

NON-ISOLATED DC/DC CONVERTERS

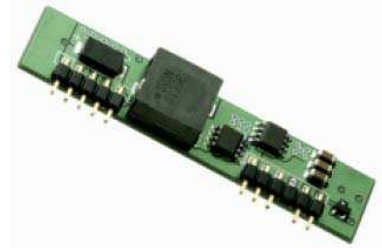
3.3 Vdc Input

1.2 Vdc - 2.5 Vdc/10 A Output

bel
POWER PRODUCTS

VRPC-10Cxxx Series RoHS Compliant Rev.A

- Non-Isolated
- Low Cost
- Fixed Frequency (300 kHz)
- Remote Sense (option)
- Remote On/Off
- Under-voltage Lockout (UVLO)
- OCP/SCP



Description

The Bel VRPC-10C is part of the low cost non-isolated dc/dc converter series. The modules use a SIP package for ease of layout and space savings. The output is closely regulated and the efficiency of 2.5 Vdc module is typically 92% at full load.

Part Selection

Output Voltage	Input Voltage	Max. Output Current	Max. Output Power	Typical Efficiency	Model Number	Part Number Remote Sense Option
2.5 V	3.3 V	10 A	25 W	92%	VRPC-10C250	VRPC-10C25S
1.8 V	3.3 V	10 A	18 W	87%	VRPC-10C180	VRPC-10C18S
1.5 V	3.3 V	10 A	15 W	86%	VRPC-10C150	VRPC-10C15S
1.2 V	3.3 V	10 A	12 W	84%	VRPC-10C120	VRPC-10C12S

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

Absolute Maximum Ratings

Parameter	Min	Typ	Max	Notes
Input Voltage (continuous)	-0.3 V	-	4 V	
Output Enable Terminal Voltage	-0.3 V	-	4 V	
Ambient Temperature	0 °C	-	70 °C	
Storage Temperature	-40 °C	-	125 °C	

Input Specifications

Parameter	Min	Typ	Max	Notes
Input Voltage	3 V	3.3 V	3.6 V	
Input Current (full load)	-	-	9.2 A	
Input Current (no load)	-	-	100 mA	
Remote Off Input Current	-	10 mA	22 mA	
Input Reflected Ripple Current (pk-pk)	-	90 mA	150 mA	Tested with 2 x 270 uF/16 V input capacitance with ESR=0.03 ohm max at 100 kHz, and simulated source impedance of 500 nH, 5 Hz to 20 MHz.
Input Reflected Ripple Current (rms)	-	20 mA	40 mA	
I ² t Inrush Current Transient	-	0.02 A ² s	0.05 A ² s	
Turn-on Voltage Threshold	-	2.85 V	-	
Turn-off Voltage Threshold	-	2.3 V	-	

NON-ISOLATED DC/DC CONVERTERS

3.3 Vdc Input

1.2 Vdc - 2.5 Vdc/10 A Output



Output Specifications

Parameter		Min	Typ	Max	Notes
Output Voltage Set Point					Vin=3.3 V, Io=full load
	Vo=2.5 V	2.450 V	2.5 V	2.550 V	
	Vo=1.8 V	1.764 V	1.8 V	1.836 V	
	Vo=1.5 V	1.470 V	1.5 V	1.530 V	
	Vo=1.2 V	1.176 V	1.2 V	1.224 V	
Load Regulation					
	Vo=2.5 V	-	7.5 mV	12.5 mV	
	Vo=1.8 V	-	5.4 mV	9.0 mV	
	Vo=1.5 V	-	4.5 mV	7.5 mV	
	Vo=1.2 V	-	3.6 mV	7.5 mV	
Line Regulation					
	Vo=2.5 V	-	3.0 mV	7.5 mV	
	Vo=1.8 V	-	2.5 mV	5.4 mV	
	Vo=1.5 V	-	2.0 mV	4.5 mV	
	Vo=1.2 V	-	2.0 mV	3.6 mV	
Regulation Over Temperature (0 °C to 70 °C)					
	Vo=2.5 V	-	12 mV	30 mV	
	Vo=1.8 V	-	10 mV	20 mV	
	Vo=1.5 V	-	10 mV	20 mV	
	Vo=1.2 V	-	10 mV	20 mV	
Output Current		0 A	-	10 A	
Current Limit Threshold		13 A	-	25 A	
Short Circuit Surge Transient		-	0.27 A ² s	0.5 A ² s	
Output Ripple and Noise (pk-pk)		-	50 mV	80 mV	Test conditions: 0-20 MHz BW, 0.1 uF ceramic capacitor on output
Output Ripple and Noise (rms)		-	18 mV	25 mV	
Turn on Time		-	10 mS	20 mS	
Overshoot at Turn on		-	-	3%	
Output Capacitance		0 uF	-	4000 uF	
Transient Response					
50% ~ 100% Max Load	Vo=1.8 V-2.5 V	-	100 mV	150 mV	di/dt = 0.5 A/uS; Vin = 3.3 V; Ta = 25 °C and with a 470 uF Aluminum capacitor on output
Settling Time		-	35 uS	50 uS	
100% ~ 50% Max Load		-	100 mV	150 mV	
Settling Time		-	35 uS	50 uS	
50% ~ 100% Max Load	Vo=1.2 V-1.5 V	-	70 mV	100 mV	
Settling Time		-	35 uS	50 uS	
100% ~ 50% Max Load		-	70 mV	100 mV	
Settling Time		-	35 uS	50 uS	

