

Features

ICE Technology*

- 115°C Maximum Case Temperature
- -40°C Minimum Temp.
- UL Certified
- Built-in FCC/EN55022 Class B Filter
- 4:1 Wide Input Voltage Range
- Six Sided Shielded Enclosure
- Ribbed or Baseplate Case Styles
- Min. Efficiency 86%
- 2kVDC Isolation
- Low Quiescent Current

Description

The RPP20-W series 4:1 input range DC/DC converters are ideal for high end industrial applications and COTS Military applications where a very wide operating temperature range of -40°C to +115°C is required. Although the case size is compact, the converter contains a built-in filter EN55022 Class B / FCC Level B without the need for any external components. The RPP20-W is available in two case styles: the ribbed case for active cooling and the baseplate case for high vibration, bulkhead-mounting or for passive cooling applications. They are UL-60950-1 certified.

Selection Guide 24V and 48V 4:1 Input Types

| Part Number | Input Range VDC | Output Voltage VDC | Output Current mA | Input ⁽¹⁾ Current mA | Efficiency ⁽²⁾ (Min.) |
|-----------------|-----------------|--------------------|-------------------|---------------------------------|----------------------------------|
| RPP20-243.3SW** | 9-36 | 3.3 | 6000 | 59/955 | 87% |
| RPP20-2405SW** | 9-36 | 5 | 4000 | 65/946 | 86% |
| RPP20-2412SW** | 9-36 | 12 | 1666 | 23/946 | 86% |
| RPP20-2415SW** | 9-36 | 15 | 1333 | 25/931 | 86% |
| RPP20-2424SW** | 9-36 | 24 | 830 | 25/931 | 86% |
| RPP20-483.3SW** | 18-75 | 3.3 | 6000 | 28/465 | 87% |
| RPP20-4805SW** | 18-75 | 5 | 4000 | 33/465 | 86% |
| RPP20-4812SW** | 18-75 | 12 | 1666 | 13/470 | 86% |
| RPP20-4815SW** | 18-75 | 15 | 1333 | 12/466 | 86% |
| RPP20-4824SW** | 18-75 | 24 | 830 | 12/466 | 86% |
| RPP20-2412DW** | 9-36 | ±12 | ±833 | 28/930 | 86% |
| RPP20-2415DW** | 9-36 | ±15 | ±666 | 24/946 | 87% |
| RPP20-2424DW** | 9-36 | ±24 | ±416 | 24/946 | 87% |
| RPP20-4812DW** | 18-75 | ±12 | ±833 | 16/472 | 86% |
| RPP20-4815DW** | 18-75 | ±15 | ±666 | 13/466 | 87% |
| RPP20-4824DW** | 18-75 | ±24 | ±416 | 13/466 | 87% |

** add suffix for case options

SUFFIX INFORMATION

none = Standard Ribbed Case
-B = Baseplate Case

For other CTRL logic (-1), case style (-F) or low temperature options (-L, -M, -T) please contact RECOM for availability.

POWERLINE+

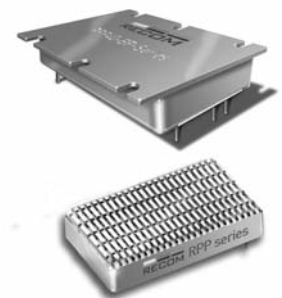
DC/DC-Converter

with 3 year Warranty

RECOM

20 Watt

4:1 Single & Dual Output



UL-60950-1 Certified
E224736

RPP20-W

* ICE Technology

ICE (Innovation in Converter Excellence) uses state-of-the-art techniques to minimise internal power dissipation and to increase the internal temperature limits to extend the ambient operating temperature range to the maximum. Refer to Application Notes

