NON-ISOLATED DC/DC CONVERTERS

3.3 Vdc Input 0.9 Vdc - 2.5 Vdc/7 A Output

xRAH-07C1A0 Series RoHS Compliant

- Non-Isolated
- Fixed Frequency
- High Efficiency
- High Power Density
- UL60950 Recognized (UL/cUL)
- Remote On/Off
- Input Under Voltage Lockout
- OCP/SCP
- Wide Range Trim
- Low Cost

Description

The Bel xRAH-07C1A0 module is a series of non-isolated, step down dc/dc power converters that operate from a nominal 3.3 Vdc source. These converters are available in a range of output voltages from 0.9 Vdc to 2.5 Vdc (default output voltage is 1.8 Vdc). It is packaged in a compact, overmolder package rated at 7 A. Optional lead forming provides a vertical mount product for minimal footprint or a surface mount option for a very low profile. The output is closely regulated and the efficiency is typically 92% 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
0.9 Vdc - 2.5 Vdc	3.3 Vdc	7 A	17.5 W	92%	SRAH-07C1A0	VRAH-07C1A0

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

Absolute Maximum Ratings

Parameter	Min	Typ	Max	Notes
Input Voltage (continuous)	-0.3 V	-	6 V	
Output Enable Terminal Voltage	-0.3 V	-	6 V	
Ambient Temperature	-40 °C	-	85 °C	
Storage Temperature	-40 °C	-	125 °C	

Input Specifications

Parameter	Min	Typ	Max	Notes
Input Voltage	3 V	-	3.6 V	
Input Current (no load)	-	-	110 mA	
Input Current (full load)				
Vo=2.5 V	-	-	6.6 A	
Vo=1.8 V	-	-	5.3 A	
Vo=1.5 V	-	-	4.6 A	
Vo=1.2 V	-	-	3.8 A	
Vo=1.0 V	-	-	3.2 A	
Vo=0.9 V	-	-	3.0 A	
Remote Off Input Current	-	7 mA	15 mA	
Input Reflected Ripple Current (pk-pk)	-	150 mA	250 mA	With simulated source impedance of 500 nH, 5 Hz to 20 MHz and a 270 uF/16 V with ESR=0.03 ohm max. at 100 kHz
Input Reflected Ripple Current (rms)	-	50 mA	80 mA	
I^2t Inrush Current Transient	-	0.08 A^2s	0.16 A^2s	
Turn on Voltage Threshold	2.5 V	-	2.8 V	
Turn off Voltage Threshold	-	2.4 V	-	

Output Specifications

Parameter			Min	Typ	Max	Notes
Output Voltage Set Point						
	Vo=2.5 V		2.450 V	2.5 V	2.550 V	Test conditions: Vin=3.3 V, Io= full load
	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	
	Vo=1.0 V		0.980 V	1.0 V	1.020 V	
	Vo=0.9 V		0.882 V	0.9 V	0.918 V	
Line Regulation						
	Vo=1.5 V-2.5 V		-	±3 mV	±10 mV	
	Vo=0.9 V-1.2 V		-	±1 mV	±5 mV	
Load Regulation						
	Vo=1.5 V-2.5 V		-	±3 mV	±10 mV	
	Vo=0.9 V-1.2 V		-	±1 mV	±5 mV	
Regulation Over Temperature						
(-40 °C to +85 °C)	Vo=2.5 V		-	±25 mV	±40 mV	
	Vo=1.8 V		-	±15 mV	±30 mV	
	Vo=1.5 V		-	±15 mV	±30 mV	
	Vo=1.2 V		-	±10 mV	±20 mV	
	Vo=1.0 V		-	±8 mV	±15 mV	
	Vo=0.9 V		-	±8 mV	±15 mV	
Output Current			0 A	-	7 A	
Current Limit Threshold			8.4 A	-	17.5 A	
Short Circuit Surge Transient			-	0.08 A^2s	0.12 A^2s	
Ripple and Noise (rms)						
	Vo=2.5 V-0.9 V		-	10 mV	20 mV	Test condition: 0-20 MHz BW, with a 1 uF ceramic capacitor and 10 uF aluminum capacitor at the output.
Ripple and Noise (pk-pk)						
	Vo=2.5 V-1.2 V		-	40 mV	80 mV	
	Vo=1.0 V-0.9 V		-	40 mV	70 mV	
Turn on Time			-	7 mS	15 mS	
Overshoot at Turn on			-	0%	1%	
Output Capacitance			0 uF	-	2200 uF	
Transient Response						
50% ~ 100% Max Load	Overshoot	Vo=1.8 V-2.5 V	-	120 mV	180 mV	Test conditions: di/dt = 0.5 A/uS; Vin = 3.3 V; without any external capacitor at the output.
	Settling Time		-	40 uS	80 uS	
100% ~ 50% Max Load	Overshoot		-	120 mV	180 mV	
	Settling Time		-	40 uS	80 uS	
50% ~ 100% Max Load	Overshoot	Vo=1.5 V	-	100 mV	150 mV	
	Settling Time		-	40 uS	80 uS	
100% ~ 50% Max Load	Overshoot		-	100 mV	150 mV	
	Settling Time		-	40 uS	80 uS	
50% ~ 100% Max Load	Overshoot	Vo=0.9 V-1.2 V	-	50 mV	100 mV	
	Settling Time		-	40 uS	80 uS	
100% ~ 50% Max Load	Overshoot		-	50 mV	100 mV	
	Settling Time		-	40 uS	80 uS	