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

NON-ISOLATED DC/DC CONVERTERS

3.3 Vdc Input 1.2 Vdc - 2.5 Vdc/10 A Output



General Specifications

Parameter	Min	Typ	Max	Notes
Efficiency (Vin=3.3V, Io=Io-max)				Vin=3.3 V, full load
Vo=2.5 V	88%	92%	-	
Vo=1.8 V	84%	87%	-	
Vo=1.5 V	82%	86%	-	
Vo=1.2 V	80%	84%	-	
Switching Frequency	250 kHz	300 kHz	340 kHz	
Remote sense compensation				Total adjustment of trim, setpoint and remote sense combined should not exceed 5% at nominal Vin, 25 °C ambient for 2.5 V output module.
Vo=2.5 V	-	-	5%	
Vo=1.8 V	-	-	10%	
Vo=1.5 V	-	-	10%	
Vo=1.2 V	-	-	10%	
Output Trim Range				
Vo=2.5 V	90%	-	105%	
Vo=1.8 V	90%	-	110%	
Vo=1.5 V	90%	-	110%	
Vo=1.2 V	90%	-	110%	
MTBF	6,787,987 hours			Calculated Per Bell Core SR-332 (Vin= 3.3 V; Vo=2.5 V; Io = 10 A; Ta = 25 °C)
Dimensions				
Inches (L × W × H)	2.5 x 0.55 x 0.361			
Millimeters (L × W × H)	63.50 x 13.97 x 9.18			
Weight	-	8.3 g	-	

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

Control Specifications

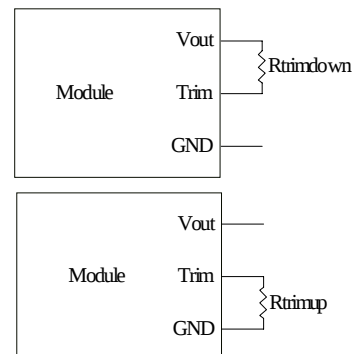
Parameter	Min	Typ	Max	Notes
Signal Low (Unit Off)	-0.3 V	-	0.3 V	
Signal High (Unit On)	2.8 V	-	4.0 V	

Output Trim Equations

Equations for calculating the trim resistor (in kΩ) given the desired adjusted voltage (Vadj) and the nominal output voltage of the converter (Vnom) are shown below. The Trim Down resistor should be connected between the Trim pin and Vout. The Trim Up resistor should be connected between the Trim pin and Ground. Only one of the resistors should be used for any given application.

