

## 25W BASEPLATE COOLED

DC-DC CONVERTER

The RDF25 Series delivers 25W and offers single output voltages ranging from 5V to 24V. With an ultra-wide 10:1 input range of 16 to 160VDC, which covers standard industrial voltages and meets all requirements of the EN50155 transportation standard.

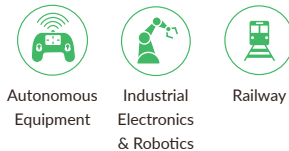
With world-wide industrial safety approvals and compliance to transportation standards, high efficiency, high reliability, 3kVAC isolation, remote on/off and wide output trimming, the RDF25 series benefits system designers with easy integration into a wide range of applications including; renewable energy, battery systems, autonomous equipment, factory automation and harsh railway applications.



### Features

- Single voltage outputs from 5V to 24VDC
- Wide output voltage trim and remote sense
- 10:1 ultra-wide input range 16 to 160VDC
- Industry standard half brick format
- High efficiency, up to 85%
- 3kVAC reinforced input to output isolation
- ITE safety approvals and EN50155 compliance
- Remote On/Off with low 15mA stand-by current
- -40°C to +100°C operating temperature
- Overvoltage, overload, and short circuit protection
- 3 year warranty

### Applications



### Dimensions

50.8 x 25.4 x 11.5mm (2.0" x 1.0" x 0.45")

### Models & Ratings

Model Number	Input Voltage	Output Voltage	Output Current	Input Current		Maximum Capacitive Load	Efficiency <sup>(2)</sup>
				No Load	Full Load		
RDF2572S05	16-160VDC	5V	5000mA	10mA	413.36mA	6800µF	85%
RDF2572S12		12V	2080mA		412.70mA	1000µF	84%
RDF2572S15		15V	1670mA		409.31mA	820µF	85%
RDF2572S24		24V	1040mA		407.84mA	470µF	85%

#### Notes:

1. Input current measured at nominal input voltage.

2. For heatsink add suffix '-HK', e.g. RDF2572S15-HK

## Input

Characteristic	Minimum	Typical	Maximum	Units	Notes & Conditions
Input Voltage Range	16		160	VDC	24V, 37.5V, 48V, 72V, 96V & 110V nominal inputs
Input Surge			176	VDC	For 100ms
Undervoltage Lockout		On: 13.8V		VDC	On
		Off: 12V			Off
Standby Mode		3		mA	When module inhibited
Input Filter	Pi type				

## Output

Characteristic	Minimum	Typical	Maximum	Units	Notes & Conditions
Output Voltage	5		24	VDC	See Models & Ratings
Output Trim			±10	%	
Initial Set Accuracy			±1.0	%	At full load
Minimum Load	No minimum load required				
Line Regulation			±0.2	%	From minimum to maximum input at full load
Load Regulation			±0.5	%	From 0% to full load
Transient Response			±4	%	Maximum deviation, recovering to less than 1% in 500µs for 25% step load change
Ripple & Noise			100	mV pk-pk	See Models & Ratings, measured using external 10µF MLCC
Overload Protection		150		%	
Short Circuit Protection	Continuous hiccup mode, with autorecovery				
Maximum Capacitive Load	See Models & Ratings table				
Temperature Coefficient			0.02	%/°C	
Overvoltage Protection		120		%	Zener diode clamp
Remote On/Off	ON at 3.0VDC to 12.0VDC or open circuit (Positive logic reference to -Vin (pin 2)) OFF at 0VDC to 1.2VDC or short pin 2 to pin 3				

## General

Characteristic	Minimum	Typical	Maximum	Units	Notes & Conditions
Efficiency		85		%	See Models & Ratings table
Isolation: Input to Output	3000			VDC	60s basic isolation
Isolation Resistance	10 <sup>8</sup>			Ω	At 3kVDC
Isolation Capacitance		2000		pF	
Switching Frequency		250		kHz	
Power Density			28	Win <sup>3</sup>	
Mean Time Between Failure	230			khrs	MIL-HDBK-217F, +25°C GB
Weight		36.0 (0.079)		g (lb)	Standard
		47.0 (0.104)			With heatsink
Case Material	Copper case with non-conductive plastic base, UL94V-0 rated				
Potting Material	Epoxy UL94V-0				
Pin Material	Tinned copper Ø1.0 mm brass, solder coated				
Fire and Smoke	Meets EN45545-2				
Lead Free Reflow Solder Process	IPC JEDEC J-STD 020D.1. 260°C max. 1.5mm from case. 10s max.				

