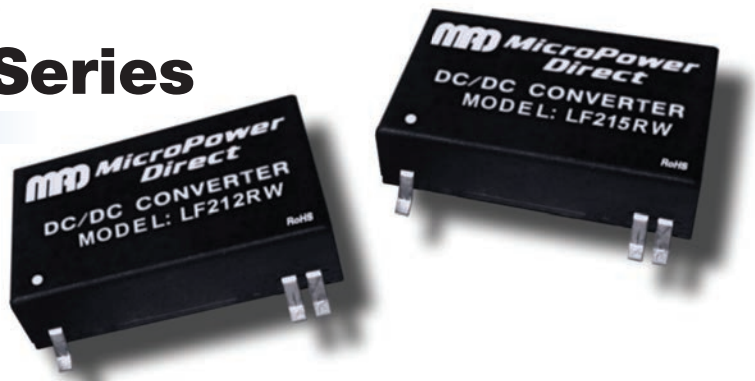


# LF200RW Series

## Miniature SMT, 2W Wide Input Range DC/DC Converters



### Key Features:

- 2W Output Power
- 2:1 Input Voltage Range
- 1,500 VDC Isolation
- Short Circuit Protected
- Miniature SMT Package
- Single & Dual Outputs
- 1.0 MH MTBF
- Industry 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 Start Voltage                 | 5 VDC Input                                       | 3.5   | 4.0   | 4.5   | VDC      |  |
|                                     | 12 VDC Input                                      | 4.5   | 7.0   | 9.0   |          |  |
|                                     | 24 VDC Input                                      | 8.0   | 12.0  | 18.0  |          |  |
|                                     | 48 VDC Input                                      | 16.0  | 24.0  | 36.0  |          |  |
| Input Filter                        | π (Pi) Filter                                     |       |       |       |          |  |
| Reverse Polarity Input Current      |   |       |       | 1.0   | A        |  |
| Short Circuit Input Power           |   |       |       | 1,500 | mW       |  |
| Output                              |   |       |       |       |          |  |
| Parameter                           | Conditions  | Min.  | Typ.  | Max.  | Units    |  |
| Output Voltage Accuracy             |   |       | ±1.0  | ±2.0  | %        |  |
| Output Voltage Balance              |   |       | ±1.0  | ±2.0  | %        |  |
| Line Regulation                     | V <sub>in</sub> = Min to Max                      |       | ±0.3  | ±0.5  | %        |  |
| Load Regulation                     | I <sub>out</sub> = 25% to 100%                    |       | ±0.5  | ±0.75 | %        |  |
| Ripple & Noise (20 MHz)             | See Note 1  |       | 30    | 50    | mV P - P |  |
| Ripple & Noise (20 MHz)             | Over Line, Load & Temp.                           |       |       | 75    | mV P - P |  |
| Ripple & Noise (20 MHz)             |   |       |       | 15    | mV rms   |  |
| Output Power Protection             |   | 120   |       |       | %        |  |
| Transient Response Time, See Note 2 | 50% Load Step Change                              |       | 100   | 300   | μSec     |  |
| Transient Response Deviation        |   |       | ±3.0  | ±5.0  | %        |  |
| Temperature Coefficient             |   |       | ±0.01 | ±0.02 | %/°C     |  |
| Output Short Circuit                | Continuous (Autorecovery)                         |       |       |       |          |  |
| General                             |   |       |       |       |          |  |
| Parameter                           | Conditions  | Min.  | Typ.  | Max.  | Units    |  |
| Isolation Voltage                   | 60 Seconds  | 1,500 |       |       | VDC      |  |
| Isolation Test Voltage              | Flash Tested For 1 Sec                            | 1,650 |       |       | VDC      |  |
| Isolation Resistance                | 1,000 VDC   | 1,000 |       |       | MΩ       |  |
| Isolation Capacitance               | 100 kHz, 1V                                       |       | 250   | 420   | pF       |  |
| Switching Frequency                 |   |       | 300   |       | kHz      |  |
| Environmental                       |   |       |       |       |          |  |
| Parameter                           | Conditions  | Min.  | Typ.  | Max.  | Units    |  |
| Operating Temperature Range         | Ambient   | -40   | +25   | +65   | °C       |  |
| Operating Temperature Range         | Case  |       |       | +90   | °C       |  |
| Storage Temperature Range           |   | -40   |       | +125  | °C       |  |
| Cooling                             | Free Air Convection                               |       |       |       |          |  |
| Humidity                            | RH, Non-condensing                                |       |       | 95    | %        |  |
| Physical                            |   |       |       |       |          |  |
| Case Size                           | 0.94 x 0.54 x 0.30 Inches (23.8 x 13.7 x 7.62 mm) |       |       |       |          |  |
| Case Material                       | Non-Conductive Black Plastic (UL94-V0)            |       |       |       |          |  |
| Weight                              | 0.18 Oz (5.1g)                                    |       |       |       |          |  |
| Reliability Specifications          |   |       |       |       |          |  |
| Parameter                           | Conditions  | Min.  | Typ.  | Max.  | Units    |  |
| MTBF                                | MIL HDBK 217F, 25°C, Gnd Benign                   | 1.0   |       |       | MHours   |  |
| Absolute Maximum Ratings            |   |       |       |       |          |  |
| Parameter                           | Conditions  | Min.  | Typ.  | Max.  | Units    |  |
| Input Voltage Surge (1 Sec)         | 5 VDC Input                                       | -0.7  |       | 11.0  | VDC      |  |
|                                     | 12 VDC Input                                      | -0.7  |       | 25.0  |          |  |
|                                     | 24 VDC Input                                      | -0.7  |       | 50.0  |          |  |
|                                     | 48 VDC Input                                      | -0.7  |       | 100.0 |          |  |
| Lead Temperature                    | 1.5 mm From Case For 10 Sec                       |       |       | 260   | °C       |  |
| Internal Power Dissipation          | All Models  |       |       | 1,800 | mW       |  |

