NON-ISOLATED DC/DC CONVERTERS

9.0 Vdc - 18 Vdc Input 5 Vdc - 12 Vdc/1A Output

xRAH-01K Series RoHS Compliant Rev.A

- Non-Isolated
- High Efficiency
- Fixed Frequency (450kHz)
- UL60950-1 Recognized (UL/cUL)
- Low Profile Package
- Remote On/Off
- Active Low/High

Description

The Bel xRAH-01Kxxx is a part of the low cost non-isolated dc/dc converter Power Module series. The modules use a SMD or SIP package for ease of layout and space savings. The output is closely regulated and the efficiency of 9 Vdc output module is typically 86% at full load.

Part Selection

Output Voltage	Input Voltage	Max. Output Current	Max. Output Power	Typical Efficiency	Part Number Surface Mount	Part Number Vertical Mount
5 V	9 V - 18 V	1 A	5 W	81%	SRAH-01K50x	VRAH-01K50x
9 V	9 V - 18 V	1 A	9 W	86%	SRAH-01K90x	VRAH-01K90x
12 V	9 V - 18 V	1 A	12 W	87%	SRAH-01KX2x	VRAH-01KX2x

Notes: 1. Add “0” suffix at the end of the model number to indicate “Tube Packaging”, and “R” for “Reel Packaging”, and “G” for “Tray Packaging”.

2. Use "0" to replace "x" in the above part number to indicate Active High, and "L" to indicate Active Low.
3. 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	-	24 V	
Remote On/Off	-0.3 V	-	24 V	
Ambient Temperature	-40 °C	-	85 °C	
Storage Temperature	-40 °C	-	125 °C	

Input Specifications

Parameter	Min	Typ	Max	Notes
Input Voltage	9 V	-	18 V	
Remote Off Input Current	-	18 mA	25 mA	
Input Current (no load)	-	30 mA	45 mA	
Input Current (full load) Vo=5 V Vo=9 V Vo=12 V	 - - -	 - - -	 0.8 A 1.3 A 1.8 A	
Input Reflected Ripple Current (pk-pk) Vo=5 V Vo=9 V Vo=12 V	 - - -	 55 mA 75 mA 95 mA	 80 mA 110 mA 130 mA	With simulated source impedance of 500 nH, 5 Hz to 20 MHz; Use one 100 uF/25 V tantalum capacitor at the input.
Input Reflected Ripple Current (rms) Vo=5 V Vo=9 V Vo=12 V	 - - -	 15 mA 20 mA 30 mA	 25 mA 30 mA 40 mA	
I^2t Inrush Current Transient	-	0.003 A^2s	0.01 A^2s	
Turn-on Voltage Threshold	8.0 V	8.5 V	8.8 V	
Turn-off Voltage Threshold	7.2 V	7.6 V	8.2 V	

