

## Features

## ICE Technology\*

- +115°C Maximum Case Temperature
- -40°C Minimum Temp.
- Built-in FCC/EN55022 Class B Filter
- 2:1 Input Voltage Range
- Six Sided Shielded Enclosure
- Ribbed or Baseplate Case Styles
- Min. Efficiency 87%
- 2kVDC Isolation
- Low Quiescent Current

### Description

The RPP20 series 2:1 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 very compact, the converter contains a built-in filter EN55022 Class B / FCC Level B without the need for any external components. The RPP20 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 12V, 24V and 48V Input Types

Part Number	Input Range VDC	Output Voltage VDC	Output Current mA	Efficiency <sup>(2)</sup> (Typ.)
RPP20-123.3S**	9-18	3.3	6000	88%
RPP20-1205S**	9-18	5	4000	89%
RPP20-1212S**	9-18	12	1666	88%
RPP20-1215S**	9-18	15	1333	88%
RPP20-1224S**	9-18	24	830	88%
RPP20-243.3S**	18-36	3.3	6000	88%
RPP20-2405S**	18-36	5	4000	89%
RPP20-2412S**	18-36	12	1666	88%
RPP20-2415S**	18-36	15	1333	89%
RPP20-2424S**	18-36	24	830	89%
RPP20-483.3S**	36-75	3.3	6000	88%
RPP20-4805S**	36-75	5	4000	89%
RPP20-4812S**	36-75	12	1666	89%
RPP20-4815S**	36-75	15	1333	88%
RPP20-4824S**	36-75	24	830	88%
RPP20-1212D**	9-18	±12	±833	88%
RPP20-1215D**	9-18	±15	±666	88%
RPP20-1224D**	9-18	±24	±416	88%
RPP20-2412D**	18-36	±12	±833	88%
RPP20-2415D**	18-36	±15	±666	89%
RPP20-2424D**	18-36	±24	±416	88%
RPP20-4812D**	36-75	±12	±833	88%
RPP20-4815D**	36-75	±15	±666	88%
RPP20-4824D**	36-75	±24	±416	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

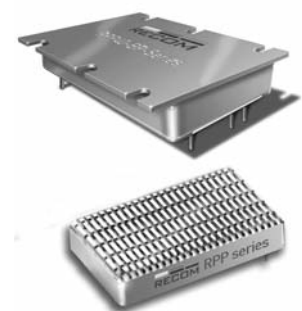
with 3 year Warranty

# RECOM

## 20 Watt

## 2:1 Single &

## Dual Output



**UL-60950-1 Certified**  
**E224736**

# RPP20

### \* ICE Technology

**ICE (Innovation in Converter Excellence) uses state-of-the-art techniques to minimize 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	12V nominal input	9-18VDC	
	24V nominal input	18-36VDC	
	48V nominal input	36-75VDC	
Under Voltage Lockout	12V input	DC-DC ON (min.)	8.5VDC
		DC-DC OFF (max.)	8VDC
	24V input	DC-DC ON (min.)	17.5VDC
		DC-DC OFF (max.)	17VDC
	48V input	DC-DC ON (min.)	35VDC
		DC-DC OFF (max.)	34VDC
Input Voltage Variation dv/dt (Complies with ETS300 132 part 4.4)		5V/ms max	
Input Surge Voltage (100 ms max.)	12V, 24V Input	50VDC	
	48V Input	100VDC	
Start Up Time	nominal Vin and constant resistor load	20ms typ., 50ms max.	
Remote ON/OFF <sup>(4)</sup>	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	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)	3.3V, 5V	100mVp-p typ.	
	All others	1% p-p Vout 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% typ.	
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 <sup>(7)</sup>		Aluminium	
Potting Material		Silicone (UL94-V0)	

continued on next page

**Specifications** (cont.)

Weight	Ribbed Case	26g
	Baseplate Case	43g
Packing Quantity	Ribbed Case	5pcs per Tube
	Baseplate Case	4pcs per Tube
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 <sup>(5)</sup>	EN61000-4-4	Perf. Criteria B
Surge <sup>(5)</sup>	EN61000-4-5	Perf. Criteria B
Conducted Immunity	EN61000-4-6	Perf. Criteria A
MTBF calculated according to BELLCORE TR-NWT-000332 <sup>(6)</sup>	2195 x 10 <sup>3</sup> 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. RPP20-2405S, RPP20-4805D-B.  
Pos. 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 bottom plate is pressed firmly into place into the aluminium case. The hydraulic press can leave tooling marks and deformations to both the case and plate. 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:

