

Features

ICE Technology*

- 115°C Maximum Case Temperature
- -40°C Minimum Temp.
- Built-in FCC/EN55022 Class B Filter
- 4:1 Wide Input Voltage Range
- 40 Watts Output Power
- Ribbed or Baseplate Case Styles
- Min. Efficiency 86%
- 3kVDC Isolation
- Low Quiescent Current

Description

The RPP40-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 very compact, the converter contains a built-in filter EN55022 Class B / FCC Level B without the need for any external components. The RPP40-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 heatsink cooling applications. They are UL-60950-1 certified.

Selection Guide 24V and 48V Input Types

Part Number	Input Range VDC	Output Voltage VDC	Output Current A	Input ⁽¹⁾ Current mA	Efficiency ⁽²⁾ (Min.)
RPP40-243.3SW	9-36	3.3	12	58/1896	86%
RPP40-2405SW	9-36	5	8	60/1894	87%
RPP40-2412SW	9-36	12	3.33	100/1894	87%
RPP40-2415SW	9-36	15	2.67	100/1885	87%
RPP40-2424SW	9-36	24	1.67	100/1885	87%
RPP40-483.3SW	18-75	3.3	12	42/946	86%
RPP40-4805SW	18-75	5	8	37/941	87%
RPP40-4812SW	18-75	12	3.33	5/938	87%
RPP40-4815SW	18-75	15	2.67	5/939	87%
RPP40-4824SW	18-75	24	1.67	5/939	87%
RPP40-2412DW	9-36	±12	±1.67	32/1453	87%
RPP40-2415DW	9-36	±15	±1.33	30/1436	87%
RPP40-2424DW	9-36	±24	±0.84	30/1436	87%
RPP40-4812DW	18-75	±12	±1.67	18/727	87%
RPP40-4815DW	18-75	±15	±1.33	20/718	87%
RPP40-4824DW	18-75	±24	±0.84	20/718	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

40 Watt 4:1 Single & Dual Output



**UL-60950-1 Certified
E224736**

RPP40-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	300mA _{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	
	Nominal input	2mA typ.	
Remote OFF input current	Nominal input	2mA typ.	
Output Voltage Accuracy	10% Load and nominal Vin	±1%	
Voltage Adjustability		±10%	
Minimum Load		0%	
Line Regulation	low line, high line at full load	±0.3%	
Load Regulation	10% to 100% full load	±0.5%	
Ripple and Noise (20MHz bandwidth limited) (measured with 1µF capacitor across output)	3.3V, 5V	60mV _{p-p} typ.	
	All others	40mV _{p-p} typ.	
Temperature Coefficient		±0.04%/°C max.	
Transient Response	25% load step change	200µs	
Over Load Protection	% of full load at nominal Vin	120% typ.	
Short Circuit Protection		Hiccup, automatic recovery	
Output Over Voltage Protection (refer to block diagram in Application Notes)		Converter shutdown if Vout > Vout nominal + 20%	
Isolation Voltage		Rated at 2250VDC/1 minute, Flash tested at 3000VDC/1 second	
Isolation Resistance		10MΩ min.	
Isolation Capacitance (refer to block diagram in Application Notes)		3000pF max.	
Operating Frequency		260kHz ± 40kHz 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	
RPP40 Operating Temperature Range	Ambient, Free Convection	-40°C to see Calculation (Note 7)	
Thermal Impedance (Natural convection)	Ribbed Case: Vertical	7.3°C/Watt	
	Ribbed Case: Horizontal	10°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	39g
	Baseplate Case	43g
Packing Quantity	Ribbed Case	4 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⁾	1989 x 10 ³ hours	

Notes :

- Typical values at nominal input voltage and no load/full load.
- Min. values at nominal input voltage and full load.
- 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. RPP40-2405SW
Positive logic: 0= OFF, 1 = ON. The converter will be ON if the CTRL is left open.
- Requires an external 100µF low ESR capacitor to meet EN61000-4-4 and EN61000-4-5
- Case I: 50% Stress, Temperature at 50°C (Ground Benign).
- 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.
- Example:

$$R_{th\text{case-ambient}} = 7.3^{\circ}\text{C/W (vertical)}$$

$$R_{th\text{case-ambient}} = 11^{\circ}\text{C/W (horizontal)}$$

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

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

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

Practical Example:

Take the RPP40-2405SW with 80% load. What is the maximum ambient operating temperature? Use converter vertical in application.

