

# Features

## Regulated Converters

- 2kV, 4kVDC & 6kVDC Isolation
- Industry Standard 3W DIP24 Package
- Feedback Regulated Output
- Continuous Short Circuit Protection
- Wide Input 2:1 & 4:1
- Medical Approvals (4kV/6kV Versions)
- EN and UL Certificates
- 3 Pinout Options, 3 Case Styles
- Control Pin Option
- Efficiency to 86%

### Description

Besides the standard isolation of 2kVDC, this series offers options of 4kVDC (= "/H4") or 6kVDC (= "/H6") making it suitable for medical applications and other sophisticated industrial applications. Packaging can be either DIP-24 plastic or 5-side-shielded DIP24 metal case (= option "/M") as well as SMD pinning (= option "/SMD"). For all the above variants, 2 industry-standard pinouts (= option "/A" or "/C") are available, and B pinning is available with 1.6kVDC isolation. Remote on/off control is possible with the /CTRL option (A pinning only)

### Selection Guide

| Part Number<br>DIP24 (SMD) | Input Voltage (VDC)               | Output Voltage (VDC) | Output Current (mA) | Efficiency (%) | Max. Cap. Load |
|----------------------------|-----------------------------------|----------------------|---------------------|----------------|----------------|
| REC3-xx3.3SRW/H*           | 4.5 - 9, 9 - 18, 18 - 36, 36 - 72 | 3.3                  | 900                 | 66-76          | 2200µF         |
| REC3-xx05SRW/H*            | 4.5 - 9, 9 - 18, 18 - 36, 36 - 72 | 5                    | 600                 | 71-79          | 1000µF         |
| REC3-xx09SRW/H*            | 4.5 - 9, 9 - 18, 18 - 36, 36 - 72 | 9                    | 330                 | 74-83          | 470µF          |
| REC3-xx12SRW/H*            | 4.5 - 9, 9 - 18, 18 - 36, 36 - 72 | 12                   | 250                 | 75-85          | 220µF          |
| REC3-xx15SRW/H*            | 4.5 - 9, 9 - 18, 18 - 36, 36 - 72 | 15                   | 200                 | 75-86          | 120µF          |
| REC3-xx05DRW/H*            | 4.5 - 9, 9 - 18, 18 - 36, 36 - 72 | ±5                   | ±300                | 74-83          | ±470µF         |
| REC3-xx12DRW/H*            | 4.5 - 9, 9 - 18, 18 - 36, 36 - 72 | ±12                  | ±125                | 75-85          | ±100µF         |
| REC3-xx15DRW/H*            | 4.5 - 9, 9 - 18, 18 - 36, 36 - 72 | ±15                  | ±100                | 75-86          | ±68µF          |
| REC3-xx3.3SRWZ/H*          | 9 - 36, 18 - 72                   | 3.3                  | 900                 | 77-79          | 2200µF         |
| REC3-xx05SRWZ/H*           | 9 - 36, 18 - 72                   | 5                    | 600                 | 78-80          | 1000µF         |
| REC3-xx09SRWZ/H*           | 9 - 36, 18 - 72                   | 9                    | 330                 | 80-83          | 470µF          |
| REC3-xx12SRWZ/H*           | 9 - 36, 18 - 72                   | 12                   | 250                 | 83-85          | 220µF          |
| REC3-xx15SRWZ/H*           | 9 - 36, 18 - 72                   | 15                   | 200                 | 83-85          | 120µF          |
| REC3-xx05DRWZ/H*           | 9 - 36, 18 - 72                   | ±5                   | ±300                | 77-80          | ±470µF         |
| REC3-xx12DRWZ/H*           | 9 - 36, 18 - 72                   | ±12                  | ±125                | 83-85          | ±100µF         |
| REC3-xx15DRWZ/H*           | 9 - 36, 18 - 72                   | ±15                  | ±100                | 83-85          | ±68µF          |

H\* = H2, H4 or H6 for A or C pinning options with 2kVDC, 4kVDC or 6kVDC isolation.

H\* = H for B pinning option with 1.6kVDC isolation only.

#### 2:1 Input

(REC3-S/DRWH4/H6)  
xx = 4.5-9Vin = 05  
xx = 9-18Vin = 12  
xx = 18-36Vin = 24  
xx = 36-72Vin = 48

#### 4:1 Input

(REC3-S/DRWZ(H4/H6))  
xx = 9-36Vin = 24  
xx = 18-72Vin = 48

\* add suffix "/A", "/B" or "/C" for pinning options, see next page and Isolation Restrictions.

