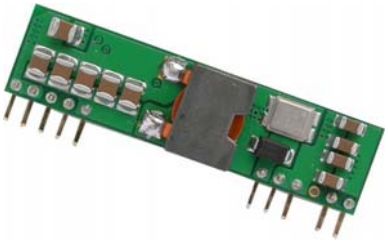
NON-ISOLATED DC/DC CONVERTERS

20 Vdc - 30 Vdc Input 5 Vdc/10 A - 15 Vdc/4.5 A Outputs

VRBC-70R1A0 RoHS Compliant Rev.D

- Non-Isolated
- High Efficiency
- Fixed Frequency
- Low Cost
- Wide Input Voltage Range
- Over Temperature Protection
- Excellent Thermal Performance
- OCP/SCP
- Low Output Ripple
- Output Voltage Trim
- Remote On/Off



Description

The VRBC-70R1A0 is a non-isolated dc/dc converter that operates over a wide range of input voltage (VIN = 20 Vdc-30 Vdc). This unit can provide a precisely regulated output voltage from 5.0 Vdc to 15.0 Vdc and can deliver up to 10 A of output current. This unit is designed to be highly efficient and low cost. The converter is provided in an industry standard package.

Part Selection

Output Voltage	Input Voltage	Max. Output Current	Max. Output Power	Typical Efficiency	Model Number Active High
5 Vdc - 15 Vdc	20 Vdc - 30 Vdc	10 A - 4.5 A	70 W	96.5%	VRBC-70R1A0

Notes: 1. Add “G” suffix at the end of the model number to indicate “Tray Packaging”.
2. All part numbers above indicate RoHS 6. Change the second letter "R" to "7" for RoHS 5 part numbers.

Absolute Maximum Ratings

Parameter	Min	Typ	Max	Notes
Input Voltage (continuous)	-0.3 V	-	36 V	
Remote On/Off	-0.3 V	-	36 V	
Ambient Temperature	-40 °C	-	85 °C	
Storage Temperature	-55 °C	-	125 °C	

Note: All specifications are typical at 25 °C unless otherwise stated.

Input Specifications

Parameter	Min	Typ	Max	Notes
Operating Input Voltage	20 V	24 V	30 V	
Input Current (full load)	-	-	4.5 A	
Input Reflected Ripple Current (pk-pk)	-	35 mA	-	With simulated source impedance of 1uH, 5Hz to 20MHz. Use a 470uF/50V electrolytic capacitor with ESR=0.1 ohm max, at 100KHz
Input Reflected Ripple Current (rms)	-	10 mA	-	
I^2t Inrush Current Transient	-	-	1 A^2s	
Turn-on Voltage Threshold	-	18.5 V	-	
Turn-off Voltage Threshold	-	17.5 V	-	

Note: All specifications are typical at 25 °C unless otherwise stated.

Output Specifications

Parameter	Min	Typ	Max	Notes
Output Voltage Set Point Accuracy	-2%Vo,set	-	+2%Vo,set	VIN=VIN,nor, IO=IO,max load
Load Regulation	-	-	0.5%Vo	
Line Regulation	-	-	0.4%Vo	
Regulation Over Temperature (-40 °C to +85 °C)	-	-	0.02%Vo/C	
Output Current Vo=5 V Vo=12 V Vo=15 V	 0 A 0 A 0 A	 - - -	 10 A 6 A 4.5 A	
Current Limit Threshold	-	17 A	-	
Ripple and Noise (pk-pk) Vo=5 V Vo=12 V Vo=15 V	 - - -	 70 mV 100 mV 120 mV	 120 mV 160 mV 180 mV	0-20MHz BW, with a 1µF ceramic capacitor and a 10uF Tantalum cap at output.
Ripple and Noise (rms) Vo=5 V Vo=12 V Vo=15 V	 - - -	 25 mV 35 mV 40 mV	 35 mV 55 mV 65 mV	
Turn on Time	-	-	18 mS	
Rise Time	-	5 mS	9 mS	
Overshoot at Turn on and off	-	-	2%	
Output Capacitance ESR≥5 mΩ	 0 uF	 -	 1500 uF	

Output Specifications (continued)

