

From -45°C up to 100°C Full Load Operating Temperature
 Built-in EN55022/FCC Class B EMC Filter
 Up to 3kVDC Isolation
 Compact Size, Standard Pinouts
 Efficiency above 90%
 Single & Dual Outputs
 2:1and 4:1 Input Voltage Ranges
 20W, 30W, 40W or 50W DC-DC Power Packages



The POWERLINE PLUS uses ICE Technology. A combination of techniques to minimise internal heat dissipation and maximise the heat transfer to ambient to create a new converter series which offers high end performance at a price which is significantly lower than conventional specialist converters. RECOM - Green high-efficiency power solutions. SAVE ENERGY. NOW.



**POWERLINE PLUS** DC-DC Converters

The RPP20 series 2:1 input range DC-DC converters are ideal for high end industrial applications and COTS Military applications where a very high ambient operating temperature converter 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.

# **Features**

- Up to 100°C Industrial Temperature Range without Derating: 105°C max Ambient.
- Built-in FCC/EN55022 Class B Filter
- 2:1 Wide Input Voltage Range
- 15-20 Watts Output Power

- Compact 40.6 x 25.4 x 11.7 mm package
- Efficiency > 90%
- 2kVDC Isolation
- Fully Protected Outputs
- Low Quiescent Current

### Selection Guide 12V, 24V and 48V Input Types

Part Number	Input Range	Output Voltage	Output Current	Input <sup>(1)</sup> Current	Efficiency <sup>(2)</sup>	Max <sup>(3)</sup> Operating
	VDC	VDC	mA	mA	%	Temp
RPP20-123.3S	9-18	3.3	6000	71/1860	88.8%	96°C
RPP20-1205S	9-18	5	4000	57/1850	90.2%	99°C
RPP20-1212S	9-18	12	1666	26/1890	88.0%	94°C
RPP20-1215S	9-18	15	1333	24/1880	88.8%	96°C
RPP20-243.3S	18-36	3.3	6000	40/930	88.7%	96°C
RPP20-2405S	18-36	5	4000	57/920	90.4%	99°C
RPP20-2412S	18-36	12	1666	15/930	90.2%	99°C
RPP20-2415S	18-36	15	1333	16/930	90.3%	99°C
RPP20-483.3S	36-75	3.3	6000	23/458	90.7%	99°C
RPP20-4805S	36-75	5	4000	23/458	90.8%	100°C
RPP20-4812S	36-75	12	1666	10/469	88.8%	96°C
RPP20-4815S	36-75	15	1333	10/462	90.2%	99°C
RPP20-1212D	9-18	±12	±833	24/1900	89.7%	98°C
RPP20-1215D	9-18	±15	±666	27/1840	90.4%	99°C
RPP20-2412D	18-36	±12	±833	17/950	88.9%	96°C
RPP20-2415D	18-36	±15	±666	18/910	90.1%	99°C
RPP20-2424D	18-36	±24	±416	34/940	89.0%	96°C
RPP20-4812D	36-75	±12	±630	10/469	89.0%	96°C
RPP20-4815D	36-75	±15	±666	12/458	89.7%	98°C
RPP20-4824D	36-75	±24	±416	21/479	87.5%	94°C



# RPP20-xxxxSW\_DW



# **Features**

- Up to 97°C Ambient Temperature Range without Derating: 100°C max.
- Built-in FCC/EN55022 Class B Filter
- 2:1 Wide Input Voltage Range
- O Watts Output Power

- Compact 50.8 x 30.5 x 11.7 mm Package
- Efficiency up to 92%
- 2kVDC Isolation
- Fully Protected
- Low Quiescent Current

### Selection Guide 12V, 24V and 48V Input Types

Part Number	Input	Output	Output	Input <sup>(1)</sup>	Efficiency <sup>(2)</sup>	Max <sup>(3)</sup>
	Range VDC	Voltage VDC	Current mA	Current mA	%	Operating Temp
RPP30-123.3S	9-18	3.3	8500	78/2666	87.5%	86°C
RPP30-1205S	9-18	5	6000	109/2768	90.3%	91°C
RPP30-1212S	9-18	12	2500	26/2784	89.8%	89°C
RPP30-1215S	9-18	15	2000	31/2775	90.1%	91°C
RPP30-243.3S	18-36	3.3	8000	59/1394	89.7%	89°C
RPP30-2405S	18-36	5	6000	62/1372	91.1%	93°C
RPP30-2412S	18-36	12	2500	18/1400	90.4%	91°C
RPP30-2415S	18-36	15	2000	18/1380	91.4%	94°C
RPP30-483.3S	36-75	3.3	8000	24/697	89.6%	89°C
RPP30-4805S	36-75	5	6000	37/680	92.0%	96°C
RPP30-4812S	36-75	12	2500	11/687	91.0%	94°C
RPP30-4815S	36-75	15	2000	12/682	91.6%	94°C
RPP30-1212D	9-18	±12	±1250	29/2790	89.6%	89°C
RPP30-1215D	9-18	±15	±1000	33/2784	89.8%	89°C
RPP30-2412D	18-36	±12	±1100	20/1300	88.4%	86°C
RPP30-2415D	18-36	±15	±1000	10/1392	89.8%	89°C
RPP30-2424D	18-36	±24	±600	10/1384	90.3%	91°C
RPP30-4812D	36-75	±12	±1150	11/647	88.8%	87°C
RPP30-4815D	36-75	±15	±1000	12/689	90.7%	94°C
RPP30-4824D	36-75	±24	±550	26/622	88.4%	86°C



# RPP30-xxxxSW\_DW

# **Features**

- High Ambient Temperature Range without Derating: 105°C max.
- Built-in FCC/EN55022 Class B Filter
- 2:1 Wide Input Voltage Range
- 40/50 Watts Output Power

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

Part Number	Input Range	Output Voltage	Output Current	Input <sup>(1)</sup> Current	Efficiency <sup>(2)</sup>	Max <sup>(3)</sup> Operating
	VDC	VDC	mA	mA	%	W
RPP40-243.3S	18-36	3.3	12	58/1885	88.4%	77°C
RPP40-2405S	18-36	5	8	60/1831	91.0%	86°C
RPP40-2412S	18-36	12	3.33	100/1875	87.8%	75°C
RPP40-2415S	18-36	15	2.67	100/1870	89.5%	81°C
RPP40-483.3S	36-75	3.3	12	42/923	90.2%	84°C
RPP40-4805S	36-75	5	8	37/906	92.0%	89°C
RPP40-4812S	36-75	12	3.33	5/930	88.9%	78°C
RPP40-4815S	36-75	15	2.67	5/930	89.7%	81°C