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

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

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

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

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

Practical Example:

Take the RPP20-1205S with 50% load. What is the maximum ambient operating temperature? Use converter vertical in application.

$$\text{Eff}_{\text{min}} = 89\% @ V_{\text{nom}}$$

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

$$P_{\text{outapp}} = 20 \times 0.5 = 10\text{W}$$

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

$$\eta = \sim 88\% \text{ (from Eff vs Load Graph)}$$

$$P_{\text{dissipation}} = \frac{10}{0.88} - 10 = 1.36\text{W}$$

$T_{\text{case}}$  = Case Temperature

$T_{\text{ambient}}$  = Environment Temperature

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

$P_{\text{in}}$  = Input Power

$P_{\text{out}}$  = Output Power

$\eta$  = Efficiency under given Operating Conditions

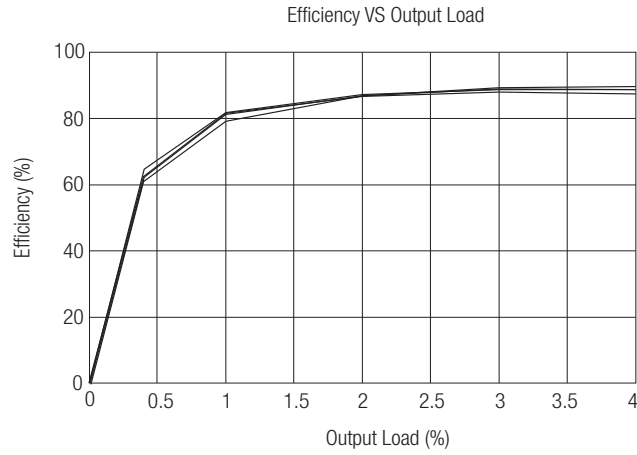
$R_{th\text{case-ambient}}$  = Thermal Impedance

$$R_{th} = \frac{T_{\text{casemax}} - T_{\text{ambient}}}{P_{\text{dissipation}}} \rightarrow 7.5^{\circ}\text{C/W} = \frac{115^{\circ}\text{C} - T_{\text{ambient}}}{1.36\text{W}}$$

