

## Features

## ICE Technology\*

- T2 Temperature Range without Derating
- 120°C Maximum Case Temperature
- -45°C Minimum Operating Temperature
- EN 50155 Certified
- EN 50121-3-2 Certified
- CE Marked
- 24, 48 and 110VDC Input Ranges
- Six Sided Shielded Enclosure
- Baseplate Case Styles
- Efficiency to >89%
- Low Quiescent Current

### Description

The RPR30 series DC/DC converters are designed for railway rolling stock applications. Besides covering all the input voltages from 24VDC up to 110VDC, the converters have a very wide operating temperature range of -45°C to +120°C. The RPR30 has a baseplate case for high vibration or bulkhead-mounting applications. It is EN 50155 and EN 50121-3-2 certified.

### Selection Guide 24V, 48V and 110V Input Types

| Part Number     | Nominal Input VDC | Nom. Input Range VDC | Lockout Voltage VDC | Output Voltage VDC | Output Current mA |
|-----------------|-------------------|----------------------|---------------------|--------------------|-------------------|
| RPR30-243.3S-B  | 24                | 12-36                | 8                   | 3.3                | 9100              |
| RPR30-2405S-B   | 24                | 12-36                | 8                   | 5                  | 6000              |
| RPR30-2412S-B   | 24                | 12-36                | 8                   | 12                 | 2500              |
| RPR30-2415S-B   | 24                | 12-36                | 8                   | 15                 | 2000              |
| RPR30-2424S-B   | 24                | 12-36                | 8                   | 24                 | 1250              |
| RPR30-483.3S-B  | 48                | 25-75                | 17                  | 3.3                | 9100              |
| RPR30-4805S-B   | 48                | 25-75                | 17                  | 5                  | 6000              |
| RPR30-4812S-B   | 48                | 25-75                | 17                  | 12                 | 2500              |
| RPR30-4815S-B   | 48                | 25-75                | 17                  | 15                 | 2000              |
| RPR30-4824S-B   | 48                | 25-75                | 17                  | 24                 | 1250              |
| RPR30-1103.3S-B | 110               | 40-160               | 36                  | 3.3                | 9100              |
| RPR30-11005S-B  | 110               | 40-160               | 36                  | 5                  | 6000              |
| RPR30-11012S-B  | 110               | 40-160               | 36                  | 12                 | 2500              |
| RPR30-11015S-B  | 110               | 40-160               | 36                  | 15                 | 2000              |
| RPR30-11024S-B  | 110               | 40-160               | 36                  | 24                 | 1250              |
| RPR30-2412D-B   | 24                | 12-36                | 8                   | ±12                | ±1250             |
| RPR30-2415D-B   | 24                | 12-36                | 8                   | ±15                | ±1000             |
| RPR30-2424D-B   | 24                | 12-36                | 8                   | ±24                | ±620              |
| RPR30-4812D-B   | 48                | 25-75                | 17                  | ±12                | ±1250             |
| RPR30-4815D-B   | 48                | 25-75                | 17                  | ±15                | ±1000             |
| RPR30-4824D-B   | 48                | 25-75                | 17                  | ±24                | ±620              |
| RPR30-11012D-B  | 110               | 40-160               | 36                  | ±12                | ±1250             |
| RPR30-11015D-B  | 110               | 40-160               | 36                  | ±15                | ±1000             |
| RPR30-11024D-B  | 110               | 40-160               | 36                  | ±24                | ±620              |

For other CTRL logic or case style options please contact RECOM for availability.