$$R_{trimdown} = \frac{A}{V_o - V_{o,adj}} - B$$

$$R_{trimup} = \frac{C}{V_{o,adj} - V_o} - D$$



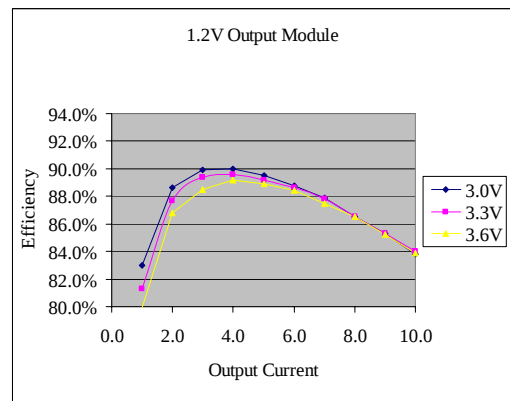
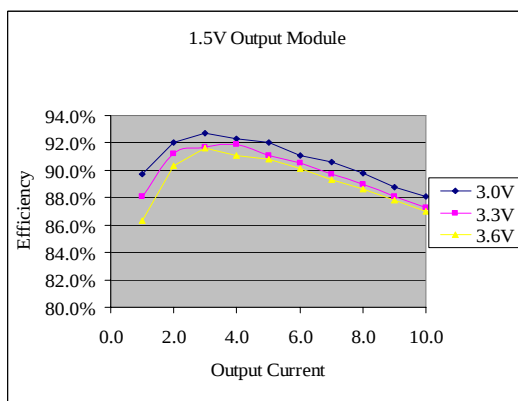
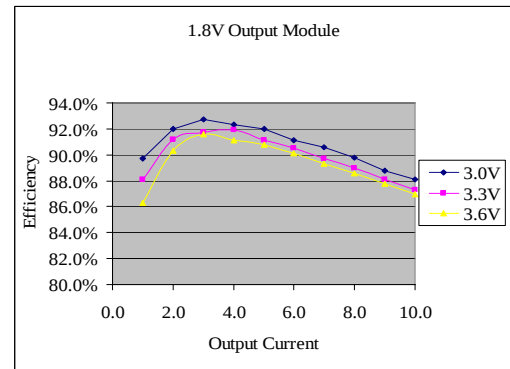
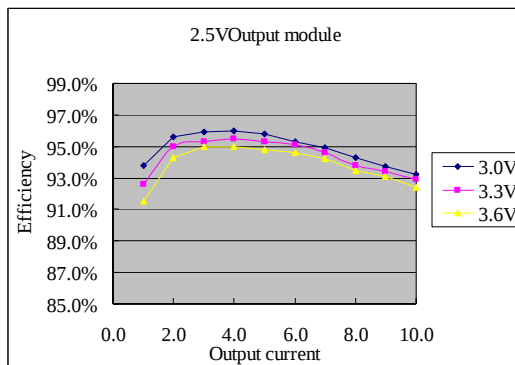
Vnom	A	B	C	D
2.5	9.590	10.740	4.504	5.110
1.8	3.869	9.460	3.072	5.620
1.5	1.765	8.120	2.000	5.620
1.2	1.562	6.580	3.072	2.740

NON-ISOLATED DC/DC CONVERTERS

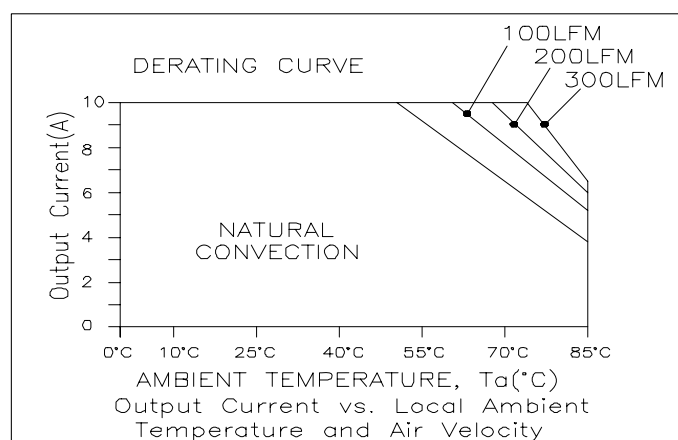
3.3 Vdc Input 1.2 Vdc - 2.5 Vdc/10 A Output