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

Output Specifications

Parameter			Min	Typ	Max	Notes
Output Voltage Set Point						
	Vo=5 V		4.90 V	5 V	5.10 V	Test condition:
	Vo=9 V		8.82 V	9 V	9.18 V	Vin=12 V, Iout=full load
	Vo=12 V		11.76 V	12 V	12.24 V	
Line Regulation						
	Vo=5 V		-	8 mV	15 mV	
	Vo=9 V		-	15 mV	25 mV	
	Vo=12 V		-	20 mV	35 mV	
Load Regulation						
	Vo=5 V		-	15 mV	25 mV	
	Vo=9 V		-	25 mV	45 mV	
	Vo=12 V		-	35 mV	60 mV	
Regulation Over Temperature (-40°C to +85 °C)						
	Vo=5 V		-	50 mV	80 mV	
	Vo=9 V		-	70 mV	100 mV	
	Vo=12 V		-	90 mV	140 mV	
Output Current			0.005 A	-	1 A	
Output DC Current Limit			1.1 A	-	1.8 A	
Ripple and Noise (rms)						
	Vo=5 V		-	3 mV	5 mV	Test conditions: BW = 0-20 MHz; with π filter (Co1=10 uF, L=0.47 uH, Co2=10 uF) at the output
	Vo=9 V		-	3 mV	5 mV	
	Vo=12 V		-	4 mV	6 mV	
Ripple and Noise (pk-pk)						
	Vo=5 V		-	10 mV	15 mV	
	Vo=9 V		-	15 mV	20 mV	
	Vo=12 V		-	20 mV	30 mV	
Ripple and Noise (rms)						
	Vo=5 V		-	15 mV	25 mV	Test conditions: BW = 0-20 MHz; with two 10 uF ceramic capacitors at the output.
	Vo=9 V		-	25 mV	35 mV	
	Vo=12 V		-	35 mV	50 mV	
Ripple and Noise (pk-pk)						
	Vo=5 V		-	40 mV	70 mV	
	Vo=9 V		-	70 mV	100mV	
	Vo=12 V		-	110 mV	160mV	
Turn On Time						
	Vo=5 V		-	20 mS	30 mS	
	Vo=9 V		-	30 mS	45 mS	
	Vo=12 V		-	30 mS	45 mS	
Overshoot at Turn on			-	0%	5%	
Output Capacitance			0 uF	-	47 uF	
Transient Response						
50% ~ 75% Max Load	Overshoot	5.0 V	-	200mV	300mV	di/dt = 0.5 A/uS; Vin = 12 V; and with two 10 uF ceramic capacitors at the output
	Settling Time		-	100uS	150uS	
75% ~ 50% Max Load	Overshoot		-	200mV	300mV	
	Settling Time		-	100uS	150uS	
50% ~ 75% Max Load	Overshoot	9.0 V	-	300mV	400mV	
	Settling Time		-	150uS	200uS	
75% ~ 50% Max Load	Overshoot		-	300mV	400mV	
	Settling Time		-	150uS	200uS	
50% ~ 75% Max Load	Overshoot	12.0 V	-	350mV	500mV	
	Settling Time		-	150uS	200uS	
75% ~ 50% Max Load	Overshoot		-	350mV	500mV	
	Settling Time		-	150uS	200uS	

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=9 V Vo=12 V	 77% 82% 83%	 81% 86% 87%	 - - -	Measured at Vin=12 V, full load
Switching Frequency	400 kHz	450 kHz	480 kHz	
MTBF	14,760,000 hours			Calculated Per Bell Core TR-332 (Io = Nominal; Ta = 25°C)
Dimensions (surface mount) Inches (L × W × H) Millimeters (L × W × H)	 0.78 x 0.7 x 0.32 19.81 x 17.78 x 8.13			
Dimensions (vertical) Inches (L × W × H) Millimeters (L × W × H)	 0.7 x 0.308 x 0.65 17.78 x 7.82 x 16.51			
Weight	-	5 g	-	

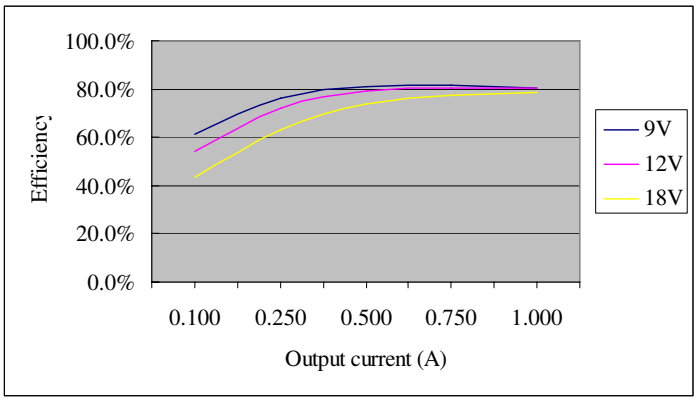
Note: All specifications are typical at 25°C unless otherwise stated.