## POWERLINE+

### Railway-Converter

with 5 year Warranty

RECOM

## 30 Watt Single & Dual Output



**EN-50155 Certified**  
**EN-60950 Certified**

## RPR30

### \* 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**

## Railway Input Voltage Requirements

| Nominal Input Voltage | EN50155     |                   |                | NF F 01-510 |                   |                | RPR30       |                   |                |
|-----------------------|-------------|-------------------|----------------|-------------|-------------------|----------------|-------------|-------------------|----------------|
|                       | Input Range | Min. Input (0.1s) | Max Input (1s) | Input Range | Min. Input (0.1s) | Max Input (1s) | Input Range | Min. Input (0.1s) | Max Input (1s) |
| 24V                   | 16.8~30V    | 14.4V             | 33.6V          | 18~34V      | 12V               | 40V            | 12~36V      | 9V                | 40V            |
| 48V                   | 33.6~60V    | 28.8V             | 67.2V          |             |                   |                | 25~75V      | 18V               | 80V            |
| 72V                   | 50.4~90V    | 43.2V             | 100.8V         | 50~90V      | 36V               | 115V           | 40~160V     | 36V               | 176V           |
| 96V                   | 67.2~120V   | 57.6V             | 134.4V         |             |                   |                | 40~160V     | 36V               | 176V           |
| 110V                  | 77~137.5V   | 66V               | 154V           | 77~137V     | 55V               | 176V           | 40~160V     | 36V               | 176V           |

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

|                                                               |      |                                                             |                                                 |                                 |
|---------------------------------------------------------------|------|-------------------------------------------------------------|-------------------------------------------------|---------------------------------|
| Input Voltage Range (continuous)                              |      | complies with EN50155 and NFF 01-510 (Un=24V)               |                                                 | 12-36VDC                        |
|                                                               |      | complies with EN50155 and NFF 01-510 (Un=48V)               |                                                 | 25-75VDC                        |
|                                                               |      | complies with EN50155 and NFF 01-510 (Un=72V, 96V &110V)    |                                                 | 40-160VDC                       |
| Low Transient operating voltage (100ms)                       |      | complies with EN50155 and NFF 01-510                        |                                                 | Un x 0.5                        |
| High Transient operating voltage (1 second)                   |      | complies with EN50155 and NFF 01-510                        |                                                 | Un x 1.6                        |
| Allowed Input Ripple                                          |      | complies with EN50155                                       |                                                 | 15%                             |
| Input Reflected Ripple                                        |      | nominal Vin and full load                                   |                                                 | 20mA <sub>p-p</sub>             |
| Supply Interruption (Perf. Criteria B)                        |      | according to EN50155, 5.1.1.2                               |                                                 | Class S2                        |
|                                                               |      | according to EN50155, 5.1.3                                 |                                                 | Class C2                        |
| Start Up Time                                                 |      | nominal Vin and constant resistive load                     |                                                 | 2ms typ., 5ms max.              |
| Remote ON/OFF <sup>(1)</sup>                                  |      | Logic High, Vin=24V, 48V                                    |                                                 | Open or 3V < Vr < 5,5V          |
|                                                               |      | Logic High, Vin=110V                                        |                                                 | Open or 8V < Vr < 60V           |
|                                                               |      | Logic Low                                                   |                                                 | Short or 0V < Vr < 1.2V         |
| Remote OFF input current                                      |      | Nominal input                                               |                                                 | 2mA typ.                        |
| Output Voltage Accuracy                                       |      | 50% Load and nominal Vin                                    |                                                 | ±1.5%                           |
| Voltage Adjustability                                         |      | Single Output only                                          |                                                 | ±10%                            |
| 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)                |                                                 | 1% Vout typ. / 3% max.          |
| 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                                |      | Single Output                                               | Converter shutdown if Vout > Vout nominal + 20% |                                 |
|                                                               |      | Dual Output                                                 | Converter shutdown if Vout > Vout nominal + 10% |                                 |
| Isolation Voltage                                             |      | According to EN50155 12.2.9.2                               |                                                 | Tested at 1500VAC/1 minute      |
| Isolation Resistance                                          |      | According to EN50155 12.2.9.1                               |                                                 | 10MΩ min.                       |
| Isolation Capacitance                                         |      |                                                             |                                                 | 1500pF max.                     |
| Operating Frequency                                           |      |                                                             |                                                 | 260kHz ± 40kHz                  |
| Operating Temperature Range<br>(Ambient Air, Free Convection) | (T2) | complies with EN50155: 4.1.2 and EN50125-1<br>with derating |                                                 | -45°C to +85°C                  |
|                                                               | (Tx) |                                                             |                                                 | -45°C to +100°C                 |
| Maximum Case Temperature                                      |      |                                                             |                                                 | +120°C                          |
| Over Temperature Protection                                   |      |                                                             |                                                 | Internal thermistor             |