Specifications (typical at nominal input and 25°C unless otherwise noted)

| | | | |
|--|---|-----------------------------------|---------|
| Input Voltage Range | 24V nominal input | 9-36VDC | |
| | 48V nominal input | 18-75VDC | |
| Under Voltage Lockout | 24V input | DC-DC ON (min.) | 8.5VDC |
| | | DC-DC OFF (max.) | 8VDC |
| | 48V input | DC-DC ON (min.) | 17.5VDC |
| | | DC-DC OFF (max.) | 17VDC |
| Input Filter | Common Mode EMC Filter | | |
| Input Surge Voltage (100 ms max.) | 24V Input | 50VDC | |
| | 48V Input | 100VDC | |
| Input Reflected Ripple | nominal Vin and full load | 200mA _{p-p} | |
| Start Up Time | nominal Vin and constant resistor load | 20ms typ., 50ms max. | |
| Remote ON/OFF ⁽³⁾ | Logic High | Open or 3.0V < Vr < 5.5V | |
| | Logic Low | Short or 0V < Vr < 1.2V | |
| Remote OFF input current | Nominal input | 2mA typ. | |
| Output Power | 20W | | |
| Output Voltage Accuracy | Nominal Vin | ±1.5% | |
| Voltage Adjustability | Single Output only | ±5% | |
| Minimum Load | 0% | | |
| Line Regulation | low line, high line at full load | ±0.3% | |
| Load Regulation | 10% to 100% full load | ±0.5% | |
| Cross Regulation (10% <> 100% Load) | Dual Outputs only | 3% typ. / 5% max. | |
| Ripple and Noise (20MHz bandwidth limited) (measured with 1µF capacitor across outputs) | 3.3V | 100mV _{p-p} typ. | |
| | All others | 40mV-75mV _{p-p} typ. | |
| Temperature Coefficient | ±0.04%/°C max. | | |
| Transient Response | 25% load step change | 800µs | |
| Over Load Protection | % of full load at nominal Vin | 120% typ. | |
| Short Circuit Protection | Power Limit, automatic recovery | | |
| Output Over Voltage Protection (refer to block diagram in Application Notes) | Converter shutdown if Vout > Vout nominal + 20% | | |
| Isolation Voltage | Rated at 1600VDC/1 minute, Flash tested at 2000VDC/1 second | | |
| Isolation Resistance | 10MΩ min. | | |
| Isolation Capacitance (refer to block diagram in Application Notes) | 1500pF max. | | |
| Operating Frequency | 260kHz ± 40kHz | | |
| Operating Temperature Range | Ambient, Free Convection | -40°C to see Calculation (Note 7) | |
| Maximum Case Temperature | +115°C | | |
| Storage Temperature Range | -55°C to +125°C | | |
| Over Temperature Protection (refer to block diagram in Application Notes) | internal thermistor | | |
| Thermal Impedance (Natural convection) | Ribbed Case: Vertical | 7.5°C/Watt | |
| | Ribbed Case: Horizontal | 11.5°C/Watt | |
| Relative Humidity | 5% to 95% RH | | |
| Case Material ⁽⁶⁾ | Aluminium | | |
| Potting Material | Silicone (UL94-V0) | | |

continued on next page

Specifications (typical at nominal input and 25°C unless otherwise noted)

| | | |
|--|--|------------------|
| Weight | Ribbed Case | 26g |
| | Baseplate Case | 43g |
| Packing Quantity | Ribbed Case | 5 pcs per Tube |
| | Baseplate Case | Single packed |
| Safety Standards | certified UL-60950-1, 1st Edition | |
| Thermal Cycling | complies with MIL-STD-810F | |
| Vibration | 10-55Hz, 12G, 30 Min. along X, Y and Z | |
| Conducted Emissions | EN55022 | Class B |
| Radiated Emissions | EN55022 | Class B |
| ESD | EN61000-4-2 | Perf. Criteria B |
| Radiated Immunity | EN61000-4-3 | Perf. Criteria A |
| Fast Transient ⁽⁴⁾ | EN61000-4-4 | Perf. Criteria B |
| Surge ⁽⁴⁾ | EN61000-4-5 | Perf. Criteria B |
| Conducted Immunity | EN61000-4-6 | Perf. Criteria A |
| MTBF calculated according to BELLCORE TR-NWT-000332 ⁽⁵⁾ | 2195 x 10 ³ hours | |

Notes :

