | 2 | Split | DIP-8, SO-8, SO-16W | Low Noise |
| SA5532 | ±3.0 | ±20 | 10 | 9.0 | 4.0 @ ±15 V | 200 | 8.0 | -40 to 85 | 100 | 8.0 | 2 | Split | DIP-8 | Low Noise |
| SE5532/A | ±3.0 | ±20 | 10 | 9.0 | 2.0 @ ±15 V | 200 | 8.0 | -55 to 125 | 100 | 8.0 | 2 | Split | DIP-8, SO-8 | Low Noise |
| TCA0372 | 5.0 or ±2.5 | 40 or ±20 | 1.4 | 1.4 | 15 @ ±15 V | 100 | 5.0 | -40 to +125 | 90 | 22 | 2 | Single, Split | SOP (12+2+2) DIP-8, DIP-16 | Power, High Current |
| TCA0372B | 5.0 or ±2.5 | 40 or ±20 | 1.4 | 1.4 | 15 @ ±15 V | 100 | 5.0 | -40 to +125 | 90 | 22 | 2 | Single, Split | DIP-8, SO-16W | Power, High Current |

*I_B typical for total device (all channels)

QUAD OPERATIONAL AMPLIFIERS

| Device Name | V _{CC} (min) (V) | V _{CC} (max) (V) | GBW (typ) (MHz) | Slew Rate (typ) (V/us) | V _{IO} (max @ 25°C, V _S = 5.0 V) (mV) | I _B (typ) (nA) | I _D * (typ) (mA) | Temp Range (°C) | CMR (typ) (dB) | e _n (typical) (nV/√Hz) @ f = 1.0 kHz | Number of Channels | Supply Type | Package | Description |
|-------------|---------------------------|---------------------------|-----------------|------------------------|---|---------------------------|-----------------------------|-----------------|----------------|---|--------------------|---------------|-------------------------|--|
| LM224 | 3.0 ±1.5 | 32 ±16 | 1.0 | 0.6 | 5.0 | 90 | - | -25 to +85 | 85 | - | 4 | Single, Split | DIP-14, SO-14 | Low Power |
| LM324 | 3.0 ±1.5 | 32 ±16 | 1.0 | 0.6 | 7.0 | 90 | - | 0 to 70 | 70 | - | 4 | Single, Split | DIP-14, SO-14 | Low Power |
| LM324A | 3.0 ±1.5 | 32 ±16 | 1.0 | 0.6 | 3.0 | 45 | 0.7 | 0 to 70 | 70 | - | 4 | Single, Split | DIP-14, SO-14 | Low Power |
| LM2902 | 3.0 ±1.5 | 26 ±13 | 1.0 | 0.6 | 7.0 | 90 | - | -40 to +105 | 70 | - | 4 | Single, Split | DIP-14, SO-14 | Low Power |
| LM2902V | 3.0 ±1.5 | 26 ±13 | 1.0 | 0.6 | 7.0 | 90 | - | -40 to +125 | 70 | - | 4 | Single, Split | DIP-14, SO-14 | Low Power, Extended Temp. Range |
| MC3303 | 3.0 ±1.5 | 36 ±18 | 1.0 | 0.6 | 8.0 | 200 | 2.8 | -40 to +85 | 90 | - | 4 | Single, Split | DIP-14, SO-14 | Low Power |
| MC33074 | 3.0 or ±1.5 | 44 or ±22 | 4.5 | 13* | 5.0 | 100 | 6.4 | -40 to +85 | 97 | 32 | 4 | Single, Split | DIP-14, SO-14, TSSOP-14 | High SR, Wide BW, Single Supply, *AV = -1.0 |
| MC33074A | 3.0 or ±1.5 | 44 or ±22 | 4.5 | 13* | 3.0 | 100 | 6.4 | -40 to +85 | 97 | 32 | 4 | Single, Split | DIP-14, SO-14, TSSOP-14 | High SR, Wide BW, Single Supply, *AV = -1.0 |
| MC33079 | ±5.0 | ±18 | 16 | 7.0 | 2.5 | 300 | 8.4 | -40 to +85 | 100 | 4.5 | 4 | Split | DIP-14, SO-14 | Low Noise |
| MC33174 | 3.0 or ±1.5 | 44 or ±22 | 1.8 | 2.1 | 5.0 | 20 | 0.72 | -40 to +85 | 90 | 32 | 4 | Single, Split | DIP-14, SO-14, TSSOP-14 | Low Power, Single Supply, Two Voltage Ranges |
| MC33174V | 3.0 or ±1.5 | 44 or ±22 | 1.8 | 2.1 | 5.0 | 20 | 0.72 | -40 to +105 | 90 | 32 | 4 | Single, Split | DIP-14, SO-14 | Low Power, Single Supply, Two Voltage Ranges, Extended Temp. Range |
| MC33179 | ±2.0 | ±18 | 5.0 | 2.0 | 3.0 | 100 | 1.7 | -40 to +85 | 110 | 7.5 | 4 | Split | DIP-14, SO-14 | High Output Current, Low Power, Low Noise |

*I_D typical for total device (all channels)

QUAD OPERATIONAL AMPLIFIERS (continued)

| Device Name | V _{CC} (min) (V) | V _{CC} (max) (V) | GBW (typ) (MHz) | Slew Rate (typ) (V/μs) | V _{IO} (max @ 25°C, V _S = 5.0 V) (mV) | I _{IB} (typ) (nA) | I _D * (typ) (mA) | Temp Range (°C) | CMR (typ) (dB) | e _n (typical) (nV/√Hz) @ f = 1.0 kHz | Number of Channels | Supply Type | Package | Description |
|-------------|---------------------------|---------------------------|-----------------|------------------------|---|----------------------------|-----------------------------|-----------------|----------------|---|--------------------|---------------|-------------------------|--|
| MC33204 | 1.8 or ±0.9 | 12 or ±6.0 | 2.2 | 1.0 | 10 | 80 | 3.6 | -40 to +105 | 90 | 20 | 4 | Single, Split | DIP-14, SO-14, TSSOP-14 | Low Voltage, Rail-to-Rail |
| MC33204V | 1.8 or ±0.9 | 12 or ±6.0 | 2.2 | 1.0 | 10 | 80 | 3.6 | -55 to +125 | 90 | 20 | 4 | Single, Split | DIP-14, SO-14 | Low Voltage, Rail-to-Rail, Extended Temp. Range |
| MC33274A | 3.0 or ±1.5 | 36 or ±18 | 24 | 10 | 1.0 @ V _S = ±15 V 2.0 @ V _S = 5.0 V | 300 | 8.6 | -40 to +85 | 100 | 18 | 4 | Single, Split | DIP-14, SO-14 | Single Supply, High SR, Low Input Offset Voltage |
| MC3403 | 3.0 ±1.5 | 36 ±18 | 1.0 | 0.6 | 10 | 200 | 2.8 | 0 to 70 | 90 | - | 4 | Single, Split | DIP-14, SO-14 | Low Power |
| MC34074 | 3.0 or ±1.5 | 44 or ±22 | 4.5 | 13* | 5.0 | 100 | 6.4 | 0 to 70 | 97 | 32 | 4 | Single, Split | DIP-14, SO-14 | High SR, Wide BW, Single Supply, *AV = -1.0 |
| MC34074A | 3.0 or ±1.5 | 44 or ±22 | 4.5 | 13* | 3.0 | 100 | 6.4 | 0 to 70 | 97 | 32 | 4 | Single, Split | DIP-14, SO-14 | High SR, Wide BW, Single Supply, *AV = -1.0 |
| MC34074V | 3.0 or ±1.5 | 44 or ±22 | 4.5 | 13* | 5.0 | 100 | 6.4 | -40 to +125 | 97 | 32 | 4 | Single, Split | DIP-14, SO-14 | High SR, Wide BW, Single Supply, *AV = -1.0 |
| NCV33274A | 3.0 or ±1.5 | 36 or ±18 | 24 | 10 | 3.5 @ V _S = ±15 V 2.0 @ V _S = ±5.0 V | 300 | 8.6 | -40 to +125 | 100 | 18 | 4 | Single, Split | DIP-14, SO-14 | Single Supply, High SR, Low Input Offset Voltage |

*I_D typical for total device (all channels)

SINGLE COMPARATORS

| Device Name | V _{CC} (min) | V _{CC} (max) | V _{IO} (max) (mV) | I _{IO} (max) (nA) | I _{IB} (typ) (nA) | I _q (typ) (mA) | Temp Range (°C) | Response Time (ns) | Supply Type | Number of Channels | Package | Description |
|-------------|-----------------------|-----------------------|----------------------------|----------------------------|----------------------------|---------------------------|-----------------|--------------------|--------------|--------------------|----------------------|------------------------------|
| LM211 | 5.0 or ±2.5 | 36 or ±15 | 3.0 | 10 | 45 | 2.4 | -25 to +85 | 200 | Single Split | 1 | SO-8 | Highly Flexible Voltage |
| LM311 | 5.0 or ±2.5 | 36 or ±15 | 7.5 | 50 | 45 | 2.4 | 0 to 70 | 200 | Single Split | 1 | SO-8 DIP-8 | Highly Flexible Voltage |
| NCS2200 | 0.85 or ±0.425 | 6.0 or ±3.0 | +8.0 | - | 1.0 pA | 10 | -40 to +105 | 700 | Single Split | 1 | SOT23-5 QFN 2x2.2 | Low Voltage CMOS |
| NCS2201 | 0.85 or ±0.425 | 6.0 or ±3.0 | +8.0 | - | 1.0 pA | 10 | -40 to +105 | 700 | Single Split | 1 | SOT23-6 | Low Voltage CMOS with Enable |
| NCS2202 | 0.85 or ±0.425 | 6.0 or ±3.0 | +8.0 | - | 1.0 pA | 10 | -40 to +105 | 700 | Single Split | 1 | SOT23-5 | Low Voltage CMOS |
| NCS2203 | 0.85 or ±0.425 | 6.0 or ±3.0 | +8.0 | - | 1.0 pA | 10 | -40 to +105 | 700 | Single Split | 1 | SOT23-6 | Low Voltage CMOS with Enable |

DUAL COMPARATORS

| Device Name | V _{CC} (min) | V _{CC} (max) | V _{IO} (max) (mV) | I _{IO} (max) (nA) | I _{IB} (typ) (nA) | I _q * (typ) (mA) | Temp Range (°C) | Response Time (ns) | Supply Type | Number of Channels | Package | Description |
|-------------|-----------------------|-----------------------|----------------------------|----------------------------|----------------------------|-----------------------------|-----------------|--------------------|--------------|--------------------|---------------|--------------------|
| LM293 | 2.0 or ±1.0 | 36 or ±18 | 5.0 | 50 | 25 | 0.4 | -25 to +85 | 1300 | Single Split | 2 | SO-8 | Low Offset Voltage |
| LM393 | 2.0 or ±1.0 | 36 or ±18 | 5.0 | 50 | 25 | 0.4 | 0 to 70 | 1300 | Single Split | 2 | SO-8 DIP-8 | Low Offset Voltage |
| LM2903 | 2.0 or ±1.0 | 36 or ±18 | 7.0 | 50 | 25 | 0.4 | -40 to +105 | 1500 | Single Split | 2 | SO-8 DIP-8 | Low Offset Voltage |
| LM2903V | 2.0 or ±1.0 | 36 or ±18 | 7.0 | 50 | 25 | 0.4 | -40 to +125 | 1500 | Single Split | 2 | SO-8 DIP-8 | Low Offset Voltage |

*I_q typical for total device (all channels)

QUAD COMPARATORS

| Device Name | V _{cc} (min) | V _{cc} (max) | V _{io} (max) (mV) | I _o (max) (nA) | I _B (typ) (nA) | I _q * (typ) (mA) | Temp Range (°C) | Response Time (ns) | Supply Type | Number of Channels | Package | Description |
|-------------|--------------------------|--------------------------|----------------------------------|---------------------------------|---------------------------------|-----------------------------------|-----------------------|--------------------------|-----------------|-----------------------|-----------------|----------------------------|
| LM239 | 3.0 or ±1.5 | 36 or ±18 | 5.0 | 50 | 25 | 0.8 | -25 to +85 | 1300 | Single Split | 4 | SO-14 DIP-14 | TTL and CMOS Compatible |
| LM339 | 3.0 or ±1.5 | 36 or ±18 | 5.0 | 50 | 25 | 0.8 | 0 to 70 | 1300 | Single Split | 4 | SO-14 DIP-14 | TTL and CMOS Compatible |
| LM2901 | 3.0 or ±1.5 | 36 or ±18 | 7.0 | 50 | 25 | 0.8 | -40 to +105 | 1300 | Single Split | 4 | SO-14 DIP-14 | TTL and CMOS Compatible |
| LM2901V | 3.0 or ±1.5 | 36 or ±18 | 7.0 | 50 | 25 | 0.8 | -40 to +125 | 1300 | Single Split | 4 | SO-14 DIP-14 | TTL and CMOS Compatible |
| MC3302 | 3.0 or ±1.5 | 30 or ±15 | 20 | 100 | 25 | 0.8 | -40 to +85 | 1300 | Single Split | 4 | SO-14 DIP-14 | TTL and CMOS Compatible |

*I_q typical for total device (all channels)

AUDIO AMPLIFIERS

| Audio Output/ Application | Class | Topology/ Features | Output Power | PSRR @ 217 Hz | Efficiency | THD + N | Turn-On Time (typ) | I _q (typ) | Shutdown Current (typ) | Package | Device Solutions |
|---|-------|---|------------------------------------|------------------|------------|---------------------|-----------------------|-------------------------|---------------------------|---------------------|---------------------|
| Mono Speaker – Basic Telephone Operations and Polyphonic Ringtones | AB | BTL | 1 W+ | -73 dB | 63% | 0.02% | 285 ms | 1.5 mA | 10 nA | Micro8™ Microbump-9 | NCP2890 |
| | AB | BTL | 1 W+ | -73 dB | 63% | 0.02% | 100 ms | 1.5 mA | 10 nA | Micro8™ Microbump-9 | NCP2892A |
| | AB | Differential | 1 W+ | -80 dB | 64% | 0.006% | 140 ms | 1.9 mA | 20 nA | Microbump-9 DFN-10 | NCP4894 |
| Stereo Headphones – MP3 Players, Bluetooth Headsets | AB | Virtual Ground No Output Cap | 135 mW/Ch | -82 dB | 63% | 0.003% | 285 ms | 1.54 mA | 10 nA | Micro10 | NCP2809 |
| | AB | Differential | 150 mW/Ch | -80 dB | 64% | 0.006% | 140 ms | 1.9 mA | 20 nA | Microbump-9 DFN10 | NCP4894 |
| Mono Speaker/Earpiece – Low Cost Integrated Solution | AB | Single-End/Differential | 1 W to Speaker; 250 mW to Earpiece | -70 dB | 64% | SE 0.003% BTL 0.01% | 140 ms | 1.7 mA | 20 nA | Microbump-9 | NCP4896 |
| Mono Speaker – Handsfree Speaker Phone | D | Filterless, Gain Select by Resistor | 2 W+ | -65 dB | 90% | 0.05% | 9 ms | 2.2 mA | 300 nA | Microbump-9 DFN-8 | NCP2820 |
| Stereo Speakers – Offer Stereo Sound Quality to Play Video/Music on Demand, MP3 | D | Filterless, Gain Selection by Resistor | 2W+ per Channel | -65 dB | 90% | 0.05% | 9 ms | 4.4 mA | 600 nA | Microbump-9 | 2x NCP2820 |
| Mono Speaker – Handsfree Speaker Phone | D | Filterless Integrated Gain. Selectable Gain of 6 dB or 12 dB on External Pin. | 2.65W | -65 dB | 90% | 0.05% | 9 ms | 2.5 mA | 500 nA | Microbump-9 | NCP2821 |

TRANSCONDUCTANCE AMPLIFIERS

| Device Name | Channels | V _{CC} (typ) (V) | T _A (min) (°C) | T _A (max) (°C) | g _M (typ) (μmho) | V _{IO} (typ) (mV) | I _{IB} (typ) (μA) | S _R (typ) (V/μs) | B _w (typ) (MHz) | e _n (typ) (pA/Hz) | THD (typ) (%) | Package |
|-------------|----------|---------------------------------|---------------------------------|---------------------------------|-----------------------------------|----------------------------------|----------------------------------|-----------------------------------|----------------------------------|------------------------------------|------------------|------------------|
| AU5517 | 2 | 44 | -40 | 125 | 9600 | 0.4 | 0.4 | 50 | 2 | 25 | 0.5 | SOIC-16 |
| NE5517A | 2 | 44 | 0 | 70 | 9600 | 0.4 | 0.4 | 50 | 2 | 25 | 0.5 | PDIP-16 |
| NE5517 | 2 | 44 | 0 | 70 | 9600 | 0.4 | 0.4 | 50 | 2 | 25 | 0.5 | SOIC-16, PDIP-16 |

VIDEO AMPLIFIERS

| Device Name | Channels | GBW (typ) (MHz) | V _{CC} (max) (V) | I _D (typ) (mA) | T _A (min) (°C) | T _A (max) (°C) | Package |
|-------------|----------|--------------------|------------------------------|------------------------------|------------------------------|------------------------------|---------|
| NE592D14 | 1 | 90 | 8 | 18 | 0 | 70 | SOIC-14 |
| NE592D8 | 1 | 40 | 8 | 18 | 0 | 70 | SOIC-8 |
| NE592N14 | 1 | 90 | 8 | 18 | 0 | 70 | PDIP-14 |
| NE592N8 | 1 | 40 | 8 | 18 | 0 | 70 | PDIP-8 |

COMPANDORS

| Device Name | Channels | V _{CC} (min) (V) | V _{CC} (max) (V) | I _{CC} (max) (V) | THD (typ) (%) | e _n (typ) (μ V) | V _{REF} (V) | T _A (min) (°C) | T _A (max) (°C) | Package |
|-------------|----------|------------------------------|------------------------------|------------------------------|------------------|------------------------------------|-------------------------|------------------------------|------------------------------|-------------------------------|
| NE570 | 2 | 6 | 24 | 4.3 | 0.3 | 20 | 1.8 | 0 | 70 | SO-16 WB |
| SA571 | 2 | 6 | 18 | 4.3 | 0.5 | 20 | 1.8 | -40 | 85 | SO-16 WB, PDIP-16 |
| SA572D | 2 | 6 | 22 | 6.3 | 0.05 | 6 | 2.5 | -40 | 85 | SO-16 WB, TSSOP-16, PDIP-16 |
| SA575D | 2 | 3 | 7 | 4.2 | 0.12 | 6 | | -40 | 85 | SOIC-20 WB, TSSOP-20, PDIP-20 |

Analog Switches

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ANALOG SWITCHES

| Device | Description | Temperature Range (°C) | Operating Voltage (V) |
|--|--|------------------------|-----------------------|
| AUDIO ANALOG SWITCHES | | | |
| NLAS3699 | Dual DPDT Analog Switch | -55 to +125 | 1.65 to 3.6 |
| NLAS3699B | Dual DPDT Analog Switch | -55 to +125 | 1.65 to 4.3 |
| NLAS3799 | Dual DPDT Ultra-Low Ron Analog Switch | -55 to +125 | 1.65 to 3.6 |
| NLAS3799B | Dual DPDT Analog Switch | -55 to +125 | 1.65 to 4.3 |
| NLAS4157 | SPDT 1 Ω Analog Switch | -55 to +125 | 1.65 to 5.5 |
| NLAS4684 | Dual SPDT .5 Ω Analog Switch | -55 to +125 | 1.8 to 5.5 |
| NLAS4783B | Triple SPDT 1 Ω Analog Switch | -55 to +125 | 1.65 to 4.3 |
| NLAS5123 | SPDT Low Ron Analog Switch | -55 to +125 | 1.65 to 5.5 |
| NLAS5223 | Dual SPDT Ultra-Low Ron Switch | -55 to +125 | 1.65 to 3.6 |
| NLAS5223B | Dual SPDT Ultra-Low Ron Switch | -55 to +125 | 1.65 to 4.3 |
| DATA ANALOG SWITCHES | | | |
| NLAS4717 | Dual SPDT High Bandwidth USB 2.0 Compliant Analog Switch | -55 to +125 | 1.8 to 5.5 |
| NLAS4717EP | Dual SPDT High Bandwidth USB 2.0 Compliant Analog Switch | -55 to +125 | 1.8 to 5.5 |
| NLAS7222A | USB 2.0 High Speed Analog Switch | -55 to +125 | 3.0 to 3.6 |
| GENERAL PURPOSE ANALOG SWITCHES | | | |
| M74VHC1GT66 | Single Supply Analog Switch | -55 to +125 | 2 to 5.5 |
| MC14016B | Quad Analog Switch/Quad Multiplexer | -40 to +85 | 3 to 18 |
| MC14051B | Analog Multiplexer/Demultiplexer | -40 to +85 | 3 to 18 |
| MC14052B | Analog Multiplexer/Demultiplexer | -40 to +85 | 3 to 18 |
| MC14053B | Analog Multiplexer/Demultiplexer | -40 to +85 | 3 to 18 |
| MC14066B | Quad Analog Switch/Quad Multiplexer | -40 to +85 | 3 to 18 |
| MC14067B | Analog Multiplexer/Demultiplexer | -40 to +85 | 3 to 18 |
| MC14551B | Quad 2-Channel Analog Multiplexer/Demultiplexer | -40 to +85 | 3 to 18 |
| MC74HC4051 | Analog Multiplexer/Demultiplexer | -55 to +125 | 2 to 6 |
| MC74HC4052 | Analog Multiplexer/Demultiplexer | -55 to +125 | 2 to 6 |
| MC74HC4053 | Analog Multiplexer/Demultiplexer | -55 to +125 | 2 to 6 |
| MC74HC4066 | Quad Analog Switch/Multiplexer/Demultiplexer | -40 to +85 | 2 to 12 |
| MC74HC4316 | Quad Analog Switch/Multiplexer/Demultiplexer | -55 to +125 | 2 to 6 |
| MC74HC4851 | Analog Multiplexers/Demultiplexers with Injection Current Effect Control | -55 to +125 | 2 to 6 |
| MC74HC4852 | Analog Multiplexers/Demultiplexers with Injection Current Effect Control | -55 to +125 | 2 to 6 |
| MC74LVX4066 | Quad Analog Switch/Multiplexer/Demultiplexer | -55 to +125 | 2 to 6 |
| MC74LVX8051 | Analog Multiplexer/Demultiplexer | -40 to +85 | 2 to 6 |
| MC74LVX8053 | Analog Multiplexer/Demultiplexer | -40 to +85 | 2 to 6 |
| MC74LVXT4066 | Quad Analog Switch/Multiplexer/Demultiplexer | -40 to +85 | 2 to 5.5 |
| MC74LVXT8051 | 8 Channel Analog Switch | -40 to +85 | 2 to 5.5 |
| MC74LVXT8053 | Analog Multiplexer/Demultiplexer | -40 to +85 | 2 to 5.5 |
| MC74VHC1G66 | Single Supply Analog Switch | -55 to +125 | 2 to 5.5 |

ANALOG SWITCHES

| Device | Description | Temperature Range (°C) | Operating Voltage (V) |
|--|--|------------------------|-----------------------|
| GENERAL PURPOSE ANALOG SWITCHES | | | |
| MC74VHC1GT6 | Single Supply Analog Switch | -55 to +125 | 2 to 5.5 |
| MC74VHC4051 | Analog Multiplexer/Demultiplexer | -55 to +125 | 2 to 6 |
| MC74VHC4066 | Quad Analog Switch/Multiplexer/Demultiplexer | -40 to +85 | 2 to 12 |
| NLAS1053 | 2:1 Mux/Demux Analog Switches | -55 to +125 | 2 to 5.5 |
| NLAS2066 | Dual SPST Analog Switch, OVT Inputs | -55 to +125 | 1.65 to 5.5 |
| NLAS3158 | Dual SPDT Analog Switch | -55 to +125 | 1.65 to 5.5 |
| NLAS323 | Dual SPST Analog Switch, Single Supply | -55 to +125 | 2 to 5.5 |
| NLAS324 | Dual SPST Analog Switch, Single Supply | -55 to +125 | 2 to 5.5 |
| NLAS325 | Dual SPST Analog Switch, Single Supply | -55 to +125 | 2 to 5.5 |
| NLAS3799 | Dual DPDT Ultra-Low Ron Analog Switch | -55 to +125 | 1.65 to 3.6 |
| NLAS4051 | Analog Multiplexer/Demultiplexer | -55 to +125 | 2.5 to 5.5 |
| NLAS4053 | Triple 2:1 Analog Switch – Multiplexer | -55 to +125 | 2.5 to 5.5 |
| NLAS44599 | Dual DPDT Analog Switch | -55 to +125 | 2 to 5.5 |
| NLAS4501 | Single SPST Analog Switch | -55 to +125 | 2 to 5.5 |
| NLAS4599 | Single SPDT Analog Switch Single Supply | -55 to +125 | 2 to 5.5 |
| NLAS9431 | Dual DPDT Analog Switch | -55 to +125 | 2 to 5.5 |
| NLASB3157 | Single SPDT Analog Switch | -55 to +125 | 1.65 to 5.5 |
| NLAST4051 | Analog Multiplexer/Demultiplexer | -55 to +125 | 2.5 to 5.5 |
| NLAST44599 | Dual DPDT Analog Switch, TTL Level | -55 to +125 | 2 to 5.5 |
| NLAST4501 | Single SPST Analog Switch, TTL Level | -55 to +125 | 2 to 5.5 |
| NLAST4599 | Single SPDT Analog Switch Single Supply, TTL Level | -55 to +125 | 2 to 5.5 |
| NLAST9431 | Dual DPDT Analog Switch | -55 to +125 | 2 to 5.5 |
| NLVHC1G66 | Single Supply Analog Switch | -55 to +125 | 2 to 5.5 |
| NLVHC1GT66 | Single Supply Analog Switch | -55 to +125 | 2 to 5.5 |

Thyristors

Thyristors

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In Brief...

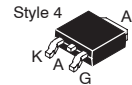
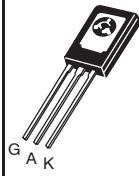
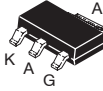
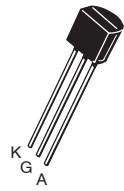
ON Semiconductor's broad line of Thyristors includes...

- A full line of Silicon Controlled Rectifiers (SCR's) covering a forward current range of 0.8 A to 25 A and blocking voltages from 30 V to 800 V. Available in a choice of six different plastic packages in both through hole and surface mount, for space saving requirements.
- An extensive line of Triacs (bidirectional devices) from 0.6 A to 16 A with blocking voltages from 200 V to 800 V. Like the SCR's, the Triacs are available in a choice of six different plastic packages.
- A new line of Thyristor Surge Suppressors in the surface mount SMB package covering surge currents of 50 A and 100 A, with break over voltages from 77 V to 400 V.
- Trigger devices, including Sidacs and PUT's (Programmable Unijunction Transistors). Trigger devices are available in both the axial lead and TO-92 packages.

SCRs

SILICON CONTROLLED RECTIFIERS

| On-State RMS Current IT(RMS) (Amps) | Blocking Voltage VDRM, VRRM (Volts) | TO-92 (Note 1) (TO-226AA) Case 029 Style 10 | SOT-223 Case 318E Style 10 | TO-225AA (TO-126) Case 077 Style 2 | D-PAK Case 369C Style 4 & 5 Case 369D Style 5 | Surge Current ITSM (Amps) 60 Hz | Max IGT (mA) | Max VGT (Volts) |
|---|---|---|----------------------------------|---|---|--|--------------------|-----------------------|
| 0.8 | 30 | 2N5060 | | | | 10 | 0.2 | 0.8 |
| | 60 | 2N5061 | | | | | | |
| | 100 | 2N5062 | | | | | | |
| | 200 | 2N5064 | | | | | | |
| | 100 | MCR100-3 | | | | | | |
| | 200 | MCR100-4 | | | | | | |
| | 400 | MCR100-6 | | | | | | |
| | 600 | MCR100-8 | | | | | | |
| | 200 | | MCR08B | | | | | |
| 600 | | MCR08M | | | | | | |
| 1.5 | 400 | MCR22-6 | | | | 15 | 0.2 | 0.8 |
| | 600 | MCR22-8 | | | | | | |
| 4.0 | 200 | | | C106B | | 20 | 0.2 | 0.8 |
| | 400 | | | C106D | | | | |
| | | | | C106D1 | | | | |
| | 600 | | | C106M | | | | |
| | | | | C106M1 | | | | |
| | 400 | | | MCR106-6 | | 25 | 0.2 | 1.0 |
| | 600 | | | MCR106-8 | | | | |
| | 100 | | | | MCR703A (Note 2) | 25 | 0.1 | 0.8 |
| | 400 | | | | MCR706A (Note 2) | | | |
| | 600 | | | | MCR708A (Note 2) | | | |
| | | | | MCR708A1 (Note 2 & 4) | | | | |
| 400 | | | | MCR716 (Note 3) | | | | |
| 600 | | | | MCR718 (Note 3) | | | | |


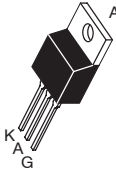
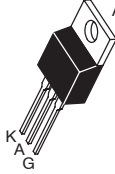


- See TO-92 data sheets for complete device suffix packaging ordering options.
RLRA, RLRE, RL, & RL1 suffixes: Radial Tape and Reel
RLRM & ZL1 suffixes: Radial Tape and Ammo Pack
- Denotes pkg style 5
- Denotes pkg style 4
- Denotes straight lead package

Lead Identification
A = Anode
K = Cathode
G = Gate

Shaded devices denote sensitive gate SCR's

SCRs (continued)

| | |  CASE 369C |  A K A G |  A K A G | | | |
|-------------------------------------|-------------------------------------|--|---|--|---------------------------------|--------------|-----------------|
| On-State RMS Current IT(RMS) (Amps) | Blocking Voltage VDRM, VRRM (Volts) | D-PAK Case 369C -001 = Case 369D Style 4 | TO-220AB Case 221A-09 Style 3 | TO-220AB Case 221A-07 Style 3 | Surge Current ITSM (Amps) 60 Hz | Max IGT (mA) | Max VGT (Volts) |
| 8.0 | 600 | MCR8DCM | | | 80 | 15 | 1.0 |
| | 800 | MCR8DCN | | | | | |
| | 400 | | MCR8SD | | 80 | 0.2 | 1.0 |
| | 600 | | MCR8SM | | | | |
| | 800 | | MCR8SN | | | | |
| | 800 | | MCR8N | | 80 | 15 | 1.0 |
| | 50 | | | C122F1 | 90 | 25 | 1.5 |
| | 600 | MCR8DSM | | | 90 | 0.2 | 1.0 |
| | 800 | MCR8DSN | | | | | |
| | 100 | | | MCR72-3 | 100 | 0.2 | 1.5 |
| | 400 | | | MCR72-6 | | | |
| | 600 | | | MCR72-8 | | | |
| | 50 | | | MCR218-2 | 100 | 25 | 1.5 |
| | 200 | | | MCR218-4 | | | |
| | 400 | | | MCR218-6 | | | |
| 10 | 400 | | MCR12LD | | 100 | 8.0 | 0.8 |
| | 600 | | MCR12LM | | | | |
| | 800 | | MCR12LN | | | | |
| | 800 | | | MCR310-10 | 100 | 0.2 | 1.5 |
| 12 | 600 | MCR12DSM | | | 100 | 0.2 | 1.0 |
| | 800 | MCR12DSN | | | | | |
| | 800 | MCR12DSN-001 | | | | | |
| | 600 | MCR12DCM | | | 100 | 20 | 1.0 |
| | 800 | MCR12DCN | | | | | |
| | 400 | | MCR12D | | | | |
| | 600 | | MCR12M | | | | |
| | 800 | | MCR12N | | | | |
| 50 | | | MCR68-2 | 100 | 30 | 1.5 | |

UL logo indicates UL Recognized File #E69369

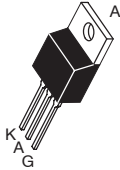
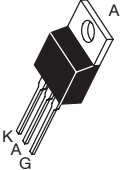
Shaded devices denote sensitive gate SCR's

Lead Identification

A = Anode
K = Cathode
G = Gate

ON Semiconductor Selector Guide – Thyristors

SCRs (continued)

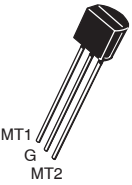
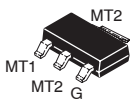
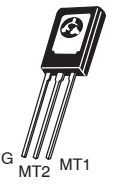
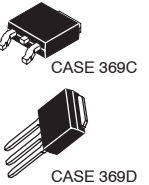
| | |  |  | | | |
|-------------------------------------|-------------------------------------|---|---|---------------------------------|--------------|-----------------|
| On-State RMS Current IT(RMS) (Amps) | Blocking Voltage VDRM, VRRM (Volts) | TO-220AB Case 221A-09 Style 3 | TO-220AB Case 221A-07 Style 3 | Surge Current ITSM (Amps) 60 Hz | Max IGT (mA) | Max VGT (Volts) |
| 12 | 50 | | 2N6394 | 100 | 30 | 1.5 |
| | 100 | | 2N6395 | | | |
| | 400 | | 2N6397 | | | |
| | 800 | | 2N6399 | | | |
| 16 | 800 | MCR16N | | 160 | 20 | 1.0 |
| | 50 | | 2N6400 | 160 | 30 | 1.5 |
| | 100 | | 2N6401 | | | |
| | 200 | | 2N6402 | | | |
| | 400 | | 2N6403 | | | |
| | 600 | | 2N6404 | | | |
| | 800 | | 2N6405 | | | |
| 25 | 400 | MCR25D | | 300 | 30 | 1.0 |
| | 600 | MCR25M | | | | |
| | 800 | MCR25N | | | | |
| | 50 | | 2N6504 | 300 | 30 | 1.5 |
| | 100 | | 2N6505 | | | |
| | 400 | | 2N6507 | | | |
| | 600 | | 2N6508 | | | |
| | 800 | | 2N6509 | | | |
| | 50 | | MCR69-2 | | | |
| | 100 | | MCR69-3 | | | |

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Lead Identification

A = Anode
K = Cathode
G = Gate

TRIACs (Bidirectional Devices)



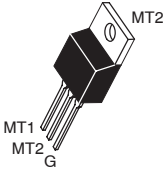
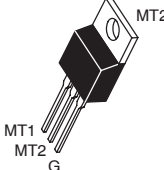
| | |  |  |  |  | | | | | | |
|-------------------------------------|-------------------------------------|---|---|---|--|---------------------------------|--------------|-----|-----|-----|--|
| | | | | | | | Max IGT (mA) | | | | |
| On-State RMS Current IT(RMS) (Amps) | Blocking Voltage VDRM, VRRM (Volts) | TO-92 (Note 5) (TO-226AA) Case 029 Style 12 | SOT-223 Case 318E Style 11 | TO-225AA (TO-126) Case 077 Style 5 | D-PAK Case 369C -001 = Case 369D Style 6 | Surge Current ITSM (Amps) 60 Hz | Q1 | Q2 | Q3 | Q4 | |
| 0.6 | 200 | MAC97A4 | | | | 8.0 | 5.0 | 5.0 | 5.0 | 7.0 | |
| | 400 | MAC97A6 | | | | | | | | | |
| | 600 | MAC97A8 | | | | | | | | | |
| 0.8 | 400 | MAC997A6 | | | | 25 | | | | | |
| | | MAC997B6 | | | | | 3.0 | 3.0 | 3.0 | 5.0 | |
| | | MAC997A8 | | | | | 5.0 | 5.0 | 5.0 | 7.0 | |
| | 600 | MAC997B8 | | | | | 3.0 | 3.0 | 3.0 | 5.0 | |
| | 200 | | MAC08B | | | | 10 | 10 | 10 | 10 | |
| | 600 | | MAC08M | | | | | | | | |
| 2.5 | 200 | | | T2322B | | 25 | 10 | 10 | 10 | 10 | |
| 4.0 | 200 | | | 2N6071A | | 30 | 5.0 | 5.0 | 5.0 | 10 | |
| | | | | 2N6071B | | | 3.0 | 3.0 | 3.0 | 5.0 | |
| | | 400 | | 2N6073A | | | 5.0 | 5.0 | 5.0 | 10 | |
| | | | | 2N6073B | | | 3.0 | 3.0 | 3.0 | 5.0 | |
| | 600 | | 2N6075A | | | 5.0 | 5.0 | 5.0 | 10 | | |
| | | | 2N6075B | | | 3.0 | 3.0 | 3.0 | 5.0 | | |
| | | | | MAC4DLM (Note 6) | | 40 | 3.0 | 3.0 | 3.0 | 5.0 | |
| | | | | MAC4DLM-1 (Note 7) | | | | | | | |
| | | | | MAC4DHM (Note 6) | | | 5.0 | 5.0 | 5.0 | 10 | |
| | | | | MAC4DHM-1 (Note 7) | | | | | | | |

- 5. See TO-92 data sheets for complete device suffix packaging ordering options.
 RLRA, RLRE, RL, & RL1 suffixes: Radial Tape and Reel
 RLRM & ZL1 suffixes: Radial Tape and Ammo Pack
- 6. Denotes SMT package
- 7. Denotes straight lead package

Lead Identification
 MT1 = Main Terminal 1
 MT2 = Main Terminal 2
 G = Gate

Shaded devices denote sensitive gate Triacs

TRIACs (Bidirectional Devices) (continued)

| On-State RMS Current IT(RMS) (Amps) | Blocking Voltage VDRM, VRRM (Volts) |  CASE 369C  CASE 369D |  MT1 MT2 G |  MT1 MT2 G | Surge Current ITSM (Amps) 60 Hz | Max IGT (mA) | | | | | | | | | |
|-------------------------------------|-------------------------------------|--|---|--|---------------------------------|--------------|-----|-----|----|----|----|----|----|---|--|
| | | | | | | Q1 | Q2 | Q3 | Q4 | | | | | | |
| 4.0 | 600 | MAC4DSM (Note 8) | | | 40 | 10 | 10 | 10 | - | | | | | | |
| | | MAC4DSM-1 (Note 9) | | | | | | | | | | | | | |
| | 800 | MAC4DSN (Note 8) | | | | | | | | | | | | | |
| | | MAC4DSN-1 (Note 9) | | | | | | | | | | | | | |
| | 600 | MAC4DCM (Note 8) | | | | | | | | 40 | 35 | 35 | 35 | - | |
| | | MAC4DCM-1 (Note 9) | | | | | | | | | | | | | |
| | | 800 | MAC4DCN (Note 8) | | | | | | | | | | | | |
| | | | MAC4DCN-1 (Note 9) | | | | | | | | | | | | |
| 6.0 | 400 | | | T2500D | 60 | 25 | 60 | 25 | 60 | | | | | | |
| 8.0 | 400 | | MAC8SD | | 70 | 5.0 | 5.0 | 5.0 | - | | | | | | |
| | 600 | | MAC8SM | | | | | | | | | | | | |
| | 800 | | MAC8SN | | | | | | | | | | | | |
| | 400 | | MAC8D | | 80 | 35 | 35 | 35 | - | | | | | | |
| | 600 | | MAC8M | | | | | | | | | | | | |
| | 800 | | MAC8N | | | | | | | | | | | | |
| | 400 | | MAC9D | | | | | | | | | | | | |
| | 600 | | MAC9M | | | | | | | | | | | | |
| | 800 | | MAC9N | | | | | | | | | | | | |
| | 200 | | | MAC228A4 | 5.0 | 5.0 | 5.0 | 5.0 | 10 | | | | | | |
| | 400 | | | MAC228A6 | | | | | | | | | | | |
| | 600 | | | MAC228A8 | | | | | | | | | | | |
| | 800 | | | MAC228A10 | | | | | | | | | | | |
| | 600 | | | 2N6344 | 100 | 50 | 75 | 50 | 75 | | | | | | |
| | 400 | | | T2800D | | | | | | 25 | 60 | 25 | 60 | | |

8. Denotes SMT package
9. Denotes straight lead package

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Shaded devices denote sensitive gate Triacs

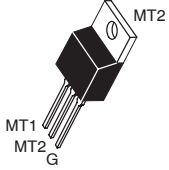
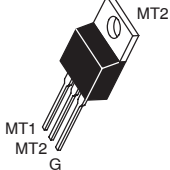
Lead Identification

MT1 = Main Terminal 1

MT2 = Main Terminal 2

G = Gate

TRIACs (Bidirectional Devices) (continued)

| | |  |  | | | | | | | | | |
|-------------------------------------|-------------------------------------|---|---|---------------------------------|--------------|-----|-----|----|----|----|----|----|
| | | | | | Max IGT (mA) | | | | | | | |
| On-State RMS Current IT(RMS) (Amps) | Blocking Voltage VDRM, VRRM (Volts) | TO-220AB Case 221A-09 Style 4 | TO-220AB Case 221A-07 Style 4 | Surge Current ITSM (Amps) 60 Hz | Q1 | Q2 | Q3 | Q4 | | | | |
| 10 | 600 | | MAC210A8 | 100 | 50 | 50 | 50 | 75 | | | | |
| | 800 | | MAC210A10 | | | | | | | | | |
| 12 | 600 | MAC12SM | | 90 | 5.0 | 5.0 | 5.0 | - | | | | |
| | 800 | MAC12SN | | | | | | | | | | |
| | 400 | MAC12HCD | | 100 | 50 | 50 | 50 | - | | | | |
| | 600 | MAC12HCM | | | | | | | | | | |
| | 800 | MAC12HCN | | | | | | | | | | |
| | 400 | MAC12D | | | | | | | | | | |
| | 600 | MAC12M | | | | | | | | | | |
| | 800 | MAC12N | | | | | | | | | | |
| | 600 | | MAC212A8 | | | | | | 50 | 50 | 50 | 75 |
| | 800 | | MAC212A10 | | | | | | | | | |
| | 600 | | 2N6344A | | | | | | 50 | 75 | 50 | 75 |
| | 600 | | 2N6348A | | | | | | | | | |
| 800 | | 2N6349A | | | | | | | | | | |
| 15 | 400 | MAC15SD | | 120 | 5.0 | 5.0 | 5.0 | - | | | | |
| | 600 | MAC15SM | | | | | | | | | | |
| | 800 | MAC15SN | | | | | | | | | | |
| | 600 | MAC15M | | 150 | 35 | 35 | 35 | - | | | | |
| | 800 | MAC15N | | | | | | | | | | |
| | 400 | | MAC15A6 | | | | | | 50 | 50 | 50 | 75 |
| | 600 | | MAC15A8 | | | | | | | | | |
| | 800 | | MAC15A10 | | | | | | | | | |
| 16 | 400 | MAC16D | | 50 | 50 | 50 | - | | | | | |
| | 600 | MAC16M | | | | | | | | | | |
| | 800 | MAC16N | | | | | | | | | | |
| | 600 | MAC16CM | | | | | | | | | | |
| | 800 | MAC16CN | | | | | | | | | | |

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Shaded devices denote sensitive gate Triacs

Lead Identification


MT1 = Main Terminal 1

MT2 = Main Terminal 2

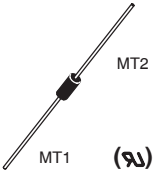
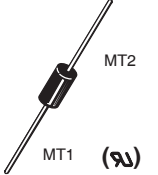
G = Gate

Surge Suppressors and Triggers

THYRISTOR SURGE SUPPRESSORS (Bidirectional Devices)

| | |  (S) | | | |
|---|---|---|---|---|--|
| Surge Current IPPS1 10 x 1000 μ sec (Amps) | Maximum Off-State Voltage (Volts) | SMB Case 403C | Maximum Breakover Voltage VBO (Volts) | Minimum Holding Current IH (mA) | General Description |
| 50 | 58 | NP0640SA | 77 | 150 | These Thyristor Surge Protector Devices (TSPD) protect telecommunication circuits such as central office, access, and customer premises equipment from overvoltage conditions. These are bidirectional devices so they are able to have functionality of 2 devices in one package, saving valuable space on board layout. These devices will act as a crowbar when overvoltage occurs and will divert the energy away from circuit or device that is being protected. Use of the NP Series in equipment will help meet various regulatory requirements including: GR-1089-CORE, EC 61000-4-5, ITU K.20/21/45, IEC 60950, TIA-968-A, FCC Part 68, EN 60950, UL 1950. |
| | 65 | NP0720SA | 88 | | |
| | 75 | NP0900SA | 98 | | |
| | 90 | NP1100SA | 130 | | |
| | 120 | NP1300SA | 160 | | |
| | 140 | NP1500SA | 180 | | |
| | 170 | NP1800SA | 220 | | |
| | 180 | NP2100SA | 240 | | |
| | 190 | NP2300SA | 260 | | |
| | 220 | NP2600SA | 300 | | |
| | 275 | NP3100SA | 350 | | |
| 320 | NP3500SA | 400 | | | |
| 80 | 58 | NP0640SB | 77 | 150 | |
| | 65 | NP0720SB | 88 | | |
| | 75 | NP0900SB | 98 | | |
| | 90 | NP1100SB | 130 | | |
| | 120 | NP1300SB | 160 | | |
| | 140 | NP1500SB | 180 | | |
| | 170 | NP1800SB | 220 | | |
| | 180 | NP2100SB | 240 | | |
| | 190 | NP2300SB | 260 | | |
| | 220 | NP2600SB | 300 | | |
| | 275 | NP3100SB | 350 | | |
| 320 | NP3500SB | 400 | | | |
| 100 | 58 | NP0640SC | 77 | 150 | |
| | 65 | NP0720SC | 88 | | |
| | 75 | NP0900SC | 98 | | |
| | 90 | NP1100SC | 130 | | |
| | 120 | NP1300SC | 160 | | |
| | 140 | NP1500SC | 180 | | |
| | 170 | NP1800SC | 220 | | |
| | 180 | NP2100SC | 240 | | |
| | 190 | NP2300SC | 260 | | |
| | 220 | NP2600SC | 300 | | |
| | 275 | NP3100SC | 350 | | |
| 320 | NP3500SC | 400 | | | |

High Voltage Bidirectional Triggers: Sidacs

| | | | | | |
|--|---|---|--|--|---|
| |  |  | | | |
| On-State RMS Current IT(RMS) (Amps) | DO-41 Case 059A | Surmetic 50 Case 267 Style 2 | Breakover Voltage Range VBO (Volts) | Surge Current ITSM (Amps) 60 Hz | General Description |
| 0.9 | MKP1V120 | | 110-130 | 4.0 | High voltage trigger devices similar in operation to triacs. Upon reaching the breakover voltage in either direction, the devices switch to a low voltage on state. |
| | MKP1V130 | | 120-140 | | |
| | MKP1V160 | | 150-170 | | |
| | MKP1V240 | | 220-250 | | |
| 1.0 | | MKP3V120 MKP3V240 | 220-250 | 20 | |

Lead Identification: Suppressor/Sidac

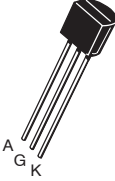
Lead Identification: PUT

Surge Suppressors and Triggers (continued)

MT1 = Main Terminal 1
MT2 = Main Terminal 2

A = Anode
K = Cathode
G = Gate

THYRISTOR TRIGGERS: PROGRAMMABLE UNIJUNCTION TRANSISTORS (PUT's)

| | | | | | |
|-----------------------------------|----------------------------------|--|-----------------------------------|----------------------------------|---|
| | |  | | | |
| IP | | | IV | | |
| RG = 10KΩ (μ Amps max.) | RG = 1MΩ (μ Amps max.) | TO-92 (Note 10) (TO-226AA) Case 029 Style 16 | RG = 10KΩ (μ Amps min.) | RG = 1MΩ (μ Amps max.) | General Description |
| 5.0 | 2.0 | 2N6027 | 70 | 50 | Similar to unijunction transistors, except that IP, IV, and intrinsic voltage are programmable (adjustable) by means of external voltage divider. |
| 1.0 | 0.15 | 2N6028 | 25 | 25 | |

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10. See TO-92 data sheets for complete device suffix packaging ordering options.

RLRA, RLRE, RL, & RL1 suffixes: Radial Tape and Reel
RLRM & ZL1 suffixes: Radial Tape and Ammo Pack



Diodes

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Tuning and Switching Diodes

TUNING DIODES – ABRUPT JUNCTION

| Device | V _R Volts | C _T @ V _R = 4.0 V, 1.0 MHz | | | Cap Ratio Min | Q @ 4.0 V 50 MHz Typ | Package |
|------------------|-------------------------|--|---------------|-----------|------------------|-------------------------|---|
| | | pF Min | pF Nominal | pF Max | | | |
| MV2105 | 30 | 13.5 | 15 | 16.5 | 2.5 | 400 |  TO-226AC, TO-92 2-Lead Case 182-06 |
| MV2109 | 30 | 29.7 | 33 | 36.3 | 2.5 | 200 | |
| MMBV2105L | 30 | 13.5 | 15 | 16.5 | 2.5 | 400 |  TO-236AB, SOT-23 Case 318-08 |
| MMBV2109L | 30 | 29.7 | 33 | 36.3 | 2.5 | 200 | |
| MMBV2101L | 30 | 6.1 | 6.8 | 7.5 | 2.5 | 450 | |
| MMBV3102L | 30 | 20 | – | 25 | 4.5 | 200 | |







Devices listed in **bold italic** are ON Semiconductor preferred devices.

TUNING DIODES – HYPER-ABRUPT JUNCTION

| Device | V _R Volts | C _T (f = 1.0 MHz) | | | Cap Ratio | | | Q 3.0 V Min | Type | Package |
|------------------|-------------------------|------------------------------|-----------|-------|-----------|-----|---------|-------------------|---------------------------|---|
| | | pF Min | pF Max | Volts | Min | Max | Volts | | | |
| MV209 | 30 | 26 | 32 | 3.0 | 5.0 | 6.5 | 3.0/25 | 200 | Single |  TO-226AC, TO-92 2-Lead Case 182-06 |
| MV104 | 32 | 37 | 42 | 3.0 | 2.5 | 2.8 | – | 100 | Single | |
| MMBV105GL | 30 | 1.5 | 2.8 | 25 | 4.0 | 6.5 | 3.0/25 | 200 | Single |  TO-236AB, SOT-23 Case 318-08 |
| MMBV109L | 30 | 26 | 32 | 3.0 | 5.0 | 6.5 | 3.0/25 | 200 | Single | |
| MMBV409L | 20 | 26 | 32 | 3.0 | 1.5 | 1.9 | 3.0/8.0 | 200 | Single | |
| MMBV809L | 20 | 4.5 | 6.1 | 2.0 | 1.8 | 2.6 | 2.0/8.0 | 300 | Single | |
| MMBV432L | 14 | 43 | 48 | 2.0 | 1.5 | 2.0 | – | 100@ 2.0V | Single | |
| MMBV609L | 20 | 26 | 32 | 3.0 | 1.8 | 2.4 | 3/8 | 250 | Dual Common Cathode | |
| MMVL109 | 30 | 26 | 32 | 3 | 5.0 | 6.5 | 3.0/25 | 200 | Single |  SOD-323 Case 477-02 |

Devices listed in **bold italic** are ON Semiconductor preferred devices.





SCHOTTKY DIODES


| Device | V _R Volts | C _T @ V | | V _F Volts Max | I _R @ V | | Type | Package |
|-------------------|-------------------------|--------------------|-------|--------------------------------|--------------------|-------|---------------------|--|
| | | pF Max | Volts | | nA Max | Volts | | |
| <i>MBD701</i> | 70 | 1.0 | 20 | 1.0 | 200 | 35 | Single |  TO-226AC, TO-92 2-Lead Case 182-06 |
| <i>MBD301</i> | 30 | 1.5 | 15 | 0.6 | 200 | 25 | Single | |
| <i>MMSD701</i> | 70 | 1.0 | 20 | 1.0 | 200 | 35 | Single |  SOD-123 Case 425-04 |
| <i>BAT54</i> | 30 | 10 | 1.0 | 0.4 | 2000 | 25 | Single | |
| <i>MMSD301</i> | 30 | 1.5 | 15 | 0.6 | 200 | 25 | Single | |
| <i>MMDL770</i> | 70 | 1.0 | 20 | 1.0 | 200 | 35 | Single |  SOD-323 Case 477-02 |
| <i>BAT54H</i> | 30 | 10 | 1.0 | 0.4 | 2000 | 25 | Single | |
| <i>MMDL301</i> | 30 | 1.5 | 15 | 0.6 | 200 | 25 | Single | |
| <i>RB751V40</i> | 30 | 2.5 | 1.0 | 0.37 | 500 | 30 | Single | |
| <i>MMDL101</i> | 7.0 | 1.0 | 0 | 0.6 | 250 | 3.0 | Single | |
| <i>NSR0320MW2</i> | 23 | 35 | 5.0 | 0.27 | 1000 | 15 | Single | |
| <i>BAS70L</i> | 70 | 2.0 | 0 | 0.75 | 100 | 50 | Single |  TO-236AB, SOT-23 Case 318-08 |
| <i>BAS70-04L</i> | 70 | 2.0 | 0 | 0.75 | 100 | 50 | Dual Series | |
| <i>MMBD701L</i> | 70 | 1.0 | 20 | 1.0 | 200 | 35 | Single | |
| <i>BAS40L</i> | 40 | 5.0 | 1.0 | 0.5 | 1000 | 25 | Single | |
| <i>BAS40-04L</i> | 40 | 5.0 | 1.0 | 0.5 | 1000 | 25 | Dual Series | |
| <i>BAS40-06L</i> | 40 | 5.0 | 1.0 | 0.5 | 1000 | 25 | Dual Common Anode | |
| BAT54CL | 30 | 10 | 1.0 | 0.4 | 2000 | 25 | Dual Common Cathode | |
| <i>BAT54L</i> | 30 | 10 | 1.0 | 0.4 | 2000 | 25 | Single | |
| <i>BAT54AL</i> | 30 | 10 | 1.0 | 0.4 | 2000 | 25 | Dual Common Anode | |
| <i>BAT54SL</i> | 30 | 10 | 1.0 | 0.4 | 2000 | 25 | Dual Series | |
| <i>MMBD301L</i> | 30 | 1.5 | 15 | 0.6 | 200 | 25 | Single | |
| MMBD452L | 30 | 1.5 | 15 | 0.6 | 200 | 25 | Dual Series | |
| <i>MMBD101L</i> | 7.0 | 1.0 | 0 | 0.6 | 250 | 3.0 | Single | |
| <i>MMBD352L</i> | 7.0 | 1.0 | 0 | 0.6 | 250 | 3.0 | Dual Series | |
| <i>MMBD353L</i> | 7.0 | 1.0 | 0 | 0.6 | 250 | 3.0 | Dual Series | |
| <i>MMBD354L</i> | 7.0 | 1.0 | 0 | 0.6 | 250 | 3.0 | Dual Common Cathode | |
| <i>MMBD355L</i> | 7.0 | 1.0 | 0 | 0.6 | 250 | 3.0 | Dual Common Anode | |
| <i>MMBD770</i> | 70 | 1.0 | 20 | 1.0 | 200 | 35 | Single |  SC-70, SOT-323 Case 419-04 |
| BAT54AW | 30 | 10 | 1.0 | 0.4 | 2000 | 25 | Dual Common Anode | |
| BAT54CW | 30 | 10 | 1.0 | 0.4 | 2000 | 25 | Dual Common Cathode | |
| <i>BAT54W</i> | 30 | 10 | 1.0 | 0.4 | 2000 | 25 | Single | |
| <i>BAT54SW</i> | 30 | 10 | 1.0 | 0.4 | 2000 | 25 | Dual Series | |
| <i>MMBD330</i> | 30 | 1.5 | 15 | 0.6 | 200 | 25 | Single | |
| <i>MMBD717L</i> | 20 | 2.5 | 1.0 | 0.37 | 1000 | 10 | Dual Common Anode | |
| <i>MMBD352W</i> | 7.0 | 1.0 | 0 | 0.6 | 250 | 3.0 | Dual Series | |
| BAT54CT | 30 | 10 | 1.0 | 0.4 | 2000 | 25 | Dual Common Cathode |  SOT-416, SC-75, SC-90 Case 463-01 |


Devices listed in **bold italic** are ON Semiconductor preferred devices.

ON Semiconductor Selector Guide – Diodes

SCHOTTKY DIODES

| Device | V _R Volts | C _T @ V | | V _F Volts Max | I _R @ V | | Type | Package |
|-------------------|-------------------------|--------------------|-------|--------------------------------|--------------------|-------|---------------------|--|
| | | pF Max | Volts | | nA Max | Volts | | |
| <i>MBD770DW</i> | 70 | 1.0 | 0 | 0.5 | 200 | 35 | Dual Isolated |  SC-88, SOT-363 Case 419B-02 |
| <i>MBD54DW</i> | 30 | 1.0 | 0 | 0.32 | 2000 | 25 | Dual Isolated | |
| <i>MBD330DW</i> | 30 | 1.5 | 0 | 0.4 | 200 | 25 | Dual Isolated | |
| <i>NSR15TW1T2</i> | 15 | 1.0 | 0 | 0.415 | 50 | 1.0 | Triple | |
| NSR0320XV6 | 23 | 35 | 5.0 | 0.27 | 1000 | 15 | Single |  SOT-563 Case 463A-01 |
| NSR15ADXV6 | 15 | 1.0 | 0 | 0.415 | 50 | 1.0 | Dual Isolated | |
| BAT54CXV3 | 30 | 10 | 1.0 | 0.4 | 2000 | 25 | Dual Common Cathode |  SC-89 Case 463C-03 |
| RB751S40 | 40 | 2.5 | 1.0 | 0.37 | 500 | 30 | Single |  SOD-523 Case 502-01 |
| BAT54XV2 | 30 | 10 | 1.0 | 0.4 | 2000 | 25 | Single | |
| RB520S30 | 30 | – | – | 0.5 | 1000 | 10 | Single | |
| RB521S30 | 30 | – | – | 0.6 | 30000 | 10 | Single | |



| Device | Technology | V _R Volts | C _T @ V | | V _F Max | I _R @ V | | T _{RR} nS | Package |
|----------|------------|-------------------------|--------------------|-------|--------------------|--------------------|-------|-----------------------|--|
| | | | pF Max | Volts | Volts | nA Max | Volts | | |
| NSR30CM3 | Schottky | 30 | 10 | 1.0 | 0.8 | 2.0 | 25 | 5 |  SOT-723 Case 631AA-01 |

| Device | V _R Volts | C _T @ V | | V _F Max | I _R @ V | | Type | Package |
|-----------|-------------------------|--------------------|-------|--------------------|--------------------|-------|--------|--|
| | | pF Max | Volts | Volts Max | μA Max | Volts | | |
| NSR0130P2 | 30 | – | – | 0.385 | 0.350 | 10 | Single |  SOD-923 Case 514AA-01 |
| NSR0140P2 | 40 | 2.5 | 1.0 | 0.350 | 0.500 | 30 | Single | |
| NSR0230P2 | 30 | – | – | 0.325 | 10 | 10 | Single | |

Devices listed in ***bold italic*** are ON Semiconductor preferred devices.

Switching Diodes





PIN SWITCHING DIODES

| Device | V _R Volts Min | C _T @ V | | Resistance Ω Max | I _R μA Max | Type | Package |
|-------------------------|-----------------------------|--------------------|-------|---------------------|--------------------------|--------|--|
| | | pF Max | Volts | | | | |
| MMBV3700L | 200 | 1.0 | 20 | 1.0 | 0.1 | Single |  TO-236AB, SOT-23 Case 318-08 |
| <i>MMBV3401L</i> | 35 | 1.0 | 20 | 0.7 | 0.1 | Single | |
| <i>MMVL3401</i> | 35 | 1.0 | 20 | 0.7 | 0.1 | Single |  SOD-323 Case 477-02 |

Devices listed in ***bold italic*** are ON Semiconductor preferred devices.

Switching Diodes








GENERAL-PURPOSE SIGNAL AND SWITCHING DIODES

| Device | V _R Min Volts | I _R Max μA | V _F | | C _T Max pF | t _{rr} Max ns | Type | Package | |
|------------------|--------------------------------|-----------------------------|----------------|--------------|-----------------------------|------------------------------|---------------------|---|--|
| | | | Min Volts | Max Volts | | | | | |
| <i>BAS21L</i> | 250 | 0.1 | – | 1.0 | 5.0 | 50 | Single |  TO-236AB, SOT-23 Case 318-08 | |
| <i>BAS21SL</i> | 250 | 0.1 | – | 1.0 | 5.0 | 50 | Dual Series | | |
| <i>MMBD914L</i> | 100 | 5.0 | – | 1.0 | 4.0 | 4.0 | Single | | |
| <i>BAS16L</i> | 75 | 1.0 | – | 1.0 | 2.0 | 6.0 | Single | | |
| <i>MMBD6050L</i> | 70 | 0.1 | 0.85 | 1.1 | 2.5 | 4.0 | Single | | |
| <i>BAL99L</i> | 70 | 2.5 | – | 1.0 | 1.5 | 6.0 | Single | | |
| <i>BAS116L</i> | 75 | 0.005 | – | 0.9 | 2.0 | 3000 | Single | | |
| <i>MMBD7000L</i> | 100 | 1.0 | 0.75 | 1.1 | 1.5 | 4.0 | Dual Series | | |
| MMBD2836L | 75 | 0.1 | – | 1.0 | 4.0 | 4.0 | Dual Common Anode | | |
| MMBD2838L | 75 | 0.1 | – | 1.0 | 4.0 | 4.0 | Dual Common Cathode | | |
| <i>BAV70L</i> | 70 | 5.0 | – | 1.0 | 1.5 | 6.0 | Dual Common Cathode | | |
| <i>BAV99L</i> | 70 | 2.5 | – | 1.0 | 1.5 | 4.0 | Dual Series | | |
| <i>BAW56L</i> | 70 | 2.5 | – | 1.0 | 2.0 | 6.0 | Dual Common Anode | | |
| MMBD6100L | 70 | 0.1 | 0.85 | 1.1 | 2.5 | 4.0 | Dual Common Cathode | | |
| BAV74L | 50 | 0.1 | – | 1.0 | 2.0 | 4.0 | Dual Common Cathode | | |
| MMBD2835L | 35 | 0.1 | – | 1.0 | 4.0 | 4.0 | Dual Common Anode | | |
| MMBD2837L | 35 | 0.1 | – | 1.0 | 4.0 | 4.0 | Dual Common Cathode | | |
| <i>BAV199L</i> | 70 | 0.005 | – | 0.9 | 2.0 | 3000 | Dual Series | | |
| <i>BAS20L</i> | 200 | 0.1 | – | 1.0 | 5.0 | 50 | Single | | |
| <i>BAS19L</i> | 120 | 0.1 | – | 1.0 | 5.0 | 50 | Single | | |
| <i>M1MA151K</i> | 40 | 0.1 | – | 1.2 | 2.0 | 3.0 | Single | |  SC-59 Case 318D-04 |
| <i>M1MA152K</i> | 80 | 0.1 | – | 1.2 | 2.0 | 3.0 | Single | | |
| <i>M1MA151WA</i> | 40 | 0.1 | – | 1.2 | 15 | 10 | Dual Common Anode | | |
| <i>M1MA151WK</i> | 40 | 0.1 | – | 1.2 | 2.0 | 3.0 | Dual Common Cathode | | |
| <i>M1MA152WA</i> | 80 | 0.1 | – | 1.2 | 15 | 10 | Dual Common Anode | | |
| <i>M1MA152WK</i> | 80 | 0.1 | – | 1.2 | 2.0 | 3.0 | Dual Common Cathode | | |
| <i>BAS16W</i> | 75 | 1.0 | – | 1.25 | 2.0 | 6.0 | Single | | |
| <i>M1MA141K</i> | 40 | 0.1 | – | 1.2 | 2.0 | 3.0 | Single |  SC-70, SOT-323 Case 419-04 | |
| <i>M1MA174</i> | 100 | 5.0 | – | 1.0 | 4.0 | 4.0 | Single | | |
| <i>M1MA142WK</i> | 80 | 0.1 | – | 1.2 | 2.0 | 3.0 | Dual Common Cathode | | |
| <i>M1MA142WA</i> | 80 | 0.1 | – | 1.2 | 15 | 10 | Dual Common Anode | | |
| <i>BAW56W</i> | 70 | 2.5 | – | 1.0 | 2.0 | 6.0 | Dual Common Anode | | |
| <i>BAV70W</i> | 70 | 5.0 | – | 1.0 | 1.5 | 6.0 | Dual Common Cathode | | |
| <i>BAV99W</i> | 70 | 2.5 | – | 1.0 | 1.5 | 6.0 | Dual Series | | |
| <i>BAV99RW</i> | 70 | 2.5 | – | 1.0 | 1.5 | 6.0 | Dual Series | | |
| <i>M1MA141WA</i> | 40 | 0.1 | – | 1.2 | 15 | 10 | Dual Common Anode | | |
| <i>MMSD914</i> | 100 | 5.0 | – | 1.0 | 4.0 | 4.0 | Single | |  SOD-123 Case 425-04 |
| <i>MMSD103</i> | 250 | 100 | – | 1.0 | 5.0 | 50 | Single | | |
| <i>MMSD4148</i> | 100 | 5.0 | – | 1.0 | 4.0 | 4.0 | Single | | |

Devices listed in **bold italic** are ON Semiconductor preferred devices.

Switching Diodes

GENERAL-PURPOSE SIGNAL AND SWITCHING DIODES

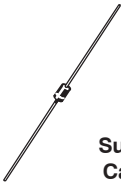

| Device | V _R Min Volts | I _R Max μA | V _F | | C _T Max pF | t _{rr} Max ns | Type | Package |
|------------------------|--------------------------------|-----------------------------|----------------|--------------|-----------------------------|------------------------------|-----------------------|--|
| | | | Min Volts | Max Volts | | | | |
| <i>BAS16H</i> | 75 | 1.0 | – | 1.0 | 2.0 | 6.0 | Single |  SOD-323 Case 477-02 |
| <i>BAS20H</i> | 200 | 0.1 | – | 1.0 | 5.0 | 50 | Single | |
| <i>BAS21H</i> | 250 | 0.1 | – | 1.0 | 5.0 | 50 | Single | |
| <i>MMDL914</i> | 100 | 5.0 | – | 1.0 | 4.0 | 4.0 | Single | |
| <i>MMDL6050</i> | 70 | 0.1 | 0.85 | 1.1 | 2.5 | 4.0 | Single | |
| <i>BAS16T</i> | 75 | 1.0 | – | 1.0 | 2.0 | 6.0 | Single |  SOT-416, SC-75, SC-90 Case 463-01 |
| <i>DA121T</i> | 80 | 1.0 | – | 1.0 | 2.0 | 6.0 | Single | |
| <i>DAP222</i> | 80 | 0.1 | – | 1.2 | 3.5 | 4.0 | Dual Common Anode | |
| <i>BAW56T</i> | 70 | 2.5 | – | 1.0 | 2.0 | 6.0 | Dual Common Anode | |
| <i>DAN222</i> | 80 | 0.1 | – | 1.2 | 3.5 | 4.0 | Dual Common Cathode | |
| <i>BAV70T</i> | 70 | 5.0 | – | 1.0 | 1.5 | 6.0 | Dual Common Cathode | |
| HN2D02FUTW1 | 85 | 0.1 | – | 1.2 | 2.0 | 3.0 | Triple Isolated |  SC-88 Case 419B-02 |
| BAS21DW5 | 250 | 0.1 | – | 1.0 | 5.0 | 50 | Dual Isolated |  SC-88A Case 419A-02 |
| 1SS400 | 100 | 0.1 | – | 1.2 | 3.0 | 4.0 | Single |  SOD-523 Case 502-01 |
| BAS16XV2 | 75 | 1.0 | – | 1.0 | 2.0 | 6.0 | Single | |
| NSD914XV2 | 100 | – | – | 1.0 | 4.0 | 4.0 | Single | |
| NSDEMP11XV6 | 70 | 0.01 | – | 1.2 | 3.5 | 4.0 | Two Dual Common Anode |  SOT-563 Case 463A-01 |
| BAS16DXV6 | 75 | 0.001 | – | 1.25 | 2.0 | 6.0 | Dual Isolated | |
| DAN222M3 | 80 | 0.1 | – | 1.2 | 3.5 | 4.0 | Dual Common Cathode |  SOT-723 Case 631AA-01 |
| DAP222M3 | 80 | 0.1 | – | 1.2 | 3.5 | 4.0 | Dual Common Anode | |

Devices listed in ***bold italic*** are ON Semiconductor preferred devices.

1. Devices in ***bold***, samples starting Oct. 2002, production starting Dec. 2002.
2. Remainder of devices, 4 to 8 weeks after receipt of request based on note 1 timetable.



Zener Diodes – Regulation in Axial Leads

Table 1. AXIAL LEADED – 3, 5 WATT

| Nominal Zener Breakdown Voltage | 3 Watt | | 5 Watt |
|---------------------------------|---|-------------------------------|--|
| | Cathode = Polarity Band | | Cathode = Polarity Band |
| Volts |  <p>Plastic Surmetic 30 Case 59-10 (DO-41)</p> | |  <p>Plastic Surmetic 40 Case 17</p> |
| 1.8 2.0 2.2 2.4 2.5 | | | |
| 2.7 2.8 3.0 3.3 3.6 | MZP4729A | 1N5913B | 1N5333B 1N5334B |
| 3.9 4.3 4.7 5.1 5.6 | | 1N5917B 1N5919B | 1N5335B 1N5336B 1N5337B 1N5338B 1N5339B |
| 6.0 6.2 6.8 7.5 8.2 | MZP4735A | 1N5920B 1N5921B 1N5923B | 1N5340B 1N5341B 1N5342B 1N5343B 1N5344B |
| 8.7 9.1 10 11 12 | | 1N5924B 1N5925B 1N5927B | 1N5346B 1N5347B 1N5348B 1N5349B |
| 13 14 15 16 17 | 3EZ16D MZP4746A | 1N5929B | 1N5350B 1N5351B 1N5352B 1N5353B 1N5354B |
| 18 19 20 22 24 | 3EZ18D MZP4749A | 1N5931B 1N5932B 1N5934B | 1N5355B 1N5356B 1N5357B 1N5358B 1N5359B |





Zener Diodes – Regulation in Axial Leads (continued)

Table 1. AXIAL LEADED – 3, 5 WATT (continued)

| Nominal Zener Breakdown Voltage | 3 Watt | | 5 Watt |
|---------------------------------|---|---------|--|
| | Cathode = Polarity Band | | Cathode = Polarity Band |
| Volts |  <p>Plastic Surmetic 30 Case 59-10 (DO-41)</p> | |  <p>Plastic Surmetic 40 Case 17</p> |
| 25 | MZP4750A | 1N5935B | 1N5360B |
| 27 | | | 1N5361B |
| 28 | | | 1N5362B |
| 30 | | | 1N5363B |
| 33 | | | 1N5364B |
| 36 | | 1N5938B | 1N5365B |
| 39 | | 1N5366B | |
| 43 | | 1N5940B | 1N5367B |
| 47 | | 1N5941B | 1N5368B |
| 51 | | 1N5942B | 1N5369B |
| 56 | | 1N5946B | 1N5370B |
| 60 | | | 1N5371B |
| 62 | | | 1N5372B |
| 68 | | | 1N5373B |
| 75 | | | 1N5374B |
| 82 | | 1N5948B | 1N5375B |
| 87 | | | 1N5377B |
| 91 | | | 1N5378B |
| 100 | | | |
| 110 | | | |
| 120 | | 1N5953B | 1N5380B |
| 130 | | | 1N5381B |
| 140 | | | |
| 150 | | | 1N5383B |
| 160 | | | 1N5384B |
| 170 | | 1N5955B | 1N5386B |
| 180 | | | 1N5387 |
| 190 | | | |
| 200 | | 1N5956B | 1N5388B |

Zener Diodes – Regulation in Surface Mount





Table 2. SURFACE MOUNT PACKAGES – 0.2 WATT

| Nominal Zener Breakdown Voltage | 200 mW Standard Tolerance SOD-523 | 200 mW Tight Tolerance SOD-523 | 200 mW Standard Tolerance SOD-323 | 200 mW Tight Tolerance SOD-323 |
|--|---|---|--|---|
| Volts |  Case 502 |  Case 502 |  Case 477 Style 1 |  Case 477 Style 1 |
| 1.8 2.0 2.2 2.4 2.5 | MM5Z2V4 | MM5Z2V4S | MM3Z2V4 | |
| 2.7 2.8 3.0 3.3 3.6 3.7 | MM5Z2V7 MM5Z3V0 MM5Z3V3 MM5Z3V6 | | MM3Z2V7 MM3Z3V0 MM3Z3V3 MM3Z3V6 | MM3Z3V3S |
| 3.9 4.0 4.3 4.7 5.1 5.6 | MM5Z4V7 MM5Z5V1 MM5Z5V6 | MM5Z4V7S MM5Z5V1S MM5Z5V6S | MM3Z3V9 MM3Z4V3 MM3Z4V7 MM3Z5V1 MM3Z5V6 | MM3Z3V9S MM3Z4V3S MM3Z4V7S MM3Z5V1S MM3Z5V6S |
| 6.0 6.2 6.8 7.5 8.2 | MM5Z6V8 MM5Z7V5 MM5Z8V2 | MM5Z6V2S MM5Z6V8S MM5Z8V2S | MM3Z6V2 MM3Z6V8 MM3Z7V5 MM3Z8V2 | MM3Z6V2S MM3Z6V8S MM3Z7V5S MM3Z8V2S |
| 8.7 9.1 10 11 12 | MM5Z9V1 MM5Z10V MM5Z12V | MM5Z9V1S | MM3Z9V1 MM3Z10V MM3Z11V MM3Z12V | MM3Z9V1S MM3Z10VS MM3Z12VS |
| 13 14 14.5 15 16 17 | MM5Z15V MM5Z16V | | MM3Z15V MM3Z16V | MM3Z15V5 MM3Z16VS |
| 18 19 20 22 24 | | | MM3Z18V MM3Z20V MM3Z22V MM3Z24V | MM3Z18VS |
| 25 27 28 30 33 | MM5Z27V MM5Z30V MM5Z33V | | MM3Z27V MM3Z33V | |

Devices listed in **bold**, *italic* are ON Semiconductor preferred devices.

Zener Diodes – Regulation in Surface Mount

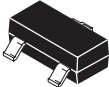
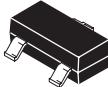
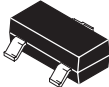
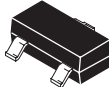
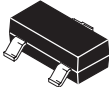
Table 2. SURFACE MOUNT PACKAGES – 0.2 WATT (continued)

| Nominal Zener Breakdown Voltage | 200 mW Standard Tolerance SOD-523 | 200 mW Tight Tolerance SOD-523 | 200 mW Standard Tolerance SOD-323 | 200 mW Tight Tolerance SOD-323 |
|---------------------------------|---|---|--|---|
| Volts |  Case 502 |  Case 502 |  Case 477 Style 1 |  Case 477 Style 1 |
| 36 | <i>MM5Z36V</i> | | MM3Z36V | |
| 39 | | | MM3Z39V | |
| 43 | | | MM3Z43V | |
| 47 | <i>MM5Z47V</i> | | | |
| 51 | | | | |

Devices listed in **bold, italic** are ON Semiconductor preferred devices.

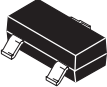
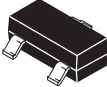
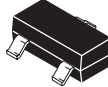
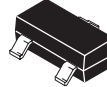
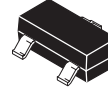
Zener Diodes – Regulation in Surface Mount

Table 3. SURFACE MOUNT PACKAGES – 0.225 WATT

| Nominal Zener Breakdown Voltage | 225 mW Standard Tolerance SOT-23 | 225 mW Tight Tolerance SOT-23 | 225 mW Energy Rated SOT-23 | 225 mW Standard Tolerance SOT-23 | 225 mW Energy Rated SOT-23 |
|---------------------------------|---|---|---|---|---|
| Volts |  Case 318 |  Case 318 |  Case 318 |  Case 318 |  Case 318 |
| 1.8 | | | | | |
| 2.0 | | | | | |
| 2.2 | | | | | |
| 2.4 | BZX84C2V4L | | | MMBZ5221BL | |
| 2.5 | | | | MMBZ5222BL | |
| 2.7 | BZX84C2V7L | | | MMBZ5223BL | |
| 2.8 | | | | | |
| 3.0 | BZX84C3V0L | | | MMBZ5225BL | |
| 3.3 | BZX84C3V3L | | BZX84C3V3E | MMBZ5226BL | |
| 3.6 | BZX84C3V6L | | | MMBZ5227BL | MMBZ5227EL |
| 3.7 | | | | | |
| 3.9 | BZX84C3V9L | | BZX84C3V9E | MMBZ5228BL | |
| 4.0 | | | | | |
| 4.3 | BZX84C4V3L | | | MMBZ5229BL | |
| 4.7 | <i>BZX84C4V7L</i> | | <i>BZX84C4V7E</i> | MMBZ5230BL | |
| 5.1 | <i>BZX84C5V1L</i> | <i>BZX84B5V1L</i> | <i>BZX84C5V1E</i> | <i>MMBZ5231BL</i> | <i>MMBZ5231EL</i> |
| 5.6 | <i>BZX84C5V6L</i> | <i>BZX84B5V6L</i> | <i>BZX84C5V6E</i> | <i>MMBZ5232BL</i> | <i>MMBZ5232EL</i> |
| 6.0 | | | | MMBZ5233BL | |
| 6.2 | <i>BZX84C6V2L</i> | <i>BZX84B6V2L</i> | <i>BZX84C6V2E</i> | <i>MMBZ5234BL</i> | <i>MMBZ5234EL</i> |

Zener Diodes – Regulation in Surface Mount (continued)







Table 3. SURFACE MOUNT PACKAGES – 0.225 WATT (continued)

| Nominal Zener Breakdown Voltage | 225 mW Standard Tolerance SOT-23 | 225 mW Tight Tolerance SOT-23 | 225 mW Energy Rated SOT-23 | 225 mW Standard Tolerance SOT-23 | 225 mW Energy Rated SOT-23 |
|---------------------------------|---|---|---|---|---|
| Volts |  Case 318 |  Case 318 |  Case 318 |  Case 318 |  Case 318 |
| 6.8 | BZX84C6V8L | BZX84B6V8L | | MMBZ5235BL | |
| 7.5 | BZX84C7V5L | BZX84B7V5L | | MMBZ5236BL | |
| 8.2 | BZX84C8V2L | BZX84B8V2L | BZX84C8V2E | MMBZ5237BL | MMBZ5237EL |
| 8.7 | | | | MMBZ5238BL | |
| 9.1 | BZX84C9V1L | BZX84B9V1L | BZX84C9V1E | MMBZ5239BL | |
| 10 | BZX84C10L | | | MMBZ5240BL | MMBZ5240EL |
| 11 | BZX84C11L | | | MMBZ5241BL | |
| 12 | BZX84C12L | | | MMBZ5242BL | MMBZ5242EL |
| 13 | BZX84C13L | | BZX84C13E | MMBZ5243BL | MMBZ5243EL |
| 14 | | | | MMBZ5244BL | MMBZ5244EL |
| 15 | BZX84C15L | | | MMBZ5245BL | MMBZ5245EL |
| 16 | BZX84C16L | BZX84B16L | | MMBZ5246BL | MMBZ5246EL |
| 17 | | | | MMBZ5247BL | |
| 18 | BZX84C18L | BZX84B18L | BZX84C18E | MMBZ5248BL | MMBZ5248EL |
| 19 | | | | MMBZ5249BL | |
| 20 | BZX84C20L | | | MMBZ5250BL | MMBZ5250EL |
| 22 | BZX84C22L | | | MMBZ5251BL | |
| 24 | BZX84C24L | | | MMBZ5252BL | MMBZ5252EL |
| 25 | | | | MMBZ5253BL | |
| 27 | BZX84C27L | | | MMBZ5254BL | |
| 28 | | | | MMBZ5255BL | |
| 30 | BZX84C30L | | | MMBZ5256BL | |
| 33 | BZX84C33L | | | MMBZ5257BL | MMBZ5257EL |
| 36 | BZX84C36L | | BZ84C36E | MMBZ5258BL | |
| 39 | BZX84C39L | | | MMBZ5259BL | |
| 43 | BZX84C43L | | | | |
| 47 | BZX84C47L | | | MMBZ5261BL | MMBZ5261EL |
| 51 | BZX84C51L | | | MMBZ5262BL | |
| 56 | BZX84C56L | | | MMBZ5263BL | |
| 60 | | | | MMBZ5264BL | |
| 62 | BZX84C62L | | | MMBZ5265BL | |
| 68 | BZX84C68L | | | | |
| 75 | BZX84C75L | | | | |
| 82 | | | | MMBZ5268BL | |
| 87 | | | | | |
| 91 | | | | MMBZ5270BL | |

Devices listed in **bold**, *italic* are ON Semiconductor preferred devices.







Zener Diodes – Regulation in Surface Mount (continued)

Table 4. SURFACE MOUNT PACKAGES – 0.5 WATT

| Nominal Zener Breakdown Voltage | 500 mW SOD-123 | 500 mW Energy Rated SOD-123 | 500 mW SOD-123 | 500 mW Energy Rated SOD-123 | 500 mW SOD-123 | 500 mW Energy Rated SOD-123 |
|--|---|---|---|--|---|---|
| Volts |  Case 425 |  Case 425 |  Case 425 |  Case 425 |  Case 425 |  Case 425 |
| 1.8 2.0 2.2 2.4 2.5 | MMSZ2V4 | | MMSZ4678 MMSZ4679 MMSZ4680 MMSZ4681 | | MMSZ5221B MMSZ5222B | MMSZ5221E |
| 2.7 2.8 3.0 3.3 3.6 3.7 | MMSZ2V7 MMSZ3V0 MMSZ3V3 MMSZ3V6 | MMSZ2V7E | MMSZ4682 MMSZ4683 MMSZ4684 MMSZ4685 | MMSZ4684E | MMSZ5223B MMSZ5225B MMSZ5226B MMSZ5227B | MMSZ5223E MMSZ5226E |
| 3.9 4.0 4.3 4.7 5.1 5.6 | MMSZ3V9 MMSZ4V3 MMSZ4V7 MMSZ5V1 MMSZ5V6 | | MMSZ4686 MMSZ4687 MMSZ4688 MMSZ4689 MMSZ4690 | MMSZ4688E MMSZ4689E MMSZ4690E | MMSZ5228B MMSZ5229B MMSZ5230B MMSZ5231B MMSZ5232B | |
| 6.0 6.2 6.8 7.5 8.2 | MMSZ6V2 MMSZ6V8 MMSZ7V5 MMSZ8V2 | MMSZ8V2E | MMSZ4691 MMSZ4692 MMSZ4693 MMSZ4694 | | MMSZ5233B MMSZ5234B MMSZ5235B MMSZ5236B MMSZ5237B | MMSZ5235E MMSZ5237E |
| 8.7 9.1 10 11 12 | MMSZ9V1 MMSZ10 MMSZ11 MMSZ12 | | MMSZ4695 MMSZ4696 MMSZ4697 MMSZ4698 MMSZ4699 | | MMSZ5238B MMSZ5239B MMSZ5240B MMSZ5241B MMSZ5242B | MMSZ5240E MMSZ5242E |
| 13 14 15 16 17 | MMSZ13 MMSZ15 MMSZ16 | MMSZ15E | MMSZ4700 MMSZ4701 MMSZ4702 MMSZ4703 MMSZ4704 | MMSZ4701E MMSZ4702E MMSZ4704E | MMSZ5243B MMSZ5244B MMSZ5245B MMSZ5246B MMSZ5247B | MMSZ5244E MMSZ5245E MMSZ5246E |
| 18 19 20 22 24 | MMSZ18 MMSZ20 MMSZ22 MMSZ24 | MMSZ18E | MMSZ4705 MMSZ4706 MMSZ4707 MMSZ4708 MMSZ4709 | | MMSZ5248B MMSZ5249B MMSZ5250B MMSZ5251B MMSZ5252B | MMSZ5248E MMSZ5250E MMSZ5252E |
| 25 27 28 30 33 | MMSZ27 MMSZ30 MMSZ33 | | MMSZ4710 MMSZ4711 MMSZ4713 MMSZ4714 | | MMSZ5253B MMSZ5254B MMSZ5255B MMSZ5256B MMSZ5257B | MMSZ5254E MMSZ5256E MMSZ5257E |

Zener Diodes – Regulation in Surface Mount (continued)





Table 4. SURFACE MOUNT PACKAGES – 0.5 WATT (continued)

| Nominal Zener Breakdown Voltage | 500 mW SOD-123 | 500 mW Energy Rated SOD-123 | 500 mW SOD-123 | 500 mW Energy Rated SOD-123 | 500 mW SOD-123 | 500 mW Energy Rated SOD-123 |
|---------------------------------|---|---|---|--|---|---|
| Volts |  Case 425 |  Case 425 |  Case 425 |  Case 425 |  Case 425 |  Case 425 |
| 36 | MMSZ36 | | MMSZ4715 | | MMSZ5258B | |
| 39 | MMSZ39 | | | | MMSZ5259B | MMSZ5259E |
| 43 | MMSZ43 | | MMSZ4717 | | MMSZ5260B | MMSZ5260E |
| 47 | | | | | MMSZ5261B | |
| 51 | MMSZ51 | | | | MMSZ5262B | |
| 56 | MMSZ56 | | | | MMSZ5263B | |
| 60 | | | | | MMSZ5264B | |
| 62 | | | | | MMSZ5265B | |
| 68 | | | | | MMSZ5266B | |
| 75 | | | | | MMSZ5267B | |
| 82 | | | | | MMSZ5268B | |
| 87 | | | | | | |
| 91 | | | | | MMSZ5270B | |
| 100 | | | | | | |
| 110 | | | | | MMSZ5272B | |

Devices listed in **bold, italic** are ON Semiconductor preferred devices.