Comnact	50.8	x 30	5 x 11	7 mm	Packane
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- Efficiency up to 92%
- 3kVDC/Isolation
- Fully Protected
- Low Quiescent Current



# RPP40/RPP50



# **POWERLINE PLUS - CONTENTS**

The POWERLINE PLUS uses ICE Technology. A combination of techniques to minimise internal heat dissipation and maximise the heat transfer to ambient to create a new converter series which offers high end performance at a price which is significantly lower than conventional specialist converters. RECOM - Green high-efficiency power solutions. SAVE ENERGY. NOW



### Introduction

The RPP series 2:1 and 4:1 input range DC/DC converters are ideal for high end industrial applications and COTS (Commercial Off-The-Shelf) Military applications where a high ambient operating temperature converter is required.

The converters series feature ICE Technology, a revolutionary method of extending the temperature range without increasing the converter dimensions over standard converters. The built-in aluminium heat sink ensures optimum heat transfer to ambient.

Although the case size is compact, the converters contain a built-in EN55022 Class B / FCC Level B filter without the need for any external components.

All RPP series converters are fully protected with undervoltage lockout protection, overload, overcurrent and overvoltage protection, short circuit current limiting and overtemperature shutdown.

In addition, the converters have a quiescent current that is an order of magnitude lower than equivalent power converters.

### **Regulated DC/DC Converters**

Series (**)	Isolation (kVDC)	Power (Watts)	Input Voltages (VDC)	Output Voltages (VDC)	Case Dimensions mm	Outputs	Page No.
RPP20	2	15-20	9-18, 18-36, 36-75	3.3, 5, 12, 15	50.8 x 25.4 x 11.7	Single and Dual	PP1
				±12, ±15, ±24	(1.6" x 1")		
RPP20 (W)	2	19-20	9-36, 18-75	3.3, 5, 12, 15	50.8 x 25.4 x 11.7	Single and Dual	PP5
				±12, ±15	(1.6" x 1")		
RPP30	2	24-30	9-18, 18-36, 36-75	3.3, 5, 12, 15	50.8 x 30.5 x 11.7	Single and Dual	PP9
				±12, ±15	(2" x 1.2")		
RPP30 (W)	2	30	10-40, 18-75	3.3, 5, 12, 15	50.8 x 30.5 x 11.7	Single and Dual	PP13
				±12, ±15	(2" x 1.2")		
RPP40	2	40	18-36, 36-75	3.3, 5, 12, 15	50.8 x 30.5 x 11.7	Single	PP17
					(2" x 1.2")		
RPP50	2	50	18-36, 36-75	3.3, 5, 12, 15	50.8 x 30.5 x 11.7	Single	PP17
					(2" x 1.2")		

Products in bold type are new products for 2009

Features	<ul> <li>Up to 100°C Ambient with no derating</li> <li>120°C Maximum Case Temperature</li> </ul>
ICE	<ul> <li>-45°C Minimum Operating Temperature</li> <li>Built-in FCC/EN55022 Class B Filter</li> </ul>
Technologu*	<ul> <li>2:1 Input Voltage Range</li> <li>Six Sided Shielded Enclosure</li> </ul>
recimology	Compact 40.6x25.4x11.7mm Package
	<ul> <li>Efficiency to 89%</li> </ul>
	2kVDC Isolation
	Fully Protected

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 high ambient operating temperature converter 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.

#### Selection Guide 12V. 24V and 48V Input Types

Part Number	Input Range VDC	Output Voltage VDC	Output Current mA	Input <sup>(1)</sup> Current mA	Efficiency <sup>(2)</sup>	Max <sup>(3)</sup> Operating Temp
RPP20-123.3S	9-18	3.3	6000	71/1860	88.8%	96°C
RPP20-1205S	9-18	5	4000	57/1850	90.2%	99°C
RPP20-1212S	9-18	12	1666	26/1890	88.0%	94°C
RPP20-1215S	9-18	15	1333	24/1880	88.8%	96°C
RPP20-243.3S	18-36	3.3	6000	40/930	88.7%	96°C
RPP20-2405S	18-36	5	4000	57/920	90.4%	99°C
RPP20-2412S	18-36	12	1666	15/930	90.2%	99°C
RPP20-2415S	18-36	15	1333	16/930	90.3%	99°C
RPP20-483.3S	36-75	3.3	6000	23/458	90.7%	99°C
RPP20-4805S	36-75	5	4000	23/458	90.8%	100°C
RPP20-4812S	36-75	12	1666	10/469	88.8%	96°C
RPP20-4815S	36-75	15	1333	10/462	90.2%	99°C
RPP20-1212D	9-18	±12	±833	24/1900	89.7%	98°C
RPP20-1215D	9-18	±15	±666	27/1840	90.4%	99°C
RPP20-2412D	18-36	±12	±833	17/950	88.9%	96°C
RPP20-2415D	18-36	±15	±666	18/910	90.1%	99°C
RPP20-2424D	18-36	±24	±416	34/940	89.0%	96°C
RPP20-4812D	36-75	±12	±630	10/469	89.0%	96°C
RPP20-4815D	36-75	±15	±666	12/458	89.7%	98°C
RPP20-4824D	36-75	±24	±416	21/479	87.5%	94°C





# 20 Watt Single & Dual Output



#### UL-60950-1 Pending



#### **Derating Graph (Ambient Temperature)**

RPP20-4805S

Derating graphs are valid only for the shown part number. Please contact Technical Support for more information: info@recom-development.at