Parameter	Min	Typ	Max	Notes
Transient Response				
50% ~ 100% Max Load	Vo=5 V	-	200 mV	300 mV	di/dt=1 A/us, Vin=24 Vdc, Ta=25°C, Co=0 uF
Settling Time		-	50 uS	100 uS	
100% ~ 50% Max Load		-	200 mV	300 mV	
Settling Time		-	50 uS	100 uS	
50% ~ 100% Max Load	Vo=12 V	-	200 mV	300 mV	
Settling Time		-	80 uS	150 uS	
100% ~ 50% Max Load		-	200 mV	300 mV	
Settling Time		-	80 uS	150 uS	
50% ~ 100% Max Load	Vo=15 V	-	200 mV	300 mV	
Settling Time		-	80 uS	150 uS	
100% ~ 50% Max Load		-	200 mV	300 mV	
Settling Time		-	80 uS	150 uS	

Note: All specifications are typical at nominal input, full load at 25 °C unless otherwise stated.

General Specifications

Parameter	Min	Typ	Max	Notes
Efficiency Vo=5 V Vo=12 V Vo=15 V	 - - -	 92.5% 96.5% 96.5%	 - - -	Measured at Vin=24 V, full load
Switching Frequency	-	300 kHz	-	
Output Voltage Trim Range	5 V	-	15 V	Trim pin is open, Vo = 5 V
Remote Voltage Compensation	-	-	0.5 V	
MTBF	TBD			Calculated Per Bell Core SR-332 (I_O = 80% Load; T_a = 25°C)
Dimensions Inches (L × W × H) Millimeters (L × W × H)	 2.0 x 0.5 x 0.36 50.8 x 12.7 x 9.13			
Weight	-	7.5 g	-	

Notes: All specifications are typical at 25 °C unless otherwise stated.

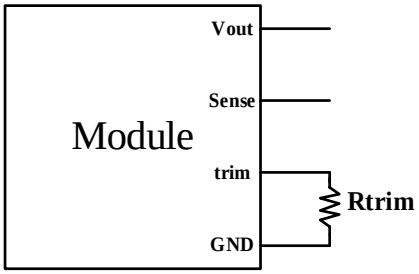
Control Specifications

Parameter	Min	Typ	Max	Notes
Remote On/Off (Active High)				
Signal Low (Unit Off)	-0.3 V	-	1.2 V	Remote On/Off pin open, Unit on.
Signal High (Unit On)	Vin-2.5	-	Vin	
Current Source/Sink	0 mA	-	3.3 mA	

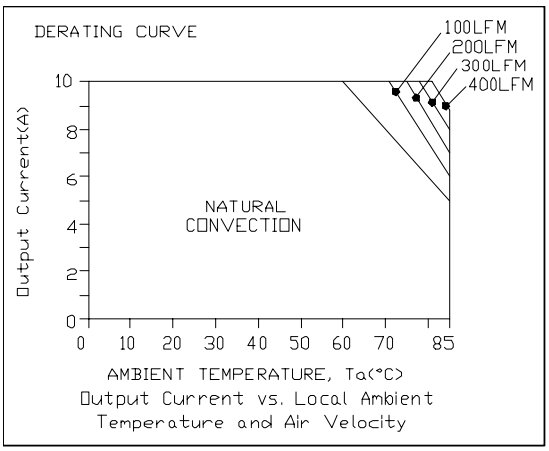
Output Trim Equations

Equation for calculating the trim resistor (in Ω) given the desired output voltage (Vo) is shown below. The Trim resistor should be connected between the Trim pin and GND.

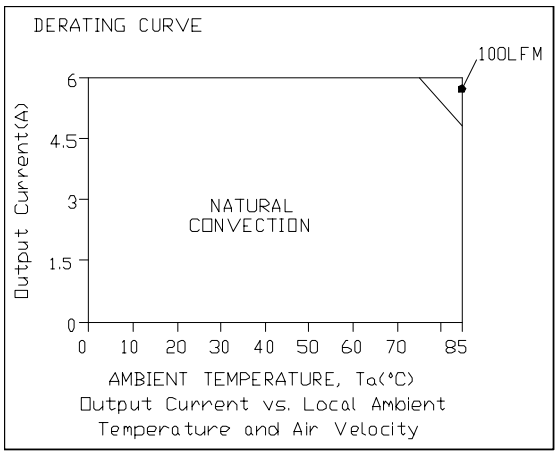
$$Rtrim = \left[\frac{10500}{Vo - 5.021} - 1000 \right]$$