continued on next page

# POWERLINE+

## DC/DC-Converter

# RPR30-S\_D

## Series

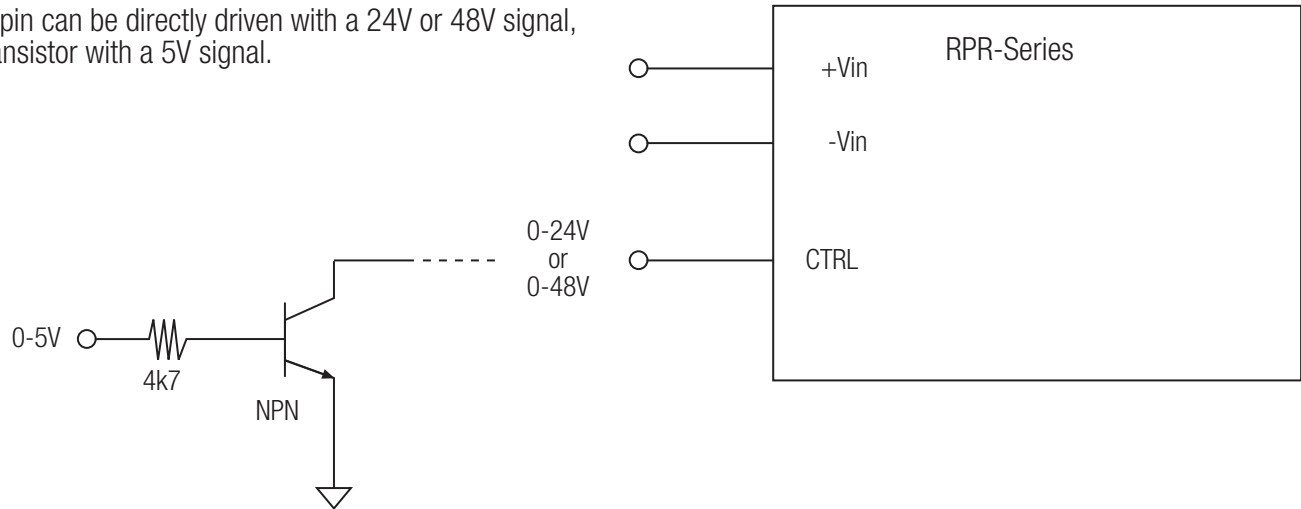
### Specifications (typical at nominal input and 25°C unless otherwise noted)

|                                                                                                             |                     |                                                  |
|-------------------------------------------------------------------------------------------------------------|---------------------|--------------------------------------------------|
| Storage Temperature Range                                                                                   | -55°C to +125°C     |                                                  |
| Relative Humidity                                                                                           | 5% to 95% RH        |                                                  |
| Case Material <sup>(2)</sup>                                                                                | Aluminium           |                                                  |
| Weight                                                                                                      | 43g                 |                                                  |
| Packing Quantity                                                                                            | 4pcs per Tube       |                                                  |
| Safety Standards                                                                                            | CE Marked           | certified to EN-60950-1, 1st Edition             |
| Thermal Performance                                                                                         | Cold                | -40°C /16 Hours                                  |
|                                                                                                             | Dry Heat, Operating | -40°C/+85°C/ 5 Cycles                            |
| complies to EN50155: 12.2.3/4/5                                                                             | Damp Heat, Cyclic   | +25°C/+55°C, 95%RH / 2 x 24 Hours                |
| Vibration, Shock & Bump (complies with EN61373, Category 1 Class B)                                         | Vibration           | 5-150Hz, X:0.7m/s², Y:0.45m/s², Z:1m/s², 30 mins |
|                                                                                                             | Shock               | 5g/30ms/18 shocks                                |
| Input Filter                                                                                                | Built-in Pi Filter  |                                                  |
| Conducted Emissions                                                                                         | EN50121-3-2***      | Class A                                          |
| Radiated Emissions                                                                                          | EN50121-3-2***      | Class A                                          |
| ESD                                                                                                         | EN50121-3-2***      | Perf. Criteria B                                 |
| Radiated Immunity                                                                                           | EN50121-3-2***      | Perf. Criteria A                                 |
| Fast Transient                                                                                              | EN50121-3-2***      | Perf. Criteria A                                 |
| Surge                                                                                                       | EN50121-3-2***      | Perf. Criteria B                                 |
| Conducted Immunity                                                                                          | EN50121-3-2***      | Perf. Criteria A                                 |
| MTBF calculated according to BELLCORE TR-NWT-000332 Case I: 50% Stress, Temperature at 50°C (Ground Benign) | 2195 x 10³ hours    |                                                  |