#### \* 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 end of section for more details.

DC/DC-Converter

# RPP20-S\_D Series

Input Voltage Pape	12V nominal input	0.18//00
input voltage hange	24V nominal input	18-36VDC
	48V nominal input	36-75VDC
Under Voltage Lockout	12V input DC-DC ON (min.) DC-DC OFE (max.)	8.5VDC 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 Filter		Common Mode EMC Filter
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
Input Reflected Ripple	nominal Vin and full load	20mAp-p
Start Up Time	nominal Vin and constant resistor l	2ms typ., 5ms max.
Remote ON/OFF (4)	DC-DC ON	Open or 3.0V < Vr < 5.5V
Domoto OFF input ourrent	DC-DC OFF	Short or OV < Vr < 1.2V
	Nominal input	ZITA typ.
		2000 Max.
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 bandwith limited)	3.3V, ±24V	75mV-100mVp-p typ.
(measured with 1µF capacitor across outputs)	All others	40mV-60mVp-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% min.
Short Circuit Protection		Current limit, automatic recovery
Output Over Voltage Protection (refer to block diagram in Application Notes)	Con	verter shutdown if Vout > Vout nominal + 20%
Isolation Voltage	Rated at 1600VD0	C/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	-45°C to +100°C (without derating)
	· · · , · · · · · · · ·	-45°C to +105°C (with derating)
Maximum Case Temperature		+120°C
Storage Temperature Range		-55°C to +125°C
Over Temperature Protection (refer to block diagram in Application Notes)		internal thermistor
Thermal Impedance	Vertical	7.5°C/Watt
(Natural convection)	Horizonzal	11.5°C/Watt
Relative Humidity		5% to 95% RH
Case Material <sup>(7)</sup>		Aluminium
Pottino Material		Silicone (III 94-V0)
Weight		26n
Dimencione		1 6" v 1" v 0 49" (50 9 v 25 4 v 11 7mm)
פווטוויוים		I.U A I A U.40 (JU.0 X ZJ.4 X II./IIIII)

### DC/DC-Converter

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

# RPP20-5\_D Series

Safety Standards	UL-60950-1 Pending	
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. Typical values at nominal input voltage and full load.
- 3. Typical values at nominal input voltage and full load in vertical orientation and with Eurocard-sized PCB ground planes to assist in heat dissipation. For horizontal orientation, reduce the maximum temperatures by 10°C.
- 4. The ON/OFF control function can be positive or negative logic. The pin voltage is referenced to negative input. Positive logic ON/OFF is standard, no suffix (Ex. RPP20-2405S)
  - Negative logic ON/OFF option has suffix /N (Ex. RPP20-2405S/N)
- 5. Requires an external 100µF/100V low ESR capacitor to meet EN61000-4-4 and EN61000-4-5
- 6. Case I: 50% Stress, Temperature at 50°C (Ground Benign).
- 7. 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.

#### **Recommended PCB Layout**

Single Output



# Dual Output



Input Fuse is recommended, but optional. 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  $1\mu$ F/100V MLCC To ensure optimum thermal performance, use large areas of copper on the PCB to assist with heat dissipation and mount the converter vertically. **POWERLINE+** DC/DC-Converter

# RPP20-5\_D Series

RPP20-2405S



### Package Style and Pinning (mm)

**RPP-20** 





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



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



Features	<ul> <li>Up to 97°C Ambient, no derating</li> <li>120°C Maximum Case Temperature</li> </ul>
ICE	<ul> <li>-45°C Minimum OperatingTemperature</li> <li>Built-in FCC/EN55022 Class B Filter</li> </ul>
Technology*	<ul> <li>4:1 Wide Input Voltage Range</li> <li>Six Sided Shielded Enclosure</li> </ul>
	Compact 40.6x25.4x11.7mm Package
	<ul> <li>Efficiency to &gt;89%</li> <li>EV/DCL Luit</li> </ul>
	CKVDC Isolation     Eully Destasted
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#### 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 high ambient operating temperature converter is required. Although the case size is compact, the converter contains a built-in EN55022 Class B / FCC Level B EMC filter without the need for any external components.

#### 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>	Max <sup>(3)</sup> Operating Temp
RPP20-243.3SW	9-36	3.3	6000	59/955	87.2%	93°C
RPP20-2405SW	9-36	5	4000	65/946	88.1%	95°C
RPP20-2412SW	9-36	12	1666	23/946	88.1%	95°C
RPP20-2415SW	9-36	15	1333	25/931	89.5%	97°C
RPP20-483.3SW	18-75	3.3	6000	28/465	89.6%	97°C
RPP20-4805SW	18-75	5	4000	33/465	89.6%	97°C
RPP20-4812SW	18-75	12	1666	13/470	88.6%	96°C
RPP20-4815SW	18-75	15	1333	12/466	89.3%	97°C
RPP20-2412DW	9-36	±12	±833	28/930	89.6%	97°C
RPP20-2415DW	9-36	±15	±666	24/946	88.0%	95°C
RPP20-4812DW	18-75	±12	±833	16/472	88.2%	95°C
RPP20-4815DW	18-75	±15	±666	13/466	89.4%	97°C





# 20 Watt Single & Dual Output



#### UL-60950-1 Pending



#### **Derating Graph (Ambient Temperature)**

RPP20-2405SW



\* 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 end of section for more details.

Derating graphs are valid only for the shown part number. Please contact Technical Support for more information: info@recom-development.at

#### www.recom-international.com

DC/DC-Converter

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

# RPP2O-5\_DW Series

Input Voltage Range	24V nominal input	9-36VDC
Inder Valtage Leakeut	48V nominal input	18-75VDC
Under voltage Lockoul	DC-DC ON (IIIII.)	8.5VDC 8VDC
	48V input DC-DC ON (min.)	35VDC
	DC-DC OFF (max.)	34VDC
Input Filter		Common Mode EMC Filter
Input Voltage Variation dv/dt (Complies with ETS300 132 part 4.4)		5V/ms max
Input Surge Voltage (100 ms max.)	24V Input	50VDC
	48V Input	100VDC
Input Reflected Ripple	nominal Vin and full load	20mAp-p
Start Up Time	nominal Vin and constant resistor load	2ms typ., 5ms max.
Remote ON/OFF (4)	DC-DC ON	Open or 3.0V < Vr < 5.5V
	DC-DC OFF	Short or $0V < Vr < 1.2V$
Remote OFF input current	Nominal input	2mA typ.
Output Power		20W max.
Output Voltage Accuracy	50% Load and 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 bandwith limited)	3.3V	100mVp-p typ.
(measured with 1µF capacitor across outputs)	All others	40mV-75mVp-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		Current limit, automatic recovery
Output Over Voltage Protection (refer to block diagram in Application Notes)	Converte	er shutdown if Vout > Vout nominal + 20%
Isolation Voltage	Rated at 1600VDC/1 r	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	-45°C to +97°C (without derating)
		-45°C to +105°C (with derating)
Maximum Case Temperature		+120°C
Storage Temperature Range		-55°C to +125°C
Over Temperature Protection (refer to block diagram in Application Notes)		internal thermistor
Thermal Impedance	Vertical	7.5°C/Watt
(Natural convection)	Horizontal	11.5°C/Watt
Relative Humidity		5% to 95% RH
Case Material (7)		Aluminium
Potting Material		Silicone (UL94-V0)
Weight		26g
Dimensions		1.6" x 1" x 0.48" (50.8 x 25.4 x 11.7mm)

