

## 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 <sup>(1)</sup> Current mA	Efficiency <sup>(2)</sup> (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+

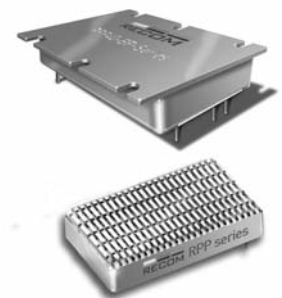
DC/DC-Converter

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 <sub>p-p</sub>	
Start Up Time	nominal Vin and constant resistor load	20ms typ., 50ms max.	
Remote ON/OFF <sup>(3)</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	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 <sub>p-p</sub> typ.	
	All others	40mV-75mV <sub>p-p</sub> 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 <sup>(6)</sup>	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 <sup>(4)</sup>	EN61000-4-4	Perf. Criteria B
Surge <sup>(4)</sup>	EN61000-4-5	Perf. Criteria B
Conducted Immunity	EN61000-4-6	Perf. Criteria A
MTBF calculated according to BELLCORE TR-NWT-000332 <sup>(5)</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. RPP20-2405SW, 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:

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

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

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

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

$T_{\text{case}}$  = 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

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

Practical Example:

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

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

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

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

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

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

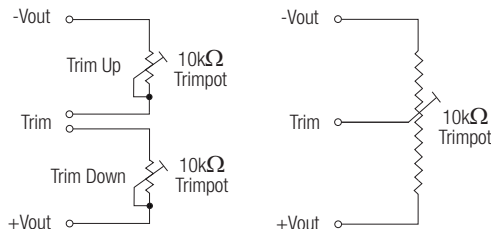
$$P_{\text{dissipation}} = \frac{12}{0.85} - 12 = 2.12\text{W}$$

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

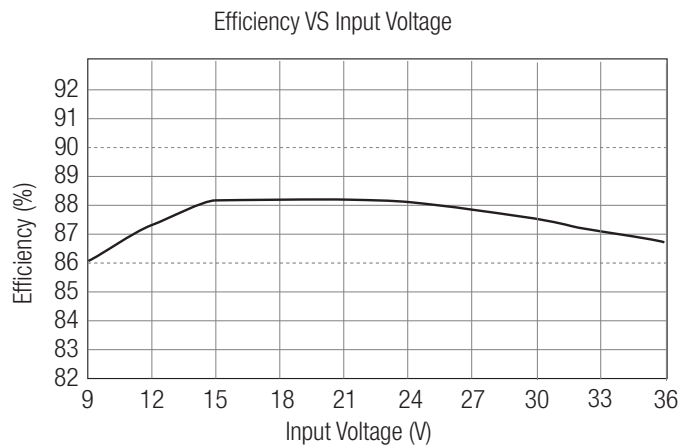
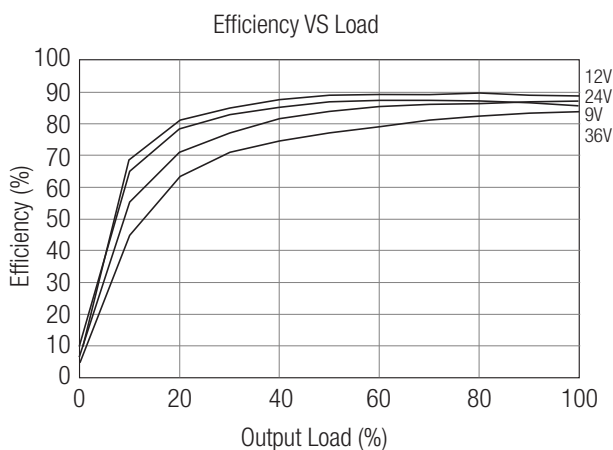
$$T_{\text{ambient}} = 99.1^{\circ}\text{C}$$