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

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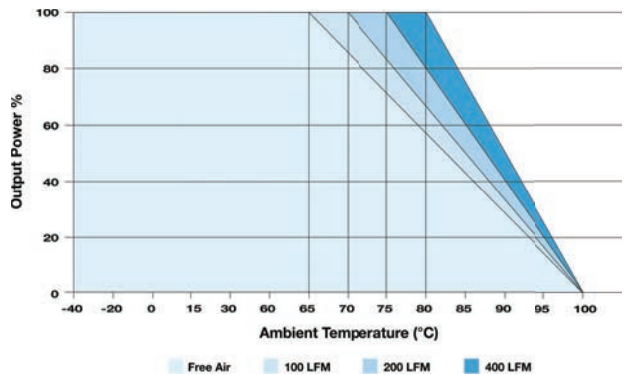
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| Model Number | Input         |             |              |         | Output        |                   |                   | Reflected Ripple Current (mA) | Efficiency (% Typ) | Output Capacitive Load (μF, Max) | Fuse Rating Slow-Blow (mA) |
|--------------|---------------|-------------|--------------|---------|---------------|-------------------|-------------------|-------------------------------|--------------------|----------------------------------|----------------------------|
|              | Voltage (VDC) |             | Current (mA) |         | Voltage (VDC) | Current (mA, Max) | Current (mA, Min) |                               |                    |                                  |                            |
|              | Nominal       | Range       | Full-Load    | No-Load |               |                   |                   |                               |                    |                                  |                            |
| LF201RW      | 5             | 4.5 - 9.0   | 471          | 40      | 3.3           | 500.0             | 125.0             | 100                           | 70                 | 2,200                            | 1,000                      |
| LF202RW      | 5             | 4.5 - 9.0   | 548          | 40      | 5.0           | 400.0             | 100.0             | 100                           | 73                 | 1,000                            | 1,000                      |
| LF203RW      | 5             | 4.5 - 9.0   | 534          | 40      | 12.0          | 167.0             | 42.0              | 100                           | 75                 | 170                              | 1,000                      |
| LF204RW      | 5             | 4.5 - 9.0   | 582          | 40      | 15.0          | 134.0             | 33.0              | 100                           | 73                 | 110                              | 1,000                      |
| LF205RW      | 5             | 4.5 - 9.0   | 667          | 40      | ±5.0          | ±200.0            | ±50.0             | 100                           | 64                 | ±470                             | 1,000                      |
| LF206RW      | 5             | 4.5 - 9.0   | 615          | 40      | ±12.0         | ±83.0             | ±21.0             | 100                           | 69                 | ±100                             | 1,000                      |
| LF207RW      | 5             | 4.5 - 9.0   | 598          | 40      | ±15.0         | ±67.0             | ±17.0             | 100                           | 71                 | ±47                              | 1,000                      |
| LF211RW      | 12            | 9.0 - 18.0  | 184          | 20      | 3.3           | 500.0             | 125.0             | 25                            | 73                 | 2,200                            | 500                        |
| LF212RW      | 12            | 9.0 - 18.0  | 217          | 20      | 5.0           | 400.0             | 100.0             | 25                            | 77                 | 1,000                            | 500                        |
| LF213RW      | 12            | 9.0 - 18.0  | 209          | 20      | 12.0          | 167.0             | 42.0              | 25                            | 80                 | 170                              | 500                        |
| LF214RW      | 12            | 9.0 - 18.0  | 220          | 20      | 15.0          | 134.0             | 33.0              | 25                            | 80                 | 110                              | 500                        |
| LF215RW      | 12            | 9.0 - 18.0  | 242          | 20      | ±5.0          | ±200.0            | ±50.0             | 25                            | 73                 | ±470                             | 500                        |
