

LM78XX/LM78XXA

3-Terminal 1A Positive Voltage Regulator

Features

- Output Current up to 1A
- Output Voltages of 5, 6, 8, 9, 10, 12, 15, 18, 24
- Thermal Overload Protection
- Short Circuit Protection
- Output Transistor Safe Operating Area Protection

General Description

The LM78XX series of three terminal positive regulators are available in the TO-220 package and with several fixed output voltages, making them useful in a wide range of applications. Each type employs internal current limiting, thermal shut down and safe operating area protection, making it essentially indestructible. If adequate heat sinking is provided, they can deliver over 1A output current. Although designed primarily as fixed voltage regulators, these devices can be used with external components to obtain adjustable voltages and currents.

Ordering Information

| Product Number | Output Voltage Tolerance | Package | Operating Temperature | |
|----------------|--------------------------|---------|-----------------------|---------------|
| LM7805CT | ±4% | TO-220 | -40°C to +125°C | |
| LM7806CT | | | | |
| LM7808CT | | | | |
| LM7809CT | | | | |
| LM7810CT | | | | |
| LM7812CT | | | | |
| LM7815CT | | | | |
| LM7818CT | | | | |
| LM7824CT | | | | |
| LM7805ACT | ±2% | | TO-220 | 0°C to +125°C |
| LM7806ACT | | | | |
| LM7808ACT | | | | |
| LM7809ACT | | | | |
| LM7810ACT | | | | |
| LM7812ACT | | | | |
| LM7815ACT | | | | |
| LM7818ACT | | | | |
| LM7824ACT | | | | |

Block Diagram

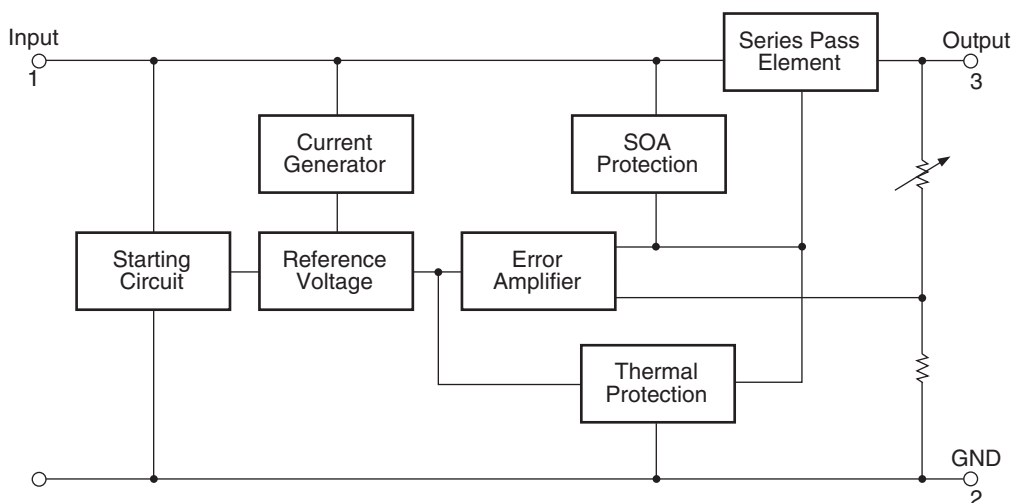


Figure 1.

Pin Assignment

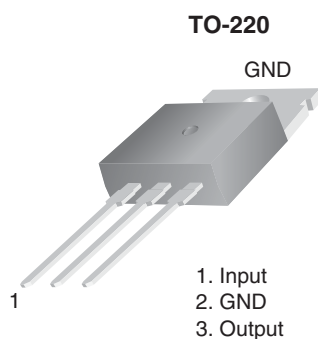


Figure 2.

Absolute Maximum Ratings

Absolute maximum ratings are those values beyond which damage to the device may occur. The datasheet specifications should be met, without exception, to ensure that the system design is reliable over its power supply, temperature, and output/input loading variables. Fairchild does not recommend operation outside datasheet specifications.

| Symbol | Parameter | | Value | Unit |
|-----------------|--|----------------------------|-------------|---------------|
| V_I | Input Voltage | $V_O = 5V \text{ to } 18V$ | 35 | V |
| | | $V_O = 24V$ | 40 | V |
| $R_{\theta JC}$ | Thermal Resistance Junction-Cases (TO-220) | | 5 | $^{\circ}C/W$ |
| $R_{\theta JA}$ | Thermal Resistance Junction-Air (TO-220) | | 65 | $^{\circ}C/W$ |
| T_{OPR} | Operating Temperature Range | LM78xx | -40 to +125 | $^{\circ}C$ |
| | | LM78xxA | 0 to +125 | |
| T_{STG} | Storage Temperature Range | | -65 to +150 | $^{\circ}C$ |

Electrical Characteristics (LM7805)

Refer to the test circuits. $-40^{\circ}\text{C} < T_J < 125^{\circ}\text{C}$, $I_O = 500\text{mA}$, $V_I = 10\text{V}$, $C_I = 0.1\mu\text{F}$, unless otherwise specified.

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|-------------------------|-------------------------------------|--|---------------------------------------|------|------|------------------------|
| V_O | Output Voltage | $T_J = +25^{\circ}\text{C}$ | 4.8 | 5.0 | 5.2 | V |
| | | $5\text{mA} \leq I_O \leq 1\text{A}$, $P_O \leq 15\text{W}$, $V_I = 7\text{V to } 20\text{V}$ | 4.75 | 5.0 | 5.25 | |
| Regline | Line Regulation ⁽¹⁾ | $T_J = +25^{\circ}\text{C}$ | $V_O = 7\text{V to } 25\text{V}$ | – | 4.0 | mV |
| | | | $V_I = 8\text{V to } 12\text{V}$ | – | 1.6 | |
| Regload | Load Regulation ⁽¹⁾ | $T_J = +25^{\circ}\text{C}$ | $I_O = 5\text{mA to } 1.5\text{A}$ | – | 9.0 | mV |
| | | | $I_O = 250\text{mA to } 750\text{mA}$ | – | 4.0 | |
| I_Q | Quiescent Current | $T_J = +25^{\circ}\text{C}$ | – | 5.0 | 8.0 | mA |
| ΔI_Q | Quiescent Current Change | $I_O = 5\text{mA to } 1\text{A}$ | – | 0.03 | 0.5 | mA |
| | | $V_I = 7\text{V to } 25\text{V}$ | – | 0.3 | 1.3 | |
| $\Delta V_O / \Delta T$ | Output Voltage Drift ⁽²⁾ | $I_O = 5\text{mA}$ | – | -0.8 | – | mV/ $^{\circ}\text{C}$ |
| V_N | Output Noise Voltage | $f = 10\text{Hz to } 100\text{kHz}$, $T_A = +25^{\circ}\text{C}$ | – | 42.0 | – | $\mu\text{V}/V_O$ |
| RR | Ripple Rejection ⁽²⁾ | $f = 120\text{Hz}$, $V_O = 8\text{V to } 18\text{V}$ | 62.0 | 73.0 | – | dB |
| V_{DROP} | Dropout Voltage | $I_O = 1\text{A}$, $T_J = +25^{\circ}\text{C}$ | – | 2.0 | – | V |
| r_O | Output Resistance ⁽²⁾ | $f = 1\text{kHz}$ | – | 15.0 | – | $\text{m}\Omega$ |
| I_{SC} | Short Circuit Current | $V_I = 35\text{V}$, $T_A = +25^{\circ}\text{C}$ | – | 230 | – | mA |
| I_{PK} | Peak Current ⁽²⁾ | $T_J = +25^{\circ}\text{C}$ | – | 2.2 | – | A |

Notes:

1. Load and line regulation are specified at constant junction temperature. Changes in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.
2. These parameters, although guaranteed, are not 100% tested in production.

Electrical Characteristics (LM7806) (Continued)

Refer to the test circuits. $-40^{\circ}\text{C} < T_J < 125^{\circ}\text{C}$, $I_O = 500\text{mA}$, $V_I = 11\text{V}$, $C_I = 0.33\mu\text{F}$, $C_O = 0.1\mu\text{F}$, unless otherwise specified.

| Symbol | Parameter | Conditions | Min | Typ. | Max. | Unit |
|-------------------------|-------------------------------------|--|------|------|------|------------------------|
| V_O | Output Voltage | $T_J = +25^{\circ}\text{C}$ | 5.75 | 6.0 | 6.25 | V |
| | | $5\text{mA} \leq I_O \leq 1\text{A}$, $P_O \leq 15\text{W}$, $V_I = 8.0\text{V to } 21\text{V}$ | 5.7 | 6.0 | 6.3 | |
| Regline | Line Regulation ⁽³⁾ | $T_J = +25^{\circ}\text{C}$ $V_I = 8\text{V to } 25\text{V}$ | — | 5.0 | 120 | mV |
| | | | — | 1.5 | 60.0 | |
| Regload | Load Regulation ⁽³⁾ | $T_J = +25^{\circ}\text{C}$ $I_O = 5\text{mA to } 1.5\text{A}$ | — | 9.0 | 120 | mV |
| | | | — | 3.0 | 60.0 | |
| I_Q | Quiescent Current | $T_J = +25^{\circ}\text{C}$ | — | 5.0 | 8.0 | mA |
| ΔI_Q | Quiescent Current Change | $I_O = 5\text{mA to } 1\text{A}$ | — | — | 0.5 | mA |
| | | $V_I = 8\text{V to } 25\text{V}$ | — | — | 1.3 | |
| $\Delta V_O / \Delta T$ | Output Voltage Drift ⁽⁴⁾ | $I_O = 5\text{mA}$ | — | -0.8 | — | mV/ $^{\circ}\text{C}$ |
| V_N | Output Noise Voltage | $f = 10\text{Hz to } 100\text{kHz}$, $T_A = +25^{\circ}\text{C}$ | — | 45.0 | — | $\mu\text{V}/V_O$ |
| RR | Ripple Rejection ⁽⁴⁾ | $f = 120\text{Hz}$, $V_O = 8\text{V to } 18\text{V}$ | 62.0 | 73.0 | — | dB |
| V_{DROP} | Dropout Voltage | $I_O = 1\text{A}$, $T_J = +25^{\circ}\text{C}$ | — | 2.0 | — | V |
| r_O | Output Resistance ⁽⁴⁾ | $f = 1\text{kHz}$ | — | 19.0 | — | $\text{m}\Omega$ |
| I_{SC} | Short Circuit Current | $V_I = 35\text{V}$, $T_A = +25^{\circ}\text{C}$ | — | 250 | — | mA |
| I_{PK} | Peak Current ⁽⁴⁾ | $T_J = +25^{\circ}\text{C}$ | — | 2.2 | — | A |

Notes:

- Load and line regulation are specified at constant junction temperature. Changes in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.
- These parameters, although guaranteed, are not 100% tested in production.