Zener Diodes – Regulation in Surface Mount (continued)

Table 5. SURFACE MOUNT PACKAGES – 1.5, 3 WATT

| Nominal Zener Breakdown Voltage | 1.5 Watt SMA | 1.5 Watt SMA | 3 Watt POWERMITE® | 3 Watt SMB |
|---------------------------------|---|---|---|--|
| Volts |  Plastic Case 403B Cathode = Notch |  Plastic Case 403B Cathode = Notch | Cathode  Anode Plastic Case 457 |  Plastic Case 403A |
| 1.8 2.0 2.2 2.4 2.5 | | | | |
| 2.7 2.8 3.0 3.3 3.6 | 1SMA5913B 1SMA5914B | | | 1SMB5913B 1SMB5914B |
| 3.9 4.3 4.7 5.1 5.6 | 1SMA5915B 1SMA5916B 1SMA5917B 1SMA5918B 1SMA5919B | | | 1SMB5915B 1SMB5916B 1SMB5917B 1SMB5918B 1SMB5919B |
| 6.0 6.2 6.8 7.5 8.2 | 1SMA5920B 1SMA5921B 1SMA5922B 1SMA5923B | | 1PMT5920B 1PMT5921B 1PMT5922B | 1SMB5920B 1SMB5921B 1SMB5922B 1SMB5923B |
| 8.7 9.1 10 11 12 | 1SMA5924B 1SMA5925B 1SMA5927B | | 1PMT5924B 1PMT5927B | 1SMB5924B 1SMB5925B 1SMB5926B 1SMB5927B |
| 13 14 15 16 17 | 1SMA5928B 1SMA5929B 1SMA5930B | BZG03C15 | 1PMT5929B | 1SMB5928B 1SMB5929B 1SMB5930B |
| 18 19 20 22 24 | 1SMA5931B 1SMA5932B 1SMA5933B 1SMA5934B | | 1PMT5933B 1PMT5934B | 1SMB5931B 1SMB5932B 1SMB5933B 1SMB5934B |
| 25 27 28 30 33 | 1SMA5935B 1SMA5936B 1SMA5937B | | | 1SMB5935B 1SMB5936B 1SMB5937B |

Zener Diodes – Regulation in Surface Mount (continued)

Table 5. SURFACE MOUNT PACKAGES – 1.5, 3 WATT (continued)

| Nominal Zener Breakdown Voltage | 1.5 Watt SMA | 1.5 Watt SMA | 3 Watt POWERMITE® | 3 Watt SMB |
|---------------------------------|---|---|---|--|
| Volts |  Plastic Case 403B Cathode = Notch |  Plastic Case 403B Cathode = Notch | Cathode  Anode Plastic Case 457 |  Plastic Case 403A |
| 36 | 1SMA5938B | | | 1SMB5938B |
| 39 | 1SMA5939B | | | 1SMB5939B |
| 43 | 1SMA5940B | | | 1SMB5940B |
| 47 | 1SMA5941B | | 1PMT5941B | 1SMB5941B |
| 51 | 1SMA5942B | | | 1SMB5942B |
| 56 | 1SMA5943B | | | 1SMB5943B |
| 60 | | | | |
| 62 | | | | 1SMB5944B |
| 68 | 1SMA5945B | | | 1SMB5945B |
| 75 | | | | 1SMB5946B |
| 82 | | | | 1SMB5947B |
| 87 | | | | |
| 91 | | | | 1SMB5948B |
| 100 | | | | 1SMB5949B |
| 110 | | | | |
| 120 | | | | 1SMB5951B |
| 130 | | | | 1SMB5952B |
| 150 | | BZG03C150 | | 1SMB5953B |
| 160 | | | | 1SMB5954B |
| 180 | | | | 1SMB5955B |
| 200 | | | | 1SMB5956B |

Dual Zeners – Duals in Surface Mount

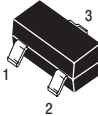

MMBZ15VDLT1 – Common Cathode Series

Table 6. SOT-23 DUAL COMMON CATHODE ZENER; 40 WATTS PEAK POWER (10 x 1000 μs)

ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted)

BIDIRECTIONAL (Circuit tied to Pins 1 and 2)

($V_F = 0.9\text{ V Max @ } I_F = 10\text{ mA}$)

| Device | Breakdown Voltage | | | @ I_T (mA) | Reverse Voltage Working Peak V_{RWM} (V) | Max Reverse Leakage Current I_R (nA) | Max Reverse Surge Current I_{PP} (A) | Max Reverse Voltage @ I_{PP} (Clamping Voltage) V_C (V) | Maximum Temperature Coefficient of V_{BR} (mV/°C) |
|--|--------------------------|-----|------|-----------------|---|--|---|--|---|
| | V_{BR} (Note 1) (V) | | | | | | | | |
| | Min | Nom | Max | | | | | | |
|  <p style="text-align: center;">CASE 318-08 TO-236AB LOW PROFILE SOT-23</p>  | | | | | | | | | |
| MMBZ15VDL | 14.3 | 15 | 15.8 | 1.0 | 12.8 | 100 | 1.9 | 21.2 | 12 |

($V_F = 1.1\text{ V Max @ } I_F = 200\text{ mA}$)

| | | | | | | | | | |
|-----------|-------|----|-------|-----|----|----|-----|----|----|
| MMBZ27VCL | 25.65 | 27 | 28.35 | 1.0 | 22 | 50 | 1.0 | 38 | 26 |
|-----------|-------|----|-------|-----|----|----|-----|----|----|

1. V_{BR} measured at pulse test current I_T at an ambient temperature of 25°C .

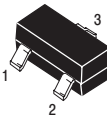

MMBZ5V6ALT1 – Common Anode Series

Table 7. SOT-23 DUAL COMMON ANODE ZENER; 24 WATTS PEAK POWER (10 x 1000 μs)

ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted)

UNIDIRECTIONAL (Circuit tied to Pins 1 and 3 or Pins 2 and 3)

($V_F = 0.9\text{ V Max @ } I_F = 10\text{ mA}$)

| Device | Breakdown Voltage | | | @ I_T (mA) | Max Reverse Leakage Current | | Max Zener Impedance (Note 3) | | Max Reverse Surge Current I_{PP} (A) | Max Reverse Voltage @ I_{PP} (Clamping Voltage) V_C (V) | Max Temp Coefficient of V_{BR} (mV/°C) | | |
|---|--------------------------|-----|------|-----------------|-----------------------------------|--------------|---------------------------------|------------------|---|--|--|--------------------------|------------------|
| | V_{BR} (Note 2) (V) | | | | $I_R @ V_R$ (μA) | V_R (V) | $Z_{ZT} @ I_{ZT}$ (Ω) | I_{ZT} (mA) | | | | $Z_{ZK} @ I_{ZK}$ (Ω) | I_{ZK} (mA) |
| | Min | Nom | Max | | | | | | | | | | |
|  <p style="text-align: center;">CASE 318-08 STYLE 12 LOW PROFILE SOT-23 PLASTIC</p>  | | | | | | | | | | | | | |
| MMBZ5V6AL | 5.32 | 5.6 | 5.88 | 20 | 5.0 | 3.0 | 11 | 1600 | 0.25 | 3.0 | 8.0 | 1.26 | |
| MMBZ6V2AL | 5.89 | 6.2 | 6.51 | 1.0 | 0.5 | 3.0 | – | – | – | 2.76 | 8.7 | 2.80 | |
| MMBZ6V8AL | 6.46 | 6.8 | 7.14 | 1.0 | 0.5 | 4.5 | – | – | – | 2.5 | 9.6 | 3.40 | |
| MMBZ9V1AL | 8.65 | 9.1 | 9.56 | 1.0 | 0.3 | 6.0 | – | – | – | 1.7 | 14 | 7.50 | |

2. V_{BR} measured at pulse test current I_T at an ambient temperature of 25°C .

3. Z_{ZT} and Z_{ZK} are measured by dividing the AC voltage drop across the device by the AC current supplied. The specified limits are $I_{Z(AC)} = 0.1 I_{Z(DC)}$, with AC frequency = 1 kHz.

Dual Zeners – Duals in Surface Mount (continued)

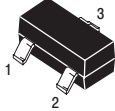
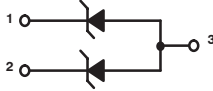
MMBZ5V6ALT1 – Common Anode Series

Table 8. SOT-23 DUAL COMMON ANODE ZENER; 40 WATTS PEAK POWER (10 x 1000 μs)

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)

UNIDIRECTIONAL (Circuit tied to Pins 1 and 3 or Pins 2 and 3)

(V_F = 0.9 V Max @ I_F = 10 mA)

| Device | Breakdown Voltage | | | Reverse Voltage Working Peak V _{RWM} (Volts) | Max Reverse Leakage Current I _R (nA) | Max Reverse Surge Current I _{PP} (A) | Max Reverse Voltage @ I _{PP} (Clamping Voltage) V _C (V) | Maximum Temperature Coefficient of V _{BR} (mV/°C) | |
|--|------------------------------|-----|-------|---|---|---|---|--|-------|
| | V _{BR} (Note 4) (V) | | | | | | | | |
| | Min | Nom | Max | | | | | | |
|  <p>CASE 318-08 STYLE 12 LOW PROFILE SOT-23 PLASTIC</p>  | | | | | | | | | |
| MMBZ12VAL | 11.40 | 12 | 12.60 | 1.0 | 8.5 | 200 | 2.35 | 17 | 7.50 |
| MMBZ15VAL | 14.25 | 15 | 15.75 | 1.0 | 12.0 | 50 | 1.9 | 21 | 12.30 |
| MMBZ18VAL | 17.10 | 18 | 18.90 | 1.0 | 14.5 | 50 | 1.6 | 25 | 15.30 |
| MMBZ20VAL | 19.00 | 20 | 21.00 | 1.0 | 17.0 | 50 | 1.4 | 28 | 17.20 |
| MMBZ27VAL | 25.65 | 27 | 28.35 | 1.0 | 22.0 | 50 | 1.0 | 40 | 24.30 |
| MMBZ33VAL | 31.35 | 33 | 34.65 | 1.0 | 26.0 | 50 | 0.87 | 46 | 30.40 |

4. V_{BR} measured at pulse test current I_T at an ambient temperature of 25°C.

Rectifiers

Rectifiers

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In Brief...

Continuing investment in research and development for discrete products has created a rectifier manufacturing facility that matches the precision and versatility of the most advanced integrated circuits. As a result, ON Semiconductor's silicon rectifiers span all high tech applications with quality levels capable of passing the most stringent environmental tests ... including those for automotive under-hood applications.

Product Highlights:

- Surface Mount Devices – A major thrust has been the development and introduction of a broad range of power rectifiers, Schottky and Ultrafast, 1/2 A to 40 A, 10 to 600 V.
- Application Specific Rectifiers –
 - ◆ Schottky rectifiers having lower forward voltage drop (0.3 V to 0.6 V) for use in low voltage SMPS outputs and as “OR”ing diodes.
 - ◆ MEGAHERTZ™ series for high frequency power supplies and power factor correction.
 - ◆ UltraSoft rectifiers for high speed rectification.
 - ◆ Energy rated rectifiers with guaranteed energy handling capability.
 - ◆ Automotive transient suppressors.
- Ultrafast rectifiers having reverse recovery times as low as 25 ns to complement the Schottky devices for higher voltage requirements in high frequency applications.
- A wide variety of package options to match virtually any potential requirement.

The rectifier selector section that follows has generally been arranged by package and technology. The individual tables have been sorted by voltage and current with the package types for the devices listed shown above each table. The Application Specific Rectifiers are also included in their respective tables.

Application Specific Rectifiers

Table 1. Low V_F Schottky Rectifiers

| Device | I_O (A) | V_{RRM} (V) | Max V_F @ Rated I_O and $T_C = 25^\circ\text{C}$ (V) | Max I_R @ Rated V_{RRM} and $T_C = 25^\circ\text{C}$ (mA) | Package |
|------------------|-----------|---------------|--|---|--------------------|
| MBR0520L | 0.5 | 20 | 0.385 | 0.25 | SOD-123 |
| MBR120LSF | 1.0 | 20 | 0.45 | 0.4 | SOD-123 Flat Lead |
| MBR120VLSF | 1.0 | 20 | 0.34 | 0.6 | SOD-123 Flat Lead |
| MBR130LSF | 1.0 | 30 | 0.38 | 1.0 | SOD-123 Flat Lead |
| MBRM110L | 1.0 | 10 | 0.365 | 0.5 | POWERMITE® |
| MBRA210L | 2.0 | 10 | 0.35 | 0.7 | SMA |
| MBRS130L | 1.0 | 30 | 0.395 | 1.0 | SMB |
| MBRS230L | 2.0 | 30 | 0.50 | 1.0 | SMB |
| MBRS410L | 4.0 | 10 | 0.33 | 5.0 | SMC |
| MBRD835L | 8.0 | 35 | 0.51 | 1.4 | DPAK |
| MBRD1035CTL | 10 | 35 | 0.56 | 2.0 | DPAK |
| MBR2030CTL | 20 | 30 | 0.58 | 5.0 | TO-220AC |
| MBRB2535CTL | 25 | 35 | 0.55 | 10 | D ² PAK |
| MBR2535CTL | 25 | 35 | 0.55 | 5.0 | TO-220AC |
| MBRB2515L | 25 | 15 | 0.45 | 15 | D ² PAK |
| MBR2515L | 25 | 15 | 0.45 | 15 | TO-220AC |
| MBRB3030CTL | 30 | 30 | 0.51 | 2.0 | D ² PAK |
| MBR4015LWT | 40 | 15 | 0.50 | 5.0 | TO-247 |
| MBR10H100CTG* | 10 | 100 | 0.85 | 0.0035 | TO-220AB |
| MBR20H100CTG* | 20 | 100 | 0.88 | 0.0045 | TO-220AB |
| MBRF20H100CTG* | 20 | 100 | 0.88 | 0.0045 | FULL PACK |
| MBR30H100CTG* | 30 | 100 | 0.93 | 0.0045 | TO-220AB |
| MBR40H100WTG* | 40 | 100 | 0.9 | 0.01 | TO-247 |
| MBR41H100CTG* | 40 | 100 | 0.9 | 0.01 | TO-220AB |
| MBRB41H100CT-1G* | 40 | 100 | 0.9 | 0.01 | I ² PAK |
| MBR60H100CTG* | 60 | 100 | 0.98 | 0.01 | TO-220AB |
| MBRB30H30CT-1G* | 30 | 30 | 0.55 | 0.8 | I ² PAK |
| MBR3045ST* | 30 | 45 | 0.76 | 0.2 | TO-220AB |
| MBRB3045CT-1G* | 30 | 45 | 0.76 | 0.2 | I ² PAK |
| MBRB30H60CT-1G* | 30 | 60 | 0.78 | 0.3 | I ² PAK |
| MBRF30H60CTG* | 30 | 60 | 0.78 | 0.3 | FULL PACK |
| MBR60L45CT | 60 | 45 | 0.73 | 1.2 | TO-220AB |
| MBR60L45WT | 60 | 45 | 0.73 | 1.2 | TO-247 |

Table 2. Low Leakage Schottky Rectifiers

| Device | I_O (A) | V_{RRM} (V) | Max V_F @ Rated I_O and $T_C = 25^\circ\text{C}$ (V) | Max I_R @ Rated V_{RRM} and $T_C = 25^\circ\text{C}$ (mA) | Package |
|-----------|-----------|---------------|--|---|-------------------|
| MBR120ESF | 1.0 | 20 | 0.53 | 0.01 | SOD-123 FLAT LEAD |
| MBRM110E | 1.0 | 10 | 0.53 | 0.001 | POWERMITE® |
| MBRM120E | 1.0 | 20 | 0.53 | 0.01 | POWERMITE® |
| MBRA120E | 1.0 | 20 | 0.53 | 0.01 | SMA |
| MBRA210E | 2.0 | 10 | 0.5 | 0.015 | SMA |
| MBRS410E | 4.0 | 10 | 0.5 | 0.15 | SMC |

Table 3. High Voltage Schottky Rectifiers

| Device | I_O (A) | V_{RRM} (V) | Max V_F @ Rated I_O and $T_C = 25^\circ\text{C}$ (V) | Max I_R @ Rated V_{RRM} and $T_C = 25^\circ\text{C}$ (mA) | Package |
|-------------|-----------|---------------|--|---|--------------------|
| MBRS3200 | 3.0 | 200 | 0.84 | 1.0 | SMB |
| MBRS3201 | 3.0 | 200 | 0.84 | 1.0 | SMC |
| MBRS4201 | 4.0 | 200 | 0.86 | 1.0 | SMC |
| MBRB20200CT | 20 | 200 | 1.0 | 1.0 | D ² PAK |
| MBR20200CT | 20 | 200 | 1.0 | 1.0 | TO-220AB |

* New Product

All devices listed are ON Semiconductor preferred devices

Application Specific Rectifiers (continued)

Table 4. High Voltage Schottky Rectifiers (continued)

| Device | I _O (A) | V _{RRM} (V) | Max V _F @ Rated I _O and T _C = 25°C (V) | Max I _R @ Rated V _{RRM} and T _C = 25°C (mA) | Package |
|-------------|--------------------|----------------------|---|--|----------|
| MBRF20200CT | 20 | 200 | 1.0 | 1.0 | FULL PAK |
| MBR40250 | 40 | 250 | 0.97 | 0.03 | TO-220AC |
| MBR40250T | 40 | 250 | 0.97 | 0.03 | TO-220AB |
| MBRF40250T | 40 | 250 | 0.97 | 0.03 | FULL PAK |

Table 5. MEGAHERTZ™ Rectifiers

| Device | I _O (A) | V _{RRM} (V) | Max V _F @ Rated I _F and T _C = 25°C (V) | Max I _R @ Rated V _{RRM} and T _C = 25°C (mA) | t _{rr} (ns) | Package |
|------------|--------------------|----------------------|---|--|----------------------|----------|
| MURH840CT | 8.0 | 400 | 2.2 | 0.01 | 28 | TO-220AB |
| MURHB840CT | 8.0 | 400 | 2.2 | 0.01 | 28 | TO-220AB |
| MURHS160 | 1.0 | 600 | 2.4 | 0.02 | 35 | SMB |
| MURHD560 | 5.0 | 600 | 2.7 | 0.01 | 30 | DPAK |
| MURH860CT | 8.0 | 600 | 2.8 | 0.01 | 35 | TO-220AB |
| MURHB860CT | 8.0 | 600 | 2.8 | 0.01 | 35 | TO-220AB |
| MURHF860CT | 8.0 | 600 | 2.8 | 0.01 | 35 | TO-220AB |

Table 6. UltraSoft Rectifiers (For High Speed Rectification)

| Device | I _O (A) | V _{RRM} (V) | Max V _F @ I _F and T _C = 25°C (V) | Max t _{rr} (ns) | T _J Max (°C) | Package |
|-----------|--------------------|----------------------|---|--------------------------|-------------------------|----------|
| MSRD620CT | 6.0 | 200 | 1.35 @ 6.0 A | 55 | 175 | DPAK |
| MSR860 | 8.0 | 600 | 1.7 @ 8.0 A | 120 | 150 | TO-220AC |
| MSR1560 | 15 | 600 | 1.8 @ 15 A | 45 | 150 | TO-220AC |

Table 7. Energy Rated Rectifiers

| Device | I _O (A) | V _{RRM} (V) | Max V _F @ I _F Rated and T _C = 25°C (V) | Max I _R @ Rated V _{RRM} and T _C = 125°C (μA) | Avalanche Energy (mJ) | Package |
|----------|--------------------|----------------------|---|---|-----------------------|----------|
| MUR180E | 1.0 | 800 | 1.75 | 10 | 10 | DO-41 |
| MUR1100E | 1.0 | 1000 | 1.75 | 10 | 10 | DO-41 |
| MUR480E | 4.0 | 800 | 1.85 | 25 | 20 | DO-201AD |
| MUR4100E | 4.0 | 1000 | 1.85 | 25 | 20 | DO-201AD |
| MUR880E | 8.0 | 800 | 1.8 | 25 | 20 | TO-220AC |
| MUR8100E | 8.0 | 1000 | 1.8 | 25 | 20 | TO-220AC |

Table 8. Automotive Transient Suppressors





| Device | I _O (A) | V _{RRM} (V) | Max V _F @ Rated I _F and T _C = 25°C (V) | I _{RSM} (A) | T _J Max (°C) | Package |
|----------|--------------------|----------------------|---|----------------------|-------------------------|-------------------|
| MR2535L | 6.0 | 20 | 1.1 @ 100 A | 62 @ 10 mS | 150 | Axial Lead Button |
| MR2835SK | 32 | 23 | 1.1 @ 100 A | 62 @ 10 mS | 175 | Top Can |
| TRA2532 | 32 | 23 | 1.18 @ 100 A | 80 @ 10 mS | 175 | Micro Button |

* New Product

All devices listed are ON Semiconductor preferred devices

SCHOTTKY Rectifiers

Table 9. Surface Mount Schottky Rectifiers

| V _{RRM} (V) | I _O ⁽¹⁾ (A) | I _O Rating Condition | Device | Max V _F @ I _F T _C = 25°C (V) | I _{FSM} (A) | T _J Max (°C) | Max I _R ⁽²⁾ T _J = 25°C (mA) | Max I _R ⁽³⁾ (mA) | Package |
|----------------------|-----------------------------------|---------------------------------|--|--|----------------------|-------------------------|---|--|--|
| 20 | 0.5 | T _L = 90°C | <i>MBR0520L</i> <i>MBR0520L</i> | 0.300 @ 0.1 A 0.385 @ 0.5 A | 5.5 | 125 | .075 @ 10 V .250 @ 20 V | 5.0 @ 10 V 8.0 @ 20 V | CASE 425-04 (SOD-123) Cathode = Band  |
| 30 | 0.5 | T _L = 100°C | <i>MBR0530</i> <i>MBR0530</i> | 0.375 @ 0.1 A 0.430 @ 0.5 A | 5.5 | 125 | .020 @ 15 V .130 @ 30 V | - | |
| 40 | 0.5 | T _L = 110°C | <i>MBR0540</i> <i>MBR0540</i> | 0.51 @ 0.5 A | 5.5 | 150 | .010 @ 20 V .020 @ 40 V | - | |
| 30 | 1.0 | T _L = 65°C | <i>MBR130</i> <i>MBR130</i> | 0.51 @ 1.0 A | 5.5 | 125 | 60 μA | - | |
| 20 | 1.0 | T _L = 140°C | <i>MBR120ESF</i> <i>MBR120ESF</i> | 0.53 @ 1.0 A | 40 | 150 | .010 | 1.6 @ 100°C | CASE 498-01 (SOD-123FL)  |
| 20 | 1.0 | T _L = 115°C | <i>MBR120LSF</i> <i>MBR120LSF</i> | 0.45 @ 1.0 A | 50 | 125 | 0.4 | 25 @ 85°C | |
| 20 | 1.0 | T _L = 119°C | <i>MBR120VLSF</i> <i>MBR120VLSF</i> | 0.340 @ 1.0 A | 45 | 125 | 0.6 | 15 @ 85°C | |
| 30 | 1.0 | T _L = 117°C | <i>MBR130LSF</i> | 0.38 @ 1.0 A | 40 | 125 | 1.0 | 25 @ 100°C | |
| 40 | 1.0 | T _L = 112°C | <i>MBR140SF</i> <i>MBR140SF</i> | 0.55 @ 1.0 A | 30 | 125 | 0.5 | 25 @ 85°C | |
| 10 | 1.0 | T _C = 100°C | <i>MBRM110E</i> <i>MBRM110E</i> | 0.53 @ 1.0 A | 50 | 150 | 0.001 | 0.5 @ 100°C | CASE 457-04 (POWERMITE®)  |
| 10 | 1.0 | T _C = 115°C | <i>MBRM110L</i> <i>MBRM110L</i> | 0.365 @ 1.0 A | 50 | 125 | 0.5 | 60 @ 100°C | |
| 20 | 1.0 | T _C = 130°C | <i>MBRM120E</i> <i>MBRM120E</i> | 0.530 @ 1.0 A 0.455 @ 0.1 A | 50 | 150 | 0.010 @ 20 V | 1.6 @ 20 V | |
| 20 | 1.0 | T _{tab} ≤ 100°C | <i>MBRM120L</i> <i>MBRM120L</i> | 0.45 @ 1.0 A 0.34 @ 0.1 A | 50 | 125 | 0.4 @ 20 V | N/A | |
| 30 | 1.0 | T _C = 135°C | <i>MBRM130L</i> <i>MBRM130L</i> | 0.38 @ 1.0 A | 50 | 125 | 0.41 | N/A | |
| 40 | 1.0 | T _{tab} ≤ 100°C | <i>MBRM140</i> | 0.36 @ 0.1 A 0.55 @ 1.0 A | 50 | 125 | 0.5 @ 40 V | N/A | |
| 20 | 1.0 | T _L = 125°C | <i>MBRA120E</i> | 0.530 @ 1.0 A | 40 | 150 | 0.010 | 1.6 @ 100°C | CASE 403D-02 (SMA) Cathode = Notch or Polarity Band  |
| 30 | 1.0 | T _C ≤ 105°C | <i>MBRA130L</i> | 0.41 @ 1.0 A 0.47 @ 2.0 A | 25 | 125 | 1.0 @ 30 V 0.4 @ 15 V | 25 @ 30 V | |
| 40 | 1.0 | T _C ≤ 100°C | <i>MBRA140</i> | 0.55 @ 1.0 A 0.71 @ 2.0 A | 30 | 125 | 0.5 @ 40 V 0.1 @ 20 V | 10 @ 40 V | |
| 60 | 1.0 | T _L = 105°C | <i>MBRA160</i> | 0.51 @ 1.0 A | 60 | 125 | 0.2 | 10 @ 125°C | |
| 60 | 1.0 | T _L = 105°C | <i>SS16</i> | 0.51 @ 1.0 A | 40 | 150 | 0.2 | 10 @ 125°C | |
| 10 | 2.0 | T _L = 125°C | <i>MBRA210E</i> | 0.50 @ 2.0 A | 100 | 150 | 0.015 | 0.2 @ 100°C | |
| 10 | 2.0 | T _L = 110°C | <i>MBRA210L</i> | 0.35 @ 2.0 A | 160 | 125 | 0.70 | 60 @ 100°C | |
| 40 | 3.0 | T _C = 100°C | <i>MBRA340</i> | 0.45 @ 3.0 A | 100 | 150 | 0.3 | 15 @ 40 V | |

⁽¹⁾I_O is total device current capability.



⁽²⁾At V_{RRM} unless noted

⁽³⁾At V_{RRM}, T_J = 100°C unless noted

All devices listed are ON Semiconductor preferred devices

SCHOTTKY Rectifiers (continued)

Table 10. Surface Mount Schottky Rectifiers (continued)

| V _{RRM} (V) | I _O ⁽¹⁾ (A) | I _O Rating Condition | Device | Max V _F @ I _F T _C = 25°C (V) | I _{FSM} (A) | T _J Max (°C) | Max I _R ⁽²⁾ T _J = 25°C (mA) | Max I _R ⁽³⁾ (mA) | Package |
|----------------------|-----------------------------------|---------------------------------|------------------|--|----------------------|-------------------------|---|--|--|
| 20 | 1.0 | T _L = 115°C | MBRS120 | 0.6 @ 1.0 A | 40 | 125 | 1.0 | 10 | CASE 403A-03 (SMB) Cathode = Notch or Polarity Band  |
| 30 | 1.0 | T _L = 120°C | MBRS130L | 0.395 @ 1.0 A | 40 | 125 | 1.0 | 10 | |
| 30 | 1.0 | T _L = 115°C | MBRS130 | 0.6 @ 1.0 A | 40 | 125 | 1.0 | 10 | |
| 40 | 1.0 | T _L = 115°C | MBRS140 | 0.6 @ 1.0 A | 40 | 125 | 1.0 | 10 | |
| 40 | 1.0 | T _C = 110°C | MBRS140L | 0.5 @ 1.0 A | 40 | 125 | 0.4 | 10 | |
| 90 | 1.0 | T _L = 120°C | MBRS190 | 0.75 @ 1.0 A | 50 | 175 | 0.5 | 5.0 | |
| 100 | 1.0 | T _L = 120°C | MBRS1100 | 0.75 @ 1.0 A | 50 | | 0.5 | 5.0 | |
| 40 | 1.5 | T _C = 100°C | MBRS1540 | 0.54 @ 1.5 A | 40 | 125 | 0.8 | 5.7 | |
| 30 | 2.0 | T _C = 110°C | MBRS230L | 0.5 @ 2.0 A | 40 | 125 | 1.0 | 75 @ 125°C | |
| 40 | 2.0 | T _C ≤ 95°C | MBRS240L | 0.43 @ 2.0 A 0.53 @ 4.0 A | 25 | 125 | 2.0 @ 40 V 0.5 @ 20 V | 60 @ 40 V 40 @ 20 V | |
| 40 | 2.0 | T _C = 103°C | MBRS2040L | 0.43 @ 2.0 A 0.50 @ 4.0 A | 70 | 125 | 0.80 @ 40 V 0.10 @ 20 V | 20 @ 40 V 6.0 @ 20 V | |
| 60 | 2.0 | T _L = 95°C | MBRS260 | 0.63 @ 2.0 A | 60 | 125 | 0.2 | 10 @ 125°C | |
| 20 | 2.0 | T _C = 100°C | SS22 | 0.5 @ 2.0 A | 75 | 150 | 0.4 | 5.7 @ 100°C | |
| 40 | 2.0 | T _C = 100°C | SS24 | 0.5 @ 2.0 A | 75 | 150 | 0.4 | 5.7 @ 100°C | |
| 60 | 2.0 | T _L = 95°C | SS26 | 0.63 @ 2.0 A | 40 | 150 | 0.2 | 10 @ 125°C | |
| 200 | 3.0 | T _L = 120°C | MBRS3200 | 0.84 @ 3.0 A | 100 | 150 | 1.0 | 5.0 @ 200 V | |
| 20 | 3.0 | T _L = 110°C | MBRS320 | 0.50 @ 3.0 A | 80 | 125 | 2.0 | 20 | CASE 403-03 (SMC) Cathode = Notch  |
| 30 | 3.0 | T _L = 110°C | MBRS330 | 0.50 @ 3.0 A | 80 | 125 | 2.0 | 20 | |
| 40 | 3.0 | T _L = 110°C | MBRS340 | 0.5 @ 3.0 A | 80 | 125 | 2.0 | 20 | |
| 60 | 3.0 | T _L = 137°C | MBRS360T3 | 0.74 @ 3.0 A | 125 | 175 | 0.15 | 10 | |
| 100 | 3.0 | T _L = 100°C | MBRS3100 | 0.79 @ 3.0 A | 130 | 175 | 0.05 | 5.0 @ 125°C | |
| 200 | 3.0 | T _C = 70°C | MBRS3201 | 0.840 @ 3.0 A | 100 | 150 | 1.0 | 5.0 @ 150°C | |
| 10 | 4.0 | T _L = 130°C | MBRS410E | 0.50 @ 4.0 A | 250 | 150 | 0.15 | 4.0 @ 100°C | |
| 10 | 4.0 | T _L = 110°C | MBRS410L | 0.33 @ 4.0 A | 150 | 125 | 5.0 | 200 @ 100°C | |
| 200 | 4.0 | T _L = 70°C | MBRS4201 | 0.860 @ 4.0 A | 100 | 150 | 1.0 | 5.0 @ 150°C | |
| 40 | 5.0 | T _C = 105°C | MBRS540 | 0.5 @ 5.0 A | 190 | 150 | 0.3 | 15 @ 40 V | |

⁽¹⁾I_O is total device current capability.

⁽²⁾At V_{RRM} unless noted







⁽³⁾At V_{RRM}, T_J = 100°C unless noted

All devices listed are ON Semiconductor preferred devices

ON Semiconductor Selector Guide – Rectifiers

SCHOTTKY Rectifiers (continued)

Table 10. Surface Mount Schottky Rectifiers (continued)

| V_{RRM} (V) | $I_O^{(1)}$ (A) | I_O Rating Condition | Device | Max V_F @ I_F $T_C = 25^\circ\text{C}$ (V) | I_{FSM} (A) | T_J Max ($^\circ\text{C}$) | Max $I_R^{(2)}$ $T_J = 25^\circ\text{C}$ (mA) | Max $I_R^{(3)}$ (mA) | Package | |
|---------------|-----------------|---------------------------|--------------------|---|---------------|--------------------------------|--|------------------------------------|--|--|
| 20 | 3.0 | $T_C = 125^\circ\text{C}$ | MBRD320 | 0.60 @ 3.0 A | 75 | 175 | 0.2 | 20 @ 125°C | CASE 369A-13 (DPAK)  |  "CT" Suffix  Non-"CT" Suffix |
| 30 | 3.0 | $T_C = 125^\circ\text{C}$ | MBRD330 | 0.60 @ 3.0 A | 75 | 175 | 0.2 | 20 @ 125°C | | |
| 40 | 3.0 | $T_C = 125^\circ\text{C}$ | MBRD340 | 0.60 @ 3.0 A | 75 | 175 | 0.2 | 20 @ 125°C | | |
| 50 | 3.0 | $T_C = 125^\circ\text{C}$ | MBRD350 | 0.60 @ 3.0 A | 75 | 175 | 0.2 | 20 @ 125°C | | |
| 60 | 3.0 | $T_C = 125^\circ\text{C}$ | MBRD360 | 0.60 @ 3.0 A | 75 | 175 | 0.2 | 20 @ 125°C | | |
| 20 | 6.0 | $T_C = 130^\circ\text{C}$ | MBRD620CT | 0.70 @ 3.0 A | 75 | 175 | 0.1 | 15 @ 125°C | | |
| 30 | 6.0 | $T_C = 130^\circ\text{C}$ | MBRD630CT | 0.70 @ 3.0 A | 75 | 175 | 0.1 | 15 @ 125°C | | |
| 40 | 6.0 | $T_C = 130^\circ\text{C}$ | MBRD640CT | 0.70 @ 3.0 A | 75 | 175 | 0.1 | 15 @ 125°C | | |
| 50 | 6.0 | $T_C = 130^\circ\text{C}$ | MBRD650CT | 0.70 @ 3.0 A | 75 | 175 | 0.1 | 15 @ 125°C | | |
| 60 | 6.0 | $T_C = 130^\circ\text{C}$ | MBRD660CT | 0.70 @ 3.0 A | 75 | 175 | 0.1 | 15 @ 125°C | | |
| 35 | 8.0 | $T_C = 88^\circ\text{C}$ | MBRD835L | 0.40 @ 3.0 A 0.51 @ 8.0 A | 75 | 150 | 1.4 | 35 | CASE 418B-04 (D ² PAK)  |  "CT" Suffix  Non-"CT" Suffix |
| 35 | 10 | $T_C = 115^\circ\text{C}$ | MBRD1035CTL | 0.56 @ 10 A | 50 | 150 | 2.0 | 130 @ 125°C | | |
| 45 | 10 | $T_C = 135^\circ\text{C}$ | MBRD1045T4G | 0.84 @ 20 A | 70 | 175 | 0.1 | 15 @ 125°C | | |
| 45 | 10 | $T_C = 135^\circ\text{C}$ | MBRB1045 | 0.84 @ 20 A | 150 | 175 | 0.1 | 15 @ 125°C | | |
| 45 | 15 | $T_C = 105^\circ\text{C}$ | MBRB1545CT | 0.84 @ 15 A | 150 | 175 | 0.1 | 15 @ 125°C | | |
| 45 | 16 | $T_C = 125^\circ\text{C}$ | MBRB1645 | 0.63 @ 16 A | 150 | 150 | 0.2 | 40 @ 125°C | | |
| 60 | 20 | $T_C = 110^\circ\text{C}$ | MBRB2060CT | 0.95 @ 20 A | 150 | 175 | 0.15 | 135 @ 125°C | | |
| 100 | 20 | $T_C = 110^\circ\text{C}$ | MBRB20100CT | 0.85 @ 10 A 0.95 @ 20 A | 150 | 175 | 0.1 | 6.0 @ 125°C | | |
| 200 | 20 | $T_C = 134^\circ\text{C}$ | MBRB20200CT | 1.0 @ 20 A | 150 | 150 | 1.0 | 50 @ 125°C | | |
| 15 | 25 | $T_C = 90^\circ\text{C}$ | MBRB2515L | 0.45 @ 25 A | 150 | 100 | 15 | 200 @ 70°C | | |
| 35 | 25 | $T_C = 110^\circ\text{C}$ | MBRB2535CTL | 0.47 @ 12.5 A 0.55 @ 25 A | 150 | 125 | 10 | 500 @ 125°C | | |
| 45 | 30 | $T_C = 130^\circ\text{C}$ | MBRB2545CT | 0.82 @ 30 A | 150 | 175 | 0.2 | 25 @ 125°C | | |
| 30 | 30 | $T_C = 134^\circ\text{C}$ | MBRB3030CT | 0.54 @ 15 A 0.67 @ 30 A | 200 | 175 | 0.6 | 145 @ 150°C 46 @ 10 V, 150°C | | |
| 30 | 30 | $T_C = 115^\circ\text{C}$ | MBRB3030CTL | 0.44 @ 15 A 0.51 @ 30 A | 300 | 125 | 2.0 | 195 @ 125°C 75 @ 10 V, 125°C | | |
| 30 | 40 | $T_C = 115^\circ\text{C}$ | MBRB4030 | 0.46 @ 20 A 0.55 @ 40 A | 300 | 175 | 0.35 | 150 @ 125°C | | |

(1) I_O is total device current capability.


(2) At V_{RRM} unless noted

(3) At V_{RRM} , $T_J = 100^\circ\text{C}$ unless noted

All devices listed are ON Semiconductor preferred devices

SCHOTTKY Rectifiers (continued)

Table 10. Axial Lead Schottky Rectifiers

| V _{RRM} (V) | I _O (A) | I _O Rating Condition | Device | Max V _F @ I _F T _C = 25°C (V) | I _{FSM} (A) | T _J Max (°C) | Max I _R ⁽²⁾ T _L = 25°C (mA) | Max I _R ⁽³⁾ (mA) | Package |
|-------------------------|-----------------------|---|-----------------|---|-------------------------|-------------------------------|--|---|---|
| 20 | 1.0 | T _A = 55°C R _{θJA} = 80°C/W | 1N5817 | 0.45 @ 1.0 A | 25 | 125 | 1.0 | 10 | <p>CASE 59-10 (DO-41) Plastic</p>  <p>Cathode = Polarity Band</p> |
| 30 | 1.0 | T _A = 55°C R _{θJA} = 80°C/W | 1N5818 | 0.55 @ 1.0 A | 25 | 125 | 1.0 | 10 | |
| 40 | 1.0 | T _A = 55°C R _{θJA} = 80°C/W | 1N5819 | 0.60 @ 1.0 A | 25 | 125 | 1.0 | 10 | |
| 50 | 1.0 | T _A = 55°C | MBR150 | 0.75 @ 1.0 A | 25 | 150 | 0.5 | 5.0 | |
| 60 | 1.0 | T _A = 55°C R _{θJA} = 80°C/W | MBR160 | 0.75 @ 1.0 A | 25 | 150 | 0.5 | 5.0 | |
| 100 | 1.0 | T _A = 120°C R _{θJA} = 50°C/W | MBR1100 | 0.79 @ 1.0 A | 50 | 175 | 0.5 | 5.0 | |
| 20 | 3.0 | T _A = 76°C R _{θJA} = 28°C/W | 1N5820 | 0.457 @ 3.0 A | 80 | 125 | 2.0 | 20 | |
| 30 | 3.0 | T _A = 71°C R _{θJA} = 28°C/W | 1N5821 | 0.500 @ 3.0 A | 80 | 125 | 2.0 | 20 | |
| 40 | 3.0 | T _A = 61°C R _{θJA} = 28°C/W | 1N5822 | 0.525 @ 3.0 A | 80 | 125 | 2.0 | 20 | |
| 40 | 3.0 | T _A = 65°C R _{θJA} = 28°C/W | MBR340 | 0.74 @ 3.0 A | 80 | 175 | 0.6 | 20 | |
| 50 | 3.0 | T _A = 65°C | MBR350RL | 0.600 @ 3.0 A | 80 | 150 | 0.6 | 20 | |
| 60 | 3.0 | T _A = 65°C R _{θJA} = 28°C/W | MBR360RL | 0.740 @ 3.0 A | 80 | 150 | 0.6 | 20 | |
| 100 | 3.0 | T _A = 100°C R _{θJA} = 28°C/W | MBR3100 | 0.79 @ 3.0 A | 150 | 175 | 0.6 | 20 | |
| 45 | 8.0 | T _L = 75°C | 80SQ045N | 0.55 @ 8.0 A | 140 | 125 | 1.0 | 50 @ 100°C | |

⁽¹⁾I_O is total device current capability.

⁽²⁾At V_{RRM} unless noted

⁽³⁾At V_{RRM}, T_J = 100°C unless noted

All devices listed are ON Semiconductor preferred devices

ON Semiconductor Selector Guide – Rectifiers

SCHOTTKY Rectifiers (continued)

Table 11. TO-220 and I²PAK Thru-Hole Schottky Rectifiers

| V _{RRM} (V) | I _O (A) | I _O Rating Condition | Device | Max V _F @ I _F T _C = 25°C (V) | I _{FSM} (A) | T _J Max (°C) | Max I _R ⁽²⁾ T _C = 25°C (mA) | Max I _R ⁽³⁾ (mA) | Package |
|----------------------|--------------------|---------------------------------|------------------------|--|----------------------|-------------------------|---|--|--|
| 35 | 15 | T _C = 165°C | <i>MBR1535CT</i> | 0.84 @ 15 A | 150 | 175 | 0.1 | 15 @ 125°C | <p>CASE 221A-09 (TO-220AB)</p> |
| 45 | 15 | T _C = 165°C | <i>MBR1545CT</i> | 0.84 @ 15 A | 150 | 175 | 0.1 | 15 @ 125°C | |
| 100 | 16 | T _C = 133°C | <i>MBR16100CT</i> | 0.84 @ 16 A | 150 | 175 | 0.1 | 5.0 @ 125°C | |
| 30 | 20 | T _C = 137°C | <i>MBR2030CTL</i> | 0.52 @ 10 A 0.58 @ 20 A | 150 | 150 | 5.0 | 40 | |
| 45 | 20 | T _C = 135°C | <i>MBR2045CT</i> | 0.84 @ 20 A | 150 | 150 | 0.1 | 15 @ 125°C | |
| 60 | 20 | T _C = 133°C | <i>MBR2060CT</i> | 0.85 @ 10 A 0.95 @ 20 A | 150 | 150 | 0.1 | 6.0 @ 125°C | |
| 80 | 20 | T _C = 133°C | <i>MBR2080CT</i> | 0.95 @ 20 A | 150 | 175 | 0.1 | 6.0 @ 125°C | |
| 90 | 20 | T _C = 133°C | <i>MBR2090CT</i> | 0.95 @ 20 A | 150 | 150 | 0.1 | 6.0 @ 125°C | |
| 100 | 10 | T _C = 168°C | <i>MBR10H100CTG</i> | 0.85 @ 10 A | 180 | 175 | 0.0035 | 4.5 @ 125°C | |
| 100 | 20 | T _C = 162°C | <i>MBR20H100CTG</i> | 0.88 @ 20 A | 250 | 175 | 0.0045 | 6.0 @ 125°C | |
| 100 | 30 | T _C = 155°C | <i>MBR30H100CTG</i> | 0.93 @ 30 A | 250 | 175 | 0.0045 | 6.0 @ 125°C | |
| 100 | 40 | T _C = 150°C | <i>MBR41H100CTG</i> | 0.9 @ 40 A | 350 | 175 | 0.01 | 10 @ 125°C | |
| 100 | 60 | T _C = 133°C | <i>MBR60H100CTG</i> | 0.98 @ 60 A | 350 | 175 | 0.01 | 10 @ 125°C | |
| 100 | 20 | T _C = 133°C | <i>MBR20100CT</i> | 0.85 @ 10 A 0.95 @ 20 A | 150 | 175 | 0.1 | 6.0 @ 125°C | |
| 200 | 20 | T _C = 125°C | <i>MBR20200CT</i> | 1.0 @ 20 A | 150 | 150 | 1.0 | 50 @ 125°C | |
| 35 | 25 | T _C = 95°C | <i>MBR2535CTL</i> | 0.55 @ 25 A | 150 | 125 | 5.0 | 500 @ 125°C | |
| 45 | 25 | T _C = 130°C | <i>MBR2545CT</i> | 0.82 @ 25 A | 150 | 150 | 0.2 | 40 @ 125°C | |
| 45 | 30 | T _C = 130°C | <i>MBR3045ST</i> | 0.76 @ 30 A | 150 | 175 | 0.2 | 40 @ 125°C | |
| 15 | 40 | T _C = 105°C | <i>MBR4015CTL</i> | 0.54 @ 25 A | 150 | 125 | 1.0 | 400 @ 125°C | |
| 250 | 40 | T _C = 82°C | <i>MBR40250T</i> | 0.097 @ 40 A | 150 | 150 | 0.03 | 30 @ 125°C | |
| 45 | 60 | T _C = 145°C | <i>MBR60L45CT</i> | 0.73 @ 60 A | 200 | 175 | 1.2 | 255 @ 125°C | |
| 35 | 7.5 | T _C = 170°C | <i>MBR735</i> | 0.8 @ 15 A | 150 | 175 | 0.1 | 15 @ 125°C | <p>CASE 221B-04 (TO-220AC)</p> |
| 45 | 7.5 | T _C = 170°C | <i>MBR745</i> | 0.84 @ 15 A | 150 | 175 | 0.1 | 15 @ 125°C | |
| 35 | 10 | T _C = 135°C | <i>MBR1035</i> | 0.84 @ 20 A | 150 | 150 | 0.1 | 15 @ 125°C | |
| 45 | 10 | T _C = 135°C | <i>MBR1045</i> | 0.84 @ 20 A | 150 | 150 | 0.1 | 15 @ 125°C | |
| 60 | 10 | T _C = 133°C | <i>MBR1060</i> | 0.80 @ 10 A | 150 | 150 | 0.1 | 6.0 @ 125°C | |
| 80 | 10 | T _C = 133°C | <i>MBR1080</i> | 0.80 @ 10 A | 150 | 150 | 0.1 | 6.0 @ 125°C | |
| 90 | 10 | T _C = 133°C | <i>MBR1090</i> | 0.8 @ 10 A | 150 | 150 | 0.1 | 6.0 @ 125°C | |
| 100 | 10 | T _C = 133°C | <i>MBR10100</i> | 0.80 @ 10 A | 150 | 150 | 0.1 | 6.0 @ 125°C | |
| 35 | 16 | T _C = 125°C | <i>MBR1635</i> | 0.63 @ 16 A | 150 | 175 | 0.2 | 40 @ 125°C | |
| 45 | 16 | T _C = 125°C | <i>MBR1645</i> | 0.63 @ 16 A | 150 | 175 | 0.2 | 40 @ 125°C | |
| 15 | 25 | T _C = 90°C | <i>MBR2515L</i> | 0.45 @ 25 A | 150 | 100 | 15 | 200 @ 70°C | |
| 250 | 40 | T _C = 82°C | <i>MBR40250</i> | 0.097 @ 40 A | 150 | 150 | 0.03 | 30 @ 125°C | |
| 30 | 30 | | <i>MBRB30H30CT-1G</i> | 0.6 @ 30 A | 260 | 150 | 0.5 | 45 @ 125°C | <p>CASE 418D-01 I²PAK (TO-262)</p> |
| 45 | 30 | T _C = 130°C | <i>MBRB3045CT-1G</i> | 0.76 @ 30 A | 150 | 175 | 0.2 | 40 @ 125°C | |
| 60 | 30 | T _C = 159°C | <i>MBRB30H60CT-1G</i> | 0.78 @ 30 A | 260 | 175 | 0.3 | 45 @ 125°C | |
| 100 | 40 | T _C = 150°C | <i>MBRB41H100CT-1G</i> | 0.9 @ 40 A | 350 | 175 | 0.01 | 10 @ 125°C | |
| 60 | 20 | T _C = 133°C | Ⓢ <i>MBRF2060CT</i> | 0.95 @ 20 A | 150 | 150 | 0.15 | 15 @ 125°C | <p>CASE 221D-03 FULL PAK</p> <p>"CT" Suffix</p> |
| 100 | 20 | T _C = 133°C | Ⓢ <i>MBRF20100CT</i> | 0.95 @ 20 A | 150 | 150 | 0.15 | 15 @ 125°C | |
| 200 | 20 | T _C = 125°C | Ⓢ <i>MBRF20200CT</i> | 1.0 @ 20 A | 150 | 150 | 1.0 | 50 @ 125°C | |
| 45 | 25 | T _C = 125°C | Ⓢ <i>MBRF2545CT</i> | 0.82 @ 25 A | 150 | 150 | 0.2 | 40 @ 125°C | |
| 60 | 30 | T _C = 159°C | <i>MBRF30H60CTG</i> | 0.79 @ 30 A | 260 | 175 | 0.3 | 45 @ 125°C | |
| 250 | 40 | T _C = 46°C | Ⓢ <i>MBRF40250T</i> | 0.097 @ 40 A | 150 | 150 | 0.03 | 30 @ 125°C | |

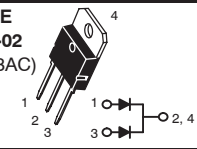
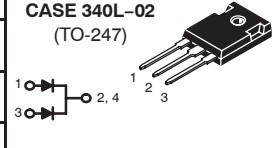
⁽²⁾At V_{RRM} unless noted

⁽³⁾At V_{RRM}, T_J = 100°C unless noted

Ⓢ Indicates UL Recognized – File #E69369

SCHOTTKY Rectifiers (continued)

Table 12. TO-218 and TO-247 Schottky Rectifiers

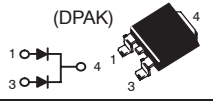
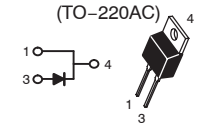
| V_{RRM} (V) | I_O (A) | I_O Rating Condition | Device | Max V_F @ I_F $T_C = 25^\circ\text{C}$ (V) | I_{FSM} (A) | T_J Max ($^\circ\text{C}$) | Max $I_R^{(2)}$ $T_C = 25^\circ\text{C}$ (mA) | Max $I_R^{(3)}$ (mA) | Package |
|------------------|--------------|---------------------------|--------------------|--|------------------|-----------------------------------|---|----------------------------|--|
| 45 | 30 | $T_C = 105^\circ\text{C}$ | <i>MBR3045PT</i> | 0.76 @ 30 A | 200 | 150 | 1.0 | 100 @ 125 $^\circ\text{C}$ | CASE 340D-02 (TO-218AC)  |
| 45 | 40 | $T_C = 125^\circ\text{C}$ | <i>MBR4045PT</i> | 0.70 @ 20 A 0.80 @ 40 A | 400 | 175 | 1.0 | 50 @ 125 $^\circ\text{C}$ | |
| 45 | 60 | $T_C = 125^\circ\text{C}$ | <i>MBR6045PT</i> | 0.62 @ 30 A 0.75 @ 60 A | 500 | 150 | 1.0 | 50 | |
| 45 | 30 | $T_C = 105^\circ\text{C}$ | <i>MBR3045WT</i> | 0.76 @ 30 A | 200 | 150 | 1.0 | 100 @ 125 $^\circ\text{C}$ | CASE 340L-02 (TO-247)  |
| 15 | 40 | $T_C = 125^\circ\text{C}$ | <i>MBR4015LWT</i> | 0.42 @ 20 A 0.50 @ 40 A | 400 | 100 | 5.0 | 150 @ 75 $^\circ\text{C}$ | |
| 45 | 40 | $T_C = 125^\circ\text{C}$ | <i>MBR4045WT</i> | 0.70 @ 20 A 0.80 @ 40 A | 400 | 150 | 1.0 | 50 | |
| 45 | 60 | $T_C = 125^\circ\text{C}$ | <i>MBR6045WT</i> | 0.62 @ 30 A 0.75 @ 60 A | 500 | 175 | 1.0 | 50 | |
| 30 | 70 | $T_C = 100^\circ\text{C}$ | <i>MBR7030WT</i> | 0.72 @ 70 A | 500 | 150 | 5.0 | 250 @ 100 $^\circ\text{C}$ | |
| 100 | 40 | $T_C = 150^\circ\text{C}$ | <i>MBR40H100WT</i> | 0.9 @ 40 A | 200 | 175 | 0.01 | 10 @ 125 $^\circ\text{C}$ | |
| 45 | 60 | $T_C = 165^\circ\text{C}$ | <i>MBR60L45WT</i> | 0.73 @ 60 A | 200 | 175 | 1.2 | 275 @ 125 $^\circ\text{C}$ | |

⁽²⁾At V_{RRM} unless noted

⁽³⁾At V_{RRM} , $T_J = 100^\circ\text{C}$ unless noted

UltraSoft Rectifiers

Table 13. UltraSoft Rectifiers (For High Speed Rectification)

| V_{RRM} (V) | $I_O^{(1)}$ (A) | I_O Rating Condition | Device | Max V_F @ I_F $T_C = 29^\circ\text{C}$ (V) | t_{rr} (ns) | T_J Max ($^\circ\text{C}$) | Max $I_R^{(2)}$ $T_C = 25^\circ\text{C}$ (μA) | Max $I_R^{(3)}$ (μA) | Package |
|------------------|--------------------|---------------------------|------------------|--|------------------|-----------------------------------|--|--------------------------------------|--|
| 200 | 6.0 | $T_C = 137^\circ\text{C}$ | <i>MSRD620CT</i> | 1.35 @ 6.0 A | 55 | 175 | 5.0 | 200 | CASE 369A-13 (DPAK)  |
| 600 | 8.0 | $T_C = 125^\circ\text{C}$ | <i>MSR860</i> | 1.7 @ 8.0 A | 120 | 150 | 10 | 1000 | CASE 221B-04 (TO-220AC)  |
| 600 | 15 | $T_C = 125^\circ\text{C}$ | <i>MSR1560</i> | 1.8 @ 15 A | 45 | 150 | 15 | 5000 | |





⁽¹⁾ I_O is total device current capability.

⁽²⁾At V_{RRM} unless noted

⁽³⁾At V_{RRM} , $T_J = 150^\circ\text{C}$ unless noted

Ultrafast Rectifiers (continued)

Table 14. Surface Mount Ultrafast Rectifiers

| V _{RRM} (V) | I _O ⁽¹⁾ (A) | I _O Rating Condition | Device | Max t _{rr} (ns) | Max V _F @ I _F T _C = 25°C (V) | I _{FSM} (A) | T _J Max (°C) | Max I _R ⁽²⁾ T _J = 25°C (μA) | Max I _R ⁽⁴⁾ (μA) | Package | |
|----------------------|-----------------------------------|---------------------------------|-------------------|--------------------------|--|----------------------|-------------------------|---|--|---|--|
| 50 | 1.0 | T _L = 155°C | <i>MURA105</i> | 30 | 0.875 @ 1.0 A | 50 | 175 | 2.0 | 50 | CASE 403D-02 SMA  Cathode = Polarity Band | |
| 100 | 1.0 | T _L = 155°C | <i>MURA110</i> | 30 | 0.875 @ 1.0 A | 50 | 175 | 2.0 | 50 | | |
| 150 | 1.0 | T _L = 155°C | <i>MURA115</i> | 35 | 0.875 @ 1.0 A | 40 | 175 | 2.0 | 50 | | |
| 200 | 1.0 | T _L = 155°C | <i>MURA120</i> | 35 | 0.875 @ 1.0 A | 40 | 175 | 2.0 | 50 | | |
| 300 | 1.0 | T _L = 150°C | <i>MURA130</i> | 35 | 1.1 @ 1.0 A | 35 | 175 | 5.0 | 150 | | |
| 400 | 1.0 | T _L = 150°C | <i>MURA140</i> | 35 | 1.1 @ 1.0 A | 35 | 175 | 5.0 | 150 | | |
| 600 | 1.0 | T _L = 145°C | <i>MURA160</i> | 75 | 1.25 @ 1.0 A | 30 | 175 | 5.0 | 150 | | |
| 600 | 1.0 | T _L = 145°C | <i>MURHS160</i> | 35 | 2.4 @ 1.0 A | 15 | 175 | 20 | 200 @ 125°C | | |
| 50 | 2.0 | T _L = 135°C | <i>MURA205</i> | 30 | 0.94 @ 2.0 A | 50 | 175 | 2.0 | 50 | | |
| 100 | 2.0 | T _L = 135°C | <i>MURA210</i> | 30 | 0.94 @ 2.0 A | 50 | 175 | 2.0 | 50 | | |
| 150 | 2.0 | T _L = 135°C | <i>MURA215</i> | 35 | 0.95 @ 2.0 A | 40 | 175 | 2.0 | 50 | | |
| 200 | 2.0 | T _L = 135°C | <i>MURA220</i> | 35 | 0.95 @ 2.0 A | 40 | 175 | 2.0 | 50 | | |
| 300 | 2.0 | T _L = 125°C | <i>MURA230</i> | 65 | 1.3 @ 2.0 A | 35 | 175 | 5.0 | 150 | | |
| 400 | 2.0 | T _L = 125°C | <i>MURA240</i> | 65 | 1.3 @ 2.0 A | 35 | 175 | 5.0 | 150 | | |
| 600 | 2.0 | T _L = 110°C | <i>MURA260</i> | 75 | 1.45 @ 2.0 A | 30 | 175 | 5.0 | 150 | | |
| 50 | 1.0 | T _L = 155°C | <i>MURS105</i> | 35 | 0.875 @ 1.0 A | 40 | 175 | 2.0 | 50 | | CASE 403A-03 SMB  Cathode = Polarity Band |
| 100 | 1.0 | T _L = 155°C | <i>MURS110</i> | 35 | 0.875 @ 1.0 A | 40 | 175 | 2.0 | 50 | | |
| 150 | 1.0 | T _L = 155°C | <i>MURS115</i> | 35 | 0.875 @ 1.0 A | 40 | 175 | 2.0 | 50 | | |
| 200 | 1.0 | T _L = 155°C | <i>MURS120</i> | 35 | 0.875 @ 1.0 A | 40 | 175 | 2.0 | 50 | | |
| 400 | 1.0 | T _L = 150°C | <i>MURS140</i> | 75 | 1.25 @ 1.0 A | 35 | 175 | 5.0 | 150 | | |
| 600 | 1.0 | T _L = 150°C | <i>MURS160</i> | 75 | 1.25 @ 1.0 A | 35 | 175 | 5.0 | 150 | | |
| 50 | 2.0 | T _L = 125°C | <i>MURS205</i> | 30 | 0.94 @ 2.0 A | 50 | 175 | 2.0 | 50 | | |
| 100 | 2.0 | T _L = 125°C | <i>MURS210</i> | 30 | 0.94 @ 2.0 A | 50 | 175 | 2.0 | 50 | | |
| 200 | 2.0 | T _L = 145°C | <i>MURS220</i> | 35 | 0.95 @ 2.0 A | 40 | 175 | 2.0 | 50 | | |
| 300 | 2.0 | T _L = 125°C | <i>MURS230</i> | 65 | 1.3 @ 2.0 A | 35 | 175 | 5.0 | 150 | | |
| 400 | 2.0 | T _L = 125°C | <i>MURS240</i> | 65 | 1.3 @ 2.0 A | 35 | 175 | 5.0 | 150 | | |
| 600 | 2.0 | T _L = 125°C | <i>MURS260</i> | 75 | 1.45 @ 2.0 A | 35 | 175 | 5.0 | 150 | | |
| 200 | 3.0 | T _L = 140°C | <i>MURS320</i> | 35 | 0.875 @ 3.0 A | 75 | 175 | 5.0 | 150 | | |
| 400 | 3.0 | T _L = 130°C | <i>MURS340</i> | 75 | 1.25 @ 3.0 A | 75 | 175 | 10 | 250 | | |
| 600 | 3.0 | T _L = 130°C | <i>MURS360</i> | 75 | 1.25 @ 3.0 A | 75 | 175 | 10 | 250 | | |
| 200 | 6.0 | T _C = 140°C | <i>MURD620CT</i> | 35 | 1.0 @ 3.0 A | 50 | 175 | 5.0 | 250 @ 125°C | CASE 403-03 SMC Cathode = Notch  | |
| 200 | 3.0 | T _C = 158°C | <i>MURD320</i> | 35 | 0.95 @ 3.0 A | 75 | 175 | 5.0 | 500 @ 125°C | | |
| 300 | 3.0 | T _C = 140°C | <i>MURD330</i> | 50 | 1.15 @ 3.0 A | 90 | 175 | 5.0 | 500 | | |
| 300 | 3.0 | T _C = 160°C | <i>MURD330</i> | 50 | 1.15 @ 3.0 A | 75 | 175 | 5.0 | 500 | | |
| 400 | 3.0 | T _C = 160°C | <i>MURD340</i> | 50 | 1.15 @ 3.0 A | 75 | 175 | 5.0 | 500 | | |
| 600 | 5.0 | T _C = 159°C | <i>MURHD560</i> | 30 | 2.7 @ 5.0 A | 50 | 175 | 10 | 70 @ 125°C | | |
| 400 | 8.0 | T _C = 120°C | <i>MURHB840CT</i> | 28 | 2.2 @ 4.0 A | 100 | 175 | 10 | 500 | | |
| 600 | 8.0 | T _C = 120°C | <i>MURHB860CT</i> | 35 | 2.8 @ 4.0 A | 100 | 175 | 10 | 500 | D²PAK CASE 418B-04  | |
| 200 | 16 | T _C = 150°C | <i>MURB1620CT</i> | 35 | 0.975 @ 8.0 A | 100 | 175 | 5.0 | 250 | | |
| 600 | 16 | T _C = 150°C | <i>MURB1660CT</i> | 60 | 1.5 @ 8.0 A | 100 | 175 | 10 | 500 | | |

(1) I_O is total device current capability.


(2) At V_{RRM} unless noted

(4) At V_{RRM}, T_J = 150°C unless noted

All devices listed are ON Semiconductor preferred devices

Ultrafast Rectifiers (continued)

Table 15. Axial Lead Ultrafast Rectifiers

| V_{RRM} (V) | I_O (A) | I_O Rating Condition | Device | Max t_{rr} (ns) | Max V_F @ I_F $T_C = 25^\circ\text{C}$ (V) | I_{FSM} (A) | T_J Max ($^\circ\text{C}$) | Max $I_R^{(2)}$ $T_J = 25^\circ\text{C}$ (μA) | Max $I_R^{(4)}$ (μA) | Package |
|------------------|--------------|---|-----------------|----------------------|--|------------------|--------------------------------------|---|--------------------------------------|--|
| 50 | 1.0 | $T_A = 130^\circ\text{C}$ | MUR105 | 35 | 0.875 @ 1.0 A | 35 | 175 | 2.0 | 50 |  <p>CASE 59-10 (DO-41) Plastic Cathode = Polarity Band</p> |
| 100 | 1.0 | $T_A = 130^\circ\text{C}$ | MUR110 | 35 | 0.875 @ 1.0 A | 35 | 175 | 2.0 | 50 | |
| 150 | 1.0 | $T_A = 130^\circ\text{C}$ | MUR115 | 35 | 0.875 @ 1.0 A | 35 | 175 | 2.0 | 50 | |
| 200 | 1.0 | $T_A = 130^\circ\text{C}$ $R_{\theta JA} = 50^\circ\text{C/W}$ | MUR120 | 25 | 0.875 @ 1.0 A | 35 | 175 | 2.0 | 50 | |
| 300 | 1.0 | $T_A = 120^\circ\text{C}$ | MUR130 | 75 | 1.25 @ 1.0 A | 35 | 175 | 5.0 | 150 | |
| 400 | 1.0 | $T_A = 120^\circ\text{C}$ | MUR140 | 75 | 1.25 @ 1.0 A | 35 | 175 | 5.0 | 150 | |
| 600 | 1.0 | $T_A = 120^\circ\text{C}$ $R_{\theta JA} = 50^\circ\text{C/W}$ | MUR160 | 75 | 1.25 @ 1.0 A | 35 | 175 | 5.0 | 150 | |
| 800 | 1.0 | $T_A = 95^\circ\text{C}$ | MUR180E | 75 | 1.75 @ 1.0 A | 35 | 175 | 10 | 600 @ 100 $^\circ\text{C}$ | |
| 1000 | 1.0 | $T_A = 95^\circ\text{C}$ $R_{\theta JA} = 50^\circ\text{C/W}$ | MUR1100E | 75 | 1.75 @ 1.0 A | 35 | 175 | 10 | 600 @ 100 $^\circ\text{C}$ | |
| 200 | 2.0 | $T_A = 90^\circ\text{C}$ | MUR220 | 35 | 0.95 @ 2.0 A | 35 | 175 | 2.0 | 50 | |
| 400 | 2.0 | $T_A = 85^\circ\text{C}$ | MUR240 | 65 | 1.15 @ 2.0 A | 35 | 175 | 5.0 | 150 | |
| 600 | 2.0 | $T_A = 60^\circ\text{C}$ | MUR260 | 75 | 1.35 @ 2.0 A | 35 | 175 | 5.0 | 150 | |
| 1000 | 2.0 | $T_A = 35^\circ\text{C}$ | MUR2100E | 100 | 2.2 @ 2.0 A | 35 | 175 | 10 | 600 | |
| 50 | 4.0 | $T_A = 80^\circ\text{C}$ | MUR405 | 35 | 0.89 @ 4.0 A | 125 | 175 | 5.0 | 150 | |
| 100 | 4.0 | $T_A = 80^\circ\text{C}$ | MUR410 | 35 | 0.89 @ 4.0 A | 125 | 175 | 5.0 | 150 | |
| 150 | 4.0 | $T_A = 80^\circ\text{C}$ | MUR415 | 35 | 0.89 @ 4.0 A | 125 | 175 | 5.0 | 150 | |
| 200 | 4.0 | $T_A = 80^\circ\text{C}$ $R_{\theta JA} = 28^\circ\text{C/W}$ | MUR420 | 35 | 0.88 @ 3.0 A | 125 | 175 | 5.0 | 150 | |
| 400 | 4.0 | $T_A = 40^\circ\text{C}$ | MUR440 | 75 | 1.28 @ 4.0 A | 110 | 175 | 10 | 250 | |
| 600 | 4.0 | $T_A = 40^\circ\text{C}$ $R_{\theta JA} = 28^\circ\text{C/W}$ | MUR460 | 75 | 1.25 @ 3.0 A | 110 | 175 | 10 | 250 | |
| 800 | 4.0 | $T_A = 35^\circ\text{C}$ | MUR480E | 75 | 1.75 @ 3.0 A | 70 | 175 | 25 | 900 | |
| 1000 | 4.0 | $T_A = 35^\circ\text{C}$ $R_{\theta JA} = 28^\circ\text{C/W}$ | MUR4100E | 75 | 1.75 @ 3.0 A | 70 | 175 | 25 | 900 | |

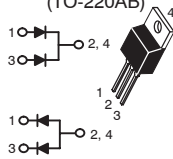
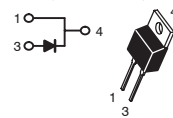

(2)At V_{RRM} unless noted

(4)At V_{RRM} , $T_J = 150^\circ\text{C}$ unless noted

ON Semiconductor Selector Guide – Rectifiers

Ultrafast Rectifiers (continued)

Table 16. TO-220 Ultrafast and MEGAHERTZ™ Rectifiers

| V _{RRM} (V) | I _O ⁽¹⁾ (A) | I _O Rating Condition | Device | Max t _{rr} (ns) | Max V _F @ I _F T _C = 25°C (V) | I _{FSM} (A) | T _J Max (°C) | Max I _R ⁽²⁾ T _C = 25°C (μA) | Max I _R ⁽⁴⁾ (μA) | Package | |
|----------------------|-----------------------------------|---------------------------------|---------------------|--------------------------|--|----------------------|-------------------------|---|--|--|--|
| 200 | 6.0 | T _C = 130°C | <i>MUR620CT</i> | 35 | 0.975 @ 3.0 A | 75 | 175 | 5.0 | 250 | CASE 221A-09 (TO-220AB)  | |
| 400 | 8.0 | T _C = 120°C | <i>MURH840CT</i> | 28 | 2.2 @ 4.0 A | 100 | 175 | 10 | 500 | | |
| 600 | 8.0 | T _C = 120°C | <i>MURH860CT</i> | 35 | 2.8 @ 4.0 A | 100 | 175 | 10 | 500 | | |
| 100 | 16 | T _C = 150°C | <i>MUR1610CT</i> | 35 | 0.975 @ 8.0 A | 100 | 175 | 5.0 | 250 | | |
| 150 | 16 | T _C = 150°C | <i>MUR1615CT</i> | 35 | 0.975 @ 8.0 A | 100 | 175 | 5.0 | 250 | | |
| 200 | 16 | T _C = 150°C | <i>MUR1620CT</i> | 35 | 0.975 @ 8.0 A | 100 | 175 | 5.0 | 250 | | |
| 200 | 16 | T _C = 160°C | <i>MUR1620CTR</i> | 85 | 1.2 @ 8.0 A | 100 | 175 | 5.0 | 500 | | MUR1620CTR Only |
| 400 | 16 | T _C = 150°C | <i>MUR1640CT</i> | 60 | 1.30 @ 8.0 A | 100 | 175 | 10 | 250 | | |
| 600 | 16 | T _C = 150°C | <i>MUR1660CT</i> | 60 | 1.5 @ 8.0 A | 100 | 175 | 10 | 500 | | CASE 221B-04 (TO-220AC)  |
| 50 | 8.0 | T _C = 150°C | <i>MUR805</i> | 35 | 0.975 @ 8.0 A | 100 | 175 | 5.0 | 250 | | |
| 100 | 8.0 | T _C = 150°C | <i>MUR810</i> | 35 | 0.975 @ 8.0 A | 100 | 175 | 5.0 | 250 | | |
| 150 | 8.0 | T _C = 150°C | <i>MUR815</i> | 35 | 0.975 @ 8.0 A | 100 | 175 | 5.0 | 250 | | |
| 200 | 8.0 | T _C = 150°C | <i>MUR820</i> | 35 | 0.975 @ 8.0 A | 100 | 175 | 5.0 | 250 | | |
| 400 | 8.0 | T _C = 150°C | <i>MUR840</i> | 60 | 1.30 @ 8.0 A | 100 | 175 | 10 | 500 | | |
| 600 | 8.0 | T _C = 150°C | <i>MUR860</i> | 60 | 1.50 @ 8.0 A | 100 | 175 | 10 | 500 | | |
| 800 | 8.0 | T _C = 150°C | <i>MUR880E</i> | 75 | 1.80 @ 8.0 A | 100 | 175 | 25 | 500 @ 100°C | | |
| 1000 | 8.0 | T _C = 150°C | <i>MUR8100E</i> | 75 | 1.80 @ 8.0 A | 100 | 175 | 25 | 500 @ 100°C | | |
| 100 | 15 | T _C = 150°C | <i>MUR1510</i> | 35 | 1.05 @ 15 A | 200 | 175 | 10 | 500 | CASE 221D-03 (TO-220) FULL PAK  | |
| 150 | 15 | T _C = 150°C | <i>MUR1515</i> | 35 | 1.05 @ 15 A | 200 | 175 | 10 | 500 | | |
| 200 | 15 | T _C = 150°C | <i>MUR1520</i> | 35 | 1.05 @ 15 A | 200 | 175 | 10 | 500 | | |
| 400 | 15 | T _C = 150°C | <i>MUR1540</i> | 60 | 1.25 @ 15 A | 150 | 175 | 10 | 500 | | |
| 600 | 15 | T _C = 145°C | <i>MUR1560</i> | 60 | 1.50 @ 15 A | 150 | 175 | 10 | 1000 | | |
| 200 | 20 | T _C = 125°C | <i>MUR2020R</i> | 95 | 1.10 @ 20 A | 250 | 175 | 50 | 1000 | | |
| 200 | 16 | T _C = 150°C | Ⓢ <i>MURF1620CT</i> | 35 | 0.975 @ 8.0 A | 100 | 150 | 5.0 | 250 | | |
| 600 | 16 | T _C = 150°C | Ⓢ <i>MURF1660CT</i> | 60 | 1.5 @ 8.0 A | 100 | 150 | 10 | 500 | | |
| 600 | 8.0 | T _C ≤ 120°C | Ⓢ <i>MURHF860CT</i> | 35 | 2.8 @ 4.0 A | 100 | 150 | 10 | 500 | | |

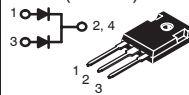
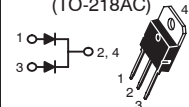
(1) I_O is total device capability

(2) At V_{RRM} unless noted

(4) At V_{RRM}, T_J = 150°C unless noted

Ⓢ Indicates UL Recognized – File #E69369

Table 17. TO-218 and TO-247 Ultrafast Rectifiers







| V _{RRM} (V) | I _O (A) | I _O Rating Condition | Device | Max t _{rr} (ns) | Max V _F @ I _F T _C = 25°C (V) | I _{FSM} (A) | T _J Max (°C) | Max I _R ⁽²⁾ T _J = 25°C (μA) | Max I _R ⁽⁴⁾ (mA) | Package |
|----------------------|--------------------|---------------------------------|------------------|--------------------------|--|----------------------|-------------------------|---|--|--|
| 200 | 30 | T _C = 145°C | <i>MUR3020WT</i> | 35 | 1.05 @ 15 A | 200 | 175 | 10 | 0.5 | CASE 340L-02 (TO-247)  |
| 600 | 30 | T _C = 145°C | <i>MUR3060WT</i> | 60 | 1.70 @ 15 A | 150 | 175 | 10 | 1.0 | |
| 200 | 30 | T _C = 150°C | <i>MUR3020PT</i> | 35 | 1.05 @ 15 A | 200 | 175 | 10 | 0.5 | CASE 340D-02 (TO-218AC)  |
| 400 | 30 | T _C = 150°C | <i>MUR3040PT</i> | 60 | 1.25 @ 15 A | 150 | 175 | 10 | 0.5 | |
| 600 | 30 | T _C = 145°C | <i>MUR3060PT</i> | 60 | 1.50 @ 15 A | 150 | 175 | 10 | 1.0 | |

(2) At V_{RRM} unless noted

(4) At V_{RRM}, T_J = 150°C unless noted

Fast Recovery Rectifiers/General Purpose Rectifiers

Table 18. Fast Recovery Rectifiers/General Purpose Rectifiers

| V _{RRM} (V) | I _O (A) | I _O Rating Condition | Device | Max V _F @ I _F T _J = 25°C (V) | Max t _{rr} (ns) | I _{FSM} (A) | T _J Max (°C) | Max I _R ⁽²⁾ T _J = 25°C (μA) | Max I _R ⁽³⁾ (μA) | Package | |
|----------------------|--------------------|--|-----------------|--|--------------------------|----------------------|-------------------------|---|--|---|--|
| 400 | 1.5 | T _L = 118°C | MRS1504 | 1.04 @ 1.5 A | – | 50 | 150 | 1.0 | 340 | CASE 403A-03 SMB  | |
| 300 | 1.0 | T _L = 150°C | MRA4003G | 1.1 @ 1.0 A | – | 30 | 175 | 10 | 50 | CASE 403B-02 SMA  Cathode = Notch | |
| 400 | 1.0 | T _L = 150°C | MRA4004G | 1.1 @ 1.0 A | – | 30 | 175 | 10 | 50 | | |
| 600 | 1.0 | T _L = 150°C | MRA4005G | 1.1 @ 1.0 A | – | 30 | 175 | 10 | 50 | | |
| 800 | 1.0 | T _L = 150°C | MRA4006G | 1.1 @ 1.0 A | – | 30 | 175 | 10 | 50 | | |
| 1000 | 1.0 | T _L = 150°C | MRA4007G | 1.1 @ 1.0 A | – | 30 | 175 | 10 | 50 | | |
| 50 | 1.0 | T _A = 75°C | 1N4001RL | 1.1 @ 1.0 A | – | 30 | 175 | 10 | 50 | CASE 59-10 ⁽⁷⁾ (DO-41) Plastic  Cathode = Polarity Band | |
| 100 | 1.0 | T _A = 75°C | 1N4002RL | 1.1 @ 1.0 A | – | 30 | 175 | 10 | 50 | | |
| 200 | 1.0 | T _A = 75°C | 1N4003RL | 1.1 @ 1.0 A | – | 30 | 175 | 10 | 50 | | |
| 400 | 1.0 | T _A = 75°C | 1N4004RL | 1.1 @ 1.0 A | – | 30 | 175 | 10 | 50 | | |
| 600 | 1.0 | T _A = 75°C | 1N4005RL | 1.1 @ 1.0 A | – | 30 | 175 | 10 | 50 | | |
| 800 | 1.0 | T _A = 75°C | 1N4006RL | 1.1 @ 1.0 A | – | 30 | 175 | 10 | 50 | | |
| 1000 | 1.0 | T _A = 75°C | 1N4007RL | 1.1 @ 1.0 A | – | 30 | 175 | 10 | 50 | | |
| 50 | 1.0 | T _A = 75°C | 1N4933RL | 1.2 @ 1.0 A | 200 | 30 | 150 | 5.0 | 100 | | |
| 100 | 1.0 | T _A = 75°C | 1N4934RL | 1.2 @ 1.0 A | 200 | 30 | 150 | 5.0 | 100 | | |
| 200 | 1.0 | T _A = 75°C | 1N4935RL | 1.2 @ 1.0 A | 200 | 30 | 150 | 5.0 | 100 | | |
| 400 | 1.0 | T _A = 75°C | 1N4936RL | 1.2 @ 1.0 A | 200 | 30 | 150 | 5.0 | 100 | | |
| 600 | 1.0 | T _A = 75°C | 1N4937RL | 1.2 @ 1.0 A | 200 | 30 | 150 | 5.0 | 100 | | |
| 50 | 3.0 | T _L = 105°C | 1N5400RL | 1.0 @ 3.0 A | – | 200 | 170 | 10 | 100 @ 150°C | | CASE 267-05 (DO-201AD) Plastic  Cathode = Polarity Band |
| 100 | 3.0 | T _L = 105°C | 1N5401RL | 1.0 @ 3.0 A | – | 200 | 170 | 10 | 100 @ 150°C | | |
| 200 | 3.0 | T _L = 105°C | 1N5402RL | 1.0 @ 3.0 A | – | 200 | 170 | 10 | 100 @ 150°C | | |
| 400 | 3.0 | T _L = 105°C | 1N5404RL | 1.0 @ 3.0 A | – | 200 | 170 | 10 | 100 @ 150°C | | |
| 600 | 3.0 | T _L = 105°C | 1N5406RL | 1.0 @ 3.0 A | – | 200 | 170 | 10 | 100 @ 150°C | | |
| 800 | 3.0 | T _L = 105°C | 1N5407RL | 1.0 @ 3.0 A | – | 200 | 170 | 10 | 100 @ 150°C | | |
| 1000 | 3.0 | T _L = 105°C | 1N5408RL | 1.0 @ 3.0 A | – | 200 | 170 | 10 | 100 @ 150°C | | |
| 200 | 3.0 | T _A = 80°C ⁽⁸⁾ | MR852RL | 1.25 @ 3.0 A | 200 | 100 | 150 | 10 | 150 | | |
| 400 | 3.0 | T _A = 80°C ⁽⁸⁾ | MR854RL | 1.25 @ 3.0 A | 200 | 100 | 150 | 10 | 150 | | |
| 600 | 3.0 | T _A = 80°C ⁽⁸⁾ | MR856RL | 1.25 @ 3.0 A | 200 | 100 | 150 | 10 | 150 | | |
| 50 | 6.0 | T _A = 60°C R _{θJA} = 25°C/W | MR750RL | 1.25 @ 100 A | – | 400 | 175 | 25 | 1000 | CASE 194-04 Axial Lead Micro Button  Cathode indicated by diode symbol | |
| 100 | 6.0 | T _A = 60°C R _{θJA} = 25°C/W | MR751RL | 1.25 @ 100 A | – | 400 | 175 | 25 | 1000 | | |
| 200 | 6.0 | T _A = 60°C R _{θJA} = 25°C/W | MR752RL | 1.25 @ 100 A | – | 400 | 175 | 25 | 1000 | | |
| 400 | 6.0 | T _A = 60°C R _{θJA} = 25°C/W | MR754RL | 1.25 @ 100 A | – | 400 | 175 | 25 | 1000 | | |
| 600 | 6.0 | T _A = 60°C R _{θJA} = 25°C/W | MR756RL | 1.25 @ 100 A | – | 400 | 175 | 25 | 1000 | | |
| 200 | 25 | T _C = 150°C | MR2502 | 1.18 @ 78.5 A | – | 400 | 175 | 100 | 500 | CASE 193-04 Micro Button  Cathode = Polarity Band | |
| 400 | 25 | T _C = 150°C | MR2504 | 1.18 @ 78.5 A | – | 400 | 175 | 100 | 500 | | |

⁽²⁾At V_{RRM} unless noted

⁽³⁾At V_{RRM}, T_J = 100°C unless noted

⁽⁷⁾Package Size: 0.120" max diameter by 0.260" length.




⁽⁸⁾Must be derated for reverse power dissipation. See data sheet.

⁽⁹⁾Overvoltage Transient Suppressor: 24–32 volts avalanche voltage.

ON Semiconductor Selector Guide – Rectifiers

Fast Recovery Rectifiers/General Purpose Rectifiers (continued)

Table 19. Overvoltage Transient Suppressors

| V _{RRM} (V) | V _{BR} ⁽¹⁾ (V) | V _{BR} (V) | I _O (A) | Device | Max V _F @ I _F T _J = 25°C (V) | I _{FSM} (A) | T _J Max (°C) | I _{RSM} (A) | Max I _R ⁽⁶⁾ (μA) | Package |
|-------------------------|---------------------------------------|------------------------|----------------------------------|-----------------|--|-------------------------|-------------------------------|-------------------------|--|---|
| 20 | 24–32 | 40 ⁽²⁾ | 6.0 T _C = 125°C | MR2535L | 1.1 I _F = 100A | 400 | 175 | 62 ⁽⁵⁾ | 0.2 | CASE 194–04 Axial Lead Micro Button  Cathode = Diode Symbol |
| 23 | 24–32 | 40 ⁽⁴⁾ | 32 T _C = 150°C | TRA2532 | 1.18 I _F = 100A | 500 | 175 | 80 ⁽⁵⁾ | 10 | CASE 193–04 Micro Button  Cathode = Polarity Band |
| 23 | 24–32 | 40 ⁽³⁾ | 32 T _C = 150°C | MR2835SK | 1.1 I _F = 100A | 400 | 150 | 62 ⁽⁵⁾ | 5.0 @ 20 V | CASE 460–02 Top Can  Cathode = Terminal |

(1)At I_r = 100 mA, 25°C

(2)At I_r = 90 A, T_c = 150°C, PW = 80 μS

(3)At I_r = 80 A, T_c = 85°C, PW = 80 μS

(4)At I_r = 80 A, T_c = 25°C, PW = 80 μS

(5)Time Constant = 10 mS, 25°C

(6)At V_{RRM}, T_j = 25°C unless noted

Bipolar Transistors

Bipolar Transistors

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In Brief...

Through ON Semiconductor's extensive process improvements and stringent quality control standards, we are proud to offer a broad line of bipolar power transistors that meet or exceed those of other suppliers. This portfolio consists of discrete and Darlington transistors in a variety of popular packages from the low power surface mount SOT-223 to the high power TO-3.

Product Highlights

Audio Transistors:

- Improved gain linearity, complementary pair gain matching and optimized die area for symmetrical characteristics in complementary configurations.
- Unsurpassed high voltage FBSOA performance.
- New state of the art 150 W and 180 W high frequency discrete transistors.
- ThermalTrak™ output transistors with internal bias control eliminate amplifier warm-up period, enable instant temperature adjustment, upgrade sound quality and improve bias stability.
- High voltage discrete audio output transistors that reach higher voltages than previously available.

Electronic Lamp Ballast:

- High frequency, high gain bipolar transistors that utilize monolithic collector/emitter diode tailored to meet the needs of lamp ballasts.
- Active anti-saturation network to provide short and highly reproducible collector current storage time.

Low $V_{CE(sat)}$ Transistors:

- Devices with combination of low saturation voltage and high gain are ideal for high speed switching applications where power savings is a concern.



Ultra High Current Transistors:

- Dual matched die configurations up to 60 A.
- Working voltages from 60 V to 120 V.




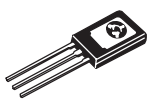
ON Semiconductor has a commitment to quality and total customer satisfaction. We will continue to demonstrate this in the new and innovative products we plan to announce in the coming year.

BIPOLAR TRANSISTORS SELECTOR GUIDE

SELECTION BY PACKAGE

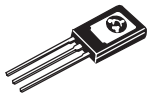

| Package | I_C Range (Amps) | V_{CE} Range (Volts) | P_D (Watts) |
|--|--------------------|------------------------|---------------|
|  SOT-223 | 0.5-3.0 | 30-300 | 2.75-3.0 |
|  DPAK | 0.5-10 | 25-450 | 12.5-25 |
|  D ² PAK | 6.0-10 | 80-350 | 50-75 |
|  DPAK | 0.5-10 | 25-450 | 12.5-25 |
|  TO-225AA | 0.3-5.0 | 25-500 | 12.5-50 |
|  TO-220AB | 0.5-15 | 32-400 | 30-150 |
|  Isolated TO-220 | 1.0-10 | 60-450 | 28-45 |
|  TO-218 | 10-25 | 60-350 | 80-150 |
|  TO-247 | 8.0-30 | 150-250 | 100-200 |
|  TO-264 | 15-20 | 250-350 | 200-250 |
|  TO-264 5-Lead | 15 | 260 | 200 |
|  TO-3 (TO-204AA) 40 Mil Pins | 4.0-30 | 40-250 | 115-250 |
|  TO-3 (TO-204AE) 60 Mil Pins | 40-60 | 60-250 | 150-300 |

DISCRETE TRANSISTORS

| I _C Cont Amps Max | V _{CEO(sus)} Volts Min | Device Type | | h _{FE} Min/Max | @ I _C Amp | f _T MHz Min | P _D (Case) Watts @ 25°C | Package |
|------------------------------------|---------------------------------------|--------------|------------|----------------------------|-------------------------|------------------------------|---|--|
| | | NPN | PNP | | | | | |
| 0.5 | 300 | | MMJT350T1 | 30/240 | 0.05 | 30 | 2.75 |  SOT-223 |
| 3.0 | 30 | MMJT9410T1 | MMJT9435T1 | 50 | 1.0 | 100 typ | 3.0 | |
| | 40 | | NJT4030P | 200/400 | 1.0 | 160 typ | 2.0 | |
| 0.5 | 300 | MJD340T4 | MJD350T4 | 30/240 | 0.05 | 30 | 15 |  DPAK |
| 1.0 | 250 | MJD47T4 | | 30/150 | 0.3 | 10 | 15 | |
| | 350 | | MJD5731T4 | 10 min | 1.0 | 10 | 15 | |
| | 400 | MJD50T4 | | 30/150 | 0.3 | 10 | 15 | |
| 2.0 | 45 | | MJD148T4 | 50 min | 2.0 | 3.0 | 20 | |
| | 50 | NJD2873T4 | | 40 min | 2.0 | 30 | 12.5 | |
| | 450 | MJD18002D2T4 | | 6.0 min | 2.0 | 13 typ | 25 | |
| 3.0 | 40 | MJD31T4 | MJD32T4 | 10 min | 1.0 | 3.0 | 15 | |
| | 100 | MJD31CT4 | MJD32CT4 | 10 min | 1.0 | 3.0 | 15 | |
| 4.0 | 100 | MJD243T4 | MJD253T4 | 40/180 | 0.2 | 40 | 12.5 | |
| 5.0 | 25 | MJD200T4 | MJD210T4 | 45/180 | 2.0 | 65 | 12.5 | |
| 6.0 | 100 | MJD41CT4 | MJD42CT4 | 15/75 | 3.0 | 3.0 | 20 | |
| 8.0 | 80 | MJD44H11T4 | MJD45H11T4 | 40 min | 4.0 | 50 typ | 20 | |
| 10 | 60 | MJD3055T4 | MJD2955T4 | 20/100 | 4.0 | 2.0 | 20 | |
| 6.0 | 100 | MJB41CT4 | MJB42CT4 | 15/75 | 3.0 | 3.0 | 65 |  D²PAK |
| 8.0 | 80 | MJB44H11T4 | MJB45H11T4 | 40/100 | 4.0 | 40 | 50 | |
| 0.3 | 350 | MJE3439 | | 40/160 | 0.02 | 15 | 15 |  TO-225AA |
| 0.5 | 200 | MJE344 | | 30/300 | 0.05 | 15 | 20.8 | |
| | 250 | 2N5655 | | 30/250 | 0.1 | 10 | 20 | |
| | 300 | MJE340 | MJE350 | 30/240 | 0.05 | 30 | 20.8 | |
| | 350 | 2N5657 | | 30/250 | 0.1 | 10 | 20 | |
| | | BD159 | | 30/240 | 0.05 | 30 | 20 | |
| 1.0 | 40 | 2N4921 | 2N4918 | 20/100 | 0.5 | 3.0 | 30 | |
| | 60 | 2N4922 | 2N4919 | 20/100 | 0.5 | 3.0 | 30 | |
| | 80 | 2N4923 | 2N4920 | 20/100 | 0.5 | 3.0 | 30 | |
| 1.5 | 45 | BD135 | BD136 | 40/250 | 0.15 | 50 | 12.5 | |
| | 60 | BD137 | BD138 | 40/250 | 0.15 | 50 | 12.5 | |
| | 80 | BD139 | BD140 | 40/250 | 0.15 | 50 | 12.5 | |
| 2.0 | 45 | | BD234 | 25 min | 1.0 | 3.0 | 25 | |
| | 80 | BD237 | | 25 min | 1.0 | 3.0 | 25 | |
| 3.0 | 40 | MJE180 | MJE170 | 50/250 | 0.1 | 50 | 12.5 | |
| | 60 | MJE181 | MJE171 | 50/250 | 0.1 | 50 | 12.5 | |
| | 80 | BD179 | BD180 | 40/250 | 0.15 | 3.0 | 25 | |
| | | MJE182 | MJE172 | 50/250 | 0.1 | 50 | 12.5 | |
| | 500 | BUH51 † | | 8.0 min | 1.0 | 12 typ | 50 | |

†Style 3.

