

### 40 Watts

- 72 & 110 VDC Input for Railway Applications
- Single and Dual Outputs
- 1500 VAC Basic Isolation
- High Efficiency - Up to 90%
- Remote On/Off
- Complies with EN50155
- EN50121-3-2 EMC for Railway Applications
- 3 Year Warranty



#### Dimensions:

##### RDC40:

2.00 x 1.60 x 0.4" (50.8 x 40.6 x 10.16 mm)

The RDC40 series of 40W DC-DC converters are designed for railway applications and comply with EN50121-3-2, the EMC standard for rolling stock apparatus. There are two input voltage ranges. The 72 VDC nominal models accept an input from 36 to 140 VDC and the 110 V nominal versions have a 55 to 176 VDC input. A trim pin allows a +/-10% adjustment for single output models. Using convection cooling the converters have a wide operating temperature range of -40°C to +85°C and a maximum case temperature of 105°C.

### Models & Ratings

| Input Voltage | Output Voltage | Output Current | Input Current <sup>(1)</sup> |           | Maximum Capacitive Load | Efficiency | Model Number <sup>(2)</sup> |
|---------------|----------------|----------------|------------------------------|-----------|-------------------------|------------|-----------------------------|
|               |                |                | No Load                      | Full Load |                         |            |                             |
| 36-140 VDC    | 3.3 V          | 10.00 A        | 30 mA                        | 526.82 mA | 25000 µF                | 87.0%      | RDC4072S3V3                 |
|               | 5.0 V          | 8.00 A         | 30 mA                        | 617.28 mA | 2000 µF                 | 90.0%      | RDC4072S05                  |
|               | 12.0 V         | 3.35 A         | 25 mA                        | 641.76 mA | 2500 µF                 | 87.0%      | RDC4072S12                  |
|               | 15.0 V         | 2.65 A         | 25 mA                        | 627.37 mA | 2500 µF                 | 88.0%      | RDC4072S15                  |
|               | ±12.0 V        | ±1.65 A        | 30 mA                        | 632.18 mA | ±1600 µF                | 87.0%      | RDC4072D12                  |
|               | ±15.0 V        | ±1.35 A        | 30 mA                        | 639.20 mA | ±1600 µF                | 88.0%      | RDC4072D15                  |
| 55-176 VDC    | 3.3 V          | 10.00 A        | 20 mA                        | 344.83 mA | 25000 µF                | 87.0%      | RDC40110S3V3                |
|               | 5.0 V          | 8.00 A         | 25 mA                        | 408.58 mA | 2000 µF                 | 89.0%      | RDC40110S05                 |
|               | 12.0 V         | 3.35 A         | 25 mA                        | 420.06 mA | 2500 µF                 | 87.0%      | RDC40110S12                 |
|               | 15.0 V         | 2.65 A         | 25 mA                        | 410.64 mA | 2500 µF                 | 88.0%      | RDC40110S15                 |
|               | ±12.0 V        | ±1.65 A        | 20 mA                        | 413.79 mA | ±1600 µF                | 87.0%      | RDC40110D12                 |
|               | ±15.0 V        | ±1.35 A        | 20 mA                        | 420.78 mA | ±1600 µF                | 87.5%      | RDC40110D15                 |

### Notes

1. Input current specified at nominal 72 V or 110 V input.

2. Add suffix '-HK' for optional heatsink.

### Input

| Characteristic            | Minimum                | Typical | Maximum                  | Units | Notes & Conditions                                    |
|---------------------------|------------------------|---------|--------------------------|-------|-------------------------------------------------------|
| Input Voltage - Operating | 36<br>55               |         | 140<br>176               | VDC   | 72 V nominal<br>110 V nominal                         |
| Input Current             |                        |         |                          |       | See models and ratings table                          |
| Input Reflected Ripple    |                        | 20      |                          | mA    | Through 12 µH inductor and 33 µF capacitor            |
| Input Filter              |                        |         |                          |       | Pi network                                            |
| Undervoltage Lockout      | OFF: 30.5<br>OFF: 48.5 |         | ON: 33.5 V<br>ON: 52.5 V | V     | 72 V models<br>110 V models                           |
| Input Surge               |                        |         | 150<br>185               | VDC   | 72 V models (for 100 ms)<br>110 V models (for 100 ms) |