$$Eff_{\text{min}} = 87\% @ V_{\text{nom}}$$

$$P_{\text{out}} = 40\text{W}$$

$$P_{\text{outapp}} = 40 \times 0.80 = 32\text{W}$$

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

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

$$P_{\text{dissipation}} = \frac{32}{0.88} - 32 = 4.36\text{W}$$

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

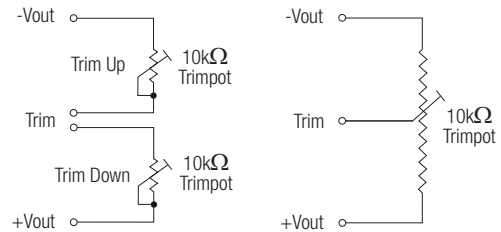
$R_{th\text{case-ambient}}$ = Thermal Impedance

$$R_{th} = \frac{T_{\text{casemax}} - T_{\text{ambient}}}{P_{\text{dissipation}}} \rightarrow 7.3^{\circ}\text{C/W} = \frac{115^{\circ}\text{C} - T_{\text{ambient}}}{4.36\text{W}}$$

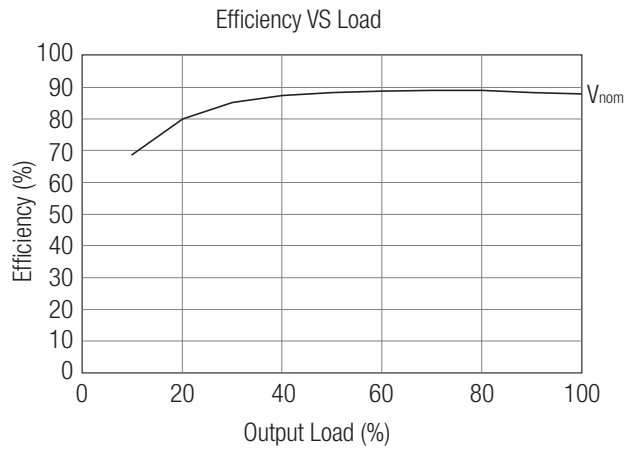
$$T_{\text{ambient}} = 83.15^{\circ}\text{C}$$

Typical Characteristics

External Output Trimming
Refer to Application Notes for suggested Resistor Values