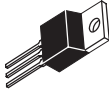
DISCRETE TRANSISTORS (continued)

| I _C Cont Amps Max | V _{CEO(sus)} Volts Min | Device Type | | h _{FE} Min/Max | @ I _C Amp | f _T MHz Min | P _D (Case) Watts @ 25°C | Package | |
|------------------------------------|---------------------------------------|-------------|----------|----------------------------|-------------------------|------------------------------|---|--|----|
| | | NPN | PNP | | | | | | |
| 4.0 | 32 | BD435 | BD436 | 50 min | 2.0 | 3.0 | 36 |  TO-225AA | |
| | | MJE521 | MJE371 | 40 min | 1.0 | 3.0 | 40 | | |
| | | 2N5190 | | 25 min | 1.5 | 2.0 | 40 | | |
| | 45 | BD437 | BD438 | 40 min | 2.0 | 3.0 | 36 | | |
| | | 60 | BD439 | BD440 | 25 min | 2.0 | 3.0 | | 36 |
| | | | BD787 | BD788 | 20 min | 2.0 | 50 | | 15 |
| | 80 | | 2N5191 | 2N5194 | 25/100 | 1.5 | 2.0 | | 40 |
| | | | 2N5192 | 2N5195 | 25/100 | 1.5 | 2.0 | | 40 |
| | | BD441 | BD442 | 15 min | 2.0 | 3.0 | 36 | | |
| | 100 | MJE243 | MJE253 | 40/120 | 0.2 | 40 | 15 | | |
| 5.0 | 25 | MJE200 | MJE210 | 45/180 | 2.0 | 65 | 15 | | |
| 1.0 | 60 | TIP29A | | 15/75 | 1.0 | 3.0 | 30 |  TO-220AB | |
| | | TIP29B | | 15/75 | 1.0 | 3.0 | 30 | | |
| | 100 | TIP29C | TIP30C | 15/75 | 1.0 | 3.0 | 30 | | |
| | 250 | TIP47 | | 30/150 | 0.3 | 10 | 40 | | |
| | 300 | TIP48 | MJE5730 | 30/150 | 0.3 | 10 | 40 | | |
| | 350 | | MJE5731 | 30/150 | 0.3 | 10 | 40 | | |
| | 375 | | MJE5731A | 30/150 | 0.3 | 10 | 40 | | |
| | 400 | TIP50 | | 30/150 | 0.3 | 10 | 40 | | |
| 2.0 | 400/700 | BUL44 | | 14/36 | 0.4 | 13 typ | 50 | | |
| | 450/1000 | BUX85 | | 30 | 0.1 | 4.0 | 50 | | |
| | | MJE18002 | | 14/34 | 0.2 | 12 typ | 40 | | |
| 3.0 | 40 | TIP31 | TIP32 | 25 min | 1.0 | 3.0 | 40 | | |
| | | TIP31A | TIP32A | 25 min | 1.0 | 3.0 | 40 | | |
| | 80 | | BD242B | 25 min | 1.0 | 3.0 | 40 | | |
| | | TIP31B | TIP32B | 25 min | 1.0 | 3.0 | 40 | | |
| | 100 | BD241C | BD242C | 25 min | 1.0 | 3.0 | 40 | | |
| | | TIP31C | TIP32C | 25 min | 1.0 | 3.0 | 40 | | |
| 4.0 | 80 | D44C12 | D45C12 | 40/120 | 0.2 | 40 typ | 30 | | |
| | | 350 | MJE15034 | MJE15035 | 10 min | 2.0 | 30 | 50 | |
| | 400/700 | MJE13005 | | 6/30 | 3.0 | 4.0 | 60 | | |
| | 500/800 | BUH50 | | 10 typ | 2.0 | 4.0 | 50 | | |
| 5.0 | 250 | 2N6497 | | 10/75 | 2.5 | 5.0 | 80 | | |
| | | 400/700 | BUL45 | | 14/34 | 0.3 | 12 typ | 75 | |
| | BUL45D2* | | | 22 min | 0.8 | 13 typ | 75 | | |
| | 450/1000 | MJE18004 | | 14/34 | 0.3 | 13 | 75 | | |
| | | MJE18004D2* | | 15 min | 0.8 | 13 | 75 | | |

NOTE: When two voltages are given, the format is V_{CEO(sus)}/V_{CES}.

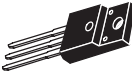

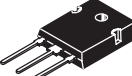
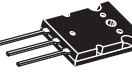

*D2 suffix indicates transistor with built-in C-E freewheeling diode and antisaturation network.

DISCRETE TRANSISTORS (continued)

| I _C Cont Amps Max | V _{CEO(sus)} Volts Min | Device Type | | h _{FE} Min/Max | @ I _C Amp | f _T MHz Min | P _D (Case) Watts @ 25°C | Package |
|------------------------------------|---------------------------------------|-------------|----------|----------------------------|-------------------------|------------------------------|---|---|
| | | NPN | PNP | | | | | |
| 6.0 | 40 | | TIP42 | 15/75 | 3.0 | 3.0 | 65 |  TO-220AB |
| | 60 | TIP41A | TIP42A | 15/75 | 3.0 | 3.0 | 65 | |
| | 80 | TIP41B | TIP42B | 15/75 | 3.0 | 3.0 | 65 | |
| | | | BD244B | 15 min | 3.0 | 3.0 | 65 | |
| | 100 | BD243C | BD244C | 15 min | 3.0 | 3.0 | 65 | |
| | | TIP41C | TIP42C | 15/75 | 3.0 | 3.0 | 65 | |
| | 400/700 | BUL146 | | 14/34 | 0.5 | 14 typ | 100 | |
| 450/1000 | MJE18006 | | 14/34 | 0.5 | 14 typ | 100 | | |
| 7.0 | 30 | 2N6288 | 2N6111 | 30/150 | 3.0 | 4.0 | 40 | |
| | 50 | | 2N6109 | 30/150 | 2.5 | 4.0 | 40 | |
| | 70 | 2N6292 | 2N6107 | 30/150 | 2.0 | 4.0 | 40 | |
| | 200 | BU406 | | 30 min | 1.5 | 10 | 60 | |
| 8.0 | 120 | MJE15028 | MJE15029 | 20 min | 4.0 | 30 | 50 | |
| | 150 | MJE15030 | MJE15031 | 20 min | 4.0 | 30 | 50 | |
| | 250 | MJE15032 | MJE15033 | 10 min | 2.0 | 30 | 50 | |
| | 300 | | MJE5850 | 15 min | 2.0 | 30 typ | 80 | |
| | 350 | | MJE5851 | 15 min | 2.0 | 30 typ | 80 | |
| | 400 | | MJE5852 | 15 min | 2.0 | 30 typ | 80 | |
| | | | MJE13007 | 5/30 | 5.0 | 14 typ | 80 | |
| 450/1000 | MJE18008 | | 16/34 | 1.0 | 13 typ | 125 | | |
| 10 | 60 | D44H8 | D45H8 | 40 min | 4.0 | 3.0 | 50 | |
| | | MJE3055T | MJE2955T | 20/70 | 4.0 | 3.0 | 75 | |
| | 80 | BD809 | BD810 | 15 min | 4.0 | 1.5 | 90 | |
| | | D44H11 | D45H11 | 40 min | 4.0 | 50 typ | 50 | |
| | 400/700 | BUH100 | | 6.0 min | 10 | 23 typ | 100 | |
| 12 | 90 | BUV26 | | 12 min | 12 | 30 typ | 85 | |
| | 120 | BUV27 | | 12 min | 8.0 | 30 typ | 70 | |
| | 400/700 | MJE13009 | | 6/30 | 8.0 | 4.0 | 100 | |
| 15 | 60 | 2N6487 | 2N6490 | 20/150 | 5.0 | 5.0 | 75 | |
| | 80 | 2N6488 | 2N6491 | 20/150 | 5.0 | 5.0 | 75 | |
| | | D44VH10 | D45VH10 | 20 min | 4.0 | 50 typ | 83 | |
| | 400/700 | BUH150 | | 4.0 min | 20 | 23 typ | 150 | |



NOTE: When two voltages are given, the format is V_{CEO(sus)}/V_{CES}.

DISCRETE TRANSISTORS (continued)



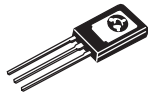

| I _C Cont Amps Max | V _{CE0(sus)} Volts Min | Device Type | | h _{FE} Min/Max | @ I _C Amp | f _T MHz Min | P _D (Case) Watts @ 25°C | Package |
|------------------------------------|---------------------------------------|-------------|-----------|----------------------------|-------------------------|------------------------------|---|---|
| | | NPN | PNP | | | | | |
| 1.0 | 250 | MJF47 | | 30/150 | 0.3 | 10 | 28 |  Isolated TO-220 |
| 3.0 | 100 | MJF31C | MJF32C | 10 min | 1.0 | 3.0 | 28 | |
| 5.0 | 450/1000 | MJF18004 | | 14/34 | 0.3 | 13 typ | 35 | |
| 6.0 | 400/700 | BUL146F | | 14/34 | 0.5 | 14 typ | 40 | |
| 8.0 | 150 | MJF15030 | MJF15031 | 40 min | 3.0 | 30 | 35 | |
| | 450/1000 | MJF18008 | | 16/34 | 1.0 | 13 typ | 45 | |
| 10 | 60 | MJF3055 | MJF2955 | 20/100 | 4.0 | 2.0 | 40 | |
| | 80 | MJF44H11 | MJF45H11 | 40/100 | 4.0 | 40 | 35 | |
| 10 | 100 | TIP33C | | 20/100 | 3.0 | 3.0 | 80 |  TO-218 |
| 15 | 60 | TIP3055 | TIP2955 | 5 min | 10 | 2.5 | 80 | |
| 16 | 160 | MJE4343 | MJE4353 | 15 min | 8.0 | 1.0 | 125 | |
| 25 | 60 | TIP35A | TIP36A | 15/75 | 15 | 3.0 | 125 | |
| | 100 | TIP35C | TIP36C | 15/75 | 15 | 3.0 | 125 | |
| 8.0 | 150 | MJW21192 | MJW21191 | 15 min | 8.0 | 4.0 | 100 |  TO-247 |
| 15 | 260 | MJW0281A | MJW0302A | 75/150 | 3.0 | 30 | 150 | |
| | | MJW3281A | MJW1302A | 75/150 | 4.0 | 30 | 200 | |
| 16 | 250 | MJW21194 | MJW21193 | 20/60 | 8.0 | 4.0 | 200 | |
| | | MJW21196 | MJW21195 | 20/60 | 8.0 | 4.0 | 200 | |
| 30 | 450/1000 | MJW18020 | | 14/35 | 3.0 | 13 typ | 250 | |
| 15 | 260 | MJL3281A | MJL1302A | 75/150 | 4.0 | 30 | 200 |  TO-264 |
| | | MJL0281A | MJL0302A | 75/150 | 3.0 | 30 | 180 | |
| | 350 | MJL4281A | MJL4302A | 80/250 | 5.0 | 35 | 230 | |
| 16 | 250 | MJL21194 | MJL21193 | 25/75 | 8.0 | 4.0 | 200 | |
| | | MJL21196 | MJL21195 | 25/75 | 8.0 | 4.0 | 200 | |
| 15 | 260 | NJL0281D | NJL0302D | 75/150 | 3.0 | 30 | 180 |  TO-264 (5-Lead) |
| | 260 | NJL3281D | NJL1302D | 75/150 | 4.0 | 30 | 200 | |
| | 350 | NJL4281D | NJL4302D | 75/150 | 5.0 | 30 | 250 | |
| 16 | 250 | NJL21194D | NJL21193D | 25/75 | 8.0 | 4.0 | 200 | |
| 10 | 140 | 2N3442 | | 20/70 | 4.0 | 3.0 | 117 | |
| | 250 | MJ15011 | | 20/100 | 2.0 | 3.0 | 200 | |
| 15 | 60 | 2N3055 | MJ2955 | 20/70 | 4.0 | 2.5 | 115 | |
| | | 2N3055A | | 20/70 | 4.0 | 0.8 | 115 | |
| | 120 | MJ15015 | MJ15016 | 20/70 | 4.0 | 1.0 | 180 | |
| 140 | MJ15001 | MJ15002 | 25/150 | 4.0 | 2.0 | 200 | | |

NOTE: When two voltages are given, the format is V_{CE0(sus)}/V_{CES}.

DISCRETE TRANSISTORS (continued)

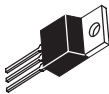

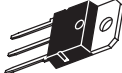


| I _C Cont Amps Max | V _{CE0(sus)} Volts Min | Device Type | | h _{FE} Min/Max | @ I _C Amp | f _T MHz Min | P _D (Case) Watts @ 25°C | Package |
|------------------------------------|---------------------------------------|-------------|---------|----------------------------|-------------------------|------------------------------|---|--|
| | | NPN | PNP | | | | | |
| 16 | 140 | 2N3773 | | 15/60 | 8.0 | 4.0 | 150 |  <p>TO-3 (TO-204AA)</p> |
| | 200 | MJ15022 | MJ15023 | 15/60 | 8.0 | 5.0 | 250 | |
| | 250 | MJ15024 | MJ15025 | 15/60 | 8.0 | 5.0 | 250 | |
| | | MJ21194 | MJ21193 | 25/75 | 8.0 | 4.0 | 250 | |
| | | MJ21196 | MJ21195 | 25/75 | 8.0 | 4.0 | 250 | |
| 20 | 60 | 2N3772 | | 15/60 | 10 | 2.0 | 150 | |
| | 90 | 2N5038 | | 20/100 | 12 | 60 | 140 | |
| | 140 | MJ15003 | MJ15004 | 25/150 | 5.0 | 2.0 | 250 | |
| 25 | 60 | 2N5885 | 2N5883 | 20/100 | 10 | 4.0 | 200 | |
| | 80 | 2N5886 | 2N5884 | 20/100 | 10 | 4.0 | 200 | |
| | 100 | 2N6338 | | 30/120 | 10 | 40 | 200 | |
| | 150 | 2N6341 | | 30/120 | 10 | 40 | 200 | |
| 30 | 40 | 2N3771 | | 15/60 | 15 | 2.0 | 150 | |
| | 60 | 2N5302 | | 15/60 | 15 | 2.0 | 200 | |
| | 100 | MJ802 | MJ4502 | 25/100 | 7.5 | 2.0 | 200 | |
| 40 | 200 | BUV21 | | 10 min | 25 | 8.0 | 150 |  <p>TO-3 (TO-204AE)</p> |
| | 250 | BUV22 | | 10 min | 20 | 8.0 | 250 | |
| 50 | 80 | 2N5686 | 2N5684 | 15/60 | 25 | 2.0 | 300 | |
| 60 | 60 | | MJ14001 | 15/100 | 50 | 3.0 | 300 | |
| | 80 | MJ14002 | | 15/100 | 50 | 3.0 | 300 | |

DARLINGTON TRANSISTORS

| I _C Cont Amps Max | V _{CEO(sus)} Volts Min | Device Type | | h _{FE} Min/Max | @ I _C Amp | f _T MHz Min | P _D (Case) Watts @ 25°C | Package |
|------------------------------------|---------------------------------------|-------------|----------|----------------------------|-------------------------|------------------------------|---|--|
| | | NPN | PNP | | | | | |
| 2.0 | 100 | MJD112T4 | MJD117T4 | 1000 min | 2.0 | 25 | 20 |  DPAK |
| 4.0 | 80 | MJD6039T4 | | 1k/2k | 2.0 | 25 | 20 | |
| | 350 | NJD35N04 | | 2000 min | 2.0 | 90 | 45 | |
| 8.0 | 100 | MJD122T4 | MJD127T4 | 1k/2k | 4.0 | 4 | 20 | |
| | 120 | | MJD128T4 | 1k/2k | 4.0 | 4 | 20 | |
| 10 | 80 | MJD44E3T4 | | 1k min | 5.0 | | 20 | |
| 10 | 350 | BUB323Z | | 500/3400 | 5.0 | 2.0 | 75 |  D²PAK |
| 2.0 | 100 | MJE270† | MJE271† | 1.5k min | 0.12 | 6.0 | 15 |  TO-225AA |
| 4.0 | 40 | | 2N6034 | 25 min | 1.5 | 2.0 | 40 | |
| | 45 | BD675 | BD676 | 750 | 1.5 | 3.0 | 40 | |
| 60 | | BD675A | BD676A | 750 | 2.0 | 3.0 | 40 | |
| | | BD677 | BD678 | 750 min | 1.5 | | 40 | |
| | BD677A | BD678A | 750 min | 2.0 | | 40 | | |
| | MJE800 | MJE700 | 750 min | 1.5 | 1.0 | 40 | | |
| 80 | | 2N6038 | 2N6035 | 750/18k | 2.0 | 25 | 40 | |
| | | BD679 | BD680 | 750 min | 1.5 | | 40 | |
| | BD679A | BD680A | 750 min | 2.0 | | 40 | | |
| | MJE802 | MJE702 | 750 min | 1.5 | 1.0 | 40 | | |
| 100 | | MJE803 | MJE703 | 750 min | 2.0 | 1.0 | 40 | |
| | | 2N6039 | 2N6036 | 750/18k | 2.0 | 25 | 40 | |
| | BD681 | BD682 | 750 min | 1.5 | | 40 | | |
| 2.0 | 60 | TIP110 | TIP115 | 500 min | 2.0 | 25 | 50 |  TO-220AB |
| | 80 | TIP111 | TIP116 | 500 min | 2.0 | 25 | 50 | |
| | 100 | TIP112 | TIP117 | 500 min | 2.0 | 25 | 50 | |
| 5.0 | 60 | TIP120 | TIP125 | 1k min | 3.0 | 4.0 | 65 | |
| | 80 | TIP121 | TIP126 | 1k min | 3.0 | 4.0 | 65 | |
| | 100 | TIP122 | TIP127 | 1k min | 3.0 | 4.0 | 75 | |
| 8.0 | 60 | 2N6043 | 2N6040 | 1k/10k | 4.0 | 4.0 | 75 | |
| | | TIP100 | | 1k/20k | 3.0 | 4.0 | 80 | |
| | 80 | BDX53B | BDX54B | 750 min | 3.0 | 4.0 | 60 | |
| | | TIP101 | TIP106 | 1k/20k | 3.0 | 4.0 | 80 | |
| | | TIP131 | | 1k/15k | 4.0 | | 70 | |
| | 100 | TIP132 | | 1k/15k | 4.0 | | 70 | |
| | | 2N6045 | 2N6042 | 1k/10k | 3.0 | 4.0 | 75 | |
| | | BDX53C | BDX54C | 750 min | 3.0 | | | |
| TIP102 | | TIP107 | 1k/20k | 3.0 | 4.0 | 80 | | |
| 400 | MJE5742 | | 200 min | 4.0 | | 80 | | |

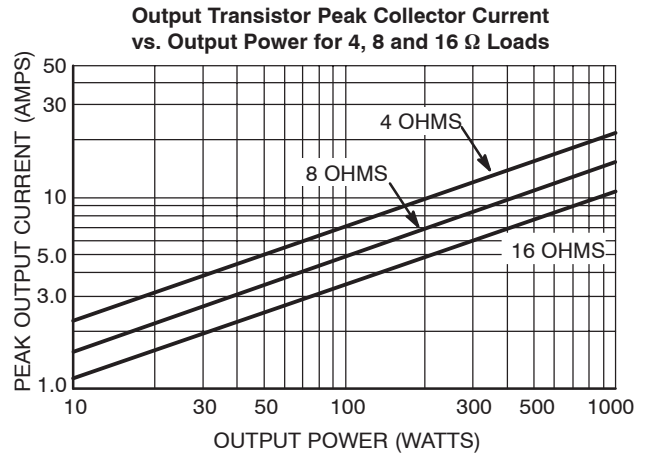
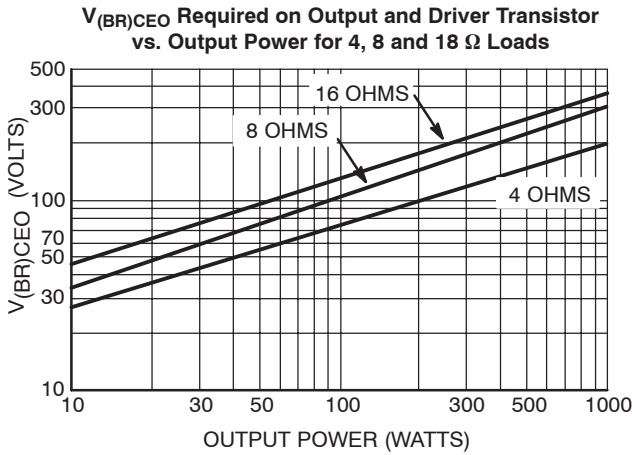
NOTE: When two voltages are given, the format is V_{CEO(sus)}/V_{CES}.
 †Style 3.

DARLINGTON TRANSISTORS (continued)

| I _C Cont Amps Max | V _{CEO(sus)} Volts Min | Device Type | | h _{FE} Min/Max | @ I _C Amp | f _T MHz Min | P _D (Case) Watts @ 25°C | Package |
|------------------------------------|---------------------------------------|-------------|----------|----------------------------|-------------------------|------------------------------|---|---|
| | | NPN | PNP | | | | | |
| 10 | 60 | 2N6387 | 2N6667 | 1k/20k | 5.0 | 20 | 65 |  TO-220AB |
| | 80 | BDX33B | BDX34B | 750 min | 3.0 | 3.0 | 70 | |
| | | 2N6388 | | 1k/20k | 5.0 | 20 | 65 | |
| | 100 | BDX33C | BDX34C | 750 min | 3.0 | 3.0 | 70 | |
| 15 | 80 | | BDW46 | 1k min | 5.0 | 4.0 | 85 | |
| | 100 | BDW42 | BDW47 | 1k min | 5.0 | 4.0 | 85 | |
| 5.0 | 100 | MJF122 | MJF127 | 2000 min | 3.0 | 4.0 | 28 |  Isolated TO-220 |
| 10 | 100 | MJF6388 | MJF6668 | 3k/20k | 3.0 | 20 | 40 | |
| 10 | 60 | TIP140 | | 500 min | 10 | 4.0 | 125 |  TO-218 |
| | | TIP141 | | 500 min | 10 | 4.0 | 125 | |
| | 100 | BDV65B | BDV64B | 1k min | 5.0 | | 125 | |
| | | TIP142 | TIP147 | 500 min | 10 | 4.0 | 125 | |
| | 350 | BU323Z | | 500/3400 | 5.0 | | 150 | |
| 15 | 150 | | MJH11017 | 400/15k | 10 | 3.0 | 150 | |
| | 200 | MJH11020 | MJH11019 | 400/15k | 10 | 3.0 | 150 | |
| | 250 | MJH11022 | MJH11021 | 400/15k | 10 | 3.0 | 150 | |
| 20 | 100 | MJH6284 | MJH6287 | 750/18k | 10 | 4.0 | 125 | |
| 12 | 100 | | 2N6052 | 750/18k | 6.0 | 4.0 | 150 |  TO-3 (TO-204AA) |
| 15 | 250 | MJ11022 | MJ11021 | 100 min | 15 | 3.0 | 175 | |
| 20 | 80 | | 2N6286 | 750/18k | 10 | 4.0 | 160 | |
| | 100 | 2N6284 | 2N6287 | 750/18k | 10 | 4.0 | 160 | |
| 30 | 60 | MJ11012 | | 1k min | 20 | 4.0 | 200 | |
| | 120 | MJ11016 | MJ11015 | 1k min | 20 | 4.0 | 200 | |
| | 250 | MJ11022 | MJ11021 | 400/15k | 10 | 3.0 | 200 | |
| 50 | 60 | MJ11028 | | 400 min | 50 | | 300 |  TO-3 (TO-204AE) |
| | 90 | MJ11030 | | 400 min | 50 | | 300 | |
| | 120 | MJ11032 | MJ11033 | 400 min | 50 | | 300 | |

Audio

GENERAL DESIGN CURVES FOR POWER AUDIO OUTPUT STAGES



Another important parameter that must be considered before selecting the output transistors is the safe-operating area these devices must withstand. For a complete discussion see Application Note AN485.

RECOMMENDED POWER TRANSISTORS FOR AUDIO/SERVO LOADS


| RMS Power Output | NPN | PNP | Package | P_D Watts @ 25°C | V_{CEO} | I_C Max | h_{FE} | | f_T MHz Typ |
|------------------|----------|----------|-----------------|--------------------|-----------|-----------|----------|--------------|---------------|
| | | | | | | | Min/Max | @ I_C Amps | |
| To 25 W | MJE15030 | MJE15031 | TO-220 | 50 | 150 | 8.0 | 20 min | 4.0 | 30 |
| | MJE15032 | MJE15033 | TO-220 | 50 | 250 | 8.0 | 50 min | 1.0 | 30 |
| 25 to 50 W | MJE15034 | MJE15035 | TO-220 | 50 | 350 | 4.0 | 50 min | 1.0 | 30 |
| | MJ15001 | MJ15002 | TO-3 | 200 | 140 | 15 | 25/150 | 4.0 | 3.0 |
| 50 to 100 W | MJ15003 | MJ15004 | TO-3 | 150 | 140 | 20 | 25/150 | 5.0 | 3.0 |
| | MJ15015 | MJ15016 | TO-3 | 180 | 120 | 15 | 20/70 | 4.0 | 3.0 |
| Over 100 W | MJW21192 | MJW21191 | TO-3 | 100 | 150 | 8.0 | 15 min | 4.0 | 4.0 |
| | MJW0281A | MJW0302A | TO-3 | 150 | 260 | 15 | 75/150 | 3.0 | 30 |
| | MJL0281A | MJL0302A | TO-264 | 180 | 260 | 15 | 75/150 | 3.0 | 30 |
| | NJL0281D | NJL0302D | TO-264 (5-Lead) | 180 | 260 | 15 | 75/150 | 3.0 | 30 |
| | MJL21194 | MJL21193 | TO-264 | 200 | 250 | 16 | 25/75 | 8.0 | 4.0 |
| | MJL21196 | MJL21195 | TO-264 | 200 | 250 | 16 | 25/75 | 8.0 | 4.0 |
| | MJW21194 | MJW21193 | TO-247 | 200 | 250 | 16 | 20/60 | 8.0 | 4.0 |
| | MJW21196 | MJW21195 | TO-247 | 200 | 250 | 16 | 25/60 | 8.0 | 4.0 |
| | MJL3281A | MJL1302A | TO-264 | 200 | 260 | 15 | 75/150 | 5.0 | 30 |

RECOMMENDED POWER TRANSISTORS FOR AUDIO/SERVO LOADS (continued)


| RMS Power Output | NPN | PNP | Package | P _D Watts @ 25°C | V _{CEO} | I _C Max | h _{FE} | | f _T MHz Typ |
|------------------|----------|----------|-----------------|-----------------------------|------------------|--------------------|-----------------|-----------------------|------------------------|
| | | | | | | | Min/Max | @ I _C Amps | |
| | MJW3281A | MJW1302A | TO-247 | 200 | 260 | 15 | 75/150 | 5.0 | 30 |
| | MJL4281A | MJL4302A | TO-264 | 200 | 350 | 15 | 80/200 | 5.0 | 35 |
| | NJL3281D | NJL1302D | TO-264 (5-Lead) | 200 | 260 | 15 | 75/150 | 7.0 | 30 |
| | NJL4281D | NJL4302D | TO-264 (5-Lead) | 250 | 350 | 15 | 75/150 | 5.0 | 30 |
| | MJ15024 | MJ15025 | TO-3 | 250 | 250 | 16 | 15/60 | 8.0 | 4.0 |
| | MJ21194 | MJ21193 | TO-3 | 250 | 250 | 16 | 25/75 | 8.0 | 4.0 |

The Power Transistors shown are provided for reference only and show device capability. The final choice of the Power Transistors used is left to the circuit designer and depends upon the particular safe-operating area required and the mounting and heat sinking configuration used.


Bipolar Power Transistors for Electronic Lamp Ballasts

| I _C Cont Amps Max | V _{CEO(sus)} Volts Min | V _{CES} Volts Min | Device Type | I _C Operating Amps | h _{FE} min @ I _C Operating V _{CE} = 1.0 V | Inductive Switching @ I _C Operating t _{si} /t _{fi} Max (μs) | P _D (Case) Watts @ 25°C | Package |
|------------------------------|---------------------------------|----------------------------|-------------|-------------------------------|--|--|------------------------------------|--|
| 2.0 | 400 | 700 | BUL44 | 1.0 | 8.0 | 2.75/0.175 | 50 |  TO-220AB |
| | 450 | 1000 | MJE18002 | 1.0 | 6.0 | 2.75/0.175 | 50 | |
| 4.0 | 500 | 800 | BUH50 | 2.0 | 8.0 typ | 2.75/0.15 | 50 | |
| 5.0 | 400 | 700 | BUL45 | 2.0 | 7.0 | 3.8/0.17 | 75 | |
| | | 700 | BUL45D2* | 2.0 | 10 | 2.25/0.015 | 75 | |
| | 450 | 1000 | MJE18004 | 2.0 | 6.0 | 2.5/0.175 | 75 | |
| 6.0 | 400 | 700 | BUL146 | 3.0 | 8.0 | 2.5/0.15 | 100 | |
| | | 1000 | MJE18006 | 3.0 | 6.0 | 3.2/0.15 | 100 | |
| 8.0 | 450 | 1000 | MJE18008 | 4.5 | 6.0 | 3.2/0.15 | 125 | |
| 10 | 400 | 700 | BUH100 | 5.0 | 10 typ | 3.5/0.15 | 100 | |
| 15 | 400 | 700 | BUH150 | 10 | 8.0 typ | 2.75/0.175 | 150 | |


Isolated TO-220

| I _C Cont Amps Max | V _{CEO(sus)} Volts Min | V _{CES} Volts Min | Device Type | I _C Operating Amps | h _{FE} min @ I _C Operating V _{CE} = 1.0 V | Inductive Switching @ I _C Operating t _{si} /t _{fi} Max (μs) | P _D (Case) Watts @ 25°C | Package |
|------------------------------|---------------------------------|----------------------------|-------------|-------------------------------|--|--|------------------------------------|--|
| 5.0 | 450 | 1000 | MJF18004 | 2.0 | 6.0 | 2.5/0.175 | 35 |  Isolated TO-220 |
| 6.0 | 400 | 700 | BUL146F | 3.0 | 8.0 | 2.5/0.15 | 40 | |
| 8.0 | 450 | 1000 | MJF18008 | 4.5 | 6.0 | 3.2/0.15 | 45 | |

DPAK

| I _C Cont Amps Max | V _{CEO(sus)} Volts Min | V _{CES} Volts Min | Device Type | I _C Operating Amps | h _{FE} min @ I _C Operating V _{CE} = 1.0 V | Inductive Switching @ I _C Operating t _{si} /t _{fi} Max (μs) | P _D (Case) Watts @ 25°C | Package |
|------------------------------|---------------------------------|----------------------------|--------------|-------------------------------|--|--|------------------------------------|--|
| 2.0 | 450 | 1000 | MJD18002D2T4 | 1.0 | 6.0 | 1.2/0.150 | 25 |  DPAK |

TO-225AA (TO-126)

| I _C Cont Amps Max | V _{CEO(sus)} Volts Min | V _{CES} Volts Min | Device Type | I _C Operating Amps | h _{FE} min @ I _C Operating V _{CE} = 1.0 V | Inductive Switching @ I _C Operating t _{si} /t _{fi} Max (μs) | P _D (Case) Watts @ 25°C | Package |
|------------------------------|---------------------------------|----------------------------|-------------|-------------------------------|--|--|------------------------------------|--|
| 3.0 | 500 | 800 | BUH51† | 1.0 | 8.0 | 3.75/0.3 | 50 |  TO-225AA |

BUH-Series are specified for Halogen applications.


*D2 suffix indicates transistor with built-in C-E freewheeling diode and antisaturation network.

†Style 3.

The isolated TO-220 is **UL RECOGNIZED** for its isolation feature and has been evaluated to 3500 volts RMS. Actual isolation rating depends on specific mounting position and maintaining required strike and creepage distances.

Bipolar Transistors



GENERAL-PURPOSE TRANSISTORS

| NPN | PNP | V _{(BR)CEO} | I _C mA Max | h _{FE} | | f _T MHz Min | NF dB Max | Package |
|-----------------|-----------------|----------------------|-----------------------------|-----------------|-----|------------------------------|-----------------|---|
| | | | | Min | Max | | | |
| MPS8099 | MPS8599 | 80 | 500 | 100 | 300 | 150 | – |  <p>TO-226AA, TO-92 Case 29-11</p> |
| MPSA06 | MPSA56 | 80 | 500 | 100 | – | 100 | – | |
| | BC490 | 80 | 1000 | 60 | 400 | 200/150 (Typ) | 0.3/0.5 | |
| BC639 | BC640 | 80 | 500 | 40 | 160 | 60 | 0.5 | |
| BC489B | – | 80 | 1000 | 160 | 400 | 100 | 0.5 | |
| BC639-16 | BC640-16 | 80 | 1000 | 100 | 250 | 60 | 0.5 | |
| BC546B | BC556B | 65 | 100 | 180 | 450 | 150 | 10 | |
| MPSA05 | MPSA55 | 60 | 500 | 100 | – | 100 | – | |
| – | MPS2907A | 60 | 600 | 100 | 300 | 200 | – | |
| MPS651 | MPS751 | 60 | 2000 | 75 | – | 75 | 0.5 | |
| BC637 | | 60 | 500 | 40 | 160 | – | 0.5 | |
| – | 2N5087 | 50 | 50 | 250 | 800 | 40 | 2.0 | |
| BC182B | BC212B | 50 | 100 | 200 | 500 | 200 | 10 | |
| BC237B | BC307B | 45 | 100 | 200 | 460 | 150 | 10 | |
| BC337 | BC327 | 45 | 800 | 100 | 630 | 210 (Typ) | – | |
| BC337-16 | BC327-16 | 45 | 800 | 100 | 250 | 260 (Typ) | – | |
| BC337-25 | BC327-25 | 45 | 800 | 160 | 400 | 260 (Typ) | – | |
| BC337-40 | BC327-40 | 45 | 800 | 250 | 630 | 260 (Typ) | – | |
| BC550C | BC560C | 45 | 100 | 380 | 800 | 250 (Typ) | 2.5 | |
| BC547A | BC557A | 45 | 100 | 120 | 220 | 150 | 10 | |
| BC547B | BC557B | 45 | 100 | 180 | 450 | 150 | 10 | |
| BC547C | BC557C | 45 | 100 | 380 | 800 | 150 | 10 | |
| MPSA18 | – | 45 | 200 | 500 | – | 100 | 1.5 | |
| MPSA20 | – | 40 | 100 | 40 | 400 | 125 | – | |
| MPS2222A | – | 40 | 600 | 100 | 300 | 300 | – | |
| 2N4401 | 2N4403 | 40 | 600 | 100 | 300 | 200 | – | |
| | MPS6652 | 40 | 1000 | 50 | – | 100 | – | |
| 2N3904 | 2N3906 | 40 | 200 | 100 | 300 | 250 | 5.0 | |
| – | MPS4250 | 40 | – | 250 | 800 | – | 2.0 | |
| BC548B | | 30 | 100 | 200 | 450 | 300 (Typ) | 10 | |
| BC548C | BC558C | 30 | 100 | 420 | 800 | 300 | 10 | |
| BC549C | – | 30 | 100 | 420 | 800 | – | – | |
| MPS2222 | – | 30 | 600 | 100 | 300 | 250 | – | |
| 2N5088 | – | 30 | 50 | 350 | – | 50 | 3.0 | |
| 2N5089 | – | 25 | 50 | 450 | – | 50 | 2.0 | |
| 2N4124 | – | 25 | 200 | 120 | 360 | 300 | – | |
| MPS4124 | – | 25 | 200 | 120 | 360 | 170 | 5.0 | |
| – | MPS4126 | 25 | 200 | 120 | 360 | 170 | 4.0 | |
| MPS5172 | – | 25 | 100 | 100 | 500 | – | – | |
| BC368 | BC369 | 20 | 1000 | 60 | – | 65 | 0.5 | |

Devices listed in **bold italic** are ON Semiconductor preferred devices.

Bipolar Transistors


GENERAL-PURPOSE TRANSISTORS (continued)

| NPN | PNP | $V_{(BR)CEO}$ | I_C mA Max | h_{FE} | | f_T MHz Min | NF dB Max | Package |
|-----------------|-------------------|---------------|--------------------|----------|-----|---------------------|-----------------|---|
| | | | | Min | Max | | | |
| MPSW06 | MPSW56 | 80 | 500 | 80 | – | 50 | – |  <p>TO-226AE (1-WATT) TO-92 Case 29-10</p> |
| MPS6717 | – | 80 | 500 | 50 | 250 | 100 | – | |
| MPSW05 | MPSW55 | 60 | 500 | 60 | – | 50 | 250 | |
| MPSW01A | MPSW51A | 40 | 1000 | 50 | – | 50 | – | |
| MPSW01 | MPSW51 | 30 | 1000 | 50 | – | 50 | – | |
| MPS6726 | – | 30 | 1000 | 50 | 250 | – | – | |
| MMBT5550L | – | 140 | 600 | 60 | 250 | – | – |  <p>TO-236AB, SOT-23 Case 318-08</p> |
| – | BSS63L | 100 | 100 | 30 | – | 50 | –0.25 | |
| BSS64L | – | 80 | 100 | 20 | – | 60 | 0.15 | |
| MMBTA06L | MMBTA56L | 80 | 500 | 100 | – | 100 | – | |
| MMBT8099L | – | 80 | 500 | 100 | 300 | 150 | – | |
| BC846AL | – | 65 | 100 | 110 | 220 | 100 | 10 | |
| BC846BL | – | 65 | 100 | 200 | 450 | 100 | 10 | |
| – | BC856AL | 65 | 100 | 125 | 250 | 100 | 10 | |
| – | BC856BL | 65 | 100 | 220 | 475 | 100 | 10 | |
| – | MMBT2907AL | 60 | 600 | 100 | 300 | 200 | – | |

Devices listed in **bold italic** are ON Semiconductor preferred devices.

Bipolar Transistors




GENERAL-PURPOSE TRANSISTORS (continued)

| NPN | PNP | V _{(BR)CEO} | I _c mA Max | h _{FE} | | f _T MHz Min | NF dB Max | Package |
|-------------------|------------------|----------------------|-----------------------------|-----------------|-----|------------------------------|-----------------|---|
| | | | | Min | Max | | | |
| MMBT2484L | - | 60 | 50 | 250 | - | - | 3.0 |  <p>TO-236AB, SOT-23 Case 318-08</p> |
| MMBTA05L | - | 60 | 500 | 100 | - | 100 | - | |
| - | MMBTA55L | 60 | 500 | 100 | - | 50 | - | |
| MMBT6428L | - | 50 | 200 | 250 | - | 100 | 3.0 (Typ) | |
| - | MMBT5087L | 50 | 50 | 250 | - | 40 | 2.0 | |
| MMBT6429L | - | 45 | 200 | 500 | - | 100 | 3.0 (Typ) | |
| BC817-16L | - | 45 | 500 | 100 | 250 | 100 | - | |
| BC817-25L | - | 45 | 500 | 160 | 400 | 100 | - | |
| BC817-40L | - | 45 | 500 | 250 | 600 | 100 | - | |
| - | BC807-16L | 45 | 500 | 100 | 250 | 100 | - | |
| - | BC807-25L | 45 | 500 | 160 | 400 | 100 | - | |
| - | BC807-40L | 45 | 500 | 250 | 600 | 100 | - | |
| BC847AL | - | 45 | 100 | 110 | 220 | 100 | 10 | |
| BC847BL | - | 45 | 100 | 200 | 450 | 100 | 10 | |
| BC847CL | - | 45 | 100 | 420 | 800 | 100 | 10 | |
| BC850BL | - | 45 | 100 | 200 | 450 | 100 | 4.0 | |
| BC850CL | - | 45 | 100 | 420 | 800 | 100 | 4.0 | |
| - | BC857AL | 45 | 100 | 125 | 250 | 100 | 10 | |
| - | BC857BL | 45 | 100 | 220 | 475 | 100 | 10 | |
| - | BC857CL | 45 | 100 | 420 | 800 | 100 | 10 | |
| - | BCW68GL | 45 | 800 | 120 | 400 | 100 | 10 | |
| - | BCW70L | 45 | 100 | 215 | 500 | - | 10 | |
| BCW72L | - | 45 | 100 | 200 | 450 | 300 | 10 | |
| - | BCX17L | 45 | 500 | 100 | 600 | - | - | |
| BCX19L | - | 45 | 500 | 100 | 600 | - | - | |
| MMBT2222AL | - | 40 | 600 | 100 | 300 | 300 | 4.0 | |
| MMBT3904L | - | 40 | 200 | 100 | 300 | 200 | 5.0 | |
| - | MMBT3906L | 40 | 200 | 100 | 300 | 250 | 4.0 | |
| MMBT4401L | - | 40 | 600 | 100 | 300 | 250 | - | |
| - | MMBT4403L | 40 | 600 | 100 | 300 | 200 | - | |
| MMBT3416L | - | 40 | 100 | 75 | 225 | - | - | |
| - | MMBTA70L | 40 | 100 | 40 | 400 | 125 | - | |
| - | BCW30L | 32 | 100 | 215 | 500 | - | 10 | |
| BCW32L | - | 32 | 100 | 200 | 450 | - | 10 | |
| BCW65AL | - | 32 | 800 | 100 | 250 | 100 | 10 | |
| BCW65CL | - | 32 | 100 | 250 | 630 | 100 | 10 | |
| BC848AL | - | 30 | 100 | 110 | 220 | 100 | 10 | |
| BC848BL | - | 30 | 100 | 200 | 450 | 100 | 10 | |
| BC848CL | - | 30 | 100 | 420 | 800 | 100 | 10 | |

Devices listed in **bold italic** are ON Semiconductor preferred devices.

Bipolar Transistors







GENERAL-PURPOSE TRANSISTORS (continued)

| NPN | PNP | V _{(BR)CEO} | I _c mA Max | h _{FE} | | f _T MHz Min | NF dB Max | Package |
|-------------------|-------------------|----------------------|-----------------------------|-----------------|------|---------------------------|-----------------|--|
| | | | | Min | Max | | | |
| <i>BC849BL</i> | - | 30 | 100 | 200 | 450 | 100 | 4.0 |  TO-236AB, SOT-23 Case 318-08 |
| <i>BC849CL</i> | - | 30 | 100 | 420 | 800 | 100 | 4.0 | |
| MMBT489L | - | 30 | 1000 | 300 | 900 | 100 | - | |
| - | MMBT589L | 30 | 1000 | 100 | 300 | 100 | - | |
| - | <i>BC858AL</i> | 30 | 100 | 125 | 250 | 100 | 10 | |
| - | <i>BC858BL</i> | 30 | 100 | 220 | 475 | 100 | 10 | |
| - | <i>BC858CL</i> | 30 | 100 | 420 | 800 | 100 | 10 | |
| - | <i>BC859BL</i> | 30 | 100 | 220 | 475 | 100 | 4.0 | |
| <i>MMBT5088L</i> | - | 30 | 50 | 300 | 900 | 5 | 3.0 | |
| MMBT2222L | - | 30 | 600 | 100 | 300 | 250 | 4.0 | |
| MMBT6521L | - | 25 | 100 | 300 | 600 | - | - | |
| <i>MMBT5089L</i> | - | 25 | 50 | 400 | 1200 | 50 | 2.0 | |
| <i>MMBT4124L</i> | - | 25 | 200 | 120 | 360 | 300 | 5.0 | |
| BC818-40L | - | 25 | 500 | 250 | 600 | 100 | - | |
| - | MMBT4126L | 25 | 200 | 120 | 300 | 250 | 4.0 | |
| - | BC808-25L | 25 | 500 | 160 | 400 | 100 | - | |
| BCW33L | - | 20 | 100 | 420 | 800 | - | 10 | |
| <i>MSD601-R</i> | - | 50 | 100 | 210 | 340 | - | - |  SC-59 Case 318D-04 |
| <i>MSD602-R</i> | - | 50 | 500 | 120 | 240 | - | - | |
| <i>MSC2712G</i> | - | 50 | 100 | 200 | 400 | - | - | |
| - | <i>MSA1162G</i> | 50 | 100 | 200 | 400 | - | - | |
| MSC2712Y | - | 50 | 100 | 120 | 240 | - | - | |
| - | <i>MSA1162Y</i> | 50 | 100 | 120 | 240 | - | - | |
| - | <i>MSB710-R</i> | 50 | 500 | 120 | 240 | - | - | |
| - | <i>MSB709-R</i> | 45 | 100 | 210 | 340 | - | - | |
| MSD1328-R | - | 20 | 500 | 200 | 350 | - | - | |
| MSD1328-S | - | 20 | 500 | 300 | 500 | - | - | |
| <i>MMBTA06W</i> | <i>MMBTA56W</i> | 80 | 500 | 100 | - | 100 | - |  SC-70, SOT-323 Case 419-04 |
| <i>BC846BW</i> | - | 65 | 100 | 200 | 450 | 100 | 10 | |
| - | <i>BC856BW</i> | 65 | 100 | 220 | 475 | 100 | 10 | |
| - | <i>MMBT2907AW</i> | 60 | 600 | 100 | - | 200 | - | |
| <i>MSD1819A-R</i> | - | 50 | 100 | 210 | 340 | - | - | |
| <i>BC847AW</i> | - | 45 | 100 | 110 | 220 | 100 | 10 | |
| <i>BC847BW</i> | - | 45 | 100 | 200 | 450 | 100 | 10 | |
| <i>BC847CW</i> | - | 45 | 100 | 420 | 800 | 100 | 4.0 | |
| - | <i>BC857BW</i> | 45 | 100 | 220 | 475 | 100 | 10 | |
| - | <i>BC857CW</i> | 45 | 100 | 420 | 800 | 100 | 10 | |
| - | <i>MSB1218A-R</i> | 45 | 100 | 210 | 340 | - | - | |
| MMBT4401W | - | 40 | 600 | 100 | 300 | 250 | - | |
| - | MMBT4403W | 40 | 600 | 100 | 300 | 200 | - | |
| <i>MMBT2222AW</i> | - | 40 | 600 | 100 | 300 | 300 | 4.0 | |
| <i>MMBT3904W</i> | - | 40 | 200 | 100 | 300 | 300 | 5.0 | |
| - | <i>MMBT3906W</i> | 40 | 200 | 100 | 300 | 250 | 4.0 | |
| <i>BC848BW</i> | - | 30 | 100 | 200 | 450 | 100 | 10 | |
| <i>BC848CW</i> | - | 30 | 100 | 420 | 800 | 100 | 4.0 | |
| - | <i>BC858AW</i> | 30 | 100 | 110 | 220 | 100 | 10 | |
| - | <i>BC858BW</i> | 30 | 100 | 200 | 450 | 100 | 10 | |

Devices listed in **bold italic** are ON Semiconductor preferred devices.

Bipolar Transistors





GENERAL-PURPOSE TRANSISTORS (continued)

| NPN | PNP | $V_{(BR)CEO}$ | I_C mA Max | h_{FE} | | f_T MHz Min | NF dB Max | Package |
|-------------------|------------------|---------------|--------------------|----------|-----|---------------------|-----------------|---|
| | | | | Min | Max | | | |
| <i>2SC4617</i> | – | 50 | 100 | 120 | 560 | 180 (Typ) | – |  SOT-416, SC-75, SC-90 Case 463-01 |
| – | <i>2SA1774</i> | 50 | 100 | 120 | 560 | 140 (Typ) | – | |
| <i>BC847BT</i> | – | 45 | 100 | 200 | 450 | 100 | 10 | |
| <i>BC847CT</i> | – | 45 | 100 | 420 | 800 | 100 | 4.0 | |
| – | <i>BC857BT</i> | 45 | 100 | 220 | 475 | 100 | 10 | |
| <i>MMBT3904T</i> | – | 40 | 200 | 100 | 300 | 300 | 5.0 | |
| – | <i>MMBT3906T</i> | 40 | 200 | 100 | 300 | 250 | 4.0 | |
| <i>MMBT2222AT</i> | – | 40 | 600 | 100 | 300 | 300 | 4.0 | |
| – | 2SA2029M3 | 50 | 100 | 120 | 560 | 140 (Typ) | – |  SOT-723 Case 631AA-01 |
| – | BC856BM3 | 45 | 100 | 220 | 475 | 100 | 10 | |
| – | MMBT2907AM3 | 60 | 600 | 100 | – | 200 | – | |
| BC846BM3 | – | 65 | 100 | 200 | 450 | 100 | 10 | |
| 2SC5658M3 | – | 50 | 100 | 120 | 560 | 180 (Typ) | – | |
| BC847BM3 | – | 45 | 100 | 200 | 450 | 100 | 10 | |
| – | – | 40 | 600 | 100 | 300 | 300 | 4.0 | |
| <i>BCP56</i> | <i>BCP53</i> | 80 | 1000 | 40 | 250 | 50 (Typ) | – |  SOT-223 Case 318E-04 |
| <i>BCP56-10</i> | <i>BCP53-10</i> | 80 | 1000 | 63 | 160 | 50 (Typ) | – | |
| <i>BCP56-16</i> | <i>BCP53-16</i> | 80 | 1000 | 100 | 250 | 50 (Typ) | – | |
| – | <i>PZT2907A</i> | 60 | 600 | 100 | 300 | 200 | – | |
| <i>PZT651</i> | <i>PZT751</i> | 60 | 2000 | 75 | – | 75 | – | |
| <i>PZT2222A</i> | – | 40 | 600 | 100 | 300 | 300 | – | |
| <i>BCP68</i> | <i>BCP69</i> | 25 | 1000 | 85 | 375 | 60 (Typ) | – | |
| – | MMBT2131 | 30 | 700 | 150 | – | – | – |  SO-74 Case 318F-05 |
| – | MBT35200M | 35 | 2000 | 100 | 400 | 100 | – |  TSOP-6 SINGLE Case 318G-02 |
| NST489AM | – | 30 | 3000 | 300 | 900 | 200 | – | |
| – | NSL12AW | 12 | 2000 | 100 | 300 | 100 | – |  SC-88, SOT-363 Case 419B-02 |

Devices listed in **bold italic** are ON Semiconductor preferred devices.

Bipolar Transistors

GENERAL-PURPOSE MULTIPLE TRANSISTORS



| Device | Type | V _{(BR)CEO} | I _C mA Max | h _{FE} | | f _T MHz Min | NF dB Max | Package |
|---------------------|--------------------|----------------------|-----------------------------|-----------------|------|---------------------------|-----------------|---|
| | | | | Min | Max | | | |
| BC846BDW1 | Dual NPN | 65 | 100 | 200 | 450 | 100 | 10 |  SC-88, SOT-363 Case 419B-02 |
| BC856BDW1 | Dual PNP | 65 | 100 | 220 | 475 | 100 | 10 | |
| BC846BPDW1 | Dual Complementary | 65 | 100 | 200 | 475 | 100 | 10 | |
| BC847BDW1 | Dual NPN | 45 | 100 | 200 | 290 | 100 | 10 | |
| BC847CDW1 | Dual NPN | 45 | 100 | 420 | 520 | 100 | 4.0 | |
| BC857BDW1 | Dual PNP | 45 | 100 | 220 | 290 | 100 | 10 | |
| BC857CDW1 | Dual PNP | 45 | 100 | 420 | 520 | 100 | 10 | |
| BC847BPDW1 | Dual Complementary | 45 | 100 | 200 | 290 | 100 | 10 | |
| MBT3904DW1 | Dual NPN | 40 | 200 | 100 | 300 | 300 | 5.0 | |
| MBT3906DW1 | Dual PNP | 40 | 200 | 100 | 300 | 250 | 4.0 | |
| MBT3946DW1 | Dual Complementary | 40 | 200 | 100 | 300 | 250 | 5.0/4.0 | |
| MBT2222ADW1 | Dual NPN | 40 | 600 | 100 | 300 | 300 | 4.0 | |
| MBT6429DW1 | Dual NPN | 45 | 200 | 500 | 1250 | 100 | – | |
| UMZ1N | Dual Complementary | 50 | 200 | 200 | 400 | 114 (Typ) | – | |
| BC848CDW1 | Dual NPN | 30 | 100 | 420 | 250 | 100 | 4.0 | |
| BC848CPDW1 | Dual Complementary | 30 | 100 | 420 | 520 | 100 | 4.0/10 | |
| BC847CDXV6 | NPN | 45 | 100 | 420 | 520 | 100 | – |  SOT-563 Case 463A-01 |
| EMT1DXV6 | Dual PNP | 60 | 100 | 120 | 560 | 140 (Typ) | – | |
| EMX1DXV6 | Dual NPN | 50 | 100 | 120 | 560 | 180 (Typ) | – | |
| EMX2DXV6 | Dual NPN | 50 | 100 | 120 | 560 | 180 (Typ) | – | |
| EMZ1DXV6 | Complementary | 60 | 100 | 120 | 560 | 140 (Typ) | – | |
| BC847BPDXV6 | Complementary | 45 | 100 | 200 | 290 | 100 | – | |
| NST3904DXV6 | Dual NPN | 40 | 200 | 100 | 300 | 300 | – | |
| NST3906DXV6 | Dual PNP | 40 | 200 | 100 | 300 | 250 | – | |
| NST3946DXV6 | Complementary | 40 | 200 | 100 | 300 | 250 | – | |
| NST30010MXV6 | Matched Dual PNP | 30 | 100 | 420 | 520 | 100 | – | |
| BC858CDXV6 | Dual PNP | 30 | 100 | 420 | 520 | 100 | – | |
| HN1B01FDW1 | Complimentary | 50 | 200 | 200 | 400 | – | – |  SO-74 Case 318F-05  8 1 SOIC-8 Case 751 STYLE 16 |
| NSS40301MD08 | Matched Dual NPN | 40 | 3000 | 200 | 500 | 150 | – | |

Devices listed in **bold italic** are ON Semiconductor preferred devices.

1. Devices in **bold**, samples starting Oct. 2002, production starting Dec. 2002.
2. Remainder of devices, 4 to 8 weeks after receipt of request based on note 1 timetable.

Bipolar Transistors





LOW NOISE AND GOOD h_{FE} LINEARITY

| NPN | PNP | $V_{(BR)CEO}$ | I_C mA Max | h_{FE} | | f_T MHz Min | NF dB Max | Package |
|------------------|------------------|---------------|--------------------|----------|-----|---------------------|-----------------|--|
| | | | | Min | Max | | | |
| – | 2N5087 | 50 | 50 | 250 | 800 | 40 | 2.0 |  TO-226AA, TO-92 Case 29-11 (Note 1) |
| BC550C | BC560C | 45 | 100 | 380 | 800 | 250 (Typ) | 2.5 | |
| MPSA18 | – | 45 | 200 | 500 | – | 100 | 1.5 | |
| 2N5088 | – | 30 | 50 | 350 | – | 50 | 3.0 | |
| 2N5089 | – | 25 | 50 | 450 | – | 50 | 2.0 | |
| MMBT2484L | – | 60 | 50 | 250 | – | – | 3.0 |  TO-236AB, SOT-23 Case 318-08 |
| MMBT6428L | – | 50 | 200 | 250 | – | 100 | 3.0 (Typ) | |
| – | MMBT5087L | 50 | 50 | 250 | – | 40 | 2.0 | |
| MMBT6429L | – | 45 | 200 | 500 | – | 100 | 3.0 (Typ) | |
| MMBT5088L | – | 30 | 50 | 300 | 900 | 5 | 3.0 | |
| MMBT5089L | – | 25 | 50 | 400 | – | 50 | 2.0 | |

Devices listed in **bold italic** are ON Semiconductor preferred devices.

1. N_F : Noise Figure at $R_S = 2.0\text{ k}\Omega$, $I_C = 200\text{ }\mu\text{A}$, $V_{CE} = 5.0\text{ Volts}$. $f = 30\text{ Hz}$ to 15 kHz .



DARLINGTON TRANSISTORS

| NPN | PNP | $V_{(BR)CEO}$ | I_C mA Max | h_{FE} | | f_T MHz Min | NF dB Max | Package |
|-----------------|-----------------|---------------|--------------------|----------|--------|---------------------|-----------------|--|
| | | | | Min | Max | | | |
| MPSW45A | – | 50 | 1000 | 25K | 150K | 100 | 1.5 |  TO-226AE (1-WATT) TO-92 Case 29-10 |
| MPSW45 | – | 40 | 1000 | 25K | 150K | 100 | 1.5 | |
| – | MPSW63 | 30 | 500 | 10K | – | 125 | 1.5 | |
| MPSW13 | – | 30 | 1000 | 10K | – | 125 | 1.5 | |
| MPSA29 | – | 100 | 500 | 10K | – | 125 | 1.5 |  TO-226AA, TO-92 Case 29-11 |
| BC372 | – | 100 | 1000 | 10K | 160K | 100 | 1.1 | |
| BC373 | – | 80 | 1000 | 10K | 160K | 100 | 1.1 | |
| MPSA27 | MPSA77 | 60 | 500 | 10K | – | – | 1.5 | |
| BC618 | – | 55 | 1000 | 10K | 50K | 150 | 1.1 | |
| – | MPSA75 | 40 | 500 | 10K | – | – | 1.5 | |
| 2N6427 | – | 40 | 500 | 20K | 200K | – | 1.5 | |
| 2N6426 | – | 40 | 500 | 30K | 300K | 125 | 1.5 | |
| MPSA14 | MPSA64 | 30 | 500 | 20K | – | 125 | 1.5 | |
| MPSA13 | MPSA63 | 30 | 500 | 10K | – | 125 | 1.5 | |
| BC517 | – | 30 | 1000 | 30K | – | 200 (Typ) | 1.0 | |
| MMBT6427L | – | 40 | 500 | 20000 | 200000 | – | 10 |  TO-236AB, SOT-23 Case 318-08 |
| MMBTA14L | MMBTA64L | 30 | 300 | 20K | – | 125 | – | |
| MMBTA13L | – | 30 | 300 | 10000 | – | 125 | – | |
| – | MMBTA63L | 30 | 500 | 10000 | – | 125 | – | |
| BSP52 | – | 80 | 1000 | 2000 | – | – | – |  SOT-223 Case 318E-04 |

Devices listed in **bold italic** are ON Semiconductor preferred devices.

Bipolar Transistors





HIGH CURRENT TRANSISTORS (≥ 500 mA)

| NPN | PNP | $V_{(BR)CEO}$ | I_C mA Max | h_{FE} | | f_T MHz Min | NF dB Max | Package | |
|------------------------|------------------------|---------------|--------------------|----------|-----|---------------------|-----------------|---|---|
| | | | | Min | Max | | | | |
| BC489 | BC490 | 80 | 1000 | 60 | 400 | 200/150 (Typ) | 0.3/0.5 |  <p>TO-226AA, TO-92 Case 29-11</p> | |
| BC639 | BC640 | 80 | 500 | 40 | 160 | 60 | 0.5 | | |
| BC489A | | 80 | 1000 | 100 | 250 | 100 | 0.5 | | |
| BC639-16 | BC640-16 | 80 | 1000 | 100 | 250 | 60 | 0.5 | | |
| <i>MPS8099</i> | <i>MPS8599</i> | 80 | 500 | 100 | 300 | 150 | - | | |
| <i>MPSA06</i> | <i>MPSA56</i> | 80 | 500 | 100 | - | 100 | - | | |
| <i>MPS651</i> | <i>MPS751</i> | 60 | 2000 | 75 | - | 75 | 0.5 | | |
| BC637 | | 60 | 500 | 40 | 160 | - | 0.5 | | |
| MPSA05 | MPSA55 | 60 | 500 | 100 | - | 100 | - | | |
| - | <i>MPS2907A</i> | 60 | 600 | 100 | 300 | 200 | - | | |
| - | P2N2907A | 60 | 600 | 100 | 300 | 200 | - | | |
| - | PN2907A | 60 | 600 | 100 | 300 | 200 | - | | |
| BC337 | BC327 | 45 | 800 | 100 | 630 | 210 (Typ) | - | | |
| BC337-25 | BC327-25 | 45 | 800 | 160 | 400 | 260 (Typ) | - | | |
| BC337-40 | BC327-40 | 45 | 800 | 250 | 630 | 260 (Typ) | - | | |
| MPS650 | MPS750 | 40 | 2000 | 40 | - | 75 | - | | |
| <i>MPS2222A</i> | - | 40 | 600 | 100 | 300 | 300 | - | | |
| <i>2N4401</i> | <i>2N4403</i> | 40 | 600 | 100 | 300 | 200 | - | | |
| P2N2222A | - | 40 | 600 | 100 | 300 | 300 | - | | |
| PN2222A | - | 40 | 600 | 100 | 300 | 300 | - | | |
| | <i>MPS6652</i> | 40 | 1000 | 50 | - | 100 | - | | |
| PN2222 | - | 30 | 600 | 100 | 300 | 250 | - | | |
| MPS2222 | - | 30 | 600 | 100 | 300 | 250 | - | | |
| MPS6560 | - | 25 | 500 | 50 | 200 | 60 | - | | |
| MPS6601 | - | 25 | 1000 | 50 | - | 100 | - | | |
| BC368 | BC369 | 20 | 1000 | 60 | - | 65 | 0.5 | | |
| <i>MPSW06</i> | <i>MPSW56</i> | 80 | 500 | 80 | - | 50 | - | |  <p>TO-226AE (1-WATT) TO-92 Case 29-10</p> |
| MPS6717 | - | 80 | 500 | 50 | 250 | 100 | - | | |
| MPSW05 | MPSW55 | 60 | 500 | 60 | - | 50 | 250 | | |
| <i>MPSW01A</i> | <i>MPSW51A</i> | 40 | 1000 | 50 | - | 50 | - | | |
| MPSW01 | MPSW51 | 30 | 1000 | 50 | - | 50 | - | | |
| MPS6726 | - | 30 | 1000 | 50 | 250 | - | - | | |

Devices listed in ***bold italic*** are ON Semiconductor preferred devices.

Bipolar Transistors






HIGH CURRENT TRANSISTORS (≥ 500 mA) (continued)

| NPN | PNP | $V_{(BR)CEO}$ | I_C mA Max | h_{FE} | | f_T MHz Min | NF dB Max | Package |
|-------------------|-------------------|---------------|--------------------|----------|-----|---------------------|-----------------|--|
| | | | | Min | Max | | | |
| MMBT5550L | – | 140 | 600 | 60 | 250 | – | – |  TO-236AB, SOT-23 Case 318-08 |
| MMBTA06L | MMBTA56L | 80 | 500 | 100 | – | 100 | – | |
| MMBT8099L | – | 80 | 500 | 100 | 300 | 150 | – | |
| – | MMBT2907AL | 60 | 600 | 100 | 300 | 200 | – | |
| MMBTA05L | – | 60 | 500 | 100 | – | 100 | – | |
| – | MMBTA55L | 60 | 500 | 100 | – | 50 | – | |
| – | BCW68GL | 45 | 800 | 120 | 400 | 100 | 10 | |
| BCW66GL | – | 45 | 800 | 160 | 400 | 100 | 10 | |
| – | BCX17L | 45 | 500 | 100 | 600 | – | – | |
| BCX19L | – | 45 | 500 | 100 | 600 | – | – | |
| MMBT2222AL | – | 40 | 600 | 100 | 300 | 300 | 4.0 | |
| MMBT4401L | – | 40 | 600 | 100 | 300 | 250 | – | |
| – | MMBT4403L | 40 | 600 | 100 | 300 | 200 | – | |
| BCW65AL | – | 32 | 800 | 100 | 250 | 100 | 10 | |
| MMBT2222L | – | 30 | 600 | 100 | 300 | 250 | 4.0 | |
| BCP56 | BCP53 | 80 | 1000 | 40 | 250 | 50 (Typ) | – |  SOT-223 Case 318E-04 |
| BCP56-10 | BCP53-10 | 80 | 1000 | 63 | 160 | 50 (Typ) | – | |
| BCP56-16 | BCP53-16 | 80 | 1000 | 100 | 250 | 50 (Typ) | – | |
| – | PZT2907A | 60 | 600 | 100 | 300 | 200 | – | |
| PZT651 | PZT751 | 60 | 2000 | 75 | – | 75 | – | |
| PZT2222A | – | 40 | 600 | 100 | 300 | 300 | – | |
| BCP68 | BCP69 | 25 | 1000 | 85 | 375 | 60 (Typ) | – | |
| MMBT2222AT | – | 40 | 600 | 100 | 300 | 300 | 4.0 |  SOT-416, SC-75, SC-90 Case 463-01 |
| – | MMBT2907AW | 60 | 600 | 100 | – | 200 | – |  SC-70, SOT-323 Case 419-04 |
| MMBT2222AW | – | 40 | 600 | 100 | 300 | 300 | 4.0 | |
| – | MSB92ASW | 300 | 500 | 120 | 200 | 50 | – | |

Devices listed in **bold italic** are ON Semiconductor preferred devices.

Bipolar Transistors




HIGH VOLTAGE TRANSISTORS (> 100 V)

| NPN | PNP | V _{(BR)CEO} | I _C mA Max | h _{FE} | | f _T MHz Min | NF dB Max | Package |
|------------------|------------------|----------------------|-----------------------------|-----------------|-----|---------------------------|-----------------|---|
| | | | | Min | Max | | | |
| - | BF493S | 350 | 500 | 40 | - | 50 | 20 |  TO-226AE (1-WATT) TO-92 Case 29-10 |
| MPSW42 | - | 300 | 500 | 40 | - | 50 | 0.5 | |
| - | MPSW92 | 300 | 500 | 25 | - | 50 | 0.5 | |
| BF393 | - | 300 | 500 | 40 | - | 50 | - | |
| 2N5551 | - | 160 | 600 | 80 | 250 | 100 | 8.0 | |
| - | 2N5401 | 150 | 600 | 60 | 240 | 100 | 8.0 | |
| MPSA44 | - | 400 | 300 | 50 | 200 | - | - |  TO-226AA, TO-92 Case 29-11 |
| 2N6517 | 2N6520 | 350 | 500 | 30 | 200 | 40 | - | |
| MPSA42 | - | 300 | 500 | 40 | - | 50 | 0.5 | |
| - | MPSA92 | 300 | 500 | 40 | - | 50 | 0.5 | |
| BF422 | BF423 | 250 | 500 | 50 | - | 60 | - | |
| MPSA43 | - | 200 | 500 | 40 | - | 50 | - | |
| - | MPSA93 | 200 | 500 | 25 | - | 50 | - | |
| 2N5550 | - | 160 | 600 | 80 | - | 100 | 0.15 | |
| 2N6515 | - | 250 | 500 | 50 | 300 | 40 | 0.3 | |
| MMBT6517L | - | 350 | 500 | 15 | - | 40 | - |  TO-236AB, SOT-23 Case 318-08 |
| - | MMBT6520L | 350 | 500 | 15 | - | 40 | - | |
| MMBT42L | - | 300 | 500 | 40 | - | 50 | - | |
| - | MMBT492L | 300 | 500 | 25 | - | 50 | - | |
| MMBT43L | - | 200 | 500 | 40 | - | 50 | - | |
| MMBT5551L | - | 160 | 600 | 80 | 250 | - | - | |
| - | MMBT5401L | 150 | 500 | 50 | - | 100 | 8.0 | |
| MMBT5550L | - | 140 | 600 | 60 | 250 | - | - | |
| PZTA96S | - | 450 | 500 | 50 | 150 | - | - |  SOT-223 Case 318E-04 |
| BSP19A | - | 350 | 1000 | 40 | - | 70 | - | |
| PZTA42 | PZTA92 | 300 | 500 | 40 | - | 50 | - | |
| - | PZTA96S | 450 | 500 | 50 | 150 | - | - | |
| - | BSP16 | 300 | 1000 | 30 | 120 | 15 | - | |
| BF720 | BF721 | 250 | 100 | 50 | - | 60 | - | |
| MSD42W | - | 300 | 150 | 40 | - | - | - |  SC-70, SOT-323 Case 419-04 |
| - | MSB92W | 300 | 500 | 25 | - | 50 | - | |
| - | MSB92AW | 300 | 500 | 120 | 200 | 50 | - | |
| - | MSB92ASW | 300 | 500 | 120 | 200 | 50 | - | |

Devices listed in **bold italic** are ON Semiconductor preferred devices.



Bipolar Transistors

RF TRANSISTORS

| NPN | PNP | $V_{(BR)CEO}$ | I_C mA Max | h_{FE} | | f_T MHz Min | Cap pF Max | Package |
|--------------------------|-----|---------------|--------------------|----------|-----|------------------|--------------------------|--|
| | | | | Min | Max | | | |
| <i>MPSH10</i> | – | 25 | – | 60 | – | 650 | $C_{RB} = 0.65$ |  TO-226AA, TO-92 Case 29-11 |
| BF959 | – | 20 | 100 | 40 | – | 600 | $C_{RE} = 0.65$ (Typ) | |
| <i>MPSH17</i> | – | 15 | – | 25 | 250 | 800 | $C_{CB} = 0.9$ | |
| <i>MMBTH10L</i> | – | 25 | – | 60 | – | 650 | $C_{CB} = 0.7$ |  TO-236AB, SOT-23 Case 318-08 |
| <i>MMBTH10-4L</i> | – | 25 | – | 120 | 240 | 800 | $C_{CB} = 0.7$ | |
| MMBT918L | – | 15 | 50 | 20 | – | 600 | $C_{OBO} = 1.7$ | |
| BSV52L | – | 12 | 100 | 40 | 120 | 400 | – | |
| <i>MSC2295-C</i> | – | 20 | 30 | 110 | 220 | 150 | $C_{RE} = 1.5$ |  SC-59 Case 318D-04 |

Devices listed in ***bold italic*** are ON Semiconductor preferred devices.



SWITCHING TRANSISTORS

| NPN | PNP | $V_{(BR)CEO}$ | I_C mA Max | h_{FE} | | f_T MHz Min | T_{off} ns Max | Package |
|--------------------------|--------------------------|---------------|--------------------|----------|-----|------------------|---------------------|--|
| | | | | Min | Max | | | |
| – | P2N2907A | 60 | 600 | 100 | 300 | 200 | 110 |  TO-226AA, TO-92 Case 29-11 |
| – | <i>MPS2907A</i> | 60 | 600 | 100 | 300 | 200 | 110 | |
| <i>2N4401</i> | <i>2N4403</i> | 40 | 600 | 100 | 300 | 200 | – | |
| <i>2N3904</i> | <i>2N3906</i> | 40 | 200 | 100 | 300 | 250 | 300 | |
| P2N2222A | – | 40 | 600 | 100 | 300 | 300 | 285 | |
| <i>MPS2222A</i> | – | 40 | 600 | 100 | 300 | 300 | 285 | |
| – | <i>MMBT2907AL</i> | 60 | 600 | 100 | 300 | 200 | 100 |  TO-236AB, SOT-23 Case 318-08 |
| <i>MMBT2222AL</i> | – | 40 | 600 | 100 | 300 | 300 | 285 | |
| <i>MMBT3904L</i> | – | 40 | 200 | 100 | 300 | 300 | 250 | |
| – | <i>MMBT3906L</i> | 40 | 200 | 100 | 300 | 250 | 300 | |
| <i>MMBT4401L</i> | – | 40 | 600 | 100 | 300 | 250 | 255 | |
| – | <i>MMBT4403L</i> | 40 | 600 | 100 | 300 | 200 | 255 | |
| <i>MMBT2369L</i> | – | 15 | 200 | 40 | 120 | – | 18 | |
| <i>MMBT2369AL</i> | – | 15 | 200 | 40 | 120 | – | 18 | |

Devices listed in ***bold italic*** are ON Semiconductor preferred devices.



Bipolar Transistors

SWITCHING TRANSISTORS

| NPN | PNP | $V_{(BR)CEO}$ | I_C mA Max | h_{FE} | | f_T MHz Min | T_{off} ns Max | Package |
|-------------------|-------------------|---------------|--------------------|----------|-----|------------------|---------------------|---|
| | | | | Min | Max | | | |
| – | <i>MMBT2907AW</i> | 60 | 600 | 100 | 300 | 200 | 100 |  SC-70, SOT-323 Case 419-04 |
| <i>MMBT3904W</i> | – | 40 | 200 | 100 | 300 | 300 | 250 | |
| – | <i>MMBT3906W</i> | 40 | 200 | 100 | 300 | 250 | 300 | |
| <i>MMBT2222AW</i> | – | 40 | 600 | 100 | 300 | 300 | 285 | |
| <i>MMBT4401W</i> | – | 40 | 600 | 100 | 300 | 250 | 255 | |
| – | <i>MMBT4403W</i> | 40 | 600 | 100 | 300 | 200 | 255 | |
| <i>MMBT3904T</i> | – | 40 | 200 | 100 | 300 | 300 | 250 |  SOT-416, SC-75, SC-90 Case 463-01 |
| – | <i>MMBT3906T</i> | 40 | 200 | 100 | 300 | 250 | 300 | |
| <i>MMBT2222AT</i> | – | 40 | 600 | 100 | 300 | 300 | 285 | |

Devices listed in ***bold italic*** are ON Semiconductor preferred devices.

MULTIPLE SWITCHING TRANSISTORS

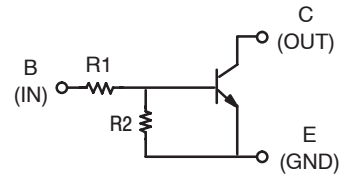
| Device | Type | $V_{(BR)CEO}$ | I_C mA Max | h_{FE} | | f_T MHz Min | T_{off} ns Max | Package |
|--------------------|--------------------|---------------|--------------------|----------|-----|------------------|---------------------|--|
| | | | | Min | Max | | | |
| <i>MBT3904DW1</i> | Dual NPN | 40 | 200 | 100 | 300 | 300 | 250 |  SC-88, SOT-363 Case 419B-02 |
| <i>MBT3906DW1</i> | Dual PNP | 40 | 200 | 100 | 300 | 250 | 300 | |
| <i>MBT3946DW1</i> | Dual Complementary | 40 | 200 | 100 | 300 | 250 | 250/300 | |
| <i>MBT2222ADW1</i> | Dual NPN | 40 | 600 | 100 | 300 | 300 | 285 | |
| HN1B01FDW1 | Dual Complementary | 50 | 200 | 200 | 400 | – | – |  SC-74 Case 318F-05 |




Devices listed in ***bold italic*** are ON Semiconductor preferred devices.

Bipolar Transistors

DIGITAL TRANSISTORS (BIAS RESISTOR TRANSISTORS)

These devices include bias resistors on the semiconductor chip with the transistor. See the BRT diagram for orientation of resistors.



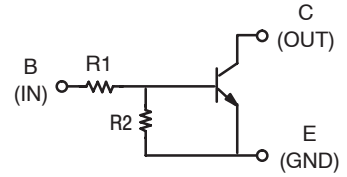
| NPN | PNP | $V_{(BR)CEO}$ | I_C mA Max | h_{FE} Min | R_1 Ω | R_2 Ω | Package |
|------------------|------------------|---------------|--------------------|-----------------|-------------------|-------------------|---|
| <i>MUN2211</i> | <i>MUN2111</i> | 50 | 100 | 35 | 10K | 10K |  SC-59 Case 318D-04 |
| <i>MUN2212</i> | <i>MUN2112</i> | 50 | 100 | 60 | 22K | 22K | |
| <i>MUN2213</i> | <i>MUN2113</i> | 50 | 100 | 80 | 47K | 47K | |
| <i>MUN2214</i> | <i>MUN2114</i> | 50 | 100 | 80 | 10K | 47K | |
| <i>MUN2215</i> | | 50 | 100 | 160 | 10K | ∞ | |
| <i>MUN2216</i> | | 50 | 100 | 160 | 4.7K | ∞ | |
| <i>MUN2230</i> | | 50 | 100 | 3.0 | 1.0K | 1.0K | |
| <i>MUN2232</i> | <i>MUN2132</i> | 50 | 100 | 15 | 4.7K | 4.7K | |
| <i>MUN2233</i> | | 50 | 100 | 80 | 4.7K | 47K | |
| <i>MUN2234</i> | | 50 | 100 | 80 | 22K | 47K | |
| <i>MUN2237</i> | | 50 | 100 | 80 | 47K | 22K | |
| <i>MUN2240</i> | - | 50 | 100 | 160 | 47K | ∞ | |
| <i>MMUN2211L</i> | <i>MMUN2111L</i> | 50 | 100 | 35 | 10K | 10K |  TO-236AB, SOT-23 Case 318-08 |
| <i>MMUN2212L</i> | <i>MMUN2112L</i> | 50 | 100 | 60 | 22K | 22K | |
| <i>MMUN2213L</i> | <i>MMUN2113L</i> | 50 | 100 | 80 | 47K | 47K | |
| <i>MMUN2214L</i> | <i>MMUN2114L</i> | 50 | 100 | 80 | 10K | 47K | |
| <i>MMUN2215L</i> | <i>MMUN2115L</i> | 50 | 100 | 160 | 10K | ∞ | |
| <i>MMUN2216L</i> | <i>MMUN2116L</i> | 50 | 100 | 160 | 4.7K | ∞ | |
| <i>MMUN2231L</i> | | 50 | 100 | 8.0 | 2.2K | 2.2K | |
| <i>MMUN2232L</i> | <i>MMUN2132L</i> | 50 | 100 | 15 | 4.7K | 4.7K | |
| <i>MMUN2233L</i> | <i>MMUN2133L</i> | 50 | 100 | 80 | 4.7K | 47K | |
| <i>MMUN2234L</i> | | 50 | 100 | 80 | 22K | 47K | |
| <i>MMUN2238L</i> | - | 50 | 100 | 160 | 2.2K | ∞ | |
| <i>MUN5211</i> | <i>MUN5111</i> | 50 | 100 | 35 | 10K | 10K |  SC-70, SOT-323 Case 419-04 |
| <i>MUN5212</i> | <i>MUN5112</i> | 50 | 100 | 60 | 22K | 22K | |
| <i>MUN5213</i> | <i>MUN5113</i> | 50 | 100 | 80 | 47K | 47K | |
| <i>MUN5214</i> | <i>MUN5114</i> | 50 | 100 | 80 | 10K | 47K | |
| <i>MUN5215</i> | | 50 | 100 | 160 | 10K | ∞ | |
| <i>MUN5230</i> | | 50 | 100 | 3.0 | 1.0K | 1.0K | |
| | <i>MUN5131</i> | 50 | 100 | 8.0 | 2.2K | 2.2K | |
| <i>MUN5232</i> | <i>MUN5132</i> | 50 | 100 | 15 | 4.7K | 4.7K | |
| <i>MUN5233</i> | <i>MUN5133</i> | 50 | 100 | 80 | 4.7K | 47K | |
| <i>MUN5235</i> | <i>MUN5135</i> | 50 | 100 | 80 | 2.2K | 47K | |



Devices listed in ***bold italic*** are ON Semiconductor preferred devices.

Bipolar Transistors

DIGITAL TRANSISTORS (BIAS RESISTOR TRANSISTORS) (continued)

These devices include bias resistors on the semiconductor chip with the transistor. See the BRT diagram for orientation of resistors.



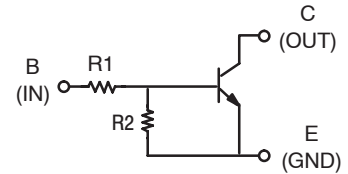
| NPN | PNP | $V_{(BR)CEO}$ | I_C mA Max | h_{FE} Min | R1 Ω | R2 Ω | Package | |
|------------------|------------------|---------------|--------------------|-----------------|----------------|----------------|---|---|
| <i>DTC114EE</i> | <i>DTA114EE</i> | 50 | 100 | 35 | 10K | 10K |  SOT-416, SC-75, SC-90 Case 463-01 | |
| <i>DTC124EE</i> | | 50 | 100 | 60 | 22K | 22K | | |
| <i>DTC144EE</i> | <i>DTA144EE</i> | 50 | 100 | 80 | 47K | 47K | | |
| <i>DTC114YE</i> | <i>DTA114YE</i> | 50 | 100 | 80 | 10K | 47K | | |
| <i>DTC114TE</i> | <i>DTA114TE</i> | 50 | 100 | 160 | 10K | ∞ | | |
| <i>DTC143TE</i> | <i>DTA143TE</i> | 50 | 100 | 160 | 4.7K | ∞ | | |
| <i>DTC123EE</i> | | 50 | 100 | 8.0 | 2.2K | 2.2K | | |
| <i>DTC143EE</i> | <i>DTA143EE</i> | 50 | 100 | 15 | 4.7K | 4.7K | | |
| <i>DTC143ZE</i> | <i>DTA143ZE</i> | 50 | 100 | 80 | 4.7K | 4.7K | | |
| <i>DTC124XE</i> | - | 50 | 100 | 80 | 22K | 47K | | |
| <i>DTC123JE</i> | | 50 | 100 | 80 | 2.2K | 47K | | |
| <i>DTC115EE</i> | <i>DTA115EE</i> | 50 | 100 | 80 | 100K | 100K | | |
| <i>DTC114EM3</i> | <i>DTA114EM3</i> | 50 | 100 | 35 | 10K | 10K | |  SOT-723 Case 631AA-01 |
| <i>DTC124EM3</i> | <i>DTA124EM3</i> | 50 | 100 | 60 | 22K | 22K | | |
| <i>DTC144EM3</i> | <i>DTA144EM3</i> | 50 | 100 | 80 | 47K | 47K | | |
| <i>DTC114YM3</i> | <i>DTA114YM3</i> | 50 | 100 | 80 | 10K | 47K | | |
| <i>DTC114TM3</i> | <i>DTA114TM3</i> | 50 | 100 | 160 | 10K | ∞ | | |
| <i>DTC143TM3</i> | <i>DTA143TM3</i> | 50 | 100 | 160 | 4.7K | ∞ | | |
| <i>DTC123EM3</i> | <i>DTA123EM3</i> | 50 | 100 | 8.0 | 2.2K | 2.2K | | |
| <i>DTC143EM3</i> | <i>DTA143EM3</i> | 50 | 100 | 15 | 4.7K | 4.7K | | |
| <i>DTC143ZM3</i> | <i>DTA143ZM3</i> | 50 | 100 | 80 | 4.7K | 4.7K | | |
| <i>DTC124XM3</i> | <i>DTA124XM3</i> | 50 | 100 | 80 | 22K | 47K | | |
| <i>DTC123JM3</i> | | 50 | 100 | 80 | 2.2K | 47K | | |
| <i>DTC115EM3</i> | <i>DTA115EM3</i> | 50 | 100 | 80 | 100K | 100K | | |
| <i>DTC144WM3</i> | <i>DTA144WM3</i> | 50 | 100 | 80 | 47K | 22K | | |
| <i>DTC144TM3</i> | <i>DTA144TM3</i> | 50 | 100 | 160 | 47K | ∞ | | |




Devices listed in **bold italic** are ON Semiconductor preferred devices.

Bipolar Transistors

DUAL DIGITAL TRANSISTORS (BIAS RESISTOR TRANSISTORS)

These devices include bias resistors on the semiconductor chip with the transistor. See the BRT diagram for orientation of resistors.



| NPN | PNP | $V_{(BR)CEO}$ | I_C mA Max | h_{FE} Min | R_1 Ω | R_2 Ω | Package |
|---------------------|---------------------|---------------|--------------------|-----------------|-------------------|-------------------|--|
| <i>MUN5211DW1</i> | <i>MUN5111DW1</i> | 50 | 100 | 35 | 10K | 10K |  SC-88, SOT-363 Duals Case 419B-02 |
| <i>MUN5212DW1</i> | | 50 | 100 | 60 | 22K | 22K | |
| <i>MUN5213DW1</i> | <i>MUN5113DW1</i> | 50 | 100 | 80 | 47K | 47K | |
| <i>MUN5214DW1</i> | <i>MUN5114DW1</i> | 50 | 100 | 80 | 10K | 47K | |
| <i>MUN5215DW1</i> | <i>MUN5115DW1</i> | 50 | 100 | 160 | 10K | ∞ | |
| <i>MUN5216DW1</i> | <i>MUN5116DW1</i> | 50 | 100 | 160 | 4.7K | ∞ | |
| <i>MUN5230DW1</i> | | 50 | 100 | 3.0 | 1.0K | 1.0K | |
| <i>MUN5232DW1</i> | <i>MUN5132DW1</i> | 50 | 100 | 15 | 4.7K | 4.7K | |
| <i>MUN5233DW1</i> | <i>MUN5133DW1</i> | 50 | 100 | 80 | 4.7K | 47K | |
| <i>MUN5235DW1</i> | <i>MUN5135DW1</i> | 50 | 100 | 80 | 2.2K | 47K | |
| NSBC114EDXV6 | NSBA114EDXV6 | 50 | 100 | 35 | 10K | 10K |  SOT-563 Duals Case 463A-01 |
| NSBC124EDXV6 | | 50 | 100 | 60 | 22K | 22K | |
| NSBC144EDXV6 | NSBA144EDXV6 | 50 | 100 | 80 | 47K | 47K | |
| NSBC114YDXV6 | NSBA114YDXV6 | 50 | 100 | 80 | 10K | 10K | |
| NSBC114TDXV6 | | 50 | 100 | 160 | 10K | – | |
| NSBC143ZDXV6 | | 50 | 100 | 80 | 4.7K | 4.7K | |
| | NSBA123JDXV6 | 50 | 100 | 80 | 2.2K | 47K | |
| NSBC115EDXV6 | NSBA115EDXV6 | 50 | 100 | 80 | 100K | 100K | |
| IMH20TR1 | – | 15 | 600 | 100 | 2.2K | – |  SC-74 Case 318F-05 |

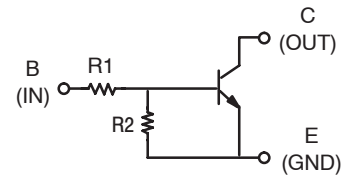
Devices listed in **bold italic** are ON Semiconductor preferred devices.