1. Typical values at nominal input voltage and no load/full load.
2. Min. values at nominal input voltage and full load.
3. The ON/OFF pin voltage is referenced to negative input. The pin is pulled high internally.
ON/OFF control is standard with positive logic: e.g. RPP20-2405SW, RPP20-4805DW-B.
Positive logic: 0= OFF, 1 = ON. The converter will be ON if the CTRL is left open.
4. Requires an external 100µF low ESR capacitor to meet EN61000-4-4 and EN61000-4-5
5. Case I: 50% Stress, Temperature at 50°C (Ground Benign).
6. To ensure a good all-round electrical contact, the baseplate is pressed firmly into place within the aluminium housing. The hydraulic press can leave tooling marks and deformations to both the housing and baseplate. The case is anodised aluminium, so there will be natural variations in the case colour and the aluminium is not scratch resistant. Any resultant marks, scratches and colour variations are cosmetic only and do not affect the operation or performance of the converters.
7. Example:

$$R_{th\text{case-ambient}} = 7.5^{\circ}\text{C/W (vertical)}$$

$$R_{th\text{case-ambient}} = 11.5^{\circ}\text{C/W (horizontal)}$$

$$R_{th\text{case-ambient}} = \frac{T_{\text{case}} - T_{\text{ambient}}}{P_{\text{dissipation}}}$$

$$P_{\text{dissipation}} = P_{\text{in}} - P_{\text{out}} = \frac{P_{\text{out}}}{\eta} - P_{\text{out}}$$

T_{case} = Case Temperature

T_{ambient} = Environment Temperature

$P_{\text{dissipation}}$ = Internal losses

P_{in} = Input Power

P_{out} = Output Power

η = Efficiency under given Operating Conditions

$R_{th\text{case-ambient}}$ = Thermal Impedance

$$P_{\text{dissipation}} = P_{\text{in}} - P_{\text{out}} = \frac{P_{\text{out}}}{\eta} - P_{\text{out}}$$

Practical Example:

Take the RPP20-2405SW with 60% load. What is the maximum ambient operating temperature? Use converter vertical in application.

$$\text{Eff}_{\text{min}} = 86\% @ V_{\text{nom}}$$

$$P_{\text{out}} = 20\text{W}$$

$$P_{\text{outapp}} = 20 \times 0.6 = 12\text{W}$$

$$P_{\text{dissipation}} = \frac{P_{\text{out}}}{\eta} - P_{\text{out}}$$

$$\eta = \sim 85\% \text{ (from Eff vs Load Graph)}$$

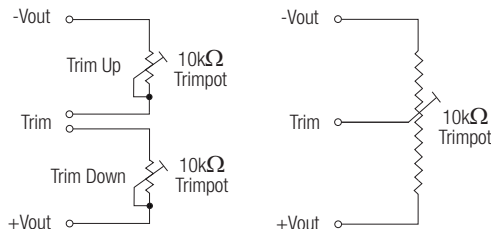
$$P_{\text{dissipation}} = \frac{12}{0.85} - 12 = 2.12\text{W}$$

$$R_{\text{th}} = \frac{T_{\text{casemax}} - T_{\text{ambient}}}{P_{\text{dissipation}}} \rightarrow 7.5^{\circ}\text{C/W} = \frac{115^{\circ}\text{C} - T_{\text{ambient}}}{2.12\text{W}}$$

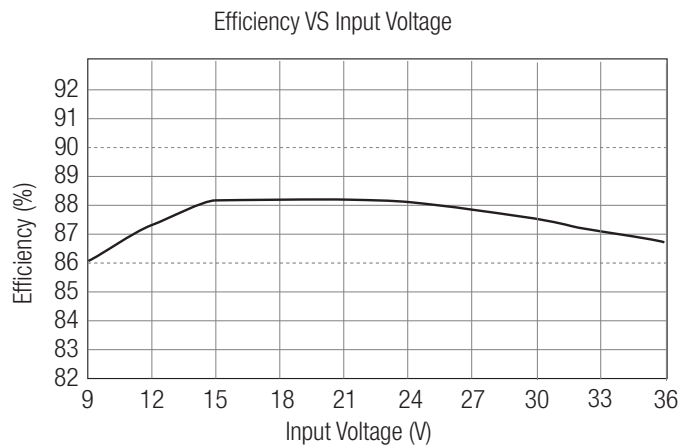
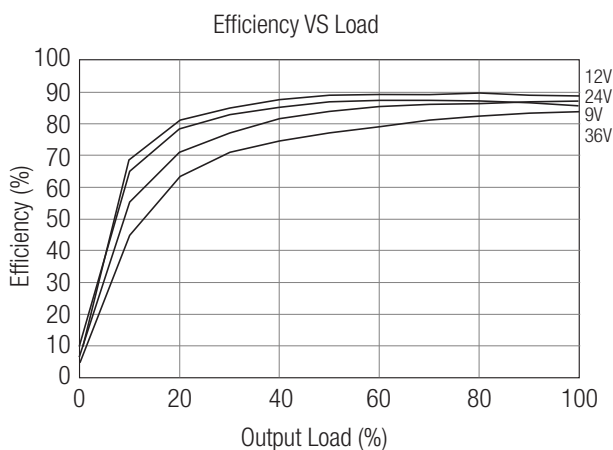
$$T_{\text{ambient}} = 99.1^{\circ}\text{C}$$

