MR50-xxSRW Series
Compact, 50W Wide Input Railway DC/DC Converter

Electric 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 | 72 VDC Input | 43.0 | 72.0 | 101.0 | VDC
| 110 VDC Input | 66.0 | 110.0 | 160.0 | VDC
Input Start Voltage | 72 VDC Input | 43.0 | 43.0 | 66.0 | VDC
| 110 VDC Input | 40.0 | 66.0 | VDC
Under Voltage Shutdown | 72 VDC Input | 43.0 | 43.0 | 66.0 | VDC
Input Filter | PI (n) Filter

Output Parameter | Conditions | Min. | Typ. | Max. | Units
--- | --- | --- | --- | --- | ---
Output Voltage Accuracy | VIN = Min to Max | ±1.0 | %
Line Regulation | IOUT = 0% to 100% | ±0.2 | %
Load Regulation | See Note 1 | 100 | mV Pk-Pk
Ripple & Noise (20 MHz) | 25% Load Change | ±0.02 | µS
Temperature Coefficient | See Note 3 | 150 | %/°C
Output Over Load Protection Continuous (Hiccup Mode)
Output Short Circuit

General Parameter | Conditions | Min. | Typ. | Max. | Units
--- | --- | --- | --- | --- | ---
Isolation Voltage, Reinforced Insulation | Input/Output | 3,000 | VAC rms
| Input/Output to Case | 1,500 | VDC
| Isolation Resistance | 500 VDC | 1,000 | MΩ
| Isolation Capacitance | 100 kHz/1V | 3,000 | pF
| Switching Frequency | 320 | kHz

Environmental Parameter | Conditions | Min. | Typ. | Max. | Units
--- | --- | --- | --- | --- | ---
Operating Temperature Range | Ambient, See Note 4 | -40 | 25 | +75 | °C
| Natural Convection | 7.5 | °C/W
| Thermal Impedance, Without Heat Sink | 100 LFM | 6.1 | °C/W
| 200 LFM | 5.3 |
| 400 LFM | 3.9 |
| Natural Convection | 6.8 |
| Thermal Impedance, With Heat Sink | 100 LFM | 4.1 |
| 200 LFM | 3.3 |
| 400 LFM | 2.2 |
| Operating Temperature Range | Base Plate | -40 | +105 | °C
| Thermal Shutdown | Base Plate | +110 | °C
| Cooling | See Derating Curves (Page 3)
| Humidity | RH, Non-condensing | 95 | %

Physical Case Size | 2.28 x 1.45 x 0.78 Inches (57.90 x 36.8 x 20.00 mm)
| Case Material | Black Anodized Aluminum Case with Aluminum Plate/Heat Sink
| Weight | 2.6 Oz (74.0g)

Remote On/Off Parameter | Conditions | Min. | Typ. | Max. | Units
--- | --- | --- | --- | --- | ---
Unit On | 3.5 VDC - 12.0 VDC or Open Circuit
| Unit Off | 0 VDC - 1.2 VDC or Short Circuit
| Control Input Current, ON | VCTRL = 5V | 0.5 | mA
| Control Input Current, OFF | VCTRL = 0V | -0.5 | mA
| Control Common | Referenced to -VIN (Pin 3)
| Standby Input Current | 2.5 | mA

Reliability Specifications Parameter | Conditions | Min. | Typ. | Max. | Units
--- | --- | --- | --- | --- | ---
MTBF | MIL HDBK 217F, 25°C, Gnd Benign | 314.9 | kHrs

Absolute Maximum Ratings, See Note 5 Parameter | Conditions | Min. | Typ. | Max. | Units
--- | --- | --- | --- | --- | ---
Input Voltage Surge (100 mS) | 77 VDC Input | -0.7 | 165.0 | VDC
| 110 VDC Input | -0.7 |
| Lead Temperature | 1.5 mm From Case for 10 Sec | 250.0 |
| | 260 | °C

www.micropowerdirect.com
4. Recommended values for components are:

<table>
<thead>
<tr>
<th>Component</th>
<th>Sociable</th>
<th>110 Vn</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuse</td>
<td>2.100 mA</td>
<td>1.500 mA</td>
</tr>
<tr>
<td>L1</td>
<td>450 µH</td>
<td>450 µH</td>
</tr>
<tr>
<td>C3</td>
<td>2.200 µF/3 kV</td>
<td>2.200 µF/3 kV</td>
</tr>
<tr>
<td>C4</td>
<td>2.200 µF/3 kV</td>
<td>2.200 µF/3 kV</td>
</tr>
<tr>
<td>C5</td>
<td>2.200 µF/3 kV</td>
<td>2.200 µF/3 kV</td>
</tr>
<tr>
<td>C7</td>
<td>4.7 µF</td>
<td>4.7 µF</td>
</tr>
</tbody>
</table>

5. Exceeding absolute maximum ratings may damage the module. These are not continuous operating ratings.

7. The circuit consisting of R1, C1 and C3 illustrates a simple open collector connection for the remote on/off control. The resistor (R1) limits the current on the control line and the capacitor (C1) bypasses noise spikes, helping to prevent phantom triggering of the control. If the control pin is not being used, it should be left open.

8. The output sense pins pin 7 and pin 5 may be used to compensate for the losses incurred over long leads to an output load. If not used for output compensation or output adjustment, the sense pins should be connected directly to the appropriate output pins, pin 7 to pin 8 and pin 5 to pin 4.

9. The output filtering capacitor (C7) is a low ESR (<100) electrolytic capacitor. Care must be taken in choosing this capacitor not to exceed the capacitive load specification for the unit.

For applications that require meeting EMCEMI standards, the diagram above illustrates a typical connection of the MR50-xxxSxxRW series. The units do not require external components to operate as specified. Some notes on this diagram (starting with the input circuit) are:

1. It is recommended that an external slow blow fuse be used. The recommended fuse rating is shown in the table at right.

2. To meet EN 55011 Class A and EN 50121-3-2, an external input filter is required. See the connection diagram below for a typical circuit.

3. To meet EN 61000-4-5, a capacitor should be connected across the input pins. See the connection diagram below for a typical circuit.

4. The ambient temperature range is the maximum possible for a converter with a heatsink mounted.

5. Operation at no-load will not damage these units, but they may not meet all specifications.

6. Output noise is measured with a 10 µF tantalum capacitor and a 1.0 µF ceramic capacitor connected in parallel across the output. Ripple & noise is 150 mV typical for 24 VDC output models.

7. Exceeding absolute maximum ratings may damage the module. These are not continuous operating ratings.

8. The output sense pins (pin 7 and pin 5) may be used to compensate for the losses incurred over long leads to an output load. If not used for output compensation or output adjustment, the sense pins should be connected directly to the appropriate output pins, pin 7 to pin 8 and pin 5 to pin 4.

9. It is recommended that a fuse be used on the input of a power supply for protection. For the correct rating, see the model selection table above.

Notes:
1. Output noise is measured with a 10 µF tantalum capacitor and a 1.0 µF ceramic capacitor connected in parallel across the output. Ripple & noise is 150 mV typical for 24 VDC output models.
2. Transient recovery is measured to within a 1% error band for a load step change of 75% to 100%.
3. Output overload protection is provided by a “hiccup” mode circuit
4. The ambient temperature range is the maximum possible for a converter with a heatsink mounted. Natural convection is 20 LFM, not “still air”. See the power derating curves on page 3 for the operating temperature limits for specific models.

EMC Specifications

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Standard</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radiated Emissions</td>
<td>See Note 1 EN 50121</td>
<td>Class A</td>
</tr>
<tr>
<td>Conducted Emissions</td>
<td>See Note 1 EN 55011</td>
<td>Class A</td>
</tr>
<tr>
<td>ESD</td>
<td>EN 61000-4-2</td>
<td>Criteria A; ±8 kV Air, ±6 kV Contact</td>
</tr>
<tr>
<td>IS</td>
<td>EN 61000-4-3</td>
<td>Criteria A; 10V/m</td>
</tr>
<tr>
<td>Surge</td>
<td>EN 61000-4-4</td>
<td>Criteria A; ±2 kV</td>
</tr>
<tr>
<td>CS</td>
<td>EN 61000-4-5</td>
<td>Criteria A; ±1 kV</td>
</tr>
<tr>
<td>CS</td>
<td>EN 61000-4-6</td>
<td>Criteria A; 10 V/m</td>
</tr>
</tbody>
</table>