Typical Characteristics

**External Output Trimming**  
Refer To Application Notes for recommended resistor Values



## RPP20-2405SW

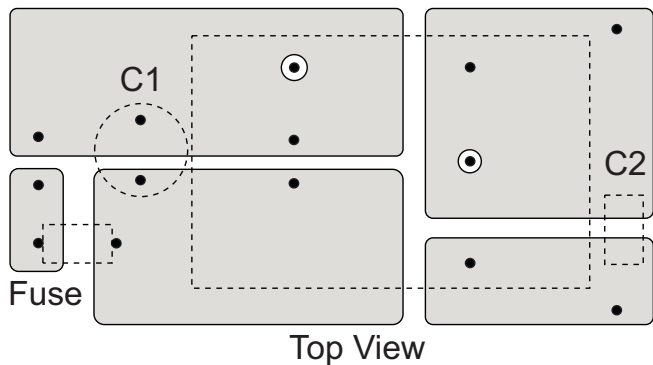


RPP20-W

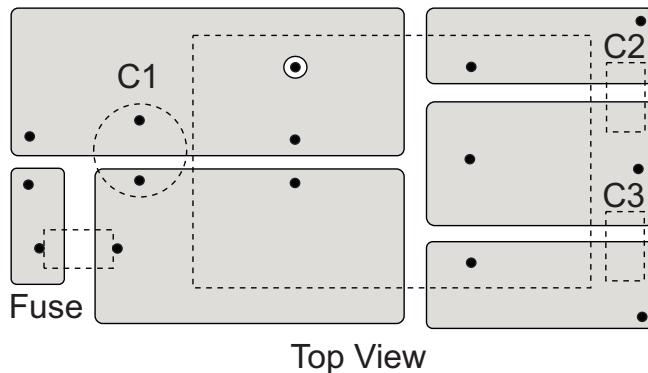
Recommended PCB Layout

### Ribbed Case

#### Single Output

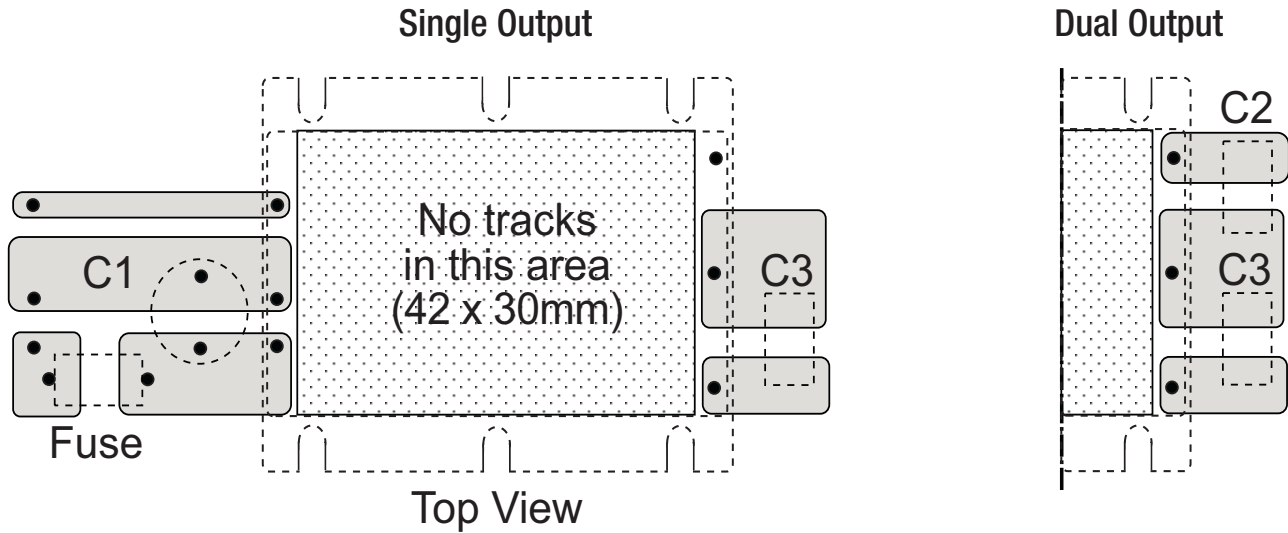


#### Dual Output



**Recommended PCB Layout**

**Baseplate Case- suggested PCB layout**



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

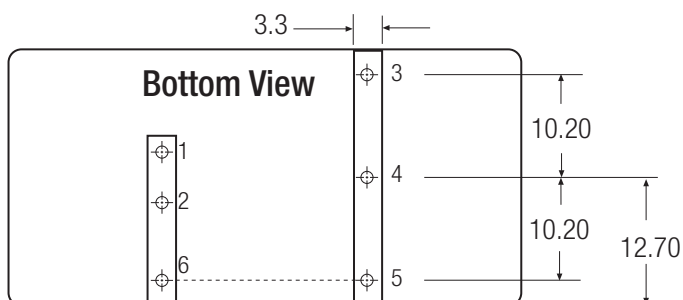
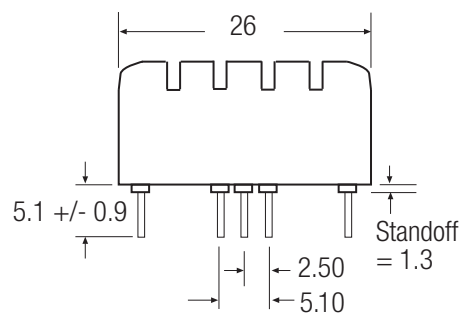
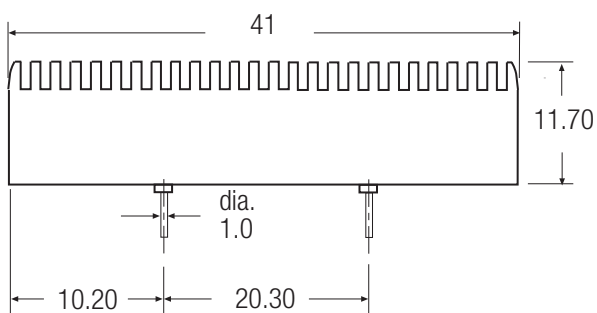
Input Capacitor, C1, is required to meet EN61000 Surge and Fast Transient, otherwise it is not required for normal operation.