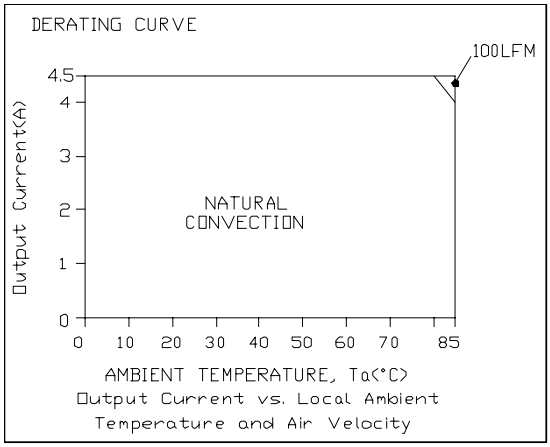
Thermal Derating Curves



Vo=5 V

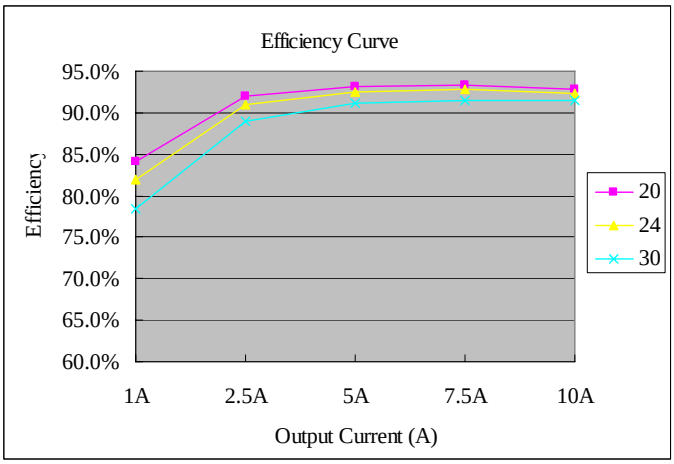


Vo=12 V

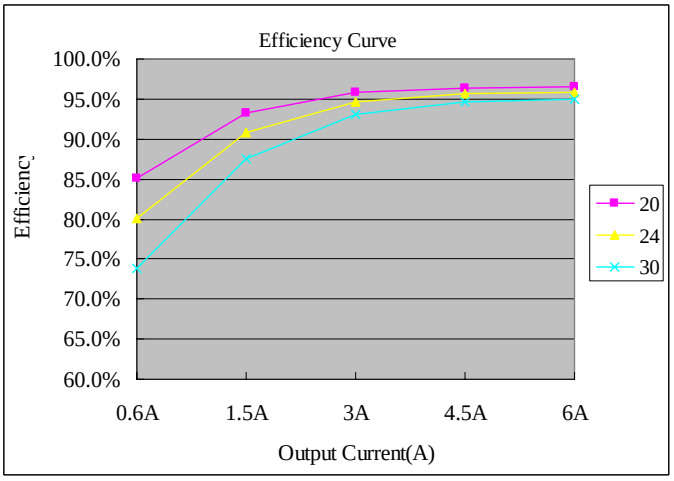


Vo=15 V

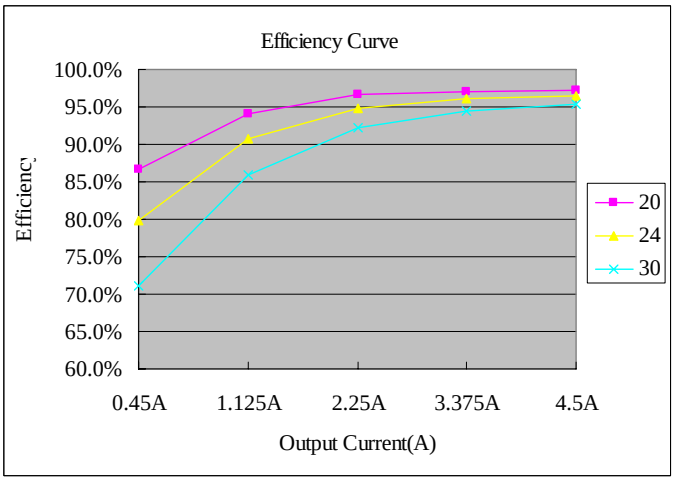
Efficiency Curves



Vo=5.0 V

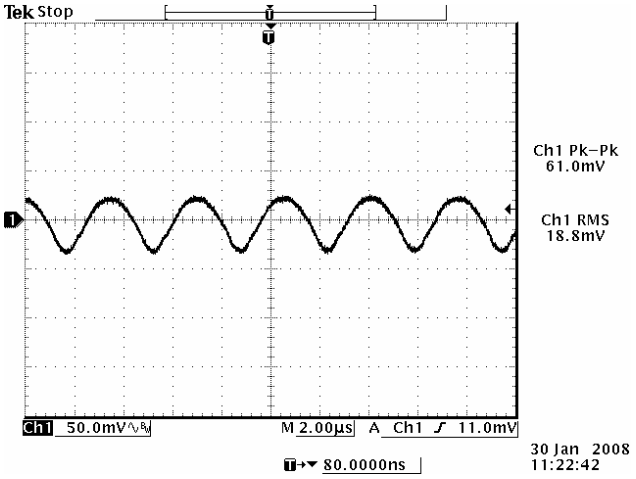


Vo=12 V