$$T_{\text{ambient}} = 104.8^{\circ}\text{C}$$

Typical Characteristics

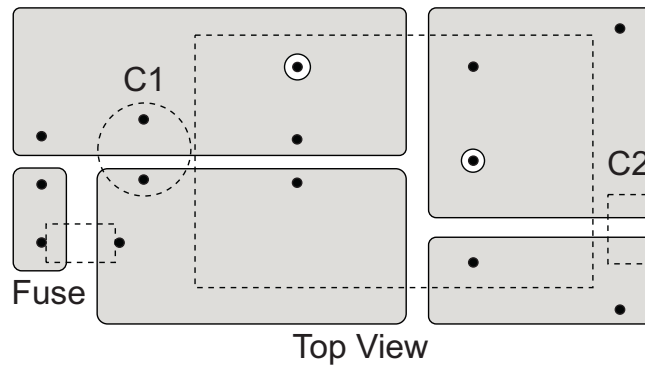
**RPP20-1209S**



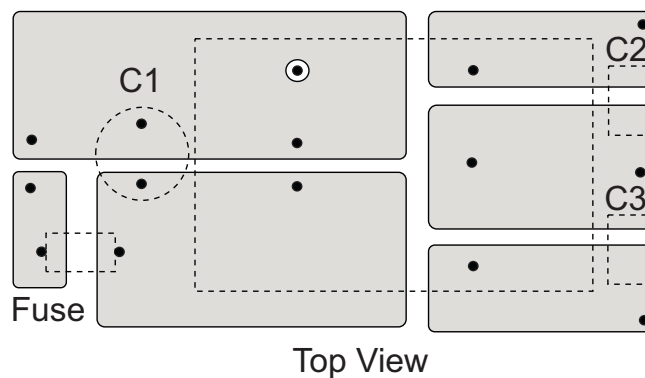
Recommended PCB Layout

**Ribbed Case**

**Single Output**

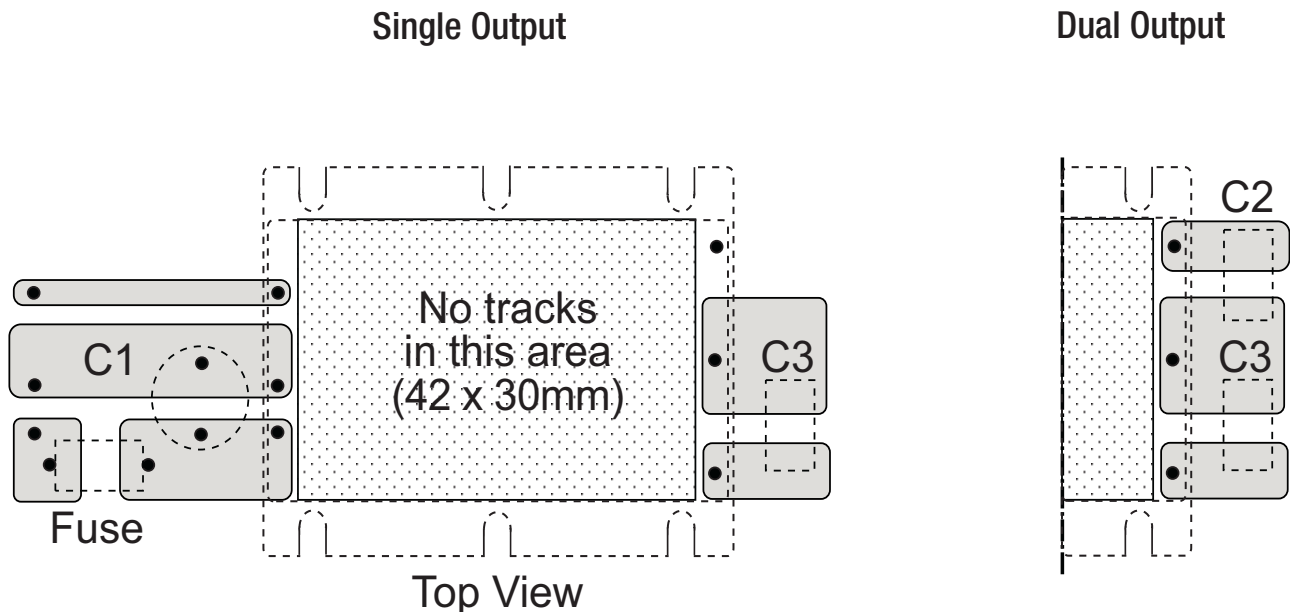


**Dual Output**



Recommended PCB Layout

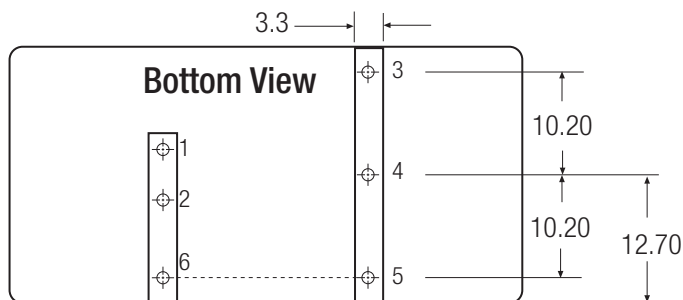
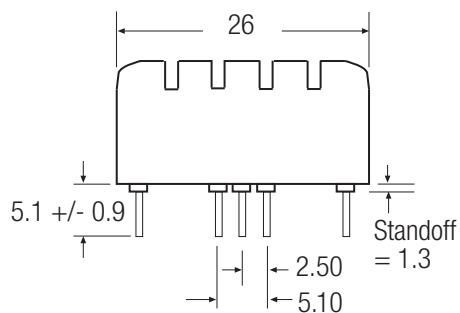
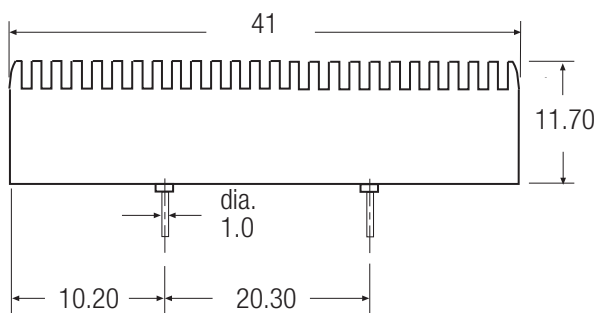
Baseplate Case- suggested PCB layout



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)