Electrical Characteristics (LM7808) (Continued)

Refer to the test circuits. $-40^{\circ}\text{C} < T_J < 125^{\circ}\text{C}$, $I_O = 500\text{mA}$, $V_I = 14\text{V}$, $C_I = 0.33\mu\text{F}$, $C_O = 0.1\mu\text{F}$, unless otherwise specified.

| Symbol | Parameter | Conditions | | Min. | Typ. | Max. | Unit |
|---------------------|-------------------------------------|---|---------------------------------|------|------|------|-------------------|
| V _O | Output Voltage | T _J = +25°C | | 7.7 | 8.0 | 8.3 | V |
| | | 5mA ≤ I _O ≤ 1A, P _O ≤ 15W, V _I = 10.5V to 23V | | 7.6 | 8.0 | 8.4 | |
| Regline | Line Regulation ⁽⁵⁾ | T _J = +25°C | V _I = 10.5V to 25V | — | 5.0 | 160 | mV |
| | | | V _I = 11.5V to 17V | — | 2.0 | 80.0 | |
| Regload | Load Regulation ⁽⁵⁾ | T _J = +25°C | I _O = 5mA to 1.5A | — | 10.0 | 160 | mV |
| | | | I _O = 250mA to 750mA | — | 5.0 | 80.0 | |
| I _Q | Quiescent Current | T _J = +25°C | | — | 5.0 | 8.0 | mA |
| ΔI _Q | Quiescent Current Change | I _O = 5mA to 1A | | — | 0.05 | 0.5 | mA |
| | | V _I = 10.5V to 25V | | — | 0.5 | 1.0 | |
| ΔV _O /ΔT | Output Voltage Drift ⁽⁶⁾ | I _O = 5mA | | — | -0.8 | — | mV/°C |
| V _N | Output Noise Voltage | f = 10Hz to 100kHz, T _A = +25°C | | — | 52.0 | — | μV/V _O |
| RR | Ripple Rejection ⁽⁶⁾ | f = 120Hz, V _O = 11.5V to 21.5V | | 56.0 | 73.0 | — | dB |
| V _{DROP} | Dropout Voltage | I _O = 1A, T _J = +25°C | | — | 2.0 | — | V |
| r _O | Output Resistance ⁽⁶⁾ | f = 1kHz | | — | 17.0 | — | mΩ |
| I _{SC} | Short Circuit Current | V _I = 35V, T _A = +25°C | | — | 230 | — | mA |
| I _{PK} | Peak Current ⁽⁶⁾ | T _J = +25°C | | — | 2.2 | — | A |

Notes:

- Load and line regulation are specified at constant junction temperature. Changes in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.
- These parameters, although guaranteed, are not 100% tested in production.

Electrical Characteristics (LM7809) (Continued)

Refer to the test circuits. $-40^{\circ}\text{C} < T_J < 125^{\circ}\text{C}$, $I_O = 500\text{mA}$, $V_I = 15\text{V}$, $C_I = 0.33\mu\text{F}$, $C_O = 0.1\mu\text{F}$, unless otherwise specified.

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|-------------------------|-------------------------------------|---|------|------|------|------------------------|
| V_O | Output Voltage | $T_J = +25^{\circ}\text{C}$ | 8.65 | 9.0 | 9.35 | V |
| | | $5\text{mA} \leq I_O \leq 1\text{A}$, $P_O \leq 15\text{W}$, $V_I = 11.5\text{V to } 24\text{V}$ | 8.6 | 9.0 | 9.4 | |
| Regline | Line Regulation ⁽⁷⁾ | $T_J = +25^{\circ}\text{C}$ $V_I = 11.5\text{V to } 25\text{V}$ | — | 6.0 | 180 | mV |
| | | | — | 2.0 | 90.0 | |
| Regload | Load Regulation ⁽⁷⁾ | $T_J = +25^{\circ}\text{C}$ $I_O = 5\text{mA to } 1.5\text{A}$ | — | 12.0 | 180 | mV |
| | | | — | 4.0 | 90.0 | |
| I_Q | Quiescent Current | $T_J = +25^{\circ}\text{C}$ | — | 5.0 | 8.0 | mA |
| ΔI_Q | Quiescent Current Change | $I_O = 5\text{mA to } 1\text{A}$ | — | — | 0.5 | mA |
| | | $V_I = 11.5\text{V to } 26\text{V}$ | — | — | 1.3 | |
| $\Delta V_O / \Delta T$ | Output Voltage Drift ⁽⁸⁾ | $I_O = 5\text{mA}$ | — | -1.0 | — | mV/ $^{\circ}\text{C}$ |
| V_N | Output Noise Voltage | $f = 10\text{Hz to } 100\text{kHz}$, $T_A = +25^{\circ}\text{C}$ | — | 58.0 | — | $\mu\text{V}/V_O$ |
| RR | Ripple Rejection ⁽⁸⁾ | $f = 120\text{Hz}$, $V_O = 13\text{V to } 23\text{V}$ | 56.0 | 71.0 | — | dB |
| V_{DROP} | Dropout Voltage | $I_O = 1\text{A}$, $T_J = +25^{\circ}\text{C}$ | — | 2.0 | — | V |
| r_O | Output Resistance ⁽⁸⁾ | $f = 1\text{kHz}$ | — | 17.0 | — | $\text{m}\Omega$ |
| I_{SC} | Short Circuit Current | $V_I = 35\text{V}$, $T_A = +25^{\circ}\text{C}$ | — | 250 | — | mA |
| I_{PK} | Peak Current ⁽⁸⁾ | $T_J = +25^{\circ}\text{C}$ | — | 2.2 | — | A |

Notes:

7. Load and line regulation are specified at constant junction temperature. Changes in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.
8. These parameters, although guaranteed, are not 100% tested in production.

Electrical Characteristics (LM7810) (Continued)

Refer to the test circuits. $-40^{\circ}\text{C} < T_J < 125^{\circ}\text{C}$, $I_O = 500\text{mA}$, $V_I = 16\text{V}$, $C_I = 0.33\mu\text{F}$, $C_O = 0.1\mu\text{F}$, unless otherwise specified.

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|-------------------------|--------------------------------------|---|------|------|------|------------------------|
| V_O | Output Voltage | $T_J = +25^{\circ}\text{C}$ | 9.6 | 10.0 | 10.4 | V |
| | | $5\text{mA} \leq I_O \leq 1\text{A}$, $P_O \leq 15\text{W}$, $V_I = 12.5\text{V to } 25\text{V}$ | 9.5 | 10.0 | 10.5 | |
| Regline | Line Regulation ⁽⁹⁾ | $T_J = +25^{\circ}\text{C}$ $V_I = 12.5\text{V to } 25\text{V}$ | – | 10.0 | 200 | mV |
| | | | – | 3.0 | 100 | |
| Regload | Load Regulation ⁽⁹⁾ | $T_J = +25^{\circ}\text{C}$ $I_O = 250\text{mA to } 750\text{mA}$ | – | 12.0 | 200 | mV |
| | | | – | 4.0 | 400 | |
| I_Q | Quiescent Current | $T_J = +25^{\circ}\text{C}$ | – | 5.1 | 8.0 | mA |
| ΔI_Q | Quiescent Current Change | $I_O = 5\text{mA to } 1\text{A}$ | – | – | 0.5 | mA |
| | | $V_I = 12.5\text{V to } 29\text{V}$ | – | – | 1.0 | |
| $\Delta V_O / \Delta T$ | Output Voltage Drift ⁽¹⁰⁾ | $I_O = 5\text{mA}$ | – | -1.0 | – | mV/ $^{\circ}\text{C}$ |
| V_N | Output Noise Voltage | $f = 10\text{Hz to } 100\text{kHz}$, $T_A = +25^{\circ}\text{C}$ | – | 58.0 | – | $\mu\text{V}/V_O$ |
| RR | Ripple Rejection ⁽¹⁰⁾ | $f = 120\text{Hz}$, $V_O = 13\text{V to } 23\text{V}$ | 56.0 | 71.0 | – | dB |
| V_{DROP} | Dropout Voltage | $I_O = 1\text{A}$, $T_J = +25^{\circ}\text{C}$ | – | 2.0 | – | V |
| r_O | Output Resistance ⁽¹⁰⁾ | $f = 1\text{kHz}$ | – | 17.0 | – | $\text{m}\Omega$ |
| I_{SC} | Short Circuit Current | $V_I = 35\text{V}$, $T_A = +25^{\circ}\text{C}$ | – | 250 | – | mA |
| I_{PK} | Peak Current ⁽¹⁰⁾ | $T_J = +25^{\circ}\text{C}$ | – | 2.2 | – | A |

Notes:

9. Load and line regulation are specified at constant junction temperature. Changes in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.
10. These parameters, although guaranteed, are not 100% tested in production.

Electrical Characteristics (LM7812) (Continued)

Refer to the test circuits. $-40^{\circ}\text{C} < T_J < 125^{\circ}\text{C}$, $I_O = 500\text{mA}$, $V_I = 19\text{V}$, $C_I = 0.33\mu\text{F}$, $C_O = 0.1\mu\text{F}$, unless otherwise specified.

| Symbol | Parameter | Conditions | | Min. | Typ. | Max. | Unit |
|---------------------|--------------------------------------|---|---------------------------------|------|------|------|-------------------|
| V _O | Output Voltage | T _J = +25°C | | 11.5 | 12.0 | 12.5 | V |
| | | 5mA ≤ I _O ≤ 1A, P _O ≤ 15W, V _I = 14.5V to 27V | | 11.4 | 12.0 | 12.6 | |
| Regline | Line Regulation ⁽¹¹⁾ | T _J = +25°C | V _I = 14.5V to 30V | – | 10.0 | 240 | mV |
| | | | V _I = 16V to 22V | – | 3.0 | 120 | |
| Regload | Load Regulation ⁽¹¹⁾ | T _J = +25°C | I _O = 5mA to 1.5A | – | 11.0 | 240 | mV |
| | | | I _O = 250mA to 750mA | – | 5.0 | 120 | |
| I _Q | Quiescent Current | T _J = +25°C | | – | 5.1 | 8.0 | mA |
| ΔI _Q | Quiescent Current Change | I _O = 5mA to 1A | | – | 0.1 | 0.5 | mA |
| | | V _I = 14.5V to 30V | | – | 0.5 | 1.0 | |
| ΔV _O /ΔT | Output Voltage Drift ⁽¹²⁾ | I _O = 5mA | | – | -1.0 | – | mV/°C |
| V _N | Output Noise Voltage | f = 10Hz to 100kHz, T _A = +25°C | | – | 76.0 | – | μV/V _O |
| RR | Ripple Rejection ⁽¹²⁾ | f = 120Hz, V _I = 15V to 25V | | 55.0 | 71.0 | – | dB |
| V _{DROP} | Dropout Voltage | I _O = 1A, T _J = +25°C | | – | 2.0 | – | V |
| r _O | Output Resistance ⁽¹²⁾ | f = 1kHz | | – | 18.0 | – | mΩ |
| I _{SC} | Short Circuit Current | V _I = 35V, T _A = +25°C | | – | 230 | – | mA |
| I _{PK} | Peak Current ⁽¹²⁾ | T _J = +25°C | | – | 2.2 | – | A |

Notes:

11. Load and line regulation are specified at constant junction temperature. Changes in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.
12. These parameters, although guaranteed, are not 100% tested in production.