\* add suffix "/M" for metal case.

\* add suffix "/SMD" for SMD package.

\* add suffix "/CTRL" for control pin option (A Pinning only)

#### Ordering Examples:

REC3-0512DRW/H2/A/CTRL = 2:1 input, 5V Vin, ±12V Vout, 2kVDC, pinout "A", plastic case, control pin  
REC3-4812SRWZ/H4/A/M = 4:1 input, 48V Vin, 12V Vout, 4kVDC, pinout "A", metal case, no control pin  
REC3-1212DRWZ/H/B = 4:1 input, 12V Vin, ±12V Vout, 1.6kVDC, pinout "B", plastic case, no control pin  
REC3-0505SRW/H6/C/SMD = 2:1 input, 5V Vin, 5V Vout, 6kVDC, SMD pinout "C", plastic case, no control pin

# ECONOLINE

DC/DC-Converter

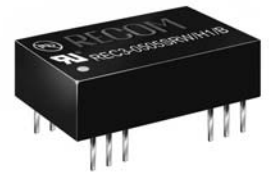
# RECOM

## 3 Watt

## DIP24 & SMD

## Single & Dual

## Output



**ERL**  
E-224736



**EN-60950-1 Certified**  
**UL-60950-1 Certified**  
**EN-60601-1 Certified**

# REC3-H\*

### Isolation Restrictions

"B" Pinning is restricted to 1.6kV isolation due to the closeness of the input and output pins.

If the options "/M" for metal case and "/SMD" for SMD pinout are combined, the maximum allowed isolation voltage is 2kVDC because of the shorter distances between pins and the metal case.

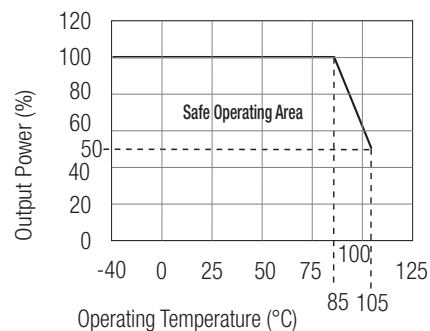
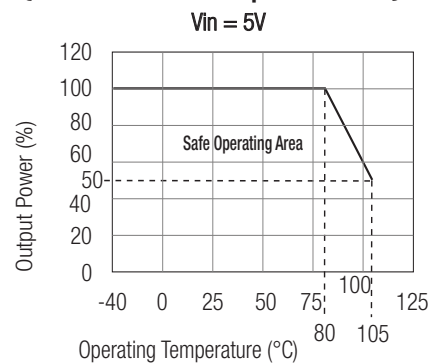
DIP-24 through-hole case and SMD-plastic case are not affected and offer the full isolation barriers of 2kV through to 6kVDC.