Typical Characteristics

External Output Trimming
Refer To Application Notes for recommended resistor Values



RPP20-2405SW

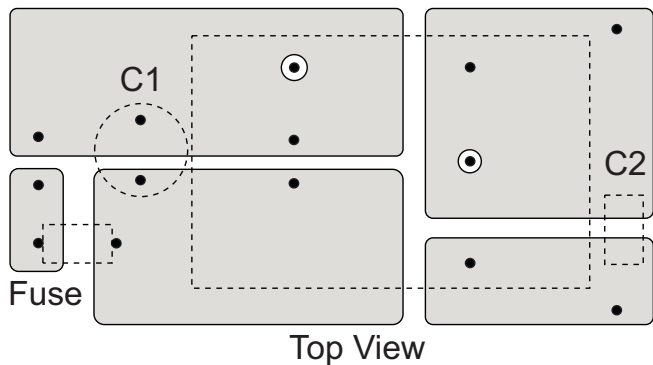


RPP20-W

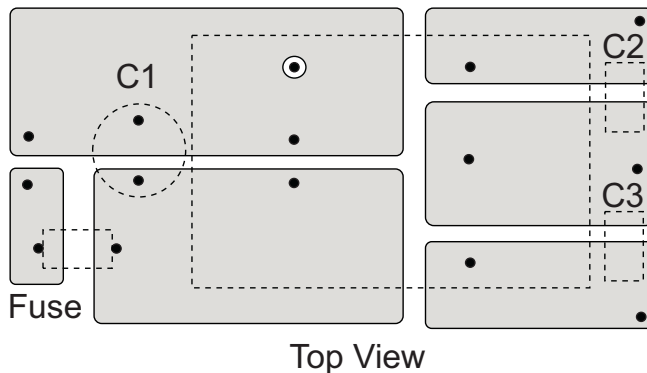
Recommended PCB Layout

Ribbed Case

Single Output

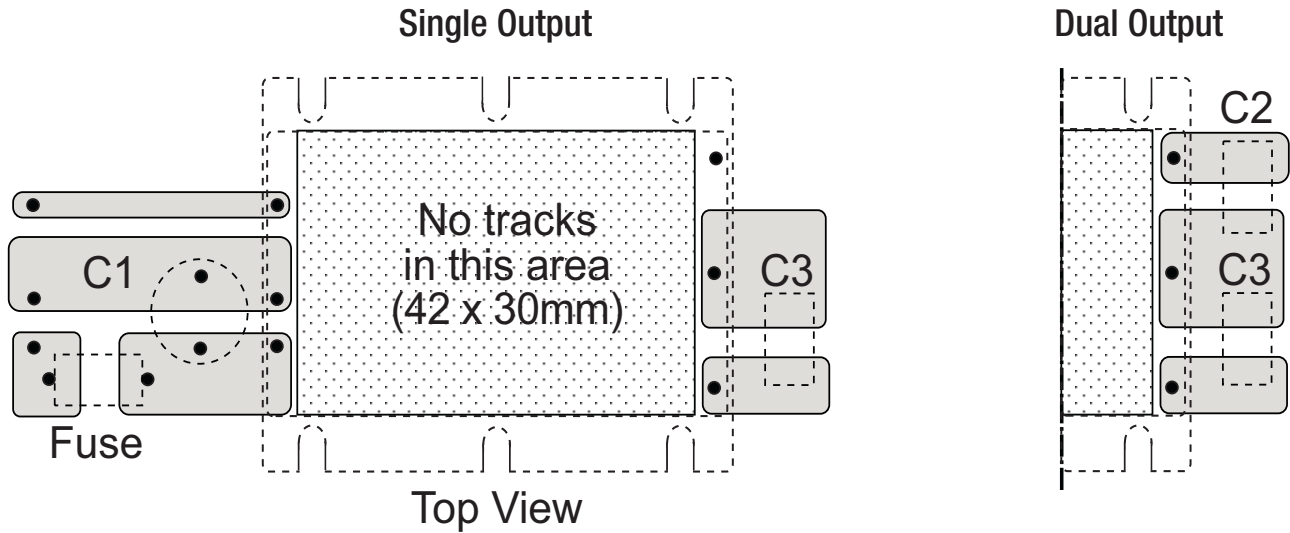


Dual Output



Recommended PCB Layout

Baseplate Case- suggested PCB layout



Input Fuse is recommended. Recommended fuse rating = double maximum input current, time delay type.