\*\*\*with filter circuit

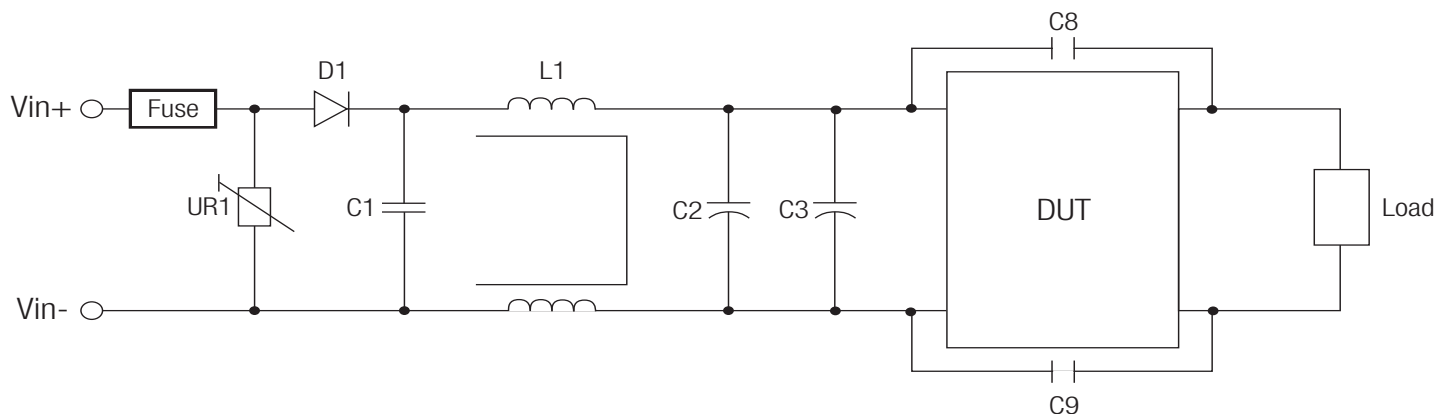
### Typical Control Pin Application Circuit

The CTRL pin can be directly driven with a 24V or 48V signal, or via a transistor with a 5V signal.