### DC/DC-Converter

Safety Standards

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

# RPP20-S\_DW Series

### UL-60950-1 Pending

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-0003	32 <sup>(6)</sup>	2195 x 10 <sup>3</sup> hours

#### Notes :

- 1. Typical values at nominal input voltage and no load/full load.
- 2. Typical values at nominal input voltage and full load.
- 3. Typical values at nominal input voltage and full load in vertical orientation and with Eurocard-sized PCB ground planes to assist in heat dissipation. For horizontal orientation, reduce the maximum temperatures by 10°C.
- 4. The ON/OFF control function can be positive or negative logic. The pin voltage is referenced to negative input. Positive logic ON/OFF is standard, no suffix (Ex. RPP20-2405SW)
  - Negative logic ON/OFF option has suffix /N (Ex. RPP20-2405SW/N)
- 5. Requires an external 100µF/100V low ESR capacitor to meet EN61000-4-4 and EN61000-4-5
- 6. Case I: 50% Stress, Temperature at 50°C (Ground Benign).
- 7. 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.

#### Recommended PCB Layout

Single Output



### Dual Output



Input Fuse is recommended, but optional. 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/100V MLCC To ensure optimum thermal performance, use large areas of copper on the PCB to assist with heat dissipation and mount the converter vertically. **POWERLINE+** DC/DC-Converter

Typical Characteristics

# RPP20-5\_DW Series

### RPP20-2405SW



### Package Style and Pinning (mm)

RPP20-W





## 3rd angle projection f $( - 25.40 \rightarrow - 1)$ $( - 2.50 \rightarrow - 1.3)$ $( - 5.10 \rightarrow - 1.3)$

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

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



Features	<ul> <li>Up to 96°C ambient, no derating</li> <li>120°C Maximum Case Temperature</li> </ul>
ICE Technology*	<ul> <li>-45°C Minimum OperatingTemperature</li> <li>Built-in FCC/EN55022 Class B Filter</li> <li>2:1 Wide Input Voltage Range</li> <li>Six Sided Shielded Enclosure</li> <li>Compact 40.6x25.4x11.7mm Package</li> <li>Efficiency to 92%</li> <li>3kVDC Isolation</li> <li>Fully Destacted</li> </ul>
	• Tong Frotected

Low Quiescent Current

#### Description

The RPP30 series 2:1 input range DC/DC converters are ideal for high end industrial applications and COTS Military applications where a high ambient operating temperature converter is required. Although the case size is compact, the converter contains a built-in EN55022 Class B / FCC Level B EMC filter without the need for any external components.

#### Selection Guide 12V, 24V and 48V Input Types

Part Number	Input Range VDC	Output Voltage VDC	Output Current mA	Input <sup>(1)</sup> Current mA	Efficiency <sup>(2)</sup>	Max <sup>(3)</sup> Operating Temp
RPP30-123.3S	9-18	3.3	8500	78/2666	87.5%	86°C
RPP30-1205S	9-18	5	6000	109/2768	90.3%	91°C
RPP30-1212S	9-18	12	2500	26/2784	89.8%	89°C
RPP30-1215S	9-18	15	2000	31/2775	90.1%	91°C
RPP30-243.3S	18-36	3.3	8000	59/1394	89.7%	89°C
RPP30-2405S	18-36	5	6000	62/1372	91.1%	93°C
RPP30-2412S	18-36	12	2500	18/1400	90.4%	91°C
RPP30-2415S	18-36	15	2000	18/1380	91.4%	94°C
RPP30-483.3S	36-75	3.3	8000	24/697	89.6%	89°C
RPP30-4805S	36-75	5	6000	37/680	92.0%	96°C
RPP30-4812S	36-75	12	2500	11/687	91.0%	94°C
RPP30-4815S	36-75	15	2000	12/682	91.6%	94°C
RPP30-1212D	9-18	±12	±1250	29/2790	89.6%	89°C
RPP30-1215D	9-18	±15	±1000	33/2784	89.8%	89°C
RPP30-2412D	18-36	±12	±1100	20/1300	88.4%	86°C
RPP30-2415D	18-36	±15	±1000	10/1392	89.8%	89°C
RPP30-2424D	18-36	±24	±600	10/1384	90.3%	91°C
RPP30-4812D	36-75	±12	±1150	11/647	88.8%	87°C
RPP30-4815D	36-75	±15	±1000	12/689	90.7%	94°C
RPP30-4824D	36-75	±24	±550	26/622	88.4%	86°C





# 30 Watt Single & Dual Output



#### UL-60950-1 Pending



#### Derating Graph (Ambient Temperature)

### RPP30-4805S

Derating graphs are valid only for the shown part numbers. Please contact Technical Support for more information info@recom-development.at