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)**



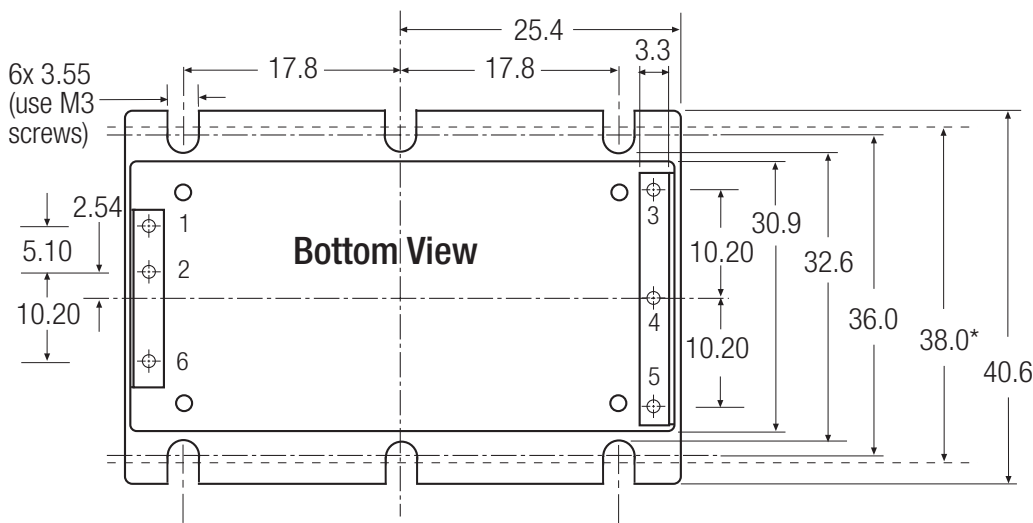
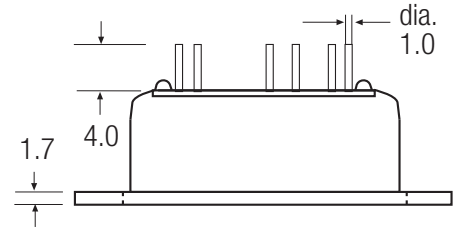
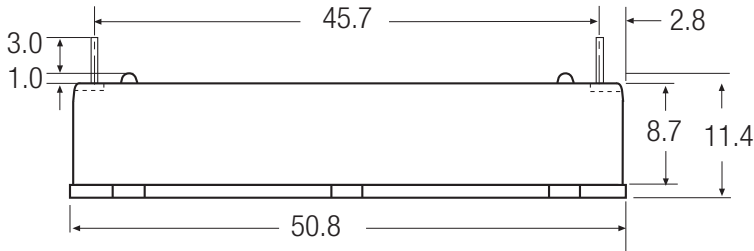
**Pin Connections**

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

Pin Pitch Tolerance  $\pm 0.35$  mm

Package Style and Pinning (mm)

Baseplate Case (-B Suffix)



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

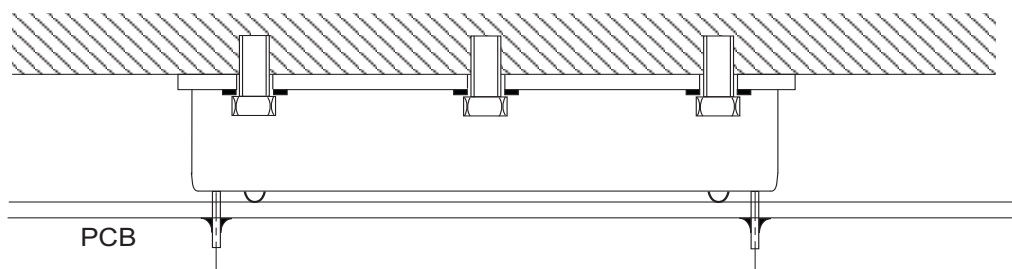
Pin Connections

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

\*Recommended Fixing Centres

Baseplate Case Fixing - Mounting onto Heatsink/Bulkhead



Baseplate Case Fixing - Anti Vibration Mounting onto PCB