Electrical Characteristics (LM7815) (Continued)

Refer to the test circuits. $-40^{\circ}\text{C} < T_J < 125^{\circ}\text{C}$, $I_O = 500\text{mA}$, $V_I = 23\text{V}$, $C_I = 0.33\mu\text{F}$, $C_O = 0.1\mu\text{F}$, unless otherwise specified.

| Symbol | Parameter | Conditions | | Min. | Typ. | Max. | Unit |
|---------------------|--------------------------------------|---|---------------------------------|-------|------|-------|-------------------|
| V _O | Output Voltage | T _J = +25°C | | 14.4 | 15.0 | 15.6 | V |
| | | 5mA ≤ I _O ≤ 1A, P _O ≤ 15W, V _I = 17.5V to 30V | | 14.25 | 15.0 | 15.75 | |
| Regline | Line Regulation ⁽¹³⁾ | T _J = +25°C | V _I = 17.5V to 30V | – | 11.0 | 300 | mV |
| | | | V _I = 20V to 26V | – | 3.0 | 150 | |
| Regload | Load Regulation ⁽¹³⁾ | T _J = +25°C | I _O = 5mA to 1.5A | – | 12.0 | 300 | mV |
| | | | I _O = 250mA to 750mA | – | 4.0 | 150 | |
| I _Q | Quiescent Current | T _J = +25°C | | – | 5.2 | 8.0 | mA |
| ΔI _Q | Quiescent Current Change | I _O = 5mA to 1A | | – | – | 0.5 | mA |
| | | V _I = 17.5V to 30V | | – | – | 1.0 | |
| ΔV _O /ΔT | Output Voltage Drift ⁽¹⁴⁾ | I _O = 5mA | | – | -1.0 | – | mV/°C |
| V _N | Output Noise Voltage | f = 10Hz to 100kHz, T _A = +25°C | | – | 90.0 | – | μV/V _O |
| RR | Ripple Rejection ⁽¹⁴⁾ | f = 120Hz, V _I = 18.5V to 28.5V | | 54.0 | 70.0 | – | dB |
| V _{DROP} | Dropout Voltage | I _O = 1A, T _J = +25°C | | – | 2.0 | – | V |
| r _O | Output Resistance ⁽¹⁴⁾ | f = 1kHz | | – | 19.0 | – | mΩ |
| I _{SC} | Short Circuit Current | V _I = 35V, T _A = +25°C | | – | 250 | – | mA |
| I _{PK} | Peak Current ⁽¹⁴⁾ | T _J = +25°C | | – | 2.2 | – | A |

Notes:

13. Load and line regulation are specified at constant junction temperature. Changes in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.
14. These parameters, although guaranteed, are not 100% tested in production.

Electrical Characteristics (LM7818) (Continued)

Refer to the test circuits. $-40^{\circ}\text{C} < T_J < 125^{\circ}\text{C}$, $I_O = 500\text{mA}$, $V_I = 27\text{V}$, $C_I = 0.33\mu\text{F}$, $C_O = 0.1\mu\text{F}$, unless otherwise specified.

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|-------------------------|--------------------------------------|---|------|------|------|------------------------|
| V_O | Output Voltage | $T_J = +25^{\circ}\text{C}$ | 17.3 | 18.0 | 18.7 | V |
| | | $5\text{mA} \leq I_O \leq 1\text{A}$, $P_O \leq 15\text{W}$, $V_I = 21\text{V to } 33\text{V}$ | 17.1 | 18.0 | 18.9 | |
| Regline | Line Regulation ⁽¹⁵⁾ | $T_J = +25^{\circ}\text{C}$ $V_I = 21\text{V to } 33\text{V}$ | — | 15.0 | 360 | mV |
| | | | — | 5.0 | 180 | |
| Regload | Load Regulation ⁽¹⁵⁾ | $T_J = +25^{\circ}\text{C}$ $I_O = 5\text{mA to } 1.5\text{A}$ | — | 15.0 | 360 | mV |
| | | | — | 5.0 | 180 | |
| I_Q | Quiescent Current | $T_J = +25^{\circ}\text{C}$ | — | 5.2 | 8.0 | mA |
| ΔI_Q | Quiescent Current Change | $I_O = 5\text{mA to } 1\text{A}$ | — | — | 0.5 | mA |
| | | $V_I = 21\text{V to } 33\text{V}$ | — | — | 1.0 | |
| $\Delta V_O / \Delta T$ | Output Voltage Drift ⁽¹⁶⁾ | $I_O = 5\text{mA}$ | — | -1.0 | — | mV/ $^{\circ}\text{C}$ |
| V_N | Output Noise Voltage | $f = 10\text{Hz to } 100\text{kHz}$, $T_A = +25^{\circ}\text{C}$ | — | 110 | — | $\mu\text{V}/V_O$ |
| RR | Ripple Rejection ⁽¹⁶⁾ | $f = 120\text{Hz}$, $V_I = 22\text{V to } 32\text{V}$ | 53.0 | 69.0 | — | dB |
| V_{DROP} | Dropout Voltage | $I_O = 1\text{A}$, $T_J = +25^{\circ}\text{C}$ | — | 2.0 | — | V |
| r_O | Output Resistance ⁽¹⁶⁾ | $f = 1\text{kHz}$ | — | 22.0 | — | $\text{m}\Omega$ |
| I_{SC} | Short Circuit Current | $V_I = 35\text{V}$, $T_A = +25^{\circ}\text{C}$ | — | 250 | — | mA |
| I_{PK} | Peak Current ⁽¹⁶⁾ | $T_J = +25^{\circ}\text{C}$ | — | 2.2 | — | A |

Notes:

15. Load and line regulation are specified at constant junction temperature. Changes in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.
16. These parameters, although guaranteed, are not 100% tested in production.

Electrical Characteristics (LM7824) (Continued)

Refer to the test circuits. $-40^{\circ}\text{C} < T_J < 125^{\circ}\text{C}$, $I_O = 500\text{mA}$, $V_I = 33\text{V}$, $C_I = 0.33\mu\text{F}$, $C_O = 0.1\mu\text{F}$, unless otherwise specified.

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|-----------------------|--------------------------------------|---|---------------------------------------|------|-------|------------------------|
| V_O | Output Voltage | $T_J = +25^{\circ}\text{C}$ | 23.0 | 24.0 | 25.0 | V |
| | | $5\text{mA} \leq I_O \leq 1\text{A}$, $P_O \leq 15\text{W}$, $V_I = 27\text{V to } 38\text{V}$ | 22.8 | 24.0 | 25.25 | |
| Regline | Line Regulation ⁽¹⁷⁾ | $T_J = +25^{\circ}\text{C}$ | $V_I = 27\text{V to } 38\text{V}$ | – | 17.0 | mV |
| | | | $V_I = 30\text{V to } 36\text{V}$ | – | 6.0 | |
| Regload | Load Regulation ⁽¹⁷⁾ | $T_J = +25^{\circ}\text{C}$ | $I_O = 5\text{mA to } 1.5\text{A}$ | – | 15.0 | mV |
| | | | $I_O = 250\text{mA to } 750\text{mA}$ | – | 5.0 | |
| I_Q | Quiescent Current | $T_J = +25^{\circ}\text{C}$ | – | 5.2 | 8.0 | mA |
| ΔI_Q | Quiescent Current Change | $I_O = 5\text{mA to } 1\text{A}$ | – | 0.1 | 0.5 | mA |
| | | $V_I = 27\text{V to } 38\text{V}$ | – | 0.5 | 1.0 | |
| $\Delta V_O/\Delta T$ | Output Voltage Drift ⁽¹⁸⁾ | $I_O = 5\text{mA}$ | – | -1.5 | – | mV/ $^{\circ}\text{C}$ |
| V_N | Output Noise Voltage | $f = 10\text{Hz to } 100\text{kHz}$, $T_A = +25^{\circ}\text{C}$ | – | 60.0 | – | $\mu\text{V}/V_O$ |
| RR | Ripple Rejection ⁽¹⁸⁾ | $f = 120\text{Hz}$, $V_I = 28\text{V to } 38\text{V}$ | 50.0 | 67.0 | – | dB |
| V_{DROP} | Dropout Voltage | $I_O = 1\text{A}$, $T_J = +25^{\circ}\text{C}$ | – | 2.0 | – | V |
| rO | Output Resistance ⁽¹⁸⁾ | $f = 1\text{kHz}$ | – | 28.0 | – | m Ω |
| I_{SC} | Short Circuit Current | $V_I = 35\text{V}$, $T_A = +25^{\circ}\text{C}$ | – | 230 | – | mA |
| I_{PK} | Peak Current ⁽¹⁸⁾ | $T_J = +25^{\circ}\text{C}$ | – | 2.2 | – | A |

Notes:

17. Load and line regulation are specified at constant junction temperature. Changes in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.
18. These parameters, although guaranteed, are not 100% tested in production.

Electrical Characteristics (LM7805A) (Continued)Refer to the test circuits. $0^{\circ}\text{C} < T_J < 125^{\circ}\text{C}$, $I_O = 1\text{A}$, $V_I = 10\text{V}$, $C_I = 0.33\mu\text{F}$, $C_O = 0.1\mu\text{F}$, unless otherwise specified.