RPR30

## EN50155 / NF F 01-510 Input Filter



Table

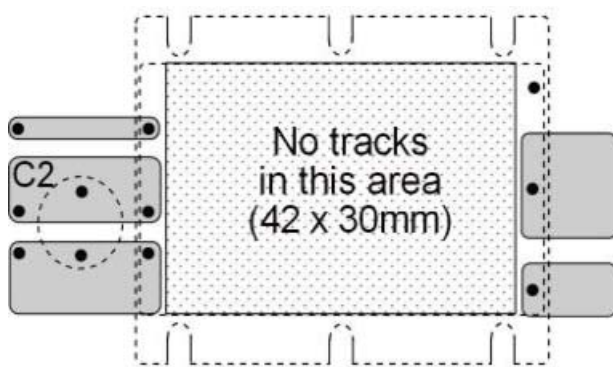
| Module | Standard | UR1            | D1      | C1              | L1                     | C2                     | C3                     | C8,C9     |
|--------|----------|----------------|---------|-----------------|------------------------|------------------------|------------------------|-----------|
| 24V    | EN50155  | MOV<br>14D361K | 100V/6A | 6,8 $\mu$ F/50V | 550 $\mu$ H $\pm$ 20%  | 330 $\mu$ F/<br>50VDC  | 330 $\mu$ F/<br>50VDC  | 4,7nF/3kV |
| 48V    | EN50155  | MOV<br>14D361K | 200V/3A | 220nF/100V      | 550 $\mu$ H $\pm$ 20%  | 330 $\mu$ F/<br>100VDC | 330 $\mu$ F/<br>100VDC | 4,7nF/3kV |
| 110V   | EN50155  | MOV<br>14D361K | 300V/3A | 470nF/250V      | 1200 $\mu$ H $\pm$ 20% | 330 $\mu$ F/<br>250VDC | 330 $\mu$ F/<br>250VDC | 4,7nF/3kV |

## Notes :

- 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. RPR20-2405S, RPR20-4805D-B.  
Positive logic: 0= OFF, 1 = ON. The converter will be ON if the CTRL is left open.
- 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.
- The converter is supplied with a protective adhesive tape to keep the top surface clean. The tape is heat resistant and the converter can be soldered into place without removing the tape. The tape should be removed just before final installation.
- The RPR series are optionally available with a ribbed heatsink case style. They will then meet Tx requirements without an external heat-sink. Please contact your RECOM supplier for more information.

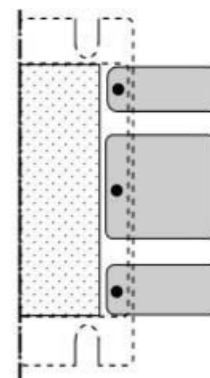
## Baseplate Case- suggested PCB layout

### Single Output



Top View

### Dual Output

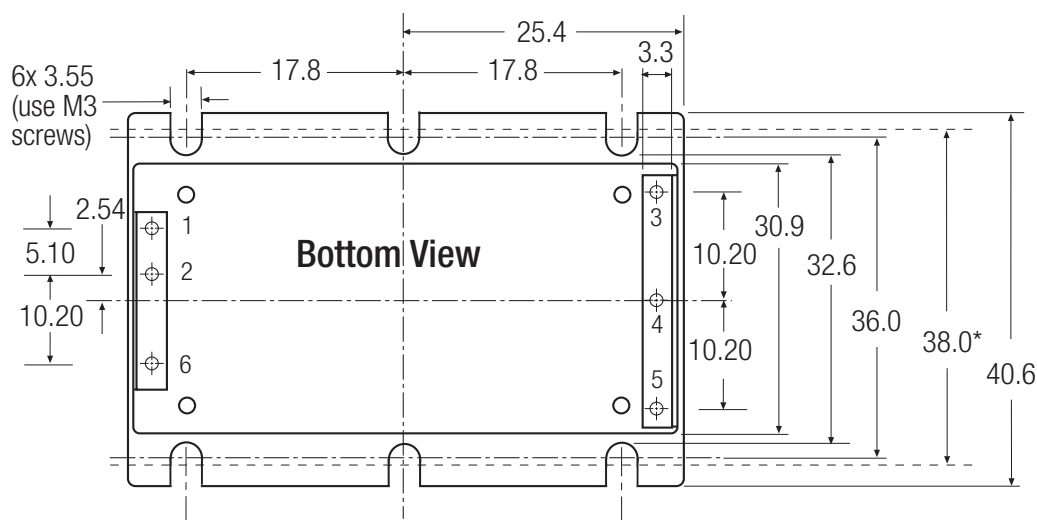
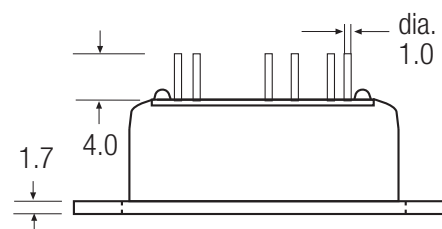
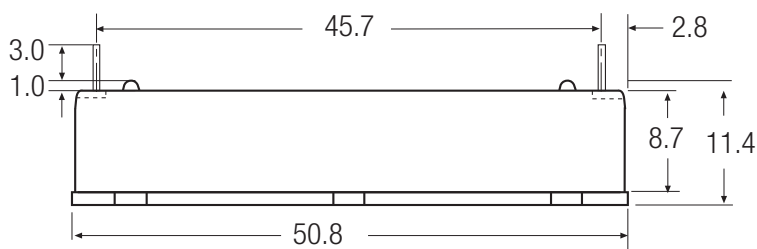