Control Specifications

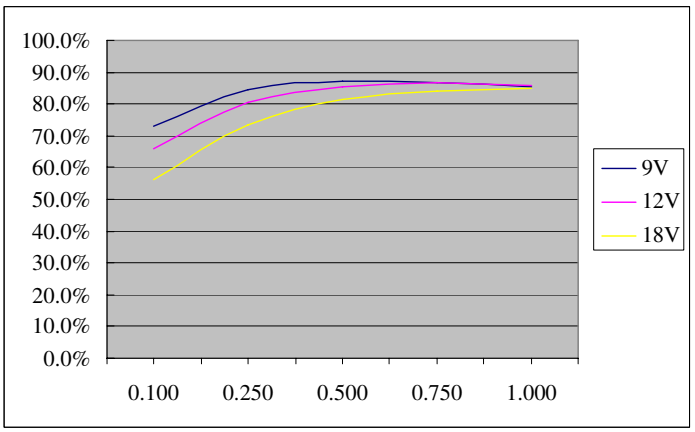
Parameter	Min	Typ	Max	Notes
Remote On/Off				
Signal Low (Unit On)	-0.3 V	-	0.4 V	xRAH-01KxxL, Remote On/Off pin open, unit off.
Signal High (Unit Off)	2.5 V	-	Vin	
Signal Low (Unit Off)	-0.3 V	-	0.4 V	xRAH-01Kxx0, Remote On/Off pin open, unit on.
Signal High (Unit On)	2.5 V	-	Vin	