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|-----------------------|--------------------------------------|--|------|------|------|------------------------|
| V_O | Output Voltage | $T_J = +25^{\circ}\text{C}$ | 4.9 | 5.0 | 5.1 | V |
| | | $I_O = 5\text{mA to } 1\text{A}$, $P_O \leq 15\text{W}$, $V_I = 7.5\text{V to } 20\text{V}$ | 4.8 | 5.0 | 5.2 | |
| Regline | Line Regulation ⁽¹⁹⁾ | $V_I = 7.5\text{V to } 25\text{V}$, $I_O = 500\text{mA}$ | — | 5.0 | 50.0 | mV |
| | | $V_I = 8\text{V to } 12\text{V}$ | — | 3.0 | 50.0 | |
| | | $T_J = +25^{\circ}\text{C}$ $V_I = 7.3\text{V to } 20\text{V}$ | — | 5.0 | 50.0 | |
| | | $V_I = 8\text{V to } 12\text{V}$ | — | 1.5 | 25.0 | |
| Regload | Load Regulation ⁽¹⁹⁾ | $T_J = +25^{\circ}\text{C}$, $I_O = 5\text{mA to } 1.5\text{A}$ | — | 9.0 | 100 | mV |
| | | $I_O = 5\text{mA to } 1\text{A}$ | — | 9.0 | 100 | |
| | | $I_O = 250\text{mA to } 750\text{mA}$ | — | 4.0 | 50.0 | |
| I_Q | Quiescent Current | $T_J = +25^{\circ}\text{C}$ | — | 5.0 | 6.0 | mA |
| ΔI_Q | Quiescent Current Change | $I_O = 5\text{mA to } 1\text{A}$ | — | — | 0.5 | mA |
| | | $V_I = 8\text{V to } 25\text{V}$, $I_O = 500\text{mA}$ | — | — | 0.8 | |
| | | $V_I = 7.5\text{V to } 20\text{V}$, $T_J = +25^{\circ}\text{C}$ | — | — | 0.8 | |
| $\Delta V_O/\Delta T$ | Output Voltage Drift ⁽²⁰⁾ | $I_O = 5\text{mA}$ | — | -0.8 | — | mV/ $^{\circ}\text{C}$ |
| V_N | Output Noise Voltage | $f = 10\text{Hz to } 100\text{kHz}$, $T_A = +25^{\circ}\text{C}$ | — | 10.0 | — | $\mu\text{V}/V_O$ |
| RR | Ripple Rejection ⁽²⁰⁾ | $f = 120\text{Hz}$, $I_O = 500\text{mA}$, $V_I = 8\text{V to } 18\text{V}$ | — | 68.0 | — | dB |
| V_{DROP} | Dropout Voltage | $I_O = 1\text{A}$, $T_J = +25^{\circ}\text{C}$ | — | 2.0 | — | V |
| r_O | Output Resistance ⁽²⁰⁾ | $f = 1\text{kHz}$ | — | 17.0 | — | $\text{m}\Omega$ |
| I_{SC} | Short Circuit Current | $V_I = 35\text{V}$, $T_A = +25^{\circ}\text{C}$ | — | 250 | — | mA |
| I_{PK} | Peak Current ⁽²⁰⁾ | $T_J = +25^{\circ}\text{C}$ | — | 2.2 | — | A |

Notes:

19. Load and line regulation are specified at constant junction temperature. Changes in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.

20. These parameters, although guaranteed, are not 100% tested in production.

Electrical Characteristics (LM7806A) (Continued)Refer to the test circuits. $0^{\circ}\text{C} < T_J < 125^{\circ}\text{C}$, $I_O = 1\text{A}$, $V_I = 11\text{V}$, $C_I = 0.33\mu\text{F}$, $C_O = 0.1\mu\text{F}$, unless otherwise specified.

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|-----------------------|--------------------------------------|--|------|------|------|------------------------|
| V_O | Output Voltage | $T_J = +25^{\circ}\text{C}$ | 5.58 | 6.0 | 6.12 | V |
| | | $I_O = 5\text{mA to } 1\text{A}$, $P_O \leq 15\text{W}$, $V_I = 8.6\text{V to } 21\text{V}$ | 5.76 | 6.0 | 6.24 | |
| Regline | Line Regulation ⁽²¹⁾ | $V_I = 8.6\text{V to } 25\text{V}$, $I_O = 500\text{mA}$ | – | 5.0 | 60.0 | mV |
| | | $V_I = 9\text{V to } 13\text{V}$ | – | 3.0 | 60.0 | |
| | | $T_J = +25^{\circ}\text{C}$ $V_I = 8.3\text{V to } 21\text{V}$ | – | 5.0 | 60.0 | |
| | | $V_I = 9\text{V to } 13\text{V}$ | – | 1.5 | 30.0 | |
| Regload | Load Regulation ⁽²¹⁾ | $T_J = +25^{\circ}\text{C}$, $I_O = 5\text{mA to } 1.5\text{A}$ | – | 9.0 | 100 | mV |
| | | $I_O = 5\text{mA to } 1\text{A}$ | – | 9.0 | 100 | |
| | | $I_O = 250\text{mA to } 750\text{mA}$ | – | 5.0 | 50.0 | |
| I_Q | Quiescent Current | $T_J = +25^{\circ}\text{C}$ | – | 4.3 | 6.0 | mA |
| ΔI_Q | Quiescent Current Change | $I_O = 5\text{mA to } 1\text{A}$ | – | – | 0.5 | mA |
| | | $V_I = 19\text{V to } 25\text{V}$, $I_O = 500\text{mA}$ | – | – | 0.8 | |
| | | $V_I = 8.5\text{V to } 21\text{V}$, $T_J = +25^{\circ}\text{C}$ | – | – | 0.8 | |
| $\Delta V_O/\Delta T$ | Output Voltage Drift ⁽²²⁾ | $I_O = 5\text{mA}$ | – | -0.8 | – | mV/ $^{\circ}\text{C}$ |
| V_N | Output Noise Voltage | $f = 10\text{Hz to } 100\text{kHz}$, $T_A = +25^{\circ}\text{C}$ | – | 10.0 | – | $\mu\text{V}/V_O$ |
| RR | Ripple Rejection ⁽²²⁾ | $f = 120\text{Hz}$, $I_O = 500\text{mA}$, $V_I = 9\text{V to } 19\text{V}$ | – | 65.0 | – | dB |
| V_{DROP} | Dropout Voltage | $I_O = 1\text{A}$, $T_J = +25^{\circ}\text{C}$ | – | 2.0 | – | V |
| r_O | Output Resistance ⁽²²⁾ | $f = 1\text{kHz}$ | – | 17.0 | – | m Ω |
| I_{SC} | Short Circuit Current | $V_I = 35\text{V}$, $T_A = +25^{\circ}\text{C}$ | – | 250 | – | mA |
| I_{PK} | Peak Current ⁽²²⁾ | $T_J = +25^{\circ}\text{C}$ | – | 2.2 | – | A |

Notes:

21. Load and line regulation are specified at constant junction temperature. Changes in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.

22. These parameters, although guaranteed, are not 100% tested in production.

Electrical Characteristics (LM7808A) (Continued)Refer to the test circuits. $0^{\circ}\text{C} < T_J < 125^{\circ}\text{C}$, $I_O = 1\text{A}$, $V_I = 14\text{V}$, $C_I = 0.33\mu\text{F}$, $C_O = 0.1\mu\text{F}$, unless otherwise specified.

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|-----------------------|--------------------------------------|---|------|------|------|------------------------|
| V_O | Output Voltage | $T_J = +25^{\circ}\text{C}$ | 7.84 | 8.0 | 8.16 | V |
| | | $I_O = 5\text{mA to } 1\text{A}$, $P_O \leq 15\text{W}$, $V_I = 10.6\text{V to } 23\text{V}$ | 7.7 | 8.0 | 8.3 | |
| Regline | Line Regulation ⁽²³⁾ | $V_I = 10.6\text{V to } 25\text{V}$, $I_O = 500\text{mA}$ | — | 6.0 | 80.0 | mV |
| | | $V_I = 11\text{V to } 17\text{V}$ | — | 3.0 | 80.0 | |
| | | $T_J = +25^{\circ}\text{C}$ $V_I = 10.4\text{V to } 23\text{V}$ | — | 6.0 | 80.0 | |
| | | $V_I = 11\text{V to } 17\text{V}$ | — | 2.0 | 40.0 | |
| Regload | Load Regulation ⁽²³⁾ | $T_J = +25^{\circ}\text{C}$, $I_O = 5\text{mA to } 1.5\text{A}$ | — | 12.0 | 100 | mV |
| | | $I_O = 5\text{mA to } 1\text{A}$ | — | 12.0 | 100 | |
| | | $I_O = 250\text{mA to } 750\text{mA}$ | — | 5.0 | 50.0 | |
| I_Q | Quiescent Current | $T_J = +25^{\circ}\text{C}$ | — | 5.0 | 6.0 | mA |
| ΔI_Q | Quiescent Current Change | $I_O = 5\text{mA to } 1\text{A}$ | — | — | 0.5 | mA |
| | | $V_I = 11\text{V to } 25\text{V}$, $I_O = 500\text{mA}$ | — | — | 0.8 | |
| | | $V_I = 10.6\text{V to } 23\text{V}$, $T_J = +25^{\circ}\text{C}$ | — | — | 0.8 | |
| $\Delta V_O/\Delta T$ | Output Voltage Drift ⁽²⁴⁾ | $I_O = 5\text{mA}$ | — | -0.8 | — | mV/ $^{\circ}\text{C}$ |
| V_N | Output Noise Voltage | $f = 10\text{Hz to } 100\text{kHz}$, $T_A = +25^{\circ}\text{C}$ | — | 10.0 | — | $\mu\text{V}/V_O$ |
| RR | Ripple Rejection ⁽²⁴⁾ | $f = 120\text{Hz}$, $I_O = 500\text{mA}$, $V_I = 11.5\text{V to } 21.5\text{V}$ | — | 62.0 | — | dB |
| V_{DROP} | Dropout Voltage | $I_O = 1\text{A}$, $T_J = +25^{\circ}\text{C}$ | — | 2.0 | — | V |
| r_O | Output Resistance ⁽²⁴⁾ | $f = 1\text{kHz}$ | — | 18.0 | — | $\text{m}\Omega$ |
| I_{SC} | Short Circuit Current | $V_I = 35\text{V}$, $T_A = +25^{\circ}\text{C}$ | — | 250 | — | mA |
| I_{PK} | Peak Current ⁽²⁴⁾ | $T_J = +25^{\circ}\text{C}$ | — | 2.2 | — | A |

Notes:

23. Load and line regulation are specified at constant junction temperature. Changes in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.

24. These parameters, although guaranteed, are not 100% tested in production.

Electrical Characteristics (LM7809A) (Continued)Refer to the test circuits. $0^{\circ}\text{C} < T_J < 125^{\circ}\text{C}$, $I_O = 1\text{A}$, $V_I = 15\text{V}$, $C_I = 0.33\mu\text{F}$, $C_O = 0.1\mu\text{F}$, unless otherwise specified.