1. Devices in **bold**, samples starting Oct. 2002, production starting Dec. 2002.
2. Remainder of devices, 4 to 8 weeks after receipt of request based on note 1 timetable.

Bipolar Transistors

COMBINATIONAL DIGITAL TRANSISTORS (BIAS RESISTOR TRANSISTORS)

These devices include bias resistors on the semiconductor chip with the transistor. See the BRT diagram for orientation of resistors.



| Device | Type | $V_{(BR)CEO}$ | I_C mA Max | h_{FE} Min | Q1 | Q2 | Package |
|--------------------------|-------------------------------------|---------------|--------------------|-----------------|-----------|----------|--|
| <i>MUN5311DW1</i> | Dual Complementary | 50 | 100 | 35 | MUN5211 | MUN5111 |  SC-88, SOT-363 Case 419B-02 |
| <i>MUN5312DW1</i> | | 50 | 100 | 60 | MUN5212 | MUN5112 | |
| <i>MUN5313DW1</i> | | 50 | 100 | 80 | MUN5213 | MUN5113 | |
| <i>MUN5314DW1</i> | | 50 | 100 | 80 | MUN5214 | MUN5114 | |
| <i>MUN5315DW1</i> | | 50 | 100 | 160 | MUN5215 | MUN5115 | |
| <i>MUN5316DW1</i> | | 50 | 100 | 160 | MUN5216 | MUN5116 | |
| <i>MUN5330DW1</i> | | 50 | 100 | 3.0 | MUN5230 | MUN5130 | |
| <i>MUN5333DW1</i> | | 50 | 100 | 80 | MUN5233 | MUN5133 | |
| <i>MUN5335DW1</i> | | 50 | 100 | 80 | MUN5235 | MUN5135 | |
| <i>UMC3N</i> | Dual Common Base Collector | 50 | 100 | 35 | 4.7K/10K | 47K/47K |  SC-88A, SOT-353 SC70-5 Case 419A-02 |
| <i>UMC5N</i> | Dual Common Base Collector | 50 | 100 | 20 | 47K/∞ | 47K/∞ | |
| NSB1706DMW5 | Dual Common Emitter | 50 | 100 | 80 | 4.7K/47K | 4.7K/47K | |
| EMC3DXV5 | Dual Common Base Collector | 50 | 100 | 35 | 10K/10K | 10K/10K |  SOT-553 Case 463B-01 |
| EMC4DXV5 | Dual Common Base Collector | 50 | 100 | 80 | 10K/47K | 4.7K/47K | |
| EMC5DXV5 | Dual Common Base Collector | 50 | 100 | 35 | 4.7K/10K | 4.7K/47K | |
| EMG2DXV5 | Dual Common Base, Common Emitter | 50 | 100 | 80 | 4.7K/47K | 4.7K/47K | |
| NSB1010XV5 | Dual Common Base Collector | 50 | 100 | - | 4.7K/4.7K | 10K/10K | |
| EMD4DXV6 | Dual Complementary | 50 | 100 | 80 | 10K/47K | 47K/47K |  SOT-563 Case 463A-01 |
| NSB1011XV6 | Dual | 50 | 100 | - | 2.2K/47K | 10K/10K | |

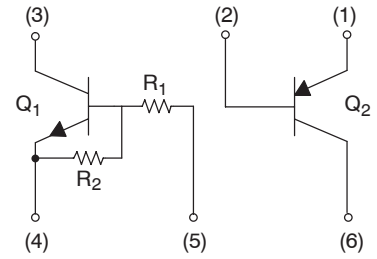
Devices listed in ***bold italic*** are ON Semiconductor preferred devices.


1. Devices in **bold**, samples starting Oct. 2002, production starting Dec. 2002.
2. Remainder of devices, 4 to 8 weeks after receipt of request based on note 1 timetable.

Bipolar Transistors

COMPLEX DIGITAL TRANSISTORS

These devices include bias resistors on the semiconductor chip with the transistor. See the BRT diagram for orientation of resistors.










| Device | Switching Transistor | | | | Digital Transistor | | | Package |
|----------|----------------------|----------------------|----------|-----|--------------------|----------------|----------------|---|
| | $V_{(BR)CEO}$ V | I_C (mA) Max | h_{FE} | | h_{FE} Min | R1 Ω | R2 Ω | |
| | | | Min | Max | | | | |
| EMF5XV6 | 12 | 500 | 270 | 680 | 80 | 47K | 47K |  SOT-563 Case 463A-01 |
| EMF18XV6 | 60 | 100 | 120 | 560 | 80 | 47K | 47K | |

Devices listed in ***bold italic*** are ON Semiconductor preferred devices.

1. Devices in ***bold***, samples starting Oct. 2002, production starting Dec. 2002.
2. Remainder of devices, 4 to 8 weeks after receipt of request based on note 1 timetable.

Bipolar Transistors




LOW SATURATION VOLTAGE TRANSISTORS

| NPN | PNP | V _{(BR)CEO} | I _{C DC} A Max | I _{C Peak} A Max | h _{FE} @ 1.0 A | | f _t MHz Min | V _{CE(sat)} @ 1.0 A Max | Package |
|-------------|-------------|----------------------|-------------------------------|---------------------------------|----------------------------|-----|---------------------------|--|---|
| | | | | | Min | Max | | | |
| NSS60201L | | 60 | 2 | 4 | 200 | 500 | 150 | 0.070 |  <p>TO-236AB, SOT-23 Case 318-08 STYLE 6</p> |
| | NSS60200L | 60 | 2 | 4 | 200 | 500 | 150 | 0.095 | |
| NSS40201L | - | 40 | 2 | 4 | 200 | 500 | 150 | 0.060 | |
| - | NSS40200L | 40 | 2 | 4 | 200 | 500 | 150 | 0.090 | |
| NSS30101L | | 30 | 1 | 2 | 100 | 500 | 100 | 0.200 | |
| - | NSS30100L | 30 | 1 | 2 | 100 | 500 | 100 | 0.300 | |
| NSS20201L | - | 20 | 2 | 4 | 200 | 500 | 150 | 0.050 | |
| - | NSS20200L | 20 | 2 | 4 | 200 | 500 | 150 | 0.080 | |
| NSS12201L | - | 12 | 2 | 4 | 200 | 500 | 150 | 0.055 |  <p>SC-74 Case 318F-05 STYLE 2</p> |
| - | NSS12200L | 12 | 2 | 4 | 200 | 500 | 150 | 0.080 | |
| NSS30071MR6 | - | 30 | 0.7 | 2 | 150 | 500 | 100 | 0.250 |  <p>TSOP-6 Single Case 318G-02 STYLE 6</p> |
| - | NSS30070MR6 | 30 | 0.7 | 2 | 150 | 500 | 100 | 0.250 | |
| - | NSS35200MR6 | 35 | 2 | 5 | 100 | 400 | 100 | 0.150 |  <p>ChipFET™ Case 1206A-03 STYLE 4</p> |
| NSS30201MR6 | - | 30 | 2 | 5 | 200 | 900 | 100 | 0.150 | |
| NSS20201MR6 | - | 20 | 2 | 5 | 200 | 900 | 100 | 0.150 | |
| - | NSS20300MR6 | 20 | 2 | 5 | 100 | 400 | 100 | 0.150 | |
| NSS40601CF8 | - | 40 | 6 | 6 | 225 | 500 | 100 | 0.065 |  <p>WDFN3 Case 506AU-01</p> |
| - | NSS40600CF8 | 40 | 6 | 6 | 220 | 500 | 100 | 0.065 | |
| - | NSS35200CF8 | 35 | 2 | 7 | 100 | 400 | 100 | 0.150 | |
| NSS20601CF8 | - | 20 | 6 | 6 | 250 | 500 | 100 | 0.050 | |
| - | NSS20600CF8 | 20 | 6 | 6 | 220 | 500 | 100 | 0.060 | |
| NSS12601CF8 | - | 12 | 6 | 6 | 250 | 500 | 100 | 0.050 | |
| - | NSS12600CF8 | 12 | 6 | 6 | 210 | 500 | 100 | 0.060 | |
| NSS40501UW3 | - | 40 | 5 | 6 | 250 | 500 | 100 | 0.045 |  <p>WDFN6 Case 506AS-01</p> |
| - | NSS40500UW3 | 40 | 5 | 6 | 250 | 500 | 100 | 0.080 | |
| NSS20501UW3 | | 20 | 5 | 6 | 250 | 500 | 100 | 0.045 | |
| - | NSS20500UW3 | 20 | 5 | 6 | 250 | 500 | 100 | 0.090 | |
| NSS12501UW3 | - | 12 | 5 | 6 | 250 | 500 | 100 | 0.045 | |
| - | NSS12500UW3 | 12 | 5 | 6 | 250 | 500 | 100 | 0.070 | |
| - | NSS40200UW6 | 40 | 2 | 4 | 150 | 500 | 100 | 0.120 |  <p>SC-88, SOT-363 Case 419B-02 STYLE 20</p> |
| - | NSS12200MW6 | 12 | 1 | 2 | 200 | 500 | 150 | 0.280 | |
| - | NSS12200W | 12 | 2 | 3 | 100 | 300 | 100 | 0.290 | |

Devices listed in **bold italic** are ON Semiconductor preferred devices.


Bipolar Transistors

LOW SATURATION VOLTAGE TRANSISTORS (continued)


| NPN | PNP | $V_{(BR)CEO}$ | I_C DC A Max | I_C Peak A Max | h_{FE} @ 1.0 A | | f_t MHz Min | $V_{CE(sat)}$ @ 1.0 A Max | Package |
|-------------|-------------|---------------|----------------------|------------------------|---------------------|-----|------------------|---------------------------------|--|
| | | | | | Min | Max | | | |
| – | NSS12100XV6 | 12 | 1 | 2 | 200 | 500 | 150 | 0.280 |  SOT-563 Case 463A-01 |
| NJD2873 | – | 50 | 2 | 3 | 120 | 360 | 65 | 0.300 |  DPAK Case 369C-01 |
| NSS40301MZ4 | – | 40 | 3 | 5 | 200 | 500 | 150 | 0.045 |  SOT-223 Case 318E-04 |
| – | NSS40300MZ4 | 40 | 3 | 5 | 200 | 500 | 150 | 0.050 | |
| NSS60301MZ4 | – | 60 | 3 | 5 | 200 | 500 | 150 | 0.060 | |
| – | NSS60300MZ4 | 60 | 3 | 5 | 200 | 500 | 150 | 0.065 | |
| – | NSB9435 | 30 | 3 | 5 | 125 | 500 | 110 | 0.210 | |

Devices listed in **bold italic** are ON Semiconductor preferred devices.

LOW SATURATION VOLTAGE MULTIPLE TRANSISTORS

| Device | Type | $V_{(BR)CEO}$ | I_C DC | I_C Peak | h_{FE} | | f_t | $V_{CE(sat)}$ | Package |
|--------------|------------------|---------------|----------|------------|----------|-----|-------|---------------|--|
| | | | | | Min | Max | | | |
| NSS40301MD08 | Matched Dual NPN | 40 | 3 | 4 | 200 | 500 | 150 | 0.044 | 8  1 SOIC-8 Case 751 |

LOAD SWITCH TRANSISTORS (Low Saturation Voltage Transistors with BRT Driver)

| NPN | PNP | $V_{(BR)CEO}$ | I_C DC A Max | I_C Peak A Max | h_{FE} @ 1.0 A | | f_t MHz Min | $V_{CE(sat)}$ @ 0.1 A Max | Package |
|-----|----------|---------------|----------------------|------------------------|---------------------|-----|------------------|---------------------------------|--|
| | | | | | Min | Max | | | |
| – | EMF5XV6 | 12 | 0.1 | 0.5 | 270 | 680 | – | 0.250 |  SOT-563 Case 463A-01 |
| – | EMF18XV6 | 600 | 0.1 | 0.5 | 120 | 560 | – | 0.400 | |

Devices listed in **bold italic** are ON Semiconductor preferred devices.

FETs

FETs

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In Brief...

Product Summary

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What's New For . . .

Computing – MOSFETs for Desktop and Notebook PCs, Workstations, Graphic Cards, Hard Disk Drives, Game Consoles

ON Semiconductor has introduced an enhanced portfolio of 30 V MOSFETs utilizing our latest Trench technology providing up to a 54% reduction in R_G . These products are available in two packages: DPAK (including IPAK and IPAK with trimmed leads) and our leading edge SO-8FL flat lead power package.

The new 30 V DPAK devices include the NTD4809NH, NTD4810NH, NTD4813NH, and NTD4815NH.

The new 30 V SO-8FL devices include the NTMFS4837NH, NTMFS4839NH, and NTMFS4841NH.

Digital Consumer – MOSFETs for Cell Phones, Digital Still Cameras, Media Players, PDAs, Portable Games, Battery Packs, MP3 Players, GPS, USB, Modems, Radio, Set-Top Boxes.

Addressing the industry's needs for thinner, smaller, faster, and cooler devices for portable devices, ON Semiconductor is pleased to announce the following 20 V NTGD3133P, 20 V NTGS3443T, and 30 V NTGS4111P additions to the TSOP-6 family.

ON Semiconductor has also expanded its SOT-723 offering with the addition of the 20 V NTK3043N, NTK3134N, NTK3139P, and NTK3142P. The devices feature low $I_{GSS} < 1.0 \mu A$, ESD protected gates, $R_{DS(on)}$ 1.5 V_{GS} rated, and an ultra-low profile of 0.50 mm for slim designs.

Automotive – MOSFETs for Entertainment, Power Train, Safety and Control, Comfort and Convenience, Body Electronics.

ON Semiconductor has released a line of 40 V low $R_{DS(on)}$ devices targeted for ABS applications including the NTB5404N, NTB5405N, NTD5406N, and NTD5407N.

How To Use This Selector Guide



1. Choose the Product Type (MOSFET).
2. Choose the Package Type, i.e., DPAK, SOT-23.
3. Choose the Channel Polarity* (i.e., N, P, Complementary).
4. Choose the Voltage Level.
5. View the Electrical Specifications and Find the Device Number.

*Configuration Codes: S = Single, D = Dual, C = Complementary, F = FETKY, L = Load Switch, Q = Quad

Junction Field–Effect Transistors



JFETs

HIGH–FREQUENCY AMPLIFIERS

| N–Channel | $R_e Y_{fs} $ mmho Min | $R_e Y_{os} $ μ mho Max | C_{iss} pF Max | C_{rss} pF Max | NF dB Max | V_{GSS} V_{GDO} Volts Min | $V_{GS(off)}$ Volts | | I_{DSS} mA | | Package |
|------------------|--------------------------------|-------------------------------------|------------------------|------------------------|-----------------|--|------------------------|-----|-----------------|-----|---|
| | | | | | | Min | Max | Min | Max | | |
| MPF102 | 1.6 | 200 | 7.0 | 3.0 | – | 25 | – | 8.0 | 2.0 | 20 |  TO–226AA, TO–92 Case 29–11 |
| 2N5486 | 3.5 | 100 | 5.0 | 1.0 | 4.0 | 25 | 2.0 | 6.0 | 8.0 | 20 | |
| J309 | 12 (Typ) | 250 (Typ) | 7.5 | 2.5 | 1.5 (Typ) | 25 | 1.0 | 4.0 | 12 | 30 | |
| J310 | 12 (Typ) | 250 (Typ) | 7.5 | 2.5 | 1.5 (Typ) | 25 | 2.0 | 6.5 | 24 | 60 | |
| MMBF5457L | 1.0 | 50 | 7.0 | 3.0 | 4.0 | 25 | 0.5 | 6.0 | 1.0 | 5.0 |  TO–236AB, SOT–23 Case 318–08 |
| MMBF5484L | 3.0 | 50 | 5.0 | 1.0 | 3.0 | 25 | 0.3 | 3.0 | 1.0 | 5.0 | |
| MMBFJ309L | 10 | 250 | 5.0 | 2.5 | 4.0 | 25 | 1.0 | 4.0 | 12 | 30 | |
| MMBFJ310L | 8.0 | 250 | 5.0 | 2.5 | 4.0 | 25 | 2.0 | 6.5 | 24 | 60 | |
| MMBFU310L | 10 | 250 | 5.0 | 2.5 | 4.0 | 25 | 2.5 | 6.0 | 24 | 60 | |
| MMBF4416L | 4.5 | 50 | 4.0 | 0.8 | 2.0 | 30 | – | 6.0 | 5.0 | 15 | |

Devices listed in **bold italic** are ON Semiconductor preferred devices.

SWITCHES AND CHOPPERS



| N–Channel | P–Channel | $R_{DS(on)}$ Ω Max | C_{iss} pF Max | C_{rss} pF Max | V_{GSS} V_{GDO} Volts Min | $V_{GS(off)}$ Volts | | I_{DSS} mA | | t_{on} ns Max | t_{off} ns Max | Package |
|------------------|------------------|---------------------------------|------------------------|------------------------|--|------------------------|-----------|-----------------|-----|-----------------------|------------------------|--|
| | | | | | | Min | Max | Min | Max | | | |
| J112 | – | 50 | 28 | 5.0 | 35 | 1.0 | 5.0 | 5.0 | – | – | – |  TO–226AA, TO–92 Case 29–11 |
| MPF4392 | – | 60 | 10 | 3.5 | 30 | – | – | 25 | 75 | 15 | 35 | |
| 2N5639 | – | 60 | 10 | 4.0 | 30 | – | 8.0 (Typ) | 25 | – | – | – | |
| MPF4393 | – | 100 | 10 | 3.5 | 30 | – | 12 (Typ) | 5.0 | 30 | 15 | 55 | |
| J110 | – | 18 | – | – | 25 | 0.5 | 4.0 | 10 | – | – | – | |
| 2N5638 | – | 30 | 10 | 4.0 | 30 | – | – | 50 | – | 4.0 | 5.0 | |
| J111 | – | 30 | 28 | 5.0 | 35 | 3.0 | 10 | 20 | – | – | – | |
| BSR58L | – | 60 | 28 | 5.0 | 40 | 0.8 | 4.0 | 8.0 | 80 | – | – |  TO–236AB, SOT–23 Case 318–08 |
| MMBF4391L | – | 30 | 10 | 3.5 | 30 | 4.0 | 10 | 50 | 150 | – | – | |
| MMBF4392L | – | 60 | 10 | 3.5 | 30 | 2.0 | 5.0 | 25 | 75 | – | – | |
| MMBF4393L | – | 100 | 10 | 3.5 | 30 | 0.5 | 3.0 | 5.0 | 30 | – | – | |
| – | MMBFJ175L | 125 | 11 | 5.5 | 30 | 3.0 | 6.0 | 7.0 | 60 | – | – | |
| – | MMBFJ177L | 300 | – | – | 30 | 0.8 | 2.5 | 1.5 | 20 | – | – | |

Devices listed in **bold italic** are ON Semiconductor preferred devices.

Junctional Field-Effect Transistors

JFETs

LOW-FREQUENCY/LOW-NOISE

| N-Channel | P-Channel | $R_e Y_{fs} $ @ 1 kHz mmho | $R_e Y_{os} $ @ 1 kHz μ mho | C_{iss} pF | C_{rss} pF | V_{GS} V_{GD0} Volts | $V_{GS(off)}$ Volts | | I_{DSS} mA | | Package |
|---------------|------------------|------------------------------------|---|-----------------|-----------------|--------------------------------|------------------------|-----|-----------------|-----|---|
| | | Min | Max | Max | Max | Min | Min | Max | Min | Max | |
| 2N5457 | – | 1.0 | 50 | 7.0 | 3.0 | 25 | 0.5 | 6.0 | 1.0 | 5.0 |  TO-226AA, TO-92 Case 29-11 |
| 2N5458 | – | 1.5 | 50 | 7.0 | 3.0 | 25 | 1.0 | 7.0 | 2.0 | 9.0 | |
| – | 2N5460 | 1.0 | 75 | 7.0 | 2.0 | 40 | 0.75 | 6.0 | 1.0 | 5.0 | |
| – | 2N5461 | 1.5 | 75 | 7.0 | 2.0 | 40 | 1.0 | 7.5 | 2.0 | 9.0 | |
| – | 2N5462 | 2.0 | 75 | 7.0 | 2.0 | 40 | 1.8 | 9.0 | 4.0 | 16 | |
| BF256A | – | 4.5 | – | – | – | 30 | 0.5 | 7.5 | 3.0 | 7.0 | |
| – | MMBF5460L | 1.0 | 75 | 7.0 | 2.0 | 40 | 0.8 | 6.0 | 1.0 | 5.0 |  TO-236AB, SOT-23 Case 318-08 |
| BFR30L | – | 1.0 | 40 | 5.0 | 1.5 | 25 | – | 5.0 | 4.0 | 10 | |
| BFR31L | – | 1.5 | 20 | 5.0 | 1.5 | 25 | – | 2.5 | 1.0 | 5.0 | |

Devices listed in **bold italic** are ON Semiconductor preferred devices.

ON Semiconductor Selector Guide – FETs

MOSFET – Surface Mount

| V _{DSS} (V) | R _{DS(on)} Max (Ω) @ V _{GS} = | | | | Q _T Typ (nC) @ V _{GS} = 4.5 V (5.0 V)/10 V | Max Rating | | Device | Config. |
|-------------------------|---|-----------------|-----------------|------------------|---|--------------------|--------------------|--------|---------|
| | 10 V | 4.5 V/ 5.0 V | 2.5 V/ 2.7 V | 1.8 V/ 1.65 V | | I _D (A) | P _D (W) | | |

SOT-723 – Case 631AA

| N-Channel | | | | | | | | | |
|-----------|--|-----|-----|------|--|-------|-----|----------|---|
| 20 | | 3.4 | 4.5 | 10.0 | | 0.255 | 0.4 | NTK3043N | S |
| | | 0.4 | 0.5 | 0.7 | | 0.890 | 0.5 | NTK3134N | S |
| P-Channel | | | | | | | | | |
| 20 | | 0.5 | 0.7 | 1.0 | | 0.780 | 0.5 | NTK3139P | S |
| | | 0.3 | 0.5 | 10.0 | | 0.260 | 0.4 | NTK3142P | S |

SOT-563 – Case 463A

| Complementary | | | | | | | | | |
|---------------|--|----------|---------|---------|---------|----------------|-----|-----------|---|
| 20 | | 0.55/0.9 | 0.7/1.2 | 0.9/2.0 | 1.5/1.7 | 0.57/ 0.455 | 0.3 | NTZD3155C | C |
| N-Channel | | | | | | | | | |
| 20 | | 0.55 | 0.07 | 0.90 | 1.5 | 0.570 | 0.3 | NTZD3154N | D |
| P-Channel | | | | | | | | | |
| 20 | | 0.90 | 1.20 | 2.00 | 1.7 | 0.455 | 0.3 | NTZD3152P | D |
| | | 0.15 | 0.20 | 0.24 | 5.6 | 0.950 | 0.2 | NTZS3151P | S |

SC-75 – Case 463

| N-Channel | | | | | | | | | |
|-----------|--|-------|-------|-------|-----|-------|-----|----------|---|
| 20 | | 3.000 | 3.500 | | | 0.238 | 0.3 | NTA4001N | S |
| | | 0.230 | 0.275 | 0.070 | 1.8 | 0.915 | 0.3 | NTA4153N | S |
| 30 | | 7.000 | 7.500 | | | 0.154 | 0.3 | NTA7002N | S |
| P-Channel | | | | | | | | | |
| 20 | | 0.360 | 0.450 | 1.000 | 2.1 | 0.760 | 0.3 | NTA4151P | S |

SC-89 – Case 463C

| N-Channel | | | | | | | | | |
|-----------|--|-------|-------|-------|-----|-------|-----|----------|---|
| 20 | | 0.230 | 0.275 | 0.700 | 1.8 | 0.915 | 0.3 | NTE4153N | S |
| P-Channel | | | | | | | | | |
| 20 | | 0.360 | 0.450 | 1.000 | 2.1 | 0.760 | 0.3 | NTE4151P | S |

WDFN6 2*2*.75 (μCool™) – Case 506AN

| Complementary | | | | | | | | | |
|------------------|--|-------|-----------------|------------------|-------------|-------|-----|------------|---|
| 20 | | | 0.065/ 0.100 | .075/ 0.135 | 0.120/0.200 | 3.800 | 3.3 | NTLJD3119C | C |
| FETKY® N-Channel | | | | | | | | | |
| 20 | | 0.065 | 0.075 | 0.120 | 3.7 | 3.800 | 1.5 | NTLJF3118N | F |
| | | 0.070 | 0.090 | 0.125/ 0.250 | 5.4 | 4.600 | 1.5 | NTLJF4156N | F |
| FETKY® P-Channel | | | | | | | | | |
| 20 | | 0.100 | 0.135 | 0.200 | 5.5 | 3.300 | 1.5 | NTLJF3117P | F |
| N-Channel | | | | | | | | | |
| 30 | | 0.070 | 0.090 | 0.125/ 0.0250 | 5.4 | 4.600 | 1.5 | NTLJD4116N | D |
| | | 0.035 | 0.045 | 0.055 | 8.5 | 7.800 | 1.9 | NTLJS4114N | S |
| | | 0.035 | 0.045 | 0.055 | 12.1 | 7.800 | 1.9 | NTLJS4159N | S |

MOSFET – Surface Mount (continued)

| V _{DSS} (V) | R _{DS(on)} Max (Ω) @ V _{GS} = | | | | Q _T Typ (nC) @ V _{GS} = 4.5 V (5.0 V)/10 V | Max Rating | | Device | Config. |
|--|---|-----------------|-----------------|------------------|---|--------------------|--------------------|------------|---------|
| | 10 V | 4.5 V/ 5.0 V | 2.5 V/ 2.7 V | 1.8 V/ 1.65 V | | I _D (A) | P _D (W) | | |
| WDFN6 2*2*.75 (μCool™) – Case 506AN | | | | | | | | | |
| P-Channel | | | | | | | | | |
| 20 | | 0.100 | 0.135 | 0.200 | 5.5 | 4.100 | 1.5 | NTLJD3115P | D |
| | | 0.040 | 0.050 | 0.075/0.2 | 13.0 | 7.700 | 1.9 | NTLJS3113P | S |
| P-Channel Load Switch | | | | | | | | | |
| 20 | | | 0.050 | 0.060 | 0.1 | 4.300 | 1.6 | NTLJD2105L | L |
| SC-88 (SOT-363) – Case 419B | | | | | | | | | |
| Complementary | | | | | | | | | |
| 20 V/8 V | | 0.375/ 0.3 | 0.455/ 0.46 | 0.900 | 1.3/2.2 | 0.63/ 0.755 | 0.3 | NTJD4105C | C |
| 30 V/20 V | | 1.5/ 0.260 | 2.5/0.500 | | | 0.25/ 0.88 | 0.3 | NTJD4158C | C |
| N-Channel | | | | | | | | | |
| 20 | | 0.375 | 0.445 | | 1.3 | 0.630 | 0.3 | NTJD4401N | D |
| | | 0.060 | 0.070 | 0.085 | 6.9 | 3.200 | 1.0 | NTJS3157N | S |
| 25 | | 0.350 | 0.040 | | 0.8 | 1.200 | 0.6 | NTJS4405N | S |
| 30 | | 1.500 | 2.500 | | 0.9 | 0.250 | 0.3 | NTJD4001N | D |
| | 0.060 | 0.085 | | | 2.8 | 2.600 | 1.0 | NTJS4160N | S |
| P-Channel | | | | | | | | | |
| 8 | | 0.300 | 0.460 | 0.900 | 2.2 | 0.775 | 0.3 | NTJD2152P | D |
| 12 | | 0.060 | 0.090 | 0.160 | 8.6 | 3.300 | 0.6 | NTJS3151P | S |
| 20 | | 0.260 | 0.500 | 1.000 | 2.2 | 0.880 | 0.4 | NTJD4152P | D |
| | | 0.060 | 0.085 | 0.205 | 10.0 | 4.200 | 1.0 | NTJS4151P | S |
| P-Channel Load Switch | | | | | | | | | |
| 8 | | 0.175 | 0.220 | 0.320 | | 1.300 | 0.4 | NTJD1155L | L |

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MOSFET – Surface Mount (continued)

| V _{DSS} (V) | R _{DS(on)} Max (Ω) @ V _{GS} = | | | | Q _T Typ (nC) @ V _{GS} = 4.5 V (5.0 V)/10 V | Max Rating | | Device | Config. |
|-------------------------|---|-----------------|-----------------|-------|---|--------------------|--------------------|--------|---------|
| | 10 V | 4.5 V/ 5.0 V | 2.5 V/ 2.7 V | 1.8 V | | I _D (A) | P _D (W) | | |

SC-70 – Case 419

| N-Channel | | | | | | | | | |
|-----------|------|------|------|------|-----|-------|-----|-----------|---|
| 20 | 1.00 | 1.40 | | | 1.4 | 0.300 | 0.2 | MMBF2201N | S |
| 25 | | 0.35 | 0.40 | | 1.2 | 0.700 | 0.3 | NTS4409N | S |
| 30 | | 1.50 | 2.00 | | 0.9 | 0.270 | 0.3 | NTS4001N | S |
| P-Channel | | | | | | | | | |
| 8 | | 0.10 | 0.14 | 0.21 | 6.4 | 1.400 | 0.3 | NTS2101P | S |
| 20 | | 0.12 | 0.16 | | 6.4 | 1.370 | 0.3 | MMBF2202P | S |
| | 2.20 | 3.50 | | | 2.7 | 0.300 | 0.2 | NTS4101P | S |

TSOP-6 – Case 318G

| N-Channel | | | | | | | | | |
|-----------------------|-------|-------|-------|-------|------|-------|-----|-----------|---|
| 20 | | 0.045 | 0.055 | | 8.0 | 5.100 | 1.0 | NTGS3446 | S |
| 30 | 0.025 | 0.035 | | | 12.0 | 7.000 | 1.0 | NTGS4141N | S |
| P-Channel | | | | | | | | | |
| 12 | | 0.075 | 0.095 | | 7.0 | 3.300 | 1.0 | NTGS3433 | S |
| 20 | | 0.145 | 0.200 | | 3.7 | 2.300 | 1.1 | NTGD3133P | D |
| | | 0.170 | 0.280 | | | 2.000 | 1.0 | NTGD4161P | D |
| | | 0.090 | 0.135 | | 6.2 | 3.300 | 1.0 | NTGS3441 | S |
| | | 0.110 | 0.165 | | 3.3 | 3.160 | 1.0 | NTGS3441P | S |
| 30 | | 0.065 | 1.000 | | 7.5 | 4.400 | 1.0 | NTGS3443 | S |
| | 0.100 | 0.170 | | | 9.0 | 3.500 | 1.0 | NTGS3455 | S |
| | 0.060 | 0.110 | | | 15.3 | 4.700 | 1.3 | NTGS4111P | S |
| P-Channel Load Switch | | | | | | | | | |
| 8 | | 0.055 | 0.070 | 0.140 | | 3.300 | 0.8 | NTGD1100L | L |

TSSOP-8 – Case 948S

| N-Channel | | | | | | | | | |
|-----------|--|-------|-------|--|------|-------|-----|-----------|---|
| 20 | | 0.030 | 0.038 | | 1.3 | 6.900 | 2.0 | NTQD6866 | D |
| | | 0.022 | 0.030 | | 12.5 | 7.000 | 1.8 | NTQD6968N | D |

SOT-23 – Case 318

| N-Channel | | | | | | | | | |
|-----------|-------|-------|--------|-------|------|-------|-----|------------|---|
| 20 | 0.090 | 0.130 | | | 6.0 | 0.750 | 0.4 | MGSF1N02L | S |
| | | | 0.085 | 0.115 | 3.5 | 2.800 | 1.3 | MGSF2N02EL | S |
| | 1.100 | 1.400 | | | 1.4 | 0.300 | 0.2 | MMBF0201NL | S |
| | | 0.080 | 0.105 | | 2.4 | 3.200 | 1.3 | NTR4501N | S |
| 30 | 0.100 | 0.145 | | | 6.0 | 2.100 | 0.7 | MGSF1N03L | S |
| | | 1.500 | 2.000 | | 1.2 | 0.560 | 0.8 | NTR4003N | S |
| | 0.110 | 0.140 | | | 3.6 | 2.500 | 0.7 | NTR4503N | S |
| 50 | | 3.500 | 10.000 | | | 0.200 | 0.2 | BSS138L | S |
| 60 | 7.500 | | | | | 0.115 | 0.2 | 2N7002L | S |
| | 5.000 | | | | | 0.500 | 0.2 | MMBF170L | S |
| 100 | 6.000 | | | | | 0.170 | 0.2 | BSS123L | S |
| P-Channel | | | | | | | | | |
| 8 | | 0.052 | 0.072 | 0.120 | 12.0 | 3.700 | 1.0 | NTR2101P | S |

MOSFET – Surface Mount (continued)

| V _{DSS} (V) | R _{DS(on)} Max (Ω) @ V _{GS} = | | | | Q _T Typ (nC) @ V _{GS} = 4.5 V (5.0 V)/10 V | Max Rating | | Device | Config. |
|-------------------------|---|-----------------|-----------------|-------|---|--------------------|--------------------|--------|---------|
| | 10 V | 4.5 V/ 5.0 V | 2.5 V/ 2.7 V | 1.8 V | | I _D (A) | P _D (W) | | |

SOT-23 – Case 318

| P-Channel | | | | | | | | | |
|-----------|-------|--------|-------|-------|-----|-------|-----|-----------|---|
| 20 | 0.800 | 1.100 | | | 2.2 | 0.400 | 0.2 | NTR0202PL | S |
| | 0.180 | 0.280 | | | 2.5 | 1.000 | 0.4 | NTR1P02 | S |
| | | 0.200 | 0.350 | | | 1.300 | 0.4 | NTR1P02L | S |
| | | 0.850 | 0.120 | 0.210 | 7.5 | 3.200 | 1.3 | NTR4101P | S |
| 30 | 0.200 | 0.350 | | | 6.0 | 1.950 | 1.3 | NTR4502P | S |
| 50 | | 10.000 | | | 6.0 | 0.130 | 0.2 | BSS84L | S |

ChipFET™ – Case 1206A

| Complementary | | | | | | | | | |
|------------------|-------|-----------------|-----------------|----------------|---------|---------|-----|-----------|---|
| 20 | | 0.08/ 0.115 | 0.115/ 0.240 | | 2.6/3.0 | 3.1/2.1 | 1.1 | NTHC5513 | C |
| | | 0.080 | 0.115/ 0.110 | | 2.3/7.4 | 3.9/4.4 | 1.1 | NTHD3100C | C |
| | | 0.045/ 0.080 | 0.050/ 0.110 | 0.070/ 0.15 | 7.9/8.9 | 5.5/4.2 | 1.1 | NTHD3102C | C |
| FETKY® N-Channel | | | | | | | | | |
| 20 | | 0.080 | 0.115 | | 2.6 | 2.700 | 1.1 | NTHD4N02F | F |
| FETKY® P-Channel | | | | | | | | | |
| 20 | | 0.080 | 0.110 | 0.170 | 7.4 | 4.400 | 1.1 | NTHD3101F | F |
| | | 0.155 | 0.240 | | 3.0 | 4.400 | 1.1 | NTHD4P02F | F |
| N-Channel | | | | | | | | | |
| 20 | | 0.075 | 0.115 | | 2.6 | 4.100 | 1.1 | NTHD4508N | D |
| | | 0.065 | 0.105 | | 4.0 | 4.500 | 1.1 | NTHD5904N | D |
| | | 0.030 | 0.045 | | 12.0 | 7.200 | 1.3 | NTHS5404 | S |
| 30 | 0.085 | 0.140 | | | 3.6 | 3.900 | 1.1 | NTHD4502N | D |
| | 0.038 | 0.050 | | | 9.1 | 6.700 | 1.3 | NTHS4501N | S |
| P-Channel | | | | | | | | | |
| 8 | | 0.058 | 0.085 | 0.160 | 8.0 | 4.600 | 1.1 | NTHD2102P | D |
| | | 0.025 | 0.036 | 0.048 | 15.0 | 7.500 | 1.3 | NTHS2101P | S |
| 20 | | 0.080 | 0.110 | 0.170 | 7.6 | 4.100 | 1.1 | NTHD4102P | D |
| | | 0.155 | 0.240 | | 3.0 | 2.100 | 1.1 | NTHD4401P | D |
| | | 0.155 | 0.260 | | 3.7 | 3.000 | 1.1 | NTHD5903 | D |
| | | 0.034 | 0.040 | 0.052 | 25.0 | 6.700 | 1.3 | NTHS4101P | S |
| | | | 0.083 | | 9.7 | 5.300 | 1.3 | NTHS5441 | S |
| | | 0.065 | 0.110 | | 7.5 | 4.900 | 1.3 | NTHS5443 | S |

Micro8™ – Case 846A

| FETKY® P-Channel | | | | | | | | | |
|------------------|-------|-------|-------|--|------|-------|-----|------------|---|
| 20 | | 0.090 | 0.150 | | 10.0 | 3.300 | 1.4 | NTTD4401FR | F |
| P-Channel | | | | | | | | | |
| 20 | | 0.090 | 0.130 | | 10.0 | 3.200 | 1.4 | NTTS2P02 | S |
| 30 | 0.085 | 0.135 | | | 15.0 | 3.750 | 1.8 | NTTS2P03 | S |

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MOSFET – Surface Mount (continued)

| V _{DSS} (V) | R _{DS(on)} Max (Ω) @ V _{GS} = | | | | Q _T Typ (nC) @ V _{GS} = 4.5 V (5.0 V)/10 V | Max Rating | | Device | Config. |
|---|---|-----------------|-----------------|-------|---|--------------------|--------------------|-------------|---------|
| | 10 V | 4.5 V/ 5.0 V | 2.5 V/ 2.7 V | 1.8 V | | I _D (A) | P _D (W) | | |
| DFN 6 3*3*.85 (μCool™) – Case 506 | | | | | | | | | |
| N-Channel | | | | | | | | | |
| 20 | | 0.090 | 0.120 | | 2.1 | 4.600 | 1.7 | NTLGF3501N | F |
| P-Channel | | | | | | | | | |
| 20 | | 0.140 | 0.225 | | 3.8 | 3.900 | 1.6 | NTLGF3402P | F |
| DFN 8 3.3*3.3 (EZFET™) – Case 846C | | | | | | | | | |
| N-Channel | | | | | | | | | |
| 20 | | 0.026 | 0.031 | | 12.0 | 9.000 | 3.2 | NTLTD7900ZN | D |
| SOT-223 – Case 318E | | | | | | | | | |
| N-Channel | | | | | | | | | |
| 60 | 1.700 | | | | 3.2 | 0.300 | 0.8 | MMFT960 | S |
| | 0.110 | | | | 10.6 | 3.000 | 2.1 | NTF3055-100 | S |
| 60 | | 0.120 | | | 7.6 | 3.000 | 2.1 | NTF3055L108 | S |
| 60 | | 0.175 | | | 5.1 | 2.000 | 2.1 | NTF3055L175 | S |
| P-Channel | | | | | | | | | |
| 20 | | 0.050 | 0.070 | | 15.0 | 10.000 | 8.3 | NTF6P02 | S |
| 30 | 0.100 | 0.150 | | | 15.0 | 5.200 | 3.1 | NTF5P03 | S |
| 60 | 0.170 | | | | 14.3 | 2.600 | 2.3 | NTF2955 | S |
| SO-8 (MiniMOS™) – Case 751 | | | | | | | | | |
| Complementary | | | | | | | | | |
| 20 | | .043/ 0.100 | 0.048/ 0.130 | | 12.0/10.0 | 5.2/3.4 | 2.0 | NTMD2C02 | C |
| 30 | 0.070/ 0.200 | 0.075/ 0.300 | | | 11.5/14.2 | 4.100 | 2.0 | MMDF2C03HD | C |
| FETKY® N-Channel | | | | | | | | | |
| 30 | 0.032 | 0.040 | | | 19.0 | 6.000 | 2.0 | NTMD6N03 | F |
| | 0.032 | 0.040 | | | 19.0 | 6.000 | 2.0 | NTMSD6N303 | F |
| FETKY® P-Channel | | | | | | | | | |
| 20 | | 0.090 | 0.130 | | | 3.850 | 2.0 | NTMSD2P102 | F |
| | | 0.090 | 0.015 | | 16.0 | 3.850 | 2.0 | NTMSD2P102L | F |
| | 0.085 | 0.125 | | | 16.0 | 3.860 | 2.0 | NTMSD3P102 | F |
| 30 | 0.085 | 0.125 | | | 16.0 | 3.860 | 2.0 | NTMSD3P303 | F |
| N-Channel | | | | | | | | | |
| 20 | 0.090 | 0.100 | | | 12.5 | 3.800 | 2.0 | MMDF3N02HD | D |
| | | 0.035 | 0.048 | | 12.0 | 6.500 | 2.0 | NTMD6N02 | D |
| | | 0.040 | 0.050 | | 11.0 | 5.900 | 2.5 | NTMS4N01 | S |
| | 0.023 | 0.028 | | | 26.0 | 6.500 | 2.5 | NTMS7N03 | S |
| 25 | 0.100 | 0.200 | | | 10.6 | 3.600 | 2.0 | MMDF2N02E | D |
| 28 | 0.0080 | 0.0098 | | | 23.0 | 14.000 | 2.5 | NTMS4503N | S |
| 30 | 0.0600 | 0.0800 | | | 8.0 | 4.000 | 2.0 | NTMD4N03 | D |
| | 0.0045 | 0.0055 | | | 45.0 | 18.000 | 2.5 | NTMS4107N | S |
| | 0.0100 | 0.0140 | | | 11.0 | 12.000 | 2.3 | NTMS4705N | S |
| | 0.0120 | 0.0150 | | | 10.0 | 10.300 | 2.2 | NTMS4706N | S |
| 40 | 0.080 | 0.100 | | | 13.9 | 3.400 | 2.0 | MMDF3N04HD | D |

MOSFET – Surface Mount (continued)

| V _{DSS} (V) | R _{DS(on)} Max (Ω) @ V _{GS} = | | | | Q _T Typ (nC) @ V _{GS} = 4.5 V (5.0 V)/10 V | Max Rating | | Device | Config. |
|-------------------------|---|-----------------|-----------------|-------|---|--------------------|--------------------|--------|---------|
| | 10 V | 4.5 V/ 5.0 V | 2.5 V/ 2.7 V | 1.8 V | | I _D (A) | P _D (W) | | |

SO-8 (MiniMOS™) – Case 751

| N-Channel | | | | | | | | | |
|-----------|-------|-------|---------|--|------|--------|-----|-------------|---|
| 50 | 0.300 | 0.500 | 300.000 | | 12.5 | 2.000 | 2.0 | M MDF1N05E | D |
| P-Channel | | | | | | | | | |
| 16 | | 0.100 | 0.150 | | 10.0 | 3.850 | 2.0 | NTMD2P01 | D |
| 20 | 0.160 | 0.180 | | | 15.0 | 3.300 | 2.0 | M MDF2P02HD | D |
| | 0.075 | 0.095 | | | 33.0 | 5.600 | 2.5 | M MSF3P02HD | S |
| | | 0.033 | 0.050 | | 20.0 | 7.800 | 2.0 | NTMD6P02 | D |
| | | 0.014 | 0.020 | | 48.0 | 10.000 | 2.5 | NTMS10P02 | S |
| 25 | | 0.033 | 0.048 | | 20.0 | 7.000 | 2.5 | NTMS5P02 | S |
| | 0.250 | 0.400 | | | 10.0 | 2.500 | 2.0 | M MDF2P02E | D |
| 30 | 0.035 | 0.050 | 35.000 | | 37.9 | 7.000 | 2.5 | M MSF7P03HD | S |
| | 0.085 | 0.125 | | | 16.0 | 3.860 | 2.0 | NTMD3P03 | D |
| | 0.085 | 0.115 | | | 16.0 | 3.860 | 2.3 | NTMS3P03 | S |

SO-8FL – Case 488

| N-Channel | | | | | | | | | |
|-----------|--------|--------|--|------|--------|---------|------------|------------|---|
| 30 | 0.0022 | 0.0034 | | | 47.0 | 35.000 | 6.3 | NTMFS4108N | S |
| | 0.0035 | 0.0048 | | | 37.0 | 30.000 | 6.1 | NTMFS4119N | S |
| | 0.0045 | 0.0055 | | | 33.0 | 31.000 | 6.9 | NTMFS4120N | S |
| | 0.0053 | 0.0070 | | | 24.0 | 29.000 | 6.6 | NTMFS4121N | S |
| | 0.0060 | 0.0085 | | | 23.0 | 23.000 | 5.8 | NTMFS4122N | S |
| | 0.0080 | 0.0110 | | | 11.0 | 12.300 | 2.3 | NTMFS4701N | S |
| | 0.0130 | 0.0170 | | | 7.5 | 10.200 | 2.3 | NTMFS4707N | S |
| | 0.0100 | 0.0140 | | | 10.0 | 11.500 | 2.2 | NTMFS4708N | S |
| | 0.0100 | 0.0140 | | | 10.0 | 11.000 | 2.2 | NTMFS4744N | S |
| | 0.0020 | 0.0030 | | | 39.0 | 191.000 | 125.0 | NTMFS4833N | S |
| | 0.0030 | 0.0040 | | | 32.0 | 130.000 | 86.2 | NTMFS4834N | S |
| | 0.0035 | 0.0050 | | | 22.0 | 104.000 | 62.5 | NTMFS4835N | S |
| | 0.0030 | 0.0060 | | | 20.0 | 90.000 | 55.6 | NTMFS4836N | S |
| | 0.0050 | 0.0075 | | | 14.2 | 74.000 | 47.2 | NTMFS4837N | S |
| | 0.0055 | 0.0095 | | | 13.0 | 66.000 | 41.7 | NTMFS4839N | S |
| 0.0070 | 0.0114 | | | 11.5 | 57.000 | 41.7 | NTMFS4841N | S | |

DPAK (TO-252) – Case 369X *

| N-Channel | | | | | | | | | |
|-----------|--------|--------|--|--|------|------|-------|-----------|---|
| 24 | 0.0046 | 0.0062 | | | 23.6 | 32.0 | 110.0 | NTD110N02 | S |
| | 0.0145 | | | | 14.4 | 30.0 | 75.0 | NTD30N02 | S |
| | 0.0058 | 0.0090 | | | 30.0 | 80.0 | 75.0 | NTD80N02 | S |
| | 0.0052 | | | | 17.7 | 32.0 | 78.1 | NTD85N02R | S |
| | 0.0050 | 0.0080 | | | 21.0 | 32.0 | 86.0 | NTD95N02R | S |

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MOSFET – Surface Mount (continued)

| V _{DSS} (V) | R _{DS(on)} Max (Ω) @ V _{GS} = | | | | Q _T Typ (nC) @ V _{GS} = 4.5 V (5.0 V)/10 V | Max Rating | | Device | Config. |
|------------------------------------|---|-----------------|-----------------|-------|---|--------------------|--------------------|-------------|---------|
| | 10 V | 4.5 V/ 5.0 V | 2.5 V/ 2.7 V | 1.8 V | | I _D (A) | P _D (W) | | |
| DPAK (TO-252) – Case 369X * | | | | | | | | | |
| N-Channel | | | | | | | | | |
| 25 | 0.0950 | 0.1300 | | | 1.8 | 14.0 | 20.8 | NTD14N03R | S |
| | 0.0450 | 0.0600 | | | 3.8 | 17.1 | 22.3 | NTD23N03R | S |
| | 0.0165 | 0.0230 | | | 5.8 | 32.0 | 50.0 | NTD40N03R | S |
| | 0.0140 | 0.0230 | | | 6.0 | 45.0 | 50.0 | NTD50N03R | S |
| | 0.0105 | 0.0125 | | | 9.5 | 32.0 | 58.0 | NTD60N02R | S |
| | 0.0084 | 0.0146 | | | 12.2 | 65.0 | 50.0 | NTD65N03R | S |
| | 0.0080 | 0.0130 | | | 13.2 | 32.0 | 62.5 | NTD70N03R | S |
| | 0.0060 | 0.0078 | | | 25.5 | 78.0 | 64.0 | NTD78N03 | S |
| 30 | | 0.0270 | | | 13.8 | 20.0 | 74.0 | NTD20N03L27 | S |
| | 0.0100 | 0.0130 | | | 55.0 | 68.0 | 75.0 | NTD4302 | S |
| | 0.0040 | 0.0055 | | | 30.0 | 117.0 | 93.8 | NTD4804N | S |
| | 0.0050 | 0.0074 | | | 20.5 | 88.0 | 66.0 | NTD4805N | S |
| | 0.0060 | 0.0094 | | | 15.0 | 76.0 | 60.0 | NTD4806N | S |
| | 0.0080 | 0.0124 | | | 11.3 | 63.0 | 54.6 | NTD4808N | S |
| | 0.0090 | 0.0140 | | | 10.7 | 58.0 | 52.0 | NTD4809N | S |
| | 0.0090 | 0.0125 | | | 12.5 | 58.0 | 52.0 | NTD4809NH | S |
| | 0.0100 | 0.0157 | | | 9.0 | 54.0 | 50.0 | NTD4810N | S |
| | 0.0100 | 0.0167 | | | 8.9 | 54.0 | 50.0 | NTD4810NH | S |
| | 0.0130 | 0.0240 | | | 6.9 | 40.0 | 35.3 | NTD4813N | S |
| | 0.0130 | 0.0259 | | | 7.1 | 40.0 | 35.3 | NTD4813NH | S |
| | 0.0150 | 0.0250 | | | 6.0 | 35.0 | 32.6 | NTD4815N | S |
| 0.0150 | 0.0277 | | | 6.4 | 35.0 | 32.6 | NTD4815NH | S | |
| 40 | 10.000 | 17.000 | | | 45.0 | 70.0 | 100.0 | NTD5406N | S |
| | 26.000 | 40.000 | | | 20.0 | 38.0 | 75.0 | NTD5407N | S |
| 60 | 0.060 | | | | 15.3 | 18.0 | 55.0 | NTD18N06 | S |
| | | 0.065 | | | 11.0 | 18.0 | 55.0 | NTD18N06L | S |
| | 0.046 | | | | 21.2 | 20.0 | 60.0 | NTD20N06 | S |
| | | 0.048 | | | 16.6 | 20.0 | 60.0 | NTD20N06L | S |
| | 0.042 | | | | 24.0 | 24.0 | 62.5 | NTD24N06 | S |
| | | 0.045 | | | 16.0 | 24.0 | 62.5 | NTD24N06L | S |
| | 0.094 | | | | 10.9 | 12.0 | 48.0 | NTD3055-094 | S |
| | 0.150 | | | | 7.1 | 9.0 | 28.8 | NTD3055-150 | S |
| | | 0.104 | | | 7.4 | 12.0 | 48.0 | NTD3055L104 | S |
| | | 0.170 | | | 4.7 | 9.0 | 28.5 | NTD3055L170 | S |
| 100 | 0.062 | | | | 33.0 | 32.0 | 93.8 | NTD32N06 | S |
| | | 0.028 | | | 23.0 | 32.0 | 93.8 | NTD32N06L | S |
| 150 | 0.165 | | | | 14.0 | 12.0 | 53.6 | NTD12N10 | S |
| | 0.146 | | | | 11.3 | 12.0 | 56.6 | NTD6600N | S |
| 200 | 0.300 | | | | 15.0 | 6.0 | 20.0 | MTD6N15 | S |
| 200 | 0.700 | | | | 13.7 | 6.0 | 50.0 | MTD6N20E | S |
| P-Channel | | | | | | | | | |
| 30 | | 0.072 | | | 15.0 | 25.0 | 75.0 | NTD25P03L | S |
| | | 0.072 | | | 15.0 | 25.0 | 75.0 | NTD25P03L | S |

MOSFET – Surface Mount (continued)

| V _{DSS} (V) | R _{DS(on)} Max (Ω) @ V _{GS} = | | | | Q _T Typ (nC) @ V _{GS} = 4.5 V (5.0 V)/10 V | Max Rating | | Device | Config. |
|--|---|-----------------|-----------------|-------|---|--------------------|--------------------|-------------|---------|
| | 10 V | 4.5 V/ 5.0 V | 2.5 V/ 2.7 V | 1.8 V | | I _D (A) | P _D (W) | | |
| DPAK (TO-252) – Case 369X * | | | | | | | | | |
| P-Channel | | | | | | | | | |
| 60 | 0.450 | | | | 12.0 | 5.0 | 40.0 | MTD5P06V | S |
| | | 0.150 | | | 15.0 | 15.5 | 65.0 | NTD20P06L | S |
| | 0.180 | | | | 15.0 | 12.0 | 55.0 | NTD2955 | S |
| D²PAK (TO-264) – Case 418B | | | | | | | | | |
| N-Channel | | | | | | | | | |
| 24 | 0.0046 | 0.0062 | | | 23.6 | 125.0 | 113.6 | NTB125N02R | S |
| | 0.0105 | 0.0125 | | | 9.5 | 65.0 | 62.5 | NTB65N02R | S |
| | 0.0058 | 0.0090 | | | 29.0 | 90.0 | 85.0 | NTB90N02 | S |
| 25 | 0.0450 | 0.0600 | | | 3.8 | 23.0 | 37.5 | NTB23N03R | S |
| | 0.0080 | 0.0130 | | | 13.2 | 75.0 | 74.4 | NTB75N03R | S |
| 28 | 0.0068 | | | | 29.0 | 85.0 | 80.0 | NTB85N03 | S |
| | 0.0093 | 0.0125 | | | 28.0 | 74.0 | 80.0 | NTB4302 | S |
| | 0.0065 | | | | 57.0 | 75.0 | 125.0 | NTB75N03-6 | S |
| | | 0.0080 | | | 57.0 | 75.0 | 125.0 | NTB75N03L09 | S |
| 40 | 4.5000 | 7.0000 | | | 125.0 | 136.0 | 167.0 | NTB5404N | S |
| | 5.8000 | 8.0000 | | | 88.0 | 116.0 | 150.0 | NTB5405N | S |
| 60 | 0.0900 | | | | 12.0 | 15.0 | 48.4 | NTB18N06 | S |
| | | 0.1000 | | | 7.3 | 15.0 | 48.4 | NTB18N06L | S |
| | 0.0420 | | | | 23.4 | 27.0 | 88.2 | NTB30N06 | S |
| | | 0.0460 | | | 16.0 | 30.0 | 88.2 | NTB30N06L | S |
| | 0.0260 | | | | 33.0 | 45.0 | 125.0 | NTB45N06 | S |
| | | 0.0280 | | | 23.0 | 45.0 | 125.0 | NTB45N06L | S |
| | 0.0140 | | | | 62.0 | 60.0 | 150.0 | NTB60N06 | S |
| | | 0.0160 | | | 43.2 | 60.0 | 150.0 | NTB60N06L | S |
| | 0.0095 | | | | 92.0 | 75.0 | 214.0 | NTB75N06 | S |
| | 0.0110 | | | 66.0 | 75.0 | 214.0 | NTB75N06L | S | |
| 100 | 0.1650 | | | | 14.0 | 13.0 | 64.7 | NTB13N10 | S |
| | 0.0300 | | | | 72.0 | 52.0 | 178.0 | NTB52N10 | S |
| 150 | 0.0500 | | | | 70.0 | 37.0 | 178.0 | NTB35N15 | S |
| 200 | 0.0810 | | | | 75.0 | 30.0 | 214.0 | NTB30N20 | S |
| P-Channel | | | | | | | | | |
| 30 | | | 25.000 | | | 50.0 | 125.0 | MTB50P03HDL | S |
| 60 | | | 80.000 | | | 30.0 | 125.0 | MTB30P06V | S |
| 60 | 0.075 | | | | 33.0 | 27.5 | 120.0 | NTB25P06 | S |
| 60 | | 0.140 | | | 13.0 | 18.5 | 88.0 | NTB5605P | S |
| 500 | | | 6000.000 | | | 2.0 | 2.5 | MTB2P50E | S |

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MOSFET – Through Hole

| V _{DSS} (V) | R _{DS(on)} Max (Ω) @ V _{GS} = | | | | Q _T Typ (nC) @ V _{GS} = 4.5 V (5.0 V)/10 V | Max Rating | | Device | Config. |
|-------------------------|---|-----------------|-----------------|------------------|---|--------------------|--------------------|--------|---------|
| | 10 V | 4.5 V/ 5.0 V | 2.5 V/ 2.7 V | 1.8 V/ 1.65 V | | I _D (A) | P _D (W) | | |

TO-92 – Case 29

| N-Channel | | | | | | | | | |
|-----------|--------|-------|--------|--|--|-------|------|-----------------|---|
| 60 | 5.000 | 6.000 | | | | 0.200 | 0.35 | 2N7000 | S |
| | 5.000 | | | | | 0.500 | 0.35 | BS170 | S |
| | 7.500 | | | | | 0.150 | 0.40 | VN2222LL | S |
| 200 | 14.000 | | 28.000 | | | 0.250 | 0.35 | BS107 | S |
| | 6.000 | | | | | 0.250 | 0.35 | BS107A | S |
| | | | 10.000 | | | 0.250 | 0.35 | BS108 | S |
| 240 | 10.000 | | | | | 0.200 | 0.35 | VN2410L | S |

TO-220AB – Case 221A

| N-Channel | | | | | | | | | |
|-----------|--------|--------|--|--|------|-------|-------|--------------------|---|
| 24 | 0.0046 | 0.0062 | | | 23.6 | 125.0 | 113.6 | NTP125N02R | S |
| | 0.0105 | 0.0125 | | | 9.5 | 65.0 | 62.5 | NTP65N02R | S |
| | 0.0058 | 0.0090 | | | 29.0 | 90.0 | 85.0 | NTP90N02 | S |
| 25 | 0.0080 | 0.0130 | | | 13.0 | 75.0 | 74.4 | NTP75N03R | S |
| 28 | 0.0068 | | | | 29.0 | 85.0 | 80.0 | NTP85N03 | S |
| 30 | 0.0065 | | | | 57.0 | 75.0 | 125.0 | NTP75N03-6 | S |
| | | 0.0080 | | | 57.0 | 75.0 | 125.0 | NTP75N03L09 | S |
| 60 | 0.0900 | | | | 12.0 | 15.0 | 48.4 | NTP18N06 | S |
| | | 0.1000 | | | 7.3 | 15.0 | 48.4 | NTP18N06L | S |
| | 0.0460 | | | | 21.2 | 27.0 | 88.2 | NTP27N06 | S |
| | | 0.0460 | | | 16.0 | 30.0 | 88.2 | NTP30N06L | S |
| | 0.0260 | | | | 33.0 | 45.0 | 125.0 | NTP45N06 | S |
| | | 0.0280 | | | 23.0 | 45.0 | 125.0 | NTP45N06L | S |
| | 0.0140 | | | | 62.0 | 60.0 | 150.0 | NTP60N06 | S |
| | | 0.0160 | | | 43.2 | 60.0 | 150.0 | NTP60N06L | S |
| 100 | | 0.2200 | | | 9.3 | 10.0 | 40.0 | MTP10N10EL | S |
| | 0.0300 | | | | 72.0 | 52.0 | 214.0 | NTP52N10 | S |
| 150 | 0.0500 | | | | 70.0 | 37.0 | 178.0 | NTP35N15 | S |
| 200 | 0.8100 | | | | 75.0 | 30.0 | 214.0 | NTP30N20 | S |
| P-Channel | | | | | | | | | |
| 30 | | 0.025 | | | 74.0 | 50.0 | 125.0 | MTP50P03HDL | S |
| 60 | 0.120 | | | | 38.0 | 23.0 | 90.0 | MTP23P06V | S |
| | 0.153 | | | | 14.0 | 14.0 | 55.6 | NTP2955 | S |
| 100 | 0.300 | | | | 33.0 | 12.0 | 75.0 | MTP12P10 | S |
| 500 | 6.000 | | | | 19.0 | 2.0 | 75.0 | MTP2P50E | S |

TO-247 – Case 340K

| N-Channel | | | | | | | | | |
|-----------|-------|--|--|--|------|--------|-------|------------------|---|
| 200 | 0.075 | | | | 85.0 | 32.000 | 180.0 | MTW32N20E | S |

TO-264 – Case 340G

| N-Channel | | | | | | | | | |
|-----------|-------|--|--|--|-------|---------|-------|------------------|---|
| 100 | 0.010 | | | | 200.0 | 123.000 | 313.0 | NTY100N10 | S |

Product Replacements

Replacement parts are parts that are equivalent to older versions, but built in newer technologies.

PRODUCT REPLACEMENT TABLE

| Part Number | Recommended New Part Numbers | New Part Status |
|---------------|------------------------------|-----------------|
| 2N7000ZL1 | 2N7000G | ACTIVE |
| BS107ARLRM | BS107AG | ACTIVE |
| BS107ARLRP | BS107AG | ACTIVE |
| BS107RL1 | BS107AG | ACTIVE |
| BS107RLRA | BS107AG | ACTIVE |
| IRF510 | MTP10N10ELG | ACTIVE |
| IRF520 | MTP10N10ELG | ACTIVE |
| MGSF1N02ELT1 | NTR4501NT1G | ACTIVE |
| MGSF1N02ELT1G | NTR4501NT1G | ACTIVE |
| MGSF1N02ELT3 | NTR4501NT3G | ACTIVE |
| MGSF1P02ELT1 | NTR1P02LT1G | ACTIVE |
| MGSF1P02ELT3 | NTR1P02LT1G | ACTIVE |
| MGSF1P02LT1 | NTR1P02T1G | ACTIVE |
| MGSF1P02LT1G | NTR1P02T1G | ACTIVE |
| MGSF1P02LT3 | NTR1P02T3G | ACTIVE |
| MGSF1P02LT3 | NTR1P02T3G | ACTIVE |
| MGSF1P02LT3G | NTR1P02T3G | ACTIVE |
| MGSF2P02HDT1 | NTGS3441T1G | ACTIVE |
| MGSF3442VT1 | NTGS3446T1G | ACTIVE |
| MGSF3454VT1 | NTHS4501NT1G | ACTIVE |
| MMBF0202PLT1 | NTR0202PLT1G | ACTIVE |
| MMBF0202PLT1G | NTR0202PLT1G | ACTIVE |
| MMDF2P01HDR2 | NTMD3P03R2G | ACTIVE |
| MMDF2P03HDR2 | NTMD3P03R2G | ACTIVE |
| MMDF3N03HDR2 | NTMD4N03R2G | ACTIVE |
| MMDF4N01HDR2 | NTMD6N02R2G | ACTIVE |
| MMDF4P03HDR2 | NTMD3P03R2G | ACTIVE |
| MMDF6N02HDR2 | NTMD6N02R2G | ACTIVE |
| MMDF6N03HDR2 | NTMD6N03R2G | ACTIVE |
| MMDFS2P102R2 | NTMSD3P102R2G | ACTIVE |
| MMDFS3P303R2 | NTMSD3P303R2G | ACTIVE |
| MMDFS6N303R2 | NTMSD6N303R2G | ACTIVE |
| MMFT2955ET1 | NTF2955T1G | ACTIVE |
| MMFT2955ET1G | NTF2955T1G | ACTIVE |
| MMFT2955ET3 | NTF2955T1G | ACTIVE |
| MMFT3055ET1 | NTF3055-100T1G | ACTIVE |
| MMFT3055VLT1 | NTF3055L108T1G | ACTIVE |
| MMFT3055VLT1G | NTF3055L108T1G | ACTIVE |
| MMFT3055VLT3 | NTF3055L108T3G | ACTIVE |

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PRODUCT REPLACEMENT TABLE

| Part Number | Recommended New Part Numbers | New Part Status |
|-----------------|------------------------------|-----------------|
| MMFT3055VLT3G | NTF3055L108T3G | ACTIVE |
| MMFT3055VLT3-LF | NTF3055L108T3LFG | ACTIVE |
| MMFT3055VT1 | NTF3055-100T1G | ACTIVE |
| MMFT3055VT1G | NTF3055-100T1G | ACTIVE |
| MMFT3055VT3 | NTF3055-100T3G | ACTIVE |
| MMFT3055VT3 | NTF3055-100T3G | ACTIVE |
| MMFT3055VT3G | NTF3055-100T3G | ACTIVE |
| MMFT5P03HDT3 | NTF5P03T3G | ACTIVE |
| MMSF2P02ER2 | NTTS2P02R2G | ACTIVE |
| MMSF3P03HDR2 | NTMS3P03R2G | ACTIVE |
| MMSF4N01HDR2 | NTMS4N01R2G | ACTIVE |
| MMSF4P01HDR2 | NTMS5P02R2G | ACTIVE |
| MMSF5N02HDR2 | NTMS4N01R2G | ACTIVE |
| MMSF5P02HDR2 | NTMS5P02R2G | ACTIVE |
| MPF9200 | BS107G | ACTIVE |
| MTB1306 | NTB75N03L09G | ACTIVE |
| MTB1306T4 | NTB75N03L09T4G | ACTIVE |
| MTB20N20E | NTB30N20G | ACTIVE |
| MTB20N20ET4 | NTB30N20T4G | ACTIVE |
| MTB23P06V | NTB25P06G | ACTIVE |
| MTB23P06VT4 | NTB25P06T4G | ACTIVE |
| MTB29N15E | NTB35N15G | ACTIVE |
| MTB29N15E1 | NTP35N15G | ACTIVE |
| MTB29N15ET4 | NTB35N15T4G | ACTIVE |
| MTB29N15ET4 | NTB35N15T4G | ACTIVE |
| MTB30N06VL | NTB30N06LT4G | ACTIVE |
| MTB30N06VLT4 | NTB30N06LT4G | ACTIVE |
| MTB33N10E | NTB52N10G | ACTIVE |
| MTB33N10ET4 | NTB52N10T4G | ACTIVE |
| MTB36N06V | NTB45N06T4G | ACTIVE |
| MTB36N06VT4 | NTB45N06T4G | ACTIVE |
| MTB40N10E | NTB52N10T4G | ACTIVE |
| MTB40N10ET4 | NTB52N10T4G | ACTIVE |
| MTB50N06V | NTB45N06G | ACTIVE |
| MTB50N06VL | NTB45N06LG | ACTIVE |
| MTB50N06VLT4 | NTB45N06LT4G | ACTIVE |
| MTB50N06VT4 | NTB45N06T4G | ACTIVE |
| MTB52N06V | NTB60N06G | ACTIVE |
| MTB52N06VL | NTB60N06LG | ACTIVE |
| MTB52N06VLT4 | NTB60N06LT4G | ACTIVE |
| MTB52N06VT4 | NTB60N06T4G | ACTIVE |
| MTB55N06Z | NTB75N06G | ACTIVE |

PRODUCT REPLACEMENT TABLE

| Part Number | Recommended New Part Numbers | New Part Status |
|----------------|------------------------------|-----------------|
| MTB55N06ZT4 | NTB75N06T4G | ACTIVE |
| MTB60N05HDL | NTB75N06LG | ACTIVE |
| MTB60N05HDLT4 | NTB75N06LT4G | ACTIVE |
| MTB60N06HD | NTB60N06G | ACTIVE |
| MTB60N06HDT4 | NTB60N06T4G | ACTIVE |
| MTB75N03HDL | NTB75N03L09G | ACTIVE |
| MTB75N03HDLT4 | NTB75N03L09T4G | ACTIVE |
| MTB75N05HD | NTB75N06G | ACTIVE |
| MTB75N05HDG | NTB75N06T4G | ACTIVE |
| MTB75N05HDT4 | NTB75N06T4G | ACTIVE |
| MTB75N05HDT4G | NTB75N06T4G | ACTIVE |
| MTB75N06HD | NTB75N06G | ACTIVE |
| MTB75N06HDT4 | NTB75N06T4G | ACTIVE |
| MTD10N10EL | NTD6600NT4G | ACTIVE |
| MTD10N10ELT4 | NTD6600NT4G | ACTIVE |
| MTD10N10ELT4G | NTD6600NT4G | ACTIVE |
| MTD1302 | NTD4302G | ACTIVE |
| MTD1302T4 | NTD4302T4G | ACTIVE |
| MTD1312T4 | NTD20N03L27T4G | ACTIVE |
| MTD14N10ET4 | NTD6600NT4G | ACTIVE |
| MTD15N06V | NTD18N06G | ACTIVE |
| MTD15N06V | NTD18N06G | ACTIVE |
| MTD15N06VL | NTD18N06LG | ACTIVE |
| MTD15N06VL | NTD18N06LG | ACTIVE |
| MTD15N06VL1 | NTD18N06L-1G | ACTIVE |
| MTD15N06VLT4 | NTD18N06LT4G | ACTIVE |
| MTD15N06VT4 | NTD18N06T4G | ACTIVE |
| MTD20N03HDL | NTD20N03L27G | ACTIVE |
| MTD20N03HDL1 | NTD20N03L27-1G | ACTIVE |
| MTD20N03HDLG | NTD20N03L27G | ACTIVE |
| MTD20N03HDLT4 | NTD20N03L27T4G | ACTIVE |
| MTD20N03HDLT4G | NTD20N03L27T4G | ACTIVE |
| MTD20N06HD | NTD24N06G | ACTIVE |
| MTD20N06HD1 | NTD24N06-1G | ACTIVE |
| MTD20N06HDL | NTD24N06LG | ACTIVE |
| MTD20N06HDL1 | NTD24N06LG | ACTIVE |
| MTD20N06HDLT4 | NTD24N06LT4G | ACTIVE |
| MTD20N06HDLT4G | NTD24N06LT4G | ACTIVE |
| MTD20N06HDT4 | NTD24N06T4G | ACTIVE |
| MTD20N06HDT4G | NTD24N06T4G | ACTIVE |
| MTD20N06V | NTD20N06G | ACTIVE |
| MTD20P03HDLT4 | NTD25P03LT4G | ACTIVE |

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PRODUCT REPLACEMENT TABLE

| Part Number | Recommended New Part Numbers | New Part Status |
|----------------|------------------------------|-----------------|
| MTD20P06HDLG | NTD20P06LG | ACTIVE |
| MTD20P06HDLT4 | NTD20P06LT4G | ACTIVE |
| MTD20P06HDLT4G | NTD20P06LT4G | ACTIVE |
| MTD2955ET4 | NTD2955T4G | ACTIVE |
| MTD2955V | NTD2955G | ACTIVE |
| MTD2955V1 | NTD2955-001 | ACTIVE |
| MTD2955V1G | NTD2955-1G | ACTIVE |
| MTD2955VG | NTD2955G | ACTIVE |
| MTD2955VT4 | NTD2955T4G | ACTIVE |
| MTD2955VT4G | NTD2955T4G | ACTIVE |
| MTD3055ELT4 | NTD3055L104T4G | ACTIVE |
| MTD3055V | NTD3055-094G | ACTIVE |
| MTD3055V1 | NTD3055-094-1G | ACTIVE |
| MTD3055VL | NTD3055L104G | ACTIVE |
| MTD3055VL1 | NTD3055L104-001 | ACTIVE |
| MTD3055VLT4 | NTD3055L104T4G | ACTIVE |
| MTD3055VT4 | NTD3055-094T4G | ACTIVE |
| MTD3302 | NTD4302G | ACTIVE |
| MTD3302T4 | NTD4302T4G | ACTIVE |
| MTD9N10E | NTD12N10G | ACTIVE |
| MTD9N10E1 | NTD12N10G | ACTIVE |
| MTD9N10ET4 | NTD12N10T4G | ACTIVE |
| MTDF2N06HDR2 | NTF3055-100T3G | ACTIVE |
| MTP10N10E | MTP10N10ELG | ACTIVE |
| MTP1302 | NTP75N03L09G | ACTIVE |
| MTP15N06V | NTP18N06G | ACTIVE |
| MTP15N06VL | NTP18N06LG | ACTIVE |
| MTP20N06V | NTP45N06G | ACTIVE |
| MTP2955V | NTP2955G | ACTIVE |
| MTP2955VG | NTP2955G | ACTIVE |
| MTP29N15E | NTP35N15G | ACTIVE |
| MTP3055V | NTP18N06G | ACTIVE |
| MTP3055VL | NTP18N06LG | ACTIVE |
| MTP30N06VL | NTP30N06LG | ACTIVE |
| MTP33N10E | NTP52N10G | ACTIVE |
| MTP36N06V | NTP45N06G | ACTIVE |
| MTP40N10E | NTP52N10G | ACTIVE |
| MTP50N06V | NTP45N06G | ACTIVE |
| MTP50N06VL | NTP45N06LG | ACTIVE |
| MTP52N06V | NTP60N06G | ACTIVE |
| MTP52N06VL | NTP60N06LG | ACTIVE |
| MTP52N06VLG | NTP60N06LG | ACTIVE |

PRODUCT REPLACEMENT TABLE

| Part Number | Recommended New Part Numbers | New Part Status |
|-----------------|------------------------------|-----------------|
| MTP5P06V | MTP23P06VG | ACTIVE |
| MTP60N06HD | NTP60N06G | ACTIVE |
| MTP75N03HDL | NTP75N03L09G | ACTIVE |
| MTP75N06HD | NTP75N06G | ACTIVE |
| MTSF2P02HDR2 | NTTS2P02R2G | ACTIVE |
| MTSF2P03HDR2 | NTTS2P03R2G | ACTIVE |
| MTW35N15E | NTP35N15G | ACTIVE |
| MTW45N10E | NTP52N10G | ACTIVE |
| MTY100N10E | NTY100N10G | ACTIVE |
| NMFT3055AVLT1 | NTF3055L108T1G | ACTIVE |
| NMFT3055AVLT3 | NTF3055L108T1G | ACTIVE |
| NTB22N06 | NTB18N06G | ACTIVE |
| NTB22N06L | NTB18N06G | ACTIVE |
| NTB22N06LT4 | NTB18N06LT4G | ACTIVE |
| NTB22N06T4 | NTB18N06T4G | ACTIVE |
| NTB23N03R | NTB23N03RG | ACTIVE |
| NTB27N06L | NTB30N06LG | ACTIVE |
| NTB27N06LT4 | NTB30N06LT4G | ACTIVE |
| NTB75N06L | NTB75N06LG | ACTIVE |
| NTD18N06-001 | NTD18N06-1G | ACTIVE |
| NTD20N06-001 | NTD20N06-1G | ACTIVE |
| NTD24N06L-001 | NTD24N06L-1G | ACTIVE |
| NTD3055L170-001 | NTD3055L170-1G | ACTIVE |
| NTD32N06-001 | NTD32N06-1G | ACTIVE |
| NTD32N06L-001 | NTD32N06L-1G | ACTIVE |
| NTD40N03RT4 | NTD40N03RT4G | ACTIVE |
| NTD4404NT4 | NTD4404NT4G | ACTIVE |
| NTD60N03 | NTD70N03RG | ACTIVE |
| NTD60N03-001 | NTD70N03R-001 | ACTIVE |
| NTD60N03T4 | NTD70N03RT4G | ACTIVE |
| NTD85N02R | NTD85N02RG | ACTIVE |
| NTD85N02R-001 | NTD85N02R-1G | ACTIVE |
| NTD95N02R | NTD95N02RG | ACTIVE |
| NTD95N02R-001 | NTD95N02R-1G | ACTIVE |
| NTF3055-160T1 | NTF3055-100T1G | ACTIVE |
| NTF3055-160T3 | NTF3055-100T3G | ACTIVE |
| NTF3055-160T3LF | NTF3055-100T3G | ACTIVE |
| NTGS4111PT1 | NTGS4111PT1G | ACTIVE |
| NTHD3100CT3 | NTHD3100CT1G | ACTIVE |
| NTHD3100CT3G | NTHD3100CT1G | ACTIVE |
| NTHD3101FT3 | NTHD3101FT1G | ACTIVE |
| NTHD3101FT3G | NTHD3101FT1G | ACTIVE |

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PRODUCT REPLACEMENT TABLE

| Part Number | Recommended New Part Numbers | New Part Status |
|----------------|------------------------------|-----------------|
| NTHD5902T1 | NTHD4502NT1G | ACTIVE |
| NTHD5904NT3 | NTHD5904NT1G | ACTIVE |
| NTHD5904NT3G | NTHD5904NT1G | ACTIVE |
| NTHD5904T1 | NTHD4508NT1G | ACTIVE |
| NTHD5905T1 | NTHD2102PT1G | ACTIVE |
| NTHS5402T1 | NTHS4501NT1G | ACTIVE |
| NTHS5402T1G | NTHS4501NT1G | ACTIVE |
| NTHS5445T1 | NTHS2101PT1G | ACTIVE |
| NTJD4105CT4G | NTJD4105CT2G | ACTIVE |
| NTJS4405NT4 | NTJS4405NT4G | ACTIVE |
| NTMS4P01R2 | NTMS5P02R2G | ACTIVE |
| NTMSD3P102R2 | NTMSD3P102R2G | ACTIVE |
| NTP22N06 | NTP18N06G | ACTIVE |
| NTP22N06L | NTP18N06LG | ACTIVE |
| NTP27N06L | NTP30N06LG | ACTIVE |
| NTP3055AV | NTP18N06G | ACTIVE |
| NTP30N06 | NTP45N06G | ACTIVE |
| NTP75N06L | NTP75N06G | ACTIVE |
| NTP85N03 | NTP85N03G | ACTIVE |
| NTQD6866R2 | NTQD6866R2G | ACTIVE |
| NTQD6968NR2 | NTQD6968NR2G | ACTIVE |
| NTQD6968R2 | NTQD6968NR2G | ACTIVE |
| NTQD6968R2G | NTQD6968NR2G | ACTIVE |
| NTR4501NT3 | NTR4501NT1G | ACTIVE |
| NTTD1P02R2 | NTTD4401FR2 | ACTIVE |
| NTTD1P02R2G | NTTD4401FR2G | ACTIVE |
| SBSS138LT3 | BSS138LT3G | ACTIVE |
| SMBF1026LT1 | MMBF170LT1G | ACTIVE |
| SMBF1034LT1 | 2N7002LT1G | ACTIVE |
| SMBF1034LT1G | 2N7002LT1G | ACTIVE |
| SMBF1035LT3G | BSS123LT3G | ACTIVE |
| SMBF1046LT1 | 2N7002LT1G | ACTIVE |
| SMBF1049LT1 | BSS123LT1G | ACTIVE |
| SMBF1057LT1 | 2N7002LT1G | ACTIVE |
| SMBF1062LT1 | BSS123LT1G | ACTIVE |
| SMFT3355VLT3 | NTF3055L108T1G | ACTIVE |
| SMTD10N10ELT4 | NTD12N10T4G | ACTIVE |
| SMTD10N10ELT4 | NTD12N10T4G | ACTIVE |
| SMTD20P03HDLT4 | NTD25P03LT4G | ACTIVE |
| SMTD2955VT4 | NTD2955T4G | ACTIVE |
| SPF3161KRLRP | 2N7000G | ACTIVE |
| STB23P06VT4 | NTB25P06T4G | ACTIVE |

PRODUCT REPLACEMENT TABLE

| Part Number | Recommended New Part Numbers | New Part Status |
|----------------|------------------------------|-----------------|
| STB30N06VLT4 | NTB45N06LT4G | ACTIVE |
| STB33N10E | NTB52N10T4G | ACTIVE |
| STB33N10ET4 | NTB52N10T4G | ACTIVE |
| STB36N06VT4 | NTB45N06T4G | ACTIVE |
| STB40N10ET4 | NTB52N10T4G | ACTIVE |
| STB50N06ET4 | NTB75N06T4G | ACTIVE |
| STB50N06VLT4 | NTB45N06LT4G | ACTIVE |
| STB52N06VLT4 | NTB60N06LT4G | ACTIVE |
| STB52N06VT4 | NTB60N06T4G | ACTIVE |
| STB52N06VT4G | NTB60N06T4G | ACTIVE |
| STB60N06HDT4 | NTB60N06G | ACTIVE |
| STB75N06HDT4 | NTB75N06T4G | ACTIVE |
| STD1003T4 | MTD5P06VT4G | ACTIVE |
| STD1009V-001 | NTD3055-094-1G | ACTIVE |
| STD1009VT4 | NTD3055-094T4G | ACTIVE |
| STD1010ET4 | NTD12N10G | ACTIVE |
| STD1010V | NTD3055L104G | ACTIVE |
| STD1010VT4 | NTD3055L104T4G | ACTIVE |
| STD1013T4 | NTD3055L104T4G | ACTIVE |
| STD1028T4 | NTD18N06T4G | ACTIVE |
| STD1030-001 | NTD3055-150G | ACTIVE |
| STD1039T4 | NTD2955T4G | ACTIVE |
| STD1040T4 | NTD3055L104T4G | ACTIVE |
| STD1045T4 | NTD2955T4G | ACTIVE |
| STD1057T4 | NTB18N06T4G | ACTIVE |
| STD1066-001 | NTD3055L104-001 | ACTIVE |
| STD1068HDL-001 | NTD20N06L-001 | ACTIVE |
| STD1069T4 | NTD3055-094G | ACTIVE |
| STD2000T4 | NTD3055L104T4G | ACTIVE |
| STD2002T4 | NTD3055-150G | ACTIVE |
| STD2004-001 | NTD2955-001 | ACTIVE |
| STD20P06HDLT4 | NTD20P06LT4G | ACTIVE |
| STD3055VLT4 | NTD3055L104T4G | ACTIVE |
| STD3055VLT4 | NTD3055L104T4G | ACTIVE |
| STD5P06VT4 | MTD5P06VT4G | ACTIVE |
| STD9N10ET4 | NTD12N10G | ACTIVE |
| STDP7222VT4 | MTD5P06VT4G | ACTIVE |
| STP20N06VLF | NTP45N06G | ACTIVE |
| STP3055VL | NTP18N06LG | ACTIVE |
| STP30N06EL | NTP30N06LG | ACTIVE |
| STP36N06V | NTP45N06G | ACTIVE |
| STP4119 | NTD3055-150G | ACTIVE |

ON Semiconductor Selector Guide – FETs

PRODUCT REPLACEMENT TABLE

| Part Number | Recommended New Part Numbers | New Part Status |
|--------------|------------------------------|-----------------|
| STP4347 | NTP60N06G | ACTIVE |
| STP4348 | NTP60N06LG | ACTIVE |
| STP4384 | NTP18N06LG | ACTIVE |
| STP4391 | NTP18N06LG | ACTIVE |
| STP50N06V | NTP45N06G | ACTIVE |
| STP60N06HDLF | NTP60N06LG | ACTIVE |
| STP8023 | NTP45N06LG | ACTIVE |
| STW1019 | NTP35N15G | ACTIVE |
| VN2222LLRL | VN2222LLRLRAG | ACTIVE |
| VN2222LLRLRM | VN2222LLRLRAG | ACTIVE |


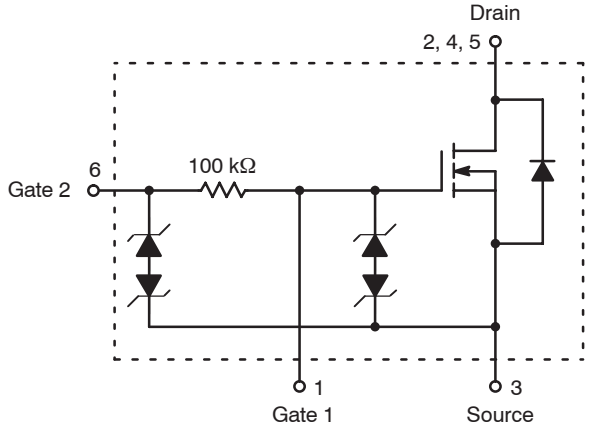
Automotive and Industrial – ON Semiconductor’s HDPlus™ platform technology which incorporates various levels of protection features within a MOSFET. The device features can include:

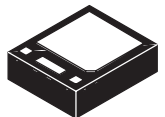
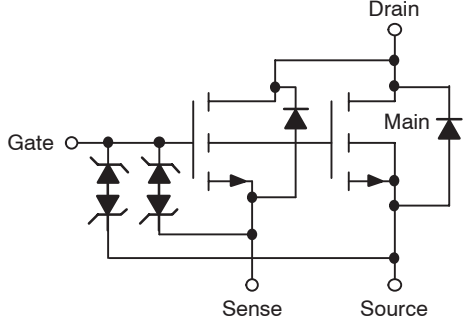
- Short Circuit Protection
- Current Limit
- Thermal Shutdown with Automatic Restart
- Overvoltage Protection
- ESD Protection
- Gate-to-Source Protection
- Current Sense Output
- Pb-free Package

Applications

- Solenoid Driver
- Relay Driver
- Relay Replacement
- Load Switching


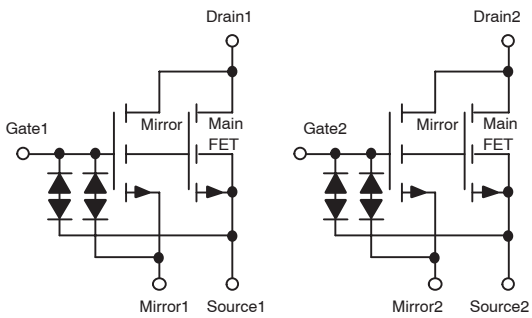
Protected MOSFETs (Automotive/Industrial)


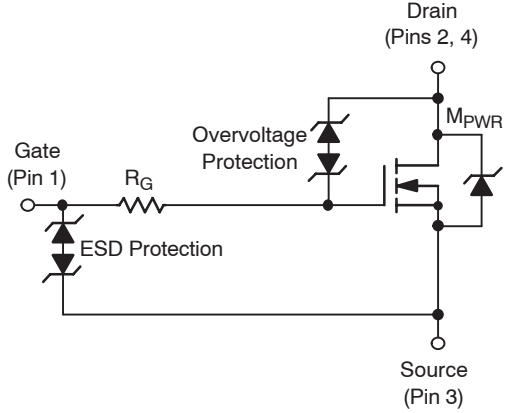
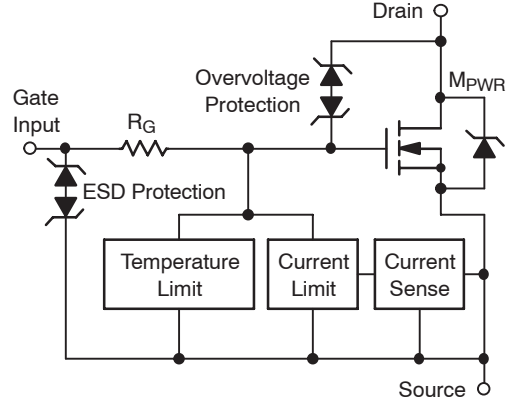
| Device | V _{(BR)DSS} (V) | R _{DS(ON)} (Ω) @ V _{GS} = 10 V | Integrated Protection | | | | | Max Rating | | |
|--|-----------------------------|---|---|-------------|-----------------|-----|----------------------|-----------------------|--|--|
| | | | Overvoltage | Overcurrent | Overtemperature | ESD | Current Sense Output | P _D (W) | | |
|  1 | | CASE 318G TSOP-6 |  | | | | | | | |
| NUD3048M* | 100 | 0.72 | - | - | - | X | - | 0.66 | | |

| | | | | | | | | | | |
|---|----|---|--|---|---|---|---|-----|--|--|
|  | | CASE 508AA (Leadless) SO-8 |  | | | | | | | |
| NILMS4501N* | 24 | 0.013 | - | - | - | X | X | 2.7 | | |

*Not Automotive Qualified.

