



**OBSOLETE PRODUCT**  
Typical unit

### FEATURES

- 16.8 to 137.5 VDC wide input voltage range
- Fixed 5.1, 12 or 24VDC unipolar output up to 120 Watts
- 3U x 4TE x 165.5mm (111 x 20.3 x 165.5 mm) cassette module for 19-inch rack mounting
- Ruggedized “no fans” high reliability enclosure with conformal coated components
- Extensive self-protection, over temperature and short circuit features
- On/Off control, sense, current share, output OK LED, UV lockout, Hold-up Cap and trim (some functions optional)
- Adjustable input undervoltage (UVLO) protection, optional
- 2250VDC/1500VAC I/O isolation plus RoHS-6 compliance
- Operating temperature range -40 to +85° Celsius
- Extensive EU transportation and railway standards adherence

### PRODUCT OVERVIEW

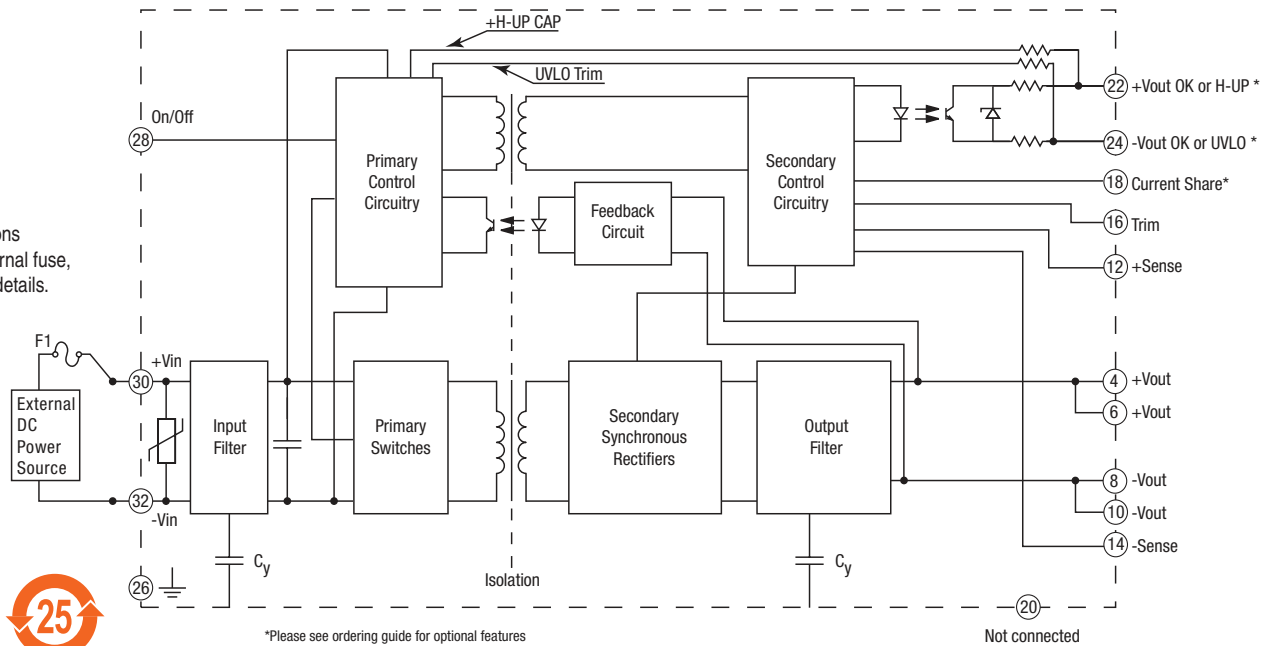
Housed in a 3U x 4TE x 165.5 mm extruded aluminum cassette suitable for 19-inch rack mounting, the UCR series of isolated 100 Watt DC-DC converters provide clean DC output power over a very wide input voltage range. The standard input range is 16.8 to 137.5 Volts DC with transient capability between 14.4V and 154V. The reverse-polarity protected input is immune to surges and transients per EN50155, IEC60571 and RIA12 standards. The double reinforced insulation system protects over the full power and temperature range in compliance with IEC/EN/UL60950-1 and EN50116. The UCR series is ideal for battery and mobile distributed power applications in transportation, industrial, vehicles, signal systems, communications and railways.

The fixed output voltage is fully regulated with excellent noise, ripple and transient settling characteristics. Isolation characteristics are 2250 Volts DC (1500 VAC) input to output and input to case.

The ruggedized 3U housing features conformal coating of internal components for moisture resistance. The high efficiency design requires no forced cooling since all internal power dissipation is routed to integral extruded aluminum chassis rails. The enclosure may also be mounted against a cold plate inside a sealed chassis in conduction cooling applications. The UCR series is designed to comply with numerous environmental, EMC/EMI and safety standards (see specifications). Protection systems include output overcurrent and short circuit, over temperature shutdown (with automatic recovery) and output overvoltage. An industry-standard DIN H15 rear connector is used.

All models are equipped with an On/Off control, sense inputs, and output voltage trim ( $\pm 10\%$ ). Optional features include output OK LED lamp and control signal, active current sharing with other UCR's, external capacitor for extended hold-up time, and adjustable input undervoltage lockout.

Murata Power Solutions recommends an external fuse, F1. See page 17 for details.

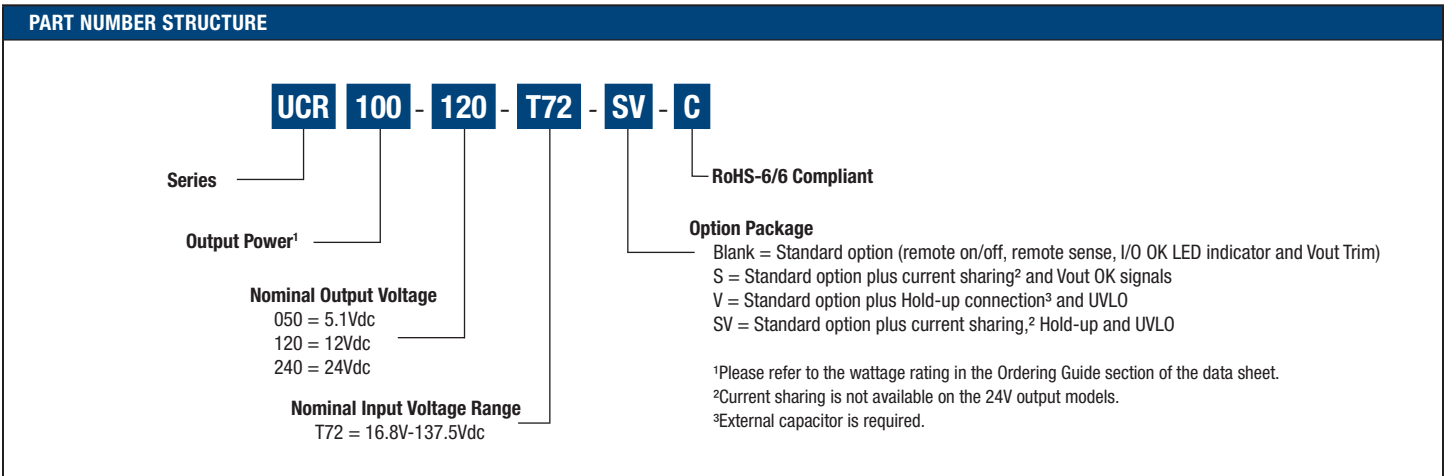


For full details go to [www.murata-ps.com/rohs](http://www.murata-ps.com/rohs)

Figure 1. UCR Block Diagram

| PERFORMANCE SPECIFICATIONS SUMMARY AND ORDERING GUIDE |                 |                  |               |              |      |                   |        |                     |                 |                  |                         |       |            |                |                |
|---|-----------------|------------------|---------------|--------------|------|-------------------|--------|---------------------|-----------------|------------------|-------------------------|-------|------------|----------------|----------------|
| Root Model Number ①                                   | Output          |                  |               |              |      | Input             |        |                     |                 |                  | Efficiency              |       | Dimensions |                |                |
|   | Vout (Volts DC) | Iout (Amps,max.) | Power (Watts) | R/N (mV p-p) |      | Regulation (max.) |        | Vin nom. (Volts DC) | Range (Volts) ③ | Pwr, no load (W) | Iin, full load (Amps) ② | Min.  | Typ.       | Inches         | mm             |
|   |                 |                  |               | Typ.         | Max. | Line              | Load   |                     |                 |                  |                         |       |            |                |                |
| UCR100-050-T72-C                                      | 5.1             | 20               | 100           | 20           | 80   | ±0.25%            | ±0.25% | 72                  | 16.8-137.5      | 3                | 1.61                    | 85.0% | 87%        | 4.38x0.81x6.52 | 111x20.3x165.5 |
| UCR100-120-T72-C                                      | 12              | 10               | 120           | 50           | 75   | ±0.25%            | ±0.25% | 72                  | 16.8-137.5      | 3.5              | 1.99                    | 84.5% | 86.5%      | 4.38x0.81x6.52 | 111x20.3x165.5 |
| UCR100-240-T72-C                                      | 24              | 5.5              | 132           | 100          | 150  | ±0.25%            | ±0.25% | 72                  | 16.8-137.5      | 3.5              | 2.11                    | 88%   | 90%        | 4.38x0.81x6.52 | 111x20.3x165.5 |

① These are not complete model numbers. Please refer to the Part Number Structure for ordering information of all options.      ③ This is the standard input range. The transient input range (0.1 seconds) is 14.4V to 154V.  
 ② Measured at nominal line voltage and max load, +25°C ambient temperature, sense lines connected.



| PART NUMBER         | CURRENT SHARE | UVLO | HOLD-UP | Vout OK |
|---------------------|---------------|------|---------|---------|
| UCR100-050-T72-C    |               |      |         |         |
| UCR100-050-T72-S-C  | ✓             |      |         | ✓       |
| UCR100-050-T72-SV-C | ✓             | ✓    | ✓       |         |
| UCR100-050-T72-V-C  |               | ✓    | ✓       |         |
| UCR100-120-T72-C    |               |      |         |         |
| UCR100-120-T72-S-C  | ✓             |      |         | ✓       |
| UCR100-120-T72-SV-C | ✓             | ✓    | ✓       |         |
| UCR100-120-T72-V-C  |               | ✓    | ✓       |         |
| UCR100-240-T72-C    |               |      |         |         |
| UCR100-240-T72-V-C  |               | ✓    | ✓       |         |