Refer to Application Notes

**Specifications** (measured at  $T_A = 25^\circ\text{C}$ , nominal input voltage, full load and after warm-up)

|   |   |  |                              |
|---|---|--|------------------------------|
| Input Voltage Range   | 2:1 & 4:1   |  |                              |
| Output Voltage Accuracy   | $\pm 2\%$ max.  |  |                              |
| Line Regulation (HL-LL)   | $\pm 0.4\%$ max.  |  |                              |
| Load Regulation (for output load current change from 20% to 100%)         | $\pm 0.6\%$ max.  |  |                              |
| Output Ripple and Noise (0,1 $\mu\text{F}$ capacitor on output, 20MHz BW) | 50mVp-p max.  |  |                              |
| Switching Frequency at Full Load and nominal Input Voltage                | 2:1 Input types   | 90kHz min. / 150kHz max.                                 |                              |
|   | 4:1 Input types   | 120kHz min. / 180kHz max.                                |                              |
| Input Filter  | Pi Network  |  |                              |
| Efficiency at Full Load   | see above   |  |                              |
| No Load Power Consumption   | 300mW max.  |  |                              |
| Isolation Voltage   | H2 types  | (tested for 1 second)                                    | 2000VDC min.                 |
| Rated Working Voltage   | (see note)  | (long term isolation)                                    | see Application Notes        |
| Isolation Voltage   | H4 types  | (tested for 1 second)                                    | 4000VDC min.                 |
| Rated Working Voltage   | (see note)  | (long term isolation)                                    | see Application Notes        |
| Isolation Voltage   | H6 types  | (tested for 1 second)                                    | 6000VDC min.                 |
| Rated Working Voltage   | (see note)  | (long term isolation)                                    | see Application Notes        |
| Isolation Capacitance   | 2:1 Input types   | 20pF min. / 60pF max.                                    |                              |
|   | 4:1 Input types   | 40pF min. / 80pF max.                                    |                              |
| Isolation Resistance  | 1 G $\Omega$ min.   |  |                              |
| Short Circuit Protection  | Continuous, Auto Restart                                    |  |                              |
| Operating Temperature Range (free air convection)                         | 5V input types  | -40 $^\circ\text{C}$ to +80 $^\circ\text{C}$ (see Graph) |                              |
|   | others  | -40 $^\circ\text{C}$ to +85 $^\circ\text{C}$ (see Graph) |                              |
| Storage Temperature Range   | -55 $^\circ\text{C}$ to +125 $^\circ\text{C}$               |  |                              |
| Relative Humidity   | 95% RH  |  |                              |
| Case Material   | Non-Conductive Plastic or Metal                             |  |                              |
| Thermal Impedance   | Natural convection  | 20 $^\circ\text{C}/\text{W}$ for plastic case            |                              |
|   |   | 12 $^\circ\text{C}/\text{W}$ for metal case              |                              |
| Package Weight  | 13g   |  |                              |
| MTBF (+25 $^\circ\text{C}$ )  | } Detailed Information see Application Notes chapter "MTBF" | using MIL-HDBK 217F                                      | 1043 x 10 <sup>3</sup> hours |
|   |   | using MIL-HDBK 217F                                      | 186 x 10 <sup>3</sup> hours  |

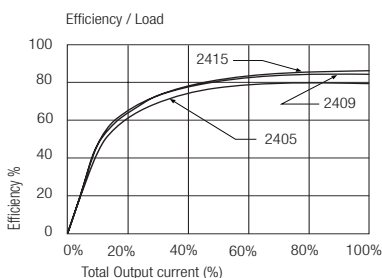
## Derating-Graph (Ambient Temperature)



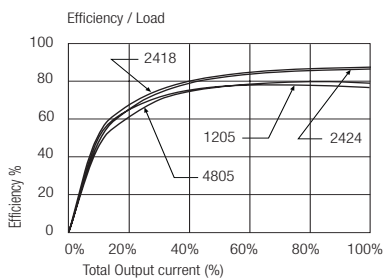
REC3-H\*

## Typical Characteristics

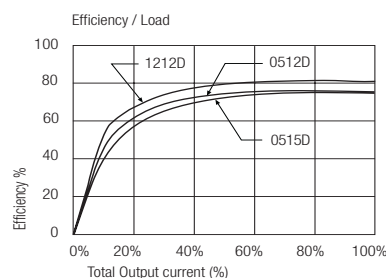
### Single 2:1 Input



### Single 2:1 Input



### Dual 2:1 Input

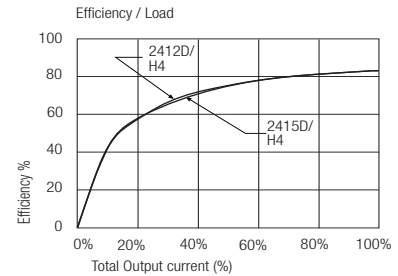
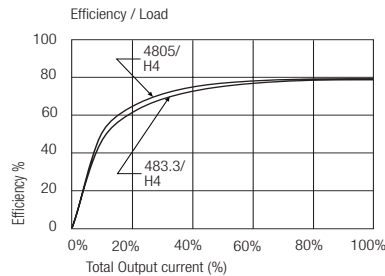
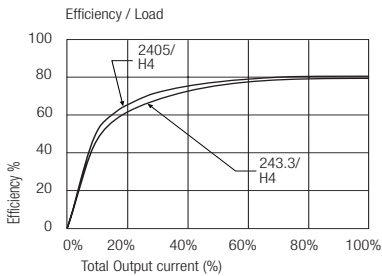