Protected MOSFETs (Automotive/Industrial) (continued)

| Device | $V_{(BR)DSS}$ (V) | $R_{DS(ON)}$ (Ω) @ $V_{GS} = 10\text{ V}$ | Integrated Protection | | | | | Max Rating | |
|---|----------------------|---|--|-------------|-----------------|-----|----------------------|--------------|--|
| | | | Overvoltage | Overcurrent | Overtemperature | ESD | Current Sense Output | P_D (W) | |
|  CASE 751 SO-8 "Dual" | | |  | | | | | | |
| | | | NIMD6302R | 30 | 0.05 | - | - | | |

| | | | | | | | | |
|--|---|-------|---|---|---|---|---|-----|
|  CASE 318E SOT-223 |  NIF9N05CL | |  NIF62514, NIF5002N, NIF5003N | | | | | |
| | NIF9N05CL | 55 | 0.125 | X | - | - | X | - |
| NIF62514 | 42 | 0.1 | X | X | X | X | - | 1.7 |
| NIF5002N | 42 | 0.2 | X | - | - | X | - | 1.1 |
| NIF5003N | 42 | 0.068 | X | X | X | X | - | 1.9 |

Protected MOSFETs (Automotive/Industrial) (continued)

| Device | $V_{(BR)DSS}$ (V) | $R_{DS(ON)}$ (Ω) @ $V_{GS} = 10\text{ V}$ | Integrated Protection | | | | | Max Rating | |
|------------------|----------------------|---|-----------------------|-------------|--------------------------------------|-----|----------------------|--------------|--|
| | | | Overvoltage | Overcurrent | Overtemperature | ESD | Current Sense Output | P_D (W) | |
| | | | | | | | | | |
| NID9N05CL | | | | | NID5001N, 5003N, 5004N, 6002N | | | | |
| NID9N05CL | 55 | 0.09 | X | - | - | X | - | 28.8 | |
| NID5001N | 42 | 0.029 | X | - | - | X | - | 64 | |
| NID5003N | 42 | 0.05 | X | - | - | X | - | 1.3 | |
| NID6002N | 60 | 0.21 | X | - | - | X | - | 1.3 | |
| NID5004N | 40 | 0.15 | X | - | - | X | - | 1.3 | |

| | | | | | | | | | |
|-----------------------------|----|-----------------------------------|---|---|---|---|---|----|--|
| | | | | | | | | | |
| MLD1N06CL, MLD2N06CL | | | | | | | | | |
| MLD1N06CL | 60 | 0.75 @ $V_{GS} = 5.0\text{ V}$ | X | X | - | X | - | 40 | |
| MLD1N06CL | 62 | 0.4 @ $V_{GS} = 5.0\text{ V}$ | X | X | - | X | - | 40 | |

Circuit Protection

Circuit Protection

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In Brief...

What's New for Integrated Functions


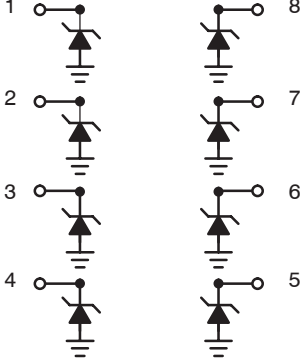
TVS Protection Arrays – ON Semiconductor miniaturizes its TVS array products by introducing the industry's smallest TVS array. The **NUP45V6** series in the ultra small SOT-953 package provides electrostatic discharge (ESD) protection of four data lines in wireless and portable applications. Other recently released products include the **NUP2202** and **NUP4202** low capacitance arrays for USB 2.0 applications.

EMI Filters – ON Semiconductor is the leading provider of integrated EMI Filter Products designed to suppress EMI radio frequency interference (RFI) noise and provide electrostatic discharge (ESD) Protection for advanced Wireless Cell Phones, Portable electronics and Computing applications. We have released more than 25 new products in miniature DFN/WDFN packages in 2005.

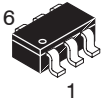
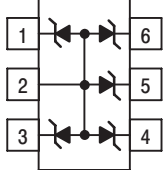
Our next generation EMI filter packages will be available in Low profile (typical 0.5 mm height) miniature μ DFN includes 4-channel (**NUF4001MU**), 6-channel (**NUF6001MU**) and 8-channel (and **NUF8001MU**) provides superior filtering performance over traditional CSP or BGA Package due to low parasitic Inductance and reliability in terms of handling and solderability.

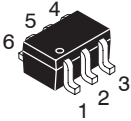
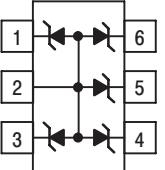
TVS Protection – Arrays in Surface Mount

- Human Body Model ESD Rating (> 16 kV)
- IEC 61000-4-2 (ESD) 15 kV (air) 8 kV (contact)
- Eight Line Protection

| Device | Breakdown Voltage | | | | Max Reverse Leakage Current | | Capacitance (pF) @ 0 V, 1.0 MHz | | Max Reverse Surge Current | Max Reverse Voltage @ I _{PP} (Clamping Voltage) | Peak Power Rating (8x20 μsec) (Note 1) |
|--|-------------------|---------------------|-----|------------------|-----------------------------|------------------|---------------------------------|-----|---------------------------|--|--|
| | | V _{BR} (V) | | @ I _T | I _R | V _{RWM} | | | | | |
| | Min | Nom | Max | (mA) | (μA) | (V) | Typ | Max | I _{PP} (A) | V _C (V) | Watts |
|  <p style="text-align: center;">CASE 506AK DFN8</p>  | | | | | | | | | | | |
| NUP8010MN | 5.3 | 5.6 | 5.9 | 1.0 | 1.0 | 3.3 | 13 | 17 | 1.6 | 13 | 20 |

- Five Line Protection


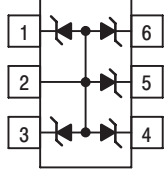
| | | | | | | | | | | | |
|---|------|---|-----|-----|-----|-----|-----|---|-----|------|-----|
|  <p style="text-align: center;">CASE 318F STYLE 1 SC-74 PLASTIC</p>  | | | | | | | | | | | |
| SMS05C | 6.2 | – | 7.2 | 1.0 | 5.0 | 5.0 | 260 | – | 24 | 14.5 | 350 |
| SMS12C | 13.3 | – | 15 | 1.0 | 1.0 | 12 | 120 | – | 15 | 23 | 350 |
| SMS15C | 17 | – | 19 | 1.0 | 1.0 | 15 | 95 | – | 12 | 29 | 350 |
| SMS24C | 26.7 | – | 32 | 1.0 | 1.0 | 24 | 60 | – | 8.0 | 44 | 350 |

| | | | | | | | | | | | |
|---|------|---|-----|-----|-----|-----|----|---|-----|------|-----|
|  <p style="text-align: center;">CASE 419B SC-88 (SOT-363)</p>  | | | | | | | | | | | |
| SMF05C | 6.2 | – | 7.2 | 1.0 | 5.0 | 5.0 | 80 | – | 8.0 | 12.5 | 100 |
| SMF12C | 13.3 | – | 15 | 1.0 | 1.0 | 12 | 40 | – | 6.0 | 23 | 100 |
| SMF15C | 17 | – | 19 | 1.0 | 1.0 | 15 | 33 | – | 5.0 | 29 | 100 |
| SMF24C | 26.7 | – | 32 | 1.0 | 1.0 | 24 | 21 | – | 2.5 | 44 | 100 |


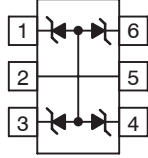
1. Surge waveform 8 x 20 μsec.

TVS Protection – Arrays in Surface Mount (continued)

- Human Body Model ESD Rating (> 16 kV)
- IEC 61000-4-2 (ESD) 15 kV (air) 8 kV (contact)
- Five Line Protection

| Device | Breakdown Voltage | | | | Max Reverse Leakage Current | | Capacitance (pF) @ 0 V, 1.0 MHz | | Max Reverse Surge Current | Max Reverse Voltage @ I _{PP} (Clamping Voltage) | Peak Power Rating (8x20 μsec) (Note 2) |
|---|-------------------|---------------------|-----|------------------|-----------------------------|------------------|---------------------------------|-----|---------------------------|--|--|
| | | V _{BR} (V) | | @ I _T | I _R | V _{RWM} | | | | | |
| | Min | Nom | Max | (mA) | (μA) | (V) | Typ | Max | I _{PP} (A) | V _C (V) | Watts |
|  <p style="text-align: center;">CASE 463A SOT-563</p>  | | | | | | | | | | | |
| NUP5120X6 | 6.2 | 6.8 | 7.2 | 1.0 | 0.5 | 3.0 | 54 | - | - | - | 90 |

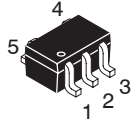
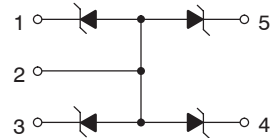
- Four Line Protection

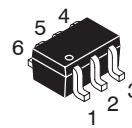
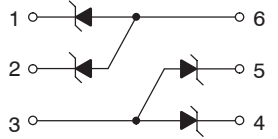
|  <p style="text-align: center;">CASE 318F STYLE 1 SC-74 PLASTIC</p>  | | | | | | | | | | | |
|--|------|-----|------|-----|-------|-----|-----|-----|-------|------|-----|
| MMQA5V6 | 5.32 | 5.6 | 5.88 | 1.0 | 2.0 | 3.0 | 257 | - | 3.0 | 8.0 | 150 |
| MMQA6V2 | 5.89 | 6.2 | 6.51 | 1.0 | 0.7 | 4.0 | 225 | - | 2.66 | 9.0 | 150 |
| MMQA6V8 | 6.46 | 6.8 | 7.14 | 1.0 | 0.5 | 4.3 | 210 | - | 2.45 | 9.8 | 150 |
| MMQA12V | 11.4 | 12 | 12.6 | 1.0 | 0.075 | 9.1 | 117 | - | 1.39 | 17.3 | 150 |
| MMQA13V | 12.4 | 13 | 13.7 | 1.0 | 0.075 | 9.8 | 108 | - | 1.29 | 18.6 | 150 |
| MMQA15V | 14.3 | 15 | 15.8 | 1.0 | 0.075 | 11 | 93 | - | 1.1 | 21.7 | 150 |
| MMQA18V | 17.1 | 18 | 18.9 | 1.0 | 0.075 | 14 | 77 | - | 0.923 | 26 | 150 |
| MMQA20V | 19 | 20 | 21 | 1.0 | 0.075 | 15 | 69 | - | 0.84 | 28.6 | 150 |
| MMQA22V | 20.9 | 22 | 23.1 | 1.0 | 0.075 | 17 | 63 | - | 0.758 | 31.7 | 150 |
| MMQA24V | 22.8 | 24 | 25.2 | 1.0 | 0.075 | 18 | 58 | - | 0.694 | 34.6 | 150 |
| MMQA27V | 25.7 | 27 | 28.4 | 1.0 | 0.075 | 21 | 50 | - | 0.615 | 39 | 150 |
| MMQA30V | 28.5 | 30 | 31.5 | 1.0 | 0.075 | 23 | 40 | - | 0.554 | 43.3 | 150 |
| MMQA33V | 31.4 | 33 | 34.7 | 1.0 | 0.075 | 25 | 42 | - | 0.504 | 48.6 | 150 |
| SMS05 | 6.0 | - | 7.2 | 1.0 | 20 | 5.0 | 300 | 400 | 23 | 15.5 | 350 |
| SMS12 | 13.3 | - | 15 | 1.0 | 1.0 | 12 | 120 | 150 | 15 | 23 | 350 |
| SMS15 | 16.7 | - | 18.5 | 1.0 | 1.0 | 15 | 100 | 125 | 12 | 29 | 350 |
| SMS24 | 26.7 | - | 32 | 1.0 | 1.0 | 24 | 60 | 75 | 8.0 | 44 | 350 |

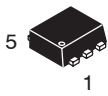
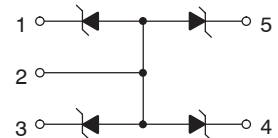
2. Surge waveform 8 x 20 μsec.

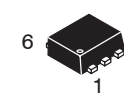
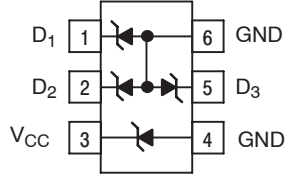
TVS Protection – Arrays in Surface Mount (continued)

- Human Body Model ESD Rating (> 16 kV)
- IEC 61000-4-2 (ESD) 15 kV (air) 8 kV (contact)
- Four Line Protection

| Device | Breakdown Voltage | | | | Max Reverse Leakage Current | | Capacitance (pF) @ 0 V, 1.0 MHz | | Max Reverse Surge Current | Max Reverse Voltage @ I _{pp} (Clamping Voltage) | Peak Power Rating (8x20 μsec) (Note 3) |
|---|-------------------|---------------------|------|------------------|-----------------------------|------------------|---------------------------------|-----|---------------------------|--|--|
| | | V _{BR} (V) | | @ I _T | I _R | V _{RWM} | | | | | |
| | Min | Nom | Max | (mA) | (μA) | (V) | Typ | Max | I _{pp} (A) | V _C (V) | Watts |
|  <p style="text-align: center;">CASE 419A SC-88A (SOT-353)</p>  | | | | | | | | | | | |
| MSQA6V1W5 | 6.1 | 6.6 | 7.2 | 1.0 | 1.0 | 3.0 | 90 | – | – | – | 150 |
| NSQA6V8AW5 | 6.4 | 6.8 | 7.1 | 1.0 | 1.0 | 5.0 | 12 | 15 | 1.6 | 13 | 20 |
| NSQA12VAW5 | 11.4 | 12 | 12.7 | 5.0 | 0.05 | 9.0 | 7.0 | 15 | 0.9 | 23 | 20 |
| SMF05 | 6.0 | – | 7.2 | 1.0 | 5.0 | 5.0 | 90 | – | 12 | 12.5 | 200 |

| | | | | | | | | | | | |
|--|-----|-----|-----|-----|-----|-----|----|---|-----|------|----|
|  <p style="text-align: center;">CASE 419B SC-88 (SOT-363)</p>  | | | | | | | | | | | |
| DF6A6.8FU | 6.4 | 6.8 | 7.2 | 1.0 | 1.0 | 5.0 | 40 | – | 7.0 | 11.4 | 75 |

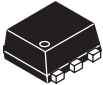
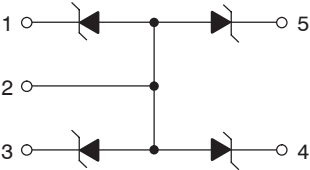
| | | | | | | | | | | | |
|--|------|-----|------|-----|-----|-----|----|----|-----|------|-----|
|  <p style="text-align: center;">CASE 463B SOT-553</p>  | | | | | | | | | | | |
| NZQA5V6XV5 | 5.32 | 5.6 | 5.88 | 1.0 | 1.0 | 3.0 | 90 | – | 10 | 10.5 | 100 |
| NZQA6V2XV5 | 5.89 | 6.2 | 6.51 | 1.0 | 0.5 | 4.0 | 80 | – | 9.0 | 11.5 | 100 |
| NZQA6V8XV5 | 6.46 | 6.8 | 7.14 | 1.0 | 0.1 | 4.3 | 70 | – | 8.0 | 12.5 | 100 |
| NZQA5V6AXV5 | 5.3 | 5.6 | 5.9 | 1.0 | 1.0 | 3.0 | 13 | 17 | 1.6 | 13 | 20 |
| NZQA6V8AXV5 | 6.1 | 6.8 | 7.2 | 1.0 | 1.0 | 3.0 | 12 | 15 | 1.6 | 13 | 20 |


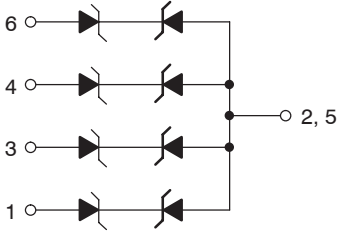
| | | | | | | | | | | | |
|--|------|-----|------|-----|------|-----|-----|----|-----|----|-------|
|  <p style="text-align: center;">CASE 463A SOT-563</p>  | | | | | | | | | | | |
| NUP4060AXV6 (D ₁ , D ₂ , and D ₃) | 6.2 | 6.8 | 7.2 | 1.0 | 0.5 | 3.0 | 7.0 | 10 | 1.6 | 13 | 20 |
| NUP4060AXV6 (V _{CC}) | 15.3 | 16 | 17.1 | 5.0 | 0.05 | 11 | 105 | – | – | – | 0.200 |


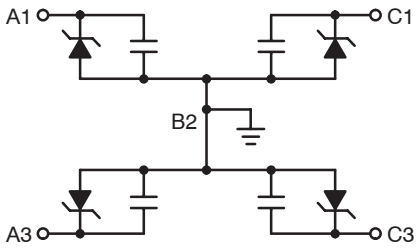
3. Surge waveform 8 x 20 μsec.

TVS Protection – Arrays in Surface Mount (continued)

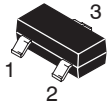
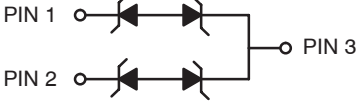
- Human Body Model ESD Rating (> 16 kV)
- IEC 61000-4-2 (ESD) 15 kV (air) 8 kV (contact)
- Four Line Protection

| Device | Breakdown Voltage V_{BR} @ 1 mA (V) | | | Leakage Current I_{RM} @ V_{RM} | | Typ Capacitance @ 0 V (pF) (Note 4) | | Typ Capacitance @ 3 V Bias (pF) (Note 4) | | |
|---|---------------------------------------|------|-----|-------------------------------------|----------------------|-------------------------------------|-----|--|-----|------|
| | Min | Nom | Max | V_{RWM} | I_{RWM} (μ A) | Typ | Max | Typ | Max | |
|  <p>CASE 526AB SOT-953</p>  | NUP45V6P5 | 5.3 | 5.6 | 5.9 | 3.0 | 1.0 | 13 | 17 | 7.0 | 11.5 |
| | NUP46V8P5 | 6.47 | 6.8 | 7.14 | 4.3 | 1.0 | 12 | 15 | 6.7 | 9.5 |
| | NUP412VP5 | 11.4 | 12 | 12.7 | 9.0 | 1.0 | 6.5 | 10 | 3.5 | 5.0 |

| Device | Breakdown Voltage | | | | Max Reverse Leakage Current | | Capacitance (pF) @ 0 V, 1.0 MHz | | Max Reverse Surge Current | Max Reverse Voltage @ I_{PP} (Clamping Voltage) | Peak Power Rating (8x20 μ sec) (Note 4) | |
|--|-------------------|--------------|-----|---------|-----------------------------|-----------|---------------------------------|-----|---------------------------|---|---|----|
| | | V_{BR} (V) | | @ I_T | I_R | V_{RWM} | | | | | | |
| | Min | Nom | Max | (mA) | (μ A) | (V) | Typ | Max | I_{PP} (A) | V_C (V) | Watts | |
|  <p>CASE 463A SOT-563</p>  | NUP4102XV6 | 13.6 | - | 17.8 | 1.0 | 0.1 | 12 | 13 | 15 | 3.0 | 25 | 75 |

| Device | Breakdown Voltage | | | | Max Reverse Leakage Current | | Capacitance (pF) @ 0 V, 1.0 MHz | | Max Reverse Surge Current | Max Reverse Voltage @ I_{PP} (Clamping Voltage) | Peak Power Rating (8x20 μ sec) (Note 4) | |
|---|-------------------|-----|-----|---------|-----------------------------|-----------|---------------------------------|-----|---------------------------|---|---|---|
| | Min | Nom | Max | @ I_T | I_R | V_{RWM} | Typ | Max | I_{PP} (A) | V_C (V) | Watts | |
|  <p>CASE 766AB 5 PIN FLIP-CHIP CSP</p>  | NUP4103FC | 6.0 | 7.0 | 8.0 | 1.0 | 0.1 | 3.3 | 47 | - | - | - | - |

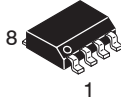
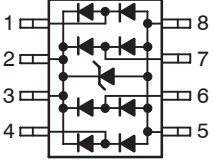
- Two Line Protection

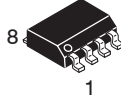
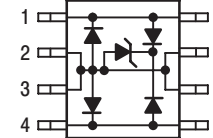
| Device | Breakdown Voltage | | | | Max Reverse Leakage Current | | Capacitance (pF) @ 0 V, 1.0 MHz | | Max Reverse Surge Current | Max Reverse Voltage @ I_{PP} (Clamping Voltage) | Peak Power Rating (8x20 μ sec) (Note 4) | |
|--|-------------------|------|-----|---------|-----------------------------|-----------|---------------------------------|-----|---------------------------|---|---|-----|
| | Min | Nom | Max | @ I_T | I_R | V_{RWM} | Typ | Max | I_{PP} (A) | V_C (V) | Watts | |
|  <p>CASE 318 SOT-23</p>  | NUP2105L | 26.2 | - | 32 | 1.0 | 0.1 | 24 | 30 | - | 8.0 | 44 | 350 |

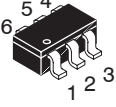
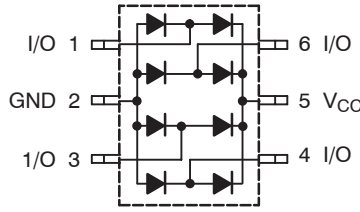
4. Surge waveform 8 x 20 μ sec.

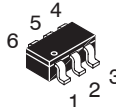
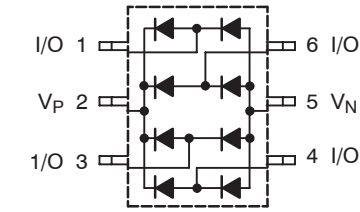
TVS Protection – Low Capacitance Surface Mount for USB 2.0 and 1.1

- ESD Protection Meeting IEC 61000-4-2, 4-4, 4-5

| Device | Breakdown Voltage | | | | Max Reverse Leakage Current | | Capacitance* (pF) @ 0 V, 1.0 MHz | | Max Reverse Surge Current | Max Reverse Voltage @ I _{pp} (Clamping Voltage) | Peak Power Rating (8x20 μsec) |
|--|---------------------|-----|------------------|----------------|-----------------------------|-----|----------------------------------|-----|---------------------------|--|-------------------------------|
| | V _{BR} (V) | | @ I _T | I _R | V _{RWM} | | | | | | |
| | Min | Nom | Max | (mA) | (μA) | (V) | Typ | Max | I _{pp} (A) | V _C (V) | Watts |
|  <p style="text-align: center;">CASE 751 SO-8</p>  | | | | | | | | | | | |
| USB 2.0 | | | | | | | | | | | |
| NUP4201DR2 | 6.0 | - | - | 1.0 | 10 | 5.0 | 2.5 | 5.0 | 10 | 12 | 500 |
| SRDA05-4R2 | 6.0 | - | - | 1.0 | 10 | 5.0 | 4.0 | 8.0 | 10 | 12 | 500 |

| | | | | | | | | | | | |
|--|-----|---|---|-----|----|-----|-----|----|----|----|------|
|  <p style="text-align: center;">CASE 751 SO-8</p>  | | | | | | | | | | | |
| USB 1.1 | | | | | | | | | | | |
| LC03-6 | 6.8 | - | - | 1.0 | 20 | 5.0 | 8.0 | 12 | 50 | 15 | 2000 |

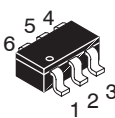
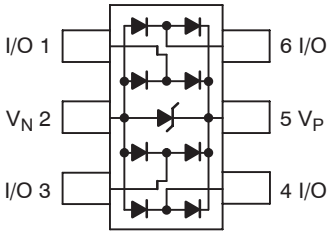
| | | | | | | | | | | | |
|---|----|---|---|-----|-----|---|-----|-----|---|---|---|
|  <p style="text-align: center;">CASE 318G TSOP-6</p>  | | | | | | | | | | | |
| USB 2.0 | | | | | | | | | | | |
| NUP4301MR6 | 70 | - | - | 0.1 | 2.5 | - | 0.8 | 1.5 | - | - | - |
| NUP4302MR6 | 30 | - | - | 0.1 | 30 | - | - | 18 | - | - | - |

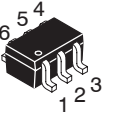
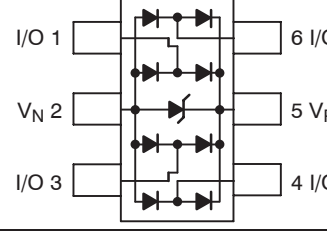
| | | | | | | | | | | | |
|---|----|---|---|-----|-----|---|-----|-----|---|---|---|
|  <p style="text-align: center;">CASE 318F TSOP-6</p>  | | | | | | | | | | | |
| USB 2.0 | | | | | | | | | | | |
| NUP4304MR6 | 70 | - | - | 0.1 | 2.5 | - | 0.8 | 1.5 | - | - | - |

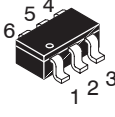
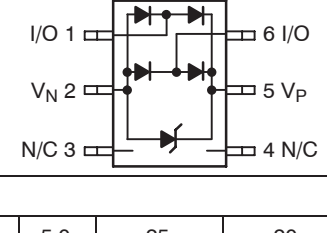
*C_J = Between I/O pins

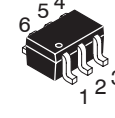
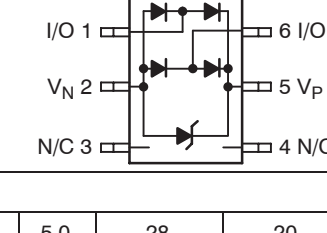
TVS Protection – Low Capacitance Surface Mount for USB 2.0 and 1.1 (continued)

- ESD Protection Meeting IEC 61000-4-2, 4-4, 4-5

| Device | Breakdown Voltage | | | Max Reverse Leakage Current | | | Capacitance* (pF) @ 0 V, 1.0 MHz | | Max Reverse Surge Current | Max Reverse Voltage @ I _{PP} (Clamping Voltage) | Peak Power Rating (8x20 μsec) |
|--|---------------------|-----|-----|-----------------------------|------|-----|----------------------------------|-----|--|--|-------------------------------|
| | V _{BR} (V) | | | @ I _T | | | Typ | Max | I _{PP} (A) | V _C (V) | Watts |
| | Min | Nom | Max | (mA) | (μA) | (V) | | | | | |
|  CASE 318G TSOP-6 | | | | | | | | |  | | |
| USB 2.0 | | | | | | | | | | | |
| NUP4201MR6 | 6.0 | - | - | 1.0 | 5.0 | 5.0 | 3.0 | 5.0 | 25 | 20 | 500 |

| | | | | | | | | | | | |
|--|-----|---|---|-----|-----|-----|-----|-----|---|----|-----|
|  CASE 419B SC-88 | | | | | | | | |  | | |
| USB 2.0 | | | | | | | | | | | |
| NUP4202W1 | 6.0 | - | - | 1.0 | 5.0 | 5.0 | 3.0 | 5.0 | 28 | 20 | 500 |

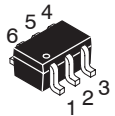
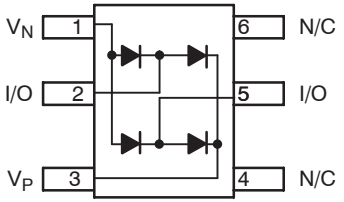
| | | | | | | | | | | | |
|--|-----|---|---|-----|-----|-----|-----|-----|--|----|-----|
|  CASE 318G TSOP-6 | | | | | | | | |  | | |
| USB 2.0 | | | | | | | | | | | |
| NUP2201MR6 | 6.0 | - | - | 1.0 | 5.0 | 5.0 | 3.0 | 5.0 | 25 | 20 | 500 |

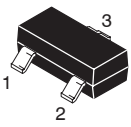
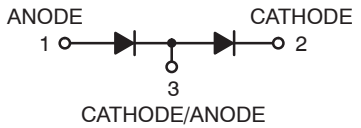
| | | | | | | | | | | | |
|---|-----|---|---|-----|-----|-----|-----|-----|--|----|-----|
|  CASE 419B SC-88 | | | | | | | | |  | | |
| USB 2.0 | | | | | | | | | | | |
| NUP2202W1 | 6.0 | - | - | 1.0 | 5.0 | 5.0 | 3.0 | 5.0 | 28 | 20 | 500 |

*C_J = Between I/O pin to ground

TVS Protection – Low Capacitance Surface Mount for USB 2.0 and 1.1 (continued)

- ESD Protection Meeting IEC 61000-4-2, 4-4, 4-5

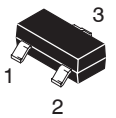
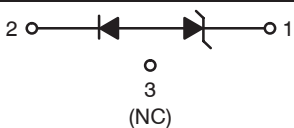
| Device | Breakdown Voltage | | | | Max Reverse Leakage Current | | Capacitance* (pF) @ 0 V, 1.0 MHz | | Max Reverse Surge Current | Max Reverse Voltage @ I _{PP} (Clamping Voltage) | Peak Power Rating (8x20 μsec) |
|---|---------------------|-----|-----|------------------|-----------------------------|------------------|----------------------------------|-----|---------------------------|--|-------------------------------|
| | V _{BR} (V) | | | @ I _T | I _R | V _{RWM} | | | | | |
| | Min | Nom | Max | (mA) | (μA) | (V) | Typ | Max | I _{PP} (A) | V _C (V) | Watts |
|  <p style="text-align: center;">CASE 419B SC-88</p>  | | | | | | | | | | | |
| USB 2.0 | | | | | | | | | | | |
| NUP2301MW6 | 70 | - | - | - | 0.1 | 2.5 | 0.8 | 1.5 | - | - | - |

| | | | | | | | | | | | |
|---|----|---|---|---|-----|-----|-----|-----|---|---|---|
|  <p style="text-align: center;">CASE 318 SOT-23</p>  | | | | | | | | | | | |
| USB 2.0 | | | | | | | | | | | |
| NUP1301ML3 | 70 | - | - | - | 0.1 | 2.5 | 0.8 | 1.5 | - | - | - |

*C_j = Between I/O pins


TVS Protection – Low Capacitance Surface Mount for High Speed Data Lines

- ESD Protection Meeting IEC 61000-4-2, 4-4, 4-5

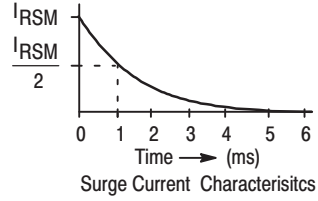
| Device | Breakdown Voltage | | | | Max Reverse Leakage Current | | Capacitance (pF) @ 0 V, 1.0 MHz | | Max Reverse Surge Current | Max Reverse Voltage @ I _{PP} = 5 A (Clamping Voltage) | Peak Power Rating (8x20 μsec) |
|---|---------------------|-----|------|------------------|-----------------------------|------------------|---------------------------------|-----|---------------------------|--|-------------------------------|
| | V _{BR} (V) | | | @ I _T | I _R | V _{RWM} | | | | | |
| | Min | Nom | Max | (mA) | (μA) | (V) | Typ | Max | I _{PP} (A) | V _C (V) | Watts |
|  <p style="text-align: center;">CASE 318 STYLE 26 SOT-23</p>  | | | | | | | | | | | |
| SL05 | 6.0 | - | 8.0 | 1.0 | 20 | 5.0 | 3.5 | 5.0 | 17 | 11 | 300 |
| SL15 | 16.7 | - | 18.5 | 1.0 | 1.0 | 15 | 3.5 | 5.0 | 10 | 30 | 300 |
| SL24 | 26.7 | - | 29 | 1.0 | 1.0 | 24 | 3.5 | 5.0 | 5.0 | 55 | 300 |

TVS – in Axial Leads

Table 1. Peak Power Dissipation, 500 Watts @ 1 ms Surge (10 x 1000 μs) Case 59 – MiniMOSORB™



CASE 59 (MiniMOSORB™)
PLASTIC
Cathode = Polarity Band



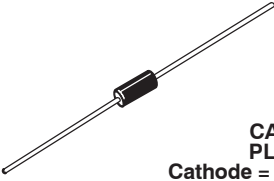
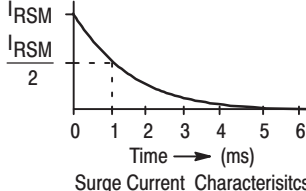
ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted) $V_F = 3.5\text{ V Max}$, $I_F = 35\text{ A Pulse}$ (except bidirectional devices).

| Working Peak Reverse Voltage V_{RWM} (Volts) (Note 1) | Device | Breakdown Voltage | | | Maximum Reverse Leakage @ V_{RWM} I_R (μA) | Maximum Reverse Surge Current I_{RSM} (Amps) (Note 3) | Maximum Reverse Voltage @ I_{RSM} (Clamping Voltage) V_{RSM} (Volts) |
|---|--------|-------------------|------|--------------------|---|---|--|
| | | V_{BR} (Volts) | | @ I_T Pulse (mA) | | | |
| | | Min (Note 2) | Max | | | | |
| 5 | SA5.0A | 6.4 | 7 | 10 | 600 | 54.3 | 9.2 |
| 6 | SA6.0A | 6.67 | 7.37 | 10 | 600 | 48.5 | 10.3 |
| 7 | SA7.0A | 7.78 | 8.6 | 10 | 150 | 41.7 | 12 |
| 9 | SA9.0A | 10 | 11.1 | 1 | 1 | 32.5 | 15.4 |
| 10 | SA10A | 11.1 | 12.3 | 1 | 1 | 29.4 | 17 |
| 12 | SA12A | 13.3 | 14.7 | 1 | 1 | 25.1 | 19.9 |
| 13 | SA13A | 14.4 | 15.9 | 1 | 1 | 23.2 | 21.5 |
| 15 | SA15A | 16.7 | 18.5 | 1 | 1 | 20.6 | 24.4 |
| 16 | SA16A | 17.8 | 19.7 | 1 | 1 | 19.2 | 26 |
| 17 | SA17A | 18.9 | 20.9 | 1 | 1 | 18.1 | 27.6 |
| 18 | SA18A | 20 | 22.1 | 1 | 1 | 17.2 | 29.2 |
| 20 | SA20A | 22.2 | 24.5 | 1 | 1 | 15.4 | 32.4 |
| 24 | SA24A | 26.7 | 29.5 | 1 | 1 | 12.8 | 38.9 |
| 26 | SA26A | 28.9 | 31.9 | 1 | 1 | 11.9 | 42.1 |
| 28 | SA28A | 31.1 | 34.4 | 1 | 1 | 11 | 45.4 |
| 30 | SA30A | 33.3 | 36.8 | 1 | 1 | 10.3 | 48.4 |
| 33 | SA33A | 36.7 | 40.6 | 1 | 1 | 9.4 | 53.3 |
| 36 | SA36A | 40 | 44.2 | 1 | 1 | 8.6 | 58.1 |
| 51 | SA51A | 56.7 | 62.7 | 1 | 1 | 6.1 | 82.4 |
| 64 | SA64A | 71.1 | 78.6 | 1 | 1 | 4.9 | 103 |
| 170 | SA170A | 189 | 209 | 1 | 1 | 1.8 | 275 |

1. A transient suppressor is normally selected according to the Working Peak Reverse Voltage (V_{RWM}) which should be equal to or greater than the DC or continuous peak operating voltage level.
2. V_{BR} measured at pulse test current I_T at ambient temperature of 25°C .
3. $10 \times 1000\ \mu\text{s}$ exponential decay surge waveform.

TVS – in Axial Leads (continued)

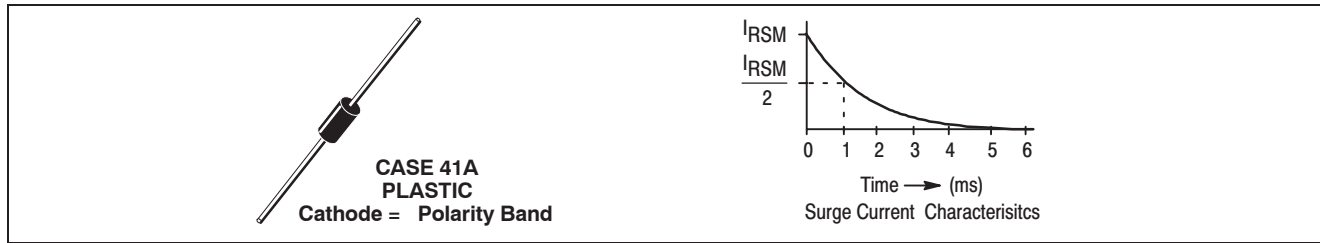
Table 1. Peak Power Dissipation, 500 Watts @ 1 ms Surge (10 x 1000 μs) Case 59 – MiniMOSORB™
(continued)

|  <p>CASE 17 PLASTIC Cathode = Polarity Band</p> | |  <p>Surge Current Characteristics</p> | | | | |
|---|--------------------|---|---|---|---|--|
| ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted) $V_F = 3.5\text{ V Max}$, $I_F = 50\text{ A Pulse}$ (except bidirectional devices). | | | | | | |
| Breakdown Voltage (Note 2) | | Device | Working Peak Reverse Voltage V_{RWM} (Volts) (Note 1) | Maximum Reverse Leakage @ V_{RWM} I_R (μA) | Maximum Reverse Surge Current I_{RSM} (Amps) (Note 3) | Maximum Reverse Voltage @ I_{RSM} (Clamping Voltage) V_{RSM} (Volts) |
| V_{BR} (Volts) | @ I_T Pulse (mA) | | | | | |
| Nom | | | | | | |
| 6.8 | 10 | P6KE6.8A | 5.8 | 1000 | 57 | 10.5 |
| 7.5 | 10 | P6KE7.5A | 6.4 | 500 | 53 | 11.3 |
| 10 | 1 | P6KE10A | 8.55 | 10 | 41 | 14.5 |
| 12 | 1 | P6KE12A | 10.2 | 5 | 36 | 16.7 |
| 13 | 1 | P6KE13A | 11.1 | 5 | 33 | 18.2 |
| 15 | 1 | P6KE15A | 12.8 | 5 | 28 | 21.2 |
| 16 | 1 | P6KE16A | 13.6 | 5 | 27 | 22.5 |
| 18 | 1 | P6KE18A | 15.3 | 5 | 24 | 25.2 |
| 20 | 1 | P6KE20A | 17.1 | 5 | 22 | 27.7 |
| 22 | 1 | P6KE22A | 18.8 | 5 | 20 | 30.6 |
| 24 | 1 | P6KE24A | 20.5 | 5 | 18 | 33.2 |
| 27 | 1 | P6KE27A | 23.1 | 5 | 16 | 37.5 |
| 30 | 1 | P6KE30A | 25.6 | 5 | 14.4 | 41.4 |
| 33 | 1 | P6KE33A | 28.2 | 5 | 13.2 | 45.7 |
| 36 | 1 | P6KE36A | 30.8 | 5 | 12 | 49.9 |
| 39 | 1 | P6KE39A | 33.3 | 5 | 11.2 | 53.9 |
| 43 | 1 | P6KE43A | 36.8 | 5 | 10.1 | 59.3 |
| 47 | 1 | P6KE47A | 40.2 | 5 | 9.3 | 64.8 |
| 51 | 1 | P6KE51A | 43.6 | 5 | 8.6 | 70.1 |
| 56 | 1 | P6KE56A | 47.8 | 5 | 7.8 | 77 |
| 62 | 1 | P6KE62A | 53 | 5 | 7.1 | 85 |
| 68 | 1 | P6KE68A | 58.1 | 5 | 6.5 | 92 |
| 75 | 1 | P6KE75A | 64.1 | 5 | 5.8 | 103 |
| 82 | 1 | P6KE82A | 70.1 | 5 | 5.3 | 113 |
| 100 | 1 | P6KE100A | 85.5 | 5 | 4.4 | 137 |
| 150 | 1 | P6KE150A | 128 | 5 | 2.9 | 207 |
| 160 | 1 | P6KE160A | 136 | 5 | 2.7 | 219 |
| 170 | 1 | P6KE170A | 145 | 5 | 2.6 | 234 |
| 180 | 1 | P6KE180A | 154 | 5 | 2.4 | 246 |
| 200 | 1 | P6KE200A | 171 | 5 | 2.2 | 274 |

1. A transient suppressor is normally selected according to the Working Peak Reverse Voltage (V_{RWM}) which should be equal to or greater than the DC or continuous peak operating voltage level.
2. V_{BR} measured at pulse test current I_T at ambient temperature of 25°C .
3. $10 \times 1000\ \mu\text{s}$ exponential decay surge waveform.

TVS – in Axial Leads (continued)

Table 1. Peak Power Dissipation, 500 Watts @ 1 ms Surge (10 x 1000 μs) Case 59 – MiniMOSORB™
(continued)




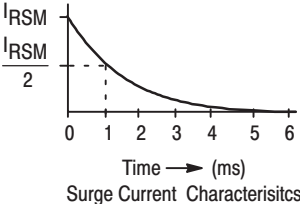
ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted) $V_F = 3.5\text{ V Max}$, $I_F = 100\text{ A Pulse}$
(C suffix denotes standard back to back bidirectional versions. Test both polarities)

| Max Reverse Stand-Off Voltage V_{RWM} (Volts) (Note 1) | JEDEC Device | Device | Breakdown Voltage | | Maximum Reverse Leakage @ V_{RWM} I_R (μA) | Maximum Reverse Surge Current I_{RSM} (Volts) (Note 3) | Maximum Reverse Voltage @ I_{RSM} (Clamping Voltage) V_{RSM} (Volts) | Clamping Voltage | |
|--|--------------|---------|-----------------------------|--------------------|---|--|--|--|---|
| | | | V_{BR} Volts Min (Note 2) | @ I_T Pulse (mA) | | | | Peak Pulse Current @ $I_{pp1} = 1\text{ A}$ V_{C1} (Volts max) | Peak Pulse Current @ $I_{pp2} = 10\text{ A}$ V_{C2} (Volts max) |
| 5 | 1N5908 | | 6 | 1 | 300 | 120 | 8.5 | 7.6 @ 30 A | 8 @ 60 A |
| 5 | 1N6373 | ICTE-5 | 6 | 1 | 300 | 160 | 9.4 | 7.1 | 7.5 |
| 12 | 1N6376 | ICTE-12 | 14.1 | 1 | 2 | 70 | 21.2 | 16.1 | 16.5 |
| 15 | 1N6377 | ICTE-15 | 17.6 | 1 | 2 | 60 | 25 | 20.1 | 20.6 |
| 18 | | ICTE-18 | 21.2 | 1 | 2 | 50 | 30 | 24.2 | 25.2 |
| 36 | 1N6380 | ICTE-36 | 42.4 | 1 | 2 | 23 | 65.2 | 50.6 | 54.3 |

1. A transient suppressor is normally selected according to the Working Peak Reverse Voltage (V_{RWM}) which should be equal to or greater than the DC or continuous peak operating voltage level.
2. V_{BR} measured at pulse test current I_T at ambient temperature of 25°C .
3. $10 \times 1000\ \mu\text{s}$ exponential decay surge waveform.

TVS – in Axial Leads (continued)

Table 2. Peak Power Dissipation, 1500 Watts @ 1 ms Surge (10 x 1000 μs) Case 41A – MOSORB


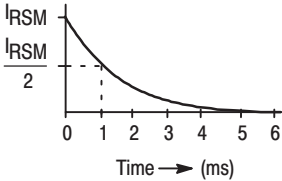
|  <p>CASE 41A PLASTIC Cathode = Polarity Band</p> | |  <p>Surge Current Characteristics</p> | | | | | |
|--|-----------------------------------|---|-----------|--|--|--|---|
| ELECTRICAL CHARACTERISTICS (T _A = 25°C unless otherwise noted) V _F = 3.5 V Max, I _F = 100 A Pulse | | | | | | | |
| Breakdown Voltage (Note 2) | | JEDEC Device | Device | Working Peak Reverse Voltage V _{RWM} (Volts) (Note 1) | Maximum Reverse Leakage @ V _{RWM} I _R (μA) | Maximum Reverse Surge Current I _{RSM} (Amps) (Note 3) | Maximum Reverse Voltage @ I _{RSM} (Clamping Voltage) V _{RSM} (Volts) |
| V _{BR} Volts | @ I _T Pulse (mA) | | | | | | |
| Nom | | | | | | | |
| 6.8 | 10 | 1N6267A | 1.5KE6.8A | 5.8 | 1000 | 143 | 10.5 |
| 8.2 | 10 | | 1.5KE8.2A | 7.02 | 200 | 124 | 12.1 |
| 10 | 1 | 1N6271A | 1.5KE10A | 8.55 | 10 | 103 | 14.5 |
| 11 | 1 | | 1.5KE11A | 9.4 | 5 | 96 | 15.6 |
| 12 | 1 | | 1.5KE12A | 10.2 | 5 | 90 | 16.7 |
| 13 | 1 | 1N6274A | 1.5KE13A | 11.1 | 5 | 82 | 18.2 |
| 15 | 1 | 1N6275A | 1.5KE15A | 12.8 | 5 | 71 | 21.2 |
| 16 | 1 | 1N6276A | 1.5KE16A | 13.6 | 5 | 67 | 22.5 |
| 18 | 1 | 1N6277A | 1.5KE18A | 15.3 | 5 | 59.5 | 25.2 |
| 20 | 1 | 1N6278A | 1.5KE20A | 17.1 | 5 | 54 | 27.7 |
| 22 | 1 | 1N6279A | | 18.8 | 5 | 49 | 30.6 |
| 24 | 1 | 1N6280A | 1.5KE24A | 20.5 | 5 | 45 | 33.2 |
| 27 | 1 | 1N6281A | 1.5KE27A | 23.1 | 5 | 40 | 37.5 |
| 30 | 1 | 1N6282A | 1.5KE30A | 25.6 | 5 | 36 | 41.4 |
| 33 | 1 | 1N6283A | 1.5KE33A | 28.2 | 5 | 33 | 45.7 |
| 36 | 1 | 1N6284A | 1.5KE36A | 30.8 | 5 | 30 | 49.9 |
| 39 | 1 | 1N6285A | 1.5KE39A | 33.3 | 5 | 28 | 53.9 |
| 43 | 1 | 1N6286A | 1.5KE43A | 36.8 | 5 | 25.3 | 59.3 |
| 47 | 1 | 1N6287A | 1.5KE47A | 40.2 | 5 | 23.2 | 64.8 |
| 51 | 1 | 1N6288A | 1.5KE51A | 43.6 | 5 | 21.4 | 70.1 |
| 56 | 1 | 1N6289A | 1.5KE56A | 47.8 | 5 | 19.5 | 77 |
| 62 | 1 | 1N6290A | 1.5KE62A | 53 | 5 | 17.7 | 85 |
| 68 | 1 | 1N6291A | 1.5KE68A | 58.1 | 5 | 16.3 | 92 |
| 75 | 1 | 1N6292A | 1.5KE75A | 64.1 | 5 | 14.6 | 103 |
| 82 | 1 | | 1.5KE82A | 70.1 | 5 | 13.3 | 113 |
| 91 | 1 | 1N6294A | 1.5KE91A | 77.8 | 5 | 12 | 125 |
| 100 | 1 | 1N6295A | | 85.5 | 5 | 11 | 137 |

1. A transient suppressor is normally selected according to the Working Peak Reverse Voltage (V_{RWM}) which should be equal to or greater than the DC or continuous peak operating voltage level.
2. V_{BR} measured at pulse test current I_T at ambient temperature of 25°C.
3. 10 x 1000 μs exponential decay surge waveform.

TVS – in Surface Mount

Table 3. 1PMT Series Unidirectional Overvoltage Transient Suppressors, 200 Watts Peak Power @ 1 ms Surge (10 x 1000 μ s)

ELECTRICAL CHARACTERISTICS ($T_L = 30^\circ\text{C}$ unless otherwise noted) ($V_F = 1.25$ Volts @ 200 mA)

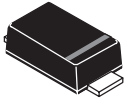
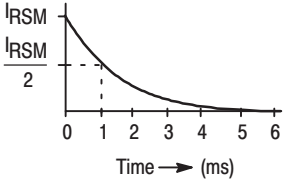
| Device | Marking | V_{RWM} (V) | V_{BR} @ I_T (V) (Note 2) | | | I_T | I_R @ V_{RWM} | V_C @ I_{PP} | I_{PP} (A) |
|---|---------|---|-------------------------------|-------|------|-------|-------------------|------------------|--------------|
| | | (Note 1) | Min | Nom | Max | (mA) | (μ A) | (V) | (Note 3) |
|  <p>POWERMITE® CASE 457 PLASTIC</p> | |  <p>Surge Current Characteristics</p> | | | | | | | |
| | | 1PMT5.0A | MKE | 5.0 | 6.4 | 6.7 | 7.0 | 10 | 800 |
| 1PMT7.0A | MKM | 7.0 | 7.78 | 8.2 | 8.6 | 10 | 500 | 12 | 14.6 |
| 1PMT12A | MLE | 12 | 13.3 | 14 | 14.7 | 1.0 | 5.0 | 19.9 | 8.8 |
| 1PMT16A | MLP | 16 | 17.8 | 18.75 | 19.7 | 1.0 | 5.0 | 26 | 7.0 |
| 1PMT22A | MLX | 22 | 24.4 | 25.6 | 26.9 | 1.0 | 5.0 | 35.5 | 4.9 |
| 1PMT26A | MME | 26 | 28.9 | 30.4 | 31.9 | 1.0 | 5.0 | 42.1 | 4.2 |
| 1PMT33A | MMM | 33 | 36.7 | 38.7 | 40.6 | 1.0 | 5.0 | 53.3 | 3.3 |

1. A transient suppressor is normally selected according to the Working Peak Reverse Voltage (V_{RWM}) which should be equal to or greater than the DC or continuous peak operating voltage level.
2. V_{BR} measured at pulse test current I_T at ambient temperature of 25°C .
3. 10 x 1000 μ s exponential decay surge waveform.

TVS – in Surface Mount (continued)

Table 4. SMF Series Unidirectional Overvoltage Transient Suppressors, 200 Watts Peak Power @ 1 ms Surge (10 x 1000 μs)

ELECTRICAL CHARACTERISTICS (T_L = 30°C unless otherwise noted) (V_F = 1.25 Volts @ 200 mA)


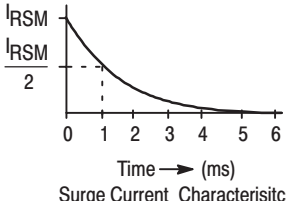
| Device | Marking | V _{RWM} (V) | V _{BR} @ I _T (V) (Note 2) | | | I _T | I _R @ V _{RWM} | V _C @ I _{PP} | I _{PP} (A) |
|---|---------|---|---|-------|------|----------------|-----------------------------------|----------------------------------|---------------------|
| | | (Note 1) | Min | Nom | Max | (mA) | (μA) | (V) | (Note 3) |
|  <p>SOD-123FL CASE 498 PLASTIC</p> | |  <p>Surge Current Characteristics</p> | | | | | | | |
| | | SMF5.0A | KE | 5.0 | 6.4 | 6.7 | 7.0 | 10 | 400 |
| SMF6.0A | KG | 6.0 | 6.67 | 7.02 | 7.37 | 10 | 400 | 10.3 | 14.6 |
| SMF6.5A | KK | 6.5 | 7.22 | 7.6 | 7.98 | 10 | 250 | 11.2 | 13.4 |
| SMF7.0A | KM | 7.0 | 7.78 | 8.2 | 8.6 | 10 | 100 | 12 | 12.5 |
| SMF7.5A | KP | 7.5 | 8.33 | 8.77 | 9.21 | 1.0 | 50 | 12.9 | 11.6 |
| SMF8.0A | KR | 8.0 | 8.89 | 9.36 | 9.83 | 1.0 | 25 | 13.6 | 11 |
| SMF9.0A | KV | 9.0 | 10 | 10.55 | 11.1 | 1.0 | 5.0 | 15.4 | 9.7 |
| SMF10A | KX | 10 | 11.1 | 11.7 | 12.3 | 1.0 | 2.5 | 17 | 8.8 |
| SMF11A | KZ | 11 | 12.2 | 12.85 | 13.5 | 1.0 | 2.5 | 18.2 | 8.2 |
| SMF12A | LE | 12 | 13.3 | 14 | 14.7 | 1.0 | 2.5 | 19.9 | 7.5 |
| SMF13A | LG | 13 | 14.4 | 15.15 | 15.9 | 1.0 | 1.0 | 21.5 | 7.0 |
| SMF14A | LK | 14 | 15.6 | 16.4 | 17.2 | 1.0 | 1.0 | 23.2 | 6.5 |
| SMF15A | LM | 15 | 16.7 | 17.6 | 18.5 | 1.0 | 1.0 | 24.4 | 6.1 |
| SMF17A | LR | 17 | 18.9 | 19.9 | 20.9 | 1.0 | 1.0 | 27.6 | 5.4 |
| SMF18A | LT | 18 | 20 | 21 | 22.1 | 1.0 | 1.0 | 29.2 | 5.1 |
| SMF20A | LV | 20 | 22.2 | 23.35 | 24.5 | 1.0 | 1.0 | 32.4 | 4.6 |
| SMF22A | LX | 22 | 24.4 | 25.6 | 26.9 | 1.0 | 1.0 | 35.5 | 4.2 |
| SMF24A | LZ | 24 | 26.7 | 28.1 | 29.5 | 1.0 | 1.0 | 38.9 | 3.9 |
| SMF26A | ME | 26 | 28.9 | 30.4 | 31.9 | 1.0 | 1.0 | 42.1 | 3.6 |
| SMF28A | MG | 28 | 31.1 | 32.8 | 34.4 | 1.0 | 1.0 | 45.4 | 3.3 |
| SMF30A | MK | 30 | 33.3 | 35.1 | 36.8 | 1.0 | 1.0 | 48.4 | 3.1 |
| SMF33A | MM | 33 | 36.7 | 38.7 | 40.6 | 1.0 | 1.0 | 53.3 | 2.8 |
| SMF36A | MP | 36 | 40 | 42.1 | 44.2 | 1.0 | 1.0 | 58.1 | 2.6 |
| SMF40A | MR | 40 | 44.4 | 46.8 | 49.1 | 1.0 | 1.0 | 64.5 | 2.3 |
| SMF43A | MT | 43 | 47.8 | 50.3 | 52.8 | 1.0 | 1.0 | 69.4 | 2.2 |
| SMF45A | MV | 45 | 50 | 52.65 | 55.3 | 1.0 | 1.0 | 72.7 | 2.1 |
| SMF48A | MX | 48 | 53.3 | 56.1 | 58.9 | 1.0 | 1.0 | 77.4 | 1.9 |
| SMF51A | MZ | 51 | 56.7 | 59.7 | 62.7 | 1.0 | 1.0 | 82.4 | 1.8 |
| SMF54A | NE | 54 | 60 | 63.15 | 66.3 | 1.0 | 1.0 | 87.1 | 1.7 |

1. A transient suppressor is normally selected according to the Working Peak Reverse Voltage (V_{RWM}) which should be equal to or greater than the DC or continuous peak operating voltage level.
2. V_{BR} measured at pulse test current I_T at ambient temperature of 25°C.
3. 10 x 1000 μs exponential decay surge waveform. TVS – in Surface Mount (continued)

TVS – in Surface Mount (continued)

Table 5. 1SMA Series Unidirectional Overvoltage Transient Suppressors; 400 Watts Peak Power @ 1 ms Surge (10 x 1000 μs)

ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted) ($V_F = 3.5$ Volts @ $I_F = 40$ A for all types) (Note 4)


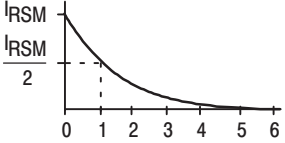
| Device | Working Peak Reverse Voltage V_{RWM} (Volts) (Note 1) | Breakdown Voltage | | Maximum Reverse Voltage @ I_{RSM} (Clamping Voltage) V_C (Volts) | Maximum Reverse Surge Current I_{PP} (Amps) (Note 3) | Maximum Reverse Leakage @ V_{RWM} I_R (μA) | Device Marking |
|---|---|-------------------------------|----------|--|--|--|----------------|
| | | V_{BR} Volts (Min) (Note 2) | I_T mA | | | | |
|  SMA CASE 403B PLASTIC | | | | | | | |
|  <p>Surge Current Characteristics</p> | | | | | | | |
| 1SMA5.0A | 5.0 | 6.4 | 10 | 9.2 | 43.5 | 400 | QE |
| 1SMA6.0A | 6.0 | 6.67 | 10 | 10.3 | 38.8 | 400 | QG |
| 1SMA6.5A | 6.5 | 7.22 | 10 | 11.2 | 35.7 | 250 | QK |
| 1SMA8.0A | 8.0 | 8.89 | 1 | 13.6 | 29.4 | 25 | QR |
| 1SMA8.5A | 8.5 | 9.44 | 1 | 14.4 | 27.8 | 5.0 | QT |
| 1SMA9.0A | 9.0 | 10 | 1 | 15.4 | 26.0 | 2.5 | QV |
| 1SMA10A | 10 | 11.1 | 1 | 17.0 | 23.5 | 2.5 | QX |
| 1SMA11A | 11 | 12.2 | 1 | 18.2 | 22.0 | 2.5 | QZ |
| 1SMA12A | 12 | 13.3 | 1 | 19.9 | 20.1 | 2.5 | RE |
| 1SMA13A | 13 | 14.4 | 1 | 21.5 | 18.6 | 2.5 | RG |
| 1SMA15A | 15 | 16.7 | 1 | 24.4 | 16.4 | 2.5 | RM |
| 1SMA16A | 16 | 17.8 | 1 | 26.0 | 15.4 | 2.5 | RP |
| 1SMA17A | 17 | 18.9 | 1 | 27.6 | 14.5 | 2.5 | RR |
| 1SMA18A | 18 | 20 | 1 | 29.2 | 13.7 | 2.5 | RT |
| 1SMA20A | 20 | 22.2 | 1 | 32.4 | 12.3 | 2.5 | RV |
| 1SMA22A | 22 | 24.4 | 1 | 35.5 | 11.3 | 2.5 | RX |
| 1SMA24A | 24 | 26.7 | 1 | 38.9 | 10.3 | 2.5 | RZ |
| 1SMA26A | 26 | 28.9 | 1 | 42.1 | 9.5 | 2.5 | SE |
| 1SMA28A | 28 | 31.1 | 1 | 45.4 | 8.8 | 2.5 | SG |
| 1SMA30A | 30 | 33.3 | 1 | 48.4 | 8.3 | 2.5 | SK |
| 1SMA33A | 33 | 36.7 | 1 | 53.3 | 7.5 | 2.5 | SM |
| 1SMA36A | 36 | 40 | 1 | 58.1 | 6.9 | 2.5 | SP |
| 1SMA40A | 40 | 44.4 | 1 | 64.5 | 6.2 | 2.5 | SR |
| 1SMA43A | 43 | 47.8 | 1 | 69.4 | 5.8 | 2.5 | ST |
| 1SMA45A | 45 | 50 | 1 | 72.2 | 5.5 | 2.5 | SV |
| 1SMA48A | 48 | 53.3 | 1 | 77.4 | 5.2 | 2.5 | SX |
| 1SMA54A | 54 | 60 | 1 | 87.1 | 4.6 | 2.5 | TE |
| 1SMA58A | 58 | 64.4 | 1 | 93.6 | 4.8 | 2.5 | TG |
| 1SMA70A | 70 | 77.8 | 1 | 113.0 | 3.5 | 2.5 | TP |

1. A transient suppressor is normally selected according to the Working Peak Reverse Voltage (V_{RWM}) which should be equal to or greater than the DC or continuous peak operating voltage level.
2. V_{BR} measured at pulse test current I_T at ambient temperature of 25°C .
3. $10 \times 1000 \mu\text{s}$ exponential decay surge waveform.
4. 1/2 sine wave (or equivalent square pulse, $PW = 8.3$ ms, duty cycle = 4 pulses per minute).

TVS – in Surface Mount (continued)

Table 6. 1SMA Series Bidirectional Zener Overvoltage Transient Suppressors; 400 Watts Peak Power @ 1 ms Surge (10 x 1000 μs)

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)


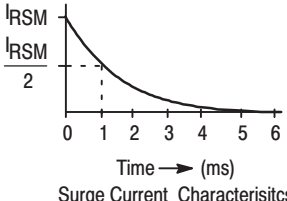
| Device | Working Peak Reverse Voltage V _{RWM} (Volts) (Note 1) | Breakdown Voltage | | Maximum Reverse Voltage @ I _{RSM} (Clamping Voltage) V _C (Volts) | Maximum Reverse Surge Current I _{PP} (Amps) (Note 3) | Maximum Reverse Leakage @ V _{RWM} I _R (μA) | Device Marking |
|--|--|--------------------------------------|-------------------|--|---|--|----------------|
| | | V _{BR} Volts (Min) (Note 2) | I _T mA | | | | |
|  <p>SMA CASE 403B PLASTIC</p>  <p>Surge Current Characteristics</p> | | | | | | | |
| 1SMA10CA | 10 | 11.1 | 1 | 17.0 | 23.5 | 2.5 | QXC |
| 1SMA13CA | 13 | 14.4 | 1 | 21.5 | 18.6 | 2.5 | RGC |
| 1SMA15CA | 15 | 16.7 | 1 | 24.4 | 16.4 | 2.5 | RMC |
| 1SMA16CA | 16 | 17.8 | 1 | 26.0 | 15.4 | 2.5 | RPC |
| 1SMA18CA | 18 | 20 | 1 | 29.2 | 13.7 | 2.5 | RTC |
| 1SMA20CA | 20 | 22.2 | 1 | 32.4 | 12.3 | 2.5 | RVC |
| 1SMA24CA | 24 | 26.7 | 1 | 38.9 | 10.3 | 2.5 | RZC |
| 1SMA26CA | 26 | 28.9 | 1 | 42.1 | 9.5 | 2.5 | SEC |
| 1SMA30CA | 30 | 33.3 | 1 | 48.4 | 8.3 | 2.5 | SKC |
| 1SMA33CA | 33 | 36.7 | 1 | 53.3 | 7.5 | 2.5 | SMC |
| 1SMA36CA | 36 | 40 | 1 | 58.1 | 6.9 | 2.5 | SPC |
| 1SMA40CA | 40 | 44.4 | 1 | 64.5 | 6.2 | 2.5 | SRC |
| 1SMA48CA | 48 | 53.3 | 1 | 77.4 | 5.2 | 2.5 | SXC |
| 1SMA58CA | 58 | 64.4 | 1 | 93.6 | 4.3 | 2.5 | TGC |
| 1SMA60CA | 60 | 66.7 | 1 | 96.8 | 4.1 | 2.5 | TKC |
| 1SMA70CA | 70 | 77.8 | 1 | 113.0 | 3.5 | 2.5 | TPC |
| 1SMA78CA | 78 | 86.7 | 1 | 126.0 | 3.2 | 2.5 | TSC |

1. A transient suppressor is normally selected according to the Working Peak Reverse Voltage (V_{RWM}) which should be equal to or greater than the DC or continuous peak operating voltage level.
2. V_{BR} measured at pulse test current I_T at ambient temperature of 25°C.
3. 10 x 1000 μs exponential decay surge waveform.

TVS – in Surface Mount (continued)

Table 7. 1SMB Series Unidirectional Overvoltage Transient Suppressors; 600 Watts Peak Power @ 1ms Surge (10 x 1000 μs)

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted) (V_F = 3.5 V Max @ I_F = 30 A) (Note 4)

| Device | Working Peak Reverse Voltage V _{RWM} Volts (Note 1) | Breakdown Voltage V _{BR} @ I _T | | Maximum Clamping Voltage V _C @ I _{pp} Volts | Peak Pulse Current I _{pp} Amps (Note 3) | Maximum Reverse Leakage @ V _R I _R μA | Device Marking |
|---|--|--|------------|---|--|--|----------------|
| | | Volts (Min) (Note 2) | mA | | | | |
|  <p>SMB CASE 403A PLASTIC</p>  <p>Surge Current Characteristics</p> | | | | | | | |
| 1SMB5.0A | 5.0 | 6.40 | 10 | 9.2 | 65.2 | 800 | KE |
| 1SMB6.0A | 6.0 | 6.67 | 10 | 10.3 | 58.3 | 800 | KG |
| 1SMB6.5A | 6.5 | 7.22 | 10 | 11.2 | 53.6 | 500 | KK |
| 1SMB7.0A | 7.0 | 7.78 | 10 | 12.0 | 50.0 | 200 | KM |
| 1SMB7.5A | 7.5 | 8.33 | 1.0 | 12.9 | 46.5 | 100 | KP |
| 1SMB8.0A | 8.0 | 8.89 | 1.0 | 13.6 | 44.1 | 50 | KR |
| 1SMB8.5A | 8.5 | 9.44 | 1.0 | 14.4 | 41.7 | 10 | KT |
| 1SMB9.0A | 9.0 | 10.0 | 1.0 | 15.4 | 39.0 | 5.0 | KV |
| 1SMB10A | 10 | 11.1 | 1.0 | 17.0 | 35.3 | 5.0 | KX |
| 1SMB11A | 11 | 12.2 | 1.0 | 18.2 | 33.0 | 5.0 | KZ |
| 1SMB12A | 12 | 13.3 | 1.0 | 19.9 | 30.2 | 5.0 | LE |
| 1SMB13A | 13 | 14.4 | 1.0 | 21.5 | 27.9 | 5.0 | LG |
| 1SMB14A | 14 | 15.6 | 1.0 | 23.2 | 25.8 | 5.0 | LK |
| 1SMB15A | 15 | 16.7 | 1.0 | 24.4 | 24.0 | 5.0 | LM |
| 1SMB16A | 16 | 17.8 | 1.0 | 26.0 | 23.1 | 5.0 | LP |
| 1SMB17A | 17 | 18.9 | 1.0 | 27.6 | 21.7 | 5.0 | LR |
| 1SMB18A | 18 | 20.0 | 1.0 | 29.2 | 20.5 | 5.0 | LT |
| 1SMB20A | 20 | 22.2 | 1.0 | 32.4 | 18.5 | 5.0 | LV |
| 1SMB22A | 22 | 24.4 | 1.0 | 35.5 | 16.9 | 5.0 | LX |
| 1SMB24A | 24 | 26.7 | 1.0 | 38.9 | 15.4 | 5.0 | LZ |
| 1SMB26A | 26 | 28.9 | 1.0 | 42.1 | 14.2 | 5.0 | ME |
| 1SMB28A | 28 | 31.1 | 1.0 | 45.4 | 13.2 | 5.0 | MG |
| 1SMB30A | 30 | 33.3 | 1.0 | 48.4 | 12.4 | 5.0 | MK |
| 1SMB33A | 33 | 36.7 | 1.0 | 53.3 | 11.3 | 5.0 | MM |
| 1SMB36A | 36 | 40.0 | 1.0 | 58.1 | 10.3 | 5.0 | MP |
| 1SMB40A | 40 | 44.4 | 1.0 | 64.5 | 9.3 | 5.0 | MR |
| 1SMB43A | 43 | 47.8 | 1.0 | 69.4 | 8.6 | 5.0 | MT |
| 1SMB45A | 45 | 50.0 | 1.0 | 72.7 | 8.3 | 5.0 | MV |
| 1SMB48A | 48 | 53.3 | 1.0 | 77.4 | 7.7 | 5.0 | MX |
| 1SMB51A | 51 | 56.7 | 1.0 | 82.4 | 7.3 | 5.0 | MZ |
| 1SMB54A | 54 | 60.0 | 1.0 | 87.1 | 6.9 | 5.0 | NE |
| 1SMB58A | 58 | 64.4 | 1.0 | 93.6 | 6.4 | 5.0 | NG |
| 1SMB60A | 60 | 66.7 | 1.0 | 96.8 | 6.2 | 5.0 | NK |
| 1SMB64A | 64 | 71.1 | 1.0 | 103 | 5.8 | 5.0 | NM |
| 1SMB70A | 70 | 77.8 | 1.0 | 113 | 5.3 | 5.0 | NP |
| 1SMB75A | 75 | 83.3 | 1.0 | 121 | 4.9 | 5.0 | NR |
| 1SMB85A | 85 | 94.4 | 1.0 | 137 | 4.4 | 5.0 | NV |
| 1SMB90A | 90 | 100 | 1.0 | 146 | 4.1 | 5.0 | NX |
| 1SMB100A | 100 | 111 | 1.0 | 162 | 3.7 | 5.0 | NZ |


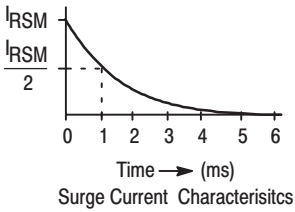
1. A transient suppressor is normally selected according to the Working Peak Reverse Voltage (V_{RWM}) which should be equal to or greater than the DC or continuous peak operating voltage level.
2. V_{BR} measured at pulse test current I_T at ambient temperature of 25°C.
3. 10 x 1000 μs exponential decay surge waveform.
4. 1/2 sine wave (or equivalent square pulse, PW = 8.3 ms, duty cycle = 4 pulses per minute).

Devices listed in **bold, italic** are ON Semiconductor preferred devices.

TVS – in Surface Mount (continued)

Table 7. 1SMB Series Unidirectional Overvoltage Transient Suppressors; 600 Watts Peak Power @ 1ms Surge (10 x 1000 μs) (continued)

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted) (V_F = 3.5 V Max @ I_F = 30 A) (Note 4)


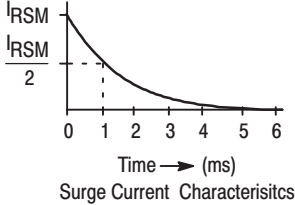
| Device | Working Peak Reverse Voltage V _{RWM} Volts (Note 1) | Breakdown Voltage V _{BR} @ I _T | | Maximum Clamping Voltage V _C @ I _{pp} Volts | Peak Pulse Current I _{pp} Amps (Note 3) | Maximum Reverse Leakage @ V _R I _R μA | Device Marking |
|--|--|---|-----|---|---|---|----------------|
| | | Volts (Min) (Note 2) | mA | | | | |
|  <p>SMB CASE 403A PLASTIC</p>  <p>Surge Current Characteristics</p> | | | | | | | |
| 1SMB110A | 110 | 122 | 1.0 | 177 | 3.4 | 5.0 | PE |
| 1SMB120A | 120 | 133 | 1.0 | 193 | 3.1 | 5.0 | PG |
| 1SMB130A | 130 | 144 | 1.0 | 209 | 2.9 | 5.0 | PK |
| 1SMB150A | 150 | 167 | 1.0 | 243 | 2.5 | 5.0 | PM |
| 1SMB160A | 160 | 178 | 1.0 | 259 | 2.3 | 5.0 | PP |
| 1SMB170A | 170 | 189 | 1.0 | 275 | 2.2 | 5.0 | PR |

1. A transient suppressor is normally selected according to the Working Peak Reverse Voltage (V_{RWM}) which should be equal to or greater than the DC or continuous peak operating voltage level.
2. V_{BR} measured at pulse test current I_T at ambient temperature of 25°C.
3. 10 x 1000 μs exponential decay surge waveform.
4. 1/2 sine wave (or equivalent square pulse, PW = 8.3 ms, duty cycle = 4 pulses per minute).

TVS – in Surface Mount (continued)

Table 8. 1SMB Series Bidirectional Overvoltage Transient Suppressors; 600 Watts Peak Power @ 1ms Surge (10 x 1000 μs)

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted).

| Device | Working Peak Reverse Voltage V _{RWM} Volts (Note 1) | Breakdown Voltage | | Maximum Clamping Voltage V _C @ I _{pp} Volts | Peak Pulse Current I _{pp} Amps (Note 3) | Maximum Reverse Leakage @ V _R I _R μA | Device Marking |
|---|--|--------------------------------------|------------|--|---|---|----------------|
| | | V _{BR} @ I _T | | | | | |
| | | Volts (Min) (Note 2) | mA | | | | |
|  | | SMB CASE 403A PLASTIC | |  | | | |
| 1SMB10CA | 10 | 11.1 | 1.0 | 17.0 | 35.3 | 5.0 | KXC |
| 1SMB11CA | 11 | 12.2 | 1.0 | 18.2 | 33.0 | 5.0 | KZC |
| 1SMB12CA | 12 | 13.3 | 1.0 | 19.9 | 30.2 | 5.0 | LEC |
| 1SMB13CA | 13 | 14.4 | 1.0 | 21.5 | 27.9 | 5.0 | LGC |
| 1SMB14CA | 14 | 15.6 | 1.0 | 23.2 | 25.8 | 5.0 | LKC |
| 1SMB15CA | 15 | 16.7 | 1.0 | 24.4 | 24.0 | 5.0 | LMC |
| 1SMB16CA | 16 | 17.8 | 1.0 | 26.0 | 23.1 | 5.0 | LPC |
| 1SMB17CA | 17 | 18.9 | 1.0 | 27.6 | 21.7 | 5.0 | LRC |
| 1SMB18CA | 18 | 20.0 | 1.0 | 29.2 | 20.5 | 5.0 | LTC |
| 1SMB20CA | 20 | 22.2 | 1.0 | 32.4 | 18.5 | 5.0 | LVC |
| 1SMB22CA | 22 | 24.4 | 1.0 | 35.5 | 16.9 | 5.0 | LXC |
| 1SMB24CA | 24 | 26.7 | 1.0 | 38.9 | 15.4 | 5.0 | LZC |
| 1SMB26CA | 26 | 28.9 | 1.0 | 42.1 | 14.2 | 5.0 | MEC |
| 1SMB28CA | 28 | 31.1 | 1.0 | 45.4 | 13.2 | 5.0 | MGC |
| 1SMB30CA | 30 | 33.3 | 1.0 | 48.4 | 12.4 | 5.0 | MKC |
| 1SMB33CA | 33 | 36.7 | 1.0 | 53.3 | 11.3 | 5.0 | MMC |
| 1SMB36CA | 36 | 40.0 | 1.0 | 58.1 | 10.3 | 5.0 | MPC |
| 1SMB40CA | 40 | 44.4 | 1.0 | 64.5 | 9.3 | 5.0 | MRC |
| 1SMB43CA | 43 | 47.8 | 1.0 | 69.4 | 8.6 | 5.0 | MTC |
| 1SMB45CA | 45 | 50.0 | 1.0 | 72.7 | 8.3 | 5.0 | MVC |
| 1SMB48CA | 48 | 53.3 | 1.0 | 77.4 | 7.7 | 5.0 | MXC |
| 1SMB51CA | 51 | 56.7 | 1.0 | 82.4 | 7.3 | 5.0 | MZC |
| 1SMB54CA | 54 | 60.0 | 1.0 | 87.1 | 6.9 | 5.0 | NEC |
| 1SMB58CA | 58 | 64.4 | 1.0 | 93.6 | 6.4 | 5.0 | NGC |
| 1SMB60CA | 60 | 66.7 | 1.0 | 96.8 | 6.2 | 5.0 | NKC |
| 1SMB64CA | 64 | 71.1 | 1.0 | 103 | 5.8 | 5.0 | NMC |
| 1SMB75CA | 75 | 83.3 | 1.0 | 121 | 4.9 | 5.0 | NRC |


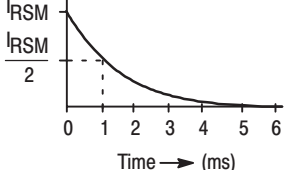
1. A transient suppressor is normally selected according to the Working Peak Reverse Voltage (V_{RWM}) which should be equal to or greater than the DC or continuous peak operating voltage level.
2. V_{BR} measured at pulse test current I_T at ambient temperature of 25°C.
3. 10 x 1000 μs exponential decay surge waveform.

Devices listed in **bold, italic** are ON Semiconductor preferred devices.

TVS – in Surface Mount (continued)

Table 9. P6SMB Series Unidirectional Overvoltage Transient Suppressors; 600 Watts Peak Power @ 1 ms Surge (10 x 1000 μs)

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted) (V_F = 3.5 V Max, I_F = 50 A for all types) (Note 4)


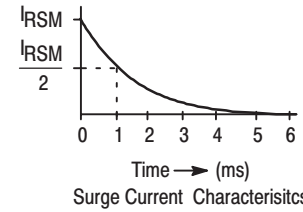
| Device | Breakdown Voltage | | | | Working Peak Reverse Voltage V _{RWM} Volts (Note 1) | Maximum Reverse Leakage @ V _{RWM} I _R μA | Maximum Reverse Surge Current I _{PP} Amps (Note 3) | Maximum Reverse Voltage @ I _{PP} (Clamping Voltage) V _C Volts | Maximum Temperature Coefficient of V _{BR} %/°C | Device Marking |
|---|---|------------|-------------|-----------|--|--|---|---|---|----------------|
| | V _{BR} @ I _T Volts (Note 2) | | | | | | | | | |
| | Min | Nom | Max | mA | | | | | | |
|  <p>SMB CASE 403A PLASTIC</p>  <p>Surge Current Characteristics</p> | | | | | | | | | | |
| P6SMB6.8A | 6.45 | 6.8 | 7.14 | 10 | 5.8 | 1000 | 57 | 10.5 | 0.057 | 6V8A |
| P6SMB7.5A | 7.13 | 7.5 | 7.88 | 10 | 6.4 | 500 | 53 | 11.3 | 0.061 | 7V5A |
| P6SMB8.2A | 7.79 | 8.2 | 8.61 | 10 | 7.02 | 200 | 50 | 12.1 | 0.065 | 8V2A |
| P6SMB9.1A | 8.65 | 9.1 | 9.55 | 1 | 7.78 | 50 | 45 | 13.4 | 0.068 | 9V1A |
| P6SMB10A | 9.5 | 10 | 10.5 | 1 | 8.55 | 10 | 41 | 14.5 | 0.073 | 10A |
| P6SMB12A | 11.4 | 12 | 12.6 | 1 | 10.2 | 5 | 36 | 16.7 | 0.078 | 12A |
| P6SMB13A | 12.4 | 13 | 13.7 | 1 | 11.1 | 5 | 33 | 18.2 | 0.081 | 13A |
| P6SMB15A | 14.3 | 15 | 15.8 | 1 | 12.8 | 5 | 28 | 21.2 | 0.084 | 15A |
| P6SMB16A | 15.2 | 16 | 16.8 | 1 | 13.6 | 5 | 27 | 22.5 | 0.086 | 16A |
| P6SMB18A | 17.1 | 18 | 18.9 | 1 | 15.3 | 5 | 24 | 25.2 | 0.088 | 18A |
| P6SMB20A | 19 | 20 | 21 | 1 | 17.1 | 5 | 22 | 27.7 | 0.09 | 20A |
| P6SMB22A | 20.9 | 22 | 23.1 | 1 | 18.8 | 5 | 20 | 30.6 | 0.092 | 22A |
| P6SMB24A | 22.8 | 24 | 25.2 | 1 | 20.5 | 5 | 18 | 33.2 | 0.094 | 24A |
| P6SMB27A | 25.7 | 27 | 28.4 | 1 | 23.1 | 5 | 16 | 37.5 | 0.096 | 27A |
| P6SMB30A | 28.5 | 30 | 31.5 | 1 | 25.6 | 5 | 14.4 | 41.4 | 0.097 | 30A |
| P6SMB33A | 31.4 | 33 | 34.7 | 1 | 28.2 | 5 | 13.2 | 45.7 | 0.098 | 33A |
| P6SMB36A | 34.2 | 36 | 37.8 | 1 | 30.8 | 5 | 12 | 49.9 | 0.099 | 36A |
| P6SMB39A | 37.1 | 39 | 41 | 1 | 33.3 | 5 | 11.2 | 53.9 | 0.1 | 39A |
| P6SMB43A | 40.9 | 43 | 45.2 | 1 | 36.8 | 5 | 10.1 | 59.3 | 0.101 | 43A |
| P6SMB47A | 44.7 | 47 | 49.4 | 1 | 40.2 | 5 | 9.3 | 64.8 | 0.101 | 47A |
| P6SMB51A | 48.5 | 51 | 53.6 | 1 | 43.6 | 5 | 8.6 | 70.1 | 0.102 | 51A |
| P6SMB56A | 53.2 | 56 | 58.8 | 1 | 47.8 | 5 | 7.8 | 77 | 0.103 | 56A |
| P6SMB62A | 58.9 | 62 | 65.1 | 1 | 53 | 5 | 7.1 | 85 | 0.104 | 62A |
| P6SMB68A | 64.6 | 68 | 71.4 | 1 | 58.1 | 5 | 6.5 | 92 | 0.104 | 68A |
| P6SMB75A | 71.3 | 75 | 78.8 | 1 | 64.1 | 5 | 5.8 | 103 | 0.105 | 75A |
| P6SMB82A | 77.9 | 82 | 86.1 | 1 | 70.1 | 5 | 5.3 | 113 | 0.105 | 82A |
| P6SMB91A | 86.5 | 91 | 95.5 | 1 | 77.8 | 5 | 4.8 | 125 | 0.106 | 91A |
| P6SMB100A | 95 | 100 | 105 | 1 | 85.5 | 5 | 4.4 | 137 | 0.106 | 100A |
| P6SMB110A | 105 | 110 | 116 | 1 | 94 | 5 | 4 | 152 | 0.107 | 110A |
| P6SMB120A | 114 | 120 | 126 | 1 | 102 | 5 | 3.6 | 165 | 0.107 | 120A |
| P6SMB130A | 124 | 130 | 137 | 1 | 111 | 5 | 3.3 | 179 | 0.107 | 130A |
| P6SMB150A | 143 | 150 | 158 | 1 | 128 | 5 | 2.9 | 207 | 0.108 | 150A |
| P6SMB160A | 152 | 160 | 168 | 1 | 136 | 5 | 2.7 | 219 | 0.108 | 160A |
| P6SMB180A | 171 | 180 | 189 | 1 | 154 | 5 | 2.4 | 246 | 0.108 | 180A |
| P6SMB200A | 190 | 200 | 210 | 1 | 171 | 5 | 2.2 | 274 | 0.108 | 200A |

- Devices listed in **bold, italic** are ON Semiconductor preferred devices.
1. A transient suppressor is normally selected according to the Working Peak Reverse Voltage (V_{RWM}) which should be equal to or greater than the DC or continuous peak operating voltage level.
 2. V_{BR} measured at pulse test current I_T at ambient temperature of 25°C.
 3. 10 x 1000 μs exponential decay surge waveform.
 4. 1/2 sine wave (or equivalent square pulse, PW = 8.3 ms, duty cycle = 4 pulses per minute).

TVS – in Surface Mount (continued)

Table 10. P6SMB Series Bidirectional Overvoltage Transient Suppressors; 600 Watts Peak Power @ 1 ms Surge (10 x 1000 μs)

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)

| Device | Breakdown Voltage | | | | Working Peak Reverse Voltage V _{RWM} Volts (Note 1) | Maximum Reverse Leakage @ V _{RWM} I _R μA | Maximum Reverse Surge Current I _{PP} Amps (Note 3) | Maximum Reverse Voltage @ I _{PP} (Clamping Voltage) V _C Volts | Maximum Temperature Coefficient of V _{BR} %/°C | Device Marking |
|---|---|-----------------------------|-----------------------------------|-------------------------|--|--|---|---|---|---------------------------------|
| | V _{BR} @ I _T Volts (Note 2) | | | | | | | | | |
| | Min | Nom | Max | mA | | | | | | |
|  <p style="text-align: center;">SMB CASE 403A PLASTIC</p>  <p style="text-align: center;">Surge Current Characteristics</p> | | | | | | | | | | |
| P6SMB11CA P6SMB12CA | 10.5 11.4 | 11 12 | 11.6 12.6 | 1 1 | 9.4 10.2 | 5 5 | 38 36 | 15.6 16.7 | 0.075 0.078 | 11C 12C |
| P6SMB15CA P6SMB16CA P6SMB18CA P6SMB20CA | 14.3 15.2 17.1 19 | 15 16 18 20 | 15.8 16.8 18.9 21 | 1 1 1 1 | 12.8 13.6 15.3 17.1 | 5 5 5 5 | 28 27 24 22 | 21.2 22.5 25.2 27.7 | 0.084 0.086 0.088 0.09 | 15C 16C 18C 20C |
| P6SMB22CA P6SMB24CA P6SMB27CA P6SMB30CA | 20.9 22.8 25.7 28.5 | 22 24 27 30 | 23.1 25.2 28.4 31.5 | 1 1 1 1 | 18.8 20.5 23.1 25.6 | 5 5 5 5 | 20 18 16 14.4 | 30.6 33.2 37.5 41.4 | 0.092 0.094 0.096 0.097 | 22C 24C 27C 30C |
| P6SMB33CA P6SMB36CA P6SMB39CA P6SMB43CA | 31.4 34.2 37.1 40.9 | 33 36 39 43 | 34.7 37.8 41 45.2 | 1 1 1 1 | 28.2 30.8 33.3 36.8 | 5 5 5 5 | 13.2 12 11.2 10.1 | 45.7 49.9 53.9 59.3 | 0.098 0.099 0.1 0.101 | 33C 36C 39C 43C |
| P6SMB47CA P6SMB51CA P6SMB56CA P6SMB62CA | 44.7 48.5 53.2 58.9 | 47 51 56 62 | 49.4 53.6 58.8 65.1 | 1 1 1 1 | 40.2 43.6 47.8 53 | 5 5 5 5 | 9.3 8.6 7.8 7.1 | 64.8 70.1 77 85 | 0.101 0.102 0.103 0.104 | 47C 51C 56C 62C |
| P6SMB68CA P6SMB82CA | 64.6 77.9 | 68 82 | 71.4 86.1 | 1 1 | 58.1 70.1 | 5 5 | 6.5 5.3 | 92 113 | 0.104 0.105 | 68C 82C |


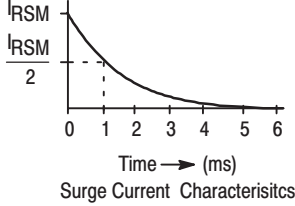
1. A transient suppressor is normally selected according to the Working Peak Reverse Voltage (V_{RWM}) which should be equal to or greater than the DC or continuous peak operating voltage level.
2. V_{BR} measured at pulse test current I_T at ambient temperature of 25°C.
3. 10 x 1000 μs exponential decay surge waveform.

Devices listed in **bold, italic** are ON Semiconductor preferred devices.

TVS – in Surface Mount (continued)

Table 11. SMBJ12AON Series Bidirectional Overvoltage Transient Suppressors; 600 Watts Peak Power @ 1 ms Surge (10 x 1000 μs)

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)


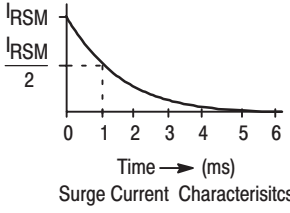
| Device | Breakdown Voltage | | | | Working Peak Reverse Voltage V _{RWM} Volts (Note 1) | Maximum Reverse Leakage @ V _{RWM} I _R μA | Maximum Reverse Surge Current I _{PP} Amps (Note 3) | Maximum Reverse Voltage @ I _{PP} (Clamping Voltage) V _C Volts |
|--|--|-------|------|----|---|--|--|---|
| | V _{BR} @ I _T Volts (Note 2) | | | | | | | |
| | Min | Nom | Max | mA | | | | |
|  <p>SMB CASE 403A PLASTIC</p> | | | | |  <p>Surge Current Characteristics</p> | | | |
| SMBJ12AON | 13.2 | 13.75 | 14.3 | 1 | 12 | 5 | 17.5 | 15.6 |

1. A transient suppressor is normally selected according to the Working Peak Reverse Voltage (V_{RWM}) which should be equal to or greater than the DC or continuous peak operating voltage level.
2. V_{BR} measured at pulse test current I_T at ambient temperature of 25°C.
3. 10 x 1000 μs exponential decay surge waveform.

