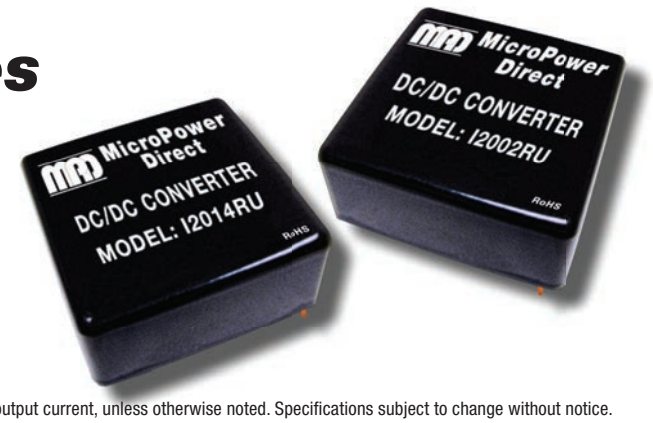
# I2000RU Series

# Ultra-Miniature 20W Wide 4:1 Input Range DC/DC Converters




## Key Features:

- 20W Output Power
- 4:1 Input Range
- Ultra- Miniature Case
- Remote On/Off Control
- 1,500 VDC Isolation
- >346 kHour MTBF
- Standard Pin-Out

## Electrical Specifications

Specifications typical @ +25°C, nominal input voltage & rated output current, unless otherwise noted. Specifications subject to change without notice.

### Input

| Parameter | Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| Input Voltage Range | 24 VDC Input | 9.0 | 24.0 | 36.0 | VDC |
| | 48 VDC Input | 18.0 | 48.0 | 75.0 | |
| Start-Up Voltage | 24 VDC Input | | | 9.0 | VDC |
| | 48 VDC Input | | | 18.0 | |
| Under Voltage Shutdown | 24 VDC Input | | | 8.5 | VDC |
| | 48 VDC Input | | | 17.0 | |
| Input Filter | LC Filter | | | | |

### Output

| Parameter | Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| Output Voltage Accuracy | | | | ±1.0 | % |
| Output Voltage Balance | Dual Output , Balanced Loads | | | ±2.0 | % |
| Line Regulation, $V_{IN}$ = Min to Max | Single Output | | | ±0.2 | % |
| | Dual Output | | | ±0.5 | |
| Load Regulation, $I_{OUT}$ = 15% to 100% | Single Output (3.3V and 5V) | | | ±0.5 | % |
| | Single Output (12V and 15V) | | | ±0.2 | |
| | Dual Output | | | ±1.0 | |
| Ripple & Noise (20 MHz), See Note 1 | Single Output (3.3V and 5V) | | 75 | | mV P - P |
| | Single Output (12V and 15V) | | 100 | | |
| | Dual Output | | 100 | | |
| Transient Recovery Time, See Note 2 | 25% Load Step Change | | 300 | | µSec |
| Transient Response Deviation | | | ±3.0 | | % |
| Output Power Protection | | | 150 | | % |
| Temperature Coefficient | | | | ±0.02 | %/°C |
| Output Short Circuit | Continuous (Autorecovery) | | | | |

### General

| Parameter | Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| Isolation Voltage | 60 Seconds | 1,500 | | | VDC |
| Isolation Resistance | 500 VDC | 1,000 | | | MΩ |
| Isolation Capacitance | 100 kHz, 1V | | 1,500 | | pF |
| Switching Frequency | | | 330 | | kHz |

### Environmental

| Parameter | Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| Operating Temperature Range | Ambient | -40 | +25 | +85 | °C |
| Operating Temperature Range | Case | | | +105 | °C |
| Storage Temperature Range | | -50 | | +125 | °C |
| Cooling | Free Air Convection | | | | |
| Derating | See Curve | | | | |
| Humidity | RH, Non-condensing | | | 95 | % |

### Physical

| | |
|---|---|
| Case Size | 1.00 x 1.00 x 0.40 Inches (25.4 x 25.4 x 10.16 mm) |
| Case Material | Six-Sided Shielded Aluminum With Non-Conductive Base (UL94-V0) |
| Weight | 0.52 Oz (15g) |

### Reliability Specifications

| Parameter | Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| MTBF | MIL HDBK 217F, 25°C, Gnd Benign | 346 | | | kHours |

