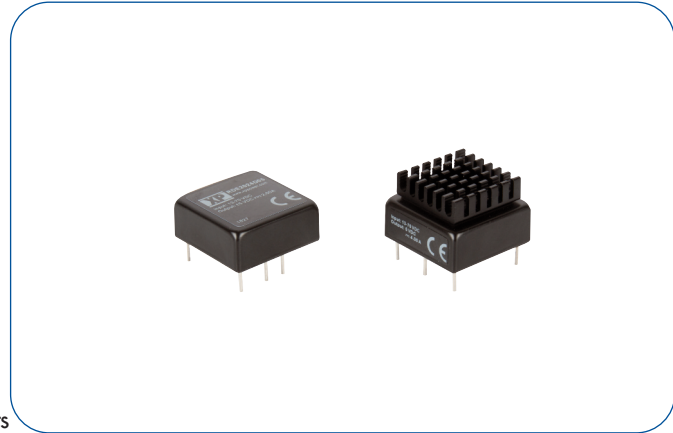


20 Watts

- Regulated Single & Dual Output
- Wide 4:1 Input Range
- Covers 24, 72 & 110 VDC for Rail Applications
- 3000 VDC Isolation
- Operating Temperature -40 °C to +100 °C
- Full Power to 55 °C
- Complies with EN50155
- Meets EMC Standard EN50121-3-2 Class A without External Components
- High Efficiency
- Remote On/Off
- Output Voltage Trim
- 3 Year Warranty



Dimensions:

RDE20:

1.0 x 1.0 x 0.41" (25.4 x 25.4 x 10.4 mm)

Models & Ratings

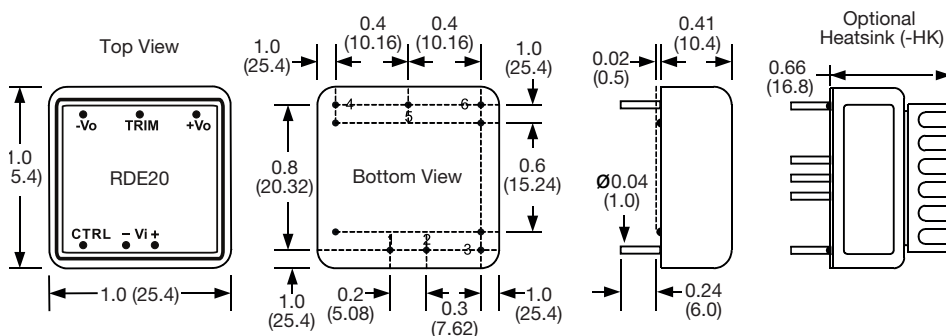
Input voltage	Output voltage	Output current	Input current ⁽¹⁾		Maximum capacitive load	Efficiency	Model number
			No load	Full load			
13-70 VDC	3.0 V	4500 mA	10 mA	711.20 mA	7000 µF	87%	RDE2024S3V3
	5.0 V	4000 mA		946.96 mA	5000 µF	88%	RDE2024S05
	12.0 V	1670 mA		936.33 mA	850 µF	89%	RDE2024S12
	15.0 V	1330 mA		925.92 mA	700 µF	90%	RDE2024S15
	±5.0 V	±2000 mA		968.99 mA	±1000 µF	86%	RDE2024D05
	±12.0 V	±833 mA		925.92 mA	±680 µF	90%	RDE2024D12
	±15.0 V	±666 mA		925.92 mA	±470 µF	90%	RDE2024D15
	3.0 V	4500 mA		156.97 mA	7000 µF	86%	RDE20110S3V3
42-176 VDC	5.0 V	4000 mA	206.61 mA	5000 µF	88%	RDE20110S05	
	12.0 V	1670 mA	211.41 mA	850 µF	86%	RDE20110S12	
	15.0 V	1330 mA	211.41 mA	700 µF	86%	RDE20110S15	
	±5.0 V	±2000 mA	216.45 mA	±1000 µF	84%	RDE20110D05	
	±12.0 V	±833 mA	208.98 mA	±680 µF	87%	RDE20110D12	
	±15.0 V	±666 mA	208.98 mA	±470 µF	87%	RDE20110D15	