#### \* 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 end of section for more details.

DC/DC-Converter

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

# RPP30-5\_D Series

Innuit Voltago Pango	12V nominal input	0.10\/DC
liiput voltaye hange	2/1/ nominal input	9-16VDC 18-36VDC
	48V nominal input	36-75VDC
Under Voltage Lockout	12V input DC-DC ON (min.)	8.5VDC
ů –	DC-DC OFF (max.)	8VDC
	24V input DC-DC ON (min.) DC-DC OFF (max.)	17.5VDC 17VDC
	48V input DC-DC ON (min.)	35VDC
	DC-DC OFF (max.)	34VDC
Input Filter		Common Mode EMCType
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
Input Reflected Ripple	nominal Vin and full load	30mAp-p
Start Up Time	nominal Vin and constant resistor loa	d 2ms typ., 5ms max.
Remote ON/OFF (4)	DC-DC ON	Open or 3.0V < Vr < 5.5V
Remote OFF input current	DC-DC OFF Nominal input	Short or UV < Vr < 1.2V
	Nominal input	2011/7 (y).
	50% Load and nominal Vin	.1 5%
Voltage Adjustability	Single Output only	±1.3 /
		±10 /8
	Level Base Istack Base at 6.11 Land	0%
	IOW line, nigh 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.
(measured with 1µF capacitor across outputs)	3.3V, 5V All others	60mVp-p typ. 25mV-45mVp-p 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		Hiccup, automatic recovery
Output Over Voltage Protection (refer to block diagram in Application Notes)	Conve	erter 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
Operating Temperature Range	Ambient, Free Convection	-45°C to +96°C max (without derating) -45°C to +105°C max (without derating)
Maximum Case Temperature		+120°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)	Vertical Horizontal	7.3°C/Watt 10°C/Wat
Relative Humidity		5% to 95% RH
Case Material (7)		Aluminium
Potting Material		Silicone (UL94-VO)
Weight		34g
Dimensions		2" x 1.2" x 0.48" (50.8 x 30.5 x 11.7mm)

### DC/DC-Converter

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

# **RPP30-5\_D** Series

Cafat	Champlanda
Saleiv	Sianname
outory	Otunuurus

Safety Standards		UL-60950-1 Pending
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. Typical values at nominal input voltage and full load.
- 3. Typical values at nominal input voltage and full load in vertical orientation and with Eurocard-sized PCB ground planes to assist in heat dissipation. For horizontal orientation, reduce the maximum temperatures by 10°C.
- 4. The ON/OFF control function can be positive or negative logic. The pin voltage is referenced to negative input. Positive logic ON/OFF is standard, no suffix (Ex. RPP20-2405SW) Negative logic ON/OFF option has suffix /N (Ex. RPP20-2405SW/N)
- 5. Requires an external 100µF/100V low ESR capacitor to meet EN61000-4-4 and EN61000-4-5
- 6. Case I: 50% Stress, Temperature at 50°C (Ground Benign).
- 7. 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 varations are cosmetic only and do not affect the operation or performance of the converters.

#### Recommended PCB Layout

Single Output





Input Fuse is recommended, but optional. 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/100V MLCC

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

**POWERLINE+** DC/DC-Converter

# RPP30-5\_D Series

RPP30-4805S



### Package Style and Pinning (mm)



REV: 0/2009

Features	<ul> <li>&gt;85°C Ambient Temperature, no derating</li> <li>120°C Maximum Case Temperature</li> </ul>	
ICE Technology*	<ul> <li>-45°C Minimum OperatingTemperature</li> <li>Built-in FCC/EN55022 Class B Filter</li> <li>4:1 Wide Input Voltage Range</li> <li>Six Sided Shielded Enclosure</li> <li>Compact 40.6x25.4x11.7mm Package</li> </ul>	
	<ul> <li>Efficiency to &gt;89%</li> <li>2kVDC Isolation</li> <li>Fully Protected</li> </ul>	

Low Quiescent Current

#### Description

The RPP30-W series 4:1 input range DC/DC converters are ideal for high end industrial applications and COTS Military applications where a high ambient operating temperature converter is required. Although the case size is compact, the converter contains a built-in EN55022 Class B / FCC Level B EMC filter without the need for any external components.

#### 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>	Max <sup>(3)</sup> Ambient Temp
RPP30-243.3SW	9-36	3.3	8400	57/1326	87.1%	85°C
RPP30-2405SW	9-36	5	6000	62/1397	89.5%	89°C
RPP30-2412SW	9-36	12	2500	27/1420	88.0%	85°C
RPP30-2415SW	9-36	15	2000	31/1436	89.7%	90°C
RPP30-483.3SW	18-75	3.3	9000	46/704	87.6%	84°C
RPP30-4805SW	18-75	5	6000	38/710	89.7%	90°C
RPP30-4812SW	18-75	12	2500	15/727	87.8%	85°C
RPP30-4815SW	18-75	15	2000	19/718	89.3%	89°C
RPP30-2412DW	9-36	±12	±1250	32/1453	89.2%	89°C
RPP30-2415DW	9-36	±15	±1000	30/1436	87.2%	85°C
RPP30-4812DW	18-75	±12	±1250	18/727	87.5%	85°C
RPP30-4815DW	18-75	±15	±1000	20/718	89.1%	89°C

# **POWERLINE+** DC/DC-Converter



# 30 Watt Single & Dual Output



#### UL-60950-1 Pending



#### **Derating Graph (Ambient Temperature)**

RPP30-4805SW



#### \* 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 end of section for more details.

Derating graphs are valid only for the shown part number. Please contact Technical Support for more information: info@recom-development.at

#### www.recom-international.com

DC/DC-Converter

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

# RPP30-5\_DW Series

Input Voltage Range	24V nominal input	9-36VDC
Inder Voltage Lockout	48V nominal input	18-75VDC 8.5VDC
Under voltage Luckout	DC-DC OFF (max.)	8.5VDC 8VDC
	48V input DC-DC ON (min.)	35VDC
	DC-DC OFF (max.)	34VDC
Input Filter		Common Mode EMC Filter
Input Voltage Variation dv/dt (Complies with ETS300 132 part 4.4)		5V/ms max
Input Surge Voltage (100 ms max.)	24V Input	50VDC
	48V Input	100VDC
Input Reflected Ripple	nominal Vin and full load	30mAp-p
Start Up Time	nominal Vin and constant resistor load	2ms typ., 5ms max.
Remote ON/OFF (4)	DC-DC ON	Open or 3.0V < Vr < 5.5V
Remote OFF input current	DC-DC OFF Nominal input	Snort or UV < Vr < 1.2V 2mA tvp.
Output Power		30W max.
Output Voltage Accuracy	50% Load and nominal Vin	+1.5%
Voltage Adjustability	Single Output only	
Minimum Load		13 %
	low line, high line at full load	.0.2%
		±0.5 %
	Dual Outrate and	±0.5%
Cross Regulation (10% <> 100% Load)	2 2V 5V	3% typ./ 5% max.
(measured with 1µF capacitor across outputs)	All others	27mV-60mVp-p 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		hiccup, automatic recovery
Output Over Voltage Protection (refer to block diagram in Application Notes)	Conve	rter 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		300kHz ± 30kHz
Operating Temperature Range	Ambient. Free Convection	-45°C to +90°C max (without derating)
	,	-45°C to +105°C max (with derating)
Maximum Case Temperature		+120°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	10°C/Watt
Relative Humidity		5% to 95% BH
Case Material <sup>(7)</sup>		Aluminium
Pottino Material		Silicone (III 94-VA)
Weight		2/n
Dimensions		2" v 1 2" v 0 /8" (50 8 v 20 5 v 11 7mm)
פווטופווסווות		2 A I.Z A U.40 (JU.O A JU.J X I I./ IIIII)