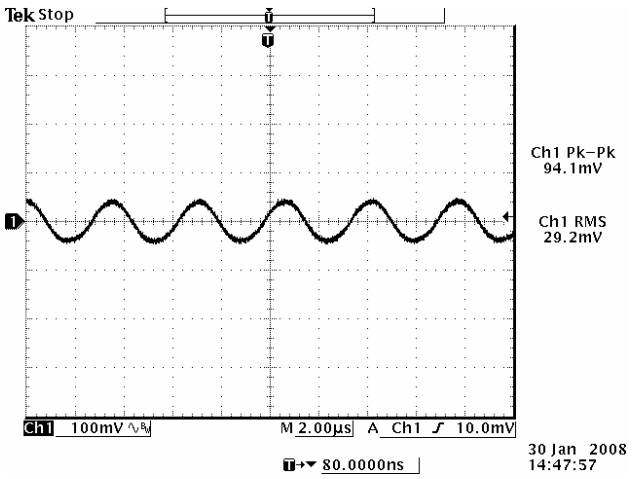


Vo=15 V

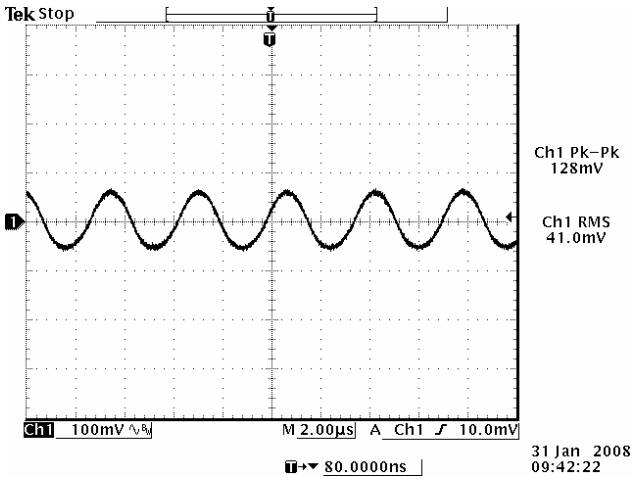
Ripple and Noise Waveforms



5.0 Vdc/10 A output



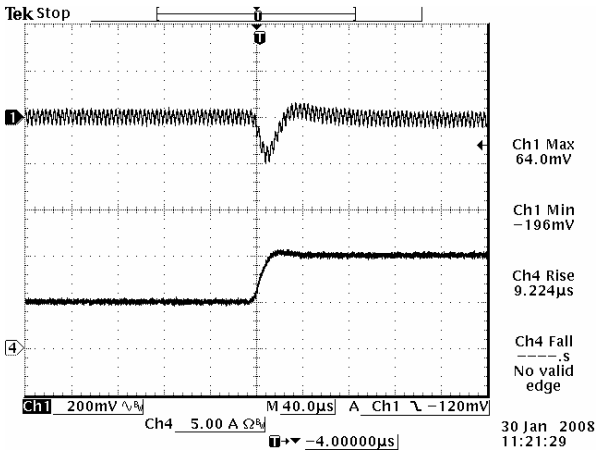
12 Vdc/6 A output



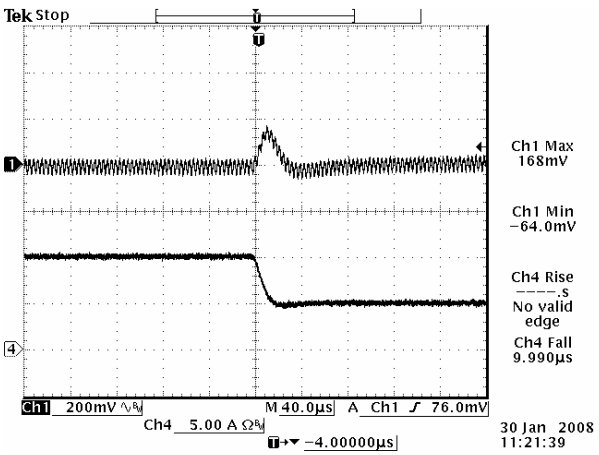
15 Vdc/4.5 A output

Note: Ripple and noise at full load, 24 Vdc input, and Ta=25 deg C.