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

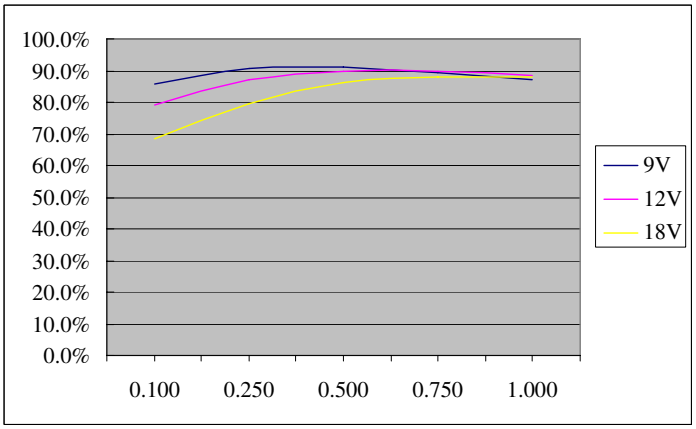
Efficiency Data



x7AH-01K500

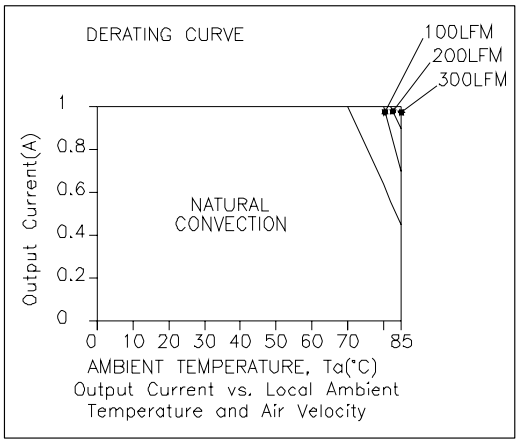


x7AH-01K900

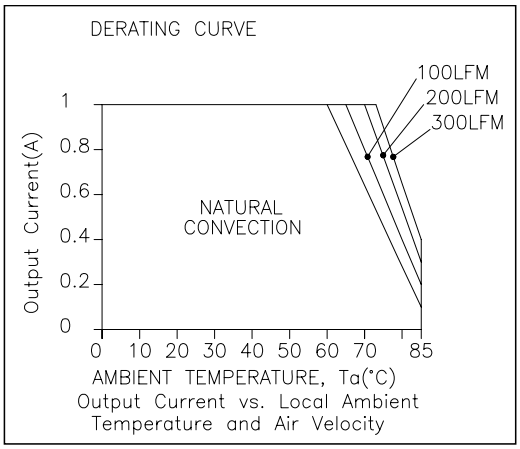


x7AH-01KX20

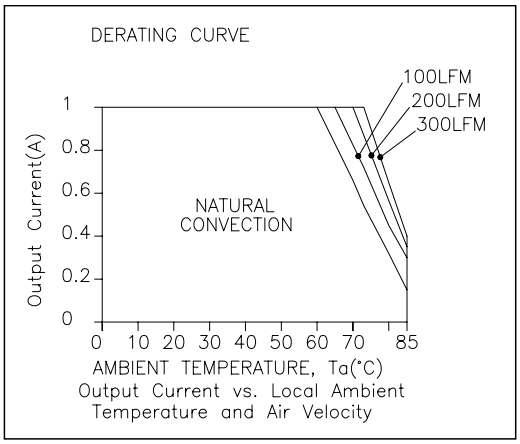
Thermal Derating Curves



Vin=12 V, Vo=5 V

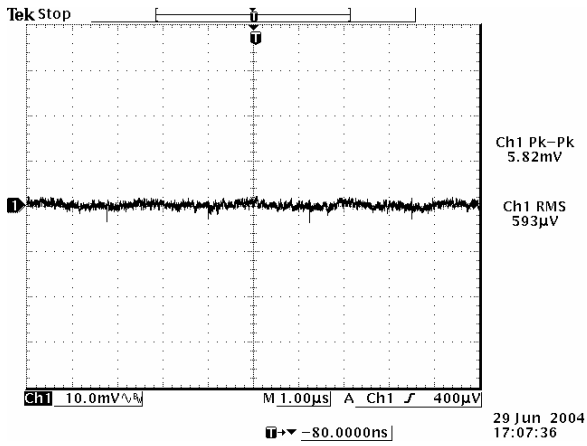


Vin=12 V, Vo=9 V

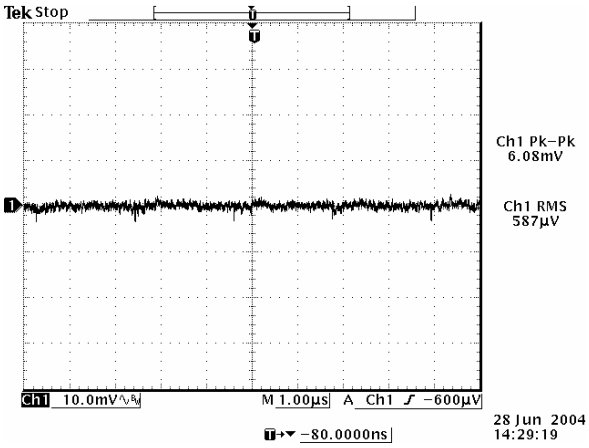


Vin=12 V, Vo=12 V

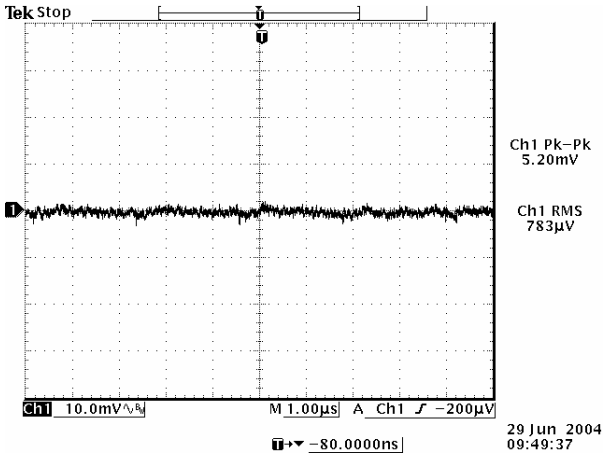
Ripple and Noise Waveforms



12 Vdc input, 5 Vdc output



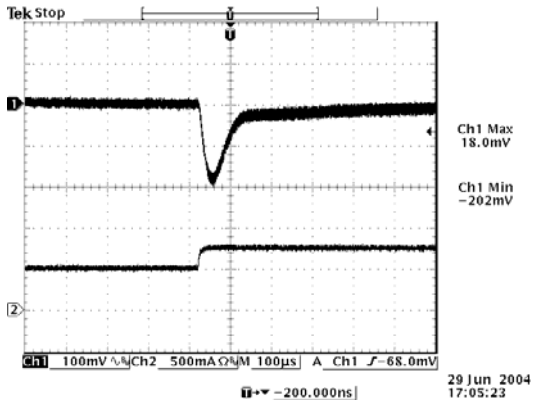
12 Vdc input, 9 Vdc output



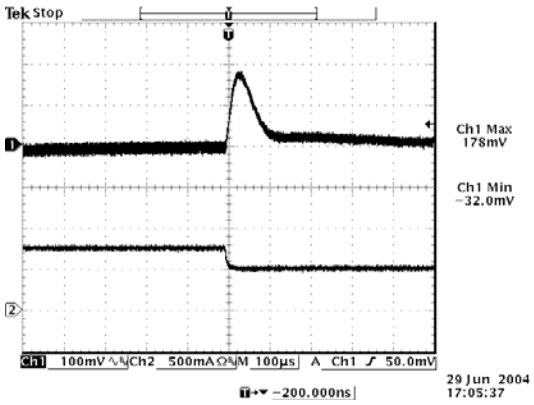
12 Vdc input, 12 Vdc output

Note: Ripple and noise at no load, with two 10 uF ceramic capacitors at the output, and Ta=25 deg C.