### DC/DC-Converter

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

# RPP30-5\_DW Series

Safety Standards		UL-60950-1 Pending
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 (5)	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. Typical values at nominal input voltage and full load.
- 3. Typical values at nominal input voltage and full load in vertical orientation and with Eurocard-sized PCB ground planes to assist in heat dissipation. For horizontal orientation, reduce the maximum temperatures by 10°C.
- 4. The ON/OFF control function can be positive or negative logic. The pin voltage is referenced to negative input. Positive logic ON/OFF is standard, no suffix (Ex. RPP30-2405S)
  - Negative logic ON/OFF option has suffix /N (Ex. RPP30-2405S/N)

Single Output

- 5. Requires an external  $100\mu$ F/100V low ESR capacitor to meet EN61000-4-4 and EN61000-4-5
- 6. Case I: 50% Stress, Temperature at 50°C (Ground Benign).
- 7. 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.

#### **Recommended PCB Layout**



Input Fuse is recommended, but optional. 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  $1\mu$ F/100V MLCC To ensure optimum thermal performance, use large areas of copper on the PCB to assist with heat dissipation and mount the converter vertically.

### Dual Output

**POWERLINE+** DC/DC-Converter Typical Characteristics

# RPP30-S\_DW Series

### RPP30-4805SW



#### Package Style and Pinning (mm)

**RPP30-W** 



+Vout •

+Vout o

Features	• Up to 89°C Ambient, no derating (40W)	P
	<ul> <li>120°C Maximum Case Temperature</li> <li>-45°C Minimum Operating Temperature</li> </ul>	D
ICE	Built-in FCC/EN55022 Class B Filter	
	• 2:1 Wide Input Voltage Range	
Technoloau*	40/50 Watts Output Power	
	Compact 50.8x30.5x11.7mm Package	5
	Efficiency to 92%	
	2.25kVDC/1 minute Isolation	
	Eully Destacted	

Low Quiescent Current

#### Description

The RPP40 and RPP50 series 2:1 input range DC/DC converters are ideal for high end industrial applications and COTS Military applications where a high ambient operating temperature converter is required. Although the case size is compact, the converters contains a built-in EN55022 Class B / FCC Level B EMC filter without the need for any external components.

Selection Guid	<b>e</b> 24V and 48	<b>3V Input Types</b>				
Part Number	Input Range VDC	Output Voltage VDC	Output Current A	Input <sup>(1)</sup> Current mA	Efficiency <sup>(2)</sup>	Max <sup>(3)</sup> Operating Temp
RPP40-243.3S	18-36	3.3	12	58/1885	88.4%	77°C
RPP40-2405S	18-36	5	8	60/1831	91.0%	86°C
RPP40-2412S	18-36	12	3.33	100/1875	87.8%	75°C
RPP40-2415S	18-36	15	2.67	100/1870	89.5%	81°C
RPP40-483.3S	36-75	3.3	12	42/923	90.2%	84°C
RPP40-4805S	36-75	5	8	37/906	92.0%	89°C
RPP40-4812S	36-75	12	3.33	5/930	88.9%	78°C
RPP40-4815S	36-75	15	2.67	5/930	89.7%	81°C
RPP50-243.3S	18-36	3.3	15	58/2405	86.6%	58°C
RPP50-2405S	18-36	5	10	60/2315	90.0%	74°C
RPP50-2412S	18-36	12	4.16	18/2370	88.3%	66°C
RPP50-2415S	18-36	15	3.33	18/2315	90.0%	74°C
RPP50-483.3S	36-75	3.3	15	42/1177	88.6%	68°C
RPP50-4805S	36-75	5	10	37/1140	91.4%	81°C
RPP50-4812S	36-75	12	4.16	11/1165	89.4%	72°C
RPP50-4815S	36-75	15	3.33	11/1141	91.2%	81°C

#### Derating Graph (Ambient Temperature)

#### RPP40-4805S



RPP50-4805S



ture DC/DC-Converter



# 40/50 Watt Single Output



UL-60950-1 Pending



\* 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 temp range to the maximum. Refer to end of section for more details.

Derating graphs are valid only for the shown part numbers. Please contact Technical Support for more information <u>info@recom-development.at</u>

DC/DC-Converter

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

# RPP40/50 Series

Input Voltage Range	24V nominal input	18-36VDC
Under Voltage Lockout	24V input DC-DC ON (min.)	17.5VDC
	DC-DC OFF (max.)	17VDC
	48V input DC-DC ON (min.) DC-DC OFF (max.)	35VDC 34VDC
Input Filter		Common Mode EMC Filter
Input Voltage Variation dv/dt (Complies with ETS300 132 part 4.4)		5V/ms max
Input Surge Voltage (100 ms max.)	24V Input	50VDC
	48V Input	100VDC
Input Reflected Ripple	nominal Vin and full load	30mAp-p
Start Up Time	nominal Vin and constant resistor load	2ms typ., 5ms max.
Remote ON/OFF (4)	DC-DC ON	Open or 3.0V < Vr < 5.5V
Remote OFF input current	DG-DG OFF Nominal input	Snort or UV < Vr < 1.2V 2mA tvp.
Output Power	· ·	
Output Voltage Accuracy	10% Load and nominal Vin	+1%
Voltage Adjustability		+10%
Minimum Load		
	low line, high line at full load	+0.3%
Load Begulation	10% to 100% full load	+0.5%
Ripple and Noise (20MHz bandwith limited)	3.3V, 5V	60mVp-p typ.
(measured with 1µF capacitor across output)	All others	40mVp-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)	Convert	er shutdown if Vout > Vout nominal + 20%
Isolation Voltage	Rated at 2250VDC/1	minute, Flash tested at 3000VDC/1 second
Isolation Resistance		$10M\Omega$ min.
Isolation Capacitance (refer to block diagram in Application Notes)		3000pF max.
Operating Frequency		260kHz ± 40kHz
RPP40 Operating Temperature Range	Ambient, Free Convection	-45°C to +89°C max (without derating)
RPP50 Operating Temperature Range	Ambient, Free Convection	-45°C to +81°C max (without derating)
		$-45^{\circ}$ C to $+105^{\circ}$ C max (with derating)
Maximum Case Temperature		+120°C
Storage Temperature Range		-55°C to +125°C
Over Temperature Protection (refer to block diagram in Application Notes)		internal thermistor
(Natural convection	Vertical Horizontal	7.3°C/Watt 10°C/Watt
Relative Humidity		5% to 95% RH
Case Material (7)		Aluminium
Potting Material		Silicone (UL94-V0)
Weight		39g
Dimensions		2" x 1.2" x 0.48" (50.8 x 30.5 x 11.7mm)