Environmental Standards

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vibration &amp; Shock</td>
<td>EN 61373</td>
</tr>
<tr>
<td>Cooling Test</td>
<td>EN 60068-2-1</td>
</tr>
<tr>
<td>Dry Heat</td>
<td>EN 60068-2-2</td>
</tr>
<tr>
<td>Damp Heat</td>
<td>EN 60068-2-30</td>
</tr>
</tbody>
</table>

Typical Connection

For applications that require meeting EMCEMI standards, the diagram above illustrates a typical connection of the MR50-xxxSxxRW series. The units do not require external components to operate as specified. Some notes on this diagram (starting with the input circuit) are:

1. It is recommended that an external slow blow fuse be used. The recommended fuse rating is shown in the table at right.

2. To meet EN 55011 Class A and EN 50121-3-2, an external input filter is required. See the connection diagram below for a typical circuit.

3. To meet EN 61000-4-5, a capacitor should be connected across the input pins. See the connection diagram below for a typical circuit.

4. The ambient temperature range is the maximum possible for a converter with a heatsink mounted. Natural convection is 20 LFM, not “still air”. See the power derating curves on page 3 for the operating temperature limits for specific models.

Notes:
1. Output noise is measured with a 10 µF tantalum capacitor and a 1.0 µF ceramic capacitor connected in parallel across the output. Ripple & noise is 150 mV typical for 24 VDC output models.
2. Transient recovery is measured to within a 1% error band for a load step change of 75% to 100%.
3. Output overload protection is provided by a “hiccup” mode circuit
4. The ambient temperature range is the maximum possible for a converter with a heatsink mounted. Natural convection is 20 LFM, not “still air”. See the power derating curves on page 3 for the operating temperature limits for specific models.
Output Voltage Adjustment

A simple external circuit may be used to adjust the converter output. The range of adjustment is ±10%.

To adjust the output down, connect a 5%, 3W resistor from the plus sense pin (7) to the VOUT trim pin (6). To adjust the output up, connect a 5%, 3W resistor from the minus sense pin (5) to the VOUT trim pin. For up/down trimming, connect a 10 kΩ potentiometer from the plus to the minus sense pins. Connect the wiper arm to the VOUT trim pin.

For a table of trim resistor values, contact the factory.
### Mechanical Dimensions

**Side View**

- **Width**: 2.28 (57.98) mm
- **Height**: 0.60 (15.70) mm
- **Thickness**: 0.10 (2.54) mm

**End View**

- **Width**: 1.66 (42.12) mm
- **Height**: 0.15 (3.81) mm
- **Thickness**: 0.15 (3.81) mm

**Bottom View**

**Top View**

**Side View**

- **Width**: 1.28 (32.51) mm
- **Height**: 0.10 (2.54) mm

**End View**

- **Width**: 1.45 (36.83) mm
- **Height**: 0.19 (4.82) mm

For the heatsink option, add suffix "H" to the model number (i.e., **MR50-110S24RW-H**)

### Pin Description

<table>
<thead>
<tr>
<th>Pin</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+Vin</td>
</tr>
<tr>
<td>2</td>
<td>Remote On/Off</td>
</tr>
<tr>
<td>3</td>
<td>-Vin</td>
</tr>
<tr>
<td>4</td>
<td>-Vout</td>
</tr>
<tr>
<td>5</td>
<td>-Sense</td>
</tr>
<tr>
<td>6</td>
<td>Trim</td>
</tr>
<tr>
<td>7</td>
<td>+Sense</td>
</tr>
<tr>
<td>8</td>
<td>+Vout</td>
</tr>
</tbody>
</table>

**Mechanical Notes:**
- All dimensions are typical in inches (mm)
- Tolerance $\pm 0.02$ (±0.50)