### FUNCTIONAL SPECIFICATIONS, UCR100-050-T72 ①

| INPUT  | Conditions/Comments  | Minimum | Typical/Nominal   | Maximum | Units         |
|--|--|---------|-------------------|---------|---------------|
| Operating voltage range, standard                    |  | 16.8    | 72                | 137.5   | Vdc           |
| Surge and Transient Protection                       | Per EN50155, IEC60571 and RIA12                                |         |                   |         |               |
| Input Limits, no damage                              | Operating or non-operating                                     | 0       |                   | 154     | Vdc           |
| Input Filter   | Per EN50155, Symmetrical combined with VDR/transorb            |         |                   |         |               |
| Reverse Polarity Protection                          | Yes, in conjunction with external fuse.                        |         |                   |         | Vdc           |
| Start-up threshold                                   |  | 12.8    | 14.6              | 16.4    | Vdc           |
| Undervoltage shutdown ②                              | 50% load   | 10.5    | 12.3              | 14.0    | Vdc           |
| Overvoltage shutdown                                 | 50% load   |         | 170               |         | Vdc           |
| <b>Input current/power</b>                           |  |         |                   |         |               |
| Full Load Current                                    |  |         | 1.30              | 1.67    | Amps          |
| Peak Inrush Current                                  |  |         | 40                |         | Amps          |
| Short Circuit Input Current                          |  |         | 0.05              | 0.1     | Amps          |
| No Load Input Power                                  | Iout = minimum   |         | 3.0               | 3.5     | Watts         |
| Low Line Input Current                               | Vin = minimum  |         | 5.89              | 7.57    | Amps          |
| Shutdown Mode Input Current                          |  |         | 5                 | 10      | mA            |
| Reflected (back) ripple current ③                    |  |         | 5                 | 10      | mA pk-pk      |
| <b>GENERAL and SAFETY</b>                            |  |         |                   |         |               |
| Efficiency   | Vin = nom., 16A load   | 85      | 87                |         | %             |
|  | Vin = 110V, 16A load   | 85      | 86.5              |         | %             |
|  | Vin = 24V, 16A load  | 81      | 82.5              |         | %             |
| Switching Frequency                                  |  | 90      | 100               | 110     | KHz           |
| Turn-On Time   | Vin on to Vout regulated                                       |         | 150               | 160     | mS            |
|  | Remote ON to Vout regulated                                    |         | 150               | 160     | mS            |
| Isolation Voltage                                    | Input to output, case and aux. test                            | 2250    |                   |         | Vdc           |
| Isolation Voltage                                    | Case to output and Aux. test voltage                           | 2250    |                   |         | Vdc           |
| Subassemblies pre-tested per EN50116/60950           |  | 4200    |                   |         | Vdc           |
| Isolation Safety Rating                              | Based on 250 VAC or 240 VDC I/O                                |         | Double/Reinforced |         |               |
| Isolation Resistance                                 |  | 100     |                   |         | Mohm          |
| Isolation Capacitance                                |  |         | 4000              |         | pF            |
| Safety (Designed to meet the following requirements) | UL-60950-1, (2nd Edition), CSA-C22.2 No.60950-1, IEC/EN60950-1 |         | Yes               |         |               |
| Calculated MTBF                                      | per MIL-HDBK-217F  |         |                   |         |               |
|  | Ground benign, Tcase = 40°C                                    |         | TBC               |         | Hours         |
|  | Ground benign, Tcase = 40/70°C                                 |         | TBC               |         | Hours         |
|  | Ground benign, Tcase = 50°C                                    |         | TBC               |         | Hours         |
| <b>OUTPUT</b>  |  |         |                   |         |               |
| Total Output Power                                   | Full temperature range   | 0.0     | 81.6              | 103.02  | Watts         |
| <b>Voltage</b>                                       |  |         |                   |         |               |
| Output Voltage Range                                 | Vout = nominal   | 5.049   | 5.1               | 5.151   | Vdc           |
| Setting Accuracy                                     | 50% load   |         | ±1                |         | % of Vnom.    |
| Overvoltage Protection                               | magnetic feedback  | 5.9     | 6.2               | 6.5     | Vdc           |
| Vout Adjustment Range <optional>                     |  | -10     |                   | 10      | % of Vnom.    |
| <b>Current</b>                                       |  |         |                   |         |               |
| Output Current Range                                 | Vin = 16.8-137.5V.   | 0.0     | 16                | 20      | Amps          |
| Current Limit Inception                              | 98% of Vnom., after warmup                                     | 24      | 26.35             | 28.70   | Amps          |
| Short Circuit Current                                | Hiccup technique, autorecovery within ±1% of Vout              |         | 0.5               | 1       | Amps          |
| Short Circuit Duration                               | Output shorted to ground                                       |         | Continuous        |         |               |
| Short circuit protection method                      | Current limiting, hiccup autorestart                           |         |                   |         |               |
| Line Regulation                                      | Vin = min. to max.   |         |                   | ±0.25   | % of Vnom.    |
|  | Vout = nom.  |         |                   |         |               |
| Load Regulation                                      | Iout = min. to max.  |         |                   | ±0.25   | % of Vnom.    |
|  |  |         |                   |         |               |
| Dynamic Load Response                                | 50-75-50% load step  |         | 75                | 150     | µSec          |
|  | settling time to within ±1% of Vout                            |         |                   |         |               |
| Ripple and Noise, 1 & 10 µF output                   | Peak deviation   |         | ±200              | ±250    | mV            |
|  | 5 Hz- 20 MHz BW  |         | 20                | 80      | mV pk-pk      |
| Temperature Coefficient                              | At all outputs   |         | ±0.02             |         | % of Vnom./°C |
| Maximum Output Capacitance                           | ESR 0.02Ω min., resistive load                                 |         |                   | 6600    | µF            |

#### Notes

① Unless otherwise noted, units are specified with 1µF ceramic and 10µF tantalum external output capacitors in parallel (low ESR). The external input capacitor is 33µF, low ESR.

② Undervoltage shutdown is also available as a user-adjustable option.

③ Back ripple current input filter is Cin=33µF, Cbus=220µF, Lbus=12µH

④ Remove overload for recovery

⑤ Output may be shorted to ground with no damage.

### FUNCTIONAL SPECIFICATIONS, UCR100-120-T72 ①

| INPUT  | Conditions/Comments  | Minimum | Typical/Nominal   | Maximum | Units                     |
|--|--|---------|-------------------|---------|---------------------------|
| Operating voltage range, standard                    |  | 16.8    | 72                | 137.5   | Vdc                       |
| Surge and Transient Protection                       | Per EN50155, IEC60571 and RIA12                                |         |                   |         |                           |
| Input Limits, no damage                              | Operating or non-operating                                     | 0       |                   | 154     | Vdc                       |
| Input Filter   | Per EN50155, Symmetrical combined with VDR/transorb            |         |                   |         |                           |
| Reverse Polarity Protection                          | Yes, in conjunction with external fuse                         |         |                   |         | Vdc                       |
| Start-up threshold                                   |  | 11.5    | 15.0              | 16.3    | Vdc                       |
| Undervoltage shutdown ②                              | 50% load   | 10.3    | 12                | 14.8    | Vdc                       |
| Overvoltage shutdown                                 | 50% load   |         | 170               |         | Vdc                       |
| <b>Input current/power</b>                           |  |         |                   |         |                           |
| Full Load Current                                    |  |         | 1.54              | 1.99    | Amps                      |
| Peak Inrush Current                                  |  |         | 40                |         | Amps                      |
| Short Circuit Input Current                          |  |         | 0.05              | 0.1     | Amps                      |
| No Load Input Power                                  | I <sub>out</sub> = minimum                                     |         | 3.5               | 4.5     | Watts                     |
| Low Line Input Current                               | V <sub>in</sub> = minimum                                      |         | 7.05              | 9.37    | Amps                      |
| Shutdown Mode Input Current                          |  |         | 5                 | 10      | mA                        |
| Reflected (back) ripple current ③                    |  |         | 5                 | 10      | mA pk-pk                  |
| <b>GENERAL and SAFETY</b>                            |  |         |                   |         |                           |
| Efficiency   | V <sub>in</sub> = nom., 8A load                                | 84.5    | 86.5              |         | %                         |
|  | V <sub>in</sub> = 110V, 8A load                                | 86      | 87.5              |         | %                         |
|  | V <sub>in</sub> = 24V, 8A load                                 | 77      | 81                |         | %                         |
| Switching Frequency                                  |  | 90      | 100               | 110     | KHz                       |
| Turn-On Time   | V <sub>in</sub> on to V <sub>out</sub> regulated               |         | 150               | 160     | mS                        |
|  | Remote ON to V <sub>out</sub> regulated                        |         | 150               | 160     | mS                        |
| Isolation Voltage                                    | Input to output, case and aux. test                            | 2250    |                   |         | Vdc                       |
| Isolation Voltage                                    | Case to output and Aux. test voltage                           | 2250    |                   |         | Vdc                       |
| Subassemblies pre-tested per EN50116/60950           |  | 4200    |                   |         | Vdc                       |
| Isolation Safety Rating                              | Based on 250 VAC or 240 VDC I/O                                |         | Double/Reinforced |         |                           |
| Isolation Resistance                                 |  | 100     |                   |         | Mohm                      |
| Isolation Capacitance                                |  |         | 4000              |         | pF                        |
| Safety (Designed to meet the following requirements) | UL-60950-1, (2nd Edition), CSA-C22.2 No.60950-1, IEC/EN60950-1 |         | Yes               |         |                           |
| Calculated MTBF                                      | per MIL-HDBK-217F  |         |                   |         |                           |
|  | Ground benign, T <sub>case</sub> = 40°C                        |         | TBC               |         | Hours                     |
|  | Ground benign, T <sub>case</sub> = 40/70°C                     |         | TBC               |         | Hours                     |
|  | Ground benign, T <sub>case</sub> = 50°C                        |         | TBC               |         | Hours                     |
| <b>OUTPUT</b>  |  |         |                   |         |                           |
| Total Output Power                                   | Full temperature range   | 0.0     | 96                | 121.2   | Watts                     |
| <b>Voltage</b>                                       |  |         |                   |         |                           |
| Output Voltage Range                                 | V <sub>out</sub> = nominal                                     | 11.88   | 12.0              | 12.12   | Vdc                       |
| Setting Accuracy                                     | 50% load   |         | ±1                |         | % of V <sub>nom</sub> .   |
| Overvoltage Protection                               | magnetic feedback  | 13.5    | 14.4              | 15      | Vdc                       |
| V <sub>out</sub> Adjustment Range <optional>         |  | -10     |                   | 10      | % of V <sub>nom</sub> .   |
| <b>Current</b>                                       |  |         |                   |         |                           |
| Output Current Range                                 | V <sub>in</sub> = 16.8-137.5V.                                 | 0.0     | 8.0               | 10.0    | Amps                      |
| Current Limit Inception                              | 98% of V <sub>nom</sub> ., after warmup                        | 14      | 16                | 18      | Amps                      |
| Short Circuit Current                                | Hiccup technique, autorecovery within ±1% of V <sub>out</sub>  |         | 0.5               | 1       | Amps                      |
| Short Circuit Duration                               | Output shorted to ground                                       |         | Continuous        |         |                           |
| Short circuit protection method                      | Current limiting, hiccup autorestart                           |         |                   |         |                           |
| Line Regulation                                      | V <sub>in</sub> = min. to max.<br>V <sub>out</sub> = nom.      |         |                   | ±0.25   | % of V <sub>nom</sub> .   |
| Load Regulation                                      | I <sub>out</sub> = min. to max.                                |         |                   | ±0.25   | % of V <sub>nom</sub> .   |
| Dynamic Load Response                                | 50-75-50% load step  |         | 100               | 200     | µSec                      |
|  | settling time to within ±1% of V <sub>out</sub>                |         |                   |         |                           |
|  | Peak deviation   |         | ±200              | ±250    | mV                        |
| Ripple and Noise, 1 & 10 µF output capacitors        | 5 Hz- 20 MHz BW  |         | 50                | 75      | mV pk-pk                  |
| Temperature Coefficient                              | At all outputs   |         | ±0.02             |         | % of V <sub>nom</sub> /°C |
| Maximum Output Capacitance                           | ESR 0.02Ω min., resistive load                                 |         |                   | 3300    | µF                        |

#### Notes

① Unless otherwise noted, units are specified with 1µF ceramic and 10µF tantalum external output capacitors in parallel (low ESR). The external input capacitor is 33µF, low ESR.

② Undervoltage shutdown is also available as a user-adjustable option.

③ Back ripple current input filter is C<sub>in</sub>=33µF, C<sub>bus</sub>=220µF, L<sub>bus</sub>=12µH

④ Remove overload for recovery

⑤ Output may be shorted to ground with no damage.