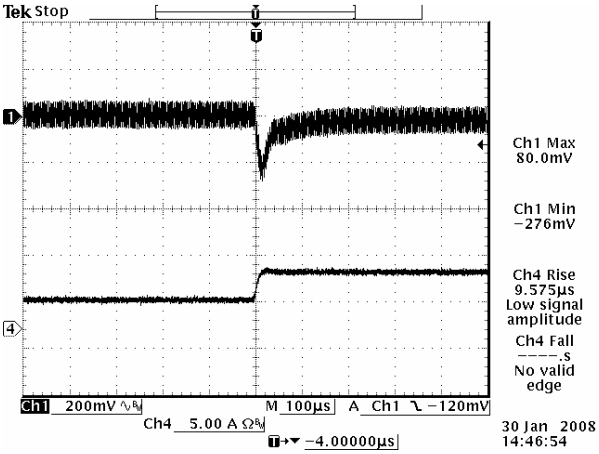
Transient Response Waveforms



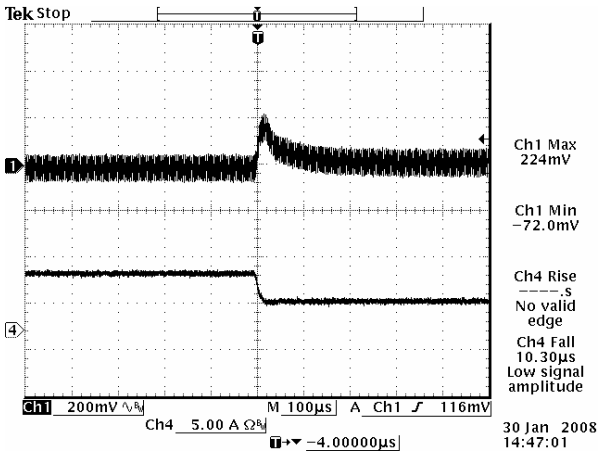
Vout= 5.0 V 50%-100% Load Transients



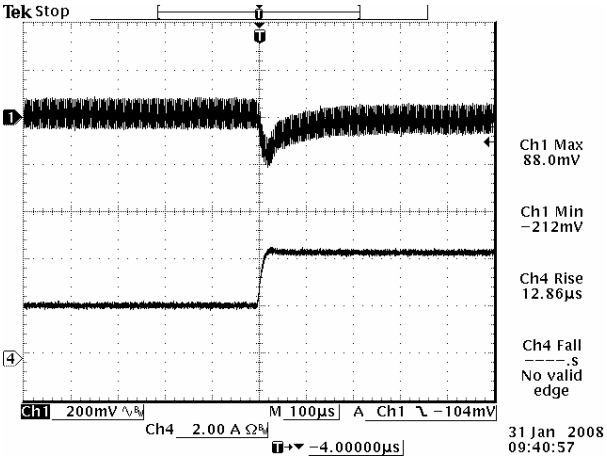
Vout=5.0 V 100%-50% Load Transients



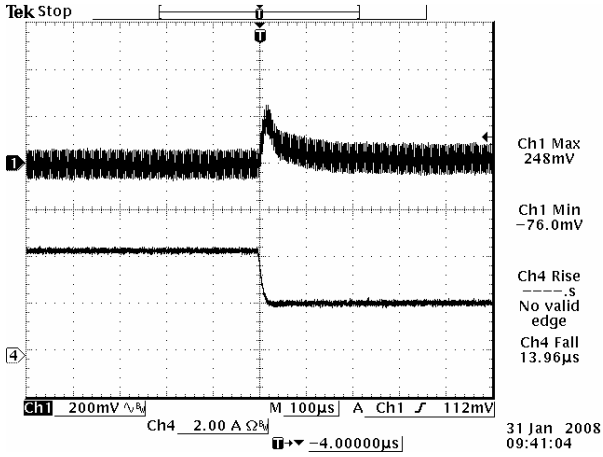
Vout= 12 V 50%-100% Load Transients



Vout=12 V 100%-50% Load Transients



Vout= 15 V 50%-100% Load Transients



Vout=15 V 100%-50% Load Transients

Note: Transients at Vin=24V and Ta=25deg C.

