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 Style
- Efficiency to >89%
- Low Quiescent Current

Description

The RPR20 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 case temperature range of -45°C to +120°C. The RPR20 has a baseplate case for high vibration or bulkhead mounting applications. It is EN 50155 and EN 50121-3-2 certified.

POWERLINE+
Railway-Converter
with 5 year Warranty

RECOM

20 Watt Single & Dual Output

RoHS 2011/65/EU 6/6

CE

EN-50155 Certified
EN-60950-1 Certified

RPR20

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
RPR20-243.3S-B	24	12-36	8	3.3	6000
RPR20-2405S-B	24	12-36	8	5	4000
RPR20-2412S-B	24	12-36	8	12	1666
RPR20-2415S-B	24	12-36	8	15	1333
RPR20-2424S-B	24	12-36	8	24	830
RPR20-483.3S-B	48	25-75	17	3.3	6000
RPR20-4805S-B	48	25-75	17	5	4000
RPR20-4812S-B	48	25-75	17	12	1666
RPR20-4815S-B	48	25-75	17	15	1333
RPR20-4824S-B	48	25-75	17	24	830
RPR20-1103.3S-B	110	40-160	36	3.3	6000
RPR20-11005S-B	110	40-160	36	5	4000
RPR20-11012S-B	110	40-160	36	12	1666
RPR20-11015S-B	110	40-160	36	15	1333
RPR20-11024S-B	110	40-160	36	24	830
RPR20-2412D-B	24	12-36	8	±12	±833
RPR20-2415D-B	24	12-36	8	±15	±666
RPR20-2424D-B	24	12-36	8	±24	±416
RPR20-4812D-B	48	25-75	17	±12	±833
RPR20-4815D-B	48	25-75	17	±15	±666
RPR20-4824D-B	48	25-75	17	±24	±416
RPR20-11012D-B	110	40-160	36	±12	±833
RPR20-11015D-B	110	40-160	36	±15	±666
RPR20-11024D-B	110	40-160	36	±24	±416

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

*** 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			RPR20		
	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		20mAp-p
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 (1)	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 bandwith 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		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 (T2)	complies with EN50155: 4.1.2 and EN50125-1		-45°C to +85°C
(Ambient Air, Free Convection) (Tx)	when mounted on a heatsink (see notes)		-45°C to +100°C
Maximum Case Temperature			+120°C
Over Temperature Protection			Internal thermistor

continued on next page

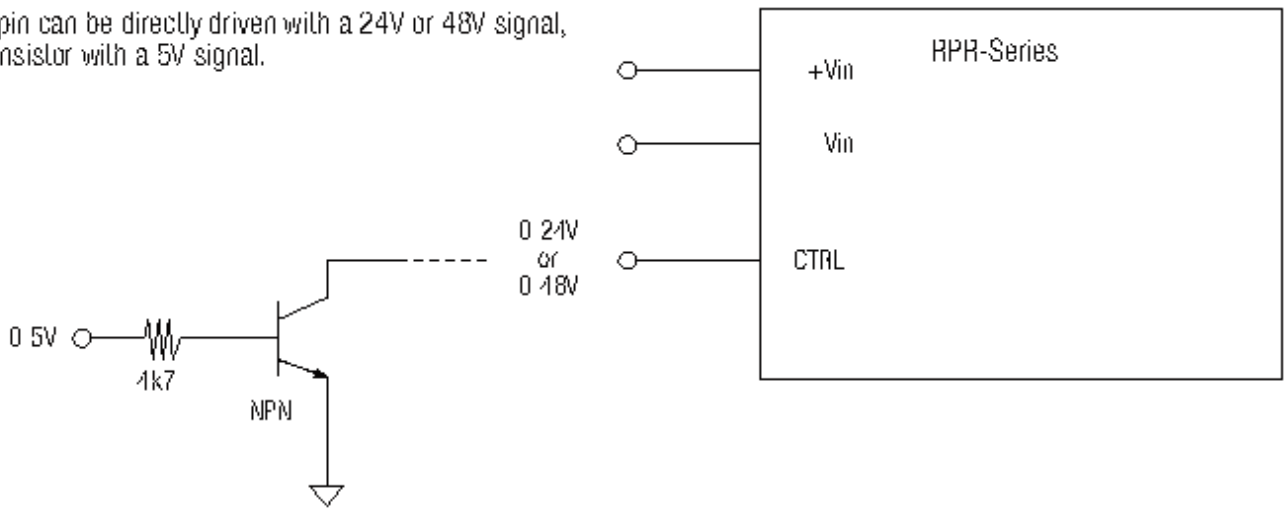
Specifications (typical at nominal input and 25°C unless otherwise noted)