## Environmental

Characteristic	Minimum	Typical	Maximum	Units	Notes & Conditions
Operating Temperature	-40		+100	°C	See derating curve
Storage Temperature	-55		+125	°C	
Thermal Impedance to Air	9.5			°C/W	Without heatsink
	8.5				With heatsink
Humidity			95	%RH	Non-condensing
Altitude	5000 m operation				
Cooling	IEC/EN 60068-2-1				
Shock & Vibration	IEC/EN 61373				
Dry Heat	IEC/EN 60068-2-2				
Damp Heat	IEC/EN 60068-2-30				

## EMC: Emissions

Phenomenon	Standard	Test Level	Notes & Conditions
Railway Equipment	EN50121-3-2		Conducted and Radiated

## EMC: Immunity

Phenomenon	Standard	Test Level	Criteria	Notes & Conditions
Railway Equipment	EN50121-3-2			Electromagnetic compatibility for rolling stock apparatus
ESD Immunity	EN50121-3-2	±6kV/±8kV	A	Contact Discharge/Air Discharge
Radiated Immunity	EN50121-3-2	20V/m	A	
EFT/Burst	EN50121-3-2	±2kV	A	With external capacitor Suggested parts are 100µF/250V electrolytic capacitors two in parallel e.g. Ruby-con BXF series
Surge	EN50121-3-2	±2kV	A	
Conducted immunity	EN50121-3-2	10Vrms	A	See application notes
Magnetic Fields	EN61000-4-8	100A/m	A	

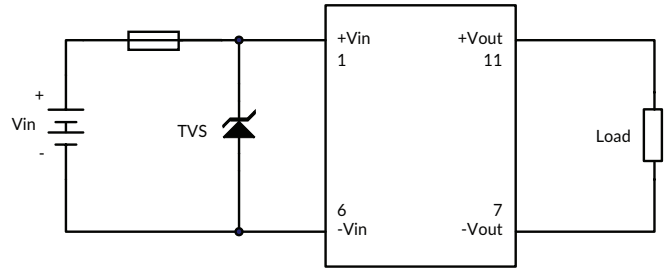
## Safety Approvals

Safety Agency	Standard	Test Level	Notes & Conditions
EN	50155		Railway
CE	Meets all applicable directives		
UKCA	Meets all applicable legislation		

## Application Notes

### Input Fusing and Safety Considerations

The RDF25 series converters have no internal fuse. In order to achieve maximum safety and system protection, always use an input line fuse. We recommend a 3A time delay fuse. It is recommended that the circuit has a transient voltage suppressor diode (TVS) across the input terminals to protect the unit against surge or spike voltages and input reverse voltage (as shown).



### Output Voltage Adjustment

The trim input permits the user to adjust the output voltage up by 10% or down by 10%. This is accomplished by connecting an external resistor between the Trim pin and either the +Vout pin or the -Vout pin.

### To Trim Up

Connecting an external resistor ( $R_u$ ) between the Trim pin and the -Sense pin increases the output voltage. The following table can be used to determine the required external resistor value to obtain a percentage output voltage change of  $\Delta\%$ .

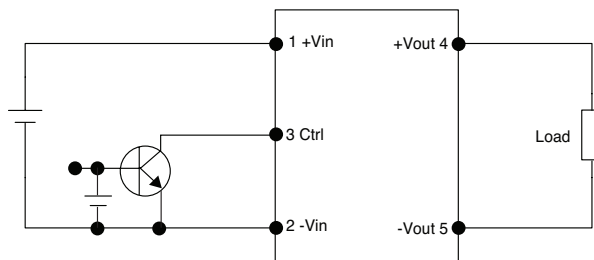
### To Trim Down

Connecting an external resistor ( $R_d$ ) between the Trim pin and the +Vout pin decreases the output voltage. The following table can be used to determine the required external resistor value to obtain a percentage output voltage change of  $\Delta\%$ .

Trim Down %	5V	12V	15V	24V
	Rd (kΩ)			
1	248.700	323.351	174.366	881.316
2	110.625	138.100	91.104	466.830
3	66.263	79.928	56.589	293.177
4	44.381	51.470	37.706	197.709
5	31.346	34.591	25.796	137.326
6	22.695	23.418	17.598	95.690
7	16.534	15.477	11.611	65.243
8	11.924	9.542	7.047	42.009
9	8.345	4.939	3.453	23.696
10	5.485	1.264	0.548	8.891

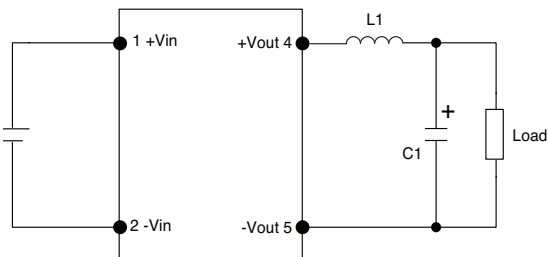
Trim Up %	5V	12V	15V	24V
	Ru (kΩ)			
1	227.338	367.425	661.510	2846.648
2	109.310	179.645	231.250	955.230
3	68.596	113.623	134.015	542.693
4	47.972	79.929	91.042	362.055
5	35.510	59.489	66.818	260.681
6	27.166	45.767	51.270	195.786
7	21.187	35.919	40.445	150.682
8	16.694	28.508	32.475	117.514
9	13.193	22.728	26.362	92.097
10	10.389	18.094	21.524	71.999

### Remote On/Off Control



Positive logic. Module turns on with logic high. Logic low turns module off. On/Off is enabled by an external switch between the control pin 3 and -Vin pin 2, e.g. open collector or drain. If the Remote On/Off is not used leave pin 3 floating.