| LF216RW      | 12            | 9.0 - 18.0  | 224          | 20      | ±12.0         | ±83.0             | ±21.0             | 25                            | 78                 | ±100                             | 500                        |
| LF217RW      | 12            | 9.0 - 18.0  | 226          | 20      | ±15.0         | ±67.0             | ±17.0             | 25                            | 78                 | ±47                              | 500                        |
| LF221RW      | 24            | 18.0 - 36.0 | 96           | 10      | 3.3           | 500.0             | 125.0             | 15                            | 72                 | 2,200                            | 250                        |
| LF222RW      | 24            | 18.0 - 36.0 | 109          | 10      | 5.0           | 400.0             | 100.0             | 15                            | 77                 | 1,000                            | 250                        |
| LF223RW      | 24            | 18.0 - 36.0 | 109          | 10      | 12.0          | 167.0             | 42.0              | 15                            | 80                 | 170                              | 250                        |
| LF224RW      | 24            | 18.0 - 36.0 | 108          | 10      | 15.0          | 134.0             | 33.0              | 15                            | 81                 | 110                              | 250                        |
| LF225RW      | 24            | 18.0 - 36.0 | 119          | 10      | ±5.0          | ±200.0            | ±50.0             | 15                            | 74                 | ±470                             | 250                        |
| LF226RW      | 24            | 18.0 - 36.0 | 112          | 10      | ±12.0         | ±83.0             | ±21.0             | 15                            | 78                 | ±100                             | 250                        |
| LF227RW      | 24            | 18.0 - 36.0 | 110          | 10      | ±15.0         | ±67.0             | ±17.0             | 15                            | 80                 | ±47                              | 250                        |
| LF231RW      | 48            | 36.0 - 72.0 | 49           | 8       | 3.3           | 500.0             | 125.0             | 10                            | 71                 | 2,200                            | 120                        |
| LF232RW      | 48            | 36.0 - 72.0 | 57           | 8       | 5.0           | 400.0             | 100.0             | 10                            | 73                 | 1,000                            | 120                        |
| LF233RW      | 48            | 36.0 - 72.0 | 53           | 8       | 12.0          | 167.0             | 42.0              | 10                            | 79                 | 170                              | 120                        |
| LF234RW      | 48            | 36.0 - 72.0 | 55           | 8       | 15.0          | 134.0             | 33.0              | 10                            | 79                 | 110                              | 120                        |
| LF235RW      | 48            | 36.0 - 72.0 | 62           | 8       | ±5.0          | ±200.0            | ±50.0             | 10                            | 71                 | ±470                             | 120                        |
| LF236RW      | 48            | 36.0 - 72.0 | 57           | 8       | ±12.0         | ±83.0             | ±21.0             | 10                            | 77                 | ±100                             | 120                        |
| LF237RW      | 48            | 36.0 - 72.0 | 57           | 8       | ±15.0         | ±67.0             | ±17.0             | 10                            | 77                 | ±47                              | 120                        |