### Output

| Characteristic             | Min. | Typ.                                   | Max.         | Units                | Notes & Conditions                                                                                                                      |
|----------------------------|------|----------------------------------------|--------------|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| Output Voltage             |      |                                        |              | VDC                  | See Models and Ratings table                                                                                                            |
| Output Voltage Trim        |      | ±10                                    |              | %                    | On single outputs models only                                                                                                           |
| Minimum Load               | 0    |                                        |              | A                    |                                                                                                                                         |
| Line Regulation            |      |                                        | ±0.2         | %                    |                                                                                                                                         |
| Load Regulation            |      |                                        | ±0.5<br>±1.0 | %                    | Single output models<br>Dual output models (balanced outputs)                                                                           |
| Cross Regulation           |      | ±5                                     |              | %                    | Dual output models, when one load is varied between 25% and 100% and the other is fixed at 100%                                         |
| Setpoint Accuracy          |      | ±1                                     |              | %                    |                                                                                                                                         |
| Start Up Time              |      | 30                                     |              | ms                   |                                                                                                                                         |
| Ripple and Noise           |      |                                        | 100<br>150   | mV pk-pk<br>mV pk-pk | Single output models<br>Dual output model<br>Measured with 20 MHz bandwidth in parallel with 1 µF ceramic capacitor across output rails |
| Transient Response         |      |                                        | 4            | %                    | Deviation, recovery to within 1% in <500 µs for a 25% load change                                                                       |
| Overshoot Protection       |      | 3.9<br>6.2<br>15.0<br>18<br>±15<br>±18 |              | V                    | 3.3 V Models<br>5.0 V Models<br>12 V Models<br>15 V Models<br>±12 V Models<br>±15 V Models                                              |
| Overload Protection        |      | 130                                    |              | %                    | Of Full Load                                                                                                                            |
| Short Circuit Protection   |      |                                        |              |                      | Trip and restart (hiccup mode, auto recovery)                                                                                           |
| Overtemperature Protection |      | 115                                    |              | °C                   | Case temperature                                                                                                                        |
| Remote On/Off              |      |                                        |              |                      | On = Logic High (>3.0) or Open<br>Off = Logic Low (<1.2 V) or short pin 2 to 3                                                          |
| Maximum Capacitive Load    |      |                                        |              |                      | See Models and Ratings table                                                                                                            |

### General

| Characteristic             | Minimum | Typical    | Maximum | Units  | Notes & Conditions           |
|----------------------------|---------|------------|---------|--------|------------------------------|
| Efficiency                 |         | 88         |         | %      | See Models and Ratings table |
| Isolation: Input to Output |         |            | 1500    | VAC    |                              |
| Input to Case              |         |            | 1600    | VDC    |                              |
| Output to Case             |         |            | 1600    | VDC    |                              |
| Switching Frequency        |         | 270        |         | kHz    |                              |
| Power Density              |         | 31         |         | W/in³  |                              |
| Mean Time Between Failure  | 320     |            |         | kHrs   | MIL-HDBK-217F at 25 °C GB    |
| Weight                     |         | 0.105 (48) |         | lb (g) |                              |

### Environmental

| Characteristic        | Minimum | Typical | Maximum | Units | Notes & Conditions                      |
|-----------------------|---------|---------|---------|-------|-----------------------------------------|
| Operating Temperature | -40     |         | +85     | °C    | See derating curve in Applications Note |
| Case Temperature      |         |         | +105    | °C    | See derating curve in Applications Note |
| Cooling               |         |         |         |       | Convection-cooled                       |
| Operating Humidity    |         |         | 95      | %RH   | Non-condensing                          |
| Storage Temperature   | -55     |         | +125    | °C    |                                         |

### EMC: Emissions

| Phenomenon | Standard                                                                                                              | Test Level                    | Notes & Conditions        |
|------------|-----------------------------------------------------------------------------------------------------------------------|-------------------------------|---------------------------|
| General    | Complies with EN50155 & EN50121-3-2, Railway Applications - Electromagnetic Compatibility for Rolling Stock Apparatus |                               |                           |
| Emissions  | EN55011                                                                                                               | 79 dB $\mu$ V / 73 dB $\mu$ V | 0.15-0.5 MHz / 0.5-30 MHz |

### EMC: Immunity

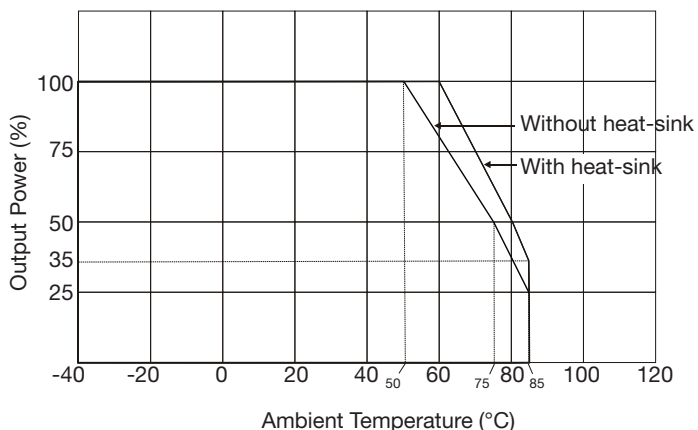
| Phenomenon     | Standard    | Test Level | Criteria | Notes & Conditions                                    |
|----------------|-------------|------------|----------|-------------------------------------------------------|
| ESD            | EN61000-4-2 | 3          | A        |                                                       |
| Radiated       | EN61000-4-3 | 20 V/m     | A        |                                                       |
| EFT            | EN61000-4-4 | 3          | A        |                                                       |
| Surges         | EN61000-4-5 | 2          | A        | External Input Capacitor required 220 $\mu$ F / 250 V |
| Conducted      | EN61000-4-6 | 10 Vrms    | A        |                                                       |
| Magnetic Field | EN61000-4-8 | 10 A/m     | A        |                                                       |