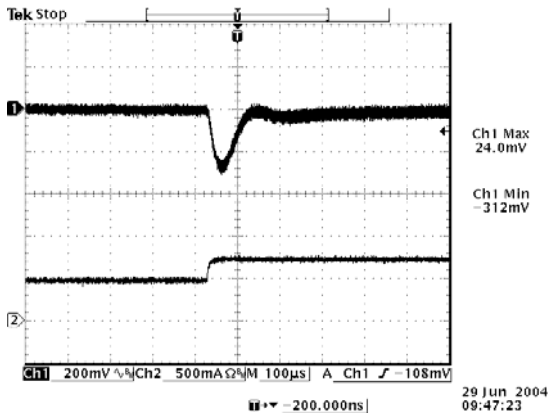
Transient Response Waveforms



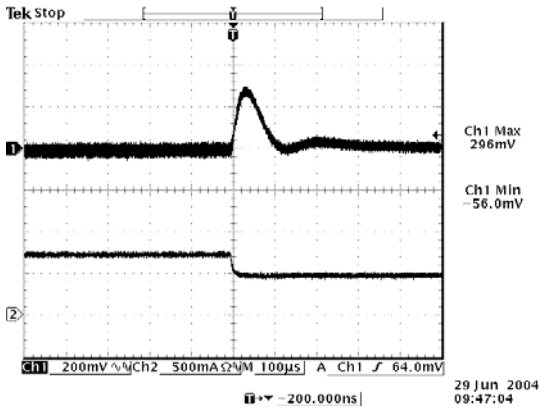
50% to 75% load transient at 5 Vdc output



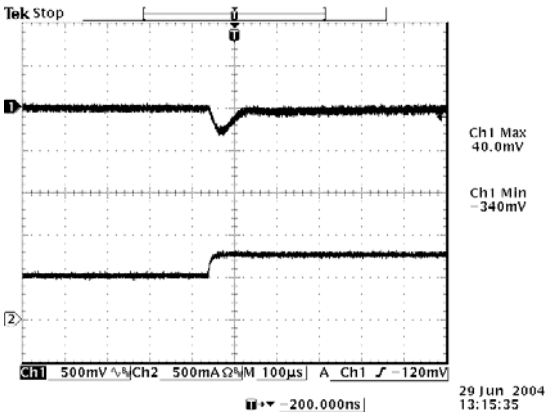
75% to 50% load transient at 5 Vdc output



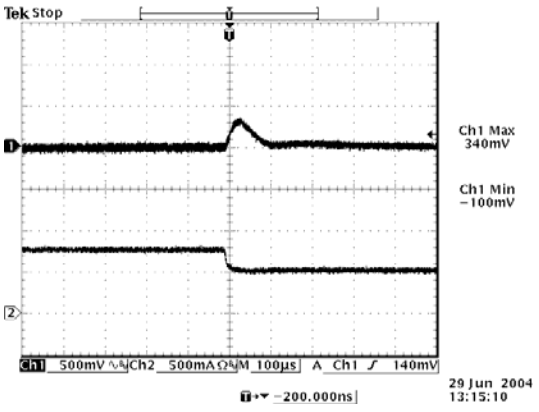
50% to 75% load transient at 9 Vdc output