Efficiency Data



Thermal Derating Curve

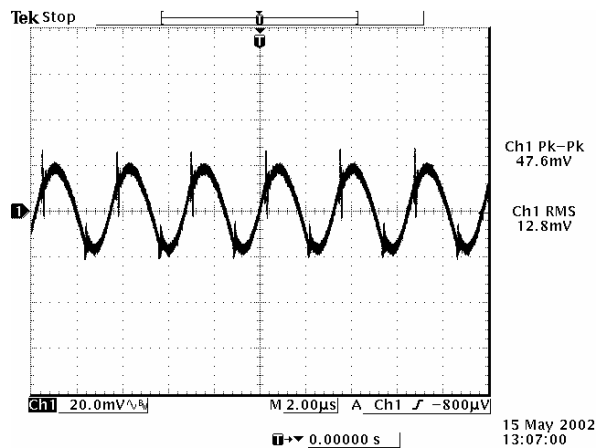


NON-ISOLATED DC/DC CONVERTERS

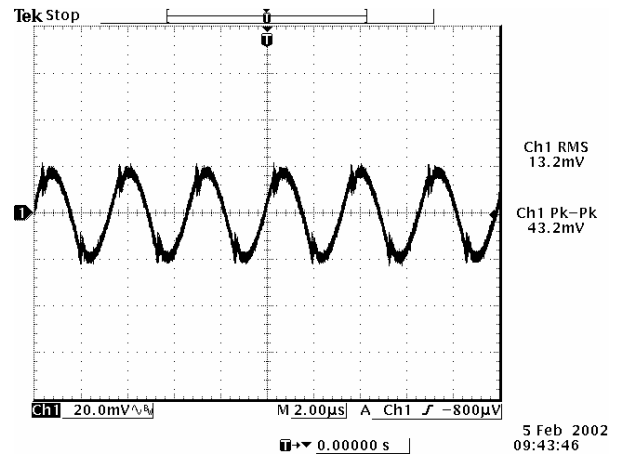
3.3 Vdc Input 1.2 Vdc - 2.5 Vdc/10 A Output



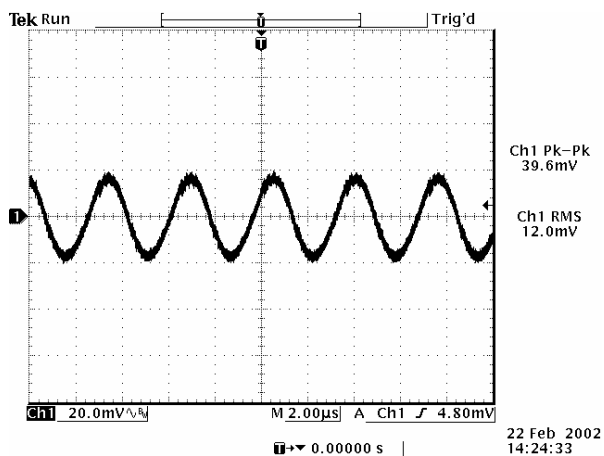
Ripple and Noise Waveforms



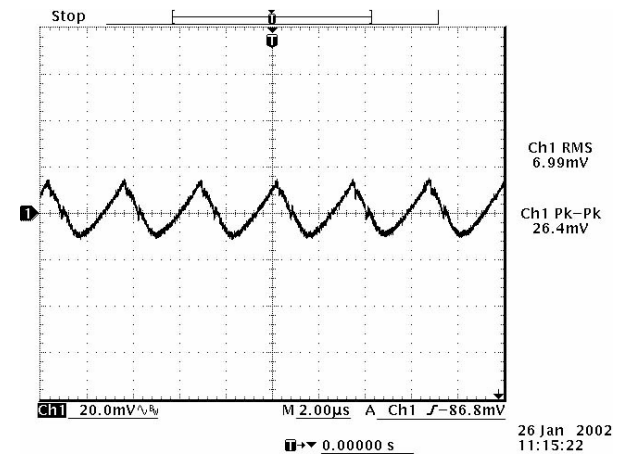
3.3 V input, 1.2 V output



3.3 V input, 1.5 V output



3.3 V input, 1.8 V output



3.3 V input, 2.5 V output

Note: Ripple and noise Max load, 0-20 MHz BW, with 0.1 μ F ceramic capat the output, $T_a=25$ deg C.