### FUNCTIONAL SPECIFICATIONS, UCR100-240-T72 ①

| INPUT  | Conditions/Comments  | Minimum | Typical/Nominal   | Maximum | Units                      |
|--|--|---------|-------------------|---------|----------------------------|
| Operating voltage range, standard                    |  | 16.8    | 72                | 137.5   | Vdc                        |
| Surge and Transient Protection                       | Per EN50155, IEC60571 and RIA12                                |         |                   |         |                            |
| Input Limits, no damage                              | Operating or non-operating                                     | 0       |                   | 154     | Vdc                        |
| Input Filter   | Per EN50155, Symmetrical combined with VDR/transorb            |         |                   |         |                            |
| Reverse Polarity Protection                          | Supplied standard  |         | Yes               |         | Vdc                        |
| Start-up threshold                                   |  | 11.5    | 13.9              | 16.3    | Vdc                        |
| Undervoltage shutdown ②                              | 50% load   | 10.5    | 12.7              | 14.8    | Vdc                        |
| Overvoltage shutdown                                 | 50% load   |         | 170               |         | Vdc                        |
| <b>Input current/power</b>                           |  |         |                   |         |                            |
| Full Load Current                                    |  |         | 1.63              | 2.11    | Amps                       |
| Peak Inrush Current                                  |  |         | 40                |         | Amps                       |
| Short Circuit Input Current                          |  |         | 0.25              | 0.35    | Amps                       |
| No Load Input Power                                  | I <sub>out</sub> = minimum                                     |         | 3.5               | 4.5     | Watts                      |
| Low Line Input Current                               | V <sub>in</sub> = minimum                                      |         | 7.76              | 10.09   | Amps                       |
| Shutdown Mode Input Current                          |  |         | 5                 | 10      | mA                         |
| Reflected (back) ripple current ③                    |  |         | 5                 | 10      | mA pk-pk                   |
| <b>GENERAL and SAFETY</b>                            |  |         |                   |         |                            |
| Efficiency   | V <sub>in</sub> = nom., 4.4A load                              | 88      | 90                |         | %                          |
|  | V <sub>in</sub> = 110V, 4.4A load                              | 86.5    | 88.5              |         | %                          |
|  | V <sub>in</sub> = 24V, 4.4A load                               | 79      | 81                |         | %                          |
| Switching Frequency                                  |  | 90      | 100               | 110     | KHz                        |
| Turn-On Time   | V <sub>in</sub> on to V <sub>out</sub> regulated               |         | 150               | 160     | mS                         |
|  | Remote ON to V <sub>out</sub> regulated                        |         | 150               | 160     | mS                         |
| Isolation Voltage                                    | Input to output, case and aux. test                            | 2250    |                   |         | Vdc                        |
| Isolation Voltage                                    | Case to output and Aux. test voltage                           | 2250    |                   |         | Vdc                        |
| Subassemblies pre-tested per EN50116/60950           |  | 4200    |                   |         | Vdc                        |
| Isolation Safety Rating                              | Based on 250 VAC or 240 VDC I/O                                |         | Double/Reinforced |         |                            |
| Isolation Resistance                                 |  | 100     |                   |         | Mohm                       |
| Isolation Capacitance                                |  |         | 4000              |         | pF                         |
| Safety (Designed to meet the following requirements) | UL-60950-1, (2nd Edition), CSA-C22.2 No.60950-1, IEC/EN60950-1 |         | Yes               |         |                            |
| Calculated MTBF                                      | per MIL-HDBK-217F  |         |                   |         |                            |
|  | Ground benign, T <sub>case</sub> = 40°C                        |         | TBC               |         | Hours                      |
|  | Ground benign, T <sub>case</sub> = 40/70°C                     |         | TBC               |         | Hours                      |
|  | Ground benign, T <sub>case</sub> = 50°C                        |         | TBC               |         | Hours                      |
| <b>OUTPUT</b>  |  |         |                   |         |                            |
| Total Output Power                                   | Full temperature range   | 0.0     | 105.6             | 133.98  | Watts                      |
| <b>Voltage</b>                                       |  |         |                   |         |                            |
| Output Voltage Range                                 | V <sub>out</sub> = nominal                                     | 23.64   | 24.0              | 24.36   | Vdc                        |
| Setting Accuracy                                     | 50% load   |         | ±1.5              |         | % of V <sub>nom.</sub>     |
| Overvoltage Protection                               | magnetic feedback  | 27      | 28.5              | 30      | Vdc                        |
| V <sub>out</sub> Adjustment Range <optional>         |  | -10     |                   | 10      | % of V <sub>nom.</sub>     |
| <b>Current</b>                                       |  |         |                   |         |                            |
| Output Current Range                                 | V <sub>in</sub> = 16.8-137.5V.                                 | 0.0     | 4.4               | 5.5     | Amps                       |
| Current Limit Inception                              | 98% of V <sub>nom.</sub> , after warmup                        | 6.5     | 7.75              | 9.5     | Amps                       |
| Short Circuit Current                                | Hiccup technique, autorecovery within ±1% of V <sub>out</sub>  |         | 0.5               | 1       | Amps                       |
| Short Circuit Duration                               | Output shorted to ground                                       |         | Continuous        |         |                            |
| Short circuit protection method                      | Current limiting, hiccup autorestart                           |         |                   |         |                            |
| Line Regulation                                      | V <sub>in</sub> = min. to max.<br>V <sub>out</sub> = nom.      |         |                   | ±0.25   | % of V <sub>nom.</sub>     |
| Load Regulation                                      | I <sub>out</sub> = min. to max.                                |         |                   | ±0.25   | % of V <sub>nom.</sub>     |
| Dynamic Load Response                                | 50-75-50% load step  |         | 100               | 200     | µSec                       |
|  | settling time to within ±1% of V <sub>out</sub>                |         |                   |         |                            |
|  | Peak deviation   |         | ±200              | ±250    | mV                         |
| Ripple and Noise, 1 & 10 µF output                   | 5 Hz- 20 MHz BW  |         | 100               | 150     | mV pk-pk                   |
| Temperature Coefficient                              | At all outputs   |         | ±0.02             |         | % of V <sub>nom.</sub> /°C |
| Maximum Output Capacitance                           | ESR 0.02Ω min., resistive load                                 |         |                   | 1200    | µF                         |

#### Notes

① Unless otherwise noted, units are specified with 1µF ceramic and 10µF tantalum external output capacitors in parallel (low ESR). The external input capacitor is 33µF, low ESR.

- ② Undervoltage shutdown is also available as a user-adjustable option.
- ③ Back ripple current input filter is C<sub>in</sub>=33µF, C<sub>bus</sub>=220µF, L<sub>bus</sub>=12µH
- ④ Remove overload for recovery
- ⑤ Output may be shorted to ground with no damage.

### FUNCTIONAL SPECIFICATIONS FOR ALL MODELS, CONTINUED

| FEATURES and OPTIONS   | Conditions/Comments                                  | Minimum | Typical/Nominal  | Maximum | Units     |
|--|--|---------|------------------|---------|-----------|
| <b>Remote On/Off Control</b>                                   |  |         |                  |         |           |
|  | Negative logic                                       |         |                  |         |           |
| Unit is OFF  | Pin open or external voltage                         | 2.5     |                  | 50      | Vdc       |
| Unit is ON   |  | -0.5    |                  | 0.8     | Vdc       |
| Shutdown Current   | Open collector/drain                                 |         | 1                | 2       | mA        |
| Remote Sense   | Sense pins connected externally to respective Vout's |         |                  | 10      | %         |
| Vout trim  |  | -10     |                  | +10     | % of Vout |
| Pre-biased startup   | External voltage < Vset                              |         | Monotonic        |         |           |
| <b>Isolated Vout "OK" Signal &lt;optional&gt; ("S" suffix)</b> |  |         |                  |         |           |
| Vout ready (LO)  | Iok < 0.5 mA   |         | 0.8              | 1.0     | Vdc       |
| Vout fail (HI)   | External Vok < 15V.                                  |         |                  | 25      | μA        |
| Current Share <optional>                                       | "S" or "SV" suffix                                   |         | ±20              |         | % of Iout |
| External Cap Hold-up Time <"V" or "SV" suffix>                 | See Hold-up Time note                                | 10      |                  |         | mS        |
| Input Undervoltage Lockout <"V" or "SV" suffix>                | See Input Undervoltage Lockout note                  |         |                  |         |           |
| <b>MECHANICAL</b>  |  |         |                  |         |           |
| Outline Dimensions   |  |         | 4.38x0.81x6.52   |         | Inches    |
| please refer to Mechanical Specifications                      |  |         | 111x20.3x165.5   |         | mm        |
| Weight: UCR100-050-T72, UCR100-120-T72                         |  |         | 18               |         | Ounces    |
|  |  |         | 510              |         | Grams     |
| Weight: UCR100-240-T72   |  |         | 21               |         | Ounces    |
|  |  |         | 595              |         | Grams     |
| Case Material  |  |         | Aluminum         |         |           |
| Rear Connector   | P87 pinout, per DIN41612                             |         | H15              |         |           |
| EMI/RFI Shielding  |  |         | Provided by case |         |           |
| <b>ENVIRONMENTAL</b>   |  |         |                  |         |           |
| Operating Ambient Temperature Range                            | See Performance Data for temperature derating curves | -40     |                  | 71      | °C        |
| Absolute Operating Temperature Range                           | With derating  | -40     |                  | 95      | °C        |
| Storage Temperature  | Vin = Zero (no power)                                | -55     |                  | 125     | °C        |
| Thermal Protection/Shutdown                                    | Measured at case center                              | 105     | 110              | 120     | °C        |
| <b>Electromagnetic Interference (pending)</b>                  |  |         |                  |         |           |
| Conducted, EN55022/CISPR22                                     | Measure within 19" rack                              |         |                  |         |           |
| Radiated, EN55022/CISPR22                                      |  |         |                  |         |           |
| Relative humidity, non-condensing                              |  |         | To +85°C/85%     |         |           |
| <b>ABSOLUTE MAXIMUM RATINGS</b>                                |  |         |                  |         |           |
| Input Voltage, Transient                                       | Operating or non-operating, 100 mS max.              | 0       |                  | 154     | Vdc       |
| Input Reverse Polarity   |  |         | Yes              |         | Vdc       |
| On/Off Control   | Power on or off, referred to -Vin                    | -0.5    |                  | 50      | Vdc       |
| Storage Temperature Range                                      | Vin = Zero (no power)                                | -55     |                  | 125     | °C        |

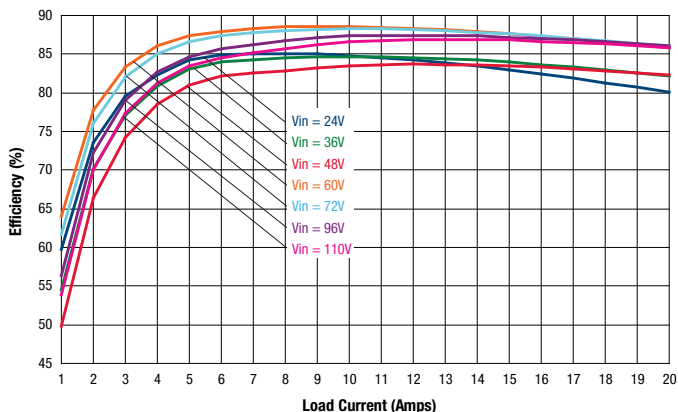
### Notes

- ① Unless otherwise noted, units are specified with 1μF ceramic and 10μF tantalum external output capacitors in parallel (low ESR). The external input capacitor is 33μF, low ESR.
- ② Undervoltage shutdown is also available as a user-adjustable option.

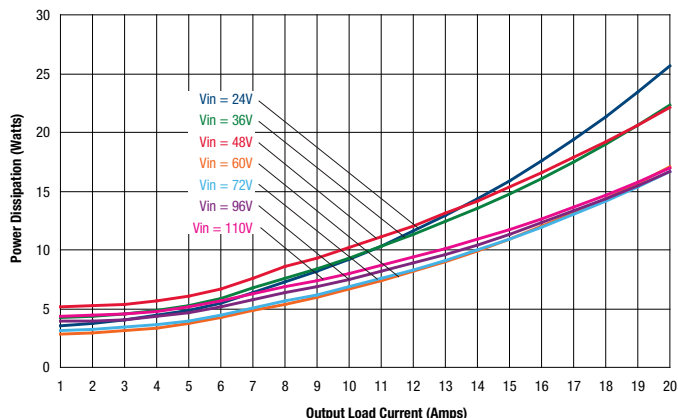
- ③ Back ripple current input filter is Cin=33μF, Cbus=220μF, Lbus=12μH
- ④ Remove overload for recovery
- ⑤ Output may be shorted to ground with no damage.

**PERFORMANCE DATA, UCR100-050-T72-C**

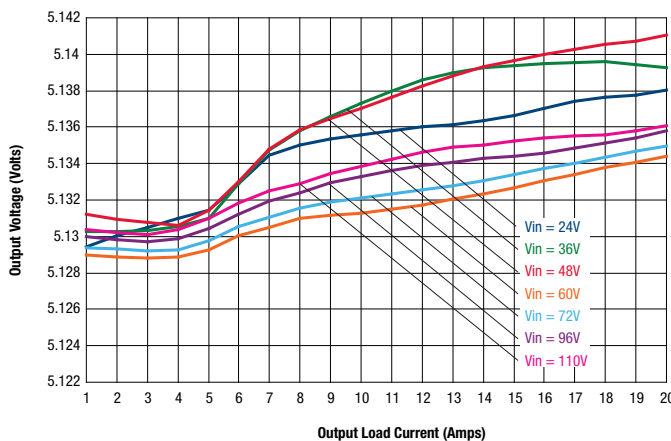
Efficiency vs. Line Voltage and Load Current @ Ta = +25°C



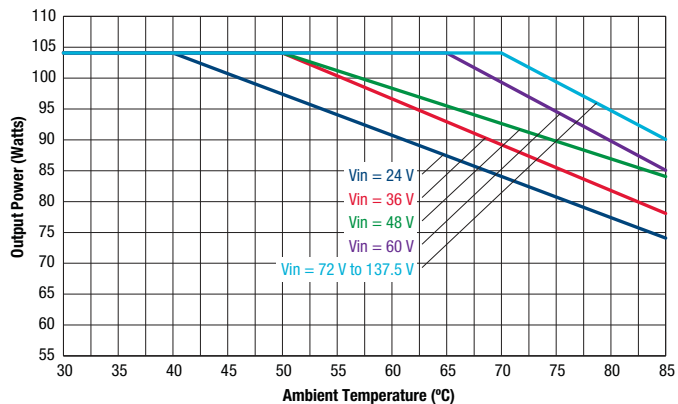
Power Dissipation vs. Load Current @ Ta = +25°C



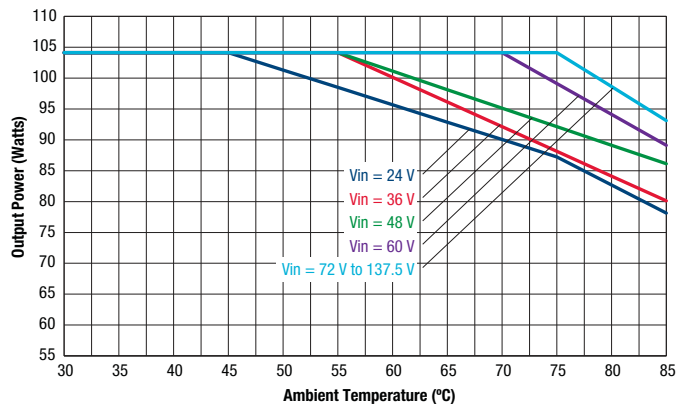
Output Voltage Vs. Input Line Voltage and Output Load Current



Maximum Power Temperature Derating at Sea Level  
Natural Convection



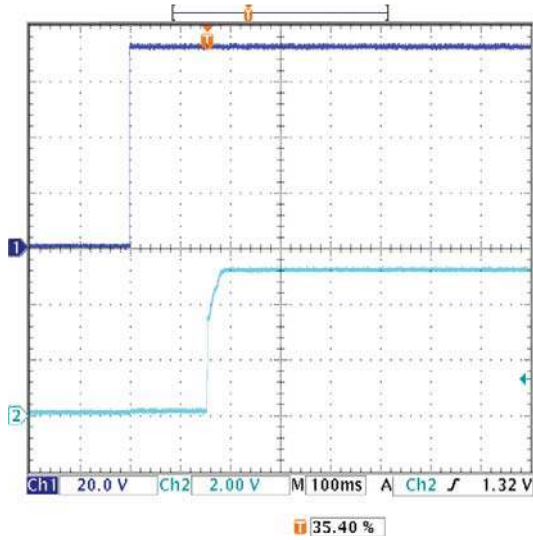
Maximum Power Temperature Derating at Sea Level  
100 LFM (air flow from Rear Panel to Input Conn.)