### Typical Characteristics - Continued

## Single 4:1 Input

## Single 4:1 Input

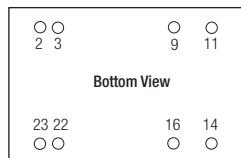
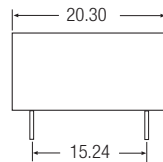
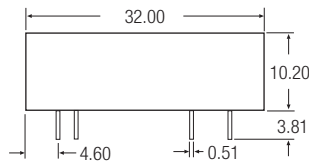
## Dual 4:1 Input



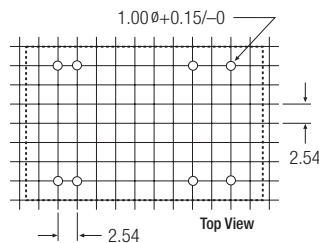
### Package Style and Pinning (mm) DIP 24 , Wide Input 2:1 & 4:1

#### "A" Pinning

/H2, /H4 & /H6

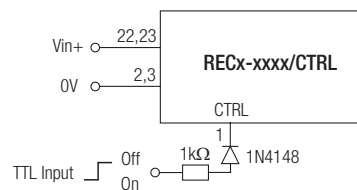


#### Recommended Footprint Details



#### CTRL Option

ON = Open or  $0V < V_{ctrl} < 1.2V$   
OFF =  $2.2V < V_{ctrl} < 12V$



#### Pin Connections

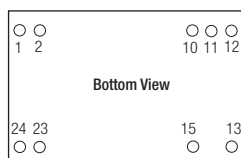
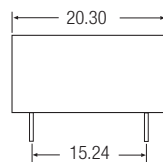
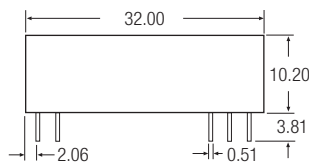
| Pin #      | Single | Dual  |
|------------|--------|-------|
| 1 (option) | CTRL   | CTRL  |
| 2          | -Vin   | -Vin  |
| 3          | -Vin   | -Vin  |
| 9          | NC     | Com   |
| 11         | NC     | -Vout |
| 14         | +Vout  | +Vout |
| 16         | -Vout  | Com   |
| 22         | +Vin   | +Vin  |
| 23         | +Vin   | +Vin  |

NC = No Connection

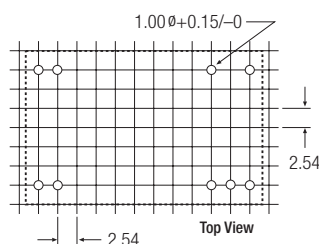
XX.X  $\pm$  0.5 mm  
XX.XX  $\pm$  0.25 mm

#### "C" Pinning

/H2, /H4 & /H6



#### Recommended Footprint Details



#### Pin Connections

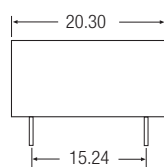
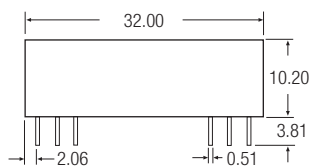
| Pin # | Single | Dual  |
|-------|--------|-------|
| 1     | +Vin   | +Vin  |
| 2     | +Vin   | +Vin  |
| 10    | NC     | Com   |
| 11    | NC     | Com   |
| 12    | -Vout  | NC    |
| 13    | +Vout  | -Vout |
| 15    | NC     | +Vout |
| 23    | -Vin   | -Vin  |
| 24    | -Vin   | -Vin  |

NC = No Connection

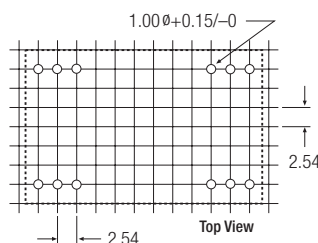
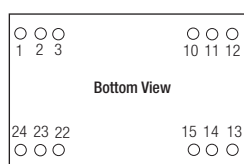
XX.X  $\pm$  0.5 mm  
XX.XX  $\pm$  0.25 mm