Input Fuse is recommended.  
Recommended fuse rating =  
double maximum input current,  
time delay type.

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)

### Baseplate Case (-B Suffix)



\*Recommended Fixing Centres

#### 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  $\pm 0.35$  mm

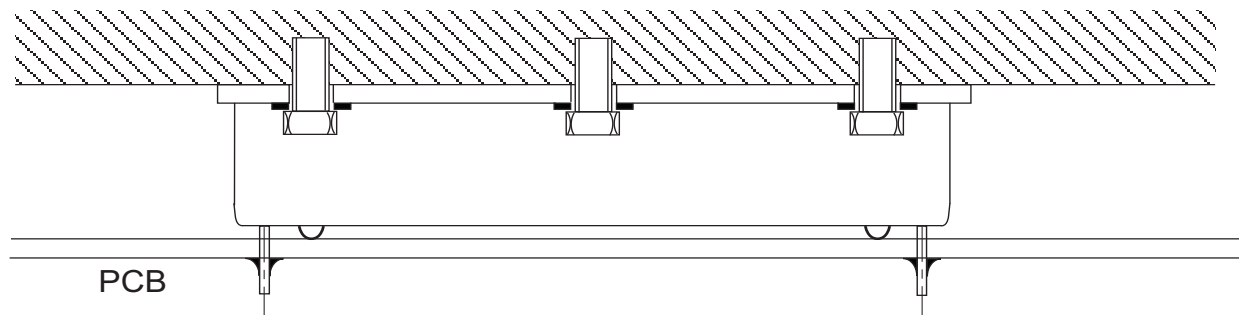
**POWERLINE+**

DC/DC-Converter

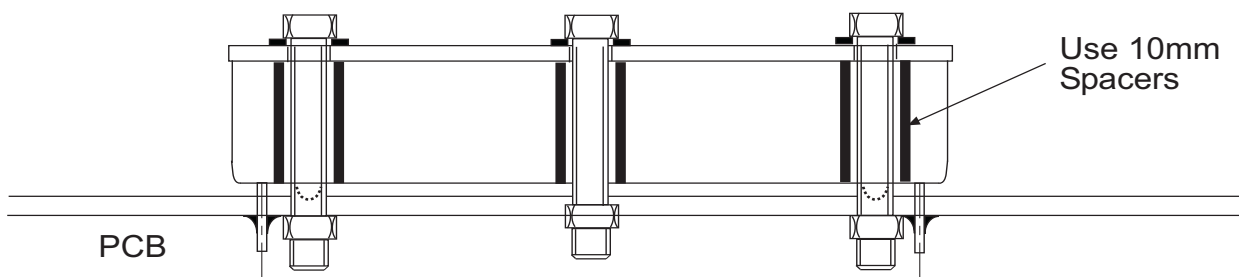
Package Style and Pinning (mm)

**RPR30-S\_D  
Series**

### Baseplate Case Fixing - Mounting onto Heatsink/Bulkhead



### Baseplate Case Fixing - Anti Vibration Mounting onto PCB



RPR30