Storage Temperature Range		-55°C to +125°C
Relative Humidity		5% to 95% RH
Case Material (2)		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 10^3 hours

***with filter circuit

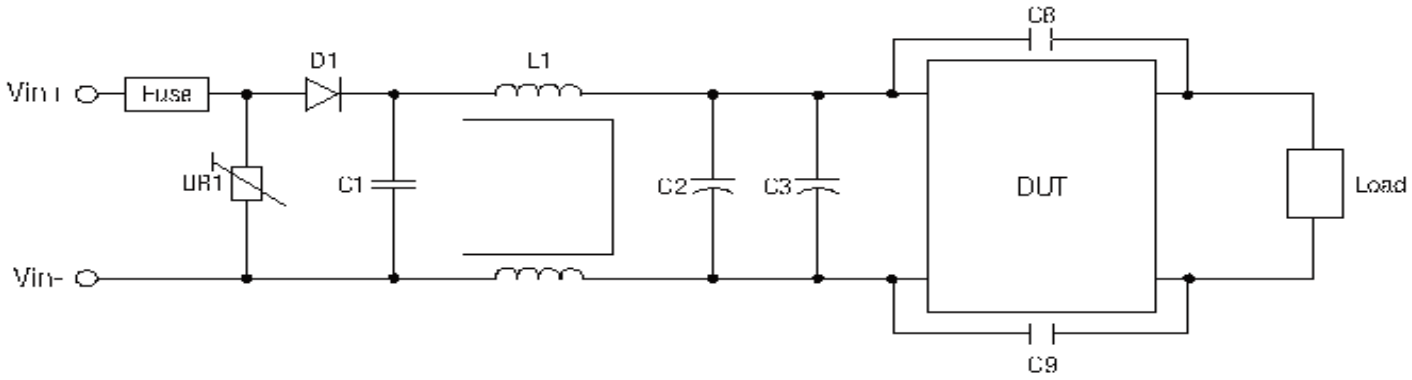
Typical Control Pin Application Circuit

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



Typical Application Circuit

EN50155 / NF F 01-510 Input Filter



Table

Module	Standard	UR1	D1	C1	L1	C2	C3	C8,C9
24V	EN50155	MOV 14D361K	100V/6A	6,8µF/50V	550µH±20%	330µF/ 50VDC	330µF/ 50VDC	4,7nF/3kV
48V	EN50155	MOV 14D361K	200V/3A	220nF/100V	550µH±20%	330µF/ 100VDC	330µF/ 100VDC	4,7nF/3kV
110V	EN50155	MOV 14D361K	300V/3A	470nF/250V	1200µH±20%	330µF/ 250VDC	330µF/ 250VDC	4,7nF/3kV

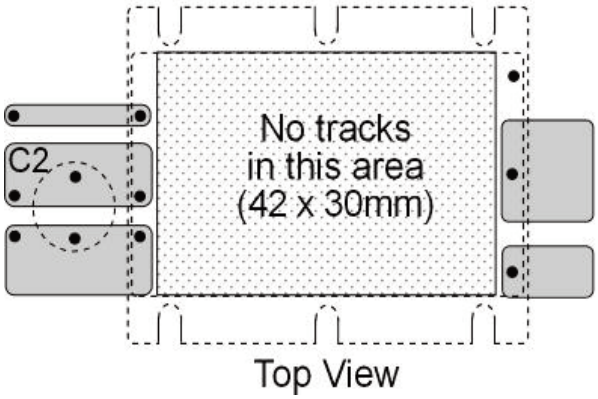
Notes :

1. 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. RPR20-4805D-B.
   Positive logic: 0= OFF, 1 = ON. The converter will be ON if the CTRL is left open.
2. 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.
3. 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.
4. 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.