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Units |
|-------------------------|--------------------------------------|---|------|------|------|------------------------|
| V_O | Output Voltage | $T_J = +25^{\circ}\text{C}$ | 8.82 | 9.0 | 9.16 | V |
| | | $I_O = 5\text{mA to } 1\text{A}$, $P_O \leq 15\text{W}$, $V_I = 11.2\text{V to } 24\text{V}$ | 8.65 | 9.0 | 9.35 | |
| Regline | Line Regulation ⁽²⁵⁾ | $V_I = 11.7\text{V to } 25\text{V}$, $I_O = 500\text{mA}$ | – | 6.0 | 90.0 | mV |
| | | $V_I = 12.5\text{V to } 19\text{V}$ | – | 4.0 | 45.0 | |
| | | $T_J = +25^{\circ}\text{C}$ $V_I = 11.5\text{V to } 24\text{V}$ | – | 6.0 | 90.0 | |
| | | $V_I = 12.5\text{V to } 19\text{V}$ | – | 2.0 | 45.0 | |
| Regload | Load Regulation ⁽²⁵⁾ | $T_J = +25^{\circ}\text{C}$, $I_O = 5\text{mA to } 1.5\text{A}$ | – | 12.0 | 100 | mV |
| | | $I_O = 5\text{mA to } 1\text{A}$ | – | 12.0 | 100 | |
| | | $I_O = 250\text{mA to } 750\text{mA}$ | – | 5.0 | 50.0 | |
| I_Q | Quiescent Current | $T_J = +25^{\circ}\text{C}$ | – | 5.0 | 6.0 | mA |
| ΔI_Q | Quiescent Current Change | $I_O = 5\text{mA to } 1\text{A}$ | – | – | 0.5 | mA |
| | | $V_I = 12\text{V to } 25\text{V}$, $I_O = 500\text{mA}$ | – | – | 0.8 | |
| | | $V_I = 11.7\text{V to } 25\text{V}$, $T_J = +25^{\circ}\text{C}$ | – | – | 0.8 | |
| $\Delta V_O / \Delta T$ | Output Voltage Drift ⁽²⁶⁾ | $I_O = 5\text{mA}$ | – | -1.0 | – | mV/ $^{\circ}\text{C}$ |
| V_N | Output Noise Voltage | $f = 10\text{Hz to } 100\text{kHz}$, $T_A = +25^{\circ}\text{C}$ | – | 10.0 | – | $\mu\text{V}/V_O$ |
| RR | Ripple Rejection ⁽²⁶⁾ | $f = 120\text{Hz}$, $I_O = 500\text{mA}$, $V_I = 12\text{V to } 22\text{V}$ | – | 62.0 | – | dB |
| V_{DROP} | Dropout Voltage | $I_O = 1\text{A}$, $T_J = +25^{\circ}\text{C}$ | – | 2.0 | – | V |
| r_O | Output Resistance ⁽²⁶⁾ | $f = 1\text{kHz}$ | – | 17.0 | – | $\text{m}\Omega$ |
| I_{SC} | Short Circuit Current | $V_I = 35\text{V}$, $T_A = +25^{\circ}\text{C}$ | – | 250 | – | mA |
| I_{PK} | Peak Current ⁽²⁶⁾ | $T_J = +25^{\circ}\text{C}$ | – | 2.2 | – | A |

Notes:25. Load and line regulation are specified at constant junction temperature. Changes in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.

26. These parameters, although guaranteed, are not 100% tested in production.

Refer to the test circuits. $0^{\circ}\text{C} < T_J < 125^{\circ}\text{C}$, $I_O = 1\text{A}$, $V_I = 16\text{V}$, $C_I = 0.33\mu\text{F}$, $C_O = 0.1\mu\text{F}$, unless otherwise specified.

Electrical Characteristics (LM7812A) (Continued)Refer to the test circuits. $0^{\circ}\text{C} < T_J < 125^{\circ}\text{C}$, $I_O = 1\text{A}$, $V_I = 19\text{V}$, $C_I = 0.33\mu\text{F}$, $C_O = 0.1\mu\text{F}$, unless otherwise specified.

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Units |
|-------------------------|--------------------------------------|---|-------|------|-------|------------------------|
| V_O | Output Voltage | $T_J = +25^{\circ}\text{C}$ | 11.75 | 12.0 | 12.25 | V |
| | | $I_O = 5\text{mA to } 1\text{A}$, $P_O \leq 15\text{W}$, $V_I = 14.8\text{V to } 27\text{V}$ | 11.5 | 12.0 | 12.5 | |
| Regline | Line Regulation ⁽²⁹⁾ | $V_I = 14.8\text{V to } 30\text{V}$, $I_O = 500\text{mA}$ | – | 10.0 | 120 | mV |
| | | $V_I = 16\text{V to } 22\text{V}$ | – | 4.0 | 120 | |
| | | $T_J = +25^{\circ}\text{C}$ $V_I = 14.5\text{V to } 27\text{V}$ | – | 10.0 | 120 | |
| | | $V_I = 16\text{V to } 22\text{V}$ | – | 3.0 | 60.0 | |
| Regload | Load Regulation ⁽²⁹⁾ | $T_J = +25^{\circ}\text{C}$, $I_O = 5\text{mA to } 1.5\text{A}$ | – | 12.0 | 100 | mV |
| | | $I_O = 5\text{mA to } 1\text{A}$ | – | 12.0 | 100 | |
| | | $I_O = 250\text{mA to } 750\text{mA}$ | – | 5.0 | 50.0 | |
| I_Q | Quiescent Current | $T_J = +25^{\circ}\text{C}$ | – | 5.1 | 6.0 | mA |
| ΔI_Q | Quiescent Current Change | $I_O = 5\text{mA to } 1\text{A}$ | – | – | 0.5 | mA |
| | | $V_I = 14\text{V to } 27\text{V}$, $I_O = 500\text{mA}$ | – | – | 0.8 | |
| | | $V_I = 15\text{V to } 30\text{V}$, $T_J = +25^{\circ}\text{C}$ | – | – | 0.8 | |
| $\Delta V_O / \Delta T$ | Output Voltage Drift ⁽³⁰⁾ | $I_O = 5\text{mA}$ | – | -1.0 | – | mV/ $^{\circ}\text{C}$ |
| V_N | Output Noise Voltage | $f = 10\text{Hz to } 100\text{kHz}$, $T_A = +25^{\circ}\text{C}$ | – | 10.0 | – | $\mu\text{V}/V_O$ |
| RR | Ripple Rejection ⁽³⁰⁾ | $f = 120\text{Hz}$, $I_O = 500\text{mA}$, $V_I = 14\text{V to } 24\text{V}$ | – | 60.0 | – | dB |
| V_{DROP} | Dropout Voltage | $I_O = 1\text{A}$, $T_J = +25^{\circ}\text{C}$ | – | 2.0 | – | V |
| r_O | Output Resistance ⁽³⁰⁾ | $f = 1\text{kHz}$ | – | 18.0 | – | $\text{m}\Omega$ |
| I_{SC} | Short Circuit Current | $V_I = 35\text{V}$, $T_A = +25^{\circ}\text{C}$ | – | 250 | – | mA |
| I_{PK} | Peak Current ⁽³⁰⁾ | $T_J = +25^{\circ}\text{C}$ | – | 2.2 | – | A |

Note:

29. Load and line regulation are specified at constant junction temperature. Changes in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.

30. These parameters, although guaranteed, are not 100% tested in production.

Electrical Characteristics (LM7815A) (Continued)Refer to the test circuits. $0^{\circ}\text{C} < T_J < 125^{\circ}\text{C}$, $I_O = 1\text{A}$, $V_I = 23\text{V}$, $C_I = 0.33\mu\text{F}$, $C_O = 0.1\mu\text{F}$, unless otherwise specified.

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Units |
|-------------------------|--------------------------------------|---|-------|------|------|------------------------|
| V_O | Output Voltage | $T_J = +25^{\circ}\text{C}$ | 14.75 | 15.0 | 15.3 | V |
| | | $I_O = 5\text{mA to } 1\text{A}$, $P_O \leq 15\text{W}$, $V_I = 17.7\text{V to } 30\text{V}$ | 14.4 | 15.0 | 15.6 | |
| Regline | Line Regulation ⁽³¹⁾ | $V_I = 17.4\text{V to } 30\text{V}$, $I_O = 500\text{mA}$ | — | 10.0 | 150 | mV |
| | | $V_I = 20\text{V to } 26\text{V}$ | — | 5.0 | 150 | |
| | | $T_J = +25^{\circ}\text{C}$ $V_I = 17.5\text{V to } 30\text{V}$ | — | 11.0 | 150 | |
| | | $V_I = 20\text{V to } 26\text{V}$ | — | 3.0 | 75.0 | |
| Regload | Load Regulation ⁽³¹⁾ | $T_J = +25^{\circ}\text{C}$, $I_O = 5\text{mA to } 1.5\text{A}$ | — | 12.0 | 100 | mV |
| | | $I_O = 5\text{mA to } 1\text{A}$ | — | 12.0 | 100 | |
| | | $I_O = 250\text{mA to } 750\text{mA}$ | — | 5.0 | 50.0 | |
| I_Q | Quiescent Current | $T_J = +25^{\circ}\text{C}$ | — | 5.2 | 6.0 | mA |
| ΔI_Q | Quiescent Current Change | $I_O = 5\text{mA to } 1\text{A}$ | — | — | 0.5 | mA |
| | | $V_I = 17.5\text{V to } 30\text{V}$, $I_O = 500\text{mA}$ | — | — | 0.8 | |
| | | $V_I = 17.5\text{V to } 30\text{V}$, $T_J = +25^{\circ}\text{C}$ | — | — | 0.8 | |
| $\Delta V_O / \Delta T$ | Output Voltage Drift ⁽³²⁾ | $I_O = 5\text{mA}$ | — | -1.0 | — | mV/ $^{\circ}\text{C}$ |
| V_N | Output Noise Voltage | $f = 10\text{Hz to } 100\text{kHz}$, $T_A = +25^{\circ}\text{C}$ | — | 10.0 | — | $\mu\text{V}/V_O$ |
| RR | Ripple Rejection ⁽³²⁾ | $f = 120\text{Hz}$, $I_O = 500\text{mA}$, $V_I = 18.5\text{V to } 28.5\text{V}$ | — | 58.0 | — | dB |
| V_{DROP} | Dropout Voltage | $I_O = 1\text{A}$, $T_J = +25^{\circ}\text{C}$ | — | 2.0 | — | V |
| r_O | Output Resistance ⁽³²⁾ | $f = 1\text{kHz}$ | — | 19.0 | — | $\text{m}\Omega$ |
| I_{SC} | Short Circuit Current | $V_I = 35\text{V}$, $T_A = +25^{\circ}\text{C}$ | — | 250 | — | mA |
| I_{PK} | Peak Current ⁽³²⁾ | $T_J = +25^{\circ}\text{C}$ | — | 2.2 | — | A |

Notes:

31. Load and line regulation are specified at constant junction temperature. Changes in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.