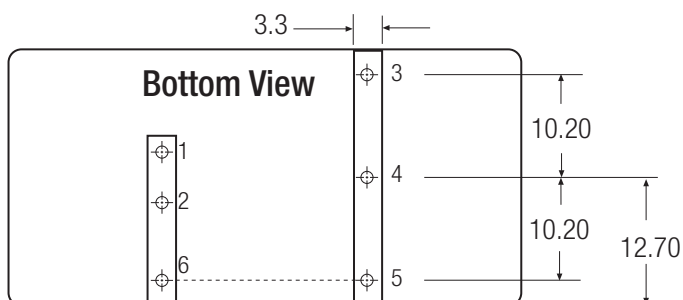
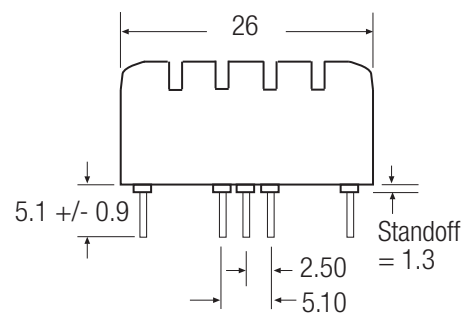
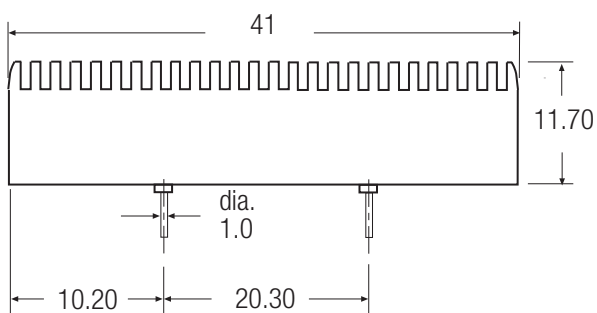
Input Capacitor, C1, is required to meet EN61000 Surge and Fast Transient, otherwise it is not required for normal operation.

Output Capacitors C2/C3 are recommended, but not required for normal operation. Typical capacitor values are 1µF MLCC

To ensure optimum thermal performance, use large areas of copper on the PCB to assist with heat dissipation and mount the converter vertically.

Package Style and Pinning (mm)

Ribbed Case (Standard - no suffix)



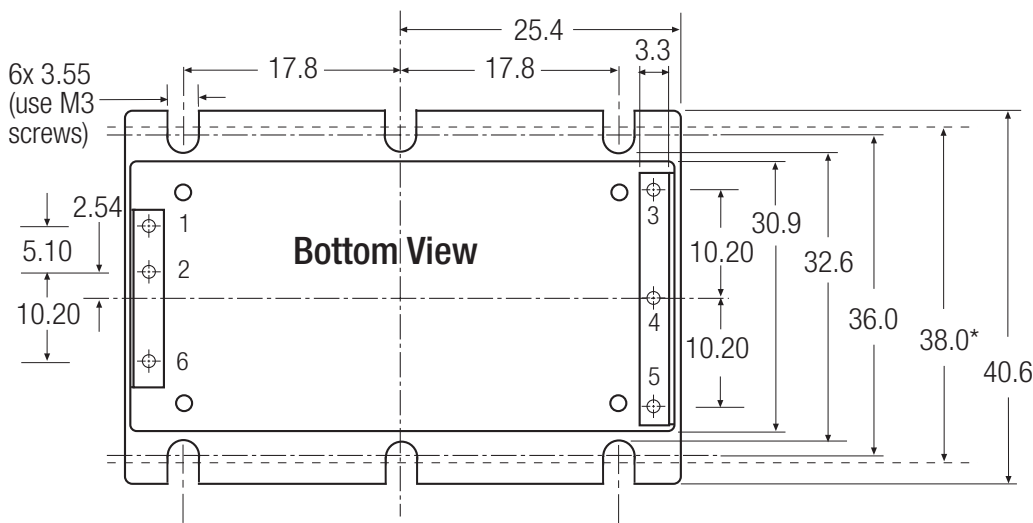
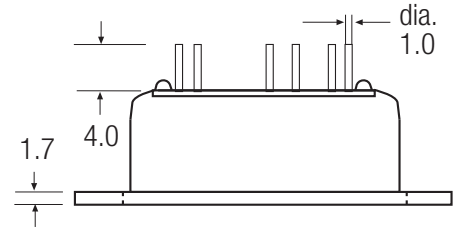
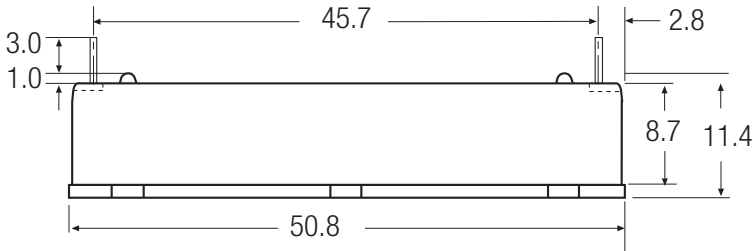
Pin Connections