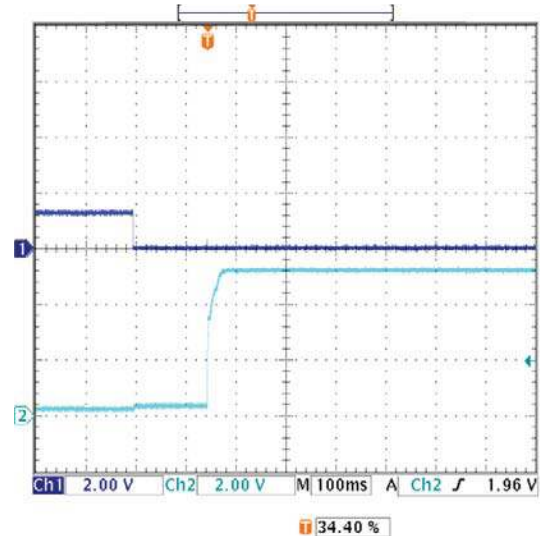


**PERFORMANCE DATA, UCR100-050-T72-C**

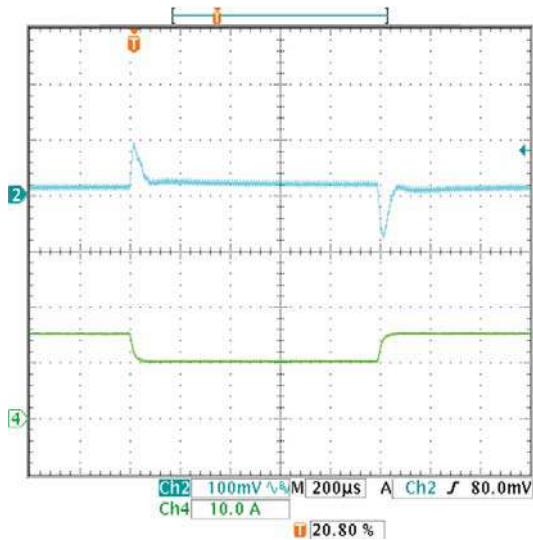
Start-up Delay (Vin=72V, Vout=nom, Iout=20A, Cload=8000uF, Ta=+25°C)  
Trace1=Vin, Trace 2=Vout.



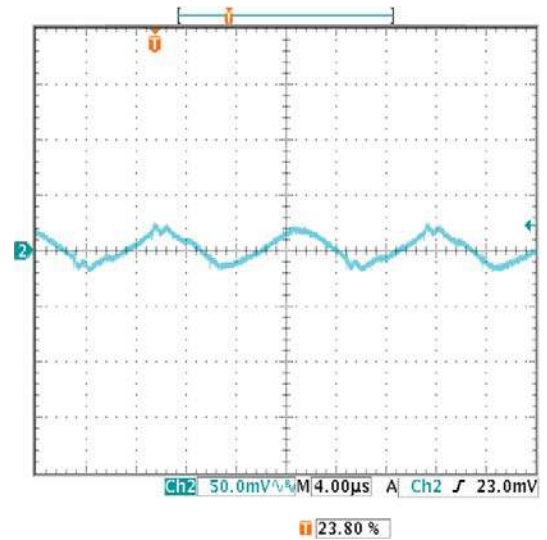
On/Off Enable Start-up (Vin=72V, Vout=nom, Iout=20A, Cload=8000uF, Ta=+25°C) Trace1=Vin, Trace 2=Vout.



Step Load Transient Response (Vin=72V, Vout=nom, Cload= 10uF || 1uF, Iout=50-75-50% of full load (Iout=10A/Div), Ta=+25°C)



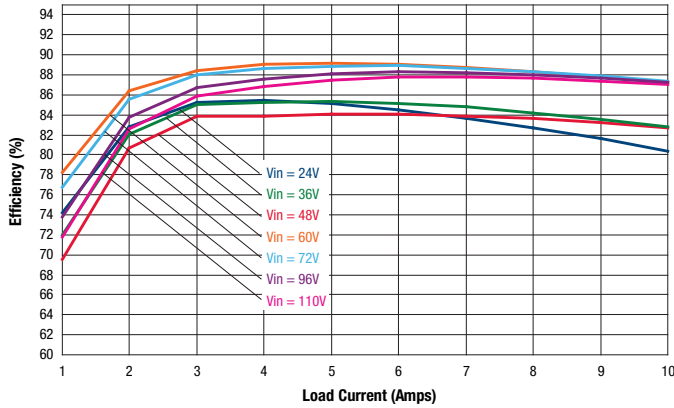
Output Ripple and Noise (Vin=72V, Iout=20A, Cload= 10uF || 1uF, Ta=+25°C)



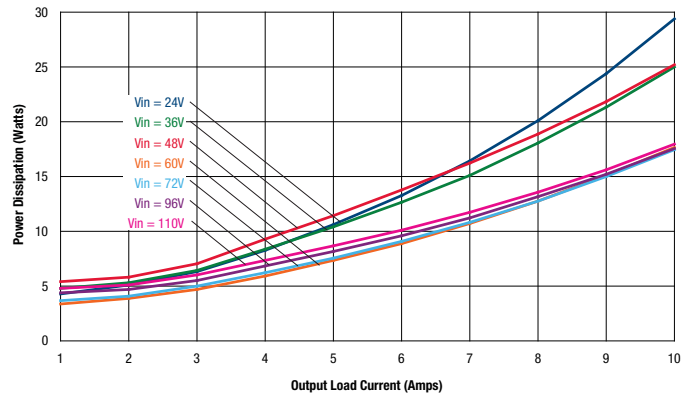


**PERFORMANCE DATA, UCR100-120-T72-C**

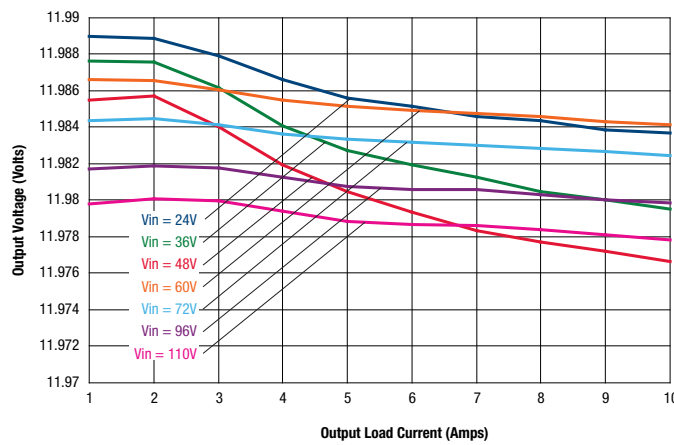
Efficiency vs. Line Voltage and Load Current @ Ta = +25°C



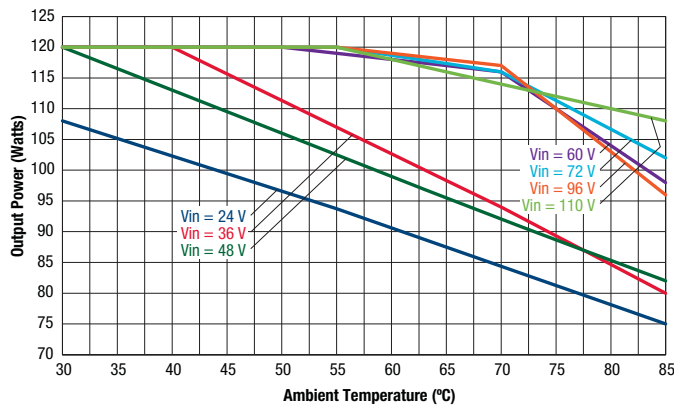
Power Dissipation vs. Load Current @ Ta = +25°C



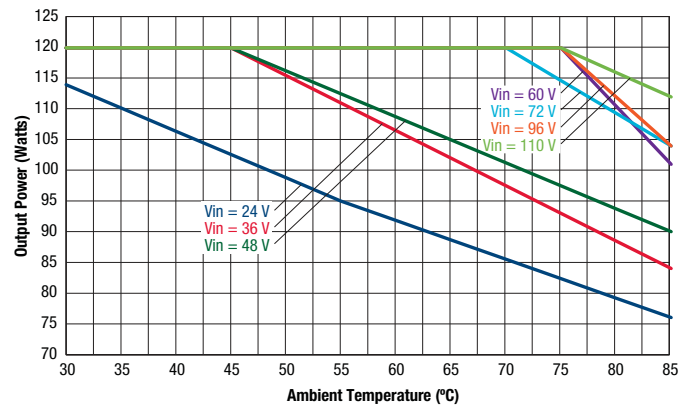
Output Voltage Vs. Input Line Voltage and Output Load Current



Maximum Power Temperature Derating at Sea Level  
Natural Convection

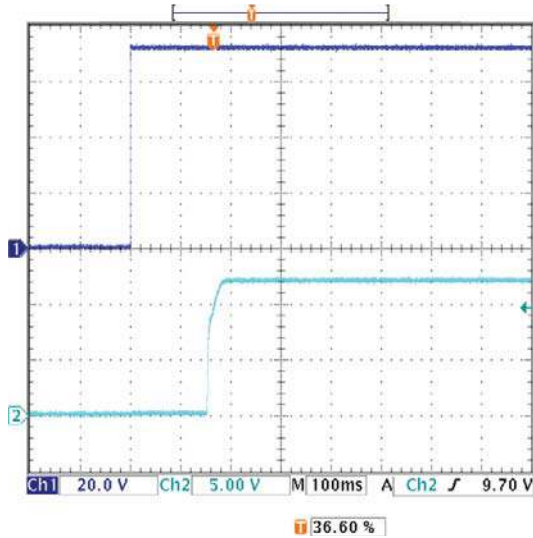


Maximum Power Temperature Derating at Sea Level  
100 LFM (air flow from Rear Panel to Input Conn.)

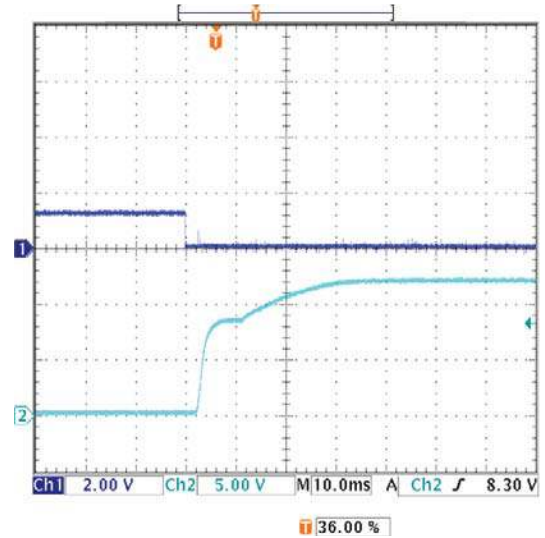


**PERFORMANCE DATA, UCR100-120-T72-C**

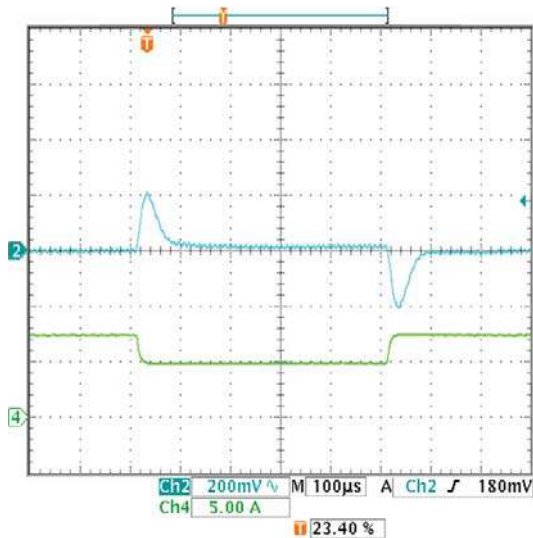
Start-up Delay (Vin=72V, Vout=nom, Iout=10A, Cload=4700uF, Ta=+25°C)  
Trace1=Vin, Trace 2=Vout.