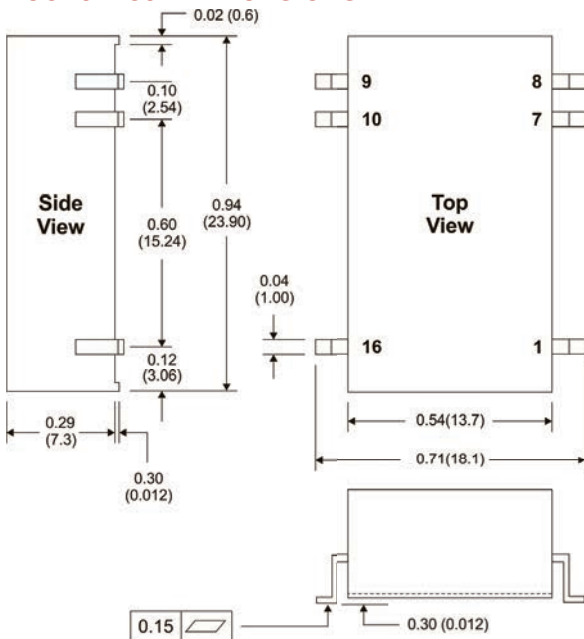
Notes:

- When measuring output ripple, it is recommended that an external 0.47 μF ceramic capacitor be placed from the +Vout pin to the -Vout pin for single output units and from each output to common for dual output units. For noise sensitive applications, the use of 3.3 μF capacitors will reduce the output ripple.
- Transient recovery is measured to within a 1% error band for a load step change of 75% to 100%.
- Operation at no-load will not damage these units. However, they may not meet all specifications.
- The converter should be connected to a low ac-impedance source. An input source with a highly inductive impedance may affect the stability of the converter. In applications where the converter output loading is high and input power is supplied over long lines, it may be necessary to use a capacitor on the input to insure start-up. In this case, it is recommended that a low ESR (ESR < 1.0Ω at 100 kHz) capacitor be mounted close to the converter. For 5V input units a 8.2 μF is recommended, for 12V input units, a 3.3 μF; and for 24V & 48V units a 1.5 μF.
- It's recommended that a fuse be used on the power supply input for protection. See the table above for the correct rating.

Derating Curve



Mechanical Dimensions



Pin Connections

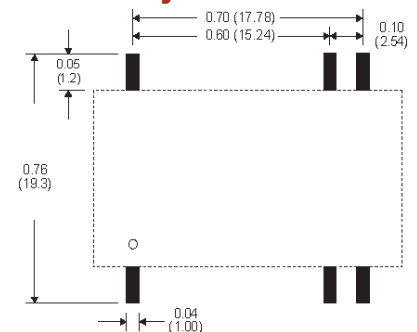
| Pin | Single | Dual   |
|-----|--------|--------|
| 1   | -Vin   | -Vin   |
| 7   | NC     | NC     |
| 8   | NC     | Common |
| 9   | +Vout  | +Vout  |
| 10  | -Vout  | -Vout  |
| 16  | +Vin   | +Vin   |

NC = No Connection

Mechanical Notes:

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

Solder Layout



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