32. These parameters, although guaranteed, are not 100% tested in production.

Electrical Characteristics (LM7818A) (Continued)Refer to the test circuits. $0^{\circ}\text{C} < T_J < 125^{\circ}\text{C}$, $I_O = 1\text{A}$, $V_I = 27\text{V}$, $C_I = 0.33\mu\text{F}$, $C_O = 0.1\mu\text{F}$, unless otherwise specified.

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Units |
|-------------------------|--------------------------------------|---|-------|------|-------|------------------------|
| V_O | Output Voltage | $T_J = +25^{\circ}\text{C}$ | 17.64 | 18.0 | 18.36 | V |
| | | $I_O = 5\text{mA to } 1\text{A}$, $P_O \leq 15\text{W}$, $V_I = 21\text{V to } 33\text{V}$ | 17.3 | 18.0 | 18.7 | |
| Regline | Line Regulation ⁽³³⁾ | $V_I = 21\text{V to } 33\text{V}$, $I_O = 500\text{mA}$ | — | 15.0 | 180 | mV |
| | | $V_I = 21\text{V to } 33\text{V}$ | — | 5.0 | 180 | |
| | | $T_J = +25^{\circ}\text{C}$ $V_I = 20.6\text{V to } 33\text{V}$ | — | 15.0 | 180 | |
| | | $V_I = 24\text{V to } 30\text{V}$ | — | 5.0 | 90.0 | |
| Regload | Load Regulation ⁽³³⁾ | $T_J = +25^{\circ}\text{C}$, $I_O = 5\text{mA to } 1.5\text{A}$ | — | 15.0 | 100 | mV |
| | | $I_O = 5\text{mA to } 1\text{A}$ | — | 15.0 | 100 | |
| | | $I_O = 250\text{mA to } 750\text{mA}$ | — | 7.0 | 50.0 | |
| I_Q | Quiescent Current | $T_J = +25^{\circ}\text{C}$ | — | 5.2 | 6.0 | mA |
| ΔI_Q | Quiescent Current Change | $I_O = 5\text{mA to } 1\text{A}$ | — | — | 0.5 | mA |
| | | $V_I = 12\text{V to } 33\text{V}$, $I_O = 500\text{mA}$ | — | — | 0.8 | |
| | | $V_I = 12\text{V to } 33\text{V}$, $T_J = +25^{\circ}\text{C}$ | — | — | 0.8 | |
| $\Delta V_O / \Delta T$ | Output Voltage Drift ⁽³⁴⁾ | $I_O = 5\text{mA}$ | — | -1.0 | — | mV/ $^{\circ}\text{C}$ |
| V_N | Output Noise Voltage | $f = 10\text{Hz to } 100\text{kHz}$, $T_A = +25^{\circ}\text{C}$ | — | 10.0 | — | $\mu\text{V}/V_O$ |
| RR | Ripple Rejection ⁽³⁴⁾ | $f = 120\text{Hz}$, $I_O = 500\text{mA}$, $V_I = 22\text{V to } 32\text{V}$ | — | 57.0 | — | dB |
| V_{DROP} | Dropout Voltage | $I_O = 1\text{A}$, $T_J = +25^{\circ}\text{C}$ | — | 2.0 | — | V |
| r_O | Output Resistance ⁽³⁴⁾ | $f = 1\text{kHz}$ | — | 19.0 | — | $\text{m}\Omega$ |
| I_{SC} | Short Circuit Current | $V_I = 35\text{V}$, $T_A = +25^{\circ}\text{C}$ | — | 250 | — | mA |
| I_{PK} | Peak Current ⁽³⁴⁾ | $T_J = +25^{\circ}\text{C}$ | — | 2.2 | — | A |

Notes:

33. Load and line regulation are specified at constant junction temperature. Changes in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.

34. These parameters, although guaranteed, are not 100% tested in production.

Electrical Characteristics (LM7824A) (Continued)Refer to the test circuits. $0^{\circ}\text{C} < T_J < 125^{\circ}\text{C}$, $I_O = 1\text{A}$, $V_I = 33\text{V}$, $C_I = 0.33\mu\text{F}$, $C_O = 0.1\mu\text{F}$, unless otherwise specified.

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Units |
|-------------------------|--------------------------------------|---|------|------|------|------------------------|
| V_O | Output Voltage | $T_J = +25^{\circ}\text{C}$ | 23.5 | 24.0 | 24.5 | V |
| | | $I_O = 5\text{mA to } 1\text{A}$, $P_O \leq 15\text{W}$, $V_I = 27.3\text{V to } 38\text{V}$ | 23.0 | 24.0 | 25.0 | |
| Regline | Line Regulation ⁽³⁵⁾ | $V_I = 27\text{V to } 38\text{V}$, $I_O = 500\text{mA}$ | – | 18.0 | 240 | mV |
| | | $V_I = 21\text{V to } 33\text{V}$ | – | 6.0 | 240 | |
| | | $T_J = +25^{\circ}\text{C}$ $V_I = 26.7\text{V to } 38\text{V}$ | – | 18.0 | 240 | |
| | | $V_I = 30\text{V to } 36\text{V}$ | – | 6.0 | 120 | |
| Regload | Load Regulation ⁽³⁵⁾ | $T_J = +25^{\circ}\text{C}$, $I_O = 5\text{mA to } 1.5\text{A}$ | – | 15.0 | 100 | mV |
| | | $I_O = 5\text{mA to } 1\text{A}$ | – | 15.0 | 100 | |
| | | $I_O = 250\text{mA to } 750\text{mA}$ | – | 7.0 | 50.0 | |
| I_Q | Quiescent Current | $T_J = +25^{\circ}\text{C}$ | – | 5.2 | 6.0 | mA |
| ΔI_Q | Quiescent Current Change | $I_O = 5\text{mA to } 1\text{A}$ | – | – | 0.5 | mA |
| | | $V_I = 27.3\text{V to } 38\text{V}$, $I_O = 500\text{mA}$ | – | – | 0.8 | |
| | | $V_I = 27.3\text{V to } 38\text{V}$, $T_J = +25^{\circ}\text{C}$ | – | – | 0.8 | |
| $\Delta V_O / \Delta T$ | Output Voltage Drift ⁽³⁶⁾ | $I_O = 5\text{mA}$ | – | -1.5 | – | mV/ $^{\circ}\text{C}$ |
| V_N | Output Noise Voltage | $f = 10\text{Hz to } 100\text{kHz}$, $T_A = +25^{\circ}\text{C}$ | – | 10.0 | – | $\mu\text{V}/V_O$ |
| RR | Ripple Rejection ⁽³⁶⁾ | $f = 120\text{Hz}$, $I_O = 500\text{mA}$, $V_I = 28\text{V to } 38\text{V}$ | – | 54.0 | – | dB |
| V_{DROP} | Dropout Voltage | $I_O = 1\text{A}$, $T_J = +25^{\circ}\text{C}$ | – | 2.0 | – | V |
| r_O | Output Resistance ⁽³⁶⁾ | $f = 1\text{kHz}$ | – | 20.0 | – | $\text{m}\Omega$ |
| I_{SC} | Short Circuit Current | $V_I = 35\text{V}$, $T_A = +25^{\circ}\text{C}$ | – | 250 | – | mA |
| I_{PK} | Peak Current ⁽³⁶⁾ | $T_J = +25^{\circ}\text{C}$ | – | 2.2 | – | A |

Notes:

35. Load and line regulation are specified at constant junction temperature. Changes in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.