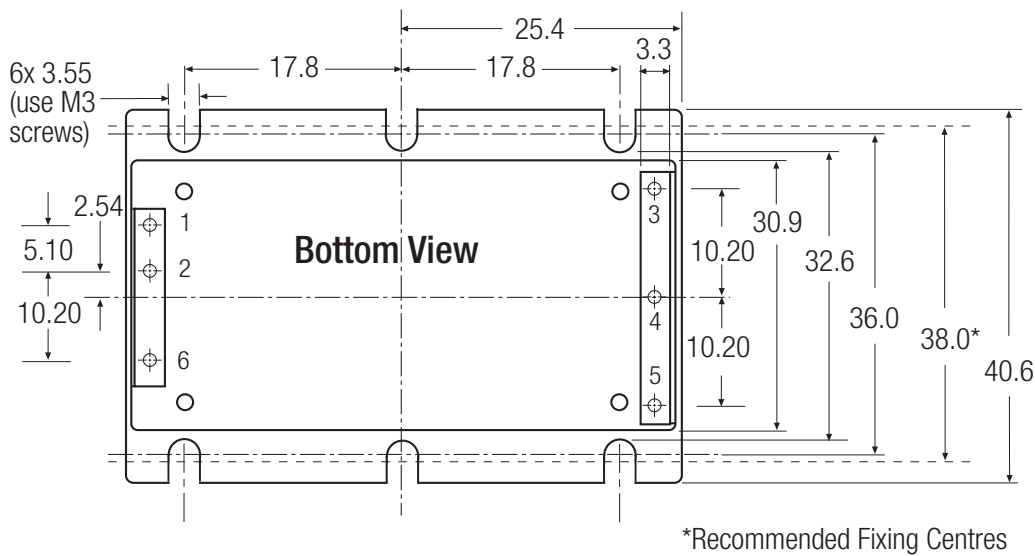
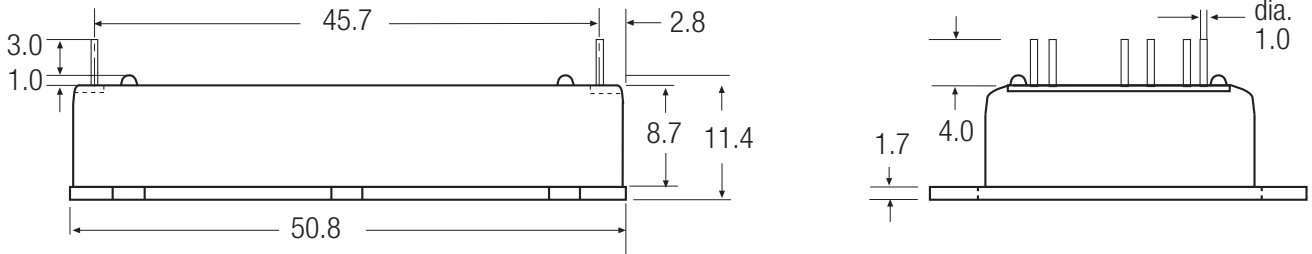
Pin Connections

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

Pin Pitch Tolerance  $\pm 0.35$  mm

Package Style and Pinning (mm)

Baseplate Case (-B suffix)



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

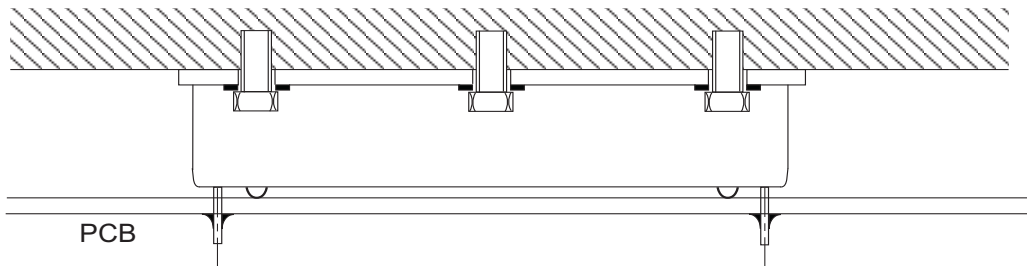
Pin Connections

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

Pin Pitch Tolerance  $\pm 0.35$  mm

RPP20

Baseplate Case Fixing - Mounting onto Heatsink/Bulkhead



Baseplate Case Fixing - Anti Vibration Mounting onto PCB