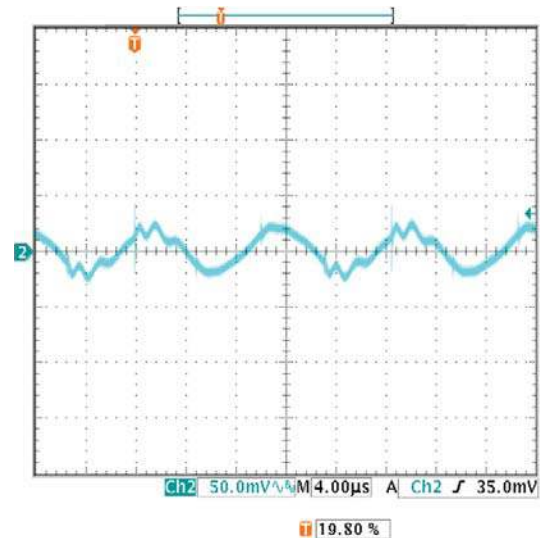
On/Off Enable Start-up (Vin=72V, Vout=nom, Iout=10A, Cload=3300uF, Ta=+25°C) Trace1=Vin, Trace 2=Vout.



Step Load Transient Response (Vin=72V, Vout=nom, Cload= 10uF || 1uF, Iout=50-75-50% of full load (Iout=5A/Div), Ta=+25°C)

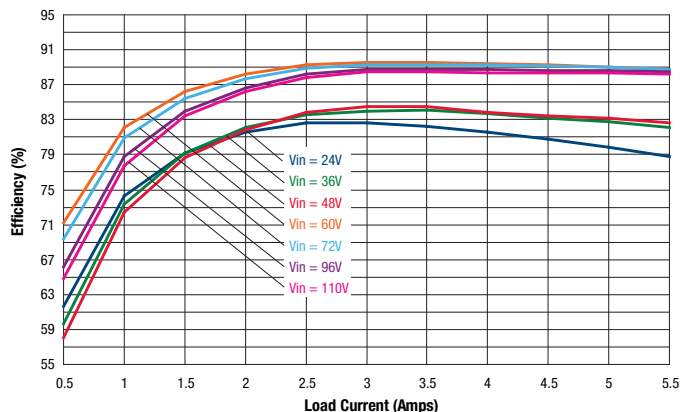


Output Ripple and Noise (Vin=72V, Iout=10A, Cload= 10uF || 1uF, Ta=+25°C)

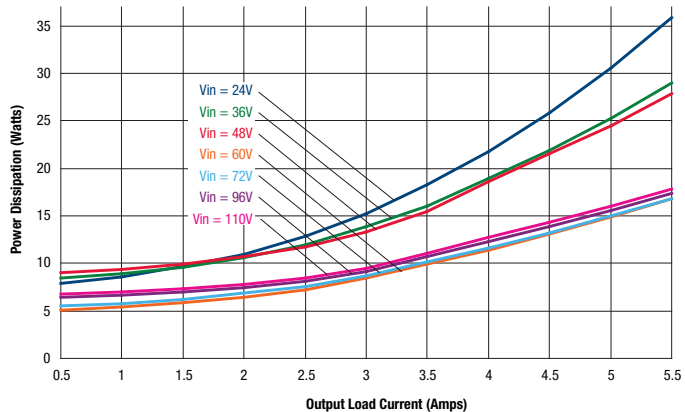


**PERFORMANCE DATA, UCR100-240-T72-C**

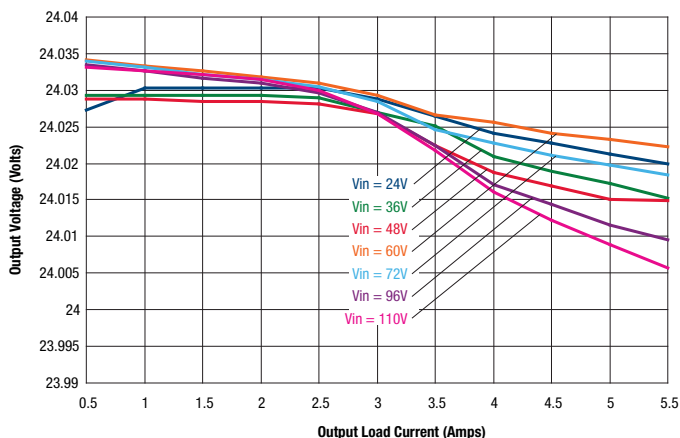
Efficiency vs. Line Voltage and Load Current @ Ta = +25°C



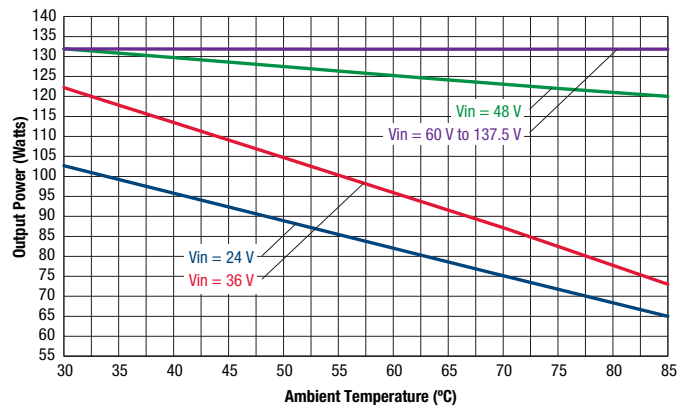
Power Dissipation vs. Load Current @ Ta = +25°C



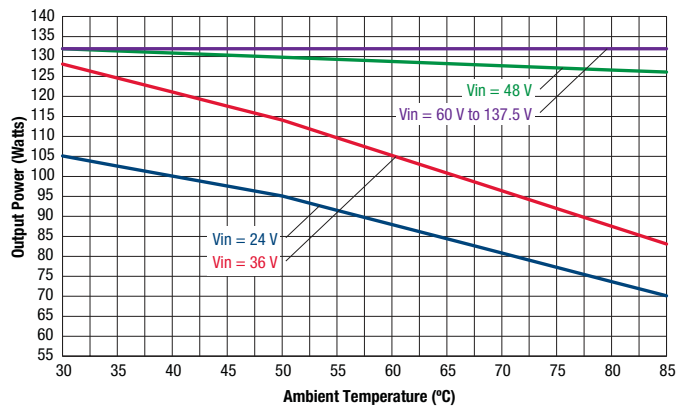
Output Voltage Vs. Input Line Voltage and Output Load Current



Maximum Power Temperature Derating at Sea Level  
Natural Convection

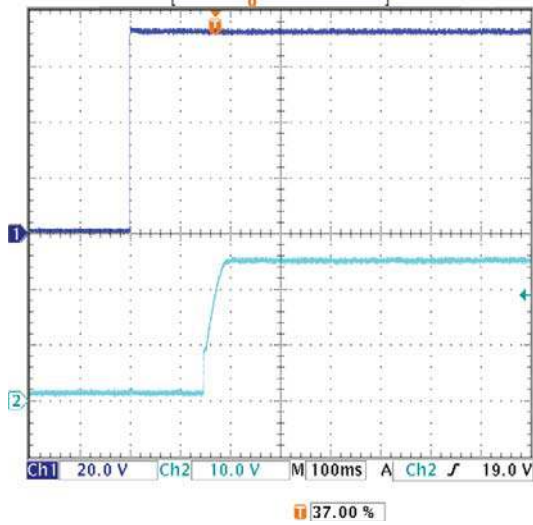


Maximum Power Temperature Derating at Sea Level  
100 LFM (air flow from Rear Panel to Input Conn.)

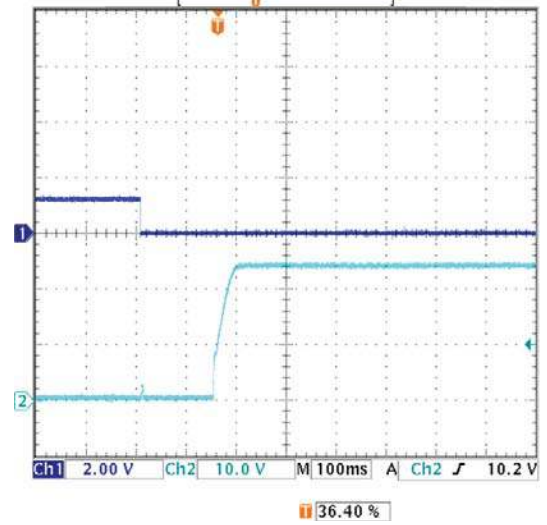


**PERFORMANCE DATA, UCR100-240-T72-C**

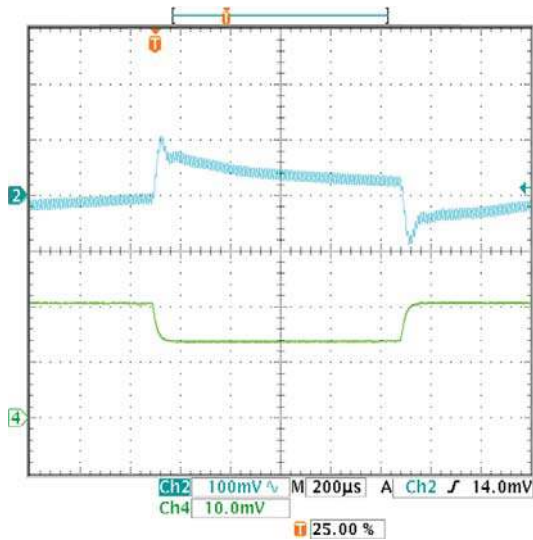
Start-up Delay (Vin=72V, Vout=nom, Iout=5.5A, Cload=1200uF, Ta=+25°C)  
Trace1=Vin, Trace 2=Vout.



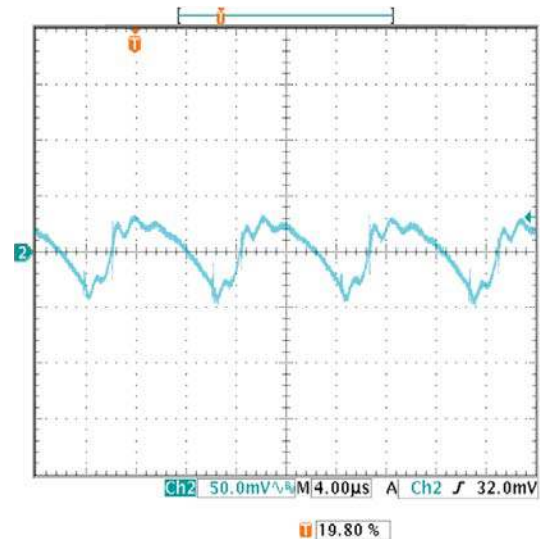
On/Off Enable Start-up (Vin=72V, Vout=nom, Iout=5.5A, Cload=1200uF, Ta=+25°C) Trace1=Vin, Trace 2=Vout.