TVS – in Surface Mount (continued)

Table 12. 1SMC Series Unidirectional Overvoltage Transient Suppressors; 1500 Watts Peak Power @ 1 ms Surge (10 x 1000 μs)

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted) (V_F = 3.5 V Max @ I_F = 100 A) (Note 4)

| Device | Working Peak Reverse Voltage V _R Volts (Note 1) | Breakdown Voltage | | Maximum Clamping Voltage V _C @ I _{pp} Volts | Peak Pulse Current I _{pp} Amps (Note 3) | Maximum Reverse Leakage @ V _R I _R μA | Device Marking |
|--|--|----------------------------------|------------|---|--|--|----------------|
| | | V _{BR} @ I _T | | | | | |
| | | Volts (Min) (Note 2) | mA | | | | |
|  <p>SMC CASE 403B PLASTIC</p>  <p>Surge Current Characteristics</p> | | | | | | | |
| 1SMC5.0A | 5.0 | 6.40 | 10 | 9.2 | 163.0 | 1000 | GDE |
| 1SMC6.0A | 6.0 | 6.67 | 10 | 10.3 | 145.6 | 1000 | GDG |
| 1SMC6.5A | 6.5 | 7.22 | 10 | 11.2 | 133.9 | 500 | GDK |
| 1SMC7.0A | 7.0 | 7.78 | 10 | 12.0 | 125.0 | 200 | GDM |
| 1SMC7.5A | 7.5 | 8.33 | 1.0 | 12.9 | 116.3 | 100 | GDP |
| 1SMC8.0A | 8.0 | 8.89 | 1.0 | 13.6 | 110.3 | 50 | GDR |
| 1SMC9.0A | 9.0 | 10.0 | 1.0 | 15.4 | 97.4 | 10 | GDV |
| 1SMC10A | 10 | 11.1 | 1.0 | 17.0 | 88.2 | 5.0 | GDX |
| 1SMC12A | 12 | 13.3 | 1.0 | 19.9 | 75.3 | 5.0 | GEE |
| 1SMC13A | 13 | 14.4 | 1.0 | 21.5 | 69.7 | 5.0 | GEG |
| 1SMC14A | 14 | 15.6 | 1.0 | 23.2 | 64.7 | 5.0 | GEK |
| 1SMC15A | 15 | 16.7 | 1.0 | 24.4 | 61.5 | 5.0 | GEM |
| 1SMC16A | 16 | 17.8 | 1.0 | 26.0 | 57.7 | 5.0 | GEP |
| 1SMC17A | 17 | 18.9 | 1.0 | 27.6 | 53.3 | 5.0 | GER |
| 1SMC18A | 18 | 20.0 | 1.0 | 29.2 | 51.4 | 5.0 | GET |
| 1SMC20A | 20 | 22.2 | 1.0 | 32.4 | 46.3 | 5.0 | GEV |
| 1SMC22A | 22 | 24.4 | 1.0 | 35.5 | 42.2 | 5.0 | GEX |
| 1SMC24A | 24 | 26.7 | 1.0 | 38.9 | 38.6 | 5.0 | GEZ |
| 1SMC26A | 26 | 28.9 | 1.0 | 42.1 | 35.6 | 5.0 | GFE |
| 1SMC28A | 28 | 31.1 | 1.0 | 45.4 | 33.0 | 5.0 | GFG |
| 1SMC30A | 30 | 33.3 | 1.0 | 48.4 | 31.0 | 5.0 | GFK |
| 1SMC33A | 33 | 36.7 | 1.0 | 53.3 | 28.1 | 5.0 | GFM |
| 1SMC36A | 36 | 40.0 | 1.0 | 58.1 | 25.8 | 5.0 | GFP |
| 1SMC40A | 40 | 44.4 | 1.0 | 64.5 | 23.2 | 5.0 | GFR |
| 1SMC43A | 43 | 47.8 | 1.0 | 69.4 | 21.6 | 5.0 | GFT |
| 1SMC48A | 48 | 53.3 | 1.0 | 77.4 | 19.4 | 5.0 | GFY |
| 1SMC51A | 51 | 56.7 | 1.0 | 82.4 | 18.2 | 5.0 | GFZ |
| 1SMC54A | 54 | 60.0 | 1.0 | 87.1 | 17.2 | 5.0 | GGE |
| 1SMC58A | 58 | 64.4 | 1.0 | 93.6 | 16.0 | 5.0 | GGG |
| 1SMC60A | 60 | 66.7 | 1.0 | 96.8 | 15.5 | 5.0 | GGK |
| 1SMC64A | 64 | 71.1 | 1.0 | 103 | 14.6 | 5.0 | GGM |
| 1SMC70A | 70 | 77.8 | 1.0 | 113 | 13.3 | 5.0 | GGP |
| 1SMC75A | 75 | 83.3 | 1.0 | 121 | 12.4 | 5.0 | GGR |
| 1SMC78A | 78 | 86.7 | 1.0 | 126 | 11.4 | 5.0 | GGT |


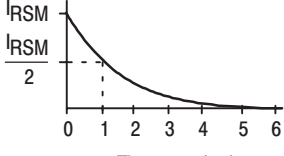
1. A transient suppressor is normally selected according to the Working Peak Reverse Voltage (V_{RWM}) which should be equal to or greater than the DC or continuous peak operating voltage level.
2. V_{BR} measured at pulse test current I_T at ambient temperature of 25°C.
3. 10 x 1000 μs exponential decay surge waveform.
4. 1/2 sine wave (or equivalent square pulse, PW = 8.3 ms, duty cycle = 4 pulses per minute).

Devices listed in **bold, italic** are ON Semiconductor preferred devices.

TVS – in Surface Mount (continued)

Table 13. 1.5 SMC Series Unidirectional Overvoltage Transient Suppressors; 1500 Watts Peak Power @ 1 ms Surge (10 x 1000 μs)

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted) (V_F = 3.5 V Max, I_F = 100 A for all types) (Note 4)

| Device | Breakdown Voltage | | | | Working Peak Reverse Voltage V _{RWM} Volts (Note 1) | Maximum Reverse Leakage @ V _{RWM} I _R μA | Maximum Reverse Surge Current I _{pp} Amps (Note 3) | Maximum Reverse Voltage @ I _{pp} (Clamping Voltage) V _C Volts | Maximum Temperature Coefficient of V _{BR} %/°C | Device Marking |
|--|---|-----------|-------------|----------|--|--|---|---|---|----------------|
| | V _{BR} @ I _T Volts (Note 2) | | | | | | | | | |
| | Min | Nom | Max | mA | | | | | | |
|  <p style="text-align: center;">SMC CASE 403 PLASTIC</p> <div style="display: flex; justify-content: space-around; align-items: center;">  </div> <p style="text-align: center;">Surge Current Characteristics</p> | | | | | | | | | | |
| 1.5SMC6.8A | 6.45 | 6.8 | 7.14 | 10 | 5.8 | 1000 | 143 | 10.5 | 0.057 | 6V8A |
| 1.5SMC7.5A | 7.13 | 7.5 | 7.88 | 10 | 6.4 | 500 | 132 | 11.3 | 0.061 | 7V5A |
| 1.5SMC10A | 9.5 | 10 | 10.5 | 1 | 8.55 | 10 | 103 | 14.5 | 0.073 | 10A |
| 1.5SMC12A | 11.4 | 12 | 12.6 | 1 | 10.2 | 5 | 90 | 16.7 | 0.078 | 12A |
| 1.5SMC13A | 12.4 | 13 | 13.7 | 1 | 11.1 | 5 | 82 | 18.2 | 0.081 | 13A |
| 1.5SMC15A | 14.3 | 15 | 15.8 | 1 | 12.8 | 5 | 71 | 21.2 | 0.084 | 15A |
| 1.5SMC16A | 15.2 | 16 | 16.8 | 1 | 13.6 | 5 | 67 | 22.5 | 0.086 | 16A |
| 1.5SMC18A | 17.1 | 18 | 18.9 | 1 | 15.3 | 5 | 59.5 | 25.2 | 0.088 | 18A |
| 1.5SMC20A | 19 | 20 | 21 | 1 | 17.1 | 5 | 54 | 27.7 | 0.09 | 20A |
| 1.5SMC22A | 20.9 | 22 | 23.1 | 1 | 18.8 | 5 | 49 | 30.6 | 0.092 | 22A |
| 1.5SMC24A | 22.8 | 24 | 25.2 | 1 | 20.5 | 5 | 45 | 33.2 | 0.094 | 24A |
| 1.5SMC27A | 25.7 | 27 | 28.4 | 1 | 23.1 | 5 | 40 | 37.5 | 0.096 | 27A |
| 1.5SMC30A | 28.5 | 30 | 31.5 | 1 | 25.6 | 5 | 36 | 41.4 | 0.097 | 30A |
| 1.5SMC33A | 31.4 | 33 | 34.7 | 1 | 28.2 | 5 | 33 | 45.7 | 0.098 | 33A |
| 1.5SMC36A | 34.2 | 36 | 37.8 | 1 | 30.8 | 5 | 30 | 49.9 | 0.099 | 36A |
| 1.5SMC39A | 37.1 | 39 | 41 | 1 | 33.3 | 5 | 28 | 53.9 | 0.1 | 39A |
| 1.5SMC43A | 40.9 | 43 | 45.2 | 1 | 36.8 | 5 | 25.3 | 59.3 | 0.101 | 43A |
| 1.5SMC47A | 44.7 | 47 | 49.4 | 1 | 40.2 | 5 | 23.2 | 64.8 | 0.101 | 47A |
| 1.5SMC51A | 48.5 | 51 | 53.6 | 1 | 43.6 | 5 | 21.4 | 70.1 | 0.102 | 51A |
| 1.5SMC56A | 53.2 | 56 | 58.8 | 1 | 47.8 | 5 | 19.5 | 77 | 0.103 | 56A |
| 1.5SMC62A | 58.9 | 62 | 65.1 | 1 | 53 | 5 | 17.7 | 85 | 0.104 | 62A |
| 1.5SMC68A | 64.6 | 68 | 71.4 | 1 | 58.1 | 5 | 16.3 | 92 | 0.104 | 68A |
| 1.5SMC75A | 71.3 | 75 | 78.8 | 1 | 64.1 | 5 | 14.6 | 103 | 0.105 | 75A |
| 1.5SMC82A | 77.9 | 82 | 86.1 | 1 | 70.1 | 5 | 13.3 | 113 | 0.105 | 82A |
| 1.5SMC91A | 86.5 | 91 | 95.5 | 1 | 77.8 | 5 | 12 | 125 | 0.106 | 91A |

1. A transient suppressor is normally selected according to the Working Peak Reverse Voltage (V_{RWM}) which should be equal to or greater than the DC or continuous peak operating voltage level.
2. V_{BR} measured at pulse test current I_T at ambient temperature of 25°C.
3. 10 x 1000 μs exponential decay surge waveform.
4. 1/2 sine wave (or equivalent square pulse, PW = 8.3 ms, duty cycle = 4 pulses per minute).



Devices listed in **bold, italic** are ON Semiconductor preferred devices.

TVS/ESD Protection – One Line

SD05 Series

Table 14. Single Line TVS/ESD in SOD-323; 350 Watts Peak Power (8 x 20 μs); Meets IEC61000-4-2, Level 4

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)
UNIDIRECTIONAL



| Device | Breakdown Voltage | | | | Reverse Voltage Working Peak V _{RWM} (Volts) | Max Reverse Leakage Current I _R (μA) | Max Reverse Surge Current I _{PP} (A) | Max Reverse Voltage @ I _{PP} (Clamping Voltage) V _C (V) | Typical Capacitance (pF) Pin 1 to 2 @ 0 Volts |
|--|------------------------------|------|-------|-----------------------|---|---|---|---|---|
| | V _{BR} (Note 5) (V) | | | @ I _T (mA) | | | | | |
| | Min | Nom | Max | | | | | | |
|  CASE 477 STYLE 1 SOD-323  | | | | | | | | | |
| SD05 | 6.2 | 6.75 | 7.3 | 1.0 | 5.0 | 10 | 24 | 14.5 | 350 |
| SD12 | 13.3 | 14.5 | 15.75 | 1.0 | 12 | 1.0 | 15 | 25 | 150 |

5. V_{BR} measured at pulse test current I_T at an ambient temperature of 25°C.

SD12C

Table 15. Single Line TVS/ESD in SOD-323; 350 Watts Peak Power (8 x 20 μs); Meets IEC61000-4-2, Level 4

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)
BIDIRECTIONAL

| Device | Breakdown Voltage | | | | Reverse Voltage Working Peak V _{RWM} (Volts) | Max Reverse Leakage Current I _R (μA) | Max Reverse Surge Current I _{PP} (A) | Max Reverse Voltage @ I _{PP} (Clamping Voltage) V _C (V) | Typical Capacitance (pF) Pin 1 to 2 @ 0 Volts |
|--|------------------------------|-----|-----|-----------------------|---|---|---|---|---|
| | V _{BR} (Note 6) (V) | | | @ I _T (mA) | | | | | |
| | Min | Nom | Max | | | | | | |
|  CASE 477 STYLE 1 SOD-323  | | | | | | | | | |
| SD12C | 13.3 | - | - | 1.0 | 12 | 1.0 | 15 | 24 | 64 |



6. V_{BR} measured at pulse test current I_T at an ambient temperature of 25°C.

TVS/ESD Protection – One Line (continued)

ESD5Z Series

Table 16. Single Line TVS/ESD in SOD–523; 200 Watts Peak Power (8 x 20 μs); Meets IEC61000–4–2, Level 4

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)
UNIDIRECTIONAL



| Device | Breakdown Voltage | | | | Reverse Voltage Working Peak V _{RWM} (Volts) | Max Reverse Leakage Current I _R (μA) | Max Reverse Surge Current I _{PP} (A) | Max Reverse Voltage @ I _{PP} (Clamping Voltage) V _C (V) | Typical Capacitance (pF) Pin 1 to 2 @ 0 Volts |
|--|------------------------------|-----|-----|-----------------------|---|---|---|---|---|
| | V _{BR} (Note 7) (V) | | | @ I _T (mA) | | | | | |
| | Min | Nom | Max | | | | | | |
|  CASE 502 SOD–523  | | | | | | | | | |
| ESD5Z2.5 | 4.0 | – | – | 1.0 | 2.5 | 6.0 | 11 | 10.9 | 145 |
| ESD5Z3.3 | 5.0 | – | – | 1.0 | 3.3 | 0.05 | 11.2 | 14.1 | 105 |
| ESD5Z5.0 | 6.2 | – | – | 1.0 | 5.0 | 0.05 | 9.4 | 18.6 | 80 |
| ESD5Z6.0 | 6.8 | – | – | 1.0 | 6.0 | 0.01 | 8.8 | 20.5 | 70 |
| ESD5Z7.0 | 7.5 | – | – | 1.0 | 7.0 | 0.01 | 8.8 | 22.7 | 65 |
| ESD5Z12 | 14.1 | – | – | 1.0 | 12 | 0.01 | 9.6 | 25 | 55 |

7. V_{BR} measured at pulse test current I_T at an ambient temperature of 25°C.

μESD Series

Table 17. Single Line TVS/ESD in SOD–723; 100 Watts Peak Power (8 x 20 μs); Meets IEC61000–4–2, Level 4

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)
UNIDIRECTIONAL

| Device | Breakdown Voltage | | | | Reverse Voltage Working Peak V _{RWM} (V) | Max Reverse Leakage Current I _R (μA) | Max Reverse Surge Current I _{PP} (A) | Max Reverse Voltage @ I _{PP} (Clamping Voltage) V _C (V) | Typical Capacitance (pF) Pin 1 to 2 @ 0 Volts |
|--|---|-----|-----|-----------------------|---|---|---|---|---|
| | V _{BR} (V) @ I _T (Note 8) | | | @ I _T (mA) | | | | | |
| | Min | Nom | Max | | | | | | |
|  CASE 509AA SOD–723  | | | | | | | | | |
| μESD3.3S | 5.0 | – | – | 1.0 | 3.3 | 2.5 | 10.4 | 10.9 | 80 |
| μESD5.0S | 6.2 | – | – | 1.0 | 5.0 | 1.0 | 8.8 | 13.3 | 65 |
| μESD12S | 13.5 | – | – | 1.0 | 12 | 1.0 | 5.4 | 23.7 | 30 |



8. V_{BR} measured at pulse test current I_T at an ambient temperature of 25°C.

TVS/ESD Protection – One Line (continued)

ESD9X Series

Table 18. Single Line TVS/ESD in SOD–923; 100 Watts Peak Power (8 x 20 μs); Meets IEC61000–4–2, Level 4

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)
UNIDIRECTIONAL

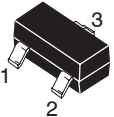
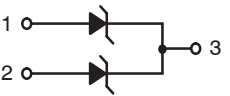
| Device | Breakdown Voltage | | | | Reverse Voltage Working Peak V _{RWM} (V) | Max Reverse Leakage Current I _R (μA) | Max Reverse Surge Current I _{PP} (A) | Max Reverse Voltage @ I _{PP} (Clamping Voltage) V _C (V) | Typical Capacitance (pF) Pin 1 to 2 @ 0 Volts |
|--|---|-----|-----|-----------------------|--|--|--|--|--|
| | V _{BR} (V) @ I _T (Note 9) | | | @ I _T (mA) | | | | | |
| | Min | Nom | Max | | | | | | |
|  CASE 514AA SOD–923  | | | | | | | | | |
| ESD9X3.3S | 5.0 | – | – | 1.0 | 3.3 | 2.5 | 9.8 | 10.4 | 80 |
| ESD9X5.0S | 6.2 | – | – | 1.0 | 5.0 | 1.0 | 8.7 | 13.3 | 65 |
| ESD9X12S | 13.5 | – | – | 1.0 | 12 | 1.0 | 5.9 | 23.7 | 30 |

9. V_{BR} measured at pulse test current I_T at an ambient temperature of 25°C.

NUP1105L – LIN Bus Protector

Table 19. Single Line TVS/ESD in SOT–23; 350 Watts Peak Power (8 x 20 μs); Meets IEC61000–4–2, Level 4

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)
BIDIRECTIONAL

| Device | Breakdown Voltage | | | | Max Reverse Leakage Current | | Capacitance (pF) @ 0 V, 1.0 MHz | | Max Reverse Surge Current I _{PP} (A) | Max Reverse Voltage @ I _{PP} (Clamping Voltage) V _C (V) | Peak Power Rating (8x20 μsec) (Note 10) |
|--|---------------------|-----|------|-----------------------|-----------------------------|----------------------|---------------------------------|-----|--|--|--|
| | V _{BR} (V) | | | @ I _T (mA) | I _R (μA) | V _{RWM} (V) | Typ | Max | | | |
| | Min | Nom | Max | | | | | | | | |
|  CASE 318 STYLE 27 SOT–23  | | | | | | | | | | | |
| NUP1105L | 25.7 | – | 28.4 | 1.0 | 0.1 | 24 | – | 30 | 8.0 | 44 | 350 |

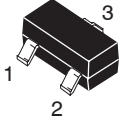
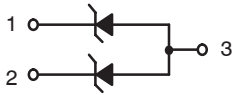
10. Surge waveform 8 x 20 μsec.

TVS/ESD Protection – Two Line

SM05 – Common Anode Series

Table 20. Two Line TVS/ESD in SOT-23; 300 Watts Peak Power (8 x 20 μs); Meets IEC61000-4-2, Level 4

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)
UNIDIRECTIONAL

| Device | Breakdown Voltage | | | | Reverse Voltage Working Peak V _{RWM} (Volts) | Max Reverse Leakage Current I _R (μA) | Max Reverse Surge Current I _{PP} (A) | Max Reverse Voltage @ I _{PP} (Clamping Voltage) V _C (V) | Typical Capacitance (pF) Pin 1 to 3 @ 0 Volts |
|---|-------------------------------|------|-------|-----------------------|---|---|---|---|---|
| | V _{BR} (Note 11) (V) | | | @ I _T (mA) | | | | | |
| | Min | Nom | Max | | | | | | |
|  <p style="text-align: center;">CASE 318 STYLE 12 LOW PROFILE SOT-23 PLASTIC</p>  | | | | | | | | | |
| SM05 | 6.2 | 6.75 | 7.3 | 1.0 | 5.0 | 10 | 17 | 9.8 | 225 |
| SM12 | 13.3 | 14.5 | 15.75 | 1.0 | 12 | 1.0 | 12 | 19 | 95 |

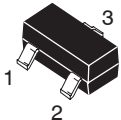
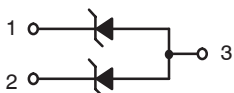
11. V_{BR} measured at pulse test current I_T at an ambient temperature of 25°C.

MA3075WAL

Table 21. Two Line TVS/ESD in SOT-23; Meets IEC61000-4-2, Level 4

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)
UNIDIRECTIONAL

(V_F = 0.9 V Max @ I_F = 10 mA)

| Device | Breakdown Voltage | | | | @ I _T (mA) | Max Reverse Leakage Current I _R (μA @ 5 V) | Maximum Temperature Coefficient of V _{BR} (mV/°C) |
|---|-------------------------------|-----|-----|-----|-----------------------|---|--|
| | V _{BR} (Note 12) (V) | | | | | | |
| | Min | Nom | Max | | | | |
|  <p style="text-align: center;">CASE 318 STYLE 12 LOW PROFILE SOT-23 PLASTIC</p>  | | | | | | | |
| MA3075WAL | 7.2 | 7.5 | 7.9 | 5.0 | 1.0 | 5.3 | |

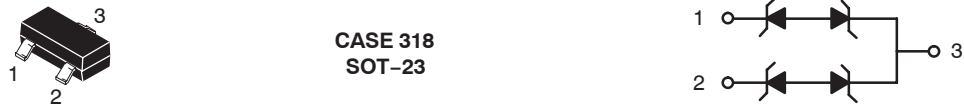
12. V_{BR} measured at pulse test current I_T at an ambient temperature of 25°C.

TVS/ESD Protection – Two Line (continued)

NUP2105L – CAN Bus Protector

Table 22. Two Line TVS/ESD in SOT-23; 350 Watts Peak Power (8 x 20 μs); Meets IEC61000-4-2, Level 4

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)
 BIDIRECTIONAL

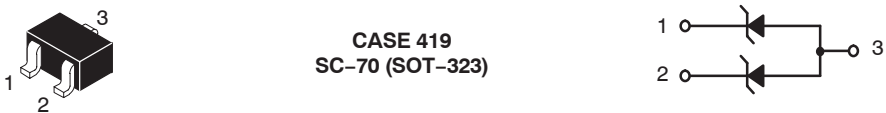
| Device | Breakdown Voltage | | | | Max Reverse Leakage Current | | Capacitance (pF) @ 0 V, 1.0 MHz | | Max Reverse Surge Current | Max Reverse Voltage @ I _{PP} (Clamping Voltage) | Peak Power Rating (8x20 μsec) (Note 13) |
|---|---------------------|-----|------------------|----------------|-----------------------------|-----|---------------------------------|-----|---------------------------|--|---|
| | V _{BR} (V) | | @ I _T | I _R | V _{RWM} | Typ | Max | | | | |
| | Min | Nom | | | | | | Max | (mA) | (μA) | (V) |
|  <p>CASE 318 SOT-23</p> | | | | | | | | | | | |
| NUP2105L | 26.2 | - | 32 | 1.0 | 0.1 | 24 | 30 | - | 8.0 | 44 | 350 |

13. Surge waveform 8 x 20 μsec.

DF3A6.8FU

Table 23. Two Line TVS/ESD in SC-70; 150 Watts Peak Power (8 x 20 μs); Meets IEC61000-4-2, Level 4

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)
 UNIDIRECTIONAL
 (V_F = 0.9 V Max @ I_F = 10 mA)

| Device | Breakdown Voltage | | | @ I _T | Max Reverse Leakage Current | | Max Reverse Surge Current I _{PP} (A) | Max Reverse Voltage @ I _{PP} (Clamping Voltage) V _C (V) |
|--|-------------------------------|-----|-----|------------------|--------------------------------------|--------------------|---|---|
| | V _{BR} (Note 14) (V) | | | | I _R @ V _R (μA) | V _R (V) | | |
| | Min | Nom | Max | (mA) | | | (μA) | (V) |
|  <p>CASE 419 SC-70 (SOT-323)</p> | | | | | | | | |
| DF3A6.8FU | 6.4 | 6.8 | 7.2 | 5.0 | 0.5 | 5.0 | 2.0 | 9.6 |

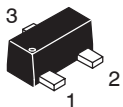

14. V_{BR} measured at pulse test current I_T at an ambient temperature of 25°C.

TVS/ESD Protection – Two Line (continued)

NZL5V6AXV Series

Table 24. Two Line ESD Protection in SC-89; Meets IEC61000-4-2, Level 4

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)
 UNIDIRECTIONAL
 (V_F = 0.9 V Max @ I_F = 10 mA)

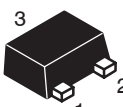
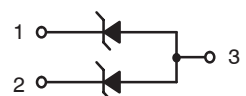
| Device | Breakdown Voltage | | | | Max Reverse Leakage Current | |
|---|----------------------------------|-----|------|--------------------------|---|-----|
| | V _{BR} (Note 15) (V) | | | @ I _T (mA) | I _R @ V _R (μA) (V) | |
| | Min | Nom | Max | | | |
|  <p style="text-align: center;">CASE 463C SC-89</p>  | | | | | | |
| NZL5V6AXV3 | 5.32 | 5.6 | 5.88 | 5.0 | 5.0 | 3.0 |
| NZL6V8AXV3 | 6.46 | 6.8 | 7.14 | 5.0 | 1.0 | 4.5 |
| NZL7V5AXV3 | 7.12 | 7.5 | 7.88 | 5.0 | 1.0 | 5.0 |

15. V_{BR} measured at pulse test current I_T at an ambient temperature of 25°C.

μESD3.3D Series

Table 25. Two Line ESD Protection in SOT-723; Meets IEC61000-4-2, Level 4


ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)
 UNIDIRECTIONAL
 (V_F = 0.9 V Max @ I_F = 10 mA)


| Device | Breakdown Voltage | | | | Max Reverse Leakage Current | |
|--|----------------------------------|-----|-----|--------------------------|---|--|
| | V _{BR} (Note 16) (V) | | | @ I _T (mA) | I _R @ V _{RWM} (μA) (V) | |
| | Min | Nom | Max | | | |
|  <p style="text-align: center;">CASE 631AA STYLE 4 SOT-723</p>  | | | | | | |
| μESD3.3D | 5.0 | – | – | 1.0 | 1.0 | |
| μESD5.0D | 6.2 | – | – | 1.0 | 0.1 | |
| μESD6.0D | 7.0 | – | – | 1.0 | 0.1 | |

16. V_{BR} measured at pulse test current I_T at an ambient temperature of 25°C.

TVS/ESD Protection – Four Line

Table 26. Four Line TVS/ESD Protection; Meets IEC61000-4-2, Level 4

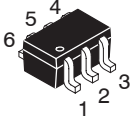
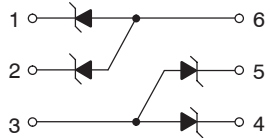
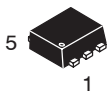
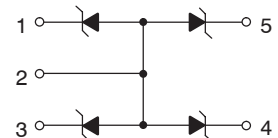

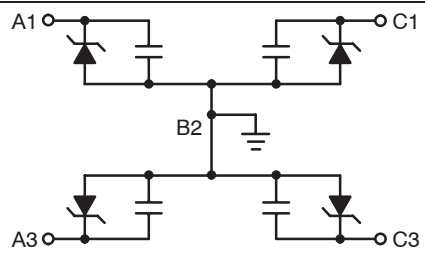
| Device | Breakdown Voltage | | | | Max Reverse Leakage Current | | Capacitance (pF) @ 0 V, 1.0 MHz | | Max Reverse Surge Current | Max Reverse Voltage @ I _{pp} (Clamping Voltage) | Peak Power Rating (8x20 μsec) (Note 17) |
|--|---------------------|-----|------------------|----------------|-----------------------------|-----|---------------------------------|-----|---------------------------|--|---|
| | V _{BR} (V) | | @ I _T | I _R | V _{RWM} | | | | | | |
| | Min | Nom | Max | (mA) | (μA) | (V) | Typ | Max | I _{pp} (A) | V _C (V) | Watts |
|  <p style="text-align: center;">CASE 318F STYLE 1 SC-74 PLASTIC</p> | | | | | | | | | | | |
| MMQA5V6 | 5.32 | 5.6 | 5.88 | 1.0 | 2.0 | 3.0 | 257 | – | 3.0 | 8.0 | 150 |
| MMQA6V2 | 5.89 | 6.2 | 6.51 | 1.0 | 0.7 | 4.0 | 225 | – | 2.66 | 9.0 | 150 |
| MMQA6V8 | 6.46 | 6.8 | 7.14 | 1.0 | 0.5 | 4.3 | 210 | – | 2.45 | 9.8 | 150 |
| MMQA12V | 11.4 | 12 | 12.6 | 1.0 | 0.075 | 9.1 | 117 | – | 1.39 | 17.3 | 150 |
| MMQA13V | 12.4 | 13 | 13.7 | 1.0 | 0.075 | 9.8 | 108 | – | 1.29 | 18.6 | 150 |
| MMQA15V | 14.3 | 15 | 15.8 | 1.0 | 0.075 | 11 | 93 | – | 1.1 | 21.7 | 150 |
| MMQA18V | 17.1 | 18 | 18.9 | 1.0 | 0.075 | 14 | 77 | – | 0.923 | 26 | 150 |
| MMQA20V | 19 | 20 | 21 | 1.0 | 0.075 | 15 | 69 | – | 0.84 | 28.6 | 150 |
| MMQA22V | 20.9 | 22 | 23.1 | 1.0 | 0.075 | 17 | 63 | – | 0.758 | 31.7 | 150 |
| MMQA24V | 22.8 | 24 | 25.2 | 1.0 | 0.075 | 18 | 58 | – | 0.694 | 34.6 | 150 |
| MMQA27V | 25.7 | 27 | 28.4 | 1.0 | 0.075 | 21 | 50 | – | 0.615 | 39 | 150 |
| MMQA30V | 28.5 | 30 | 31.5 | 1.0 | 0.075 | 23 | 40 | – | 0.554 | 43.3 | 150 |
| MMQA33V | 31.4 | 33 | 34.7 | 1.0 | 0.075 | 25 | 42 | – | 0.504 | 48.6 | 150 |
| SMS05 | 6.0 | – | 7.2 | 1.0 | 20 | 5.0 | 300 | 400 | 23 | 15.5 | 350 |
| SMS12 | 13.3 | – | 15 | 1.0 | 1.0 | 12 | 120 | 150 | 15 | 23 | 350 |
| SMS15 | 16.7 | – | 18.5 | 1.0 | 1.0 | 15 | 100 | 125 | 12 | 29 | 350 |
| SMS24 | 26.7 | – | 32 | 1.0 | 1.0 | 24 | 60 | 75 | 8.0 | 44 | 350 |

| | | | | | | | | | | | |
|---|-----|-----|-----|-----|-----|-----|----|---|----|------|-----|
|  <p style="text-align: center;">CASE 419A SC-88A (SOT-353)</p> | | | | | | | | | | | |
| MSQA6V1W5 | 6.1 | 6.6 | 7.2 | 1.0 | 1.0 | 3.0 | 90 | – | – | – | 150 |
| SMF05 | 6.0 | – | 7.2 | 1.0 | 5.0 | 5.0 | 90 | – | 12 | 12.5 | 200 |

17. Surge waveform 8 x 20 μsec.

TVS/ESD Protection – Four Line (continued)

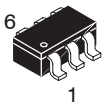
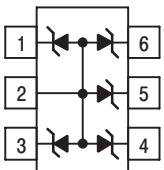
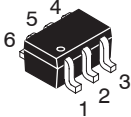
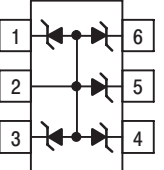
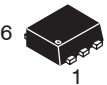
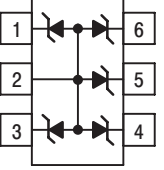
Table 26. Four Line TVS/ESD Protection; Meets IEC61000-4-2, Level 4 (continued)

| Device | Breakdown Voltage | | | Max Reverse Leakage Current | | | Capacitance (pF) @ 0 V, 1.0 MHz | | Max Reverse Surge Current | Max Reverse Voltage @ I _{pp} (Clamping Voltage) | Peak Power Rating (8x20 μsec) (Note 18) |
|---|---------------------|-----|------|-----------------------------|------|-----|---------------------------------|-----|---------------------------|--|---|
| | V _{BR} (V) | | | @ I _T | | | Typ | Max | I _{pp} (A) | V _C (V) | Watts |
| | Min | Nom | Max | (mA) | (μA) | (V) | | | | | |
|  <p style="text-align: center;">CASE 419B SC-88 (SOT-363)</p>  | | | | | | | | | | | |
| DF6A6.8FU | 6.4 | 6.8 | 7.2 | 1.0 | 1.0 | 5.0 | 40 | - | 7.0 | 11.4 | 75 |
|  <p style="text-align: center;">CASE 463B SOT-553</p>  | | | | | | | | | | | |
| NZQA5V6XV5 | 5.32 | 5.6 | 5.88 | 1.0 | 1.0 | 3.0 | 90 | - | 10 | 10.5 | 100 |
| NZQA6V2XV5 | 5.89 | 6.2 | 6.51 | 1.0 | 0.5 | 4.0 | 80 | - | 9.0 | 11.5 | 100 |
| NZQA6V8XV5 | 6.46 | 6.8 | 7.14 | 1.0 | 0.1 | 4.3 | 70 | - | 8.0 | 12.5 | 100 |
|  <p style="text-align: center;">CASE 766AB 5 PIN FLIP-CHIP CSP</p>  | | | | | | | | | | | |
| NUP4103FC | 6.0 | 7.0 | 8.0 | 1.0 | 0.1 | 3.3 | 47 | - | - | - | - |

18. Surge waveform 8 x 20 μsec.

TVS/ESD Protection – Five Line

Table 27. Five Line TVS/ESD Protection; Meets IEC61000–4–2, Level 4

| Device | Breakdown Voltage | | | | Max Reverse Leakage Current | | Capacitance (pF) @ 0 V, 1.0 MHz | | Max Reverse Surge Current | Max Reverse Voltage @ I _{pp} (Clamping Voltage) | Peak Power Rating (8x20 μsec) (Note 19) |
|---|---------------------|-----|------------------|----------------|-----------------------------|-----|---------------------------------|-----|---------------------------|--|---|
| | V _{BR} (V) | | @ I _T | I _R | V _{RWM} | | | | | | |
| | Min | Nom | Max | (mA) | (μA) | (V) | Typ | Max | I _{pp} (A) | V _C (V) | Watts |
|  <p style="text-align: center;">CASE 318F STYLE 1 SC-74 PLASTIC</p>  | | | | | | | | | | | |
| SMS05C | 6.2 | – | 7.2 | 1.0 | 5.0 | 5.0 | 260 | – | 24 | 14.5 | 350 |
| SMS12C | 13.3 | – | 15 | 1.0 | 1.0 | 12 | 120 | – | 15 | 23 | 350 |
| SMS15C | 17 | – | 19 | 1.0 | 1.0 | 15 | 95 | – | 12 | 29 | 350 |
| SMS24C | 26.7 | – | 32 | 1.0 | 1.0 | 24 | 60 | – | 8.0 | 44 | 350 |
|  <p style="text-align: center;">CASE 419B SC-88 (SOT-363)</p>  | | | | | | | | | | | |
| SMF05C | 6.2 | – | 7.2 | 1.0 | 5.0 | 5.0 | 80 | – | 8.0 | 12.5 | 100 |
| SMF12C | 13.3 | – | 15 | 1.0 | 1.0 | 12 | 40 | – | 6.0 | 23 | 100 |
| SMF15C | 17 | – | 19 | 1.0 | 1.0 | 15 | 33 | – | 5.0 | 29 | 100 |
| SMF24C | 26.7 | – | 32 | 1.0 | 1.0 | 24 | 21 | – | 2.5 | 44 | 100 |
|  <p style="text-align: center;">CASE 463A SOT-563</p>  | | | | | | | | | | | |
| NUP5120X6 | 6.2 | 6.8 | 7.2 | 1.0 | 0.5 | 3.0 | 54 | – | – | – | 90 |

19. Surge waveform 8 x 20 μsec.

Low Capacitance TVS/ESD Protection – One Line

SL05 Series

Table 28. Single Line Low Cap TVS/ESD in SOT-23; 300 Watts Peak Power (8 x 20 μs); Meets IEC61000-4-2, Level 4



| Device | Breakdown Voltage | | | Max Reverse Leakage Current | | | Capacitance (pF) @ 0 V, 1.0 MHz | | Max Reverse Surge Current | Max Reverse Voltage @ I _{pp} (Clamping Voltage) | Peak Power Rating (8x20 μsec) |
|--|---------------------|-----|------------------|-----------------------------|------------------|-----|---------------------------------|---------------------|---------------------------|--|-------------------------------|
| | V _{BR} (V) | | @ I _T | I _R | V _{RWM} | Typ | Max | I _{pp} (A) | V _C (V) | Watts | |
| | Min | Nom | Max | (mA) | (μA) | | | | | | (V) |
|  <p>CASE 318 STYLE 26 SOT-23</p> | | | | | | | | | | | |
| SL05 | 6.0 | – | 8.0 | 1.0 | 20 | 5.0 | 3.5 | 5.0 | 17 | 11 | 300 |
| SL15 | 16.7 | – | 18.5 | 1.0 | 1.0 | 15 | 3.5 | 5.0 | 10 | 30 | 300 |
| SL24 | 26.7 | – | 29 | 1.0 | 1.0 | 24 | 3.5 | 5.0 | 5.0 | 55 | 300 |

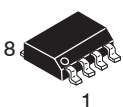
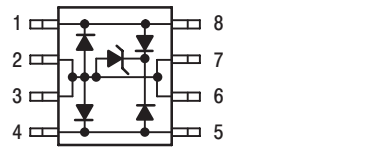
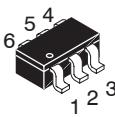
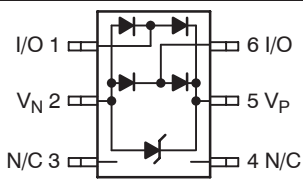
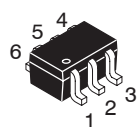
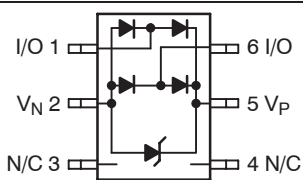
Table 29. Meets IEC61000-4-2, Level 4

| Device | Breakdown Voltage | | Forward Voltage | | Capacitance* (pF) @ 0 V, 1.0 MHz | |
|---|---------------------|-------------------|--------------------|----------------|----------------------------------|-----|
| | V _{BR} (V) | @ I _{br} | V _f (V) | I _f | Typ | Max |
| | Min | μA | Max | mA | | |
|  <p>CASE 318 SOT-23</p> | | | | | | |
| USB 2.0 | | | | | | |
| NUP1301ML3 | 70 | 100 | 0.855 | 10 | – | 0.9 |

*C_j = Between I/O pin and ground.

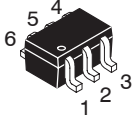
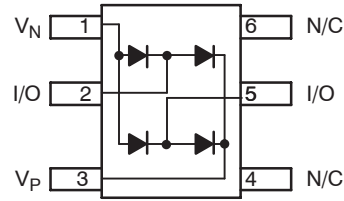
Low Capacitance TVS/ESD Protection – Two Line

Table 30. Two Line Low Cap TVS/ESD Protection; Meets IEC61000–4–2, Level 4

| Device | Breakdown Voltage | | | Max Reverse Leakage Current | | Capacitance* (pF) @ 0 V, 1.0 MHz | | Max Reverse Surge Current | Max Reverse Voltage @ I _{pp} (Clamping Voltage) | Peak Power Rating (8x20 μsec) | |
|---|---------------------|------------------|----------------|-----------------------------|------|----------------------------------|---------------------|---------------------------|--|-------------------------------|------|
| | V _{BR} (V) | @ I _T | I _R | V _{RWM} | Typ | Max | | | | | |
| | Min | Nom | Max | (mA) | (μA) | (V) | I _{pp} (A) | V _C (V) | Watts | | |
|  CASE 751 SO-8  | USB 1.1 | | | | | | | | | | |
| LC03-6 | 6.8 | - | - | 1.0 | 20 | 5.0 | 16 | 25 | 50 | 15 | 2000 |
|  CASE 318G TSOP-6  | USB 2.0 | | | | | | | | | | |
| NUP2201MR6 | 6.0 | - | - | 1.0 | 5.0 | 5.0 | 3.0 | 5.0 | 25 | 20 | 500 |
|  CASE 419B SC-88 (SOT-363)  | USB 2.0 | | | | | | | | | | |
| NUP2202W1 | 6.0 | - | - | 1.0 | 5.0 | 5.0 | 3.0 | 5.0 | 28 | 20 | 500 |

*C_j = Between I/O pin and ground.

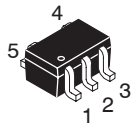
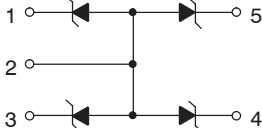
Table 31. Meets IEC61000–4–2, Level 4

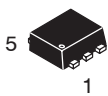
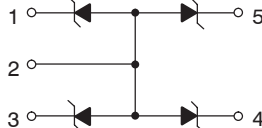
| Device | Breakdown Voltage | | Forward Voltage | | Capacitance* (pF) @ 0 V, 1.0 MHz | |
|---|---------------------|-------------------|--------------------|----------------|----------------------------------|-----|
| | V _{BR} (V) | @ I _{br} | V _f (V) | I _f | Typ | Max |
| | Min | μA | Max | mA | | |
|  CASE 419B SC-88  | USB 2.0 | | | | | |
| NUP2301MW6 | 70 | 100 | 0.855 | 10 | 1.6 | 3.0 |

*C_j = Between I/O pin and ground.

Low Capacitance TVS/ESD Protection – Four Line


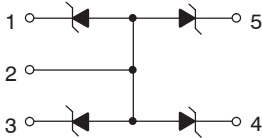
Table 32. Four Line Low Cap TVS/ESD Protection; Meets IEC61000-4-2, Level 4

| Device | Breakdown Voltage | | | Max Reverse Leakage Current | | | Capacitance* (pF) @ 0 V, 1.0 MHz | | Max Reverse Surge Current | Max Reverse Voltage @ I _{pp} (Clamping Voltage) | Peak Power Rating (8x20 μsec) (Note 20) |
|---|---------------------|-----|------|-----------------------------|------|-----|----------------------------------|-----|---------------------------|--|---|
| | V _{BR} (V) | | | @ I _T | | | Typ | Max | I _{pp} (A) | V _C (V) | Watts |
| | Min | Nom | Max | (mA) | (μA) | (V) | | | | | |
|  <p style="text-align: center;">CASE 419A SC-88A (SOT-353)</p>  | | | | | | | | | | | |
| NSQA6V8AW5 | 6.4 | 6.8 | 7.1 | 1.0 | 1.0 | 5.0 | 12 | 15 | 1.6 | 13 | 20 |
| NSQA12VAW5 | 11.4 | 12 | 12.7 | 5.0 | 0.05 | 9.0 | 7.0 | 15 | 0.9 | 23 | 20 |

| | | | | | | | | | | | |
|--|-----|-----|-----|-----|-----|-----|----|----|-----|----|----|
|  <p style="text-align: center;">CASE 463B SOT-553</p>  | | | | | | | | | | | |
| NZQA5V6AXV5 | 5.3 | 5.6 | 5.9 | 1.0 | 1.0 | 3.0 | 13 | 17 | 1.6 | 13 | 20 |
| NZQA6V8AXV5 | 6.1 | 6.8 | 7.2 | 1.0 | 1.0 | 4.3 | 12 | 15 | 1.6 | 13 | 20 |

*C_j = Between I/O pin and ground.
20. Surge waveform 8 x 20 μsec.

Table 33. Four Line Low Cap TVS/ESD Protection in SOT-953; Meets IEC61000-4-2, Level 4

| Device | Breakdown Voltage V _{BR} @ 1.0 mA (Volts) | | | Leakage Current I _{RM} @ V _{RM} | | Typ Capacitance @ 0 V Bias (pF) | | Typ Capacitance @ 3.0 V Bias (pF) | |
|---|--|-----|------|---|-----------------------|---------------------------------|-----|-----------------------------------|------|
| | Min | Nom | Max | V _{RWM} | I _{RWM} (μA) | Typ | Max | Typ | Max |
|  <p style="text-align: center;">CASE 527AB SOT-953</p>  | | | | | | | | | |
| NUP45V6P5 | 5.3 | 5.6 | 5.9 | 3.0 | 1.0 | 13 | 17 | 7.0 | 11.5 |
| NUP46V8P5 | 6.47 | 6.8 | 7.14 | 4.3 | 1.0 | 12 | 15 | 6.7 | 9.5 |
| NUP412VP5 | 11.4 | 12 | 12.7 | 9.0 | 1.0 | 6.5 | 10 | 3.5 | 5.0 |

Low Capacitance TVS/ESD Protection – Four Line (continued)

Table 34. Four Line Low Cap TVS/ESD Protection in SOT-563; Meets IEC61000-4-2, Level 4


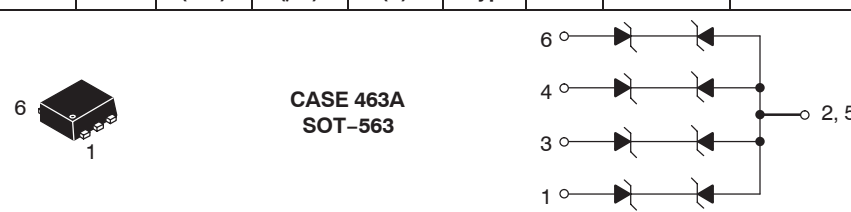
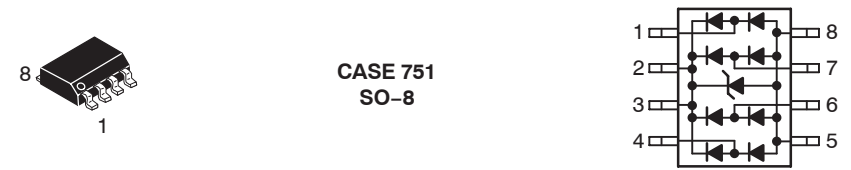
| Device | Breakdown Voltage (D ₁ , D ₂ , and D ₃) | | | | Breakdown Voltage (V _{CC}) | | | | Working Peak Reverse Voltage (D ₁ , D ₂ , and D ₃) | Max Reverse Leakage Current (D ₁ , D ₂ , and D ₃) | | Max Reverse Leakage Current (V _{CC}) | | Capacitance (pF) @ 3.0 V, 1.0 MHz | | Peak Power Rating (8x20 μsec) (D ₁ , D ₂ , and D ₃) | Peak Power Rating (8x20 μsec) (V _{CC}) |
|--|---|-----|------------------|---------------------|--------------------------------------|------------------|----------------|------------------|--|---|----------------|--|-----|-----------------------------------|------|---|--|
| | V _{BR} (V) | | @ I _T | V _{BR} (V) | @ I _T | V _{RWM} | I _R | V _{RWM} | | I _R | V _R | Typ | Max | Watts | (mW) | | |
| | Min | Nom | Max | (mA) | Min | Nom | Max | (mA) | (V) | (μA) | (V) | (μA) | (V) | | | | |
|  <p style="text-align: center;">CASE 463A SOT-563</p> | | | | | | | | | | | | | | | | | |
| NUP4060AXV6 | 6.2 | 6.8 | 7.2 | 1.0 | 15.3 | 16 | 17.1 | 5.0 | 5.0 | 0.5 | 3.0 | 0.05 | 11 | 7.0 | 10 | 20 | 200 |

Table 35. Four Line Low Cap Bidirectional TVS/ESD Protection in SOT-563; Meets IEC61000-4-2, Level 4

| Device | Breakdown Voltage | | | | Max Reverse Leakage Current | | Capacitance* (pF) @ 0 V, 1.0 MHz | | Max Reverse Surge Current | Max Reverse Voltage @ I _{PP} (Clamping Voltage) | Peak Power Rating (8x20 μsec) |
|--|---------------------|-----|------------------|------|-----------------------------|-----|----------------------------------|---------------------|---------------------------|--|-------------------------------|
| | V _{BR} (V) | | @ I _T | nA | V _{RWM} | Typ | Max | I _{PP} (A) | | | |
| | Min | Nom | Max | (mA) | (μA) | (V) | | | | | |
|  <p style="text-align: center;">CASE 463A SOT-563</p> | | | | | | | | | | | |
| NUP4102XV6 | 13.6 | - | 17.8 | 1.0 | 100 | 12 | 13 | 15 | 3.0 | 25 | 75 |

*C_J = Between I/O pin and ground.

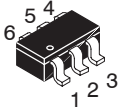
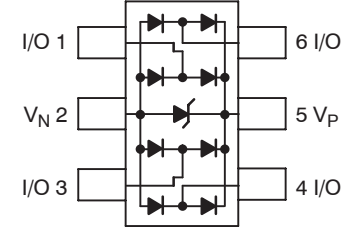
Table 36. Four Line Low Cap TVS/ESD Protection; Meets IEC61000-4-2, Level 4

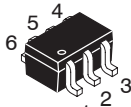
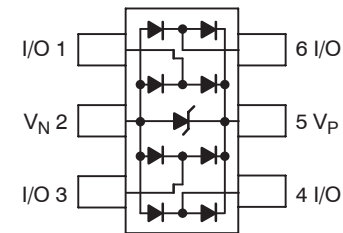
| Device | Breakdown Voltage | | | | Max Reverse Leakage Current | | Capacitance* (pF) @ 0 V, 1.0 MHz | | Max Reverse Surge Current | Max Reverse Voltage @ I _{PP} (Clamping Voltage) | Peak Power Rating (8x20 μsec) |
|--|---------------------|-----|------------------|----------------|-----------------------------|-----|----------------------------------|---------------------|---------------------------|--|-------------------------------|
| | V _{BR} (V) | | @ I _T | I _R | V _{RWM} | Typ | Max | I _{PP} (A) | | | |
| | Min | Nom | Max | (mA) | (μA) | (V) | | | | | |
|  <p style="text-align: center;">CASE 751 SO-8</p> | | | | | | | | | | | |
| USB 2.0 | | | | | | | | | | | |
| NUP4201DR2 | 6.0 | - | - | 1.0 | 10 | 5.0 | 5.0 | 10 | 10 | 12 | 500 |
| SRDA05-4R2 | 6.0 | - | - | 1.0 | 10 | 5.0 | 10 | 15 | 10 | 12 | 500 |

*C_J = Between I/O pin and ground.

Low Capacitance TVS/ESD Protection – Four Line (continued)

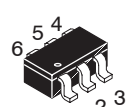
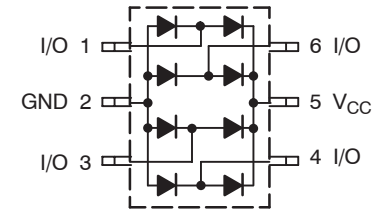
Table 36. Four Line Low Cap TVS/ESD Protection; Meets IEC61000-4-2, Level 4 (continued)

| Device | Breakdown Voltage | | | Max Reverse Leakage Current | | Capacitance* (pF) @ 0 V, 1.0 MHz | | Max Reverse Surge Current | Max Reverse Voltage @ I _{pp} (Clamping Voltage) | Peak Power Rating (8x20 μsec) | |
|---|---------------------|-----|------------------|-----------------------------|------------------|----------------------------------|-----|---------------------------|--|-------------------------------|-------|
| | V _{BR} (V) | | @ I _T | I _R | V _{RWM} | Typ | Max | | | | |
| | Min | Nom | Max | (mA) | (μA) | | | (V) | I _{pp} (A) | V _C (V) | Watts |
|  <p style="text-align: center;">CASE 318G TSOP-6</p>  | | | | | | | | | | | |
| USB 2.0 | | | | | | | | | | | |
| NUP4201MR6 | 6.0 | - | - | 1.0 | 5.0 | 5.0 | 3.0 | 5.0 | 25 | 20 | 500 |

| | | | | | | | | | | | |
|--|-----|---|---|-----|-----|-----|-----|-----|----|----|-----|
|  <p style="text-align: center;">CASE 419B SC-88 (SOT-363)</p>  | | | | | | | | | | | |
| USB 2.0 | | | | | | | | | | | |
| NUP4202W1 | 6.0 | - | - | 1.0 | 5.0 | 5.0 | 3.0 | 5.0 | 28 | 20 | 500 |

*C_j = Between I/O pin and ground.

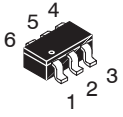
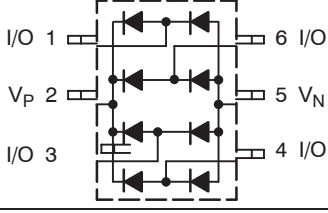
Table 37. Four Line Low Cap TVS/ESD Protection; Meets IEC61000-4-2, Level 4

| Device | Breakdown Voltage | | Forward Voltage | | Capacitance* (pF) @ 0 V, 1.0 MHz | |
|---|---------------------|-------------------|--------------------|----------------|----------------------------------|-----|
| | V _{BR} (V) | @ I _{br} | V _f (V) | I _f | Typ | Max |
| | Min | μA | Max | mA | | |
|  <p style="text-align: center;">CASE 318G TSOP-6</p>  | | | | | | |
| USB 2.0 | | | | | | |
| NUP4301MR6 | 70 | 100 | 0.855 | 10 | 1.6 | 3.0 |

*C_j = Between I/O pin and ground.

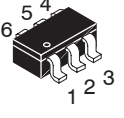
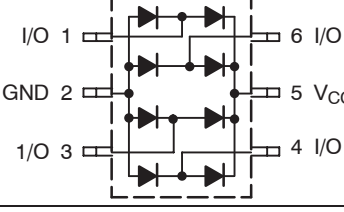
Low Capacitance TVS/ESD Protection – Four Line (continued)

Table 37. Four Line Low Cap TVS/ESD Protection; Meets IEC61000-4-2, Level 4 (continued)

| Device | Breakdown Voltage | | Forward Voltage | | Capacitance* (pF) @ 0 V, 1.0 MHz | |
|--|-------------------|------------|--|-------|----------------------------------|-----|
| | V_{BR} (V) | @ I_{br} | V_f (V) | I_f | Typ | Max |
| | Min | μA | Max | mA | | |
|  CASE 318F TSOP-6 | | |  | | | |
| USB 2.0 | | | | | | |
| NUP4304MR6 | 70 | 100 | 0.855 | 10 | 1.6 | 3.0 |

*C_j = Between I/O pin and ground.


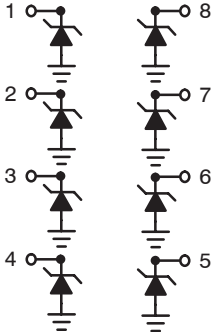
Table 38. Four Line Low Cap TVS/ESD Protection; Meets IEC61000-4-2, Level 4

| Device | Breakdown Voltage | | | Max Reverse Leakage Current | | Capacitance* (pF) @ 0 V, 1.0 MHz | | Max Reverse Surge Current | Max Reverse Voltage @ I_{pp} (Clamping Voltage) | Peak Power Rating (8x20 μ sec) | |
|--|-------------------|-----|--|-----------------------------|-------------|----------------------------------|-----|---------------------------|---|------------------------------------|-------|
| | V_{BR} (V) | | @ I_T | I_R | V_{RWM} | | | | | | |
| | Min | Nom | Max | (mA) | (μA) | (V) | Typ | Max | I_{pp} (A) | V_C (V) | Watts |
|  CASE 318G TSOP-6 | | |  | | | | | | | | |
| USB 2.0 | | | | | | | | | | | |
| NUP4302MR6 | 30 | - | - | 0.1 | 30 | - | - | 28 | - | - | - |

*C_j = Between I/O pin and ground.

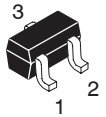
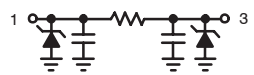
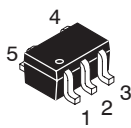
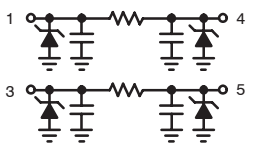

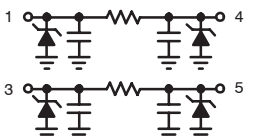
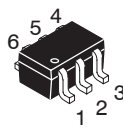
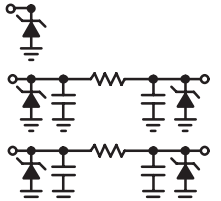

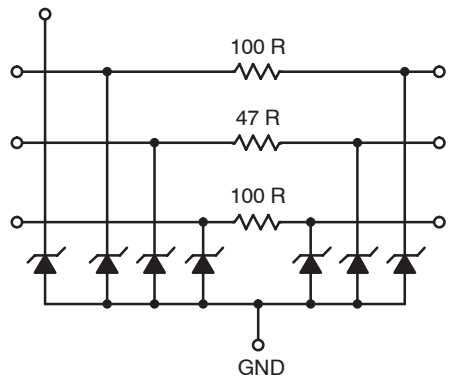
Low Capacitance TVS/ESD Protection – Eight Line

Table 39. . Eight Line Low Cap TVS/ESD Protection; Meets IEC61000–4–2, Level 4

| Device | Breakdown Voltage | | | | Max Reverse Leakage Current | | Capacitance* (pF) @ 0 V, 1.0 MHz | | Max Reverse Surge Current | Max Reverse Voltage @ I _{pp} (Clamping Voltage) | Peak Power Rating (8x20 μsec) |
|---|---|-----|-----|------------------|-----------------------------|------------------|--|-----|---------------------------|--|----------------------------------|
| | V _{BR} (V) | | | @ I _T | I _R | V _{RWM} | Typ | Max | I _{pp} (A) | V _C (V) | Watts |
| | Min | Nom | Max | (mA) | (μA) | (V) | | | | | |
|  CASE 506AK DFN8 |  | | | | | | | | | | |
| | NUP8010MN | 5.3 | 5.6 | 5.9 | 1.0 | 1.0 | 3.3 | 13 | 17 | 1.6 | 13 |

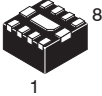
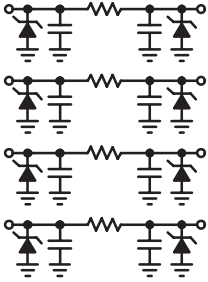
*C_j = Between I/O pin and ground.

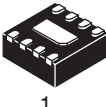
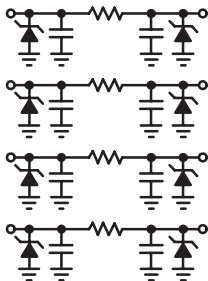
Data Line Filters


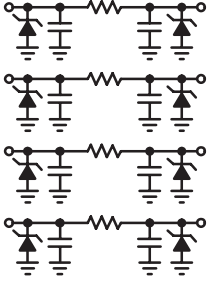
| Device | V_{BR} (V) | | I_R (μ A) | V_{RWM} | C_{diode} (pF) @ 2.5 V (Note 21) | Resistor | | |
|--|--------------|-----|------------------|-----------|------------------------------------|----------|-----|-----|
| | Typ | Max | Max | | Typ | Typ | Max | |
|  <p>CASE 463 SC-75 PLASTIC</p>  | NZF220T | 7.0 | 8.0 | 1.0 | 3.0 | 10 | 100 | 110 |
|  <p>CASE 419A SC-88A</p>  | NZF220DF | 7.0 | 8.0 | 1.0 | 3.0 | 7.5 | 100 | 110 |
|  <p>CASE 463A SOT-563</p>  | NUF2220XV6 | 7.0 | – | 1.0 | 5.0 | 7.0 | 100 | 115 |
| NUF2230XV6 | 7.0 | – | 1.0 | 5.0 | 16 | 100 | 110 | |
|  <p>CASE 419B SC-88</p>  | NUF2240W1 | 7.0 | – | 1.0 | 5.0 | 17 | 100 | 115 |
|  <p>CASE 499AG-01 FLIP-CHIP</p>  | NUF3101FC | 7.0 | 8.0 | 0.1 | 3.0 | 15 | 100 | 120 |


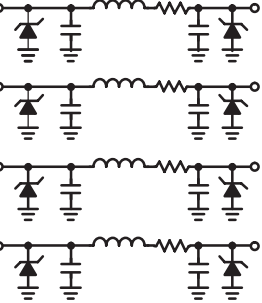
21. Line capacitance is 2x the diode capacitance (C_{diode}).

Data Line Filters (continued)

| Device | V_{BR} (V) | | I_R (μ A) | $@V_{RWM}$ (V) | C_{diode} (pF) @ 2.5 V (Note 22) | Resistor | |
|--|---|-----|------------------|----------------|------------------------------------|----------|-----|
| | Typ | Max | Max | | Typ | Typ | Max |
|  CASE 517AK DFN8 (1.6 x 1.6 x 0.85 mm) |  | | | | | | |
| NUF4402MN | 7.0 | 8.0 | 0.1 | 5.0 | 12 | 100 | 115 |
| NUF4403MN | 7.0 | 8.0 | 0.1 | 5.0 | 17 | 100 | 115 |
| NUF4210MN | 7.0 | 8.0 | 0.1 | 5.0 | 8.5 | 100 | 115 |

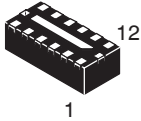
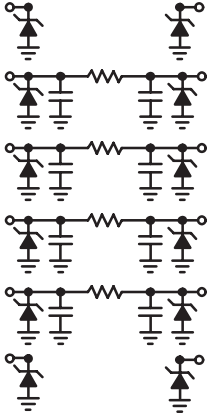

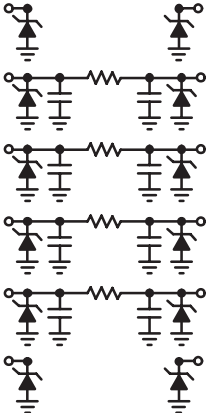
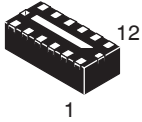
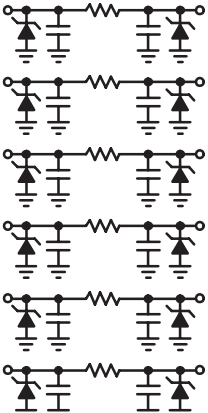
| | | | | | | | |
|--|--|-----|-----|-----|----|-----|-----|
|  CASE 506AA DFN8 (2.0 x 2.0 x 0.85 mm) |  | | | | | | |
| NUF4401MN | 7.0 | 8.0 | 0.1 | 5.0 | 15 | 200 | 230 |

| | | | | | | | |
|--|---|-----|-----|-----|----|-----|-----|
|  CASE 517AD UDFN8 (1.2 x 1.8 0.5 mm) |  | | | | | | |
| NUF4001MU | 7.0 | 8.0 | 0.1 | 5.0 | 12 | 100 | 115 |

| | | | | | | | |
|--|---|-----|-----|-----|----|----|----|
|  CASE 517AD UDFN8 (1.2 x 1.8 0.5 mm) |  | | | | | | |
| NUF4152MU | 7.0 | 8.0 | 0.1 | 5.0 | 20 | 25 | 30 |

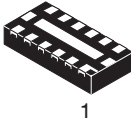
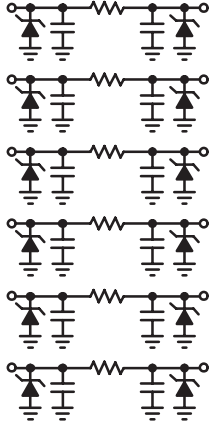

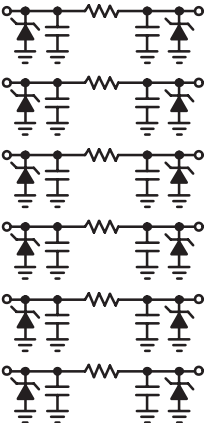
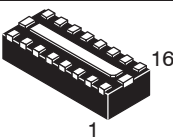
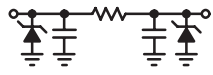
22. Line capacitance is 2x the diode capacitance (C_{diode}).

Data Line Filters (continued)

| Device | V _{BR} (V) | | I _R (μ A) | @V _{RWM} (V) | C _{diode} (pF) @ 2.5 V (Note 23) | Resistor | | |
|--|---------------------|-----|---------------------------|-----------------------|--|----------|-----|-----|
| | Typ | Max | Max | | Typ | Typ | Max | |
|  <p>CASE 506AD DFN12 (1.35 x 3.0 x 0.85 mm)</p> | | | | |  | | | |
| | NUF6402MN | 7.0 | 8.0 | 1.0 | 5.0 | 17 | 100 | 115 |
|  <p>CASE 499D FLIP-CHIP 300 μm Bumps (1.35 x 3.0 x 0.65 mm)</p> | | | | |  | | | |
| | NUF4105FC | 7.0 | 8.0 | 0.1 | 3.3 | 23 | 100 | 120 |
|  <p>CASE 506AD DFN12 (1.35 x 3.0 x 0.85 mm)</p> | | | | |  | | | |
| | NUF6401MN | 7.0 | – | 1.0 | 5.0 | 17 | 100 | 115 |
| | NUF6406MN | 7.0 | – | 1.0 | 5.0 | 12 | 100 | 115 |

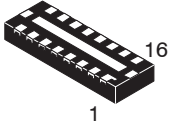
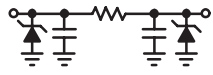
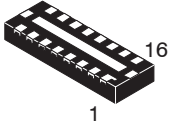
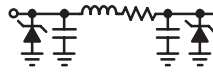
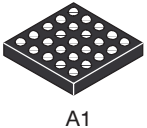
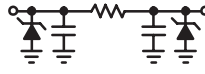
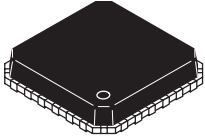
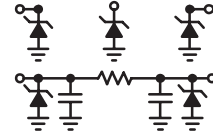
23. Line capacitance is 2x the diode capacitance (C_{diode}).

Data Line Filters (continued)

| Device | V_{BR} (V) | | I_R (μ A) | @ V_{RWM} (V) | C_{diode} (pF) @ 2.5 V (Note 24) | Resistor | | |
|---|--|-----|------------------|-----------------|------------------------------------|----------|-----|-----|
| | Typ | Max | Max | | Typ | Typ | Max | |
|  <p>CASE 517AE UDFN12 (1.2 x 2.5 x 0.5 mm)</p> |  | | | | | | | |
| | NUF6001MU | 7.0 | - | 1.0 | 5.0 | 17 | 100 | 115 |
|  <p>CASE 499D FLIP-CHIP 300 μm Bumps (1.35 x 3.0 x 0.65 mm)</p> |  | | | | | | | |
| | NUF6106FC | 7.0 | 8.0 | 0.1 | 3.3 | 10 | 100 | 120 |
| NUF6105FC | 7.0 | 8.0 | 0.1 | 3.3 | 23 | 100 | 120 | |
|  <p>CASE 507AC DFN16 (1.6 x 4.0 x 0.85 mm)</p> |  <p>1 of 8 Filter Lines</p> | | | | | | | |
| | NUF8401MN | 7.0 | 8.0 | 0.1 | 5.0 | 12 | 100 | 115 |
| | NUF8402MN | 7.0 | 8.0 | 0.1 | 3.3 | 17 | 100 | 115 |
| NUF8410MN | 7.0 | 8.0 | 0.1 | 5.0 | 8.5 | 100 | 115 | |


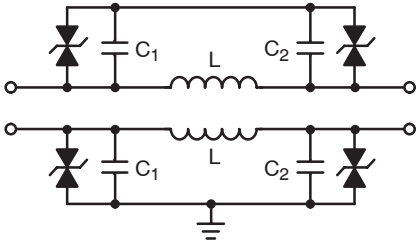
24. Line capacitance is 2x the diode capacitance (C_{diode}).


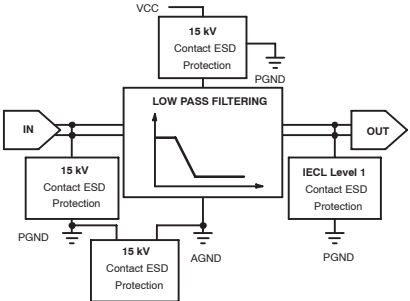
Data Line Filters (continued)

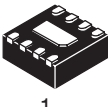
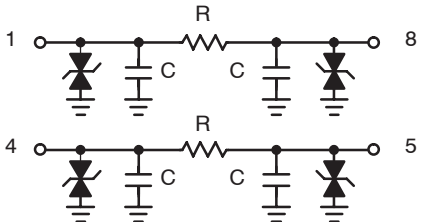
| Device | V _{BR} (V) | | I _R (μA) | @V _{RWM} (V) | C _{diode} (pF) @ 2.5 V (Note 25) | Resistor | |
|--|---------------------|-----|---------------------|-----------------------|--|----------|-----|
| | Typ | Max | Max | | Typ | Typ | Max |
|  CASE 517AF UDFN16 (1.2 x 3.5 x 0.5 mm) | | | | |  1 of 8 Filter Lines | | |
| NUF8001MU | 7.0 | 8.0 | 0.1 | 5.0 | 12 | 100 | 115 |
|  CASE 517AF UDFN16 (1.2 x 3.5 x 0.5 mm) | | | | |  1 of 8 Filter Lines | | |
| NUF8152MU | 7.0 | 8.0 | 0.1 | 5.0 | 20 | 25 | 30 |
|  CASE 499G FLIP-CHIP CSP (2.64 x 2.64 x 0.65 mm) | | | | |  1 of 10 Filter Lines | | |
| NUF9001FC | 7.0 | 8.0 | 0.1 | 5.0 | 15 | 200 | 230 |
| NUF9002FC | 7.0 | 8.0 | 0.1 | 5.0 | 10 | 100 | 115 |
|  CASE 485F 24 PIN MLF | | | | |  1 of 9 Filter Lines | | |
| NZMM7V0T4 | 7.0 | 8.0 | 0.1 | 3.0 | 10 | 100 | 110 |

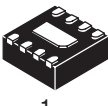
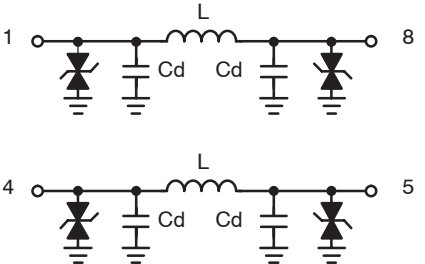
25. Line capacitance is 2x the diode capacitance (C_{diode}).

Audio Filters

| Device | V_{BR} (V) | | I_R (μ A) | @ V_{RWM} (V) | C_{diode} (pF) @ 2.5 V (Note 26) | Resistor | |
|---|--|------|------------------|-----------------|------------------------------------|----------|------|
| | Typ | Max | Max | | Typ | Typ | Max |
|  A1 CASE 499J FLIP-CHIP |  Typical L = 2.9 nH | | | | | | |
| | NUF2441FC | 14.5 | 17.7 | 0.1 | 12 | 100 | 0.28 |


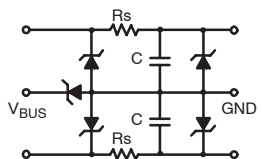
| | | | | | | | |
|--|--|----|---|-----|----|-----|-----|
|  A1 CASE 499AE FLIP-CHIP |  | | | | | | |
| | NMF3000FC | 12 | – | 0.5 | 10 | 500 | 950 |

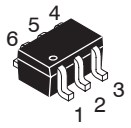
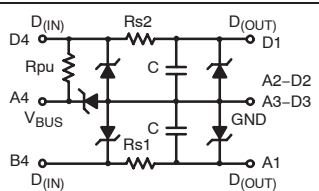
| | | | | | | | |
|--|--|------|------|-----|----|----|-----|
|  1 CASE 506AA DFN8 |  | | | | | | |
| | NUF2114MN | 15.7 | 17.7 | 0.1 | 12 | 60 | 8.4 |
| NUF2116MN | 15.7 | 17.7 | 0.01 | 12 | 50 | 64 | 75 |

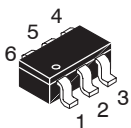
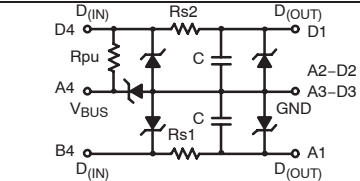
| | | | | | | | |
|--|---|------|------|-----|----|----|-----|
|  1 CASE 506AA DFN8 |  Typical L = 10 nH | | | | | | |
| | NUF2070MN | 15.7 | 17.7 | 0.1 | 12 | 64 | 2.4 |


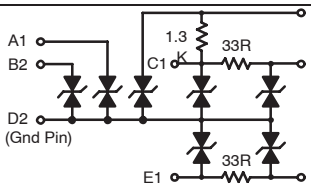
26. Line capacitance is 2x the diode capacitance.

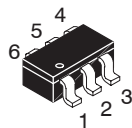
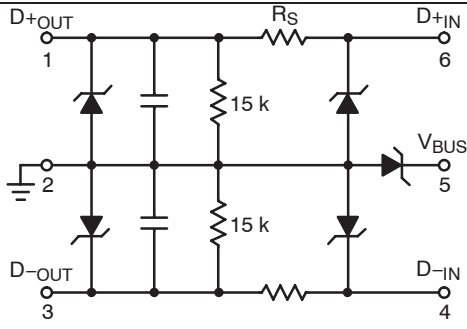
Data Line Filters

| Device | V_{BR} (V) | | I_R (μ A) | V_{RWM} | C_{line} (pF) @ 2.5 V | Resistor | |
|---|--------------|-----|------------------|-----------|--|----------|------|
| | Typ | Max | Max | | Typ | Typ | Max |
|  CASE 463A SOT-563 | | | | |  | | |
| NUF2030XV6 | 6.8 | 8.0 | 0.1 | 5.25 | 30 | 22 | 26.4 |
| NUF2042XV6 | 6.8 | 8.0 | 0.1 | 5.25 | 42 | 22 | 26.4 |

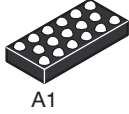
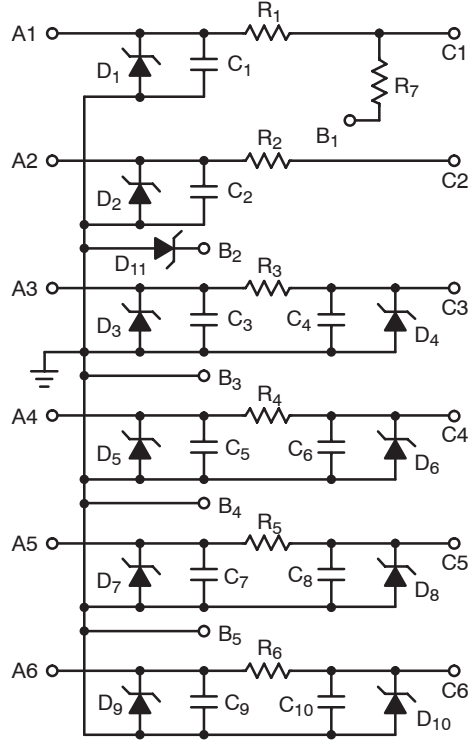
| | | | | | | | |
|---|-----|-----|-----|------|--|----|------|
|  CASE 419B SC-88 (SOT-363) | | | | |  | | |
| NUF2015W1 | 6.8 | 8.0 | 0.1 | 5.25 | 42 | 15 | 18 |
| NUF2221W1 | 6.8 | 8.0 | 0.1 | 5.25 | 42 | 22 | 26.4 |

| | | | | | | | |
|---|-----|-----|-----|------|---|----|----|
|  CASE 318G TSOP-6 | | | | |  | | |
| STF202-22 | 7.0 | 8.0 | 5.0 | 5.25 | 57 | 22 | 24 |

| | | | | | | | |
|--|-----|-----|-----|-----|--|----|----|
|  CASE 499AM FLIP-CHIP | | | | |  | | |
| NUF2222FC | 7.8 | 8.8 | 0.1 | 5.0 | 34 | 33 | 38 |

| | | | | | | | |
|---|-----|-----|-----|------|--|----|------|
|  CASE 318G STYLE 10 TSOP-6 | | | | |  | | |
| NUF2101M | 7.0 | 8.0 | 1.0 | 5.25 | 46 | 30 | 33.7 |

Data Line Filters (continued)

| Device | V_{BR} (V) | | I_R (μ A) | $@V_{RWM}$ (V) | C_{line} (pF) @ 2.5 V | Resistor | | |
|---|--|-----|------------------|----------------|-------------------------|----------|-----|-----|
| | Typ | Max | Max | | Typ | Typ | Max | |
|  <p>A1</p> <p>CASE 499AD FLIP-CHIP CSP</p>  | NUF4107FC (Pin A1 to C1, Pin A2 to C2) | 7.0 | 8.0 | 0.1 | 5.25 | 36 | 22 | 26 |
| | NUF4107FC (Pin A3 to C3, Pin A4 to C4, Pin A5 to C5, Pin A6 to C6) | 7.0 | 8.0 | 0.1 | 5.25 | 60 | 100 | 120 |

Clock and Data Management

Clock and Data Management

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In Brief...

Advanced clock management devices from ON Semiconductor deliver superior performance by providing the lowest skew and lowest jitter with the highest operating frequencies.

ON Semiconductor offers a complete family of Phase Lock Loop (PLL) based products for applications ranging from low cost portable MP3 players, to massive, mission critical servers. Our oscillator replacement ICs offer performance rivaling crystal oscillator solutions at a fraction of the cost, and our new Zero Delay Buffer family is one of the most complete in the industry. Lastly, ON Semiconductor has a series of EMI Suppression Clocks that utilize spread spectrum to minimize the peak electromagnetic interference emissions in consumer products.

This portfolio of products makes designing any low skew, high frequency clock tree an easy task with a large range of clock **distribution, generation** and **skew management** devices. We address the needs of today's systems whether operating at 2.5 V, 3.3 V or legacy systems at 5.0 V or -5.2 V.

ON Semiconductor's High Performance Data Management products are designed into state-of-the-art systems such as communication and networking switches, high-end servers, engineering workstations, high-density memory modules, storage networks and precision test and measurement systems.

While our ECLinPS™ families serve the market well at frequencies up to 6.0 GHz, GigaComm™ family of silicon germanium products enables safe and reliable design up to 12 GHz. GigaComm delivers the performance necessary for high frequency applications, while maintaining the manufacturability and price point required for cost-effective volume production.

ON Semiconductor Selector Guide – Clock and Data Management Devices

SIGNAL TRANSLATORS (Specifications are at 25°C unless otherwise stated)

| Device(s) | From | To | Voltage | # of Channels | Freq. (Typ) MHz | Prop. Delay (Typ) ps | Tr & Tf (Max) ps | Package |
|--------------|----------------------------------|----------------------------------|------------------|---------------|-----------------|---------------------------------------|-----------------------|--------------|
| MC100EL90 | LVNECL/NECL | PECL | 3.3/5 | 3 | 650 | 500 | 500 | SO-20 |
| MC100EL91 | LVPECL/PECL | NECL | 3.3/5 | 3 | 700 | 670 | 400 | SO-20 |
| MC100ELT20 | TTL | PECL | 5 | 1 | 100 MHz (min)* | 1200 | 1500 | SO-8/TSSOP-8 |
| MC100ELT21 | PECL | TTL | 5 | 1 | TBD | 5500 | 750 (10%-90%) | SO-8/TSSOP-8 |
| MC100ELT22 | TTL | PECL | 5 | 2 | 100 MHz (min)* | 1200 | 1600 | SO-8/TSSOP-8 |
| MC100ELT23 | PECL | TTL | 5 | 2 | 100 | 3500 | 1600 (10%-90%) | SO-8/TSSOP-8 |
| MC100ELT24 | TTL | NECL | 5 | 1 | 400 | 950 | 1250 | SO-8/TSSOP-8 |
| MC100ELT25 | NECL | TTL | 5/-5.2 | 1 | 100 | 3300* | 2300 (10%-90%) | SO-8/TSSOP-8 |
| MC100ELT28 | PECL to TTL & TTL to PECL (Dual) | PECL to TTL & TTL to PECL (Dual) | 5 | 2 | 100 | 3500 PECL-to-TTL/ 1200 TTL-to-PECL | 1500 | SO-8/TSSOP-8 |
| MC100EP90 | LVNECL/NECL | LVPECL/PECL | 0.66 | 3 | >3000 | 260 | 180 | SO-20 |
| MC100EPT20 | LVTTTL/LVCMOS | LVPECL | 3.3 | 1 | >1000 | 370 | 180 | SO-8/TSSOP-8 |
| MC100EPT21 | LVPECL | LVTTTL | 3.3 | 1 | 350 | 1400 | 600/900 (0.8-2.0 V) | SO-8/TSSOP-8 |
| MC100EPT22 | LVTTTL/LVCMOS | LVPECL | 3.3 | 2 | 1100 | 420 | 220 | SO-8/TSSOP-8 |
| MC100EPT23 | LVPECL | LVTTTL | 3.3 | 2 | 350 | 1500 | 600/900 (0.8-2.0 V) | SO-8/TSSOP-8 |
| MC100EPT24 | LVTTTL/LVCMOS | LVPECL | 3.3 | 1 | >1000 | 530 | 180 | SO-8/TSSOP-8 |
| MC100EPT25 | LVNECL/NECL | LVTTTL | 3.3/-3.3 to -5.2 | 1 | 275 | 1100 | 1100/1400 (0.8-2.0 V) | SO-8/TSSOP-8 |
| MC100EPT26 | LVPECL | LVTTTL | 3.3 | 1 | 275 | 1500 | 900 | SO-8/TSSOP-8 |
| MC100EPT622 | LVTTTL/LVCMOS | PECL (10-Bit) | 3.3 | 1 | 1500 | 450 | 250 | LQFP-32 |
| MC100LVEL90 | LVNECL/NECL | LVPECL | 0.66 | 3 | 650 | 500 | 500 | SO-20 |
| MC100LVEL91 | LVPECL/PECL | LVNECL | 3.3/5 | 3 | 600 | 620 | 580 | |
| MC100LVEL92 | PECL | LVPECL | 3.3/5 | 3 | 600 | 610 | 580 | SO-20 |
| MC100LVELT22 | LVTTTL/LVCMOS | LVPECL | 3.3 | 2 | 100 MHz (min)* | 350 | 500 | SO-8/TSSOP-8 |
| MC100LVELT23 | LVPECL | LVTTTL | 3.3 | 2 | >180 | 1700 | 600/900 (0.8-2.0 V) | SO-8/TSSOP-8 |
| MC100ELT20 | TTL | PECL | 5 | 1 | 100 MHz (min)* | 1200 | 1500 | SO-8/TSSOP-8 |
| MC100ELT21 | PECL | TTL | 5 | 1 | TBD | 5500 | 750 (10%-90%) | SO-8/TSSOP-8 |
| MC100LVELT20 | LVTTTL/LVCMOS | LVPECL | 3.3 | 1 | 800 | 390 | 225 | SO-8 |

SIGNAL TRANSLATORS (continued) (Specifications are at 25°C unless otherwise stated)

| Device(s) | From | To | Voltage | # of Channels | Freq. (Typ) MHz | Prop. Delay (Typ) ps | Tr & Tf (Max) ps | Package |
|-------------|--|----------------------------------|---------|---------------|-----------------|---------------------------------------|------------------|---------------|
| MC10ELT22 | TTL | PECL | 5 | 2 | 100MHz (min)* | 1200 | 1600 | SO-8/TSSOP-8 |
| MC10ELT24 | TTL | NECL | 5 | 1 | 400 | 950 | 1250 | SO-8/TSSOP-8 |
| MC10ELT25 | NECL | TTL | 5/-5.2 | 1 | 100 | 3300* | 2300 (10%-90%) | SO-8/TSSOP-8 |
| MC10ELT28 | PECL to TTL & TTL to PECL (Dual) | PECL to TTL & TTL to PECL (Dual) | 5 | 2 | 100 | 3500 PECL-to-TTL/ 1200 TTL-to-PECL | 1500 | SO-8/TSSOP-8 |
| MC10EP90 | LVNECL/NECL | LVPECL/PECL | 0.66 | 3 | >3000 | 260 | 180 | SO-20 |
| MC10EPT20 | LVTTTL/LVCMOS | LVPECL | 3.3 | 1 | >1000 | 370 | 180 | SO-8/TSSOP-8 |
| NB100ELT23L | LVPECL | LVTTTL | 3.3 | 2 | 275 | 2.1 | 1300 | SO-8/TSSOP-8 |
| NB100LVEP91 | LVPECL/LVTTTL/ LVCMOS/HSTL/ CML/LVDS | LVNECL/NECL | 2.5/3.3 | 3 | 2500 | 430 | 85 (typ) | SO-20, QFN-24 |
| *NB4N5275 | LVPECL/LVTTTL/ LVCMOS/HSTL/ CML/LVDS | LVDS | 3.3 | 2 | 1250 | 500 | 300 | QFN-16 |
| *NB4N8555 | LVPECL/LVTTTL/ LVCMOS/HSTL/ CML/LVDS | LVDS | 3.3 | 2 | 1000 | 490 | 180 | Micro10 |

*Duplicate in Receiver/Driver category.