36. These parameters, although guaranteed, are not 100% tested in production.

Typical Performance Characteristics

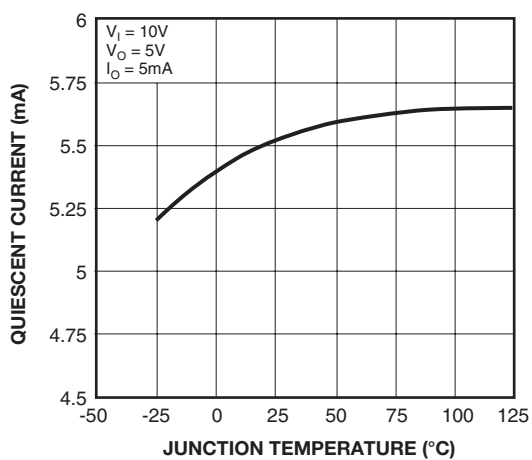


Figure 3. Quiescent Current

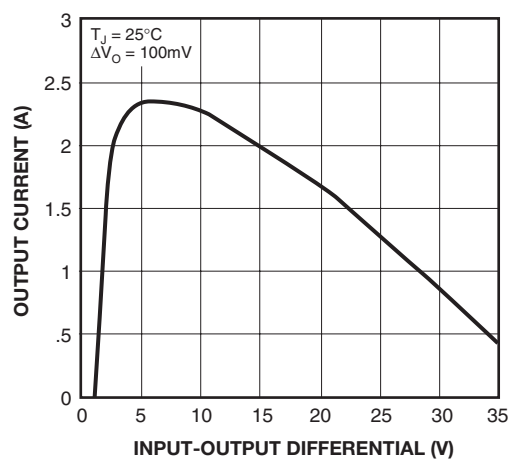


Figure 4. Peak Output Current

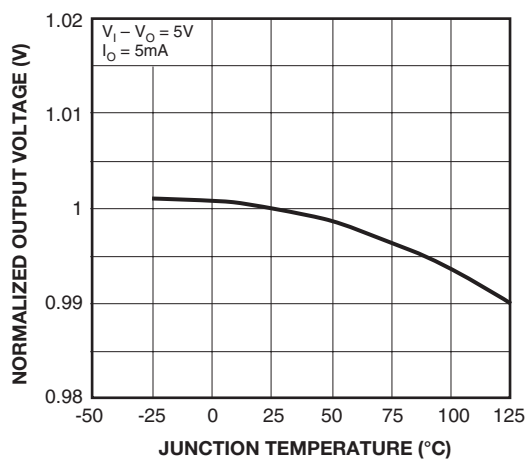


Figure 5. Output Voltage

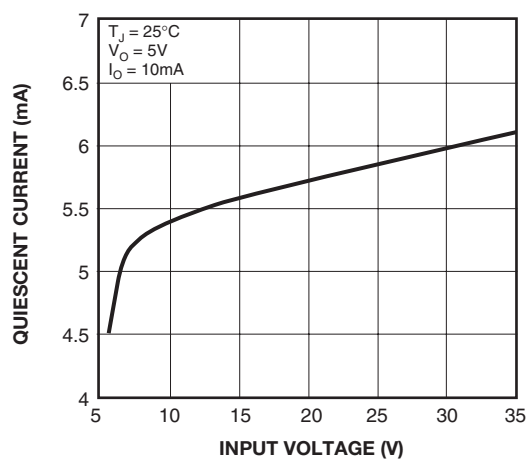


Figure 6. Quiescent Current

Typical Applications

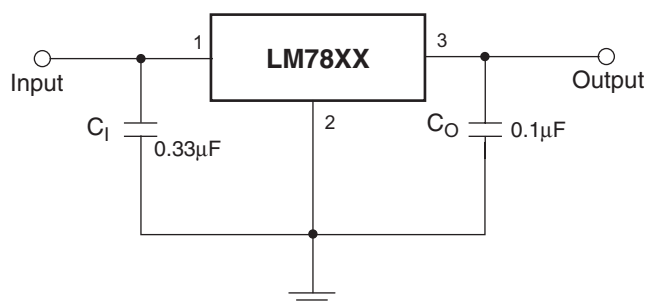


Figure 7. DC Parameters

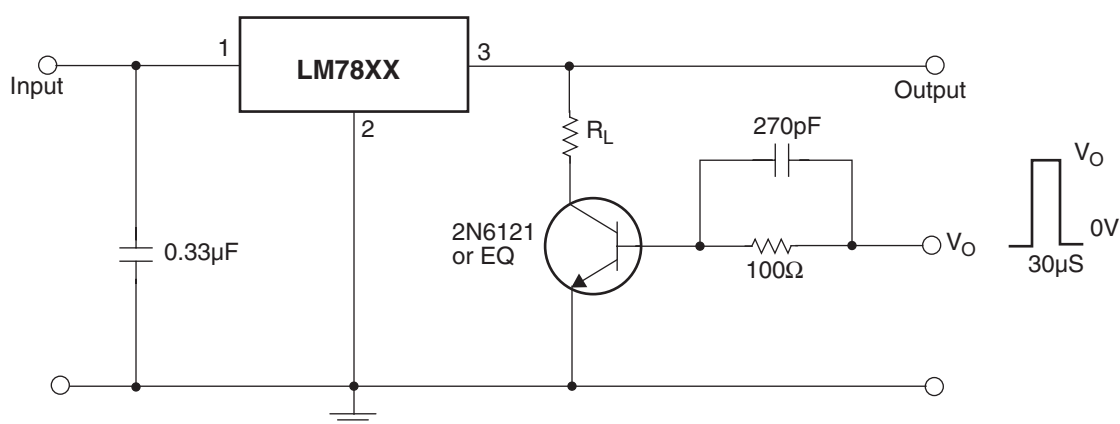


Figure 8. Load Regulation

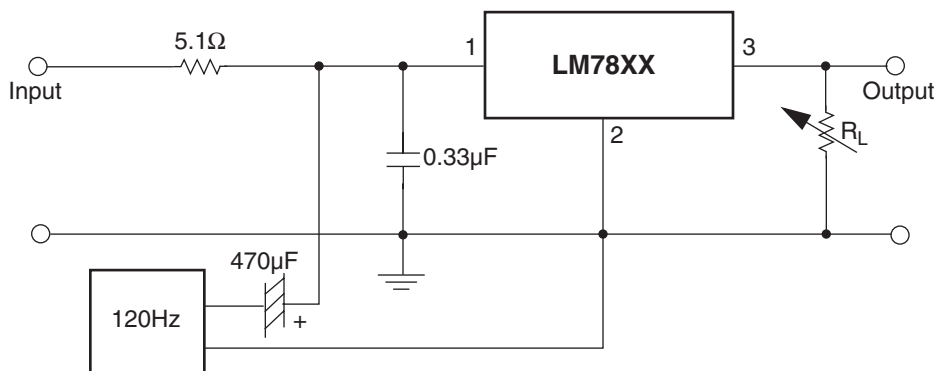


Figure 9. Ripple Rejection

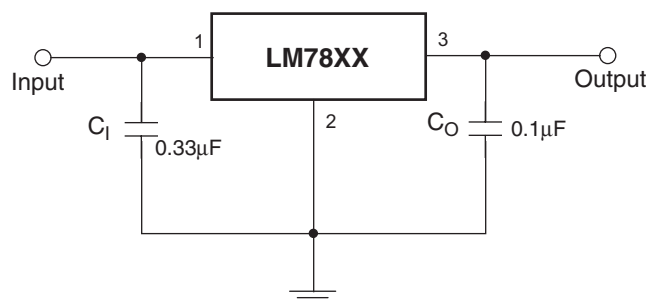
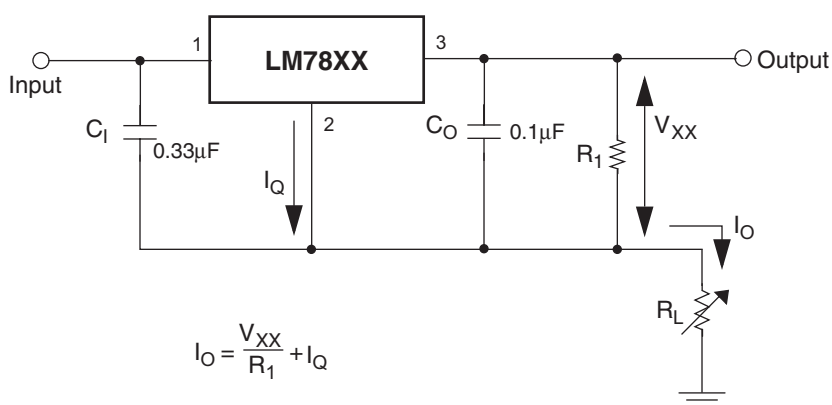


Figure 10. Fixed Output Regulator

**Notes:**

1. To specify an output voltage, substitute voltage value for "XX." A common ground is required between the input and the output voltage. The input voltage must remain typically 2.0V above the output voltage even during the low point on the input ripple voltage.
2. C_1 is required if regulator is located an appreciable distance from power supply filter.
3. C_0 improves stability and transient response.

Figure 11.

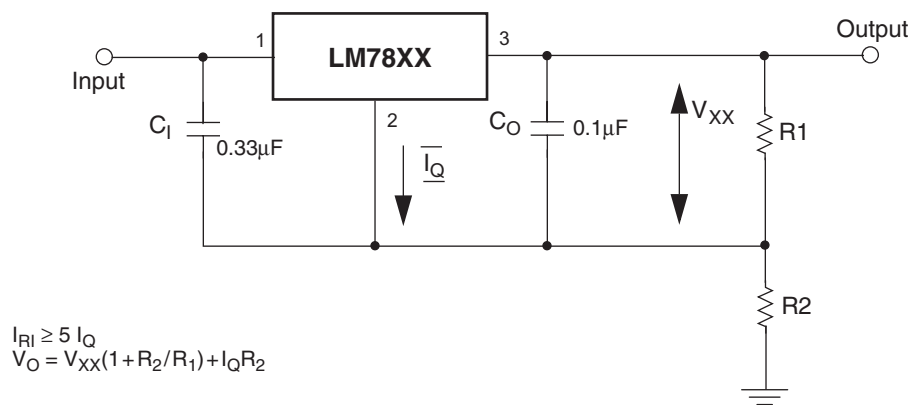


Figure 12. Circuit for Increasing Output Voltage

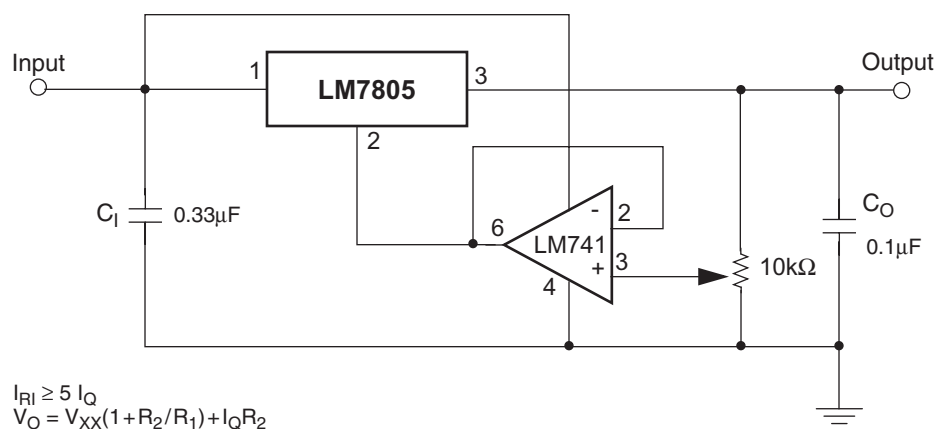


Figure 13. Adjustable Output Regulator (7V to 30V)