Step Load Transient Response (Vin=72V, Vout=nom, Cload= 10uF || 1uF, Iout=50-75-50% of full load (Iout=2A/Div), Ta=+25°C)

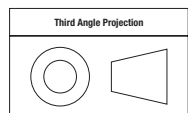


Output Ripple and Noise (Vin=72V, Iout=5.5A, Cload= 10uF || 1uF, Ta=+25°C)



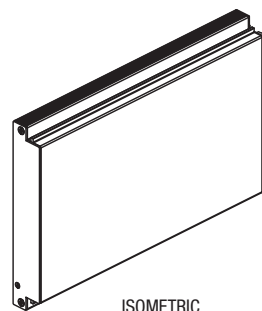
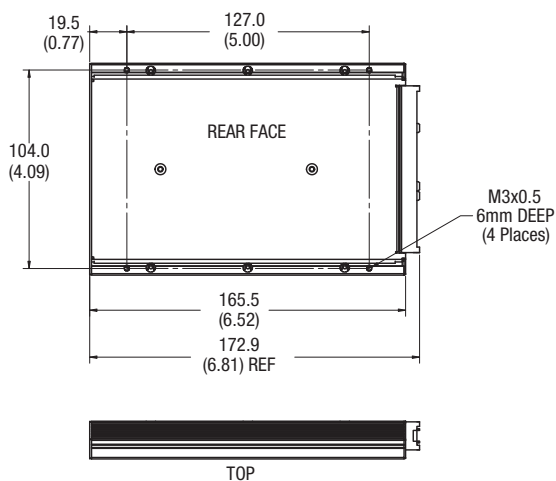
**MECHANICAL SPECIFICATIONS**

Dimensions are in mm (inches shown for ref. only).



Tolerances (unless otherwise specified):  
 .XX ± 0.02 (0.5)  
 .XXX ± 0.010 (0.25)  
 Angles ± 1°

Components are shown for reference only.



4 TE Module Slot (REF ONLY)

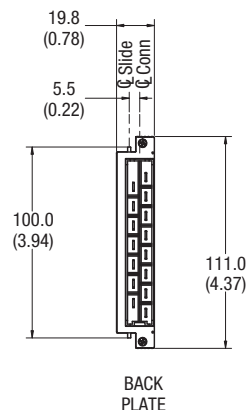
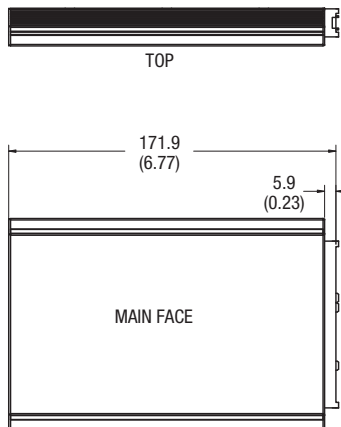
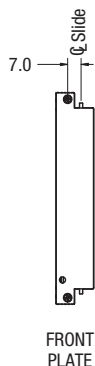
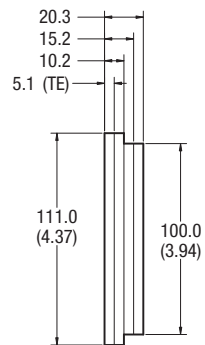


Figure 2. Case C90

**TABLE 2. PIN ALLOCATION**

| Pin | Function                  | Standard | Option "S"    | Option "V" | Option "SV"   |
|-----|---------------------------|----------|---------------|------------|---------------|
| 4   | Output Voltage (positive) | +Vout    | +Vout         | +Vout      | +Vout         |
| 6   | Output Voltage (positive) | +Vout    | +Vout         | +Vout      | +Vout         |
| 8   | Output Voltage (negative) | -Vout    | -Vout         | -Vout      | -Vout         |
| 10  | Output Voltage (negative) | -Vout    | -Vout         | -Vout      | -Vout         |
| 12  | Remote Sense (positive)*  | +Sense   | +Sense        | +Sense     | +Sense        |
| 14  | Remote Sense (negative)*  | -Sense   | -Sense        | -Sense     | -Sense        |
| 16  | Output Voltage Trim       | Trim     | Trim          | Trim       | Trim          |
| 18  | Current Share             | NA***    | Current Share | NA***      | Current Share |
| 20  | Not Connected             | NC       | NC            | NC         | NC            |
| 22  | + Vout OK / Hold-up       | NC       | +Vout OK      | H-UP       | H-UP          |
| 24  | - Vout OK / UVLO          | NC       | -Vout OK      | UVLO       | UVLO          |
| 26  | Protective Earth*         | PE       | PE            | PE         | PE            |
| 28  | Remote On/Off**           | On/Off   | On/Off        | On/Off     | On/Off        |
| 30  | Input Voltage (positive)  | +Vin     | +Vin          | +Vin       | +Vin          |
| 32  | Input Voltage (negative)  | -Vin     | -Vin          | -Vin       | -Vin          |

\* Leading pin (connect first, break last)

\*\* Connect to -Vin if not used

\*\*\* Pin is disconnected internally

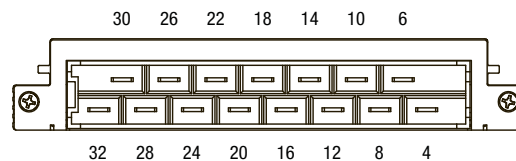
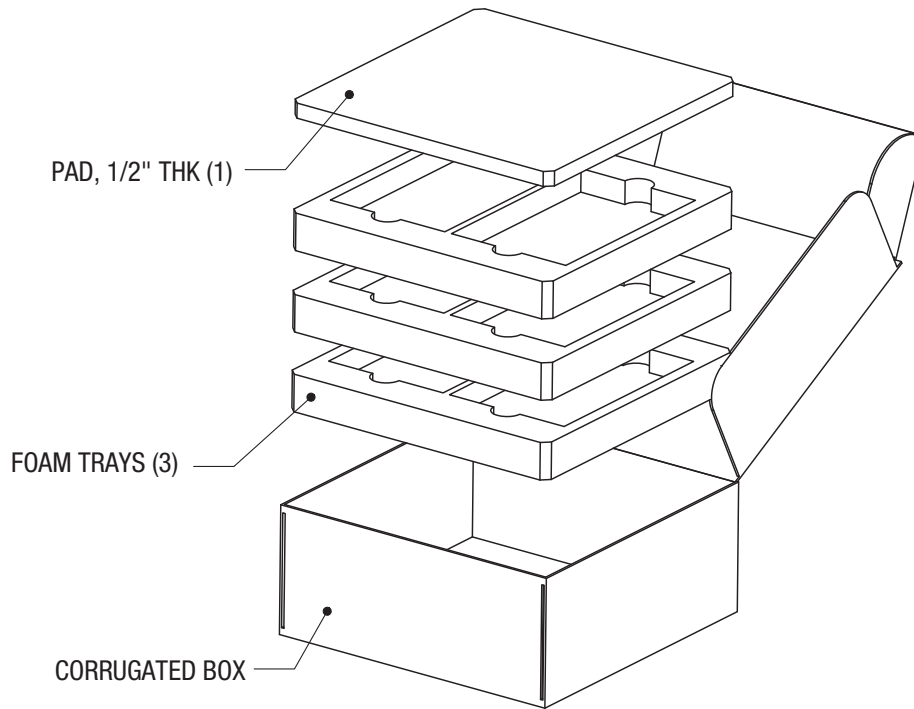


Figure 3. Rear connector detail

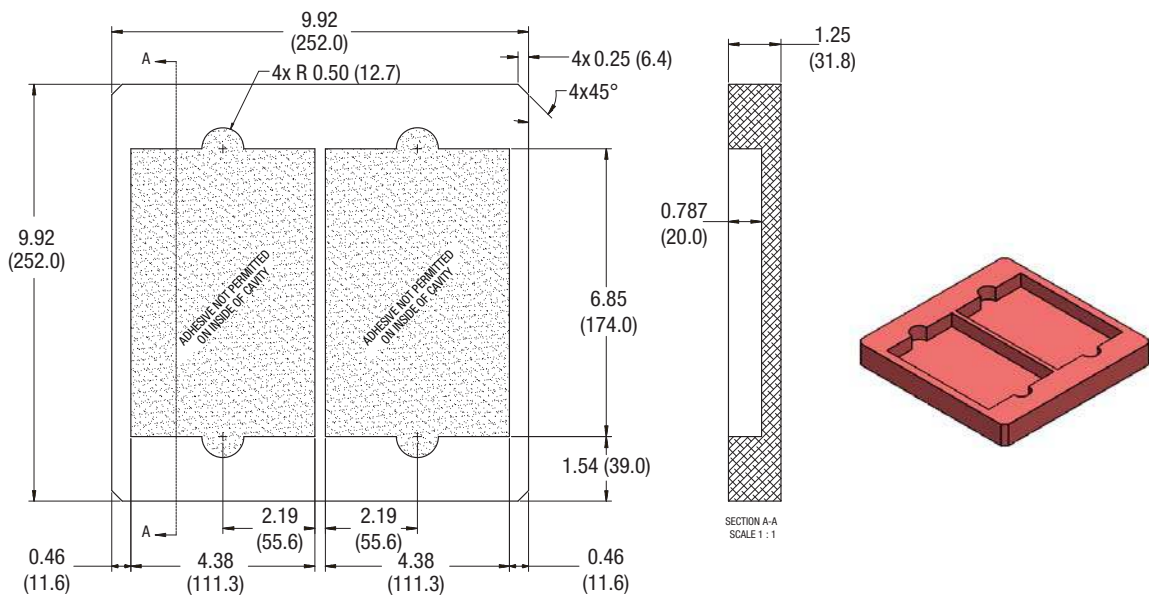
When using units with the load share option in stand-alone operation with the remote sense feature, the load share pin must be connected to -Vout. This does not apply if the remote sense lines are connected directly at the connector.

Pinout P87

**SHIPPING TRAYS AND BOXES (3 TRAYS PER CARTON, 6 UNITS PER CARTON)**



**SHIPPING TRAY DIMENSIONS (2 UNITS PER TRAY)**



MATERIAL: DOW 220 ANTISTAT ETHAFOAM  
(DENSITY: 34-35 Kg/m<sup>3</sup>)



### Electromagnetic Compatibility (EMC) Immunity:

A transorb diode together with a symmetrical input filter form an effective protection against high input transient voltages, which typically occur in most installations, but especially in battery-driven mobile applications. The UCR-Series are tested to the following specifications:

| Phenomenon                       | Standard              | Level               | Coupling mode ①           | Value applied                | Waveform   | Source impedance | Test procedure  | In operation                           | Perf. crit. ② |
|----------------------------------|-----------------------|---------------------|---------------------------|------------------------------|--|------------------|---|--|---------------|
| Supply related surge             | RIA 12                | B                   | +i/- i                    | $1.5 \times V_{\text{batt}}$ | 0.1/1/0.1 s  | 0.2 $\Omega$     | 1 positive surge  | yes                                    | A             |
|                                  | EN 50155              |                     |                           | $1.4 \times V_{\text{batt}}$ |  | 1 $\Omega$       |   |  |               |
| Direct transients                | RIA 12 EN 50155: 1995 | D ④                 | -i/c, +i/-i               | 1800 V <sub>p</sub>          | 5/50 $\mu$ s   | 5 $\Omega$       | 5 pos. and 5 neg. impulses                                  | yes                                    | A             |
|                                  |                       | G ⑤                 |                           | 8400 V <sub>p</sub>          | 0.05/0.1 $\mu$ s   | 100 $\Omega$     |   |  |               |
| H                                |                       | 1800 V <sub>p</sub> | 5/50 $\mu$ s              | 100 $\Omega$                 |  |                  |   |  |               |
| L                                |                       | 8400 V <sub>p</sub> | 0.05/0.1 $\mu$ s          |                              | 100 $\Omega$   |                  |   |  |               |
| Indirect coupled transients      | IEC/EN 61000-4-2      | 4 ⑥                 | contact discharge         | 8000 V <sub>p</sub>          |  | 1/50 ns          | 330 $\Omega$  | 10 positive and 10 negative discharges | yes           |
|                                  |                       |                     | air discharge             | 15000 V <sub>p</sub>         |  |                  |   |  |               |
| Electromagnetic field            | IEC/EN 61000-4-3      | x ⑦                 | antenna                   | 20 V/m                       | AM 80% 1 kHz   | n.a.             | 80 – 1000 MHz   | yes                                    | A             |
|                                  | ENV 50204             | 4 ⑩                 | antenna                   | 30 V/m                       | 50% duty cycle, 200 Hz repetition frequency              | n.a.             | 900 $\pm$ 5 MHz   | yes                                    | A             |
| Electrical fast transients/burst | IEC/EN 61000-4-4      | 4 ⑧                 | capacitive, o/c           | 2000 V <sub>p</sub>          | bursts of 5/50 ns 5 kHz over 15 ms; burst period: 300 ms | 50 $\Omega$      | 60 s positive<br>60 s negative transients per coupling mode | yes                                    | B             |
|                                  |                       |                     | direct, +i/c, -i/c, +i/-i | 4000 V <sub>p</sub>          |  |                  |   |  |               |
| Surges                           | IEC/EN 61000-4-5      | 3 ③                 | i/c                       | 2000 V <sub>p</sub> ③        | 1.2/50 $\mu$ s   | 12 $\Omega$      | 5 pos. and 5 neg. surges per coupling mode                  | yes                                    | B             |
|                                  |                       | 2 ③                 | +i/-i                     | 1000 V <sub>p</sub> ③        |  | 2 $\Omega$       |   |  |               |
| Conducted disturbances           | IEC/EN 61000-4-6      | 3 ⑨                 | i, o, signal wires        | 10 VAC (140 dB $\mu$ V)      | AM 80% 1 kHz   | 150 $\Omega$     | 0.15 – 80 MHz   | yes                                    | A             |

① i = input, o = output, c = case.