CROSSPOINT SWITCHES

| Device(s) | From | To | Voltage | # of Inputs | # of Outputs | Freq. (Typ) MHz | Prop. Delay (Typ) ps | Tr & Tf (Max) ps | Package |
|-----------|------------|-----------------|---------|-------------|--------------|-----------------|----------------------|------------------|---------|
| NB4L858M | LVPECL/CML | CML | 2.5/3.3 | 2+2 | 2+2 | 3000 | 350 | 80 | LQFP-32 |
| NB4N840M | LVPECL/CML | CML | 3.3 | 2+2 | 2+2 | 2700 | 225 | 80 | QFN-32 |
| NBSG72A | Any Level | LVPECL (w/o LS) | 2.5/3.3 | 2 | 2 | 7000 | 200 | 55 | QFN-16 |

ON Semiconductor Selector Guide – Clock and Data Management Devices

CLOCK FAN-OUT (Specifications are at 25°C unless otherwise stated)

| Device(s) | Input Clock | Output Clock | Voltage | # of Input Channels | # of Outputs per Channel | Frequency (Typ) GHz | Output-to-Output Skew (Max) ps | Cycle-to-Cycle Jitter (Typ/Max) ps | Tr & Tf (Max) ps | Package |
|--------------|---------------|--------------|---------|---------------------|--------------------------|---------------------|--------------------------------|------------------------------------|------------------|--------------------|
| MC100E111 | ECL/PECL | ECL/PECL | 5 | 1 | 9 | >1.5 | 50 | 0.2 | 600 | PLCC-28 |
| MC100E210 | ECL/PECL | ECL/PECL | 5 | 2 | 4/5 | 0.7 | 75 | 0.2 | 600 | PLCC-28 |
| MC100E211 | ECL/PECL | ECL/PECL | 5 | 1 | 6 | >1.5 | 75 | 0.2 | 400 | PLCC-28 |
| MC100E310 | ECL/PECL | ECL/PECL | 5 | 1 | 8 | 1 | 50 | 0.2 | 600 | PLCC-28 |
| MC100EL11 | ECL/PECL | ECL/PECL | 5 | 1 | 2 | 2 | 5 | 0.2 | 350 | SO-8, TSSOP-8 |
| MC100EL13 | ECL/PECL | ECL/PECL | 5 | 2 | 3 | 1 | 50 | 0.2 | 500 | SO-20 |
| MC100EL14 | ECL/PECL | ECL/PECL | 5 | 1 | 5 | 1 | 50 | 0.2 | 500 | SO-8, TSSOP-8 |
| MC100EL15 | ECL/PECL | ECL/PECL | 5 | 1 | 4 | 1 | 50 | 0.2 | 575 | SO-16 |
| MC100EP11 | ECL/PECL | ECL/PECL | 3.3/5 | 1 | 2 | >3 | 20 | 0.2 | 180 | SO-8, TSSOP-8 |
| MC100EP14 | ECL/PECL/HSTL | ECL/PECL | 3.3/5 | 1 | 5 | >2 | 45 | 0.2 | 270 | TSSOP-20 |
| MC100EP210S | LVDS/PECL | LVDS | 3.3 | 2 | 5 | >1 | 20 | 0.2 | 225 | LQFP-32 |
| MC100EP809 | ECL/PECL/HSTL | HSTL | 3.3 | 1 | 9 | >0.75 | 15 | 1.4 | 600 | LQFP-32 |
| MC100LVE111 | ECL/PECL | ECL/PECL | 3.3 | 1 | 9 | >1.5 | 20 | 0.2 | 600 | PLCC-28 |
| MC100LVE210 | ECL/PECL | ECL/PECL | 3.3 | 2 | 4/5 | 0.7 | 75 | 0.2 | 600 | PLCC-28 |
| MC100LVE310 | ECL/PECL | ECL/PECL | 3.3 | 1 | 8 | 1.5 | 50 | 0.2 | 600 | PLCC-28 |
| MC100LVEL11 | ECL/PECL | ECL/PECL | 3.3 | 1 | 2 | >3 | 20 | 0.2 | 180 | SO-8, TSSOP-8 |
| MC100LVEL13 | ECL/PECL | ECL/PECL | 3.3 | 2 | 3 | 1 | 50 | 0.2 | 500 | SO-20 |
| MC100LVEL14 | ECL/PECL | ECL/PECL | 3.3 | 1 | 5 | >1 | 50 | 0.2 | 500 | SOIC-20 |
| MC100LVEP11 | ECL/PECL | ECL/PECL | 2.5/3.3 | 1 | 2 | >3 | 20 | 0.2 | 180 | SO-8, TSSOP-8 |
| MC100LVEP111 | ECL/PECL | ECL/PECL | 2.5/3.3 | 1 | 10 | >3 | 25 | 0.2 | 150 | LQFP-32, QFN-32 |
| MC100LVEP14 | ECL/PECL/HSTL | ECL/PECL | 2.5/3.3 | 1 | 5 | >2 | 25 | 0.2 | 250 | TSSOP-20 |
| MC100LVEP210 | ECL/PECL/HSTL | ECL/PECL | 2.5/3.3 | 2 | 5 | >3 | 20 | 0.2 | 270 | LQFP-32 |
| MC10E111 | ECL/PECL | ECL/PECL | 5 | 1 | 9 | >1.5 | 50 | 0.2 | 600 | PLCC-28 |
| MC10E211 | ECL/PECL | ECL/PECL | 5 | 1 | 6 | >1.5 | 75 | 0.2 | 400 | PLCC-28 |

CLOCK FAN-OUT (continued) (Specifications are at 25°C unless otherwise stated)

| Device(s) | Input Clock | Output Clock | Voltage | # of Input Channels | # of Outputs per Channel | Frequency (Typ) GHz | Output-to-Output Skew (Max) ps | Cycle-to-Cycle Jitter (Typ/Max) ps | Tr & Tf (Max) ps | Package |
|--------------|--|--------------|----------|---------------------|--------------------------|---------------------|--------------------------------|------------------------------------|------------------|------------------|
| MC10E411 | ECL/PECL | ECL/PECL | 5 | 1 | 9 | 1 | 50 | 0.2 | 600 | PLCC-28 |
| MC10EL11 | ECL/PECL | ECL/PECL | 5 | 1 | 2 | 2 | 5 | 0.2 | 350 | SO-8, TSSOP-8 |
| MC10EL15 | ECL/PECL | ECL/PECL | 5 | 1 | 4 | 1 | 50 | 0.2 | 575 | SO-16 |
| MC10EP11 | ECL/PECL | ECL/PECL | 3.3/5 | 1 | 2 | >3 | 20 | 0.2 | 180 | SO-8, TSSOP-8 |
| MC10LVEP11 | ECL/PECL | ECL/PECL | 2.5/3.3 | 1 | 2 | >3 | 20 | 0.2 | 180 | SO-8, TSSOP-8 |
| NB100EP223 | ECL/PECL/HSTL | HSTL | 3.3 | 1 | 22 | >0.5 | 25 | 0.2 | 700 | LQFP-64 |
| NB100LVEP221 | ECL/PECL/HSTL | ECL/PECL | 2.5/3.3 | 1 | 20 | >1 | 20 | 0.2 | 200 (typ) | LQFP-52 |
| NB100LVEP224 | ECL/PECL | ECL/PECL | 2.5/3.3 | 1 | 24 | >1 | 15 | 0.2 | 160 (min) | LQFP-64 |
| NBSG11 | ECL/TTL/CMOS/ CML/LVDS | RSPECL/RSECL | 2.5/3.3 | 1 | 2 | >12 | 15 | 0.5 | 30 | FCBGA-16 |
| NBSG111 | ECL/PECL/TTL/ CMOS/CML/LVDS | RSPECL/RSECL | 2.5/3.3 | 1 | 10 | >6 | 15 (typ) | 0.2 | 40 (typ) | FCBGA-14 |
| NBSG14 | ECL/PECL/TTL/ CMOS/CML/LVDS | RSPECL/RSECL | 2.5/3.3 | 1 | 5 | 12 | 15 | 0.5 | 55 | FCBGA-16 |
| NB6L11 | LVPECL, LVDS, CML, LVCMOS or LVTTL | LVECL/LVPECL | 2.5, 3.3 | 1 | 2 | >6 | 15 | 0.2 | 120 | SO-8, TSSOP-8 |
| NB7L11M | ECL/TTL/ CMOS/CML/LVDS | CML | 2.5/3.3 | 1 | 2 | >8 | 15 | 0.2 | 60 | QFN-16 |
| NB7L14M | ECL/TTL/ CMOS/CML/LVDS | CML | 2.5/3.3 | 1 | 5 | >8 | 15 | 0.2 | 60 | QFN-16 |
| NB7L111M | ECL/TTL/ CMOS/CML/LVDS | CML | 2.5/3.3 | 1 | 10 | >5.5 | 20 | 0.2 | 75 | QFN-52 |
| NB4N11S | ECL/TTL/ CMOS/CML/LVDS | LVDS | 3.3 | 1 | 2 | 2.0 | 25 | 0.5 | 170 | QFN-16 |
| NB4N11M | ECL/TTL/ CMOS/CML/LVDS | CML | 3.3 | 1 | 2 | 2.5 | 25 | 1 | 300 | TSSOP-8 |

ON Semiconductor Selector Guide – Clock and Data Management Devices

CLOCK DIVIDERS (Specifications are at 25°C unless otherwise stated)

| Device(s) | Output | Frequency Division | # of Channels | Outputs per Bank | Voltage | Frequency (Typ) GHz | Propagation Delay (Typ) ps | Cycle-to-Cycle Jitter (Typ/Max) ps | Tr & Tf (Max) ps | Package |
|-------------|----------|-----------------------|---------------|------------------|---------|---------------------|----------------------------|------------------------------------|------------------|----------------------|
| MC100EL32 | ECL/PECL | Div2 | 1 | 1 | 5 | >3 | 510 | 0.2 / 1.0 | 350 | SO-8, TSSOP-8 |
| MC100EL33 | ECL/PECL | Div4 | 1 | 1 | 5 | >4 | 650 | 1.0 (typ) | 350 | SO-8, TSSOP-8 |
| MC100EL34 | ECL/PECL | Div2, Div4, Div8 | 1 | 1+1+1 | 5 | 1.1 | 1000 | <1 (typ) | 525 | SO-16 |
| MC100EL38 | ECL/PECL | Div2, Div4/6 | 1 | 2+2 | 5 | 1 | 900 | 0.2 / 1.0 | 550 | SO-20 |
| MC100EL39 | ECL/PECL | Div2/4, Div4/6 | 1 | 2+2 | 5 | 1 | 900 | 0.2 / 1.0 | 550 | SO-20 |
| MC100EP139 | ECL/PECL | Div2/4, Div4/5/6 | 1 | 2+2 | 3.3/5 | >1 | 750 | 0.2 / 1.0 | 275 | SO-20, TSSOP-20 |
| MC100EP32 | ECL/PECL | Div2 | 1 | 1 | 3.3/5 | >4 | 350 | 0.2 / 1.0 | 170 | SO-8, TSSOP-8, DFN-8 |
| MC100EP33 | ECL/PECL | Div4 | 1 | 1 | 3.3/5 | >4 | 320 | 0.2 / 1.0 | 180 | SO-8, TSSOP-8 |
| MC100LVE222 | ECL/PECL | 1:15 Diff, Div1, Div2 | 2 | 15 | 3.3 | 1.5 | 1180 | 0.2 / 1.0 | 600 | TQFP-52 |
| MC100LVEL32 | ECL/PECL | Div2 | 1 | 1 | 3.3 | >2.6 | 510 | 0.2 / 1.0 | 320 | SO-8, TSSOP-8 |
| MC100LVEL33 | ECL/PECL | Div4 | 1 | 1 | 3.3 | >4 | 630 | 0.2 / 1.0 | 320 | SO-8, TSSOP-8 |
| MC100LVEL34 | ECL/PECL | Div2, Div4, Div8 | 1 | 1+1+1 | 3.3 | 1.5 | 700 | <1 (typ) | 250 | SO-16, TSSOP-16 |
| MC100LVEL37 | ECL/PECL | Div1 Div2 | 2 | 2+2 | 3.3 | 1 | 700 | 0.2 / 1.0 | 550 | SO-20 |
| MC100LVEL38 | ECL/PECL | Div2 Div4/6 | 1 | 2+2 | 3.3 | 1 | 900 | 0.2 / 1.0 | 550 | SO-20 |
| MC100LVEL39 | ECL/PECL | Div2/4, Div4/6 | 1 | 2+2 | 3.3 | 1 | 900 | 0.2 / 1.0 | 550 | SO-20 |
| MC100LVEP34 | ECL/PECL | Div2, Div4, Div8 | 1 | 1+1+1 | 3.3 | 2.8 | 700 | <1 (typ) | 250 | SO-16 |
| MC10EL32 | ECL/PECL | Div2 | 1 | 1 | 5 | >3 | 510 | 0.2 / 1.0 | 350 | SO-8, TSSOP-8 |
| MC10EL33 | ECL/PECL | Div4 | 1 | 1 | 5 | >4 | 650 | 1.0 (typ) | 350 | SO-8, TSSOP-8 |
| MC10EL34 | ECL/PECL | Div2, Div4, Div8 | 1 | 1+1+1 | 5 | 1.1 | 1000 | <1 (typ) | 525 | SO-16 |
| MC10EP139 | ECL/PECL | Div2/4, Div4/5/6 | 1 | 2+2 | 3.3/5 | >1 | 750 | 0.2 / 1.0 | 275 | SO-20, TSSOP-20 |
| MC10EP32 | ECL/PECL | Div2 | 1 | 1 | 3.3/5 | >4 | 350 | 0.2 / 1.0 | 170 | SO-8, TSSOP-8 |

CLOCK DIVIDERS (continued) (Specifications are at 25°C unless otherwise stated)

| Device(s) | Output | Frequency Division | # of Channels | Outputs per Bank | Voltage | Frequency (Typ) GHz | Propagation Delay (Typ) ps | Cycle-to-Cycle Jitter (Typ/Max) ps | Tr & Tf (Max) ps | Package |
|--------------|----------|------------------------|---------------|------------------|----------|---------------------|----------------------------|------------------------------------|------------------|---------------|
| MC10EP33 | ECL/PECL | Div4 | 1 | 1 | 3.3/5 | >4 | 320 | 0.2 / 1.0 | 180 | SO-8, TSSOP-8 |
| NB100LVEP222 | ECL/PECL | 1:1.5 Diff, Div1, Div2 | 2 | 15 | 2.5/3.3 | 1 | 875 | 0.2 / 1.0 | 160 (typ) | LQFP-52 |
| NBSG53A | RSECL | Div1, Div2 | 2 | 1 | 2.5/3.3 | >8 | 210 | 0.5 / 1.0 | 60 | FCBGA-16 |
| NB6L239 | PECL | 1/2/4/8, 2/4/8/16 | 2 | 1 | 2.5, 3.3 | 3 | 470 | 0.2 / 1.0 | 120 | QFN-16 |
| NB6N239S | LVDS | 1/2/4/8, 2/4/8/16 | 2 | 1 | 3.3 | 3 | 470 | 0.2 / 1.0 | 120 | QFN-16 |
| NB7N017M | CML | Dual 8-Bit Modulus | 1 | 1 | 3.3 | 3.5 | 500 | 3.0 | 65 | QFN-52 |
| NB7L32M | CML | Div2 | 1 | 1 | 2.5/3.3 | 14 | 200 | <0.5 | 30 | QFN-16 |

SKEW MANAGEMENT (Specifications are at 25°C unless otherwise stated)

| Device(s) | Voltage | Frequency (Typ) GHz | Min Programmable Delay (Typ) ns | Max Programmable Delay (Typ) ns | Step Delay Resolution (Typ) ps | Cycle-to-Cycle Jitter (Max) ps | Tr & Tf (Max) ps | Package |
|-------------------------|---------|---------------------|---------------------------------|---------------------------------|--------------------------------|--------------------------------|------------------|---------|
| MC100E195 | 5 | >1 | 2.05 | 2.6 | 20 | <5 | 325 | PLCC-28 |
| MC100E196 ¹ | 5 | >1 | 2.05 | 2.6 | 20 | <5 | 325 | PLCC-28 |
| MC100EP195 | 3.3/5 | >2.5 | 2.2 | 12.2 | 10 | 0.2 / 1.0 | 300 | LQFP-32 |
| MC100EP196 ² | 3.3/5 | >1.8 | 2.2 | 12.2 | 10 | 0.2 / 1.0 | 210 | LQFP32 |
| MC10E195 | 5 | >1 | 2.05 | 2.6 | 20 | <5 | 325 | PLCC-28 |
| MC10E196 ¹ | 5 | >1 | 2.05 | 2.6 | 20 | <5 | 325 | PLCC-28 |
| MC10EP195 | 3.3/5 | >2.5 | 2.2 | 12.2 | 10 | 0.2 / 1.0 | 300 | LQFP-32 |
| MC10EP196 ² | 3.3/5 | >1.8 | 2.2 | 12.2 | 10 | 0.2 / 1.0 | 210 | LQFP32 |

SPECIAL NOTES/FEATURES:

¹ FTUNE input provides < 20 pS resolution control.

² FTUNE input provides 0 to 60 pS programmable resolution control.

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PRESCALERS (Specifications are at 25°C unless otherwise stated)

| Device(s) | Frequency Division | Voltage | Supply Current (I _{cc} -Max) mA | Frequency (Max) GHz | Supply Current Un-loaded (Typ) mA | Input Voltage Sensitivity Min/Max (mV p-p) | Package |
|-----------|----------------------------|---------|--|---------------------|-----------------------------------|--|---------|
| MC12026A | Div8/9 or Div16/17 | 5 | 5.3 | 1.1 | 4 | 100 / 1000 | SO-8 |
| MC12080 | Div10, Div20, Div40, Div80 | 5 | 5 | 1.1 | 3.7 | 100 / 1000 | SO-8 |
| MC12093 | Div2, Div4, Div8 | 3.3/5 | 4.5 | 1.1 | 3 | 100 / 1000 | SO-8 |
| MC12095 | Div2, Div4, Div8 | 3.3/5 | 14 | 2.5 | 3 | 200 / 1000 | SO-8 |

CLOCK SYNTHESIZERS (Specifications are at 25°C unless otherwise stated)

| Device(s) | V _{cc} (Typ) V | Min Output Freq. (MHz) | Max Output Freq. (MHz) | Max Input Freq. XTAL (MHz) | t _{jitter} (+-ps) | Min Output Rise/Fall (ps) | Temperature Rating | Package |
|-----------|-------------------------|------------------------|------------------------|----------------------------|----------------------------|---------------------------|--------------------|--------------------------|
| NBC12429 | 3.3, 5 | 25 | 400 | 20 | 20 | 300 | 0 to 70°C | 28-PLCC, 32-LQFP |
| NBC12430 | 3.3, 5 | 50 | 800 | 20 | 20 | 175 | 0 to 70°C | 28-PLCC, 32-LQFP |
| NBC12439 | 3.3, 5 | 50 | 800 | 20 | 25 | 300 | 0 to 70°C | 28-PLCC, 32-LQFP |
| NBC12429A | 3.3, 5 | 25 | 400 | 20 | 20 | 300 | -40 to 85°C | 28-PLCC, 32-LQFP, QFN-32 |
| NBC12430A | 3.3, 5 | 50 | 800 | 20 | 20 | 175 | -40 to 85°C | 28-PLCC, 32-LQFP, QFN-32 |
| NBC12439A | 3.3, 5 | 50 | 800 | 20 | 25 | 300 | -40 to 85°C | 28-PLCC, 32-LQFP, QFN-32 |
| NB4N507A | 3.3, 5 | 50 | 200 | 27 | 10 | 50 | -40 to 85°C | SOIC-16 |

ZERO DELAY BUFFERS (Specifications are at 25°C unless otherwise stated)

| Device(s) | Outputs Per Device | V _{DD} Typ (V) | tskew (O-O) Max (ps) | F Max (MHz) | t _{Jitter} Max (ps) | Package |
|--------------|--------------------|-------------------------|----------------------|-------------|------------------------------|----------|
| NB2304AC1D | 4 | 3.3 | 200 | 133.3 | 100 | SOIC-8 |
| NB2304AI1D | 4 | 3.3 | 200 | 133.3 | 100 | SOIC-8 |
| NB2304AC1HD | 4 | 3.3 | 200 | 133.3 | 100 | SOIC-8 |
| NB2304AI1HD | 4 | 3.3 | 200 | 133.3 | 100 | SOIC-8 |
| NB2304AC2D | 4 | 3.3 | 200 | 133.3 | 100 | SOIC-8 |
| NB2304AI2D | 4 | 3.3 | 200 | 133.3 | 100 | SOIC-8 |
| NB2305AC1D | 5 | 3.3 | 250 | 133.3 | 200 | SOIC-8 |
| NB2305AI1D | 5 | 3.3 | 250 | 133.3 | 200 | SOIC-8 |
| NB2305AC1DT | 5 | 3.3 | 250 | 133.3 | 200 | TSSOP-8 |
| NB2305AI1DT | 5 | 3.3 | 250 | 133.3 | 200 | TSSOP-8 |
| NB2305AC1HD | 5 | 3.3 | 250 | 133.3 | 200 | SOIC-8 |
| NB2305AI1HD | 5 | 3.3 | 250 | 133.3 | 200 | SOIC-8 |
| NB2305AC1HDT | 5 | 3.3 | 250 | 133.3 | 200 | TSSOP-8 |
| NB2305AI1HDT | 5 | 3.3 | 250 | 133.3 | 200 | TSSOP-8 |
| NB2308AC1D | 8 | 3.3 | 200 | 133.3 | 100 | SOIC-16 |
| NB2308AI1D | 8 | 3.3 | 200 | 133.3 | 100 | SOIC-16 |
| NB2308AC1DT | 8 | 3.3 | 200 | 133.3 | 100 | TSSOP-16 |
| NB2308AI1DT | 8 | 3.3 | 200 | 133.3 | 100 | TSSOP-16 |
| NB2308AC1HD | 8 | 3.3 | 200 | 133.3 | 100 | SOIC-16 |
| NB2308AI1HD | 8 | 3.3 | 200 | 133.3 | 100 | SOIC-16 |
| NB2308AC1HDT | 8 | 3.3 | 200 | 133.3 | 100 | TSSOP-16 |
| NB2308AI1HDT | 8 | 3.3 | 200 | 133.3 | 100 | TSSOP-16 |
| NB2308AC2D | 8 | 3.3 | 200 | 133.3 | 100 | SOIC-16 |
| NB2308AI2D | 8 | 3.3 | 200 | 133.3 | 100 | SOIC-16 |
| NB2308AC2DT | 8 | 3.3 | 200 | 133.3 | 100 | TSSOP-16 |
| NB2308AI2DT | 8 | 3.3 | 200 | 133.3 | 100 | TSSOP-16 |
| NB2308AC3D | 8 | 3.3 | 200 | 133.3 | 100 | SOIC-16 |

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ZERO DELAY BUFFERS (continued) (Specifications are at 25°C unless otherwise stated)

| Device(s) | Outputs Per Device | V _{DD} Typ (V) | tskew (O–O) Max (ps) | F Max (MHz) | t _{Jitter} Max (ps) | Package |
|--------------|--------------------|-------------------------|----------------------|-------------|------------------------------|----------|
| NB2308AI3D | 8 | 3.3 | 200 | 133.3 | 100 | SOIC–16 |
| NB2308AC3DT | 8 | 3.3 | 200 | 133.3 | 100 | TSSOP–16 |
| NB2308AI3DT | 8 | 3.3 | 200 | 133.3 | 100 | TSSOP–16 |
| NB2308AC4D | 8 | 3.3 | 200 | 133.3 | 100 | SOIC–16 |
| NB2308AI4D | 8 | 3.3 | 200 | 133.3 | 100 | SOIC–16 |
| NB2308AC4DT | 8 | 3.3 | 200 | 133.3 | 100 | TSSOP–16 |
| NB2308AI4DT | 8 | 3.3 | 200 | 133.3 | 100 | TSSOP–16 |
| NB2308AC5HD | 8 | 3.3 | 200 | 133.3 | 100 | SOIC–16 |
| NB2308AI5HD | 8 | 3.3 | 200 | 133.3 | 100 | SOIC–16 |
| NB2308AC5HDT | 8 | 3.3 | 200 | 133.3 | 100 | TSSOP–16 |
| NB2308AI5HDT | 8 | 3.3 | 200 | 133.3 | 100 | TSSOP–16 |
| NB2309AC1D | 9 | 3.3 | 250 | 133.3 | 200 | SOIC–16 |
| NB2309AI1D | 9 | 3.3 | 250 | 133.3 | 200 | SOIC–16 |
| NB2309AC1DT | 9 | 3.3 | 250 | 133.3 | 200 | SOIC–16 |
| NB2309AI1DT | 9 | 3.3 | 250 | 133.3 | 200 | TSSOP–16 |
| NB2309AC1HD | 9 | 3.3 | 250 | 133.3 | 200 | SOIC–16 |
| NB2309AI1HD | 9 | 3.3 | 250 | 133.3 | 200 | SOIC–16 |
| NB2309AC1HDT | 9 | 3.3 | 250 | 133.3 | 200 | TSSOP–16 |
| NB2309AI1HDT | 9 | 3.3 | 250 | 133.3 | 200 | TSSOP–16 |

EMI SUPPRESSION CLOCKS (Specifications are at 25°C unless otherwise stated) 133.3

| Device(s) | V _{DD} Typ (V) | Modulation | F Max (MHz) | Duty Cycle | tR & tF Max (ps) | Package |
|-----------|-------------------------|------------|-------------|------------|------------------|---------|
| NB2579A | 3.3 | ± 1% | 40 | 50 | 1100 | TSSOP-6 |
| NB2669A | 3.3 | ± 1% | 12 | 50 | 1100 | TSSOP-6 |
| NB2760A | 3.3 | ± 0.75% | 12 | 50 | 1100 | TSSOP-6 |
| NB2762A | 3.3 | - 1.25% | 12 | 50 | 1100 | TSSOP-6 |
| NB2769A | 3.3 | ± 1% | 12 | 50 | 1100 | TSSOP-6 |
| NB2779A | 3.3 | ± 1% | 30 | 50 | 1100 | TSSOP-6 |
| NB2780A | 3.3 | ± 0.75% | 50 | 50 | 1100 | TSSOP-6 |
| NB2869A | 3.3 | ± 1% | 12 | 50 | 1100 | TSSOP-6 |
| NB2870A | 3.3 | ± 0.75% | 30 | 50 | 1100 | TSSOP-6 |
| NB2872A | 3.3 | - 1.25% | 30 | 50 | 1100 | TSSOP-6 |
| NB2879A | 3.3 | ± 1% | 30 | 50 | 1100 | TSSOP-6 |
| NB2969A | 3.3 | ± 1% | 12 | 50 | 1100 | TSSOP-6 |

VCO (PLL) (Specifications are at 25°C unless otherwise stated)

| Device(s) | Frequency (Max) GHz | Voltage | Duty Cycle (Typ) % | SNR from Carrier (dB) | Package |
|-------------|---------------------|---------|--------------------|-----------------------|----------------------------------|
| MC100EL1648 | 1.1 | 5 | 50 | 40 | SOIC-8, TSSOP-8, SOIC EIAJ-14 |

PHASE/FREQUENCY DETECTORS (Specifications are at 25°C unless otherwise stated)

| Device(s) | Voltage | Transfer Gain mV/Degree | Vref & FB Inputs (S.E./Diff.) | Frequency (Typ) GHz | Propagation Delay (Typ) ps | Cycle-to-Cycle Jitter (Typ) ps | Tr & Tf (Max) ps | Package |
|-------------|---------|-------------------------|-------------------------------|---------------------|----------------------------|--------------------------------|------------------|----------|
| MC100LVEL40 | 3.3/5 | 2 | Diff | 0.25 | 1350 | 0.2 / 1.0 | 475 | SO-20 |
| MC100EP40 | 3.3/5 | 0.93 | Diff | >2 | 550 | 0.2 / 1.0 | 150 | TSSOP-20 |
| MC100EP140 | 3.3 | 1.2073 | S.E. | >2 | 475 | 0.2 / 1.0 | 200 | SO-8 |
| MCH12140 | 3.3, 5 | N/A | S.E. | 800 | 0.44 | N/A | 350 | SOIC 8 |
| MCK12140 | 3.3, 5 | N/A | S.E. | 800 | 0.44 | N/A | 350 | SOIC 8 |

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FLIP–FLOPS (Specifications are at 25°C unless otherwise stated)

| Device(s) | Description | Voltage | Freq. (Typ) GHz | Prop. Delay (Typ) ps | Setup Time (Min) ps | Hold Time (Min) ps | Set/ Reset Recovery (Min) ps | Jitter (Typ) ps RMS | Tr & Tf (Max) ps | Package |
|-------------|--|---------|--------------------|-------------------------|------------------------|-----------------------|---------------------------------------|---------------------------|------------------------|------------------|
| MC100E131 | 3.3/5 V ECL Quad D Flip–Flop with Set, Reset and Differential Clock | 5 | 1.1 | 500 | 150 | 175 | 290 | 1 | 480 | LQFP–32 |
| MC100E431 | 5 V ECL Triple Differential Data and Clock D Flip–Flop with Edge Triggered Set and Reset | 5 | 1.1 | 600 | 200 | 200 | 400 | <1 | 650 | PLCC–28 |
| MC100EL29 | 5 V ECL Dual Differential Data and Clock D Flip–Flop with Set and Reset | 5 | 1.1 | 580 | 0 | 100 | 100 | <1 | 550 | SO–20 |
| MC100EL30 | 5 V ECL Triple D Flip Flop with Set and Reset | 5 | 1.2 | 450 | 150 | 200 | 400 | <1 | 550 | SO–20 |
| MC100EL31 | 5 V ECL D Flip–Flop with Set and Reset | 5 | 2.8 | 475 | 150 | 250 | 400 | <1 | 350 | SO–8, TSSOP–8 |
| MC100EL35 | 5 V ECL JK Flip Flop | 5 | 2.2 | 525 | 150 | 250 | 400 | <1 | 350 | SO–8, TSSOP–8 |
| MC100EL51 | 5 V ECL Differential D Flip–Flop | 3.3/5 | 2.8 | 475 | 150 | 250 | 400 | <1 | 350 | SO–8, TSSOP–8 |
| MC100EL52 | 5 V Differential Data and Clock D Flip–Flop | 5 | 2.8 | 365 | 125 | 150 | N/A | <1 | 350 | SO–8, TSSOP–8 |
| MC100EP131 | 3.3/5 V ECL Quad D Flip–Flop with Set, Reset and Differential Clock | 3.3/5 | >3 | 460 | 120 | 120 | 290 | 0.2 | 290 | LQFP–32 |
| MC100EP29 | 3.3/5 V ECL Dual Differential Data and Clock D Flip–Flop with Set and Reset | 3.3/5 | 3 | 420 | 100 | 100 | 150 | 0.2 | 300 | TSSOP–20 |
| MC100EP31 | 3.3/5 V ECL D Flip–Flop with Set and Reset | 3.3/5 | >3 | 340 | 100 | 150 | 225 | 0.2 | 200 | SO–8, TSSOP–8 |
| MC100EP35 | 3.3/5 V ECL JK Flip Flop | 3.3/5 | >3 | 410 | 150 | 150 | 150 | 0.2 | 180 | SO–8, TSSOP–8 |
| MC100EP51 | 3.3/5 V ECL Differential Data and Clock D Flip–Flop | 3.3 | >3 | 375 | 100 | 100 | 150 | 0.2 | 180 | SO–8, TSSOP–8 |
| MC100EP52 | 3.3/5 V Differential Data and Clock D Flip–Flop | 3.3/5 | >4 | 330 | 50 | 0 | N/A | 0.2 | 180 | SO–8, TSSOP–8 |
| MC100LVEL29 | 3.3 V ECL Dual Differential Data and Clock D Flip–Flop with Set and Reset | 3.3 | 1.1 | 580 | 0 | 100 | 100 | <1 | 550 | SO–20 |
| MC100LVEL30 | 3.3 V ECL Triple D Flip Flop with Set and Reset | 5 | 1.2 | 450 | 150 | 200 | 400 | <1 | 550 | SO–20 |
| MC100LVEL31 | 3.3 V ECL D Flip–Flop with Set & Reset | 3.3 | 2.9 (min) | 475 | 150 | 250 | 400 | <1 | 320 | SO–8, TSSOP–8 |

FLIP-FLOPS (continued) (Specifications are at 25°C unless otherwise stated)

| Device(s) | Description | Voltage | Freq. (Typ) GHz | Prop. Delay (Typ) ps | Setup Time (Min) ps | Hold Time (Min) ps | Set/ Reset Recovery (Min) ps | Jitter (Typ) ps RMS | Tr & Tf (Max) ps | Package |
|-------------|---|-----------|--------------------|-------------------------|------------------------|-----------------------|---------------------------------------|---------------------------|------------------------|------------------|
| MC100LVEL51 | 3.3 V ECL Differential D Flip-Flop | 3.3 | 2.8 | 475 | 150 | 250 | 350 | <1 | 320 | SO-8, TSSOP-8 |
| MC10E131 | 5 V ECL Quad Differential Data and S.E. Clock D Flip-Flop with Edge Triggered Set and Reset | 5 | 1.1 | 500 | 150 | 175 | 400 | <1 | 480 (typ) | PLCC-28 |
| MC10E431 | 5 V ECL Triple Differential Data and Clock D Flip-Flop with Edge Triggered Set and Reset | 5 | 1.1 | 600 | 200 | 200 | 400 | <1 | 650 | PLCC-28 |
| MC10EL30 | 5 V ECL Triple D Flip Flop with Set and Reset | 5 | 1.2 | 450 | 150 | 200 | 400 | <1 | 550 | SO-20 |
| MC10EL31 | 5 V ECL D Flip-Flop with Set and Reset | 5 | 2.8 | 475 | 150 | 250 | 400 | <1 | 350 | SO-8, TSSOP-8 |
| MC10EL35 | 5 V ECL JK Flip Flop | 5 | 2.2 | 525 | 150 | 250 | 400 | <1 | 350 | SO-8, TSSOP-8 |
| MC10EL51 | 5 V ECL Differential D Flip-Flop | 3.3/5 | 2.8 | 475 | 150 | 250 | 400 | <1 | 350 | SO-8, TSSOP-8 |
| MC10EL52 | 5 V Differential Data and Clock D Flip-Flop | 5 | 2.8 | 365 | 125 | 150 | N/A | <1 | 350 | SO-8, TSSOP-8 |
| MC10EP29 | 3.3/5 V ECL Dual Differential Data and Clock D Flip-Flop with Set and Reset | 3.3/5 | 3 | 420 | 100 | 100 | 150 | 0.2 | 300 | TSSOP-20 |
| MC10EP131 | 3.3/5 V ECL Quad D Flip-Flop with Set, Reset and Differential Clock | 3.3/5 | >3 | 460 | 120 | 120 | 290 | 0.2 | 290 | LQFP-32 |
| MC10EP31 | 3.3/5 V ECL D Flip-Flop with Set and Reset | 3.3/5 | >3 | 340 | 100 | 150 | 225 | 0.2 | 200 | SO-8, TSSOP-8 |
| MC10EP35 | 3.3/5 V ECL JK Flip Flop | 3.3/5 | >3 | 410 | 150 | 150 | 150 | 0.2 | 180 | SO-8, TSSOP-8 |
| MC10EP51 | 3.3/5 V ECL Differential Data and Clock D Flip-Flop | 3.3 | >3 | 375 | 100 | 100 | 150 | 0.2 | 180 | SO-8, TSSOP-8 |
| MC10EP52 | 3.3/5 V Differential Data and Clock D Flip-Flop | 3.3/5 | >4 | 330 | 50 | 0 | N/A | <1 | 180 | SO-8, TSSOP-8 |
| NB4L52 | 2.5 to 5.5 V ECL D-Flip-Flop with Differential Reset and Input Termination | 2.5/3.3/5 | >4 | 330 | 145 | 50 | 100 | <1 | 190 | QFN-16 |

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LATCHES (Specifications are at 25°C unless otherwise stated)

| Device(s) | Description | Voltage | Freq. (Typ) GHz | Prop. Delay (Typ) ps | Setup Time (Min) ps | Hold Time (Min) ps | Set/Reset Recovery (Min) ps | Tr & Tf (Max) ps | Package |
|-----------|---------------------------------|---------|--------------------|-------------------------|------------------------|-----------------------|-----------------------------------|---------------------|---------|
| MC10E150 | 5 V ECL 6-Bit D Latch | 5 | >1 | 800 | 200 | 200 | 750 | 450 | PLCC-28 |
| MC10E151 | 5 V ECL 6-Bit Register | 5 | 1.1 | 650 | 150 | 350 | 750 | 450 | PLCC-28 |
| MC100E150 | 5 V ECL 6-Bit D Latch | 5 | >1 | 800 | 200 | 200 | 750 | 450 | PLCC-28 |
| MC100E151 | 5 V ECL 6-Bit Register | 5 | 1.1 | 650 | 150 | 350 | 750 | 450 | PLCC-28 |
| MC10E175 | 5 V ECL 9-Bit Latch With Parity | 5 | >1 | 600 | 275 | 175 | 850 | 800 | PLCC-28 |
| MC100E175 | 5 V ECL 9-Bit Latch With Parity | 5 | >1 | 600 | 275 | 175 | 850 | 800 | PLCC-28 |
| MC10E154 | 5 V ECL 5-Bit 2:1 Mux-Latch | 5 | >1 | 500 | 300 | 300 | 800 | 800 | PLCC-28 |
| MC10E155 | 5 V ECL 6-Bit 2:1 Mux-Latch | 5 | >1 | 500 | 300 | 300 | 800 | 800 | PLCC-28 |
| MC10E156 | 5 V ECL 3-Bit 4:1 Mux-Latch | 5 | >1 | 600 | 400 | 300 | 800 | 700 | PLCC-28 |
| MC100E154 | 5 V ECL 5-Bit 2:1 Mux-Latch | 5 | >1 | 500 | 300 | 300 | 800 | 800 | PLCC-28 |
| MC100E155 | 5 V ECL 6-Bit 2:1 Mux-Latch | 5 | >1 | 500 | 300 | 300 | 800 | 800 | PLCC-28 |
| MC100E156 | 5 V ECL 3-Bit 4:1 Mux-Latch | 5 | >1 | 600 | 400 | 300 | 800 | 700 | PLCC-28 |

SHIFT REGISTERS (Specifications are at 25°C unless otherwise stated)

| Device(s) | Description | Voltage | # of Bits | Clock Source | Freq. (Typ) GHz | Prop. Delay (Typ) ps | Setup Time (Min) ps | Hold Time (Min) ps | Set/Reset Recovery (Min) ps | Jitter (Typ) ps RMS | Tr & Tf (Max) ps | Package |
|------------|--|---------|-----------|--------------------|-----------------|----------------------|---------------------|--------------------|-----------------------------|---------------------|------------------|------------------|
| MC100E141 | 5 V ECL 8–Bit Shift Register | 5 | 8 | S.E. | 0.9 | 750 | 175 | 200 | 900 | <1 | 800 | PLCC–28 |
| MC100E142 | 5 V ECL 9–Bit Shift Register | 5 | 9 | Dual S.E. (OR'ed) | 0.9 | 800 | 50 | 300 | 900 | <1 | 800 | PLCC–28 |
| MC100E143 | 5 V ECL 9–Bit Hold Register | 5 | S.E. | Dual (OR'ed) | >1 | 800 | 50 | 300 | 900 | <1 | 800 | PLCC–28 |
| MC100E151 | 5 V ECL 6–Bit Register | 5 | S.E. | Dual (OR'ed) | 1.1 | 650 | 150 | 350 | 750 | <1 | 450 | PLCC–28 |
| MC100E212 | 5 V ECL 3–Bit Scannable Registered Address Driver | 5 | 3 | S.E. | 0.9 | 800 | 175 | 250 | 600 | <1 | 600 | PLCC–28 |
| MC100E241 | 5 V ECL 8–Bit Scannable Register | 5 | 8 | S.E. | 0.9 | 750 | 175 | 200 | 900 | <1 | 800 | PLCC–28 |
| MC100E451 | 5 V ECL 6–Bit D Register with Differential Data and Clock Inputs | 5 | Diff. | Diff. | 1.1 | 650 | 150 | 350 | 750 | <1 | 800 | PLCC–28 |
| MC100E452 | 5 V ECL 5–Bit Differential Register | 5 | Diff. | Diff. | 1.1 | 600 | 175 | 225 | 750 | <1 | 650 | PLCC–28 |
| MC100EP131 | 3.3/5 V ECL Quad D Flip–Flop with Set, Reset and Differential Clock | 3.3/5 | S.E. | Diff. | >3 | 460 | 120 | 120 | 290 | 0.2 | 290 | LOFP–32 |
| MC100EP142 | 5 V ECL 9–Bit Shift Register | 3.3/5 | 9 | Dual Diff. (OR'ed) | 3.4 | 675 | 50 | 100 | 800 | 1 | 275 | LOFP–32 |
| MC100EP451 | 3.3/5 V ECL 6–Bit D Register with Differential Data and Clock Inputs | 3.3/5 | Diff. | Diff. | >3 | 450 | 80 | 80 | 250 | 0.2 | 260 | LOFP–32 |
| MC10E141 | 5 V ECL 8–Bit Shift Register | 5 | 8 | S.E. | 0.9 | 750 | 175 | 200 | 900 | <1 | 800 | PLCC–28 |
| MC10E142 | 5 V ECL 9–Bit Shift Register | 5 | 9 | Dual S.E. (OR'ed) | 0.9 | 800 | 50 | 300 | 900 | <1 | 800 | PLCC–28 |
| MC10E143 | 5 V ECL 9–Bit Hold Register | 5 | S.E. | Dual (OR'ed) | >1 | 800 | 50 | 300 | 900 | <1 | 800 | PLCC–28 |
| MC10E151 | 5 V ECL 6–Bit Register | 5 | S.E. | Dual (OR'ed) | 1.1 | 650 | 150 | 350 | 750 | <1 | 450 | PLCC–28 |
| MC10E451 | 5 V ECL 6–Bit D Register with Differential Data and Clock Inputs | 5 | Diff. | Diff. | 1.1 | 650 | 150 | 350 | 750 | <1 | 800 | PLCC–28 |
| MC10E452 | 5 V ECL 5–Bit Differential Register | 5 | Diff. | Diff. | 1.1 | 600 | 175 | 225 | 750 | <1 | 650 | PLCC–28 |
| MC10EP142 | 5 V ECL 9–Bit Shift Register | 3.3/5 | 9 | Dual Diff. (OR'ed) | 3.4 | 675 | 50 | 100 | 800 | 1 | 275 | LOFP–32 |
| MC10EP451 | 3.3/5 V ECL 6–Bit D Register with Differential Data and Clock Inputs | 3.3/5 | Diff. | Diff. | >3 | 450 | 80 | 80 | 250 | 0.2 | 260 | LOFP–32 |
| MC10H141 | 4–Bit Universal Shift Register | 5 | 4 | S.E. | 0.25 | 1500 | 1500 | 1000 | N/A | N/A | 2400 | PLCC–20, PDIP–16 |

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MULTIPLEXERS (Specifications are at 25°C unless otherwise stated)

| Device(s) | Voltage | Mux Radio | # of Muxes | Data Path | Freq. (Typ) GHz | Prop. Delay (Typ) ps | Within Device Skew (Max) ps | Jitter (Typ) ps RMS | Tr/Tf (Max) ps | Package |
|-------------|---------|-----------|------------|-----------|-----------------|----------------------|-----------------------------|---------------------|----------------|----------|
| MC100E157 | 5 | 2:1 | 4 | S.E. | >1 | 380 | 70 | <1 | 650 | PLCC-28 |
| MC100E158 | 5 | 2:1 | 5 | S.E. | >1 | 385 | 60 | <1 | 650 | PLCC-28 |
| MC100E163 | 5 | 8:1 | 2 | S.E. | >1 | 550 | 40 | <1 | 575 | PLCC-28 |
| MC100E164 | 5 | 16:1 | 1 | S.E. | >1 | 600 | 50 (typ) | <1 | 550 | PLCC-28 |
| MC100E167 | 5 | 2:1 | 6 | S.E. | 1 | 650 | 75 | <1 | 800 | PLCC-28 |
| MC100E171 | 5 | 4:1 | 3 | S.E. | >1 | 480 | 60 (typ) | <1 | 650 | PLCC-28 |
| MC100E256 | 5 | 4:1 | 3 | S.E. | >1 | 600 | 50 | <1 | 700 | PLCC-28 |
| MC100E457 | 5 | 2:1 | 3 | Diff. | >1 | 475 | 40 | <1 | 500 | PLCC-28 |
| MC100EL56 | 3.3 | 2:1 | 2 | Diff. | >1 | 440 | 80 | <1 | 540 | SO-20 |
| MC100EL57 | 5 | 4:1 | 1 | Diff. | >1 | 560 | 100 | <1 | 375 | SO-16 |
| MC100EL58 | 5 | 2:1 | 1 | S.E. | 1.5 | 230 | N/A | <1 | 350 | SO-8 |
| MC100EL59 | 5 | 2:1 | 3 | S.E. | >1 | 500 | 100 | <1 | 540 | SO-20 |
| MC100EP56 | 3.3/5 | 2:1 | 2 | Diff. | >3 | 360 | 100 | 0.2 | 180 | SO-20 |
| MC100EP57 | 3.3/5 | 4:1 | 1 | Diff. | >3 | 475 | 200 | 0.2 | 200 | TSSOP-20 |
| MC100EP58 | 3.3/5 | 2:1 | 1 | S.E. | >3 | 310 | N/A | 0.2 | 180 | SO-8 |
| MC100LVE164 | 3.3 | 16:1 | 1 | S.E. | >1 | 600 | 50 | <1 | 550 | TQFP-32 |
| MC100LVEL56 | 3.3 | 2:1 | 2 | Diff. | >1 | 440 | 80 | <3 (typ) | 540 | SO-20 |
| MC100LVEL58 | 3.3 | 2:1 | 1 | S.E. | 1.5 | 440 | N/A | <1 | 320 | SO-8 |
| MC100LVEL59 | 3.3 | 2:1 | 3 | S.E. | >1 | 500 | 100 | <1 | 540 | SO-20 |
| MC10E154 | 5 | 2:1 | 5 | S.E. | >1 | 500 | 50 | <1 | 800 | PLCC-28 |
| MC10E155 | 5 | 2:1 | 6 | S.E. | >1 | 500 | 75 | <1 | 800 | PLCC-28 |
| MC10E156 | 5 | 4:1 | 3 | S.E. | >1 | 600 | 50 | <1 | 700 | PLCC-28 |
| MC10E157 | 5 | 2:1 | 4 | S.E. | >1 | 380 | 70 | <1 | 650 | PLCC-28 |
| MC10E158 | 5 | 2:1 | 5 | S.E. | >1 | 385 | 60 | <1 | 650 | PLCC-28 |

MULTIPLEXERS (continued) (Specifications are at 25°C unless otherwise stated)

| Device(s) | Voltage | Mux Radio | # of Muxes | Data Path | Freq. (Typ) GHz | Prop. Delay (Typ) ps | Within Device Skew (Max) ps | Jitter (Typ) ps RMS | Tr/Tf (Max) ps | Package |
|-------------|-----------|-----------|------------|-----------|-----------------|----------------------|-----------------------------|---------------------|----------------|------------------|
| MC10E163 | 5 | 8:1 | 2 | S.E. | >1 | 550 | 40 | <1 | 575 | PLCC-28 |
| MC10E164 | 5 | 16:1 | 1 | S.E. | >1 | 600 | 50 (typ) | <1 | 550 | PLCC-28 |
| MC10E167 | 5 | 2:1 | 6 | S.E. | 1 | 650 | 75 | <1 | 800 | PLCC-28 |
| MC10E171 | 5 | 4:1 | 3 | S.E. | >1 | 480 | 60 (typ) | <1 | 650 | PLCC-28 |
| MC10E457 | 5 | 2:1 | 3 | Diff. | >1 | 475 | 40 | <1 | 500 | PLCC-28 |
| MC10EL56 | 3.3 | 2:1 | 2 | Diff. | >1 | 440 | 80 | <1 | 540 | SO-20 |
| MC10EL57 | 5 | 4:1 | 1 | Diff. | >1 | 560 | 100 | <1 | 375 | SO-16 |
| MC10EL58 | 5 | 2:1 | 1 | S.E. | 1.5 | 230 | N/A | <1 | 350 | SO-8 |
| MC10EP56 | 3.3/5 | 2:1 | 2 | Diff. | >3 | 360 | 100 | 0.2 | 180 | SO-20 |
| MC10EP57 | 3.3/5 | 4:1 | 1 | Diff. | >3 | 475 | 200 | 0.2 | 200 | TSSOP-20 |
| MC10EP58 | 3.3/5 | 2:1 | 1 | S.E. | >3 | 310 | N/A | 0.2 | 180 | SO-8 |
| MC10LVEL58 | 3.3 | 2:1 | 1 | S.E. | 1.5 | 440 | N/A | <1 | 320 | SO-8 |
| NB100LVEP56 | 2.5/3.3/5 | 2:1 | 2 | Diff. | >2.5 | 700 | 650 | 0.2 | 170 | TSSOP-20, QFN-24 |
| NBSG86A | 2.5 | 2:1 | 1 | Diff. | >8 | 165 | 15 | 0.5 | 65 | FCBGA-16, QFN-16 |
| NB7L86M | 2.5/3.3 | 2:1 | 1 | Diff. | >8 | 90 | 10 | 0.2 | 60 | QFN-16 |

SERIAL/PARALLEL CONVERTER AND PARALLEL/SERIAL CONVERTERS (Specifications are at 25°C unless otherwise stated)

| Device(s) | Description | Voltage | Data Rate (Typ) Gb/s | Prop. Delay (Typ) ps | Setup Time (Typ) ps | Hold Time (Typ) ps | Reset Recovery (Typ) ps | Jitter (Typ) ps RMS | Tr/Tf (Max) ps | Package |
|------------|---|---------|----------------------|----------------------|---------------------|--------------------|-------------------------|---------------------|----------------|---------|
| MC100E445 | 5 V ECL 4–Bit Serial/Parallel Converter | 5 | 2.0 (min) | 1800 | -250 | 300 | 300 | <1 | 350 | PLCC-28 |
| MC100E446 | 5 V ECL 4–Bit Parallel/Serial Converter | 5 | 1.6 | 1200 | -450 | 650 | N/A | <1 | 350 | PLCC-28 |
| MC100EP445 | 3.3/5 V ECL 8–Bit Serial/Parallel Converter | 3.3/5 | 2.5 | 1300 | -400 | 600 | 180 | 0.2 | 300 | LQFP-32 |
| MC100EP446 | 3.3/5 V ECL 8–Bit Parallel/Serial Converter | 3.3/5 | 3.4 | 800 | -450 | -600 | N/A | 0.2 | 170 | LQFP-32 |
| MC10E445 | 5 V ECL 4–Bit Serial/Parallel Converter | 5 | 2.0 (min) | 1800 | -250 | 300 | 300 | <1 | 350 | PLCC-28 |
| MC10E446 | 5 V ECL 4–Bit Parallel/Serial Converter | 5 | 1.6 | 1200 | -450 | 650 | N/A | <1 | 350 | PLCC-28 |
| MC10EP445 | 3.3/5 V ECL 8–Bit Serial/Parallel Converter | 3.3/5 | 2.5 | 1300 | -400 | 600 | 180 | 0.2 | 300 | LQFP-32 |
| MC10EP446 | 3.3/5 V ECL 8–Bit Parallel/Serial Converter | 3.3/5 | 3.4 | 800 | -450 | -600 | N/A | 0.2 | 170 | LQFP-32 |

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GATES (Specifications are at 25°C unless otherwise stated)

| Device(s) | Output Type | Type | Frequency (Typ) GHz | Propagation Delay (Typ) ps | Jitter (Typ) ps RMS | Tr/Tf (Max) ps | Package |
|-------------|-------------|----------|------------------------|-------------------------------|------------------------|----------------|---------------|
| MC100E101 | ECL/PECL | OR/NOR | 2 | 350 | <1 | 575 | PLCC-28 |
| MC100E104 | ECL/PECL | AND/NAND | 2 | 385 | <1 | 700 | PLCC-28 |
| MC100E107 | ECL/PECL | XOR/XNOR | 2 | 410 | <1 | 700 | PLCC-28 |
| MC100E404 | ECL/PECL | AND/NAND | 2 | 475 | <1 | 400 | PLCC-28 |
| MC100EL01 | ECL/PECL | OR/NOR | 2 | 230 | <1 | 235 | SO-8, TSSOP-8 |
| MC100EL04 | ECL/PECL | AND/NAND | 2 | 240 | <1 | 350 | SO-8, TSSOP-8 |
| MC100EL05 | ECL/PECL | AND/NAND | 2 | 275 | <1 | 350 | SO-8, TSSOP-8 |
| MC100EL07 | ECL/PECL | XOR/XNOR | 2 | 260 | <1 | 225 | SO-8, TSSOP-8 |
| MC100EP01 | ECL/PECL | OR/NOR | >3 | 270 | 0.2 | 180 | SO-8, TSSOP-8 |
| MC100EP05 | ECL/PECL | AND/NAND | >3 | 220 | 0.2 | 180 | SO-8, TSSOP-8 |
| MC100EP08 | ECL/PECL | XOR/XNOR | >3 | 250 | 0.2 | 180 | SO-8, TSSOP-8 |
| MC100EP101 | ECL/PECL | OR/NOR | >3 | 300 | 0.2 | 220 | PLCC-28 |
| MC100EP105 | ECL/PECL | AND/NAND | >3 | 220 | 0.2 | 180 | SO-8, TSSOP-8 |
| MC100LVEL01 | ECL/PECL | OR/NOR | 2 | 370 | <1 | 320 | SO-8, TSSOP-8 |
| MC100LVEL05 | ECL/PECL | AND/NAND | 2 | 340 | <1 | 320 | SO-8, TSSOP-8 |
| MC10E101 | ECL/PECL | OR/NOR | 2 | 350 | <1 | 575 | PLCC-28 |
| MC10E104 | ECL/PECL | AND/NAND | 2 | 385 | <1 | 700 | PLCC-28 |
| MC10E107 | ECL/PECL | XOR/XNOR | 2 | 410 | <1 | 700 | PLCC-28 |
| MC10E404 | ECL/PECL | AND/NAND | 2 | 475 | <1 | 400 | PLCC-28 |
| MC10EL01 | ECL/PECL | OR/NOR | 2 | 230 | <1 | 235 | SO-8, TSSOP-8 |
| MC10EL04 | ECL/PECL | AND/NAND | 2 | 240 | <1 | 350 | SO-8, TSSOP-8 |
| MC10EL05 | ECL/PECL | AND/NAND | 2 | 275 | <1 | 350 | SO-8, TSSOP-8 |
| MC10EL07 | ECL/PECL | XOR/XNOR | 2 | 260 | <1 | 225 | SO-8, TSSOP-8 |
| MC10EP01 | ECL/PECL | OR/NOR | >3 | 270 | 0.2 | 180 | SO-8, TSSOP-8 |
| MC10EP05 | ECL/PECL | AND/NAND | >3 | 220 | 0.2 | 180 | SO-8, TSSOP-8 |

GATES (continued) (Specifications are at 25°C unless otherwise stated)

| Device(s) | Output Type | Type | Frequency (Typ) GHz | Propagation Delay (Typ) ps | Jitter (Typ) ps RMS | Tr/Tf (Max) ps | Package |
|-----------|-------------------------------|--|---------------------|----------------------------|---------------------|----------------|------------------|
| MC10EP08 | ECL/PECL | XOR/XNOR | >3 | 250 | 0.2 | 180 | SO-8, TSSOP-8 |
| MC10EP101 | ECL/PECL | OR/NOR | >3 | 300 | 0.2 | 220 | PLCC-28 |
| MC10EP105 | ECL/PECL | AND/NAND | >3 | 220 | 0.2 | 180 | SO-8, TSSOP-8 |
| NBSG86A | PECL with Output Level Select | Smart Gate (AND/NAND, OR/NOR, XOR/XNOR, 2:1 MUX) | >8 | 165 | 0.5 | 65 | FCBGA-16, QFN-16 |
| NB7L86M | CML | Smart Gate (AND/NAND, OR/NOR, XOR/XNOR, 2:1 MUX) | >8 | 120 | 0.2 | 60 | QFN-16 |

COUNTERS (Specifications are at 25°C unless otherwise stated)

| Device(s) | Description | Voltage | Count Freq. (Typ) GHz | Prop. Delay (Typ) ps | Setup Time (Typ) ps | Hold Time (Typ) ps | Reset Recovery (Typ) ps | Jitter (Typ) ps RMS | Tr/Tf (Max) ps | Package |
|-------------|---|---------|-----------------------|----------------------|---------------------|--------------------|-------------------------|---------------------|----------------|---------|
| MC100E016 | 5 V ECL 8-Bit Synchronous Binary Up Counter | 5 | 0.9 | 775 | -30 | 100 | 700 | 3 | 800 | PLCC-28 |
| MC100E136 | 5 V ECL 6-Bit Universal Up/Down Counter | 5 | 0.65 | 1150 | 650 | -200 | 700 | <5 | 600 | PLCC-28 |
| MC100E137 | 5 V ECL 8-Bit Ripple Counter | 5 | 2.2 | 2900 | -150 | 150 | 200 | <5 | 600 | PLCC-28 |
| MC100EP016A | 3.3 V ECL 8-Bit Synchronous Binary Up Counter | 3.3 | 1.4 | 570 | 240 | -155 | 205 | 2.5 | 320 | LQFP-32 |
| MC10E016 | 5 V ECL 8-Bit Synchronous Binary Up Counter | 5 | 0.9 | 775 | -30 | 100 | 700 | 3 | 800 | PLCC-28 |
| MC10E136 | 5 V ECL 6-Bit Universal Up/Down Counter | 5 | 0.65 | 1150 | 650 | -200 | 700 | <5 | 600 | PLCC-28 |
| MC10E137 | 5 V ECL 8-Bit Ripple Counter | 5 | 2.2 | 2900 | -150 | 150 | 200 | <5 | 600 | PLCC-28 |

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COMPARATORS (Specifications are at 25°C unless otherwise stated)

| Device(s) | Description | Voltage | Frequency (Typ) GHz | Propagation Delay (Typ) ps | Jitter (Typ) ps RMS | Tr/Tf (Max) ps | Package |
|-----------|---|---------|---------------------|----------------------------|---------------------|----------------|------------------|
| MC10E166 | 5 V ECL 9-Bit Magnitude Comparator | 5 | >1 | 850 | <1 | 800 | PLCC-28 |
| MC100E166 | 5 V ECL 9-Bit Magnitude Comparator | 5 | >1 | 850 | <1 | 800 | PLCC-28 |
| MC10E1651 | 5 V, -5 V ECL Dual ECL Output Comparator with Latch | 5 / -5 | >1 | 775 | <1 | 475 | CDIP-16, PLCC-20 |
| MC10E1652 | 5 V ECL Dual ECL Output Comparator with Latch | 5 | >1 | 775 | <1 | 475 | CDIP-16, PLCC-20 |

PARITY CHECKERS (Specifications are at 25°C unless otherwise stated)

| Device(s) | Description | Voltage | Propagation Delay (Typ) ps | Setup Time (Typ) ps | Hold Time (Typ) ps | Tr/Tf (Max) ps | Package |
|--------------|--|---------|----------------------------|---------------------|--------------------|----------------|---------|
| MC10/100E160 | 5 V ECL 12-Bit Parity Generator/Checker | 5 | 650 | 900 | -900 | 650 | PLCC-28 |
| MC100E193 | 5 V ECL Error Detection/Correction Circuit | 5 | 775 | 350 | -350 | 1100 | PLCC-28 |

DRIVERS/RECEIVERS (Specifications are at 25°C unless otherwise stated)

| Device(s) | Description | Input I/O | Output I/O | Voltage | Freq. (Typ) GHz | Prop. Delay (Typ) ps | Jitter (Typ) ps RMS | Tr/Tf (Max) ps | Package |
|---------------|---|-----------|------------|---------|-----------------|----------------------|---------------------|----------------|---------------|
| MC10100EP16VB | 3.3/5 V ECL Differential Receiver/Driver with High and Low Gain | ECL/PECL | ECL/PECL | 3.3/5 | >3 | 300 | 0.2 | 240 | SO-8, TSSOP-8 |
| MC10100EP16VC | 3.3/5 V ECL Differential Receiver/Driver with High Gain and Enable Output | ECL/PECL | ECL/PECL | 3.3/5 | >3 | 380 | 0.2 | 240 | SO-8, TSSOP-8 |
| MC100E116 | 5 V ECL Quint Differential Line Receiver | ECL/PECL | ECL/PECL | 5 | >1.2 | 300 | 0.2 | 575 | PLCC-28 |
| MC100E416 | 5 V ECL Quint Differential Line Receiver | ECL/PECL | ECL/PECL | 5 | >2 | 350 | 0.2 | 350 | PLCC-28 |
| MC100EL16 | 5 V ECL Differential Receiver | ECL/PECL | ECL/PECL | 5 | >2 | 250 | 0.2 | 350 | SO-8, TSSOP-8 |
| MC100EL17 | 5 V ECL Quad Differential Receiver | ECL/PECL | ECL/PECL | 5 | >2 | 425 | 0.2 | 550 | SO-20 |
| MC100EP116 | 3.3/5 V ECL Hex Differential Line Receiver/Driver | ECL/PECL | ECL/PECL | 3.3/5 | >3 | 260 | 0.2 | 240 | LQFP-32 |
| MC100EP16 | 3.3/5 V ECL Differential Receiver/Driver | ECL/PECL | ECL/PECL | 3.3/5 | >4 | 220 | 0.2 | 180 | SO-8, TSSOP-8 |
| MC100EP16F | 3.3/5 V ECL Differential Receiver/Driver | ECL/PECL | ECL/PECL | 2.5/3.3 | >3 | 300 | 0.2 | 100 | SO-8, TSSOP-8 |
| MC100EP16T | 3.3/5 V ECL Differential Receiver/Driver with Internal Input Termination | ECL/PECL | ECL/PECL | 3.3/5 | >3 | 220 | 0.2 | 180 | SO-8, TSSOP-8 |
| MC100EP16VA | 3.3/5 V ECL Differential Receiver/Driver with High Gain | ECL/PECL | ECL/PECL | 3.3/5 | >3 | 270 | 0.2 | 180 | SO-8, TSSOP-8 |
| MC100EP16VB | 3.3/5 V ECL Differential Receiver/Driver with High and Low Gain | ECL/PECL | ECL/PECL | 3.3/5 | >3 | 300 | 0.2 | 240 | SO-8, TSSOP-8 |
| MC100EP16VC | 3.3/5 V ECL Differential Receiver/Driver with High Gain and Enable Output | ECL/PECL | ECL/PECL | 3.3/5 | >3 | 380 | 0.2 | 240 | SO-8, TSSOP-8 |
| MC100EP16VS | 3.3/5 V ECL Differential Receiver/Driver with Variable Output Swing | ECL/PECL | ECL/PECL | 3.3/5 | >4 | 220 | 0.2 | 180 | SO-8, TSSOP-8 |

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DRIVERS/RECEIVERS (continued) (Specifications are at 25°C unless otherwise stated)

| Device(s) | Description | Input I/O | Output I/O | Voltage | Freq. (Typ) GHz | Prop. Delay (Typ) ps | Jitter (Typ) ps RMS | Tr/Tf (Max) ps | Package |
|-------------|--|-----------------------------------|------------|---------|-----------------|----------------------|---------------------|----------------|-----------------|
| NB4L16M | 2.5/3.3 V 5 Gb/s Multi Level Clock/Data Input to CML Driver/Receiver/Buffer/Translator with Internal Termination | LVPECL, LVTTTL, LVCMOS, CML, LVDS | CML | 2.5/3.3 | 3.5 | 220 | 0.2 | 90 | QFN-16 |
| MC100EP16VT | 3.3/5 V ECL Differential Receiver/Driver with Variable Output Swing and Internal Input Termination | ECL/PECL | ECL/PECL | 3.3/5 | >4 | 300 | 0.2 | 180 | SO-8, TSSOP-8 |
| MC100EP17 | 3.3 V ECL Quad Differential Receiver | ECL/PECL | ECL/PECL | 3.3/5 | >3 | 220 | 0.2 | 230 | SO-20, TSSOP-20 |
| MC100LVEL16 | 3.3 V ECL Differential Receiver | ECL/PECL | ECL/PECL | 3.3 | >2 | 300 | 0.2 | 320 | SO-8, TSSOP-8 |
| MC100LVEL17 | 3.3 V ECL Quad Differential Receiver | ECL/PECL | ECL/PECL | 3.3 | >2 | 425 | 0.2 | 550 | SO-20 |
| MC100LVEP16 | 2.5/3.3 V ECL Differential Receiver/Driver | ECL/PECL | ECL/PECL | 2.5/3.3 | >4 | 240 | 0.2 | 180 | SO-8, TSSOP-8 |
| MC10E116 | 5 V ECL Quint Differential Line Receiver | ECL/PECL | ECL/PECL | 5 | >2 | 300 | 0.2 | 575 | PLCC-28 |
| MC10E416 | 5 V ECL Quint Differential Line Receiver | ECL/PECL | ECL/PECL | 5 | >2 | 350 | 0.2 | 350 | PLCC-28 |
| MC10EL16 | 5 V ECL Differential Receiver | ECL/PECL | ECL/PECL | 5 | >2 | 250 | 0.2 | 350 | SO-8, TSSOP-8 |
| MC10EP116 | 3.3/5 V ECL Hex Differential Line Receiver/Driver | ECL/PECL | ECL/PECL | 3.3/5 | >3 | 260 | 0.2 | 240 | LQFP-32 |
| MC10EP16 | 3.3/5 V ECL Differential Receiver/Driver | ECL/PECL | ECL/PECL | 3.3/5 | >4 | 220 | 0.2 | 180 | SO-8, TSSOP-8 |
| MC10EP16T | 3.3/5 V ECL Differential Receiver/Driver with Internal Input Termination | ECL/PECL | ECL/PECL | 3.3/5 | >3 | 220 | 0.2 | 180 | SO-8, TSSOP-8 |
| MC10EP16VA | 3.3/5 V ECL Differential Receiver/Driver with High Gain | ECL/PECL | ECL/PECL | 3.3/5 | >3 | 270 | 0.2 | 180 | SO-8, TSSOP-8 |
| MC10EP16VB | 3.3/5 V ECL Differential Receiver/Driver with High and Low Gain | ECL/PECL | ECL/PECL | 3.3/5 | >3 | 300 | 0.2 | 240 | SO-8, TSSOP-8 |
| MC10EP16VC | 3.3/5 V ECL Differential Receiver/Driver with High Gain and Enable Output | ECL/PECL | ECL/PECL | 3.3/5 | >3 | 380 | 0.2 | 240 | SO-8, TSSOP-8 |

DRIVERS/RECEIVERS (continued) (Specifications are at 25°C unless otherwise stated)

| Device(s) | Description | Input I/O | Output I/O | Voltage | Freq. (Typ) GHz | Prop. Delay (Typ) ps | Jitter (Typ) ps RMS | Tr/Tf (Max) ps | Package |
|-------------|--|---|------------|-----------|-----------------|----------------------|---------------------|----------------|------------------|
| MC10EP16VT | 3.3/5 V ECL Differential Receiver/Driver with Variable Output Swing and Internal Input Termination | ECL/PECL | ECL/PECL | 3.3/5 | >4 | 300 | 0.2 | 180 | SO-8, TSSOP-8 |
| MC10EP17 | 3.3 V ECL Quad Differential Receiver | ECL/PECL | ECL/PECL | 3.3/5 | >3 | 220 | 0.2 | 230 | SO-20, TSSOP-20 |
| MC10LVEP16 | 2.5/3.3 V ECL Differential Receiver/Driver | ECL/PECL | ECL/PECL | 2.5/3.3 | >4 | 240 | 0.2 | 180 | SO-8, TSSOP-8 |
| NB100LVEP17 | 2.5 V/3.3 V/5 V ECL Quad Differential Driver/Receiver | ECL/PECL | ECL/PECL | 2.5/3.3/5 | >2.5 | 250 | 0.5 | 240 | TSSOP-20, QFN-24 |
| NBSG16 | 2.5/3.3 V SiGe Differential Receiver/Driver with RSPECL Output | ECL/PECL, HSTL, GTL, TTL, CMOS, CML or LVDS | RSECL | 2.5/3.3 | >12 | 120 | 0.3 | 65 | FCBGA-16, QFN-16 |
| NBSG16VS | 2.5/3.3 V SiGe Differential Receiver/Driver with Variable Output Swing | ECL/PECL, TTL, CMOS, LVDS or LVDS | ECL/PECL | 2.5/3.3 | >12 | 125 | 0.8 | 55 | FCBGA-16, QFN-16 |
| NB6L16 | 2.5/3.3 V Multi-level Input to Differential LVPECL Clock or Data Translator/Receiver/Driver Buffer | LVDS, LVPECL, LVNECL, CML, LVCMOS or LVTTTL | ECL/PECL | 2.5/3.3 | >6 | 130 | 0.2 | 120 | SO-8, TSSOP-8 |
| NBSG16M | 2.5/3.3 V Multi-level Input to CML Clock/Data Receiver/Driver/Translator Buffer | ECL/PECL/LVTTTL/LVCMOS/CML/LVDS | CML | 2.5/3.3 | >10 | 120 | 0.2 | 53 | QFN-16 |
| NB4N527S | 3.3 V 2.5 Gb/s Dual Any Level to LVDS Receiver/Driver/Buffer/Translator with Input Termination | LVNECL, LVPECL, LVTTTL, LVCMOS, CML, LVDS, HSTL | LVDS | 3.3 | >1.25 | 275 | 0.5 | 140 | QFN-16 |
| NB4L16M | 2.5/3.3 V 5 Gb/s Multi Level Clock/Data Input to CML Driver/Receiver/Buffer/Translator with Internal Termination | LVPECL, LVDS, CML, LVCMOS, LVTTTL | CML | 2.5/3.3 | >3.5 | 220 | 0.2 | 90 | QFN-16 |
| NB7L216 | 2.5/3.3 V 12 Gb/s Multi Level Clock/Data Input to RSECL High Gain Receiver/Buffer/Translator with Internal Termination | LVNECL, LVPECL, HSTL, LVTTTL, LVCMOS, CML or LVDS | RSECL | 2.5/3.3 | >8.5 | 120 | 0.1 | 45 | QFN-16 |
| NB4N316M | 3.3 V Any Level Input to Open Collector CML Output Buffer/Translator with Input Hysteresis | LVPECL, CML, LVCMOS, LVTTTL, LVDS | CML | 3.3 | >2 | 550 | 1 | 150 | TSSOP-8 |

ON Semiconductor Selector Guide – Clock and Data Management Devices

DRIVERS/BUFFERS (Specifications are at 25°C unless otherwise stated)

| Device(s) | Description | Voltage | Outputs | Propagation Delay (Typ) ps | Within Gate Skew (Max) ps | Tr/Tf (Max) ps | Package |
|-------------|---|---------|------------|----------------------------|---------------------------|----------------|------------------|
| MC10EL12 | 5 V ECL Low Impedance 1:2 Driver | 5 | OR/NOR ECL | 290 | N/A | 550 | SO-8, TSSOP-8 |
| MC100EL12 | 5 V ECL Low Impedance 1:2 Driver | 5 | OR/NOR ECL | 290 | N/A | 550 | SO-8, TSSOP-8 |
| MC100LVEL12 | 3.3 V ECL Low Impedance 1:2 Driver | 3.3 | OR/NOR ECL | 445 | N/A | 550 | SO-8, TSSOP-8 |
| MC10E112 | 5 V ECL Quad Driver | 5 | OR/NOR ECL | 400 | 40 | 700 | PLCC-28 |
| MC10E212 | 5 V ECL 3-Bit Scannable Registered Address Driver | 5 | OR/NOR ECL | 800 | 50 | 650 | PLCC-28 |
| MC10E122 | 5 V ECL 9-Bit Buffer | 5 | S.E. | 350 | 75 | 800 | PLCC-28 |
| MC100E112 | 5 V ECL Quad Driver | 5 | OR/NOR ECL | 400 | 40 | 700 | PLCC-28 |
| MC100E212 | 5 V ECL 3-Bit Scannable Registered Address Driver | 5 | OR/NOR ECL | 800 | 50 | 650 | PLCC-28 |
| MC100E122 | 5 V ECL 9-Bit Buffer | 5 | S.E. | 350 | 75 | 800 | PLCC-28 |

Interface

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Data Transmission

LINE RECEIVERS – EIA STANDARD

| S = Single Ended D = Differential | Type of Output | t_{prop} Delay Time Max (ns) | Party Line Operation | Strobe or Enable | Power Supplies (V) | Device | Suffix/Package | Receivers Per Package | Companion Drivers | Comments |
|--------------------------------------|----------------|--------------------------------|----------------------|------------------|--------------------|-------------------|------------------|-----------------------|--------------------|-----------|
| S | R (Note 27) | 85 | - | - | +5.0 | MC1489 MC1489A | DIP-16, SO-16 | 4 | MC1488 MC14C88B | EIA-232-D |

27. R = Resistor Pull-up, TP = Totem-pole output.

LINE DRIVERS – EIA STANDARD

| Output Current Capability (mA) | t_{prop} Delay Time Max (ns) | S = Single Ended D = Differential | Party Line Operation | Strobe or Enable | Power Supplies (V) | Device | Suffix/Package | Receivers Per Package | Companion Drivers | Comments |
|--------------------------------|--------------------------------|--------------------------------------|----------------------|------------------------|--------------------|----------------------|----------------|-----------------------|-------------------|-------------------------------|
| 85 | 35 | D | √ | √ | +5.0 | MC75174B MC75172B | SO-20L | 4 | - | EIA-485 |
| 10 | 350 | S | - | √ | ±9.0 to ±12 | MC1488 | DIP-8, SO-8 | 4 | MC1489 MC1489A | EIA-232-D |
| 60 | 300 | S/D | - | EIA-422 √ EIA-423 - | ±5.0 | MC26LS30 | SO-16 | 4 (423) 2 (422) | - | EIA-422 or EIA-423 Switchable |
| 18 | - | D | - | - | ±10.8 to ±13.2 | MC3488A | SO-8 | 1 (423) 1 (232) | - | Dual EIA-423 EIA-232D |

PERIPHERAL DRIVERS

| Output Current Capability (mA) | Input Capability | Propagation Delay Time Max (µs) | Output Clamp Diode | Off State Voltage Max (V) | Device | Drivers Per Package | Suffix/Package | Logic Function |
|--------------------------------|------------------|---------------------------------|--------------------|---------------------------|---------|---------------------|------------------|----------------|
| 500 | TTL, 5.0 V CMOS | 1.0 | √ | 50 | MC1413B | 7 | DIP-16, SO-16 | Invert |

MODULATOR/DEMODULATORS

| Product | T _A (min) (°C) | T _A (max) (°C) | Z _{is} (typ) (kΩ) | Z _{os} (typ) (kΩ) | V _{CFT} (typ) (μV) | V _{Cs} (typ) (mV) | A _{vs} (typ) (V) | B _w (typ) (MHz) | I _{IB} (typ) (μA) | A _{CM} (typ) (dB) | Packages |
|----------|---------------------------|---------------------------|----------------------------|----------------------------|-----------------------------|----------------------------|---------------------------|----------------------------|----------------------------|----------------------------|----------|
| MC1496BD | -40 | 125 | 200 | 40 | 20 | 65 | 3.5 | 300 | 12 | 85 | SOIC-14 |
| MC1496BP | -40 | 125 | 200 | 40 | 20 | 65 | 3.5 | 300 | 12 | 85 | PDIP-14 |
| MC1496D | 0 | 70 | 200 | 40 | 20 | 65 | 3.5 | 300 | 12 | 85 | SOIC-14 |
| MC1496P | 0 | 70 | 200 | 40 | 20 | 65 | 3.5 | 300 | 12 | 85 | PDIP-14 |

TIMERS

| Product | T _A (min) (°C) | T _A (max) (°C) | V _{CC} (min) (V) | V _{CC} (max) (V) | E _T (max) (%) | Packages |
|----------|---------------------------|---------------------------|---------------------------|---------------------------|--------------------------|--------------------|
| MC1455B | -40 | 85 | 4.5 | 16 | 1 | SOIC-8 Narrow Body |
| MC1455D | 0 | 70 | 4.5 | 16 | 1 | SOIC-8 Narrow Body |
| MC1455P | 0 | 70 | 4.5 | 16 | 1 | PDIP-8 |
| NCV1455B | -40 | 125 | 4.5 | 16 | 1 | SOIC-8 Narrow Body |

SMART CARD AND SIM CARD INTERFACE

| Product | Description | V _{CC} (min) (V) | V _{CC} (max) (V) | I _T (typ) (mA) | I _{I(standby)} (max) (μA) | f _{Clock} (max) (MHz) | Packages |
|----------|--|---------------------------|---------------------------|---------------------------|------------------------------------|--------------------------------|----------|
| NCN4555 | SIM Card Power Supply/Level Translator | 1.8 | 5.5 | 0.03 | 4 | 5 | QFN-16 |
| NCN4557 | Dual SIM/Smart Card Interface | 1.8 | 5.5 | 0.03 | 3 | 5 | QFN-16 |
| NCN6000 | Compact Smart Card Interface | 2.7 | 6 | 5 | 15 | 40 | TSSOP-20 |
| NCN6001 | Compact Smart Card Interface | 2.7 | 6 | 0.5 | 60 | 40 | TSSOP-20 |
| NCN6004A | Dual Asynchronous/Synchronous Smart Card Interface | 1.8 | 5.5 | | 50 | | QFP-48 |
| NCN6010 | Power Management and Level Shifter for SIM Cards | 2.7 | 6 | 20 | 2 | 10 | TSSOP-14 |

Standard Logic

Standard Logic

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In Brief...

This selector guide is a quick reference to ON Semiconductor's offering of exciting new Analog Switches and MiniGate™ products as well as the traditional standard logic integrated circuits. ON Semiconductor continues to increase the breadth of its portfolio offering in the MiniGate arena, and continues to offer the traditional industry standard IC Logic families that have become the foundation for a multitude of legacy electronic systems. The company's standard logic portfolio provides designers with a wide selection of voltages and speed/drive combinations to meet their application needs.

The **MiniGate** family of devices takes advantage of ON Semiconductor's world class discrete micropackaging manufacturing technology to enable best-in-class products. The technologies offered in the MiniGate family are direct "relatives" of the standard IC Logic products, designed and manufactured in the same CMOS based technology. These include Analog Switch, LCX, VHC and HC technologies, with the majority of the popular functions available in these different families in industry standard 5, 6 and 8 pin packages.

The traditional industry standard Logic IC offerings consist of families in the high voltage standard logic arena (5.0 V and greater).

In the low voltage standard logic arena, ON Semiconductor offers the following families:

VCX: This is the fastest, lowest voltage logic family offered by ON Semiconductor. Ten devices in all are offered, with five of the most popular functions, as well as five enhanced devices with a bus hold option. It is specified at 0.9 V to 3.6 V, is offered in the industry standard 48 pin TSSOP package and is specifically well suited for networking/ communication equipment applications, demanding high speed and low power.

LCX: LCX is fast becoming the industry "workhorse" product family in 3.0 V applications. This family features 5.0 V tolerant inputs and outputs and is especially suited for mixed-voltage, high-end, advanced workstation designs, as well as for low-power portable applications.

LVX: LVX is specified from 2.0 V to 3.6 V and is similar tin performance to VHC, but with lower output drive. It too has overvoltage tolerant (OVT) inputs to 7.0 V, allowing the interface of 5.0 V systems to 3.0 V systems. This family is available in industry standard JEDEC SOIC, EIAJ SOIC, and the popular TSSOP packages. It is specified at -55 to +125°C.

VHC: This "5.0 V to 3.0 V transitional family" is specified at 2.0 V to 5.5 V. When operating at supply voltages below 5.0 V, this family features 5.0 V tolerant inputs to support 3.0 V to 5.0 V mixed voltage system designs. Low power, low switching noise and fast switching speeds make this family perfect for low power, low cost applications. The VHCT functions offer TTL level compatibility with CMOS low power performance. VHCT accepts TTL level inputs and delivers full swing (4.5 V to 5.5 V) outputs. The supply voltage range for VHCT is VCC = 4.5 V - 5.5 V. The temperature range for this family is also -55 to +125°C and is also available in the same packages as LVX family.

There are three families offered in the more mature 5.0 V and greater operating voltage arena. **FACT (AC/ACT)**, **High Speed (HC/HCT)** and **Metal Gate (14000 series)**, remain as the legacy logic families. These families, although past the maturity stage in the industry product life cycle, continue to find new applications and will remain industry standards for many more years.