### Absolute Maximum Ratings

| Parameter | Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| Input Voltage Surge (1 Sec) | 24 VDC Input | -0.7 | | 50.0 | VDC |
| | 48 VDC Input | -0.7 | | 100.0 | |
| Lead Temperature | 1.5 mm From Case For 10 Sec | | | 260 | °C |

**Caution:** Exceeding Absolute Maximum Ratings may damage the module. These are not continuous operating ratings.

RoHS


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## Model Selection Guide



| Model Number | Input | | | | Output | | | Efficiency (%, Typ) | Capacitive Load (µF Max) | Fuse Rating Slow-Blow (mA) |
|---|---|---|---|---|---|---|---|---|---|---|
| | Voltage (VDC) | | Current (mA) | | Voltage (VDC) | Current (mA, Max) | Current (mA, Min) | | | |
| | Nominal | Range | Full-Load | No-Load | | | | | | |
| I2001RU | 24 | 9.0 - 36.0 | 1,390 | 80 | 3.3 | 4,500 | 0 | 87 | 10,300 | 4,000 |
| I2002RU | 24 | 9.0 - 36.0 | 1,852 | 90 | 5.0 | 4,000 | 0 | 89 | 6,800 | 4,000 |
| I2003RU | 24 | 9.0 - 36.0 | 1,877 | 40 | 12.0 | 1,670 | 0 | 89 | 1,200 | 4,000 |
| I2004RU | 24 | 9.0 - 36.0 | 1,882 | 40 | 15.0 | 1,340 | 0 | 89 | 750 | 4,000 |
| I2005RU | 24 | 9.0 - 36.0 | 1,877 | 40 | ±12.0 | ±835 | ±60 | 89 | ±680 | 4,000 |
| I2006RU | 24 | 9.0 - 36.0 | 1,882 | 40 | ±15.0 | ±670 | ±50 | 89 | ±380 | 4,000 |
| I2011RU | 48 | 18.0 - 75.0 | 695 | 40 | 3.3 | 4,500 | 0 | 88 | 10,300 | 2,000 |
| I2012RU | 48 | 18.0 - 75.0 | 926 | 45 | 5.0 | 4,000 | 0 | 89 | 6,800 | 2,000 |
| I2013RU | 48 | 18.0 - 75.0 | 938 | 25 | 12.0 | 1,670 | 0 | 89 | 1,200 | 2,000 |
| I2014RU | 48 | 18.0 - 75.0 | 930 | 25 | 15.0 | 1,340 | 0 | 89 | 750 | 2,000 |
| I2015RU | 48 | 18.0 - 75.0 | 938 | 25 | ±12.0 | ±835 | ±60 | 89 | ±680 | 2,000 |
| I2016RU | 48 | 18.0 - 75.0 | 941 | 25 | ±15.0 | ±670 | ±50 | 89 | ±380 | 2,000 |

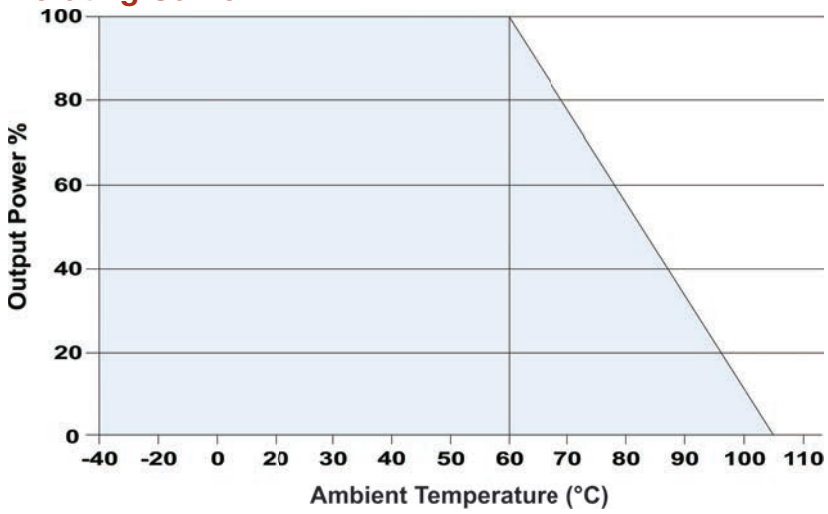
**Notes:**

1. Output ripple is measured with a 1.0 µF ceramic and a 10 µF tantalum capcitor connected across the outputs.
2. Transient recovery is measured to within a 1% error band for a load step change of 75% to 100%.
3. Operation at no-load will not damage the unit, but they may not meet all specifications.
4. The On/Off Control input (Pin 3) is referenced to -Vin (Pin 2). If it is not used, the control pin should be left open. If the pin is shorted to -VIN, the unit will turn off.