② A = Normal operation, no deviation from specs, B = Temporary deviation from specs possible.

③ Measured with an external input capacitor specified in table 4 of the standard.

④ Corresponds to EN 50155:2001, waveform A, and EN 50121-3-2:2000, table 7.2.

⑤ Corresponds to EN 50155:2001, waveform B.

⑥ Corresponds to EN 50121-3-2:2000, table 9.2.

⑦ Corresponds to EN 50121-3-2:2000, table 9.1.

⑧ Corresponds to EN 50121-3-2:2000, table 7.1.

⑨ Corresponds to EN 50121-3-2:2000, table 7.4.

⑩ Fulfills also EN 50121-5:2000, table 1.2, where ENV 50204 is referenced.

### Immunity to Environmental Conditions

| Test method |  | Standard  | Test Conditions   | Status                  |
|-------------|--|---|---|-------------------------|
| Cab         | Damp heat steady state   | IEC/EN 60068-2-78<br>MIL-STD-810D section 507.2             | Temperature: 40 ±2 °C<br>Relative humidity: 93 +2/-3 %<br>Duration: 56 days   | Converter not operating |
| Kb          | Salt mist, cyclic (sodium chloride NaCl solution)                | IEC/EN 60068-2-52   | Concentration: 5% (30°C) for 2 hours<br>Storage: 40°C, 93% rel. humidity for 22 hours<br>Number of cycles: 3 (= 3 days)   | Converter not operating |
| Eb          | Bump (half-sinusoidal)   | IEC/EN 60068-2-29<br>MIL-STD-810D section 516.3             | Acceleration amplitude: 25 g <sub>n</sub> = 245 m/s <sup>2</sup><br>Bump duration: 11 ms<br>Number of bumps: 6000 (1000 in each direction)  | Converter operating     |
| Fc          | Vibration (sinusoidal)   | IEC/EN 60068-2-6<br>MIL-STD-810D section 514.3              | Acceleration amplitude: 0.35 mm (10 – 60 Hz)<br>5 g <sub>n</sub> = 49 m/s <sup>2</sup> (60 - 2000 Hz)<br>Frequency (1 Oct/min): 10 – 2000 Hz<br>Test duration: 7.5 hours (2.5 hours in each axis)     | Converter operating     |
| Ea          | Shock (half-sinusoidal)  | IEC/EN 60068-2-27<br>MIL-STD-810D section 516.3             | Acceleration amplitude: 50 g <sub>n</sub> = 490 m/s <sup>2</sup><br>Bump duration: 11 ms<br>Number of bumps: 18 (3 in each direction)   | Converter operating     |
| --          | Shock  | EN 50155 / EN 61373 sect. 10, class A and B body mounted ①  | Acceleration amplitude: 5.1 g <sub>n</sub><br>Bump duration: 30 ms<br>Number of bumps: 18 (3 in each direction)   | Converter operating     |
| Fda         | Random vibration wide band Reproducibility high                  | IEC/EN 60068-2-35<br>DIN 40046 part 23                      | Acceleration spectral density: 0.05 g <sub>n</sub> <sup>2</sup> /Hz<br>Frequency band: 20 – 500 Hz<br>Acceleration magnitude: 4.9 g <sub>n rms</sub><br>Test duration: 3 hours (1 hour in each axis)  | Converter operating     |
| --          | Simulated long life testing at increased random vibration levels | EN 50155 / EN 61373 sect. 9, cat 1, class B, body mounted ① | Acceleration spectral density: 0.02 g <sub>n</sub> <sup>2</sup> /Hz<br>Frequency band: 5 – 150 Hz<br>Acceleration magnitude: 0.8 g <sub>n rms</sub><br>Test duration: 15 hours (5 hours in each axis) | Converter operating     |

① Body mounted = chassis of a railway coach

### Technical Notes

#### Start-Up Threshold and Undervoltage Shutdown

Under normal start-up conditions, the UCR Series will not begin to regulate properly until the ramping input voltage exceeds the Start-Up Threshold. Once operating, devices will turn off when the applied voltage drops below the Undervoltage Shutdown point. Devices will remain off as long as the undervoltage condition continues. Units will automatically re-start when the applied voltage is brought back above the Start-Up Threshold. The hysteresis built into this function avoids an indeterminate on/off condition at a single input voltage. See Performance/Functional Specifications table for actual limits.

#### Start-Up Time

The V<sub>IN</sub> to V<sub>OUT</sub> Start-Up Time is the interval between the point at which a ramping input voltage crosses the Start-Up Threshold voltage and the point at which the fully loaded output voltage enters and remains within its specified ±1% accuracy band. Actual measured times will vary with input source impedance, external input capacitance, and the slew rate and final value of the input voltage as it appears to the converter. The On/Off to V<sub>OUT</sub> start-up time assumes that the converter is turned off via the Remote On/Off Control with the nominal input voltage already applied.

#### On/Off Control

The primary-side, Remote On/Off Control function is off when On/Off is high/open and on when On/Off is pulled low or grounded. See Figure 4.

Dynamic control of the remote on/off function is best accomplished with a mechanical relay or an open-collector/open-drain drive circuit (optically isolated if appropriate). The drive circuit should be able to sink appropriate current (see Performance Specifications) when activated and withstand appropriate voltage when deactivated.

#### Current Limiting

When power demands from the output falls within the current limit inception range for the rated output current, the DC-DC converter will go into a current limiting mode. In this condition the output voltage will decrease proportionately with increases in output current, thereby maintaining a somewhat constant power dissipation. This is commonly referred to as power limiting. Current limit inception is defined as the point where the full-power output voltage falls below the specified tolerance. If the load current being drawn from the converter is significant enough, the unit will go into a short circuit condition. See “Short Circuit Condition.”

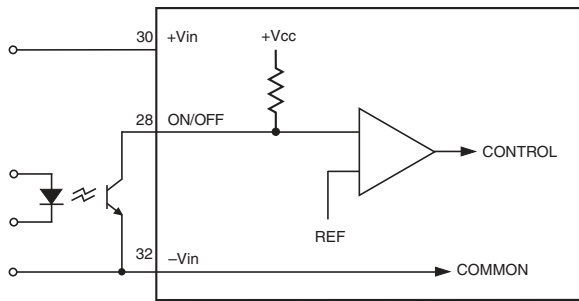


Figure 4. Driving the Remote On/Off Control Pin

**Short Circuit Condition**

When a converter is in current limit mode the output voltages will drop as the output current demand increases. If the output voltage drops too low, the magnetically coupled voltage used to develop primary side voltages will also drop, thereby shutting down the PWM controller. Following a time-out period, the PWM will restart, causing the output voltages to begin ramping to their appropriate values. If the short-circuit condition persists, another shutdown cycle will be initiated. This on/off cycling is referred to as “hiccup” mode. The hiccup cycling reduces the average output current, thereby preventing internal temperatures from rising to excessive levels. The UCR is capable of enduring an indefinite short circuit output condition.

**Thermal Shutdown**

UCR converters are equipped with thermal-shutdown circuitry. If the internal temperature of the DC-DC converter rises above the designed operating temperature (See Performance Specifications), a precision temperature sensor will power down the unit. When the internal temperature decreases below the threshold of the temperature sensor, the unit will self start.

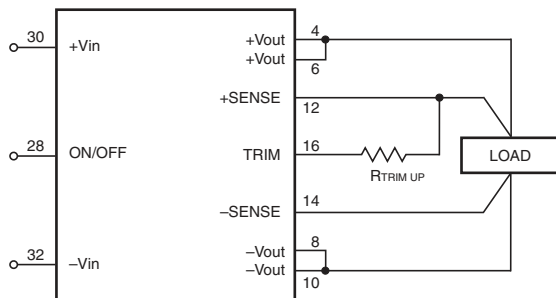


Figure 5. Trim Connections to Increase Output Voltage Using Fixed Resistors

$$R_{TRIM\ Up} (k\Omega) = \frac{4 \times (V_{out} - 2.5V)}{2.5V \times (V_{out} \div V_{nom} - 1)}$$

**Output Overvoltage Protection**

The output voltage is monitored for an overvoltage condition via magnetic coupling to the primary side. If the output voltage rises to a fault condition, which could be damaging to the load circuitry (see Functional Specifications), the sensing circuitry will power down the PWM controller causing the output voltage to decrease. Following a time-out period the PWM will restart, causing the output voltage to ramp to its appropriate value. If the fault condition persists, and the output voltages again climb to excessive levels, the overvoltage circuitry will initiate another shutdown cycle. This on/off cycling is referred to as “hiccup” mode.

**Input Fusing**

Certain applications and/or safety agencies may require the installation of fuses at the inputs of power conversion components. Fuses should also be used if the possibility of a sustained, non-current-limited, input-voltage polarity reversal exists. For MPS UCR Series DC-DC Converters, fast-blow fuses are recommended with values no greater than twice the maximum input current.

| Fuse Specifications |           |                      |
|---------------------|-----------|----------------------|
| Model               | Fuse Type | Reference and rating |
| UCR100-050-T72-C    | Fast-blow | 15A 250V             |
| UCR100-120-T72-C    | Fast-blow | 18A 250V             |
| UCR100-240-T72-C    | Fast-blow | 20A 250V             |

**Trimming Output Voltage**

UCR converters have a trim capability that enables users to adjust the output voltage from -10% to +10% of Vnominal. Adjustments to the output voltage can be accomplished with a single fixed resistor as shown in Figures 5 and 6. A single fixed resistor can increase or decrease the output voltage depending on its connection. Resistors should be located close to the converter and have TCR's less than 100ppm/°C to minimize sensitivity to changes in temperature. If the trim function is not used, leave the trim pin open.

Trim adjustments greater than the specified -10% to +10% can have an adverse affect on the converter's performance and are not recommended. Excessive voltage differences between Vout and Sense, in conjunction with trim adjustment of the output voltage, can cause the overvoltage protection circuitry to activate (see Functional Specifications for overvoltage limits).

Use only one trim up or trim down resistor. **Do not** connect both resistors simultaneously. When trimming, do not exceed maximum output power.

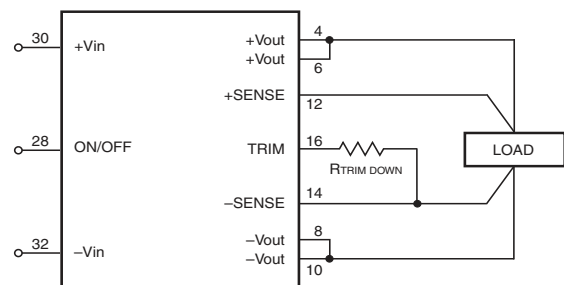


Figure 6. Trim Connections to Decrease Output Voltage Using Fixed Resistors

$$R_{TRIM\ Down} (k\Omega) = \frac{4 \times V_{out}}{V_{nom} - V_{out}}$$

**Remote Sense**

UCR series converters employ a sense feature to provide point of use regulation, thereby overcoming moderate IR drops in pcb conductors or cabling. The remote sense lines carry very little current and therefore require minimal cross-sectional-area conductors. The sense lines, which are capacitively coupled to their respective output lines, are used by the feedback control-loop to regulate the output. As such, they are not low impedance points and must be treated with care in layouts and cabling. Sense lines on a pcb should be run adjacent to dc signals, preferably ground. In cables and discrete wiring applications, twisted pair or other techniques should be implemented.

UCR series converters will compensate for drops between the output voltage at the DC-DC converter output pins and the voltage at the DC-DC sense input pins provided that:

$$[V_{out(+)} - V_{out(-)}] - [Sense(+) - Sense(-)] \leq 10\% V_{out}$$

Output overvoltage protection is monitored at the output voltage pin, not the Sense pin. Therefore, excessive voltage differences between  $V_{out}$  and Sense in conjunction with trim adjustment of the output voltage can cause the overvoltage protection circuitry to activate (see Performance Specifications for overvoltage limits). Power derating is based on maximum output current and voltage at the converter's output pins. Use of trim and sense functions can cause output voltages to increase, thereby increasing output power beyond the converter's specified rating, or cause output voltages to climb into the output overvoltage region. Therefore, the designer must ensure:

$$(V_{out \text{ at pins}}) \times (I_{out}) \leq \text{rated output power}$$

Note: The Sense and  $V_{out}$  lines are internally connected through low-value resistors. Nevertheless, if the sense function is not used for remote regulation the user must connect the +Sense to + $V_{out}$  and -Sense to - $V_{out}$  at the DC-DC converter pins.