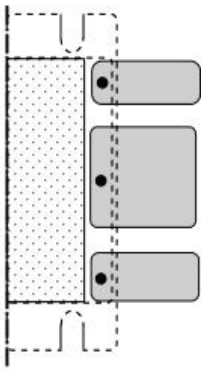
Recommended PCB Layout

Baseplate Case- suggested PCB layout

Single Output



Dual Output

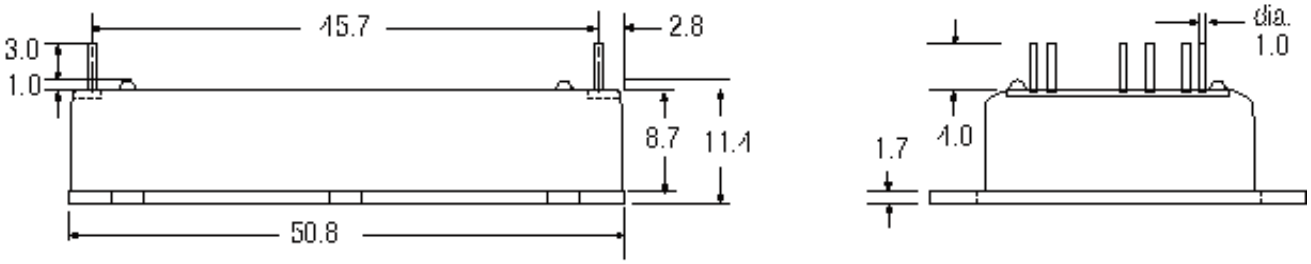


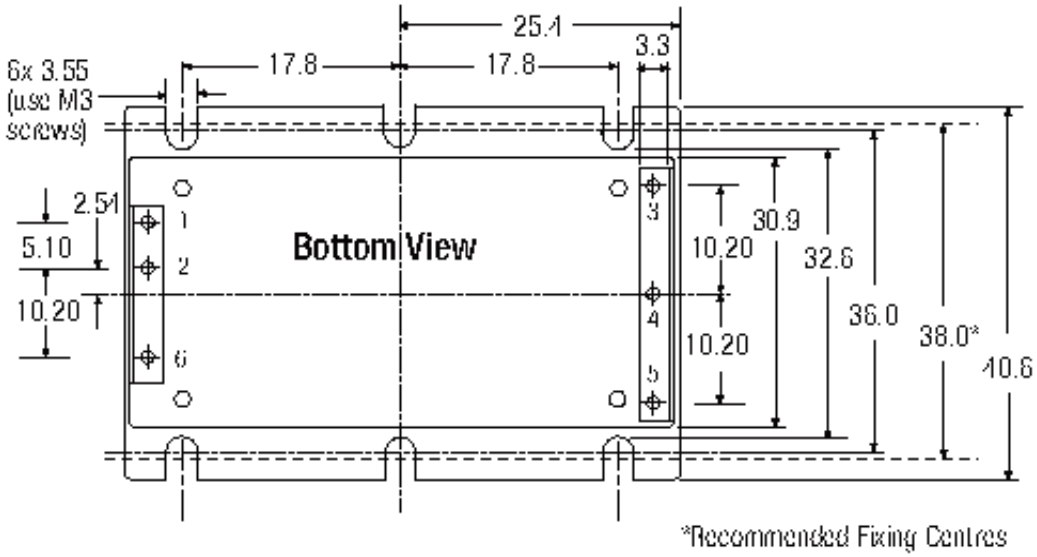
Input Fuse is recommended. Recommended fuse rating = double maximum input current, time delay type.

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)





NOTE:	Single output pinout is different for the -B version!

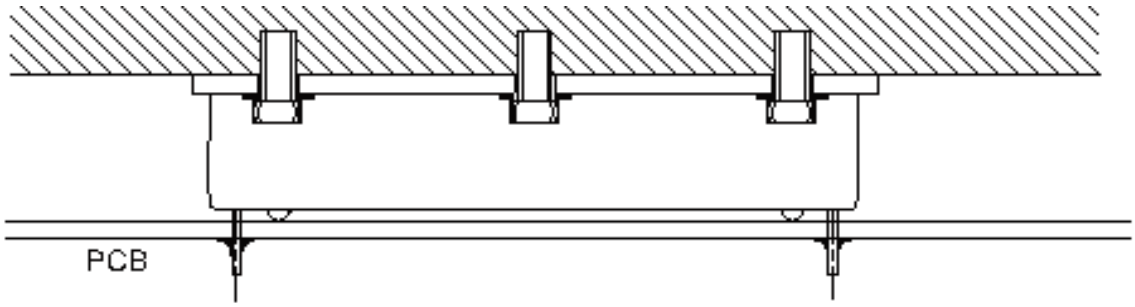
Pin Connections

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

Package Style and Pinning (mm)

Baseplate Case Fixing - Mounting onto Heatsink/Bulkhead



Baseplate Case Fixing - Anti Vibration Mounting onto PCB