### DC/DC-Converter

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

# RPP40/50 Series

**Dual Output** 

Safety Standards	UL-60950-1 Pending	
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>	1989 x 10 <sup>3</sup> hours	

#### Notes :

- 1. Typical values at nominal input voltage and no load/full load.
- 2. Typical values at nominal input voltage and full load.
- 3. Typical values at nominal input voltage and full load in vertical orientation and with Eurocard-sized PCB ground planes to assist in heat dissipation. For horizontal orientation, reduce the maximum temperatures by 10°C.
- The ON/OFF control function can be positive or negative logic. The pin voltage is referenced to negative input. Positive logic ON/OFF is standard, no suffix (Ex. RPP30-2405S) Negative logic ON/OFF option has suffix /N (Ex. RPP30-2405S/N)
- 5. Requires an external 100µF/100V low ESR capacitor to meet EN61000-4-4 and EN61000-4-5
- 6. Case I: 50% Stress, Temperature at 50°C (Ground Benign).
- 7. 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.

#### **Recommended PCB Layout**

Single Output



Input Fuse is recommended, but optional. 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  $1\mu$ F/100V MLCC To ensure optimum thermal performance, use large areas of copper on the PCB to assist with heat dissipation and mount the converter vertically.

REV:0/2009



# RPP40/50 Series

RPP40-4805SW

RPP50-4805SW



#### Package Style and Pinning (mm)

RPP40 RPP50







### External Output Trimming Refer to Application Notes for suggested Resistor Values





Pin Pitch Tolerance ±0.35 mm



# **POWERLINE+ Application Notes**

DC/DC-Converter

#### ICE Technology

#### I.C.E Technology

ICE (Innovation in Converter Excellence) Technology uses a combination of techniques to minimise internal heat dissipation and maximise the heat transfer to ambient to create a new converter series which offers high end performance at a price which is significantly lower than conventional specialist converters. The exact details of this technology must remain secret, but the following brief resume describes the main features of this technological breakthrough:

# Minimising internal heat dissipation

The difference between the input power and the output power is the internal power dissipation which generates heat within the converter.

If the converter is inefficient at converting power, then adding external heat sinks, baseplates or fans are remedies that cure the symptoms rather than address the illness. First and foremost, the converter must have the highest possible efficiency over the entire input voltage range and load conditions. Most power converters are designed to be most efficient at 25°C, full load and nominal input voltage and thus offer a compromise performance when lightly loaded or operated at the maximum ambient temperature. ICE Technology uses state-of-the-art techniques to improve power convertion efficiency by approximately 2% compared to standard converters. A two per cent improvement may not sound much, but the difference between a converter with 88% efficiency and one with 90% efficiency is a 17% reduction in the dissipated power. In addition, when lightly loaded, the converters enter a power saving mode and draw only a few milliamps from the supply.

#### Maximising heat transfer

The rate of heat transfer between a hot body and its cooler surroundings is given by Fourier's Law:

q=-k.DT

- where
- q = rate of heat transfer
- k = thermal conductivity
- and DT = temperature difference

If k can be made larger, then the rate of heat transfer can still match or exceed the rate of heat generation at lower temperature differences DT and the converter will have an extended operating temperature range. Techniques to improve thermal conductivity

ICE Technology splits the thermal conductivity problem into two areas and attacks each area seperately using different techniques.

Firstly, the internal heat transfer to the case is maximised by a combination of novel converter construction and clever thermal design.

ICE converters use a construction where the hottest components (the switching FET, the transformer and the synchronous rectification FETs) are placed closest to the case wall. This method of construction makes the manufacture of the converter more difficult, but this lack of compromise reduces greatly the internal thermal impedance.

Secondly, the rate of transfer of heat to the surroundings is improved by a novel case construction which incorporates a built-in heat sink. The case is also made from thick aircraft grade aluminium rather than thin nickel-plated copper to provide a better thermal junction between the case and the high thermal conductivity silicone potting material used inside the converter.

# Maximising high temperature performance

The final technique used in the construction of ICE Technology converters is to use high temperature internal components. The maximum operating temperature of a converter is dependent on the lowest maximum permissible operating temperature of any the components used. If the capacitors are rated up to +85°C and the FETs are rated at +160°C, then the limiting factor is the capacitor temperature of +85°C.

The temperature of the ferrite core used in the transformer is also an important limiting factor. If the transformer core temperature exceeds the Curie temperature of the ferrite, then the transformer rapidly loses performance.

ICE Technology converter uses high temperature grade components to permit a case temperature of +115°C maximum. This allows operation at up to +85°C ambient without the need for fans to blow air over the converter.



Technology

### **Electromagnetic Compatibility**

ICE

Although high temperature performance is a significant feature of ICE Technology design, it does not end there.

ICE Technology also addresses the need for electromagnetic compatibility by incorporating a built-in EN55022 Class B grade filter inside the converter. The converter has been designed from the ground up to meet EMC requirements rather than a conventional design process where first the converter is optimised for performance and then an external filter is added to combat the conducted interference.

By including the filter on the main PCB of the converter, the track path lengths and impedances between the filter and the noisegenerating components are reduced to the minimum and consequently smaller value filter components can be used that fit into the compact case dimensions of the Powerline+ converters without compromising on filter performance.