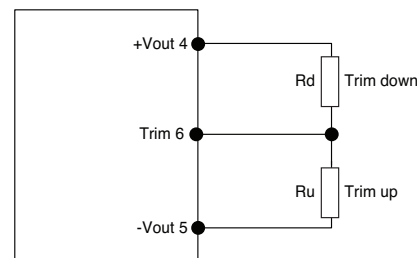
### EMC



Not applicable for 24V models

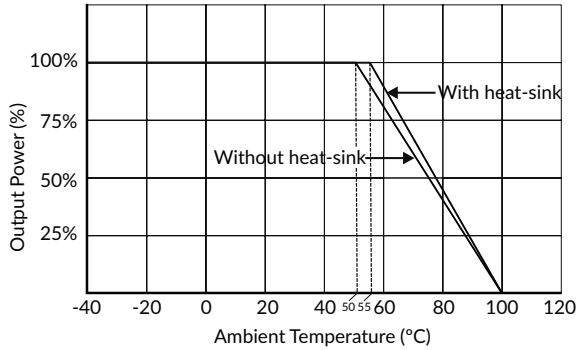
C1	L1
Electrolytic	
22μF, 100V	4.7μH

### Output Voltage Trim

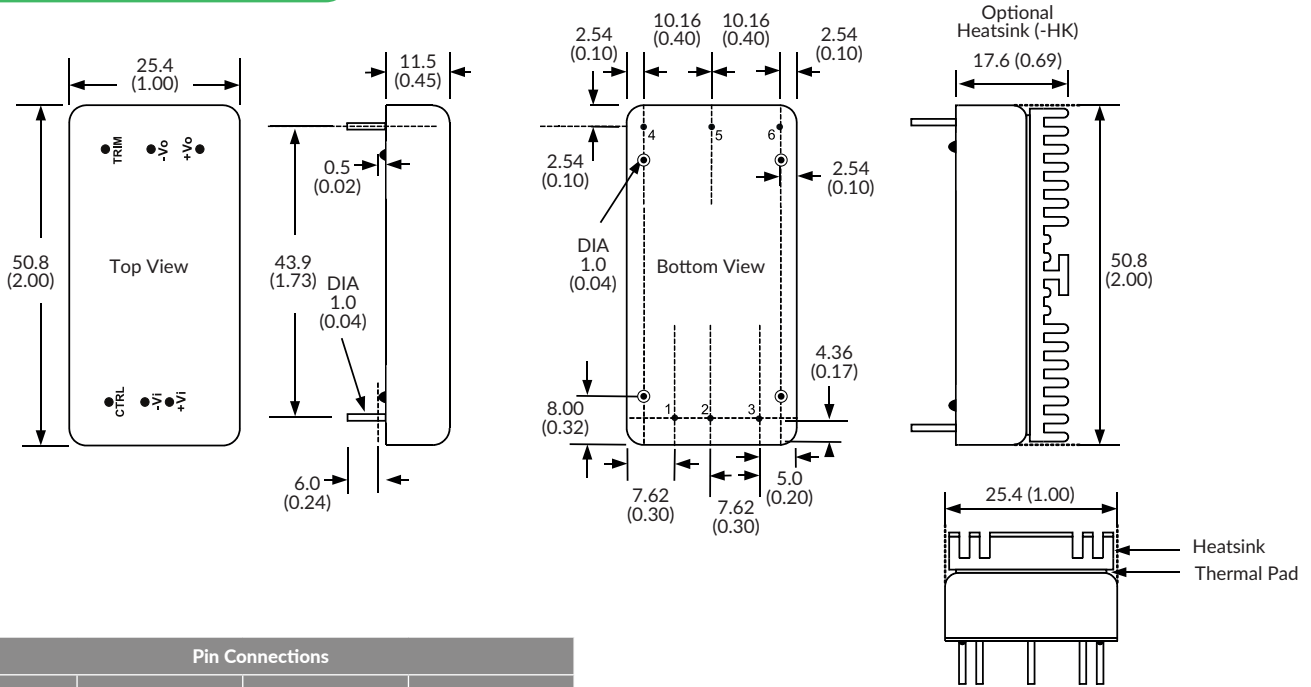


## Application Notes

### Derating Curve



## Mechanical Details



Pin Connections			
Pin	Function	Pin	Function
1	+Vin	4	+Vout
2	-Vin	5	-Vout
3	Control	6	Trim

### Notes:

1. All dimensions are in mm (inches)