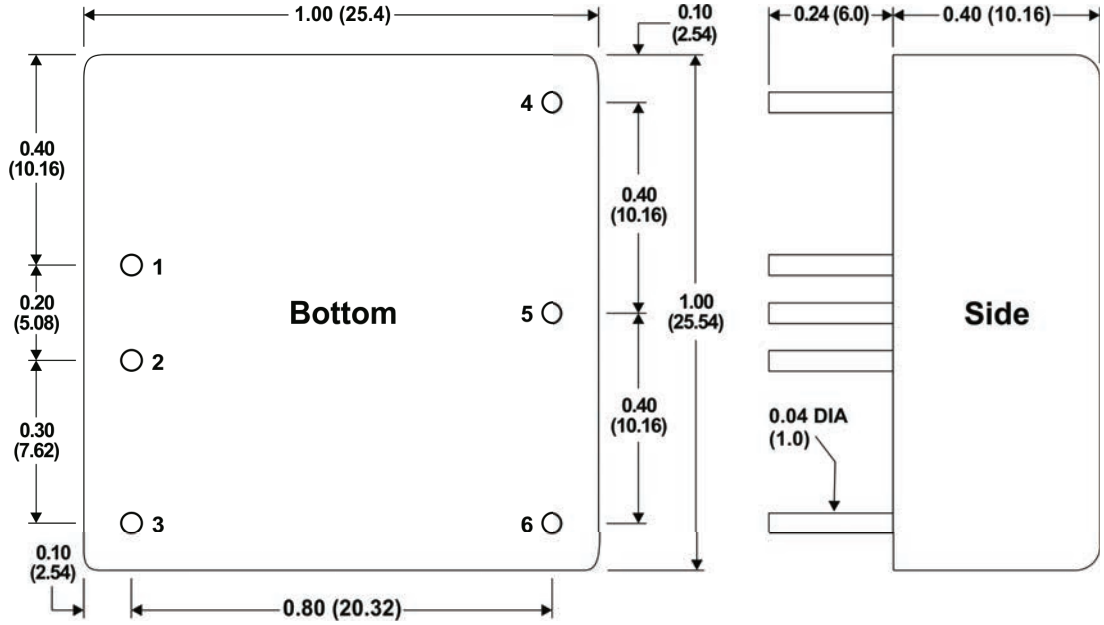
| | Min | Max |
|---|---|---|
| On | 3.5 VDC | 12 VDC |
| Off | 0.0 VDC | 1.2 VDC |
| In. Current (on) | | 0.5 mA |
| In. Current (off) | | -0.5 mA |

5. An external resistor may be used to adjust the converter output by ±10%. To adjust the output UP, connect a 5%, 3W resistor between the minus output pin and the Vout trim pin. To adjust the output DOWN, connect a 5%, 3W resistor between the plus output pin and the $V_{OUT}$ trim pin. For continuous UP/Down trimming capability, connect a 10 kW potentiometer between the plus and minus outputs with the wiper arm connected to the $V_{OUT}$ trim pin. The trim pin may be left floating if it is not used. Contact the factroy for more information.
6. It is recommended that a fuse be used on the input of a power supply for protection. See the Model Selection table above for the correct rating.

## Derating Curve




## Mechanical Dimensions




## Pin Connections

| Pin | Single | Dual |
|---|---|---|
| 1 | +Vin | +Vin |
| 2 | -Vin | -Vin |
| 3 | Remote ON/OFF | |
| 4 | +Vout | +Vout |
| 5 | Trim | Common |
| 6 | -Vout | -Vout |

**Notes:**

- All dimensions are typical in inches (mm)
- Tolerance x.xx = ±0.01 (±0.25)

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