| Pin # | Single | Dual |
|-------|--------|-------|
| 1 | +Vin | +Vin |
| 2 | -Vin | -Vin |
| 3 | +Vout | +Vout |
| 4 | Trim | Com |
| 5 | -Vout | -Vout |
| 6 | CTRL | CTRL |

Pin Pitch Tolerance ± 0.35 mm

Package Style and Pinning (mm)

Baseplate Case (-B Suffix)



NOTE:
Pin separation is different between ribbed and baseplate versions.

Pin Connections

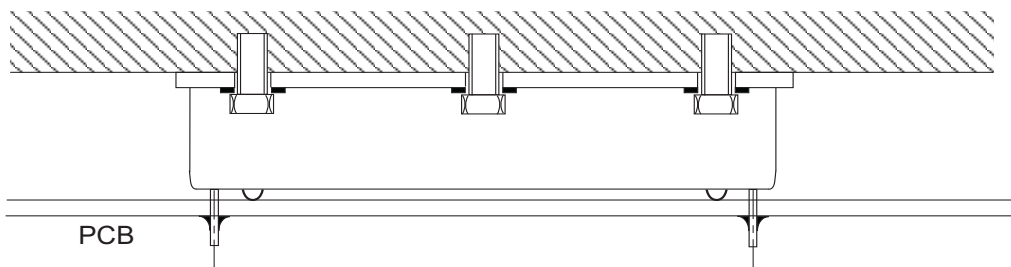
| Pin # | Single | Dual |
|-------|--------|-------|
| 1 | +Vin | +Vin |
| 2 | -Vin | -Vin |
| 3 | +Vout | +Vout |
| 4 | -Vout | Com |
| 5 | Trim | -Vout |
| 6 | CTRL | CTRL |

Pin Pitch Tolerance ± 0.35 mm

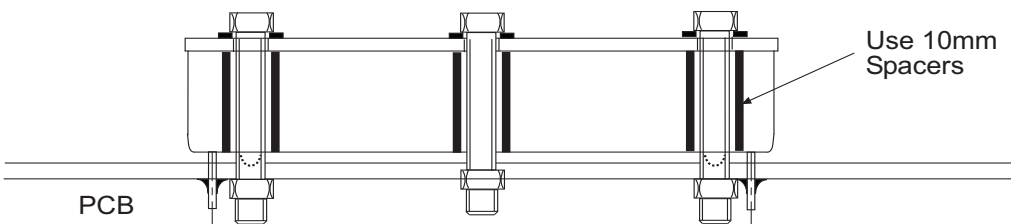
*Recommended Fixing Centres

RPP20-W

Baseplate Case Fixing - Mounting onto Heatsink/Bulkhead



Baseplate Case Fixing - Anti Vibration Mounting onto PCB



The product information and specifications are subject to change without prior notice. All products are designed for non-safety critical commercial and industrial applications. The Buyer agrees to implement safeguards that anticipate the consequences of any failures that might cause harm, loss of life and/or damage property.