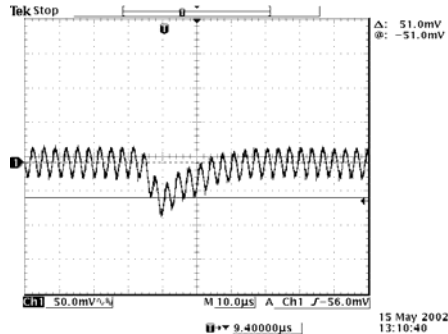
NON-ISOLATED DC/DC CONVERTERS

3.3 Vdc Input

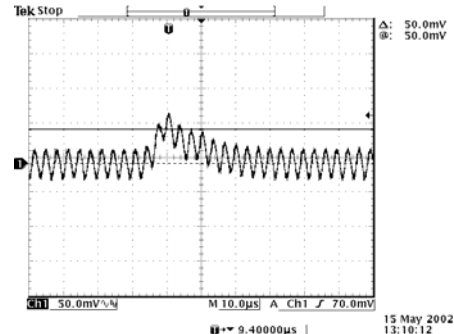
1.2 Vdc - 2.5 Vdc/10 A Output

bel
POWER PRODUCTS

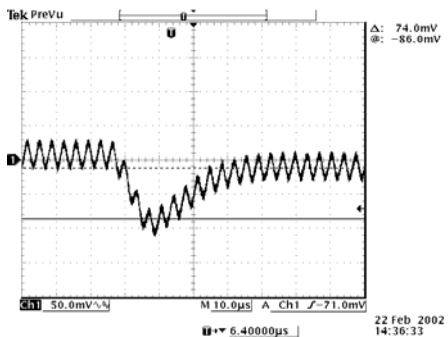
Transient Response Waveforms



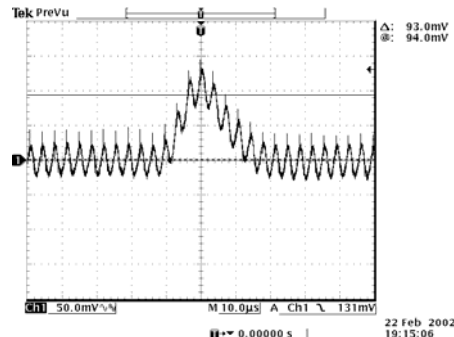
Vout=1.2 V 50% to 100% Load Transients



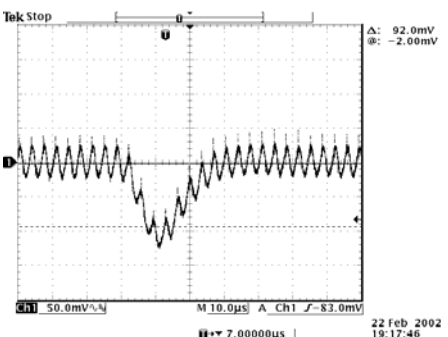
Vout=1.2 V 100% to 50% Load Transients



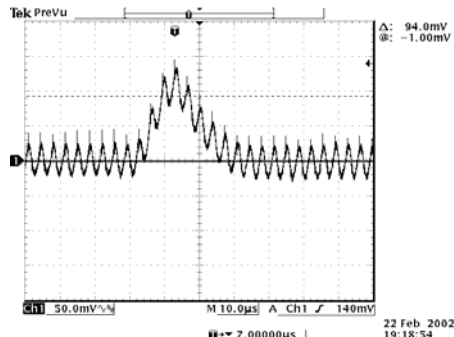
Vout=1.5 V 50% to 100% Load Transients



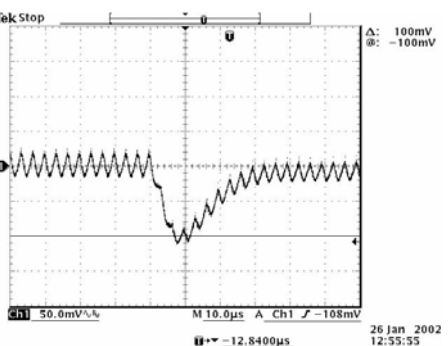
Vout=1.5 V 100% to 50% Load Transients



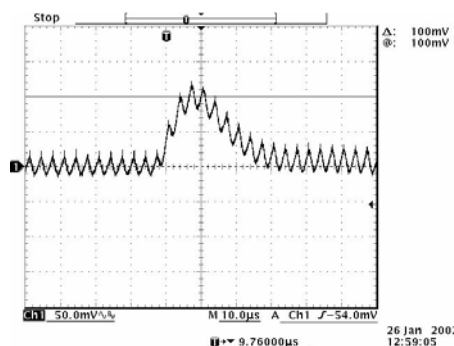
Vout=1.8 V 50% to 100% Load Transients



Vout=1.8 V 100% to 50% Load Transients



Vout=3.3 V 50% to 100% Load Transients