Package Style and Pinning (mm) DIP 24 , Wide Input 2:1 & 4:1

**"B" Pinning  
/H (1.6kV Only)**



**Recommended Footprint Details**



**Pin Connections**

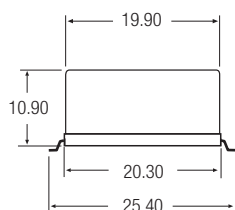
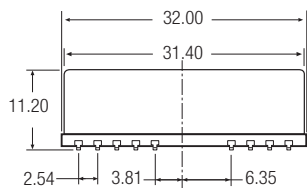
| Pin # | Single | Dual  |
|-------|--------|-------|
| 1     | +Vin   | +Vin  |
| 2     | No Pin | -Vout |
| 3     | No Pin | Com   |
| 10    | -Vout  | Com   |
| 11    | +Vout  | +Vout |
| 12    | -Vin   | -Vin  |
| 13    | -Vin   | -Vin  |
| 14    | +Vout  | +Vout |
| 15    | -Vout  | Com   |
| 22    | No Pin | Com   |
| 23    | No Pin | -Vout |
| 24    | +Vin   | +Vin  |

NC = No Connection

XX.X ± 0.5 mm

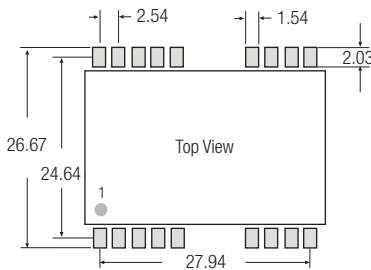
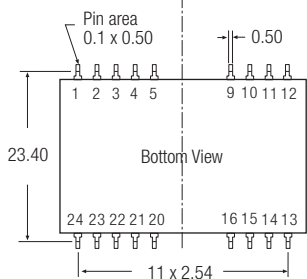
XX.XX ± 0.25 mm

**SMD Pinning**



Tol.: ± 0.35 mm

**Recommended Footprint Details**



SMD pin connections follow standard package A (/A/SMD), B (/B/SMD) or C (/C/SMD) pinning.

All unused pins are NC (No Connection). See Below for detailed pinout lists

for all packages incl.SMD case the length of plastic case is 31,8 mm, length of metal case 32.0 mm

**/A/SMD Pinning**

**/B/SMD Pinning**

**/C/SMD Pinning**

| Pin Connections |        |       | Pin Connections |        |       | Pin Connections |        |       | Pin Connections |        |       | Pin Connections |        |      | Pin Connections |        |       |
|-----------------|--------|-------|-----------------|--------|-------|-----------------|--------|-------|-----------------|--------|-------|-----------------|--------|------|-----------------|--------|-------|
| Pin #           | Single | Dual  | Pin #           | Single | Dual  | Pin #           | Single | Dual  | Pin #           | Single | Dual  | Pin #           | Single | Dual | Pin #           | Single | Dual  |
| 1 (Option)      | CTRL   | CTRL  | 13              | NC     | NC    | 1               | +Vin   | +Vin  | 13              | -Vin   | -Vin  | 1               | +Vin   | +Vin | 13              | +Vout  | -Vout |
| 2               | -Vin   | -Vin  | 14              | +Vout  | +Vout | 2               | NC     | -Vout | 14              | +Vout  | +Vout | 2               | +Vin   | +Vin | 14              | NC     | NC    |
| 3               | -Vin   | -Vin  | 15              | NC     | NC    | 3               | NC     | Com   | 15              | -Vout  | Com   | 3               | NC     | NC   | 15              | NC     | +Vout |
| 4               | NC     | NC    | 16              | -Vout  | Com   | 4               | NC     | NC    | 16              | NC     | NC    | 4               | NC     | NC   | 16              | NC     | NC    |
| 5               | NC     | NC    | 20              | NC     | NC    | 5               | NC     | NC    | 20              | NC     | NC    | 5               | NC     | NC   | 20              | NC     | NC    |
| 9               | NC     | Com   | 21              | NC     | NC    | 9               | NC     | NC    | 21              | NC     | NC    | 9               | NC     | NC   | 21              | NC     | NC    |
| 10              | NC     | NC    | 22              | +Vin   | +Vin  | 10              | -Vout  | Com   | 22              | NC     | Com   | 10              | NC     | Com  | 22              | NC     | NC    |
| 11              | NC     | -Vout | 23              | +Vin   | +Vin  | 11              | +Vout  | +Vout | 23              | NC     | -Vout | 11              | NC     | Com  | 23              | -Vin   | -Vin  |
| 12              | NC     | NC    | 24              | NC     | NC    | 12              | -Vin   | -Vin  | 24              | +Vin   | +Vin  | 12              | -Vout  | NC   | 24              | -Vin   | -Vin  |