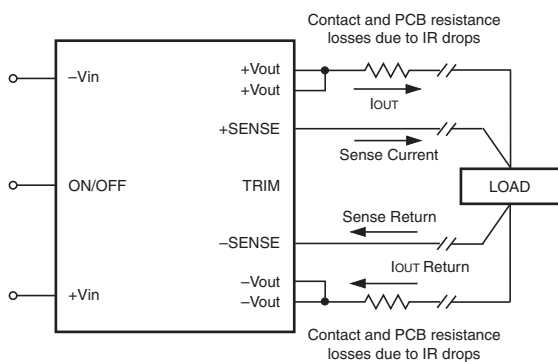


Figure 7. Remote Sense Circuit Configuration

**Conformal Coating**

The UCR modules have conformal coating to protect them against moisture, dust, and chemical and temperature extremes during all types of applications. They provide environmental and mechanical protection to extend the life of the components and circuitry significantly. Conformal coating on the UCR modules is applied by dipping. Conformal coating protects the UCR modules from moisture and contaminants, preventing short circuits and corrosion of conductors and solder joints. In addition, the use of conformal coating protects circuits and components from abrasion and solvents. Stress relief is also provided, as well as protection of the insulation resistance of the module. The conformal coating is particularly useful for protecting circuitry in severe service environments, while maintaining a low stress environment for components and connections.

**Features and Options**

**Hold-Up Time**

The hold-up time function provided by the UCR100 is designed to work with an external hold-up capacitor that is charged from circuitry internal to the converter. Hold-up time is defined as the duration of time that the DC-DC converter output will remain active following a loss of input power. When the hold-up function is activated, the UCR100 uses the hold-up capacitor energy to support operation. This provides a charge that maintains the DC-DC converter in operation for 10ms of hold-up time. The capacitors in the application are recommended below. The values in the table are standard capacitor values that will provide a hold-up time of better than 10ms.

| Vin             | 24V    | 36V    | 48V    | 72V    | 96V    | 110V   |
|-----------------|--------|--------|--------|--------|--------|--------|
| Standard        | 1900µf | 1000µf | 860µf  | 680µf  | 510µf  | 1200µf |
| Working Voltage | 75VDC  | 100VDC | 100VDC | 150VDC | 150VDC | 150VDC |

Figure 8 shows the relationship between the input voltage and the fall of the output voltage.

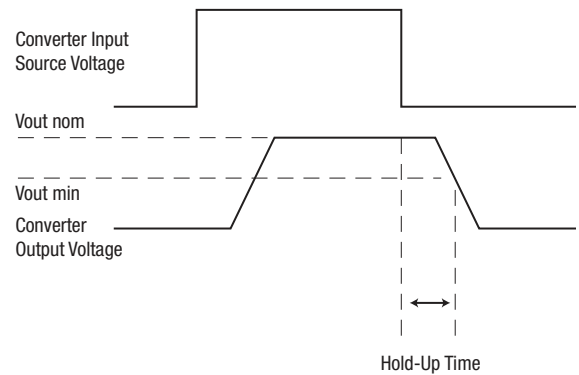


Figure 8. Hold-up Time to DC-DC Converter

Figure 9 shows the connection of the external output capacitor for the UCR100 model.

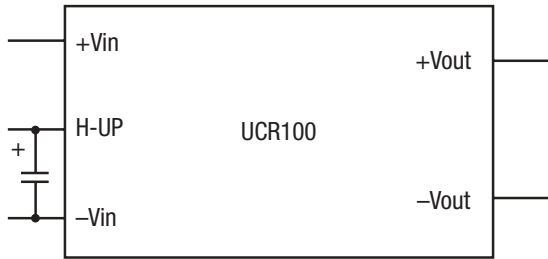


Figure 9. Connection of External Hold-up Capacitor

**Undervoltage Lockout**

URC series converters with the -V or -SV suffix have an undervoltage lockout feature that will shut down the controller if the input voltage falls below an adjustable threshold. The undervoltage threshold is determined by the value of a resistor placed between the UVLO and -Vin. Figure 10 shows a typical configuration.

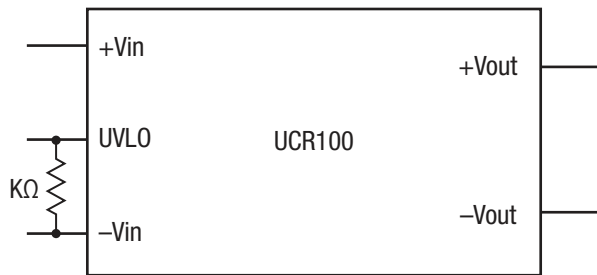


Figure 10. Undervoltage Lockout Configuration

The converter will remain off as long as the input voltage remains below the UVLO threshold. Devices will automatically restart when the applied voltage rises above the UVLO threshold. The hysteresis built into this function prevents an indeterminate on/off condition at a single input voltage. The table below shows common UVLO values for various nominal input voltages and the required resistor value for each.

| Vin Nominal (V)                  | 24         | 36         | 48         | 72         | 96         | 110      |
|----------------------------------|------------|------------|------------|------------|------------|----------|
| UVLO (V)                         | 14.4 (±1V) | 21.6 (±1V) | 28.8 (±1V) | 43.2 (±1V) | 57.6 (±1V) | 66 (±1V) |
| UVLO External Trim Resistor (KΩ) | 50         | 11.5       | 6.1        | 2.7        | 1.5        | 1.1      |

**Using Multiple Converters**

UCR converters may be connected in series to achieve a higher output voltage. URC converters with the optional current share feature (-S and -SV models) may also be connected in parallel to support higher output current, to improve redundancy or to spread the thermal load in high power, high temperature environments. Please refer to the typical circuits below. For all modes, use short connections with sufficient wire gauge and adequate grounding. Trim circuits are not shown in the following diagrams however they are the same as the Output Adjustment section.

A desirable feature of using multiple converters is that, since all units are isolated, they can use a common input power supply. Or you may use separate inputs for redundancy.

**When using units with the load share option in stand-alone operation with the remote sense feature, the load share pin must be connected to -Vout. This connection is not needed if the remote sense lines are connected directly at the connector.**

**Using series connections (see figure 11)**

Figure 11 illustrates a typical configuration for two URC converters connected in series. The Current Share inputs should be left floating or tied to -Vout. When connected in series the maximum load regulation remains constant as a percentage of the series output voltage. The total percentage of regulation does not change over the series string however the regulation amounts (in millivolts) accumulate in each converter.

When trimming UCRs in a series-connected chain, be sure to avoid exceeding the voltage trim limits for each individual converter. Specifically, try to make the trim adjustments approximately equal on all series-connected converters.

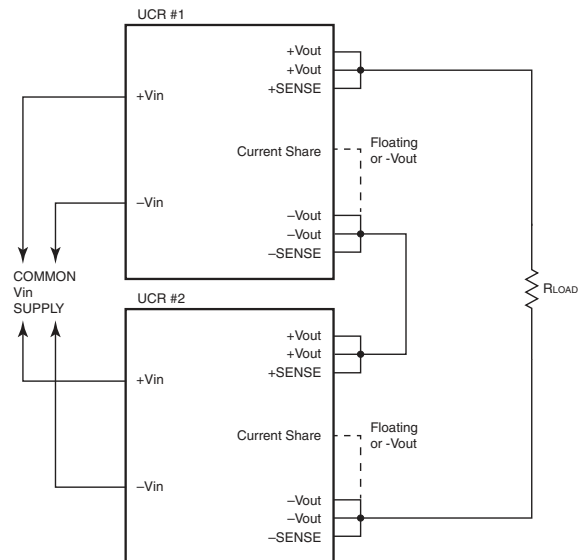


Figure 11. Series Connections

**Using parallel connections – Load Sharing (see figure 12)**

The +Sense must be left open when current sharing is required. Be sure to differentiate between wiring for redundancy or wiring for load sharing which is greater than one converter’s output current rating. Redundant connections

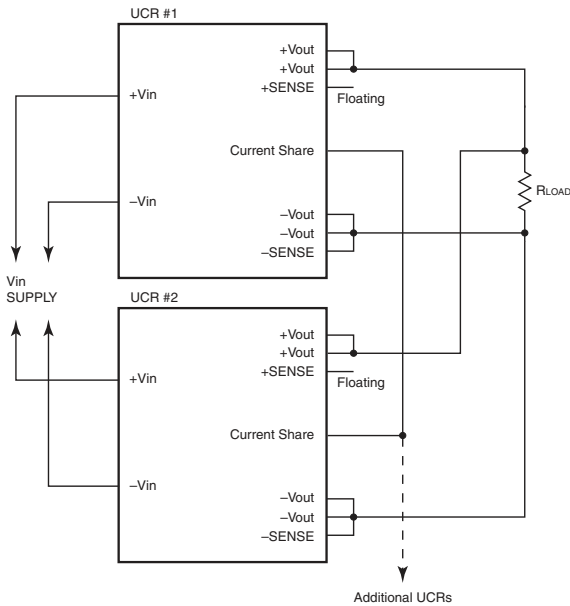


Figure 12. Load-Sharing Parallel Connections

expect one or the remaining converters to absorb the whole load if one converter fails. Therefore the entire load cannot exceed the rating of one converter.

Load sharing requires all parallel converters to be operational since failure of one converter forces all others to go into overcurrent shutdown. For two or more parallel load sharing converters, connect all Current Share pins together. The load-share parallel current circuit requires interconnection of the Current Share pins between each converter to insure that the current load is approximately balanced between all converters.

**Using parallel connections – Redundancy**

The redundancy connections in figures 13 and 14 requires external user-supplied “OR’ing” diodes to share the load. The diodes prevent one converter with slightly higher voltage forcing current into the lower-current converter. The diodes also protect the application against catastrophic “crow-barring” failure (shorted output) by one of the converters.

The diodes should be identical part numbers to enhance balance between the two converters. The default factory nominal voltage should be sufficiently matched between converters however you may wish to add optional external trim circuits to make the load approximately equal. Adjust the converters for equal output voltage before connecting in parallel.

The OR’ing diode system is the responsibility of the user. Be aware of the power levels applied to the diodes and possible heat sink requirements.

Be very careful placing the diodes “in the loop” when when using Sense inputs. This might cause the output terminals to exceed their +10% trim range or maximum power outputs. Schottky power diodes with approximately 0.3 Volt

drops may be suitable in the loop whereas 0.7 Volt silicon power diodes may not be advisable. The Sense inputs are being asked to compensate for both the diode drop and the wiring losses. Placing the diodes “in the loop” provides better system regulation at the risk of exceeding power levels (see figure 14).

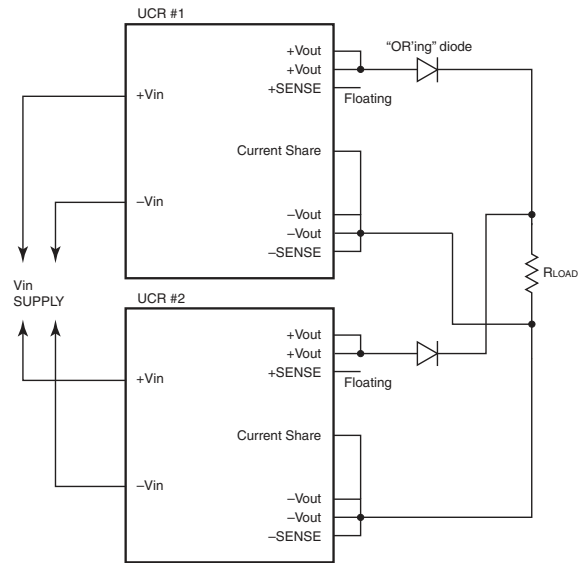


Figure 13. Redundant Parallel Connections

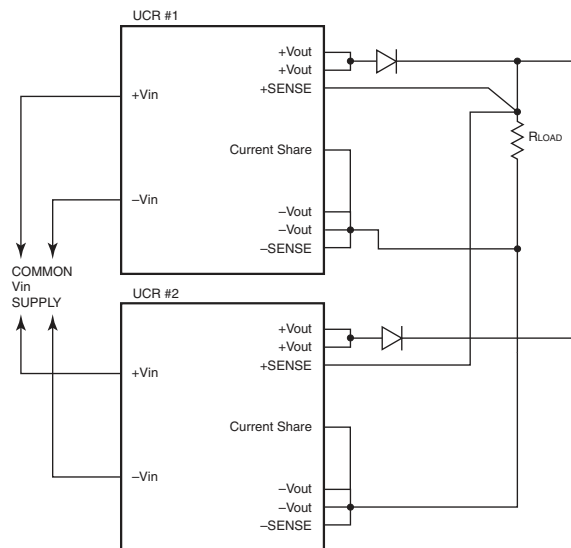


Figure 14. Optional Redundant Parallel Sense Wiring