Vout=3.3 V 100% to 50% Load Transients

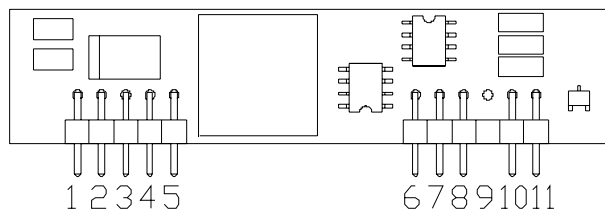
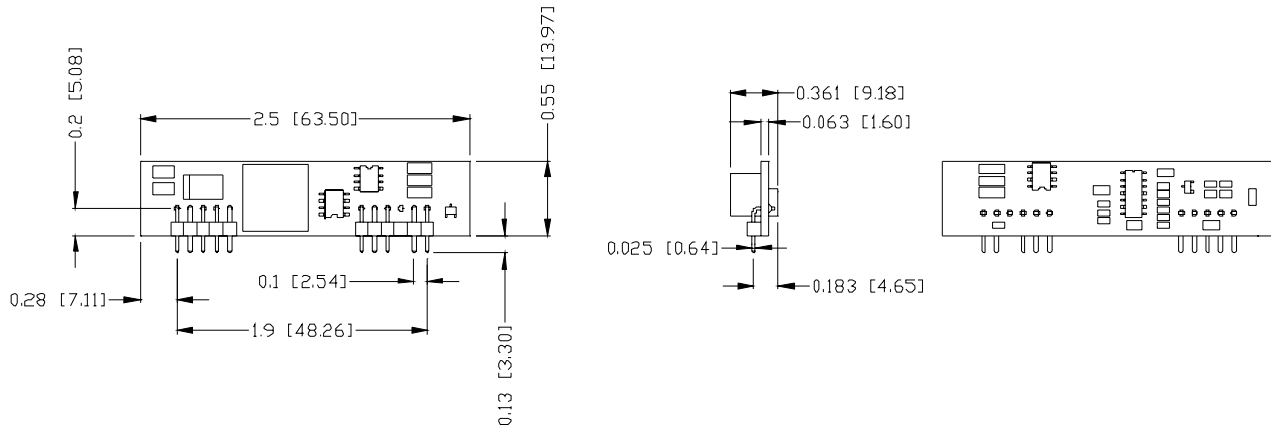
Note: Transient response at $di/dt=0.5$ A/ μ S, $V_{in}=3.3$ Vdc, $T_a=25^\circ\text{C}$, and with a 470 μ F aluminum cap at output.

NON-ISOLATED DC/DC CONVERTERS

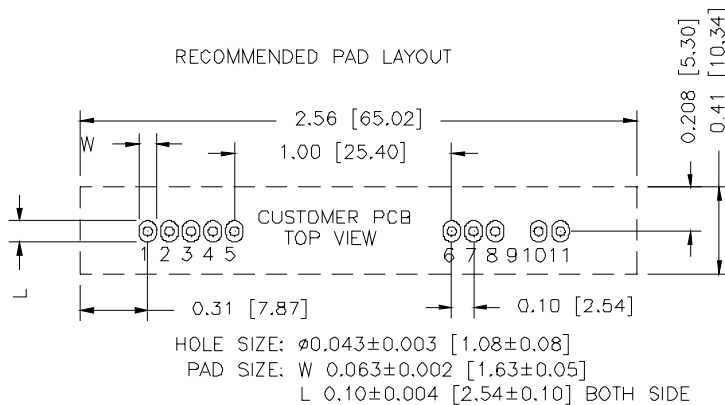
3.3 Vdc Input 1.2 Vdc - 2.5 Vdc/10 A Output



Mechanical Outline



RECOMMENDED PAD LAYOUT



Pin Connections

Pin	Function
1	Vo+
2	Vo+
3	Remote Sense (+)
4	Vo+
5	Ground
6	Ground
7	Vin+
8	Vin+
9	N/A
10	Trim
11	Remote 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.



©2007 Bel Fuse Inc. Specifications subject to change without notice. 011907

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