MiniGates

VHC One-Gates

| Ordering Suffixes: TSSOP-5 = DTT1, SC-88A = DFT2 (available in T & R only), G = Pb-free | | | | |
|---|---|------------------------|-------------|-------------------|
| Part Number | Description | Surface Mount Packages | Temperature | Operating Voltage |
| MC74VHC1G00 | 2-Input NAND Gate | TSOP-5, SC-88A | -55 to +125 | 2.0 to 5.5 V |
| MC74VHC1GT00 | 2-Input NAND Gate (TTL Compatible) | TSOP-5, SC-88A | -55 to +125 | 3.0 to 5.5 V |
| MC74VHC1G01 | 2-Input NAND Gate (Open Drain) | TSOP-5, SC-88A | -55 to +125 | 2.0 to 5.5 V |
| MC74VHC1G02 | 2-Input NOR Gate | TSOP-5, SC-88A | -55 to +125 | 2.0 to 5.5 V |
| MC74VHC1GT02 | 2-Input NOR Gate (TTL Compatible) | TSOP-5, SC-88A | -55 to +125 | 3.0 to 5.5 V |
| MC74VHC1G03 | 2-Input NOR Gate (Open Drain) | TSOP-5, SC-88A | -55 to +125 | 2.0 to 5.5 V |
| MC74VHC1G04 | Inverter | TSOP-5, SC-88A | -55 to +125 | 2.0 to 5.5 V |
| MC74VHC1GT04 | Inverter (TTL Compatible) | TSOP-5, SC-88A | -55 to +125 | 3.0 to 5.5 V |
| MC74VHC1GU04 | Inverter (Unbuffered) | TSOP-5, SC-88A | -55 to +125 | 2.0 to 5.5 V |
| MC74VHC1G05 | Inverter w/Open-Drain Output | TSOP-5, SC-88A | -55 to +125 | 2.0 to 5.5 V |
| MC74VHC1G07 | Buffer w/Open-Drain Output | TSOP-5, SC-88A | -55 to +125 | 2.0 to 5.5 V |
| MC74VHC1G08 | 2-Input AND Gate | TSOP-5, SC-88A | -55 to +125 | 2.0 to 5.5 V |
| MC74VHC1GT08 | 2-Input AND Gate (TTL Compatible) | TSOP-5, SC-88A | -55 to +125 | 3.0 to 5.5 V |
| MC74VHC1G09 | 2-Input AND Gate (Open Drain) | TSOP-5, SC-88A | -55 to +125 | 2.0 to 5.5 V |
| MC74VHC1G14 | Schmitt Trigger-Inverter | TSOP-5, SC-88A | -55 to +125 | 2.0 to 5.5 V |
| MC74VHC1GT14 | Schmitt Trigger Inverter (TTL Compatible) | TSOP-5, SC-88A | -55 to +125 | 3.0 to 5.5 V |
| MC74VHC1G32 | 2-Input OR Gate | TSOP-5, SC-88A | -55 to +125 | 2.0 to 5.5 V |
| MC74VHC1GT32 | 2-Input OR Gate (TTL Compatible) | TSOP-5, SC-88A | -55 to +125 | 3.0 to 5.5 V |
| MC74VHC1G50 | Buffer | TSOP-5, SC-88A | -55 to +125 | 2.0 to 5.5 V |
| MC74VHC1GT50 | Buffer (TTL Compatible) | TSOP-5, SC-88A | -55 to +125 | 3.0 to 5.5 V |
| MC74VHC1G66 | Analog Switch | TSOP-5, SC-88A | -55 to +125 | 2.0 to 5.5 V |
| MC74VHC1GT66 | Analog Switch | TSOP-5, SC-88A | -55 to +125 | 2.0 to 5.5 V |
| MC74VHC1G86 | 2-Input Exclusive-OR Gate | TSOP-5, SC-88A | -55 to +125 | 2.0 to 5.5 V |
| MC74VHC1GT86 | 2-Input Exclusive-OR Gate (TTL Compatible) | TSOP-5, SC-88A | -55 to +125 | 3.0 to 5.5 V |
| MC74VHC1G125 | Bus Buffer (3-State) | TSOP-5, SC-88A | -55 to +125 | 2.0 to 5.5 V |
| MC74VHC1GT125 | Non-Inverting Tri-State Buffer, Low Enable | TSOP-5, SC-88A | -55 to +125 | 3.0 to 5.5 V |
| MC74VHC1G126 | Non-Inverting Tri-State Buffer, High Enable | TSOP-5, SC-88A | -55 to +125 | 2.0 to 5.5 V |
| MC74VHC1GT126 | Bus Buffer Gate (3-State) (TTL Compatible) | TSOP-5, SC-88A | -55 to +125 | 3.0 to 5.5 V |
| MC74VHC1G132 | Quad 2-Input Schmitt NAND Gate | TSOP-5, SC-88A | -55 to +125 | 2.0 to 5.5 V |
| MC74VHC1G135 | 2-Input NAND Schmitt-Trigger with Open Drain Output | TSOP-5, SC-88A | -55 to +125 | 2.0 to 5.5 V |

HC One-Gates

| Ordering Suffixes: TSSOP-5 = DTT1, SC-88A = DFT2 (available in T & R only), G = Pb-free | | | | |
|---|-------------------------------|------------------------|-------------|-------------------|
| Part Number | Description | Surface Mount Packages | Temperature | Operating Voltage |
| MC74HC1G00 | 2-Input NAND Gate | TSOP-5, SC-88A | -55 to +125 | 2.0 to 6.0 V |
| MC74HC1G02 | 2-Input Positive-NOR Gate | TSOP-5, SC-88A | -55 to +125 | 2.0 to 6.0 V |
| MC74HC1G04 | Inverter | TSOP-5, SC-88A | -55 to +125 | 2.0 to 6.0 V |
| MC74HC1G08 | 2-Input AND Gate | TSOP-5, SC-88A | -55 to +125 | 2.0 to 6.0 V |
| MC74HC1G14 | Inverter with Schmitt Trigger | TSOP-5, SC-88A | -55 to +125 | 2.0 to 6.0 V |
| MC74HC1G32 | 2-Input OR Gate | TSOP-5, SC-88A | -55 to +125 | 2.0 to 6.0 V |
| MC74HC1GU04 | Inverter (Unbuffered) | TSOP-5, SC-88A | -55 to +125 | 2.0 to 6.0 V |

LCX One-Gates

| Ordering Suffixes: SC-88/A = DFT2, US = US8 (available in T & R only), G = Pb-free, UDFN6 = MUR2 | | | | |
|--|---|------------------------|-------------|-------------------|
| Part Number | Description | Surface Mount Packages | Temperature | Operating Voltage |
| NL7SZ18 | 2:1 Multiplexer, Tri-State | SC-88A, UDFN6 | -40 to +85 | 1.65 to 5.5 V |
| NL7SZ19 | 2:1 Multiplexer | SC-88, UDFN6 | -40 to +85 | 1.65 to 5.5 V |
| NL17SZ00 | Single 2-Input NAND Gate | SC-88A, SOT-553 | -40 to +85 | 1.65 to 5.5 V |
| NL17SZ02 | Single 2-Input NOR Gate | SC-88A, SOT-553 | -40 to +85 | 1.65 to 5.5 V |
| NL17SZ04 | Single Inverter | SC-88A, SOT-553 | -40 to +85 | 1.65 to 5.5 V |
| NL17SZ06 | Inverter w/Open Drain Outputs | SC-88A, SOT-553 | -40 to +85 | 1.65 to 5.5 V |
| NL17SZ07 | Buffer w/Open-Drain Output | SC-88A, SOT-553 | -40 to +85 | 1.65 to 5.5 V |
| NL17SZ08 | Single 2-Input AND Gate | SC-88A, SOT-553 | -40 to +85 | 1.65 to 5.5 V |
| NL17SZ14 | Schmitt Trigger Inverter | SC-88A, SOT-553 | -40 to +85 | 1.65 to 5.5 V |
| NL17SZ16 | Single Buffer | SC-88A, SOT-553 | -40 to +85 | 1.65 to 5.5 V |
| NL17SZ17 | Non-Inverting Schmitt Trigger Buffer | SC-88A, SOT-553 | -40 to +85 | 1.65 to 5.5 V |
| NL17SZ32 | Single 2-Input OR Gate | SC-88A, SOT-553 | -40 to +85 | 1.65 to 5.5 V |
| NL17SZ74 | D Flip-Flop | US8 | -40 to +85 | 1.65 to 5.5 V |
| NL17SZ86 | Exclusive OR Gate | SC-88A | -40 to +85 | 1.65 to 5.5 V |
| NL17SZ125 | Non-Inverting Tri-State Buffer, Low Enable | SC-88A | -40 to +85 | 1.65 to 5.5 V |
| NL17SZ126 | Non-Inverting Tri-State Buffer, High Enable | SC-88A | -40 to +85 | 1.65 to 5.5 V |
| NL17SZU04 | Single Inverter, Unbuffered | SC-88A, SOT-553 | -40 to +85 | 1.65 to 5.5 V |

LCX Two-Gates and Three-Gates

| Ordering Suffixes: TSSOP-5/6 = DTT1, SC-88/A = DFT2, US = US8 (available in T & R only), G = Pb-free | | | | |
|--|--|------------------------|-------------|-------------------|
| Part Number | Description | Surface Mount Packages | Temperature | Operating Voltage |
| NL27WZ00 | Dual 2-Input NAND Gate | US8 | -40 to +85 | 1.65 to 5.5 V |
| NL27WZ02 | Dual 2-Input NOR Gate | US8 | -40 to +85 | 1.65 to 5.5 V |
| NL27WZ04 | Dual Inverter | TSOP-6, SC-88 | -40 to +85 | 1.65 to 5.5 V |
| NL27WZ06 | Dual Inverter w/Open Drain Outputs | TSOP-6, SC-88 | -40 to +85 | 1.65 to 5.5 V |
| NL27WZ07 | Dual Non-Inverting Buffer, Open Drain | TSOP-6, SC-88 | -40 to +85 | 1.65 to 5.5 V |
| NL27WZ08 | Dual 2-Input AND Gate | US8 | -40 to +85 | 1.65 to 5.5 V |
| NL27WZ14 | Dual Schmitt Trigger Inverter | TSOP-6, SC-88 | -40 to +85 | 1.65 to 5.5 V |
| NL27WZ16 | Dual Non-Inverting Buffer | TSOP-6, SC-88 | -40 to +85 | 1.65 to 5.5 V |
| NL27WZ17 | Dual Non-Inverting Schmitt Trigger Buffer | TSOP-6, SC-88 | -40 to +85 | 1.65 to 5.5 V |
| NL27WZ32 | Dual 2-Input OR Gate | US8 | -40 to +85 | 1.65 to 5.5 V |
| NL27WZ86 | Dual Exclusive OR Gate | US8 | -40 to +85 | 1.65 to 5.5 V |
| NL27WZ125 | Dual Non-Inverting Tri-State Buffer, Low Enable | US8 | -40 to +85 | 1.65 to 5.5 V |
| NL27WZ126 | Dual Non-Inverting Tri-State Buffer, High Enable | US8 | -40 to +85 | 1.65 to 5.5 V |
| NL27WZU04 | Dual Inverter, Unbuffered | TSOP-6, SC-88 | -40 to +85 | 1.65 to 5.5 V |
| NL37WZ04 | Triple Inverter | US8 | -40 to +85 | 1.65 to 5.5 V |
| NL37WZ06 | Triple Inverter w/Open Drain Outputs | US8 | -40 to +85 | 1.65 to 5.5 V |
| NL37WZ07 | Triple Non-Inverting Buffer, Open Drain | US8 | -40 to +85 | 1.65 to 5.5 V |
| NL37WZ14 | Triple Schmitt Trigger Inverter | US8 | -40 to +85 | 1.65 to 5.5 V |
| NL37WZ16 | Triple Buffer | US8 | -40 to +85 | 1.65 to 5.5 V |
| NL37WZ17 | Triple Non-Inverting Schmitt Trigger Buffer | US8 | -40 to +85 | 1.65 to 5.5 V |

ON Semiconductor Selector Guide – Standard Logic

VCX One Gates

Ordering Suffixes: XV5T2 = SOT-553 (available in T & R only), G = Pb-free

| Part Number | Description | Surface Mount Packages | Temperature | Operating Voltage |
|-------------|--------------------------|------------------------|-------------|-------------------|
| NL17SV00 | Single 2-Input NAND Gate | SOT-553 | -40 to +85 | 0.9 to 3.6 V |
| NL17SV02 | Single 2-Input NOR Gate | SOT-553 | -40 to +85 | 0.9 to 3.6 V |
| NL17SV04 | Single Inverter | SOT-553 | -40 to +85 | 0.9 to 3.6 V |
| NL17SV08 | Single 2-Input AND Gate | SOT-553 | -40 to +85 | 0.9 to 3.6 V |
| NL17SV16 | Single Buffer | SOT-553 | -40 to +85 | 0.9 to 3.6 V |
| NL17SV32 | Single 2-Input OR Gate | SOT-553 | -40 to +85 | 0.9 to 3.6 V |

NLU Multi-Gates

| Part Number | Description | Operating Voltage (V) | Package Type | Size | Production |
|----------------|--|-----------------------|--------------|--------------------------|------------|
| NLU1G04MUTCG | Single Inverter | 1.65 to 5.5 | UDFN6 | 1.2 mm x 1.0mm x 0.5 mm | 2Q07 |
| NLU1G14MUTCG | Single Inverter, Schmitt Input | 1.65 to 5.5 | UDFN6 | 1.2 mm x 1.0mm x 0.5 mm | 2Q07 |
| NLU1GT04MUTCG | Single Inverter, TTL Level | 1.65 to 5.5 | UDFN6 | 1.2 mm x 1.0mm x 0.5 mm | 2Q07 |
| NLU1GT14MUTCG | Single Inverter, Schmitt Input, TTL Level | 1.65 to 5.5 | UDFN6 | 1.2 mm x 1.0mm x 0.5 mm | 2Q07 |
| NLU1GT50MUTCG | Single Buffer Non Inverting, TTL Level | 1.65 to 5.5 | UDFN6 | 1.2 mm x 1.0mm x 0.5 mm | 2Q07 |
| NLU1GU04MUTCG | Single Inverter Unbuffered | 1.65 to 5.5 | UDFN6 | 1.2 mm x 1.0mm x 0.5 mm | 2Q07 |
| NLU1G07MUTCG | Single Non Inverting Buffer, Open Drain | 1.65 to 5.5 | UDFN6 | 1.2 mm x 1.0mm x 0.5 mm | 2Q07 |
| NLU1G08MUTCG | Single 2-Input AND Gate | 1.65 to 5.5 | UDFN6 | 1.2 mm x 1.0mm x 0.5 mm | 2Q07 |
| NLU1G32MUTCG | Single 2-Input OR Gate | 1.65 to 5.5 | UDFN6 | 1.2 mm x 1.0mm x 0.5 mm | 2Q07 |
| NLU1G86MUTCG | Single 2-Input Exclusive OR Gate | 1.65 to 5.5 | UDFN6 | 1.2 mm x 1.0mm x 0.5 mm | 2Q07 |
| NLU1GT32MUTCG | Single 2-Input OR Gate, TTL Levels | 1.65 to 5.5 | UDFN6 | 1.2 mm x 1.0mm x 0.5 mm | 2Q07 |
| NLU1GT86MUTCG | Single 2-Input Exclusive OR Gate, TTL Levels | 1.65 to 5.5 | UDFN6 | 1.2 mm x 1.0mm x 0.5 mm | 2Q07 |
| NLU1GT125MUTCG | Non-Inverting 3-State Buffer, TTL Levels | 1.65 to 5.5 | UDFN6 | 1.2 mm x 1.0mm x 0.5 mm | 2Q07 |
| NLU1GT126MUTCG | Non-Inverting 3-State Buffer, TTL Levels | 1.65 to 5.5 | UDFN6 | 1.2 mm x 1.0mm x 0.5 mm | 2Q07 |
| NLU2G04MUTCG | Dual Inverter | 1.65 to 5.5 | UDFN6 | 1.2 mm x 1.0mm x 0.5 mm | 2Q07 |
| NLU2G06MUTCG | Dual Inverter, Open Drain | 1.65 to 5.5 | UDFN6 | 1.2 mm x 1.0mm x 0.5 mm | 2Q07 |
| NLU2G07MUTCG | Dual Buffer, Open Drain | 1.65 to 5.5 | UDFN6 | 1.2 mm x 1.0mm x 0.5 mm | 2Q07 |
| NLU2G14MUTCG | Dual Inverter, Schmitt | 1.65 to 5.5 | UDFN6 | 1.2 mm x 1.0mm x 0.5 mm | 2Q07 |
| NLU2G16MUTCG | Dual Buffer | 1.65 to 5.5 | UDFN6 | 1.2 mm x 1.0mm x 0.5 mm | 2Q07 |
| NLU2G17MUTCG | Dual Buffer Schmitt | 1.65 to 5.5 | UDFN6 | 1.2 mm x 1.0mm x 0.5 mm | 2Q07 |
| NLU2GU04MUTCG | Dual Unbuffered Inverter | 1.65 to 5.5 | UDFN6 | 1.2 mm x 1.0mm x 0.5 mm | 2Q07 |
| NLU3G14MUTCG | Triple Inverter, Schmitt | 1.65 to 5.5 | UDFN8 | 1.8 mm x 1.2 mm x 0.5 mm | 2Q07 |
| NLU3G16MUTCG | Triple Buffer | 1.65 to 5.5 | UDFN8 | 1.8 mm x 1.2 mm x 0.5 mm | 2Q07 |
| NLU3G17MUTCG | Triple Non Inverting Schmitt Trigger Buffer | 1.65 to 5.5 | UDFN8 | 1.8 mm x 1.2 mm x 0.5 mm | 2Q07 |

Low Voltage Standard Logic

VCX

| Ordering Suffixes: DTR = TSSOP T & R, MNR2 = DFN, G = Pb-free | | | | |
|---|--|------------------------|-------------|-------------------|
| Part Number | Description | Surface Mount Packages | Temperature | Operating Voltage |
| 74VCXH245 | 8-Bit Bus Buffer (3-State, Bus Hold) | QFN-20 | -40 to +85 | 1.65 to 3.6 V |
| 74VCXH16245 | 16-Bit Bus Transceiver (3-State, Bus Hold) | TSSOP-48 | -40 to +85 | 1.65 to 3.6 V |

VHC

| Ordering Suffixes: D = SOIC Rail, DR2 = SOIC T & R, DW = SOICW Rail, DWR2 = SOICW T & R, DT = TSSOP Rail, DTR2 = TSSOP T & R, M = SOEIAJ Rail, MEL = SOEIAJ T & R, G = Pb-free | | | | |
|--|---|---------------------------|-------------|-------------------|
| Part Number | Description | Surface Mount Packages | Temperature | Operating Voltage |
| MC74VHC00 | Quad 2-Input NAND Gate | SO-14, TSSOP-14, EIAJ-14 | -55 to +125 | 2.0 to 5.5 V |
| MC74VHCT00A | Quad 2-Input NAND Gate (TTL Compatible) | SO-14, TSSOP-14, EIAJ-14 | -55 to +125 | 4.5 to 5.5 V |
| MC74VHC02 | Quad 2-Input Positive-NOR Gate | SO-14, TSSOP-14, EIAJ-14 | -55 to +125 | 2.0 to 5.5 V |
| MC74VHCT02A | Quad 2-Input Positive-NOR Gate | SO-14, TSSOP-14, EIAJ-14 | -55 to +125 | 4.5 to 5.5 V |
| MC74VHC04 | Hex Inverter | SO-14, TSSOP-14, EIAJ-14 | -55 to +125 | 2.0 to 5.5 V |
| MC74VHCT04A | Hex Inverter (TTL Compatible) | SO-14, TSSOP-14, EIAJ-14 | -55 to +125 | 4.5 to 5.5 V |
| MC74VHCU04 | Hex Inverter (Unbuffered) | SO-14, TSSOP-14, EIAJ-14 | -55 to +125 | 2.0 to 5.5 V |
| MC74VHC08 | Quad 2-Input AND Gate | SO-14, TSSOP-14, EIAJ-14 | -55 to +125 | 2.0 to 5.5 V |
| MC74VHCT08A | Quad 2-Input AND Gate, TTL Compatible | SO-14, TSSOP-14, EIAJ-14 | -55 to +125 | 4.5 to 5.5 V |
| MC74VHC14 | Hex Schmitt Trigger | SO-14, TSSOP-14, EIAJ-14 | -55 to +125 | 2.0 to 5.5 V |
| MC74VHCT14A | Hex Schmitt Trigger, TTL Compatible | SO-14, TSSOP-14, EIAJ-14 | -55 to +125 | 4.5 to 5.5 V |
| MC74VHC32 | Quad 2-Input OR Gate | SO-14, TSSOP-14, EIAJ-14 | -55 to +125 | 2.0 to 5.5 V |
| MC74VHCT32A | Quad 2-Input OR Gate (TTL Compatible) | SO-14, TSSOP-14, EIAJ-14 | -55 to +125 | 4.5 to 5.5 V |
| MC74VHC50 | Hex Buffer | SO-14, TSSOP-14, EIAJ-14 | -55 to +125 | 2.0 to 5.5 V |
| MC74VHCT50A | Hex Buffer (TTL Compatible) | SO-14, TSSOP-14, EIAJ-14 | -55 to +125 | 4.5 to 5.5 V |
| MC74VHC74 | Dual D Flip-Flop w/Preset and Clear | SO-14, TSSOP-14, EIAJ-14 | -55 to +125 | 2.0 to 5.5 V |
| MC74VHCT74A | Dual D Flip-Flop w/Preset and Clear (TTL Compatible) | SO-14, TSSOP-14, EIAJ-14 | -55 to +125 | 4.5 to 5.5 V |
| MC74VHC86 | Quad Exclusive-OR Gate | SO-14, TSSOP-14, EIAJ-14 | -55 to +125 | 2.0 to 5.5 V |
| MC74VHCT86A | Quad 2-Input Exclusive-OR Gate (TTL Compatible) | SO-14, TSSOP-14, EIAJ-14 | -55 to +125 | 4.5 to 5.5 V |
| MC74VHC125 | Quad Bus Buffer (3-State) | SO-14, TSSOP-14, EIAJ-14 | -55 to +125 | 2.0 to 5.5 V |
| MC74VHCT125A | Quad Bus Buffer Gate (3-State) (TTL Compatible) | SO-14, TSSOP-14, EIAJ-14 | -55 to +125 | 4.5 to 5.5 V |
| MC74VHC126 | Quad Bus Buffer (3-State) | SO-14, TSSOP-14, EIAJ-14 | -55 to +125 | 2.0 to 5.5 V |
| MC74VHCT126A | Quad Bus Buffer Gate (3-State) (TTL Compatible) | SO-14, TSSOP-14, EIAJ-14 | -55 to +125 | 4.5 to 5.5 V |
| MC74VHC132 | Quad 2-Input Schmitt NAND Gate | SO-14, TSSOP-14, EIAJ-14 | -55 to +125 | 2.0 to 5.5 V |
| MC74VHCT132A | Quad 2-Input Schmitt NAND Gate | SO-14, TSSOP-14, EIAJ-14 | -55 to +125 | 4.5 to 5.5 V |
| MC74VHC138 | 3-to-8 Line Decoder/Demultiplexer | SO-16, TSSOP-16, EIAJ-16 | -55 to +125 | 2.0 to 5.5 V |
| MC74VHCT138A | 3-to-8 Line Decoder (TTL Compatible) | SO-16, TSSOP-16, EIAJ-16 | -55 to +125 | 4.5 to 5.5 V |
| MC74VHC139 | Dual 2-to-4 Line Decoder/Demultiplexer | SO-16, TSSOP-16, EIAJ-16 | -55 to +125 | 2.0 to 5.5 V |
| MC74VHCT139A | Dual 2-to-4 Line Decoder/DeMultiplexer (TTL Compatible) | SO-16, TSSOP-16, EIAJ-16 | -55 to +125 | 4.5 to 5.5 V |
| MC74VHC157 | Quad 2-Channel Multiplexer | SO-16, TSSOP-16, EIAJ-16 | -55 to +125 | 2.0 to 5.5 V |
| MC74VHCT157A | Quad 2-to-1 Data Selector/Multiplexer (TTL Compatible) | SO-16, TSSOP-16, EIAJ-16 | -55 to +125 | 4.5 to 5.5 V |
| MC74VHC240 | Octal Bus Buffer (3-State/Inverted) | SO-20W, TSSOP-20, EIAJ-20 | -55 to +125 | 2.0 to 5.5 V |
| MC74VHCT240A | Octal Bus Buffer (3-State/Inverted) (TTL Compatible) | SO-20W, TSSOP-20, EIAJ-20 | -55 to +125 | 4.5 to 5.5 V |

ON Semiconductor Selector Guide – Standard Logic

VHC (continued)

| Ordering Suffixes: D = SOIC Rail, DR2 = SOIC T & R, DW = SOICW Rail, DWR2 = SOICW T & R, DT = TSSOP Rail, DTR2 = TSSOP T & R, M = SOEIAJ Rail, MEL = SOEIAJ T & R, G = Pb-free | | | | |
|--|--|---------------------------|-------------|-------------------|
| Part Number | Description | Surface Mount Packages | Temperature | Operating Voltage |
| MC74VHC244 | Octal Bus Buffer (3-State) | SO-20W, TSSOP-20, EIAJ-20 | -55 to +125 | 2.0 to 5.5 V |
| MC74VHCT244A | Octal Bus Buffer (3-State) (TTL Compatible) | SO-20W, TSSOP-20, EIAJ-20 | -55 to +125 | 4.5 to 5.5 V |
| MC74VHC245 | Octal Bus Transceiver (3-State) | SO-20W, TSSOP-20, EIAJ-20 | -55 to +125 | 2.0 to 5.5 V |
| MC74VHCT245A | Octal Bus Transceiver (3-State) (TTL Compatible) | SO-20W, TSSOP-20, EIAJ-20 | -55 to +125 | 4.5 to 5.5 V |
| MC74VHC257 | Quad 2-Line to 1-Line Data Selectors/Multiplexer (3-State) | SO-20W, TSSOP-20, EIAJ-20 | -55 to +125 | 2.0 to 5.5 V |
| MC74VHCT257A | Quad 2-to-1 Data Selectors/Mux (3-State) (TTL Compatible) | SO-20W, TSSOP-20, EIAJ-20 | -55 to +125 | 4.5 to 5.5 V |
| MC74VHC259 | 8-Bit Addressable Latch | SO-14, TSSOP-14, EIAJ-14 | -55 to +125 | 2.0 to 5.5 V |
| MC74VHCT259A | 8-Bit Addressable Latch (TTL Compatible) | SO-14, TSSOP-14, EIAJ-14 | -55 to +125 | 4.5 to 5.5 V |
| MC74VHC373 | Octal D-Type Latch (3-State) | SO-20W, TSSOP-20, EIAJ-20 | -55 to +125 | 2.0 to 5.5 V |
| MC74VHCT373A | Octal D-Type Latch (3-State) (TTL Compatible) | SO-20W, TSSOP-20, EIAJ-20 | -55 to +125 | 4.5 to 5.5 V |
| MC74VHC374 | Octal D-Type Flip-Flop (3-State) | SO-20W, TSSOP-20, EIAJ-20 | -55 to +125 | 2.0 to 5.5 V |
| MC74VHCT374A | Octal D-Type Flip-Flop (3-State) (TTL Compatible) | SO-20W, TSSOP-20, EIAJ-20 | -55 to +125 | 4.5 to 5.5 V |
| MC74VHC540 | Octal Bus Buffer (3-State/Inverted) | SO-20W, TSSOP-20, EIAJ-20 | -55 to +125 | 2.0 to 5.5 V |
| MC74VHCT540A | Octal Bus Buffer (3-State/Inverted) (TTL Compatible) | SO-20W, TSSOP-20, EIAJ-20 | -55 to +125 | 4.5 to 5.5 V |
| MC74VHC541 | Octal Bus Buffer (3-State) | SO-20W, TSSOP-20, EIAJ-20 | -55 to +125 | 2.0 to 5.5 V |
| MC74VHCT541A | Octal Bus Buffer (3-State) (TTL Compatible) | SO-20W, TSSOP-20, EIAJ-20 | -55 to +125 | 4.5 to 5.5 V |
| MC74VHC573 | Octal D-Type Latch (3-State) | SO-20W, TSSOP-20, EIAJ-20 | -55 to +125 | 2.0 to 5.5 V |
| MC74VHCT573A | Octal D-Type Latch (3-State) (TTL Compatible) | SO-20W, TSSOP-20, EIAJ-20 | -55 to +125 | 4.5 to 5.5 V |
| MC74VHC574 | Octal D-Type Flip-Flop (3-State) | SO-20W, TSSOP-20, EIAJ-20 | -55 to +125 | 2.0 to 5.5 V |
| MC74VHCT574A | Octal D-Type Flip-Flop (3-State) (TTL Compatible) | SO-20W, TSSOP-20, EIAJ-20 | -55 to +125 | 4.5 to 5.5 V |
| MC74VHC4051 | 8-to-1 Channel Analog Multiplexer | SO-16, TSSOP-16, EIAJ-16 | -55 to +125 | 2.0 to 5.5 V |
| MC74VHC4052 | Dual 4 Channel Analog Multiplexer | SO-16, TSSOP-16, EIAJ-16 | -55 to +125 | 2.0 to 5.5 V |
| MC74VHC4053 | Triple 2 Channel Analog Multiplexer | SO-16, TSSOP-16, EIAJ-16 | -55 to +125 | 2.0 to 5.5 V |
| MC74VHC4066 | Quad Analog Switch | SO-14, TSSOP-14, EIAJ-14 | -55 to +125 | 2.0 to 5.5 V |
| MC74VHC4316 | Quad Analog Switch w/Translator | SO-16, TSSOP-16, EIAJ-16 | -55 to +125 | 2.0 to 5.5 V |

LCX

| Ordering Suffixes: D = SOIC Rail, DR2 = SOIC T & R, DW = SOICW Rail, DWR2 = SOICW T & R, DT = TSSOP Rail, DTR2 = TSSOP T & R, M = SOEIAJ Rail, MEL = SOEIAJ T & R, G = Pb-free | | | | |
|--|--------------------------------------|--------------------------|-------------|-------------------|
| Part Number | Description | Surface Mount Packages | Temperature | Operating Voltage |
| MC74LCX00 | Quad 2-Input NAND Gate | SO-14, TSSOP-14, EIAJ-14 | -40 to +85 | 2.0 to 3.6 V |
| MC74LCX02 | Quad 2-Input Positive-NOR Gate | SO-14, TSSOP-14, EIAJ-14 | -40 to +85 | 2.0 to 3.6 V |
| MC74LCX04 | Hex Inverter | SO-14, TSSOP-14, EIAJ-14 | -40 to +85 | 2.0 to 3.6 V |
| MC74LCXU04 | Hex Inverter (Unbuffered) | SO-14, TSSOP-14, EIAJ-14 | -40 to +85 | 2.0 to 3.6 V |
| MC74LCX06 | Hex Inverter w/Open-Drain Output | SO-14, TSSOP-14, EIAJ-14 | -40 to +85 | 2.0 to 3.6 V |
| MC74LCX07 | Hex Buffer w/Open-Drain Output | SO-14, TSSOP-14, EIAJ-14 | -40 to +85 | 2.0 to 3.6 V |
| MC74LCX08 | Quad 2-Input AND Gate | SO-14, TSSOP-14, EIAJ-14 | -40 to +85 | 2.0 to 3.6 V |
| MC74LCX14 | Hex Schmitt Trigger | SO-14, TSSOP-14, EIAJ-14 | -40 to +85 | 2.0 to 3.6 V |
| MC74LCX32 | Quad 2-Input OR Gate | SO-14, TSSOP-14, EIAJ-14 | -40 to +85 | 2.0 to 3.6 V |
| MC74LCX74 | Dual D Flip-Flop w/Presets and Clear | SO-14, TSSOP-14, EIAJ-14 | -40 to +85 | 2.0 to 3.6 V |

LCX (continued)

| Ordering Suffixes: D = SOIC Rail, DR2 = SOIC T & R, DW = SOICW Rail, DWR2 = SOICW T & R, DT = TSSOP Rail, DTR2 = TSSOP T & R, M = SOEIAJ Rail, MEL = SOEIAJ T & R, G = Pb-free | | | | |
|--|--|---------------------------|-------------|-------------------|
| Part Number | Description | Surface Mount Packages | Temperature | Operating Voltage |
| MC74LCX86 | Quad Exclusive-OR Gate | SO-14, TSSOP-14, EIAJ-14 | -40 to +85 | 2.0 to 3.6 V |
| MC74LCX125 | Quad Bus Buffer (3-State) | SO-14, TSSOP-14, EIAJ-14 | -40 to +85 | 2.0 to 3.6 V |
| MC74LCX138 | 3-to-8 Line Decoder/Demultiplexer | SO-16, TSSOP-16, EIAJ-16 | -40 to +85 | 2.0 to 3.6 V |
| MC74LCX139 | Dual 2-to-4 Line Decoder/Demultiplexer | SO-16, TSSOP-16, EIAJ-16 | -40 to +85 | 2.0 to 3.6 V |
| MC74LCX157 | Quad 2-Channel Multiplexer | SO-16, TSSOP-16, EIAJ-16 | -40 to +85 | 2.0 to 3.6 V |
| MC74LCX158 | Quad 2-to-1 Data Selector/Multiplexer | SO-16, TSSOP-16, EIAJ-16 | -40 to +85 | 2.0 to 3.6 V |
| MC74LCX240 | Octal Bus Buffer (3-State/Inverted) | SO-20W, TSSOP-20, EIAJ-20 | -40 to +85 | 2.0 to 3.6 V |
| MC74LCX244 | Octal Bus Buffer (3-State) | SO-20W, TSSOP-20, EIAJ-20 | -40 to +85 | 2.0 to 3.6 V |
| MC74LCX245 | Octal Bus Transceiver (3-State) | SO-20W, TSSOP-20, EIAJ-20 | -40 to +85 | 2.0 to 3.6 V |
| MC74LCX257 | Quad 2-Line To 1-Line Data Selectors/Multiplexer (3-State) | SO-20W, TSSOP-20, EIAJ-20 | -40 to +85 | 2.0 to 3.6 V |
| MC74LCX258 | Quad 2-Line To 1-Line Data Selectors/Multiplexer (3-State) | SO-20W, TSSOP-20, EIAJ-20 | -40 to +85 | 2.0 to 3.6 V |
| MC74LCX373 | Octal D-Type Latch (3-State) | SO-20W, TSSOP-20, EIAJ-20 | -40 to +85 | 2.0 to 3.6 V |
| MC74LCX374 | Octal D-Type Flip-Flop (3-State) | SO-20W, TSSOP-20, EIAJ-20 | -40 to +85 | 2.0 to 3.6 V |
| MC74LCX540 | Octal Bus Buffer (3-State/Inverted) | SO-20W, TSSOP-20, EIAJ-20 | -40 to +85 | 2.0 to 3.6 V |
| MC74LCX541 | Octal Bus Buffer (3-State) | SO-20W, TSSOP-20, EIAJ-20 | -40 to +85 | 2.0 to 3.6 V |
| MC74LCX573 | Octal D-Type Latch (3-State) | SO-20W, TSSOP-20, EIAJ-20 | -40 to +85 | 2.0 to 3.6 V |
| MC74LCX574 | Octal D-Type Flip-Flop (3-State) | SO-20W, TSSOP-20, EIAJ-20 | -40 to +85 | 2.0 to 3.6 V |
| MC74LCX16240 | 16-Bit Bus Buffer (3-State/Inverted) | TSSOP-48 | -40 to +85 | 2.0 to 3.6 V |
| MC74LCX16244 | 16-Bit Bus Buffer (3-State) | TSSOP-48 | -40 to +85 | 2.0 to 3.6 V |
| MC74LCX16245 | 16-Bit Bus Transceiver (3-State) | TSSOP-48 | -40 to +85 | 2.0 to 3.6 V |
| MC74LCX16373 | 16-Bit D-Type Latch (3-State) | TSSOP-48 | -40 to +85 | 2.0 to 3.6 V |
| MC74LCX16374 | 16-Bit D-Type Flip-Flop (3-State) | TSSOP-48 | -40 to +85 | 2.0 to 3.6 V |

LVX

| Ordering Suffixes: D = SOIC Rail, DR2 = SOIC T & R, DW = SOICW Rail, DWR2 = SOICW T & R, DT = TSSOP Rail, DTR2 = TSSOP T & R, M = SOEIAJ Rail, MEL = SOEIAJ T & R, G = Pb-free | | | | |
|--|--|---------------------------|-------------|-------------------|
| Part Number | Description | Surface Mount Packages | Temperature | Operating Voltage |
| MC74LVX00 | Quad 2-Input NAND Gate | SO-14, TSSOP-14, EIAJ-14 | -40 to +85 | 2.0 to 3.6 V |
| MC74LVX02 | Quad 2-Input Positive-NOR Gate | SO-14, TSSOP-14, EIAJ-14 | -40 to +85 | 2.0 to 3.6 V |
| MC74LVX04 | Hex Inverter | SO-14, TSSOP-14, EIAJ-14 | -40 to +85 | 2.0 to 3.6 V |
| MC74LVXU04 | Hex Inverter (Unbuffered) | SO-14, TSSOP-14, EIAJ-14 | -40 to +85 | 2.0 to 3.6 V |
| MC74LVX08 | Quad 2-Input AND Gate | SO-14, TSSOP-14, EIAJ-14 | -40 to +85 | 2.0 to 3.6 V |
| MC74LVX14 | Hex Schmitt Trigger | SO-14, TSSOP-14, EIAJ-14 | -40 to +85 | 2.0 to 3.6 V |
| MC74LVX32 | Quad 2-Input OR Gate | SO-14, TSSOP-14, EIAJ-14 | -40 to +85 | 2.0 to 3.6 V |
| MC74LVX50 | Hex Buffer | SO-14, TSSOP-14, EIAJ-14 | -40 to +85 | 2.0 to 3.6 V |
| MC74LVX74 | Dual D Flip-Flop w/Pre-set and Clear | SO-14, TSSOP-14, EIAJ-14 | -40 to +85 | 2.0 to 3.6 V |
| MC74LVX86 | Quad Exclusive-OR Gate | SO-14, TSSOP-14, EIAJ-14 | -40 to +85 | 2.0 to 3.6 V |
| MC74LVX125 | Non-Inverting Tri-State Buffer, Low Enable | SO-14, TSSOP-14, EIAJ-14 | -40 to +85 | 2.0 to 3.6 V |
| MC74LVX126 | Quad Bus Buffer | SO-14, TSSOP-14, EIAJ-14 | -40 to +85 | 2.0 to 3.6 V |
| MC74LVX132 | Quad 2-Input NAND Schmitt Trigger | SO-14, TSSOP-14, EIAJ-14 | -40 to +85 | 2.0 to 3.6 V |
| MC74LVX138 | 3-to-8 Line Decoder/Demultiplexer | SO-16, TSSOP-16, EIAJ-16 | -40 to +85 | 2.0 to 3.6 V |
| MC74LVX139 | Dual 2-to-4 Line Decoder/Demultiplexer | SO-16, TSSOP-16, EIAJ-16 | -40 to +85 | 2.0 to 3.6 V |
| MC74LVX157 | Quad 2-Channel Multiplexer | SO-16, TSSOP-16, EIAJ-16 | -40 to +85 | 2.0 to 3.6 V |
| MC74LVX240 | Octal Bus Buffer (3-State/Inverted) | SO-20W, TSSOP-20, EIAJ-20 | -40 to +85 | 2.0 to 3.6 V |
| MC74LVX244 | Octal Bus Buffer (3-State) | SO-20W, TSSOP-20, EIAJ-20 | -40 to +85 | 2.0 to 3.6 V |
| MC74LVX245 | Octal Bus Transceiver (3-State) | SO-20W, TSSOP-20, EIAJ-20 | -40 to +85 | 2.0 to 3.6 V |

ON Semiconductor Selector Guide – Standard Logic

LVX (continued)

| Ordering Suffixes: D = SOIC Rail, DR2 = SOIC T & R, DW = SOICW Rail, DWR2 = SOICW T & R, DT = TSSOP Rail, DTR2 = TSSOP T & R, M = SOEIAJ Rail, MEL = SOEIAJ T & R, G = Pb-free | | | | |
|--|---|---------------------------|-------------|-------------------|
| Part Number | Description | Surface Mount Packages | Temperature | Operating Voltage |
| MC74LVX257 | Quad 2-Line to 1-Line Data Selectors/Multiplexer (3-State) | SO-14, TSSOP-14, EIAJ-14 | -40 to +85 | 2.0 to 3.6 V |
| MC74LVX259 | 8-Bit Addressable Latch | SO-16, TSSOP-16, EIAJ-16 | -40 to +85 | 2.0 to 3.6 V |
| MC74LVX373 | Octal D-Type Latch (3-State) | SO-20W, TSSOP-20, EIAJ-20 | -40 to +85 | 2.0 to 3.6 V |
| MC74LVX374 | Octal D-Type Flip-Flop (3-State) | SO-20W, TSSOP-20, EIAJ-20 | -40 to +85 | 2.0 to 3.6 V |
| MC74LVX540 | Octal Inverting Bus Buffer | SO-20W, TSSOP-20, EIAJ-20 | -40 to +85 | 2.6 to 3.6 V |
| MC74LVX541 | Octal Bus Buffer (3-State) | SO-20W, TSSOP-20, EIAJ-20 | -40 to +85 | 2.0 to 3.6 V |
| MC74LVX573 | Octal D-Type Latch (3-State) | SO-20W, TSSOP-20, EIAJ-20 | -40 to +85 | 2.0 to 3.6 V |
| MC74LVX574 | Octal D-Type Flip-Flop (3-State) | SO-20W, TSSOP-20, EIAJ-20 | -40 to +85 | 2.0 to 3.6 V |
| MC74LVXC3245 | Octal Dual Supply Translating Bus Transceiver | SO-24W, TSSOP-24 | -40 to +85 | 2.0 to 3.6 V |
| MC74LVX4051 | 8-to-1 Channel Analog Multiplexer | SO-16, TSSOP-16, EIAJ-16 | -40 to +85 | 2.0 to 3.6 V |
| MC74LVXT4051 | 8-to-1 Channel Analog Multiplexer (TTL Compatible Inputs) | SO-16, TSSOP-16, EIAJ-16 | -40 to +85 | 2.0 to 3.6 V |
| MC74LVX4052 | Dual 4 Channel Analog Multiplexer | SO-16, TSSOP-16, EIAJ-16 | -40 to +85 | 2.0 to 3.6 V |
| MC74LVXT4052 | Dual 4 Channel Analog Multiplexer (TTL Compatible Inputs) | SO-16, TSSOP-16, EIAJ-16 | -40 to +85 | 2.0 to 3.6 V |
| MC74LVX4053 | Triple 2 Channel Analog Multiplexer | SO-16, TSSOP-16, EIAJ-16 | -40 to +85 | 2.0 to 3.6 V |
| MC74LVXT4053 | Triple 2 Channel Analog Multiplexer (TTL Compatible Inputs) | SO-16, TSSOP-16, EIAJ-16 | -40 to +85 | 2.0 to 3.6 V |
| MC74LVX4066 | Quad Analog Switch | SO-14, TSSOP-14, EIAJ-14 | -40 to +85 | 2.0 to 3.6 V |
| MC74LVXT4066 | Quad Analog Switch (TTL Compatible Inputs) | SO-14, TSSOP-14, EIAJ-14 | -40 to +85 | 2.0 to 3.6 V |
| MC74LVX4245 | Octal Dual Supply Translating Bus Transceiver | SO-24W, TSSOP-24 | -40 to +85 | 2.0 to 3.6 V |
| MC74LVX8051 | 8-to-1 Channel Analog Multiplexer | SO-16, TSSOP-16, EIAJ-16 | -40 to +85 | 2.0 to 3.6 V |
| MC74LVXT8051 | 8-to-1 Channel Analog Multiplexer (TTL Compatible Inputs) | SO-16, TSSOP-16, EIAJ-16 | -40 to +85 | 2.0 to 3.6 V |
| MC74LVX8053 | Triple 2 Channel Analog Multiplexer | SO-16, TSSOP-16, EIAJ-16 | -40 to +85 | 2.0 to 3.6 V |
| MC74LVXT8053 | Triple 2 Channel Analog Multiplexer | SO-16, TSSOP-16, EIAJ-16 | -40 to +85 | 2.0 to 3.6 V |

High-Speed CMOS Product Designation Definitions

HC vs. HCT

ON Semiconductor's High-Speed CMOS product family, intended to give the designer an alternative to LSTTL. HSCMOS, with the faster speed advantage over metal-gate CMOS (MC14000 series) and the lower power consumption advantage over LSTTL, is an optimum choice for midrange designs. With the availability of high-speed CMOS microprocessors and memories, the ability to design a 100% CMOS system is possible.

HCT devices offer a short-term solution to the TTL/NMOS-to-CMOS interface problem. To achieve this interface capability, some CMOS advantages had to be compromised. These compromises include power consumption, operating voltage range, and noise immunity.

In most cases HCT devices are drop-in replacements of TTL devices with significant advantages over the TTL

devices. However, in some cases, an equivalent HCT device may not replace a TTL device without some form of circuit modification.

Designers can use HCT devices to perform logic level conversions only. In newer designs, the designer wants all the advantages of a true CMOS system and designs using only HC devices.

“A” versus “Non-A”

“A” Versus “Non-A” — ON Semiconductor has a device performance enhancement program for the High-Speed CMOS family. This is indicated by an “A” suffix on the device identification. Some of the characteristics of this “A” enhancement program are improved design, a better quality process, faster performing AC propagation delays and enhancements to various DC characteristics.

5.0 V and Greater Standard Logic

High Speed CMOS: HC A-Family

| Ordering Suffixes: N = PDIP Rail, D = SOIC Rail, DR2 = SOIC T & R, DW = SOICW Rail, DWR2 = SOICW T & R, DT = TSSOP Rail, DTR2 = TSSOP T & R, F = SOEIAJ Rail, FEL = SOEIAJ T & R, G = Pb-free | | | | | |
|---|---|-----------------------|---------------------------|-------------|-------------------|
| Part Number | Description | Dual-In-Line Packages | Surface Mount Packages | Temperature | Operating Voltage |
| MC74HC00A | Quad 2-Input NAND Gate | DIP-14 | SO-14, TSSOP-14, EIAJ-14 | -55 to +125 | 2.0 to 6.0 V |
| MC74HC02A | Quad 2-Input Positive-NOR Gate | DIP-14 | SO-14, TSSOP-14, EIAJ-14 | -55 to +125 | 2.0 to 6.0 V |
| MC74HC03A | Quad 2-Input NAND Gate (Open Drain) | DIP-14 | SO-14, TSSOP-14, EIAJ-14 | -55 to +125 | 2.0 to 6.0 V |
| MC74HC04A | Hex Inverter | DIP-14 | SO-14, TSSOP-14, EIAJ-14 | -55 to +125 | 2.0 to 6.0 V |
| MC74HCT04A | Hex Inverter (TTL Compatible) | DIP-14 | SO-14, TSSOP-14, EIAJ-14 | -55 to +125 | 4.5 to 5.5 V |
| MC74HCU04A | Hex Inverter (Unbuffered) | DIP-14 | SO-14, TSSOP-14, EIAJ-14 | -55 to +125 | 2.0 to 6.0 V |
| MC74HC08A | Quad 2-Input AND Gate | DIP-14 | SO-14, TSSOP-14, EIAJ-14 | -55 to +125 | 2.0 to 6.0 V |
| MC74HC14A | Hex Schmitt Trigger | DIP-14 | SO-14, TSSOP-14, EIAJ-14 | -55 to +125 | 2.0 to 6.0 V |
| MC74HCT14A | Hex Schmitt Trigger Inverter (TTL Compatible) | DIP-14 | SO-14, TSSOP-14, EIAJ-14 | -55 to +125 | 4.5 to 5.5 V |
| MC74HC32A | Quad 2-Input OR Gate | DIP-14 | SO-14, TSSOP-14, EIAJ-14 | -55 to +125 | 2.0 to 6.0 V |
| MC74HC74A | Dual D Flip-Flop w/Preset and Clear | DIP-14 | SO-14, TSSOP-14, EIAJ-14 | -55 to +125 | 2.0 to 6.0 V |
| MC74HCT74A | Dual D Flip-Flop w/ Preset and Clear (TTL Compatible) | DIP-14 | SO-14, TSSOP-14, EIAJ-14 | -55 to +125 | 4.5 to 5.5 V |
| MC74HC86A | Quad Exclusive-OR Gate | DIP-14 | SO-14, TSSOP-14, EIAJ-14 | -55 to +125 | 2.0 to 6.0 V |
| MC74HC125A | Quad Bus Buffer (3-State) | DIP-14 | SO-14, TSSOP-14, EIAJ-14 | -55 to +125 | 2.0 to 6.0 V |
| MC74HC126A | Quad Bus Buffer (3-State) | DIP-14 | SO-14, TSSOP-14, EIAJ-14 | -55 to +125 | 2.0 to 6.0 V |
| MC74HC132A | Quad 2-Input Schmitt NAND Gate | DIP-14 | SO-14, TSSOP-14, EIAJ-14 | -55 to +125 | 2.0 to 6.0 V |
| MC74HC138A | 3-to-8 Line Decoder/Demultiplexer | DIP-16 | SO-16, TSSOP-16, EIAJ-16 | -55 to +125 | 2.0 to 6.0 V |
| MC74HCT138A | Dual 2-to-4 Line Decoder/Demultiplexer | DIP-16 | SO-16, TSSOP-16, EIAJ-16 | -55 to +125 | 4.5 to 5.5 V |
| MC74HC139A | Dual 1-of-4 Decoder/Demultiplexer | DIP-16 | SO-16, TSSOP-16, EIAJ-16 | -55 to +125 | 2.0 to 6.0 V |
| MC74HC157A | Quad 2-Channel Multiplexer | DIP-16 | SO-16, TSSOP-16, EIAJ-16 | -55 to +125 | 2.0 to 6.0 V |
| MC74HC161A | Synchronous Binary Counter w/Asynchronous Clear | DIP-16 | SO-16, TSSOP-16, EIAJ-16 | -55 to +125 | 2.0 to 6.0 V |
| MC74HC163A | Synchronous Binary Counter w/Asynchronous Clear | DIP-16 | SO-16, TSSOP-16, EIAJ-16 | -55 to +125 | 2.0 to 6.0 V |
| MC74HC164A | 8-Bit SIPO Shift Register | DIP-14 | SO-14, TSSOP-14, EIAJ-14 | -55 to +125 | 2.0 to 6.0 V |
| MC74HC165A | 8-Bit PISO Shift Register | DIP-16 | SO-16, TSSOP-16, EIAJ-16 | -55 to +125 | 2.0 to 6.0 V |
| MC74HC174A | Hex D Flip-Flop w/Clear | DIP-16 | SO-16, TSSOP-16, EIAJ-16 | -55 to +125 | 2.0 to 6.0 V |
| MC74HC175A | Quad D Flip-Flop w/Clear | DIP-16 | SO-16, TSSOP-16, EIAJ-16 | -55 to +125 | 2.0 to 6.0 V |
| MC74HC240A | Octal Bus Buffer (3-State/Inverted) | DIP-20 | SO-20W, TSSOP-20, EIAJ-20 | -55 to +125 | 2.0 to 6.0 V |
| MC74HC244A | Octal Bus Buffer (3-State) | DIP-20 | SO-20W, TSSOP-20, EIAJ-20 | -55 to +125 | 2.0 to 6.0 V |
| MC74HCT244A | Octal Bus Buffer (3-State) (TTL Compatible) | DIP-20 | SO-20W, TSSOP-20, EIAJ-20 | -55 to +125 | 4.5 to 5.5 V |
| MC74HC245A | Octal Bus Transceiver (3-State) | DIP-20 | SO-20W, TSSOP-20, EIAJ-20 | -55 to +125 | 2.0 to 6.0 V |

High Speed CMOS: HC A-Family

| Ordering Suffixes: N = PDIP Rail, D = SOIC Rail, DR2 = SOIC T & R, DW = SOICW Rail, DWR2 = SOICW T & R, DT = TSSOP Rail, DTR2 = TSSOP T & R, F = SOEIAJ Rail, FEL = SOEIAJ T & R, G = Pb-free | | | | | |
|---|---|-----------------------|---------------------------|-------------|-------------------|
| Part Number | Description | Dual-In-Line Packages | Surface Mount Packages | Temperature | Operating Voltage |
| MC74HCT245A | Octal Bus Transceiver (3-State) (TTL Compatible) | DIP-20 | SO-20W, TSSOP-20, EIAJ-20 | -55 to +125 | 4.5 to 5.5 V |
| MC74HC273A | Octal D-Type Flip-Flop | DIP-20 | SO-20W, TSSOP-20, EIAJ-20 | -55 to +125 | 2.0 to 5.5 V |
| MC74HCT273A | Octal D-Type Flip-Flop w/Clear (TTL Compatible) | DIP-20 | SO-20W, TSSOP-20, EIAJ-20 | -55 to +125 | 4.5 to 5.5 V |
| MC74HC373A | Octal D-Type Latch (3-State) | DIP-20 | SO-20W, TSSOP-20, EIAJ-20 | -55 to +125 | 2.0 to 6.0 V |
| MC74HCT373A | Octal D-Type Latch (3-State) (TTL Compatible) | DIP-20 | SO-20W, TSSOP-20, EIAJ-20 | -55 to +125 | 4.5 to 5.5 V |
| MC74HC374A | Octal D-Type Flip-Flop (3-State) | DIP-20 | SO-20W, TSSOP-20, EIAJ-20 | -55 to +125 | 2.0 to 6.0 V |
| MC74HCT374A | Octal D-Type Flip-Flop (3-State) (TTL Compatible) | DIP-20 | SO-20W, TSSOP-20, EIAJ-20 | -55 to +125 | 4.5 to 5.5 V |
| MC74HC390A | Dual Binary Counter w/ +2 +5 Sections | DIP-16 | SO-16, TSSOP-16, EIAJ-16 | -55 to +125 | 2.0 to 6.0 V |
| MC74HC393A | Dual 4-Stage Binary Ripple Counter | DIP-14 | SO-14, TSSOP-14, EIAJ-14 | -55 to +125 | 2.0 to 6.0 V |
| MC74HC540A | Octal Bus Buffer (3-State/Inverted) | DIP-20 | SO-20W, TSSOP-20, EIAJ-20 | -55 to +125 | 2.0 to 6.0 V |
| MC74HC541A | Octal Bus Buffer (3-State) | DIP-20 | SO-20W, TSSOP-20, EIAJ-20 | -55 to +125 | 2.0 to 6.0 V |
| MC74HCT541A | Octal Bus Buffer (3-State) (TTL Compatible) | DIP-20 | SO-20W, TSSOP-20, EIAJ-20 | -55 to +125 | 4.5 to 5.5 V |
| MC74HC573A | Octal D-Type Latch (3-State) | DIP-20 | SO-20W, TSSOP-20, EIAJ-20 | -55 to +125 | 2.0 to 6.0 V |
| MC74HCT573A | Octal D-Type Latch (3-State) (TTL Compatible) | DIP-20 | SO-20W, TSSOP-20, EIAJ-20 | -55 to +125 | 4.5 to 5.5 V |
| MC74HC574A | Octal D-Type Flip-Flop (3-State) | DIP-20 | SO-20W, TSSOP-20, EIAJ-20 | -55 to +125 | 2.0 to 6.0 V |
| MC74HCT574A | Octal D-Type Flip-Flop (3-State) (TTL Compatible) | DIP-20 | SO-20W, TSSOP-20, EIAJ-20 | -55 to +125 | 4.5 to 5.5 V |
| MC74HC589A | 8-Bit Shift Register | DIP-16 | SO-16, TSSOP-16, EIAJ-16 | -55 to +125 | 2.0 to 6.0 V |
| MC74HC595A | 8-Bit Shift Register/Latch (3-State) | DIP-16 | SO-16, TSSOP-16, EIAJ-16 | -55 to +125 | 2.0 to 6.0 V |
| MC74HC4020A | 14-Stage Binary Ripple Counter | DIP-16 | SO-16, TSSOP-16, EIAJ-16 | -55 to +125 | 2.0 to 6.0 V |
| MC74HC4040A | 12-Stage Binary Ripple Counter | DIP-16 | SO-16, TSSOP-16, EIAJ-16 | -55 to +125 | 2.0 to 6.0 V |
| MC74HC4046A | Phase Lock Loop | DIP-16 | SO-16, TSSOP-16, EIAJ-16 | -55 to +125 | 2.0 to 6.0 V |
| MC74HC4051A | 8-to-1 Channel Analog Multiplexer | DIP-16 | SO-16, TSSOP-16, EIAJ-16 | -55 to +125 | 2.0 to 6.0 V |
| MC74HC4052A | Dual 4 Channel Analog Multiplexer | DIP-16 | SO-16, TSSOP-16, EIAJ-16 | -55 to +125 | 2.0 to 6.0 V |
| MC74HC4053A | Triple 2 Channel Analog Multiplexer | DIP-16 | SO-16, TSSOP-16, EIAJ-16 | -55 to +125 | 2.0 to 6.0 V |
| MC74HC4060A | 14-Stage Binary Ripple Counter w/Oscillator | DIP-16 | SO-16, TSSOP-16, EIAJ-16 | -55 to +125 | 2.0 to 6.0 V |
| MC74HC4066A | Quad Analog Switch | DIP-14 | SO-14, TSSOP-14, EIAJ-14 | -55 to +125 | 2.0 to 6.0 V |
| MC74HC4316A | Quad Analog Switch w/Translator | DIP-16 | SO-16, TSSOP-16, EIAJ-16 | -55 to +125 | 2.0 to 6.0 V |

ON Semiconductor Selector Guide – Standard Logic

High Speed CMOS: HC A-Family

| Ordering Suffixes: N = PDIP Rail, D = SOIC Rail, DR2 = SOIC T & R, DW = SOICW Rail, DWR2 = SOICW T & R, DT = TSSOP Rail, DTR2 = TSSOP T & R, F = SOEIAJ Rail, FEL = SOEIAJ T & R, G = Pb-free | | | | | |
|---|---|-----------------------|--------------------------|-------------|-------------------|
| Part Number | Description | Dual-In-Line Packages | Surface Mount Packages | Temperature | Operating Voltage |
| MC74HC4538A | Dual Re-triggerable Precision Monostable Multivibrator | DIP-16 | SO-16, TSSOP-16, EIAJ-16 | -55 to +125 | 2.0 to 6.0 V |
| MC74HC4851A | 8-to-1 Channel Analog Multiplexer w/Inj Current Control | DIP-16 | SO-16, TSSOP-16, EIAJ-16 | -55 to +125 | 2.0 to 6.0 V |
| MC74HC4852A | Dual 4 Channel Analog Multiplexer w/Inj Current Control | DIP-16 | SO-16, TSSOP-16, EIAJ-16 | -55 to +125 | 2.0 to 6.0 V |

High Speed CMOS: HC Family

| Ordering Suffixes: DR2G = Pb-free SOIC in Tape & Reel, DTR2G = Pb-free TSSOP in Tape & Reel | | | | |
|---|---|-----------------|------------------|-----------------------|
| Part Number | Description | Packages | Temperature (°C) | Operating Voltage (V) |
| 74HC00 | Quad 2-Input NAND Gate | SO-14, TSSOP-14 | -55 to +125 | 2.0 to 6.0 |
| 74HC02 | Quad 2-Input Positive NOR Gate | SO-14, TSSOP-14 | -55 to +125 | 2.0 to 6.0 |
| 74HC04 | Hex Inverter | SO-14, TSSOP-14 | -55 to +125 | 2.0 to 6.0 |
| 74HCT04 | Hex Inverter (TTL Compatible) | SO-14, TSSOP-14 | -55 to +125 | 4.5 to 6.0 |
| 74HCU04 | Hex Inverter (Unbuffered) | SO-14, TSSOP-14 | -55 to +125 | 4.5 to 6.0 |
| 74HC08 | Quad 2-Input AND Gate | SO-14, TSSOP-14 | -55 to +125 | 2.0 to 6.0 |
| 74HCT08 | Quad 2-Input AND Gate (TTL Compatible) | SO-14, TSSOP-14 | -55 to +125 | 4.5 to 6.0 |
| 74HC14 | Hex Schmitt Trigger | SO-14, TSSOP-14 | -55 to +125 | 2.0 to 6.0 |
| 74HCT14 | Hex Schmitt Trigger (TTL Compatible) | SO-14, TSSOP-14 | -55 to +125 | 4.5 to 6.0 |
| 74HC32 | Quad 2-Input OR Gate | SO-14, TSSOP-14 | -55 to +125 | 2.0 to 6.0 |
| 74HC74 | Dual D Flip-Flop 2/ Preset and Clear | SO-14, TSSOP-14 | -55 to +125 | 2.0 to 6.0 |
| 74HC86 | Quad Exclusive OR Gate | SO-14, TSSOP-14 | -55 to +125 | 2.0 to 6.0 |
| 74HC125 | Quad Bus Buffer 3-State | SO-14, TSSOP-14 | -55 to +125 | 2.0 to 6.0 |
| 74HC132 | Quad 2-Input Schmitt NAND Gate | SO-14, TSSOP-14 | -55 to +125 | 2.0 to 6.0 |
| 74HC138 | 3-to-8 Line Decoder / Demultiplexer | SO-16, TSSOP-16 | -55 to +125 | 2.0 to 6.0 |
| 74HCT157 | Quad 2-Channel Multiplexer (TTL Compatible) | SO-16, TSSOP-16 | -55 to +125 | 4.5 to 6.0 |
| 74HC244 | Octal Bus Buffer (3-State) | TSSOP-20 | -55 to +125 | 2.0 to 6.0 |
| 74HC245 | Octal Bus Transceiver (3-State) | TSSOP-20 | -55 to +125 | 2.0 to 6.0 |
| 74HC373 | Octal D-Type Latch (3-State) | TSSOP-20 | -55 to +125 | 2.0 to 6.0 |
| 74HC374 | Octal D-Type Flip-Flop (3-State) | TSSOP-20 | -55 to +125 | 2.0 to 6.0 |
| 74HC574 | Octal D-Type Flip Flop (3-State) | TSSOP-20 | -55 to +125 | 2.0 to 6.0 |
| 74HC595 | 8 Bit Shift Register/Latch (3-State) | SO-16, TSSOP-16 | -55 to +125 | 2.0 to 6.0 |

AC/ACT

| Ordering Suffixes: N = PDIP Rail, D = SOIC Rail, DR2 = SOIC T & R, DW = SOICW Rail, DWR2 = SOICW T & R, DT = TSSOP Rail, DTR2 = TSSOP T & R, M = SOEIAJ Rail, MEL = SOEIAJ T & R, G = Pb-free | | | | | |
|---|--|-----------------------|--------------------------|-------------|-------------------|
| Part Number | Description | Dual-In-Line Packages | Surface Mount Packages | Temperature | Operating Voltage |
| MC74AC00 | Quad 2-Input NAND Gate | DIP-14 | SO-14, TSSOP-14, EIAJ-14 | -40 to +85 | 2.0 to 6.0 V |
| MC74ACT00 | Quad 2-Input NAND Gate (TTL Compatible) | DIP-14 | SO-14, TSSOP-14, EIAJ-14 | -40 to +85 | 4.5 to 5.5 V |
| MC74AC02 | Quad 2-Input NOR Gate | DIP-14 | SO-14, TSSOP-14, EIAJ-14 | -40 to +85 | 2.0 to 6.0 V |
| MC74ACT02 | Quad 2-Input NOR Gate (TTL Compatible) | DIP-14 | SO-14, TSSOP-14, EIAJ-14 | -40 to +85 | 4.5 to 5.5 V |
| MC74AC04 | Hex Inverter | DIP-14 | SO-14, TSSOP-14, EIAJ-14 | -40 to +85 | 2.0 to 6.0 V |
| MC74ACT04 | Hex Inverter (TTL Compatible) | DIP-14 | SO-14, TSSOP-14, EIAJ-14 | -40 to +85 | 4.5 to 5.5 V |
| MC74AC05 | Hex Inverter w/Open-Drain Output | DIP-14 | SO-14, TSSOP-14, EIAJ-14 | -40 to +85 | 2.0 to 6.0 V |
| MC74ACT05 | Hex Inverter w/Open-Drain Output (TTL Compatible) | DIP-14 | SO-14, TSSOP-14, EIAJ-14 | -40 to +85 | 4.5 to 5.5 V |
| MC74AC08 | Quad 2-Input AND Gate | DIP-14 | SO-14, TSSOP-14, EIAJ-14 | -40 to +85 | 2.0 to 6.0 V |
| MC74ACT08 | Quad 2-Input AND Gate (TTL Compatible) | DIP-14 | SO-14, TSSOP-14, EIAJ-14 | -40 to +85 | 4.5 to 5.5 V |
| MC74AC10 | Triple 3-Input NAND Gate | DIP-14 | SO-14, TSSOP-14, EIAJ-14 | -40 to +85 | 2.0 to 6.0 V |
| MC74ACT10 | Triple 3-Input NAND Gate (TTL Compatible) | DIP-14 | SO-14, TSSOP-14, EIAJ-14 | -40 to +85 | 4.5 to 5.5 V |
| MC74AC11 | Triple 3-Input AND Gate | DIP-14 | SO-14, TSSOP-14, EIAJ-14 | -40 to +85 | 2.0 to 6.0 V |
| MC74ACT11 | Triple 3-Input AND Gate (TTL Compatible) | DIP-14 | SO-14, TSSOP-14, EIAJ-14 | -40 to +85 | 4.5 to 5.5 V |
| MC74AC14 | Hex Schmitt Trigger | DIP-14 | SO-14, TSSOP-14, EIAJ-14 | -40 to +85 | 2.0 to 6.0 V |
| MC74ACT14 | Hex Schmitt Trigger Inverter (TTL Compatible) | DIP-14 | SO-14, TSSOP-14, EIAJ-14 | -40 to +85 | 4.5 to 5.5 V |
| MC74AC20 | Dual 4-Input NAND Gate | DIP-14 | SO-14, TSSOP-14, EIAJ-14 | -40 to +85 | 2.0 to 6.0 V |
| MC74ACT20 | Dual 4-Input NAND Gate (TTL Compatible) | DIP-14 | SO-14, TSSOP-14, EIAJ-14 | -40 to +85 | 4.5 to 5.5 V |
| MC74AC32 | Quad 2-Input OR Gate | DIP-14 | SO-14, TSSOP-14, EIAJ-14 | -40 to +85 | 2.0 to 6.0 V |
| MC74ACT32 | Quad 2-Input OR Gate (TTL Compatible) | DIP-14 | SO-14, TSSOP-14, EIAJ-14 | -40 to +85 | 4.5 to 5.5 V |
| MC74AC74 | Dual D Flip-Flop w/Preset and Clear | DIP-14 | SO-14, TSSOP-14, EIAJ-14 | -40 to +85 | 2.0 to 6.0 V |
| MC74ACT74 | Dual D Flip-Flop w/Preset and Clear (TTL Compatible) | DIP-14 | SO-14, TSSOP-14, EIAJ-14 | -40 to +85 | 4.5 to 5.5 V |
| MC74AC86 | Quad Exclusive-OR Gate | DIP-14 | SO-14, TSSOP-14, EIAJ-14 | -40 to +85 | 2.0 to 6.0 V |
| MC74ACT86 | Quad 2-Input Exclusive-OR Gate (TTL Compatible) | DIP-14 | SO-14, TSSOP-14, EIAJ-14 | -40 to +85 | 4.5 to 5.5 V |
| MC74AC125 | Quad Bus Buffer (3-State) | DIP-16 | SO-16, TSSOP-16, EIAJ-16 | -40 to +85 | 2.0 to 6.0 V |
| MC74ACT125 | Quad Bus Buffer Gate (3-State) (TTL Compatible) | DIP-14 | SO-14, TSSOP-14, EIAJ-14 | -40 to +85 | 4.5 to 5.5 V |
| MC74AC132 | Quad 2-Input NAND Gate (Schmitt-Trigger) | DIP-14 | SO-14, TSSOP-14, EIAJ-14 | -40 to +85 | 2.0 to 6.0 V |
| MC74ACT132 | Quad 2-Input NAND Gate (Schmitt-Trigger, TTL Compatible) | DIP-14 | SO-14, TSSOP-14, EIAJ-14 | -40 to +85 | 4.5 to 5.5 V |
| MC74AC138 | 3-to-8 Line Decoder/Demultiplexer | DIP-16 | SO-16, TSSOP-16, EIAJ-16 | -40 to +85 | 2.0 to 6.0 V |

ON Semiconductor Selector Guide – Standard Logic

AC/ACT

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|---|---|--------|---------------------------|------------|--------------|
| MC74ACT138 | 3-to-8 Line Decoder (TTL Compatible) | DIP-16 | SO-16, TSSOP-16, EIAJ-16 | -40 to +85 | 4.5 to 5.5 V |
| MC74AC139 | Dual 2-to-4 Line Decoder/Demultiplexer | DIP-16 | SO-16, TSSOP-16, EIAJ-16 | -40 to +85 | 2.0 to 6.0 V |
| MC74ACT139 | Dual 2-to-4 Line Decoder/DeMultiplexer (TTL Compatible) | DIP-16 | SO-16, TSSOP-16, EIAJ-16 | -40 to +85 | 4.5 to 5.5 V |
| MC74ACT153 | Dual 4-Input Multiplexer, TTL Compatible Inputs | DIP-16 | SO-16, EIAJ-16 | -40 to +85 | 4.5 to 5.5 V |
| MC74AC157 | Quad 2-Channel Multiplexer | DIP-16 | SO-16, TSSOP-16, EIAJ-16 | -40 to +85 | 2.0 to 6.0 V |
| MC74ACT157 | Quad 2-to-1 Data Selector/Multiplexer (TTL Compatible) | DIP-16 | SO-16, TSSOP-16, EIAJ-16 | -40 to +85 | 4.5 to 5.5 V |
| MC74AC161 | Synchronous Presettable Binary Counter | DIP-16 | SO-16, EIAJ-16 | -40 to +85 | 2.0 to 6.0 V |
| MC74ACT161 | Synchronous Presettable Binary Counter, TTL Compatible Inputs | DIP-16 | SO-16, EIAJ-16 | -40 to +85 | 4.5 to 5.5 V |
| MC74AC163 | Synchronous Presettable Binary Counter | DIP-16 | SO-16, EIAJ-16 | -40 to +85 | 2.0 to 6.0 V |
| MC74ACT163 | Synchronous Presettable Binary Counter, TTL Compatible Inputs | DIP-16 | SO-16, EIAJ-16 | -40 to +85 | 4.5 to 5.5 V |
| MC74AC240 | Octal Bus Buffer (3-State/Inverted) | DIP-20 | SO-20W, TSSOP-20, EIAJ-20 | -40 to +85 | 2.0 to 6.0 V |
| MC74ACT240 | Octal Bus Buffer (3-State/Inverted) (TTL Compatible) | DIP-20 | SO-20W, TSSOP-20, EIAJ-20 | -40 to +85 | 4.5 to 5.5 V |
| MC74ACT241 | Octal Bus Buffer (3-State/Non-Inverted) (TTL Compatible) | DIP-20 | SO-20W, TSSOP-20, EIAJ-20 | -40 to +85 | 4.5 to 5.5 V |
| MC74AC244 | Octal Bus Buffer (3-State) | DIP-20 | SO-20W, TSSOP-20, EIAJ-20 | -40 to +85 | 2.0 to 6.0 V |
| MC74ACT244 | Octal Bus Buffer (3-State) (TTL Compatible) | DIP-20 | SO-20W, TSSOP-20, EIAJ-20 | -40 to +85 | 4.5 to 5.5 V |
| MC74AC245 | Octal Bus Transceiver (3-State) | DIP-20 | SO-20W, TSSOP-20, EIAJ-20 | -40 to +85 | 2.0 to 6.0 V |
| MC74ACT245 | Octal Bus Transceiver (3-State) (TTL Compatible) | DIP-20 | SO-20W, TSSOP-20, EIAJ-20 | -40 to +85 | 4.5 to 5.5 V |
| MC74AC253 | Dual 4-Input Multiplexer w/3-State Outputs | DIP-16 | SO-16, TSSOP-16, EIAJ-16 | -40 to +85 | 2.0 to 6.0 V |
| MC74ACT253 | Dual 4-Input Multiplexer w/3-State Outputs | DIP-16 | SO-16, TSSOP-16, EIAJ-16 | -40 to +85 | 4.5 to 5.5 V |
| MC74AC257 | Quad 2-Line to 1-Line Data Selectors/Multiplexer (3-State) | DIP-16 | SO-16, TSSOP-16, EIAJ-16 | -40 to +85 | 2.0 to 6.0 V |
| MC74ACT257 | Quad 2-to-1 Data Selectors/Mux (3-State) (TTL Compatible) | DIP-16 | SO-16, TSSOP-16, EIAJ-16 | -40 to +85 | 4.5 to 5.5 V |
| MC74AC259 | 8-Bit Addressable Latch | DIP-16 | SO-16, TSSOP-16, EIAJ-16 | -40 to +85 | 2.0 to 6.0 V |
| MC74ACT259 | 8-Bit Addressable Latch | DIP-16 | SO-16, TSSOP-16, EIAJ-16 | -40 to +85 | 4.5 to 5.5 V |
| MC74AC273 | Octal D-Type Flip-Flop | DIP-20 | SO-20W, TSSOP-20, EIAJ-20 | -40 to +85 | 2.0 to 6.0 V |
| MC74ACT273 | Octal D-Type Flip-Flop w/Clear (TTL Compatible) | DIP-20 | SO-20W, TSSOP-20, EIAJ-20 | -40 to +85 | 4.5 to 5.5 V |
| MC74AC373 | Octal D-Type Latch (3-State) | DIP-20 | SO-20W, TSSOP-20, EIAJ-20 | -40 to +85 | 2.0 to 6.0 V |

AC/ACT

| Ordering Suffixes: N = PDIP Rail, D = SOIC Rail, DR2 = SOIC T & R, DW = SOICW Rail, DWR2 = SOICW T & R, DT = TSSOP Rail, DTR2 = TSSOP T & R, M = SOEIAJ Rail, MEL = SOEIAJ T & R, G = Pb-free | | | | | |
|---|--|--------|---------------------------|------------|--------------|
| MC74ACT373 | Octal D-Type Latch (3-State) (TTL Compatible) | DIP-20 | SO-20W, TSSOP-20, EIAJ-20 | -40 to +85 | 4.5 to 5.5 V |
| MC74AC374 | Octal D-Type Flip-Flop (3-State) | DIP-20 | SO-20W, TSSOP-20, EIAJ-20 | -40 to +85 | 2.0 to 6.0 V |
| MC74ACT374 | Octal D-Type Flip-Flop (3-State) (TTL Compatible) | DIP-20 | SO-20W, TSSOP-20, EIAJ-20 | -40 to +85 | 4.5 to 5.5 V |
| MC74AC377 | Octal D-Type Flip-Flop w/Data Enable (3-State) | DIP-20 | SO-20W, TSSOP-20, EIAJ-20 | -40 to +85 | 2.0 to 6.0 V |
| MC74ACT377 | Octal D-Type Flip-Flop w/Data Enable (3-State) (TTL Compatible) | DIP-20 | SO-20W, TSSOP-20, EIAJ-20 | -40 to +85 | 4.5 to 5.5 V |
| MC74AC540 | Octal Bus Buffer (3-State/Inverted) | DIP-20 | SO-20W, TSSOP-20, EIAJ-20 | -40 to +85 | 2.0 to 6.0 V |
| MC74ACT540 | Octal Bus Buffer (3-State/Inverted) (TTL Compatible) | DIP-20 | SO-20W, TSSOP-20, EIAJ-20 | -40 to +85 | 4.5 to 5.5 V |
| MC74AC541 | Octal Bus Buffer (3-State) | DIP-20 | SO-20W, TSSOP-20, EIAJ-20 | -40 to +85 | 2.0 to 6.0 V |
| MC74ACT541 | Octal Bus Buffer (3-State) (TTL Compatible) | DIP-20 | SO-20W, TSSOP-20, EIAJ-20 | -40 to +85 | 4.5 to 5.5 V |
| MC74ACT564 | Octal D-Type Latch w/3-State Outputs (TTL Compatible) | DIP-20 | SO-20W, TSSOP-20, EIAJ-20 | -40 to +85 | 4.5 to 5.5 V |
| MC74AC573 | Octal D-Type Latch (3-State) | DIP-20 | SO-20W, TSSOP-20, EIAJ-20 | -40 to +85 | 2.0 to 6.0 V |
| MC74ACT573 | Octal D-Type Latch (3-State) (TTL Compatible) | DIP-20 | SO-20W, TSSOP-20, EIAJ-20 | -40 to +85 | 4.5 to 5.5 V |
| MC74AC574 | Octal D-Type Flip-Flop (3-State) | DIP-20 | SO-20W, TSSOP-20, EIAJ-20 | -40 to +85 | 2.0 to 6.0 V |
| MC74ACT574 | Octal D-Type Flip-Flop (3-State) (TTL Compatible) | DIP-20 | SO-20W, TSSOP-20, EIAJ-20 | -40 to +85 | 4.5 to 5.5 V |
| MC74ACT640 | Octal Bus Transceiver (Inverting, 3-State) (TTL Compatible) | DIP-20 | SO-20W, TSSOP-20, EIAJ-20 | -40 to +85 | 4.5 to 5.5 V |
| MC74AC646 | Octal Bus Transceiver/Register (3-State) | DIP-24 | SO-24W, TSSOP-24, EIAJ-24 | -40 to +85 | 2.0 to 6.0 V |
| MC74ACT646 | Octal Bus Transceiver/Register (3-State) (TTL Compatible) | DIP-24 | SO-24W, TSSOP-24, EIAJ-24 | -40 to +85 | 4.5 to 5.5 V |
| MC74AC652 | Octal Bus Transceiver/Register (3-State) | DIP-24 | SO-24W, TSSOP-24, EIAJ-24 | -40 to +85 | 2.0 to 6.0 V |
| MC74ACT652 | Octal Bus Transceiver/Register (3-State) (TTL Compatible) | DIP-24 | SO-24W, TSSOP-24, EIAJ-24 | -40 to +85 | 4.5 to 5.5 V |
| MC74AC4040 | 12-Stage Binary Ripple Counter | DIP-16 | SO-16, TSSOP-16, EIAJ-16 | -40 to +85 | 2.0 to 6.0 V |

ON Semiconductor Selector Guide – Standard Logic

Metal Gate CMOS

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|---|--|-----------------------|--------------------------|-------------|-------------------|
| Part Number | Description | Dual-In-Line Packages | Surface Mount Packages | Temperature | Operating Voltage |
| MC14001B | Quad 2-Input NOR Gate | DIP-14 | SO-14, TSSOP-14, EIAJ-14 | -55 to +125 | 3.0 to 18 V |
| MC14001UB | Quad 2-Input NOR Gate Unbuffered | DIP-14 | SO-14 | -55 to +125 | 3.0 to 18 V |
| MC14007UB | Dual Complementary Pair plus Inverter | DIP-14 | SO-14, TSSOP-14, EIAJ-14 | -55 to +125 | 3.0 to 18 V |
| MC14008B | 4-Bit Full Adder | DIP-16 | SO-16, EIAJ-16 | -55 to +125 | 3.0 to 18 V |
| MC14011B | Quad 2-Input NAND Gate | DIP-14 | SO-14, TSSOP-14, EIAJ-14 | -55 to +125 | 3.0 to 18 V |
| MC14011UB | Quad 2-Input NAND Gate Unbuffered | DIP-14 | SO-14 | -55 to +125 | 3.0 to 18 V |
| MC14012B | Dual 4-Input NAND Gate | DIP-14 | SO-14, EIAJ-14 | -55 to +125 | 3.0 to 18 V |
| MC14013B | Dual D Flip-Flop | DIP-14 | SO-14, TSSOP-14, EIAJ-14 | -55 to +125 | 3.0 to 18 V |
| MC14014B | 8-Bit Static Shift Register | DIP-16 | SO-16, EIAJ-16 | -55 to +125 | 3.0 to 18 V |
| MC14015B | Dual 4-Bit Static Shift Register | DIP-16 | SO-16, TSSOP-16, EIAJ-16 | -55 to +125 | 3.0 to 18 V |
| MC14016B | Quad Analog Switch/Multiplexer | DIP-14 | SO-14, TSSOP-14, EIAJ-14 | -55 to +125 | 3.0 to 18 V |
| MC14017B | Decade Counter | DIP-16 | SO-16, EIAJ-16 | -55 to +125 | 3.0 to 18 V |
| MC14018B | Presetable Divide-by-N Counter | DIP-16 | SO-16, EIAJ-16 | -55 to +125 | 3.0 to 18 V |
| MC14020B | 14-Bit Binary Counter | DIP-16 | SO-16, TSSOP-16, EIAJ-16 | -55 to +125 | 3.0 to 18 V |
| MC14021B | 8-Bit Static Shift Register | DIP-16 | SO-16, TSSOP-16, EIAJ-16 | -55 to +125 | 3.0 to 18 V |
| MC14022B | Octal Counter | DIP-16 | SO-16 | -55 to +125 | 3.0 to 18 V |
| MC14023B | Triple 3-Input NAND Gate | DIP-14 | SO-14, TSSOP-14, EIAJ-14 | -55 to +125 | 3.0 to 18 V |
| MC14024B | 7-Stage Ripple Counter | DIP-14 | SO-14, EIAJ-14 | -55 to +125 | 3.0 to 18 V |
| MC14025B | Triple 3-Input NOR Gate | DIP-14 | SO-14, EIAJ-14 | -55 to +125 | 3.0 to 18 V |
| MC14027B | Dual J-K Flip-Flop | DIP-16 | SO-16, EIAJ-16 | -55 to +125 | 3.0 to 18 V |
| MC14028B | BCD-to-Decimal/Binary-to-Octal Decoder | DIP-16 | SO-16, EIAJ-16 | -55 to +125 | 3.0 to 18 V |
| MC14029B | Presetable Binary/BCD Up/Down Counter | DIP-16 | SO-16, EIAJ-16 | -55 to +125 | 3.0 to 18 V |
| MC14040B | 12-Stage Ripple-Carry Binary Counter/Divider | DIP-16 | SO-16, TSSOP-16, EIAJ-16 | -55 to +125 | 3.0 to 18 V |
| MC14042B | Quad Clocked D-Latch | DIP-16 | SO-16, EIAJ-16 | -55 to +125 | 3.0 to 18 V |
| MC14043B | Quad NOR R-S Latch | DIP-16 | SO-16, EIAJ-16 | -55 to +125 | 3.0 to 18 V |
| MC14044B | Quad NAND R-S Latch | DIP-16 | SO-16, EIAJ-16 | -55 to +125 | 3.0 to 18 V |
| MC14046B | Phase-Locked Loop | DIP-16 | SO-16W, EIAJ-16 | -55 to +125 | 3.0 to 18 V |
| MC14049B | Hex Inverter | DIP-16 | SO-16, TSSOP-16, EIAJ-16 | -55 to +125 | 3.0 to 18 V |
| MC14049UB | Hex Inverter Unbuffered | DIP-16 | SO-16, TSSOP-16, EIAJ-16 | -55 to +125 | 3.0 to 18 V |
| MC14050B | Hex Buffer | DIP-16 | SO-16, TSSOP-16, EIAJ-16 | -55 to +125 | 3.0 to 18 V |

Metal Gate CMOS

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|---|---|-----------------------|--------------------------|-------------|-------------------|
| Part Number | Description | Dual-In-Line Packages | Surface Mount Packages | Temperature | Operating Voltage |
| MC14051B | 8-Channel Analog Multiplexer/Demultiplexer | DIP-16 | SO-16, TSSOP-16, EIAJ-16 | -55 to +125 | 3.0 to 18 V |
| MC14052B | Dual 4-Channel Analog Multiplexer/Demultiplexer | DIP-16 | SO-16, TSSOP-16, EIAJ-16 | -55 to +125 | 3.0 to 18 V |
| MC14053B | Triple 2-Channel Analog Multiplexer/Demultiplexer | DIP-16 | SO-16, TSSOP-16, EIAJ-16 | -55 to +125 | 3.0 to 18 V |
| MC14060B | 14-Stage Binary Counter/Oscillator | DIP-16 | SO-16, TSSOP-16, EIAJ-16 | -55 to +125 | 3.0 to 18 V |
| MC14066B | Quad Analog Switch | DIP-14 | SO-14, TSSOP-14, EIAJ-14 | -55 to +125 | 3.0 to 18 V |
| MC14067B | 16-Channel Analog Multiplexer/Demultiplexer | DIP-24 | SO-24W, TSSOP-24 | -55 to +125 | 3.0 to 18 V |
| MC14069UB | Hex Inverter | DIP-14 | SO-14, TSSOP-14, EIAJ-14 | -55 to +125 | 3.0 to 18 V |
| MC14070B | Quad 2-Input Exclusive-OR Gate | DIP-14 | SO-14, EIAJ-14 | -55 to +125 | 3.0 to 18 V |
| MC14071B | Quad 2-Input OR Gate | DIP-14 | SO-14, TSSOP-14, EIAJ-14 | -55 to +125 | 3.0 to 18 V |
| MC14073B | Triple 3-Input AND Gate | DIP-14 | SO-14, TSSOP-14, EIAJ-14 | -55 to +125 | 3.0 to 18 V |
| MC14076B | Quad D-Type Register w/3-State Outputs | DIP-24 | SO-24 | -55 to +125 | 3.0 to 18 V |
| MC14077B | Quad 2-Input Exclusive-NOR Gate | DIP-14 | SO-14, EIAJ-14 | -55 to +125 | 3.0 to 18 V |
| MC14081B | Quad 2-Input AND Gate | DIP-14 | SO-14, TSSOP-14, EIAJ-14 | -55 to +125 | 3.0 to 18 V |
| MC14082B | Dual 4-Input AND Gate | DIP-14 | SO-14, TSSOP-14, EIAJ-14 | -55 to +125 | 3.0 to 18 V |
| MC14093B | Quad 2-Input Schmitt Trigger NAND | DIP-14 | SO-14, TSSOP-14, EIAJ-14 | -55 to +125 | 3.0 to 18 V |
| MC14094B | 8-Stage Shift/Store Register w/3-State Outputs | DIP-16 | SO-16, TSSOP-16, EIAJ-16 | -55 to +125 | 3.0 to 18 V |
| MC14099B | 8-Bit Addressable Latch | DIP-16 | SO-16W | -55 to +125 | 3.0 to 18 V |
| MC14106B | Hex Schmitt Trigger | DIP-14 | SO-14, TSSOP-14 | -55 to +125 | 3.0 to 18 V |
| MC14174B | Hex D Flip-Flop | DIP-16 | SO-16, EIAJ-16 | -55 to +125 | 3.0 to 18 V |
| MC14175B | Quad D Flip-Flop | DIP-16 | SO-16, EIAJ-16 | -55 to +125 | 3.0 to 18 V |
| MC14490 | Hex Contact Bounce Eliminator | DIP-16 | SO-16W, EIAJ-16 | -55 to +125 | 3.0 to 18 V |
| MC14503B | Hex 3-State Buffer | DIP-16 | SO-16, EIAJ-16 | -55 to +125 | 3.0 to 18 V |
| MC14504B | TTL or CMOS to CMOS Hex Level Shifter | DIP-16 | SO-16, TSSOP-16, EIAJ-16 | -55 to +125 | 3.0 to 18 V |
| MC14511B | BCD-to-7 Segment Latch/Decoder/Driver | DIP-16 | SO-16, SO-16W, EIAJ-16 | -55 to +125 | 3.0 to 18 V |
| MC14512B | 8-Channel Data Selector | DIP-16 | SO-16, EIAJ-16 | -55 to +125 | 3.0 to 18 V |
| MC14513B | BCD-to-7 Segment Latch/Decoder/Driver w/Ripple Blanking | DIP-18 | N/A | -55 to +125 | 3.0 to 18 V |
| MC14514B | 4-Bit Transparent Latch/4-to-16 Line Decoder (High) | DIP-24 | SO-24W | -55 to +125 | 3.0 to 18 V |
| MC14515B | 4-Bit Transparent Latch/4-to-16 Line Decoder (Low) | DIP-24 | SO-24W | -55 to +125 | 3.0 to 18 V |
| MC14516B | Presetable Binary Up/Down Counter | DIP-16 | SO-16, EIAJ-16 | -55 to +125 | 3.0 to 18 V |

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Metal Gate CMOS

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|---|---|-----------------------|--------------------------|-------------|-------------------|
| Part Number | Description | Dual-In-Line Packages | Surface Mount Packages | Temperature | Operating Voltage |
| MC14517B | Dual 64-Bit Static Shift Register | DIP-16 | SO-16W | -55 to +125 | 3.0 to 18 V |
| MC14518B | Dual BCD Up Counter | DIP-16 | SO-16W, EIAJ-16 | -55 to +125 | 3.0 to 18 V |
| MC14520B | Dual Binary Up Counter | DIP-16 | SO-16W, EIAJ-16 | -55 to +125 | 3.0 to 18 V |
| MC14521B | 24-Stage Frequency Divider | DIP-16 | SO-16, EIAJ-16 | -55 to +125 | 3.0 to 18 V |
| MC14526B | Presettable 4-Bit Binary Down Counter | DIP-16 | SO-16W, EIAJ-16 | -55 to +125 | 3.0 to 18 V |
| MC14528B | Dual Monostable Multivibrator | DIP-16 | SO-16, EIAJ-16 | -55 to +125 | 3.0 to 18 V |
| MC14532B | 8-Bit Priority Encoder | DIP-16 | SO-16, EIAJ-16, | -55 to +125 | 3.0 to 18 V |
| MC14536B | Programmable Timer | DIP-16 | SO-16W, EIAJ-16 | -55 to +125 | 3.0 to 18 V |
| MC14538B | Dual Precision Monostable Multivibrator | DIP-16 | SO-16, TSSOP-16, EIAJ-16 | -55 to +125 | 3.0 to 18 V |
| MC14541B | Programmable Oscillator/Timer | DIP-16 | SO-16, TSSOP-16, EIAJ-16 | -55 to +125 | 3.0 to 18 V |
| MC14543B | BCD-to-7 Segment Latch/Decoder/Driver for LCD | DIP-16 | SO-16, EIAJ-16 | -55 to +125 | 3.0 to 18 V |
| MC14549B | Successive Approximation Register | DIP-16 | SO-16W | -55 to +125 | 3.0 to 18 V |
| MC14551B | Quad 2-Channel Analog Multiplexer/Demultiplexer | DIP-16 | SO-16, EIAJ-16 | -55 to +125 | 3.0 to 18 V |
| MC14553B | 3-Digit BCD Counter | DIP-16 | SO-16W | -55 to +125 | 3.0 to 18 V |
| MC14555B | Dual Binary to 1-of-4 Decoder (Active High Outputs) | DIP-16 | SO-16, EIAJ-16 | -55 to +125 | 3.0 to 18 V |
| MC14556B | Dual Binary to 1-or-4 Decoder/Demultiplexer | DIP-16 | SO-16, EIAJ-16 | -55 to +125 | 3.0 to 18 V |
| MC14557B | 1-to-64 Bit Variable Length Shift Register | DIP-16 | SO-16W, EIAJ-16 | -55 to +125 | 3.0 to 18 V |
| MC14559B | Successive Approximation Register | DIP-16 | SO-16W | -55 to +125 | 3.0 to 18 V |
| MC14562B | 128-Bit Static Shift Register | DIP-14 | N/A | -55 to +125 | 3.0 to 18 V |
| MC14569B | Programmable Dual 4-Bit Binary/BCD Down Converter | DIP-16 | SO-16W, TSSOP-16 | -55 to +125 | 3.0 to 18 V |
| MC14572UB | Hex Gate Unbuffered | DIP-16 | SO-16, EIAJ-16 | -55 to +125 | 2.0 to 5.5 V |
| MC14584B | Hex Schmitt Trigger | DIP-14 | SO-14, TSSOP-14, EIAJ-14 | -55 to +125 | 2.0 to 5.5 V |
| MC14585B | 4-Bit Magnitude Comparator | DIP-16 | SO-16, EIAJ-16 | -55 to +125 | 2.0 to 5.5 V |
| MC14598B | 8-Bit Bus-Compatible Addressable Latch | DIP-18 | N/A | -55 to +125 | 2.0 to 5.5 V |

Logic Special Functions

| Part Number | Description | Dual-In-Line Packages | Surface Mount Packages | Temperature | Operating Voltage |
|-------------|-----------------------------------|-----------------------|---------------------------|-------------|-------------------|
| JLC1562 | I2C Bus I/O Expander | DIP-16 | EIAJ-16 | -40 to +85 | 4.2 to 6.0 V |
| NL7SZ18 | 2:1 Digital MUX, 3-State Output | | SC-88 | -40 to +85 | 1.65 to 5.5 V |
| NL7SZ19 | 2:1 Digital MUX | | SC-88 | -40 to +85 | 1.65 to 5.5 V |
| NLSF1174 | Hex D Flip-Flop with Clear | | QFN-16, 3x3mm | -55 to +125 | 2.0 to 6.0 V |
| NLSF2500 | Keypad Multiplexer | | QFN-16, 3x3mm | -40 to +85 | 1.5 to 5.5 V |
| NLSF3T125 | Quad Bus Buffer, TTL Compatible | | QFN-16, 3x3mm | -40 to +85 | 2.5 to 5.5 V |
| NLSF3T126 | Quad Bus Buffer, TTL Compatible | | QFN-16, 3x3mm | -40 to +85 | 2.5 to 5.5 V |
| NLSF595 | Serial (SPI) Tri-Color LED Driver | | TSSOP-16, SOIC-16, QFN-16 | -55 to +125 | 2.0 to 5.5 V |

Translators

| Device | Type | Description | Package | Size | Production |
|-----------------|---------------------------|--|---------|-------------------|------------|
| NLSX3014MUTAG | Auto Sense Bi-Directional | 4-Bit 100 Mbps Configurable Dual-Supply Level Translator | UQFN12 | 2.00 mm x 1.70 mm | 2Q07 |
| NLSV4T3234FCT1G | Uni-Directional | 4-Bit Dual-Supply Bus Buffer Level Translator with 26 Ohm Output Series Resistor | µBump11 | 2.04 mm x 1.41 mm | NOW |
| NLSV1T240MUTAG | Uni-Directional | 1-Bit Configurable Dual-Supply Bus Buffer Level Translator (Inverter) | UDFN6 | 1.20 mm x 1.00 mm | 2Q07 |
| NLSV1T244MUTAG | Uni-Directional | 1-Bit Configurable Dual-Supply Bus Buffer Level Translator | UDFN6 | 1.20 mm x 1.00 mm | 2Q07 |
| NLSV2T240MUTAG | Uni-Directional | 2-Bit Configurable Dual-Supply Bus Buffer Level Translator (Inverter) | UDFN8 | 1.80 mm x 1.20 mm | 2Q07 |
| NLSV2T244MUTAG | Uni-Directional | 2-Bit Configurable Dual-Supply Bus Buffer Level Translator | UDFN8 | 1.80 mm x 1.20 mm | 2Q07 |
| NLSV4T240MUTAG | Uni-Directional | 4-Bit Configurable Dual-Supply Bus Buffer Level Translator (Inverter) | UQFN12 | 1.70 mm x 2.00 mm | 2Q07 |
| NLSV4T244MUTAG | Uni-Directional | 4-Bit Configurable Dual-Supply Bus Buffer Level Translator | UQFN12 | 1.70 mm x 2.00 mm | 2Q07 |

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