RPP40-2405SW / RPP40-2412SW

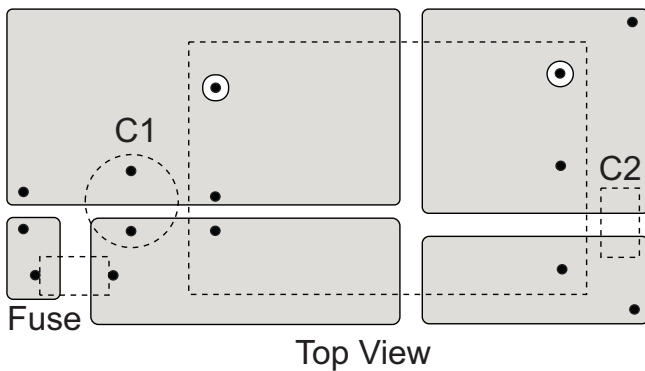


RPP40-W

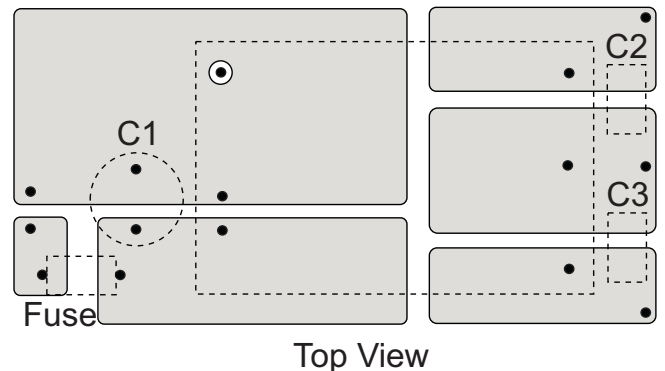
Recommended PCB Layout

Ribbed Case

Single Output

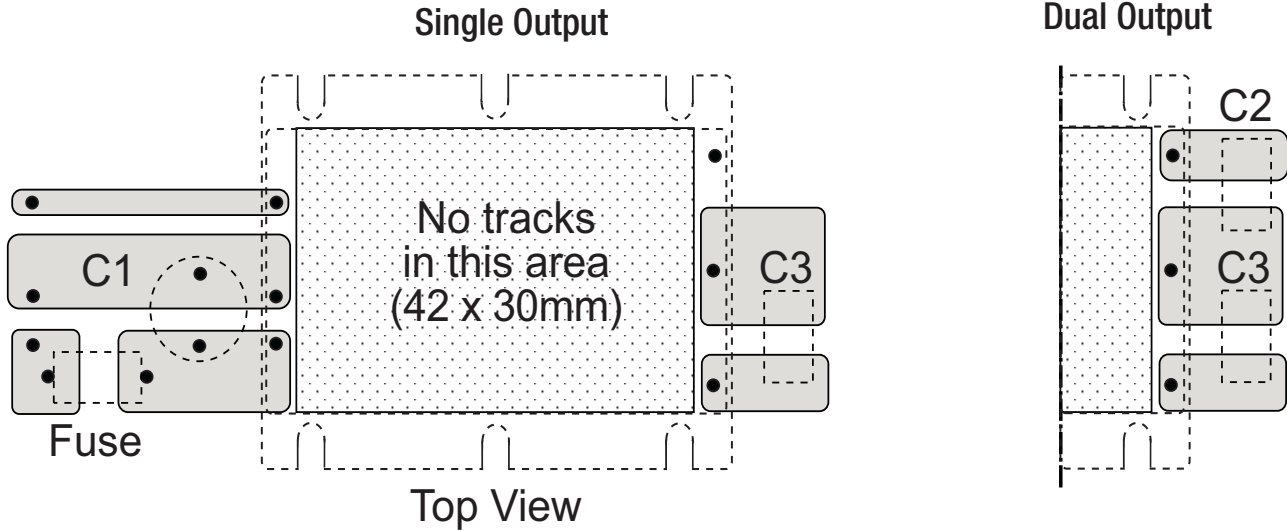


Dual Output



Recommended PCB Layout

Baseplate Case- suggested PCB layout



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

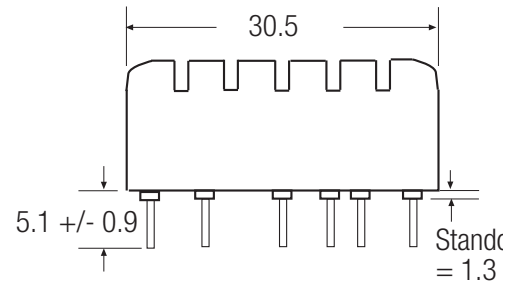
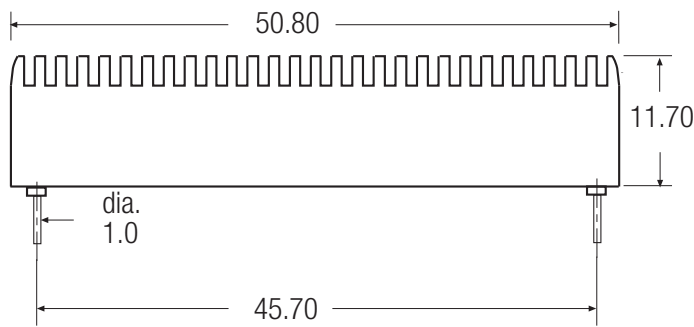
Input Capacitor, C1, is required to meet EN61000 Surge and Fast Transient, otherwise it is not required for normal operation.

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

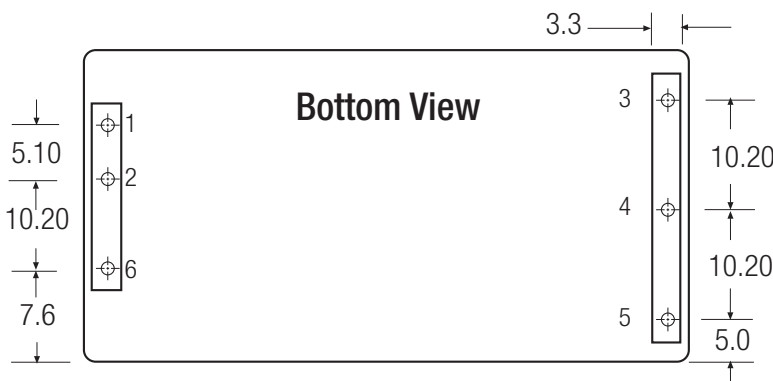
To ensure optimum thermal performance, use large areas of copper on the PCB to assist with heat dissipation and mount the converter vertically.