Notes

1. Input current measured at nominal input voltage.

2. For heatsink add suffix '-HK', e.g. RDE2024S15-HK

Mechanical Details



Pin	Pin Connections	
	Single Output	Dual Output
1	+Vin	+Vin
2	-Vin	-Vin
3	Control	Control
4	+Vout	+Vout
5	Trim	Com
6	-Vout	-Vout

Input

Characteristic	Minimum	Typical	Maximum	Units	Notes & Conditions
Input Voltage Range	13		70	VDC	24 V nominal
	42		176		110V nominal
Input Filter	Internal Pi type				
Input Surge			100	VDC for 100 ms	24 V nominal input voltage
			185		110 V nominal input voltage
Undervoltage Lockout	OFF at <11.6 V, ON at 12.3 V				24 V nominal
	OFF at <38.4.0 V, ON at 40.5				48 V nominal
Remote On/Off (Positive Logic)	ON at 3.0 VDC to 12.0 VDC or open circuit				Positive logic reference to -Vin (pin 2)
	OFF at 0 VDC to 1.2 VDC or short pin 2 to pin 3				
Off Mode Idle Current		3		mA	

Output

Characteristic	Minimum	Typical	Maximum	Units	Notes & Conditions
Output Voltage	3.3		30	VDC	See Models and Ratings table
Output Trim			±10	%	Single output models only
Initial Set Accuracy			±1.0	%	At full load
Minimum Load				A	No minimum load required
Line Regulation			±0.5	%	From minimum to maximum input at full load
Load Regulation			±0.5/±1.0	%	From 0 to full load. Single Output/Dual Output
Cross Regulation			±5.0	%	On dual output models when one load is varied between 25% and 100% and other is fixed at 100%
Transient Response		±3	±5	% deviation	Recovery within 1% in less than 250 µs for a 25% load change.
Ripple & Noise			75	mV pk-pk	20 MHz bandwidth. Measured using 10 µF MLCC
Overshoot Protection		140		%	
Overload Protection		170		%	
Short Circuit Protection					Continuous trip & restart (hiccup mode), with auto recovery
Maximum Capacitive Load					See Models and Ratings table
Temperature Coefficient			0.02	%/°C	

General

Characteristic	Minimum	Typical	Maximum	Units	Notes & Conditions
Efficiency	84		90	%	See Models and Ratings table
Isolation: Input to Output	3000			VDC	60 s functional isolation
Isolation Resistance	10 ⁹			Ω	At 3 kVDC
Isolation Capacitance		2000		pF	
Switching Frequency		330/220		kHz	24/110 V input models
Power Density			48.8	W/in ³	
Mean Time Between Failure	190			KHrs	MIL-HDBK-217F, +25 °C GB
Case Material	Coppoly Case, Non conductive black plastic base, UL95V-0 rated				
Potting Material	Epoxy UL94V-0				
PCB Pin Material	Tinned copper				
Lead Free Reflow Solder Process	IPC JEDEC J-STD 020D.1. 260 °C max. 1.5 mm from case. 10 s max.				
Weight		0.04 (19.0)		lb (g)	Standard
		0.048 (22.0)			With heatsink

Environmental

Characteristic	Minimum	Typical	Maximum	Units	Notes & Conditions
Operating Temperature	-40		+100	°C	See derating curve
Maximum Case Temperature			+105	°C	
Storage Temperature	-55		+125	°C	
Altitude	5000 m operation				
Humidity			95	%RH	Non-condensing
Cooling	IEC/EN 60068-2-1				
Dry Heat	IEC/EN 60068-2-2				
Damp Heat	IEC/EN 60068-2-30				
Shock & Vibration	IEC/EN 61373				