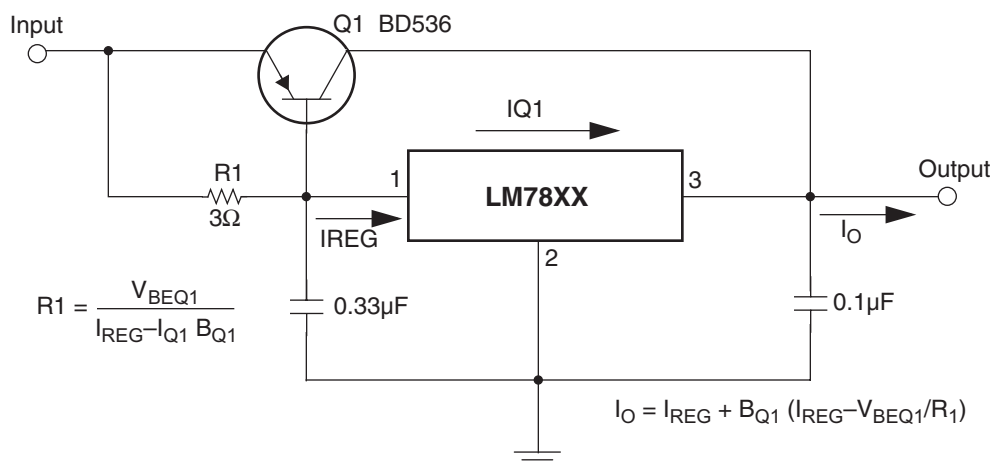


Figure 14. High Current Voltage Regulator

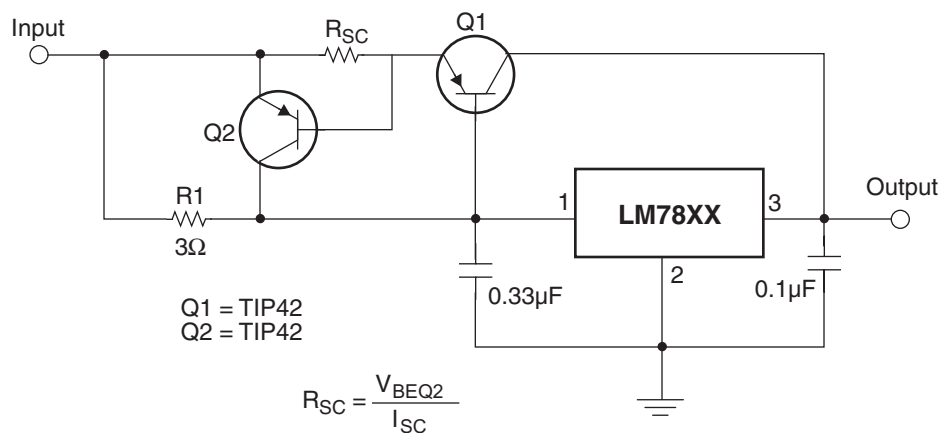


Figure 15. High Output Current with Short Circuit Protection

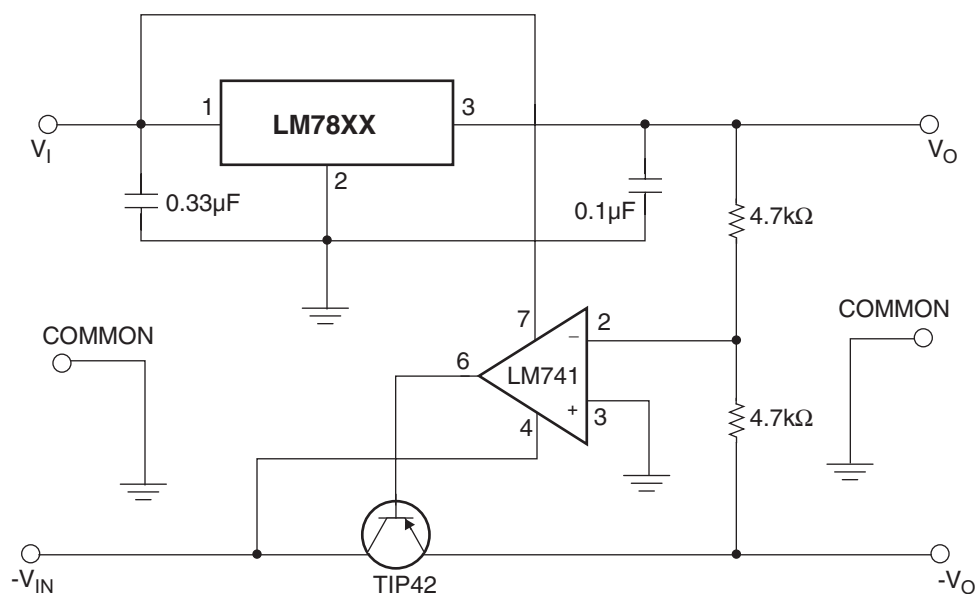


Figure 16. Tracking Voltage Regulator

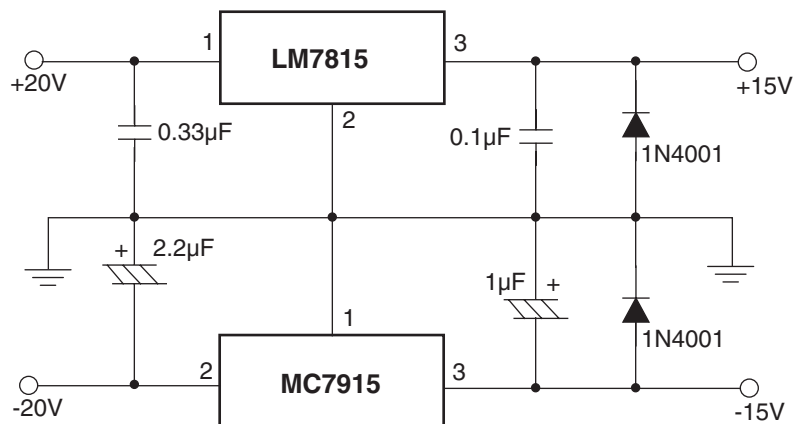


Figure 17. Split Power Supply ($\pm 15\text{V} - 1\text{A}$)

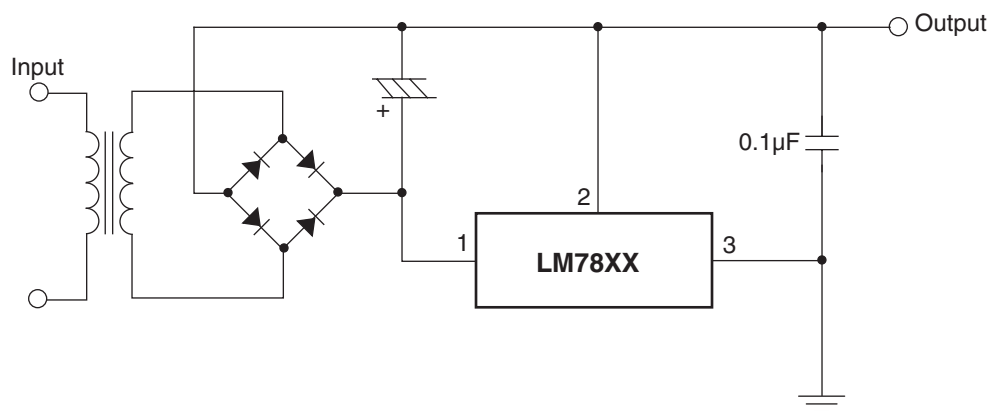


Figure 18. Negative Output Voltage Circuit

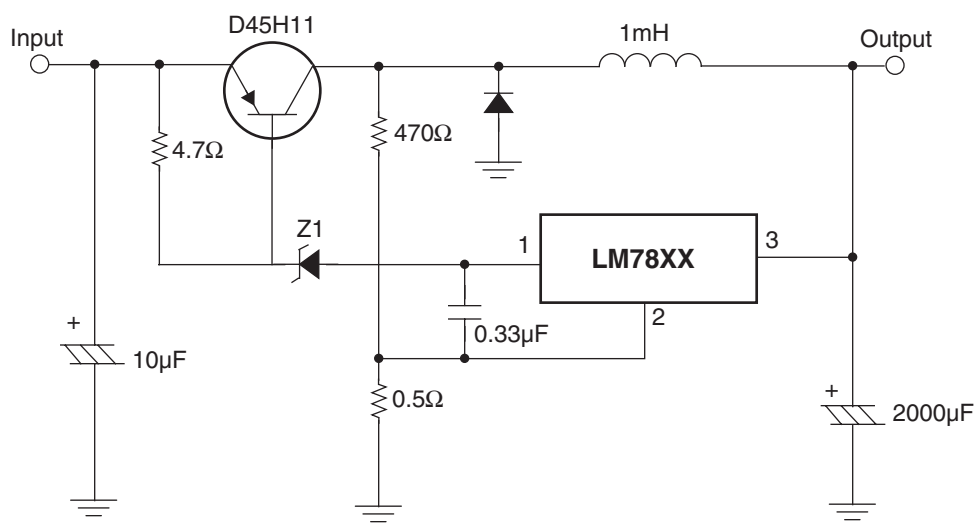
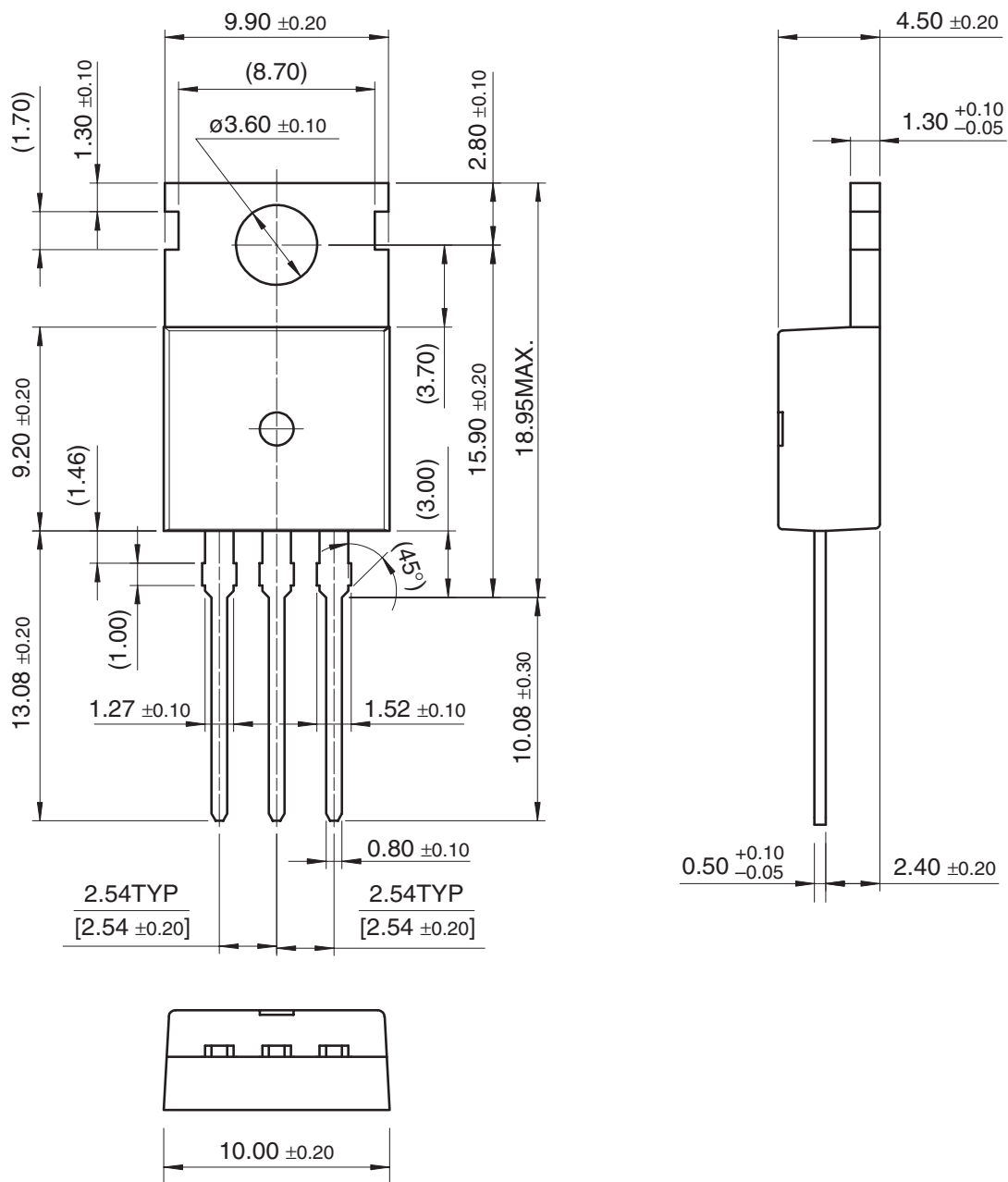


Figure 19. Switching Regulator

Mechanical Dimensions

Dimensions in millimeters

TO-220

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