#### Safety and Protection

ICE Technology converters are fully protected from output short circuits, overload, output over-voltage and over-temperature. In addition, they feature under-voltage lockout that will automatically disable the converter if the input voltage falls below the minimum level.

The output is current limited which means that temporary overloads can occur without the converter shutting down. When overloaded, the output voltage will decrease to keep the maximum power constant. For the 40W and 50W converters, if the overload is too high, the converter will go into hiccup short circuit protection mode. In this mode, the converter will attempt to reconnect power every 10-20 milliseconds.

Output overvoltage protection is monitored by a separate and independent feedback circuit and an internal thermistor sensor is used to protect the converter against overheating.

# **POWERLINE+ Application Notes**

### DC/DC-Converter

#### **Powerline Plus Output Trim Tables**



**Trim Tables** 

### Output Voltage Trimming:

Single output Powerline Plus converters offer the feature of trimming the output voltage over a certain range around the nominal value by using external trim resistors.

No general equation can be given for calculating the trim resistors, but the following trimtables give typical values for chosing these trimming resistors. If voltages between the given trim points are required, extrapolate between the two nearest given values to work out the resistor required or use a variable resistor to set the output voltage.

#### RPPxx-xx3.3S

Trim up	1	2	3	4	5	6	7	8	9	10	%
Vout =	3,333	3,366	3,399	3,432	3,465	3,498	3,531	3,564	3,597	3,63	Volts
R <sub>U</sub> =	72.8	34.4	21.2	14.4	9.9	7.2	5.3	3.88	2.74	1.84	KOhms
Trim down	1	2	3	4	5	6	7	8	9	10	%
Vout =	3,267	3,234	3,201	3,168	3,135	3,102	3,069	3,036	3,003	2,97	Volts
R <sub>D</sub> =	101.3	36.2	21.0	13.65	9.2	6.0	4.12	2.56	1.34	0.87	KOhms

#### RPPxx-xx05S

Trim up	1	2	3	4	5	6	7	8	9	10	%
Vout =	5,05	5,1	5,15	5,2	5,25	5,3	5,35	5,4	5,45	5,5	Volts
Ru =	109.7	51	31.2	20.3	14.2	9.87	7.1	5.0	3.38	2.08	KOhms
Trim down	1	2	3	4	5	6	7	8	9	10	%
Vout =	4,95	4,9	4,85	4,8	4,75	4,7	4,65	4,6	4,55	4,5	Volts
R <sub>D</sub> =	127.6	55.8	33.0	20.2	14.2	9.46	5.97	3.6	1.77	0.28	KOhms

#### RPPxx-xx12S

Trim up	1	2	3	4	5	6	7	8	9	10	%
Vout =	12,12	12,24	12,36	12,48	12,6	12,72	12,84	12,96	13,08	13,2	Volts
R <sub>U</sub> =	270	120	70	45.2	30.1	19.8	12.8	7.52	3.31	0	KOhms
Trim down	1	2	3	4	5	6	7	8	9	10	%
Vout =	11,88	11,76	11,64	11,52	11,4	11,28	11,16	11,04	10,92	10,8	Volts
R <sub>D</sub> =	270	120	70	45.2	30.1	19.8	12.8	7.52	3.31	0	KOhms

#### RPPxx-xx15S

Trim up	1	2	3	4	5	6	7	8	9	10	%
Vout =	15,15	15,3	15,45	15,6	15,75	15,9	16,05	16,2	16,35	16,5	Volts
R <sub>U</sub> =	337	150	87	56.2	37.5	24.7	16	9.4	4.16	0	KOhms
Trim down	1	2	3	4	5	6	7	8	9	10	%
Vout =	14,85	14,7	14,55	14,4	14,25	14,1	13,95	13,8	13,65	13,5	Volts
R <sub>D</sub> =	337	150	87	56.2	37.5	24.7	16	9.4	4.16	0	KOhms

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# Innovation, Top Quality, Top Service and Long

Partnership demands reliability. We have heeded this maxim for more than 30 years, which is why RECOM Electronic is considered one of the strongest performing suppliers of converter technology in the market. As a manufacturer of high-quality DC-DC converters, AC-DC modules, switching regulators and LED drivers, we offer the electronics industry one of the broadest range of products available.

Continuous growth and top quality products and service have made RECOM one of the world's leading manufacturers of high performance custom solutions for high end and technically demanding applications.

### Customer satisfaction world-wide

Beside renowned OEM manufacturers, RECOM supplies leading international companies in numerous branches including industrial automation, telecommunication, test and measurement, military, medical technology, transportation (including avionics) and data processing. Our worldwide customer portfolio is continuously expanding because we deliver on our promises.

### Manufacturing quality - 0.25-60W

As one of the pioneers in the area of miniature DC-DC converters, our current product-catalogue covers the power range of quarter watt up to 60 watt. Besides our standard products with single, dual- and triple outputs as well as a wide variety of input voltages and ranges, customer specific product solutions are also readily available on request.

### **Cost-efficiency instead of redesign**

Based on standardized pinouts and converters, our customers can specify individual options with order quantities as low as a few hundred pieces

- custom input or output voltages and ranges or performance parameters
- extra long or extra short pins / custom pinouts
- customer specific labelling

Through these individual modifications of parameters, we can not only meet the needs of industry but often save our customers the costs having to do a redesign or having to modify their circuit board.

### Reliability and long life

The highest standards of workmanship, from initial development through to optimised internal PCB design and up to the final quality control of each and every converter, guarantee the highest reliability and longe-vity for all RECOM products often with failure rates that are orders of magnitude better than comparable products offered on the market.

# Certification that you can depend on

Continuous improvements in quality are our daily challenge. Besides strict internal controls in our production and distribution, we submit ourselves to objective monitoring by both national and international certification processes.

# Production

Quality Certificates

- ISO 9001
- EN 14001



### **Product Certificates**

- EN-60950-1, UL-60950
- EN-60601-1, UL-60601, cUL-60601



In addition, all of our converters go through a detailed final test and approval before delivery.

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Our policy is to offer more consistent on time distribution and shorter delivery times than the competition. We have three global RECOM distribution hubs plus several carefully selected national and international catalogue companies, which together guarantee fast delivery anywhere in the world and provide for local deliveries and flexibility in order processing whether for a few samples for testing or large production quantities.

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- No external components needed



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