Package Style and Pinning (mm)

Ribbed Case (Standard - no Suffix)



RPP40-W



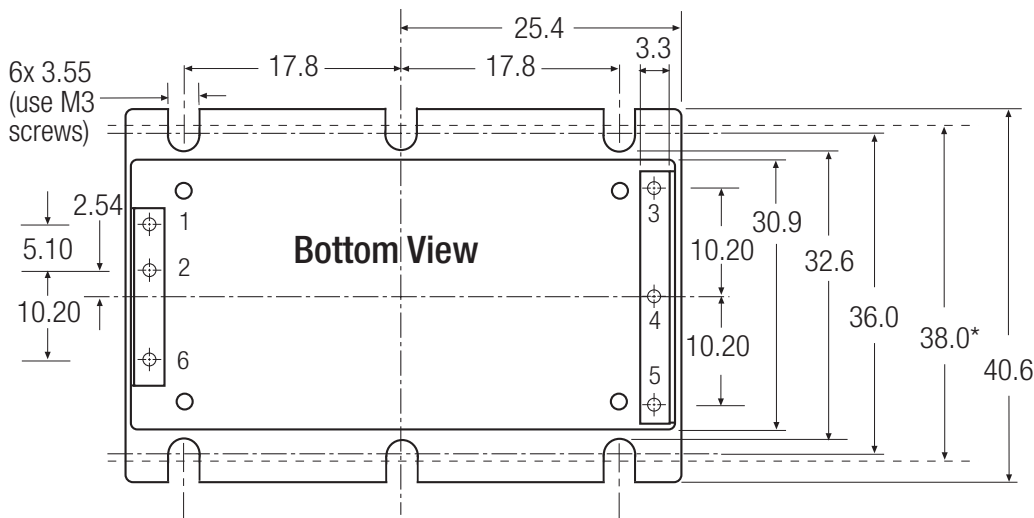
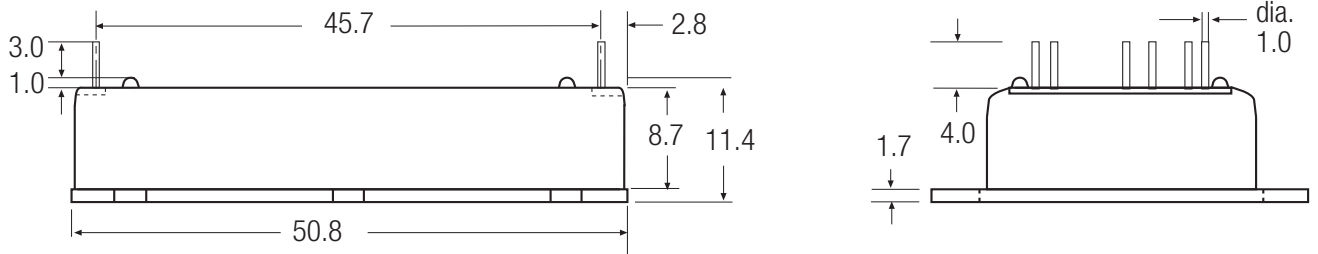
Pin Connections

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

Typical Characteristics

Baseplate Case (-B Suffix)



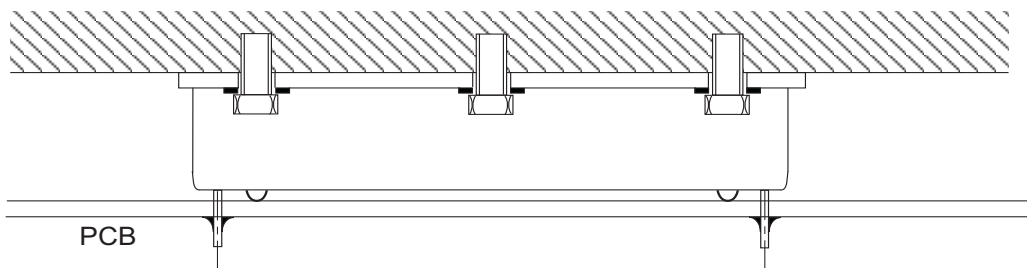
Pin Connections

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

Baseplate Case Fixing - Mounting onto Heatsink/Bulkhead



Baseplate Case Fixing - Anti Vibration Mounting onto PCB