### Safety Approvals

| Safety Agency | Safety Standard            | Notes & Conditions     |
|---------------|----------------------------|------------------------|
| TUV           | EN60950-1:2006 + A12: 2011 | Information Technology |
| CE            | LVD & RoHS                 |                        |

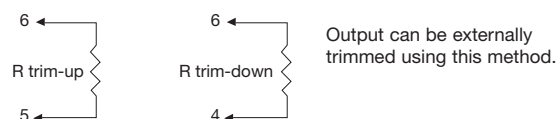
### Application Notes

#### Derating Curve



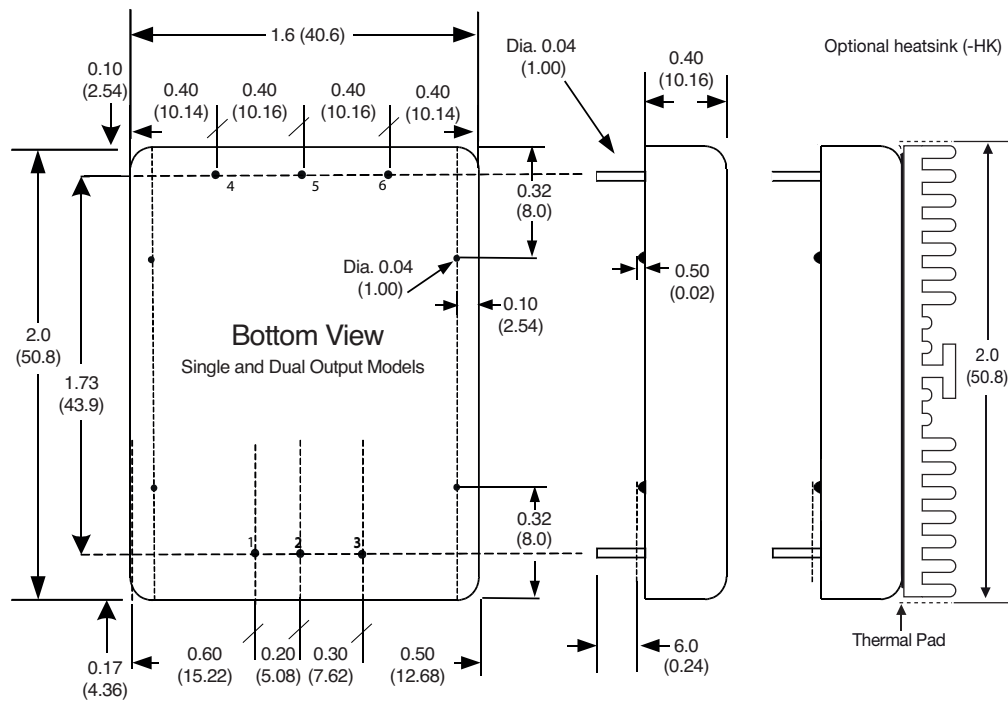
#### External Output Trim

On single output versions only.



| Typical Resistor |                 |                 |                 |                 |
|------------------|-----------------|-----------------|-----------------|-----------------|
|                  | S3V3            | S05             | S12             | S15             |
| Trim Down 10%    | 15.3 k $\Omega$ | 5.31 k $\Omega$ | 5.3 k $\Omega$  | 5.8 k $\Omega$  |
| Trim Up 10%      | 10.3 k $\Omega$ | 10.6 k $\Omega$ | 22.1 k $\Omega$ | 20.0 k $\Omega$ |

## Mechanical Details



## Notes

1. Dimensions shown in inches (mm).  
2. Weight: 0.105 lbs (48.0 g)  
3. Pin diameter:  $0.04 \pm 0.002$  ( $1.0 \pm 0.05$ )  
4. Pin pitch tolerance:  $\pm 0.014$  ( $\pm 0.35$ )  
5. Case tolerance:  $\pm 0.02$  ( $\pm 0.5$ )

| PIN CONNECTIONS |               |               |
|-----------------|---------------|---------------|
| Pin             | Single        | Dual          |
| 1               | +Vin          | +Vin          |
| 2               | -Vin          | -Vin          |
| 3               | Remote On/Off | Remote On/Off |
| 4               | +Vout         | +Vout         |
| 5               | -Vout         | Com           |
| 6               | Trim          | -Vout         |