EMC: Emissions

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

EMC: Immunity

Phenomenon	Standard	Test Level	Criteria	Notes & Conditions
Railway Equipment	EN50121-3-2			Electromagnetic compatibility for rolling stock apparatus
ESD	EN50121-3-2	±8 kV air discharge, ±6 kV contact	A	
Radiated	EN50121-3-2	20 V/m	A	
EFT/Burst	EN50121-3-2	±2 kV	A	With external capacitor Suggested parts are 24V: CHEMI-CON KY 330 µF/100 V 110V: BXF SERIES 100 µF/250 V in parallel
Surge	EN50121-3-2	±2 kV	A	
Conducted	EN50121-3-2	10 V rms	A	See application note for EN55032 compliance
Magnetic Fields	EN61000-4-8	100 A/m	A	

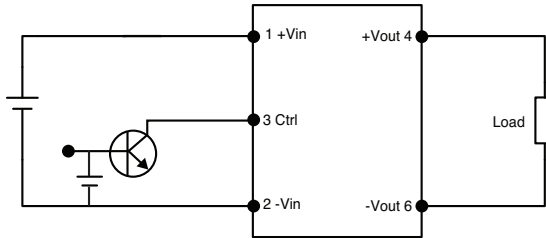
Safety Approvals

Safety Agency	Safety Standard	Notes & Conditions
CB Report	IEC62368-1	Information Technology
UL	UL/cUL62368-1	Information Technology

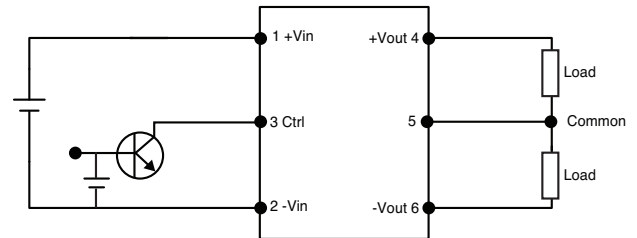
Safety Agency	Safety Standard	Notes & Conditions
EN	EN50155	Railway Applications, Electronic Equipment used on Rolling Stock

Applications Notes

Remote On/Off - Single Output

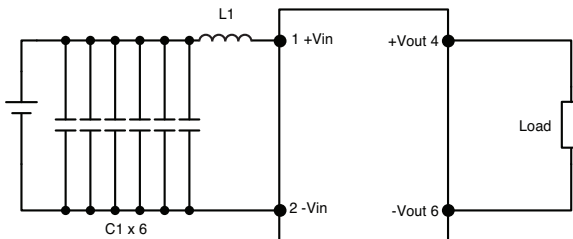


Remote On/Off - Dual Output



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.

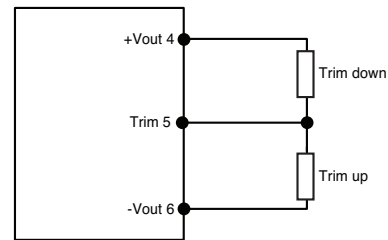
EMI - 110 V Input Models Only



Not applicable for 24 V models

C1	L1
1 μ F, 250 V	12 μ H

Output Voltage Trim - Single Output Models Only



Trim Tables

Trim Down %	3.3 V	5 V	12 V	15 V
	Rd (k Ω)			
1	817.535	117.886	345.033	174.366
2	362.230	61.634	164.830	91.104
3	215.448	38.388	98.862	56.589
4	142.957	25.688	64.647	37.706
5	99.747	17.684	43.707	25.796
6	71.057	12.179	29.571	17.598
7	50.622	8.159	19.386	11.611
8	35.326	5.096	11.699	7.047
9	23.448	2.683	5.692	3.453
10	13.957	0.735	0.867	0.548

Trim Up%	3.3 V	5 V	12 V	15 V
	Ru (k Ω)			
1	567.584	616.020	1015.590	661.510
2	263.172	221.402	448.881	231.250
3	158.473	131.336	280.558	134.015
4	105.497	91.426	199.789	91.042
5	73.508	68.900	152.361	66.818
6	52.096	54.432	121.162	51.270
7	36.760	44.353	99.078	40.445
8	25.235	36.930	82.625	32.475
9	16.257	31.235	69.892	26.362
10	9.066	26.727	59.745	21.524