75% to 50% load transient at 9 Vdc output



50% to 75% load transient at 12 Vdc output



75% to 50% load transient at 12 Vdc output

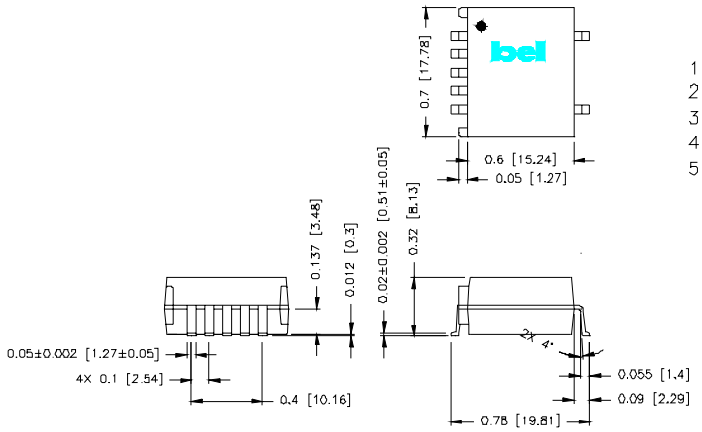
Note: Transient response at 12 Vdc input, di/dt=0.5 A/uS, with two 10 uF ceramic capacitors at the output, and Ta=25 deg C.

NON-ISOLATED DC/DC CONVERTERS

9.0 Vdc - 18 Vdc Input 5 Vdc - 12 Vdc/1A Output

Mechanical Outline

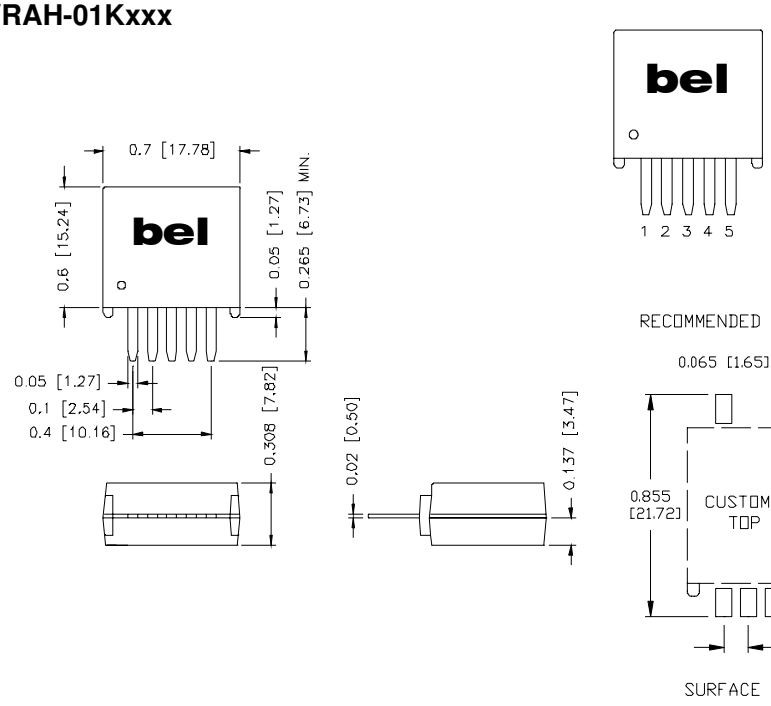
SRAH-01Kxxx



Pin Connections

Pin	Function
1	On/Off
2	Vin
3	Ground
4	Vout
5	N/A
6	N/A
7	N/A

VRAH-01Kxxx



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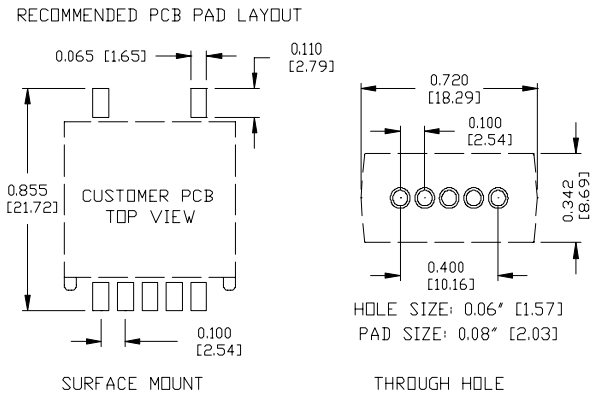

RoHS Compliance

Complies with the European Directive 2002/95/EC, calling for the elimination of lead and other hazardous substances from electronic products. These parts are not however compatible with the higher temperatures associated with lead free solder processes and must be soldered using a reflow profile with a peak temperature of no more than 240 °C.

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