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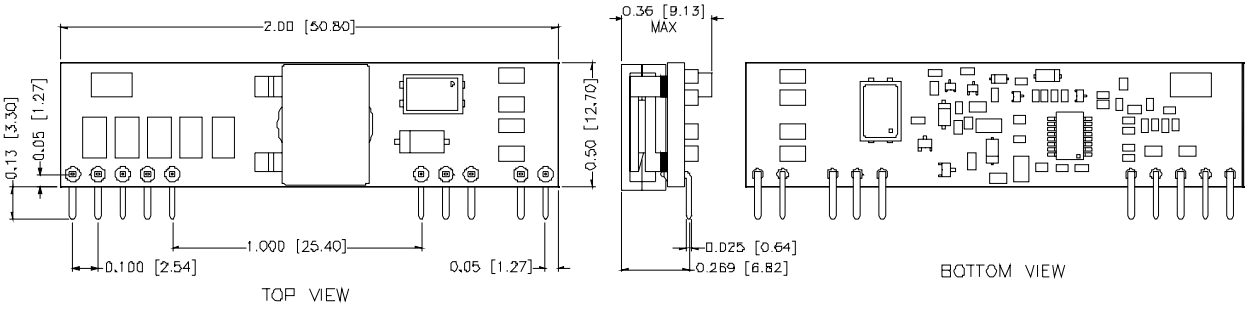
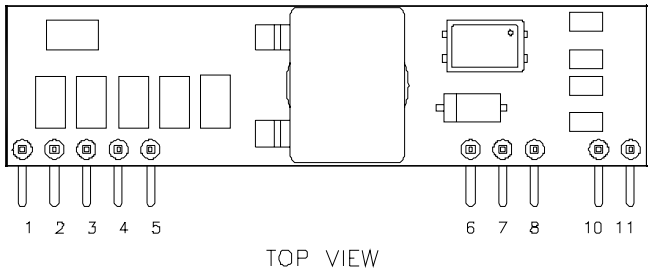
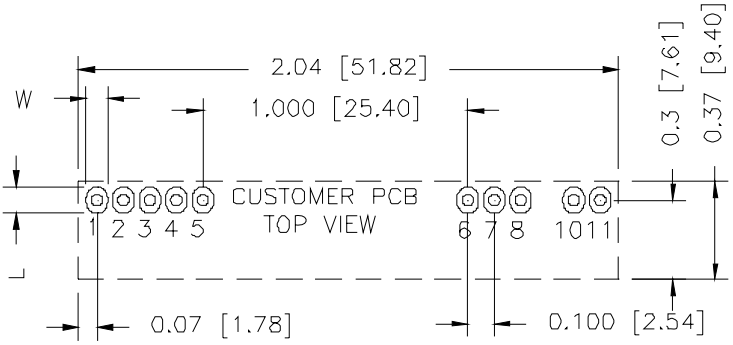
20 Vdc - 30 Vdc Input 5 Vdc/10 A - 15 Vdc/4.5 A Outputs

Mechanical Outline





RECOMMENDED PAD LAYOUT



HOLE SIZE: ø0.043±0.003 [1.08±0.08]
PAD SIZE: W 0.063±0.002 [1.63±0.05]
L 0.10±0.004 [2.54±0.10] BOTH SIDE

Pin Connections

Pin	Function
1	Vo
2	Vo
3	Vo, sense
4	Vo
5	GND
6	GND
7	Vin
8	Vin
9	N/A
10	Trim
11	On/Off

RoHS Compliance

Complies with the European Directive 2002/95/EC, calling for the elimination of lead and other hazardous substances from electronic products.

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CORPORATE

Bel Fuse Inc.
206 Van Vorst Street
Jersey City, NJ 07302
Tel 201-432-0463
Fax 201-432-9542
www.belfuse.com

FAR EAST

Bel Fuse Ltd.
8F/ 8 Luk Hop Street
San Po Kong
Kowloon, Hong Kong
Tel 852-2328-5515
Fax 852-2352-3706
www.belfuse.com

EUROPE

Bel Fuse Europe Ltd.
Preston Technology Management Centre
Marsh Lane, Suite G7, Preston
Lancashire, PR1 8UD, U.K.
Tel 44-1772-556601
Fax 44-1772-888366
www.belfuse.com