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

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3.3 Vdc Input 0.9 Vdc - 2.5 Vdc/7 A Output

General Specifications

Parameter	Min	Typ	Max	Notes
Efficiency				
V_O=2.5 V	90%	92%	-	Measured at Vin=3.3 V, full load and Ta=25 °C
V_O=1.8 V	86%	88%	-	
V_O=1.5 V	84%	86%	-	
V_O=1.2 V	81%	83%	-	
V_O=1.0 V	79%	81%	-	
V_O=0.9 V	78%	80%	-	
Switching Frequency	250 kHz	300 kHz	340 kHz	
Output Trim Range	50%	-	146%	V_O=1.8 V
MTBF	3,391,747 hours			Calculated Per Bell Core SR-332 (Vin=3.3 V; Vo=1.8 V; I_O = 5.6 A; T_a = 25°C)
Dimensions (surface mount)				
Inches (L × W × H)	0.78 x 0.70 x 0.32			
Millimeters (L × W × H)	19.81 x 17.78 x 8.13			
Dimensions (vertical)				
Inches (L × W × H)	0.70 x 0.308 x 0.65			
Millimeters (L × W × H)	17.78 x 7.82 x 16.51			
Weight	-	5 g	-	

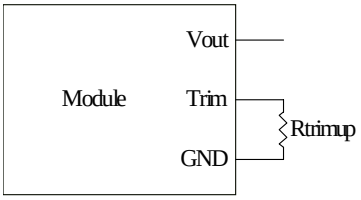
Control Specifications

Parameter	Min	Typ	Max	Notes
Remote On/Off				
Signal Low (Unit Off)	-0.3 V	-	1 V	Remote on/off pin open, unit on.
Signal High (Unit On)	1.8 V	-	3.6 V	

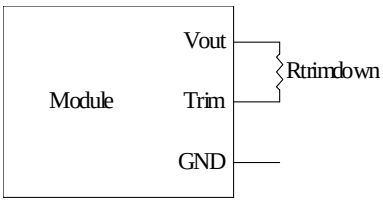
Output Trim Equations

Equations for calculating the trim resistor given the desired adjusted voltage (Vadj) and the nominal output voltage of the converter (Vnom) are shown below. The Trimup resistor should be connected between the Trim pin and Ground and the Trimdown resistor should be connected between the Trim pin and Vout pin.

$$Rtrim\_up = \left(\frac{3.064}{Vo,adj - Vo} - 0.261\right) Kohm$$

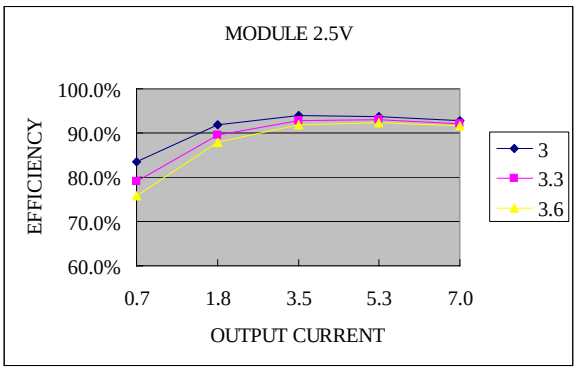


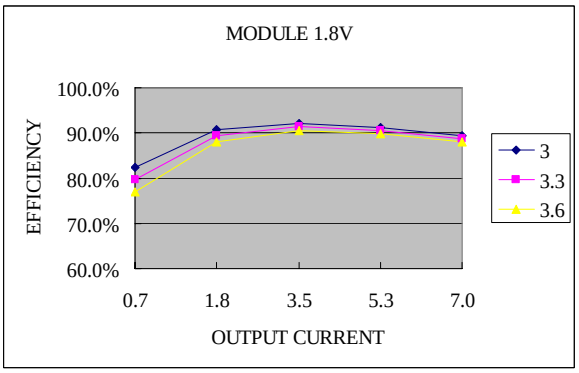
$$Rtrim\_down = \left(\frac{3.8488}{Vo - Vo,adj} - 4.091\right) Kohm$$

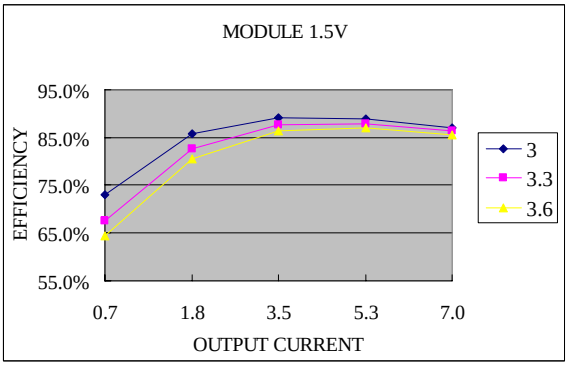


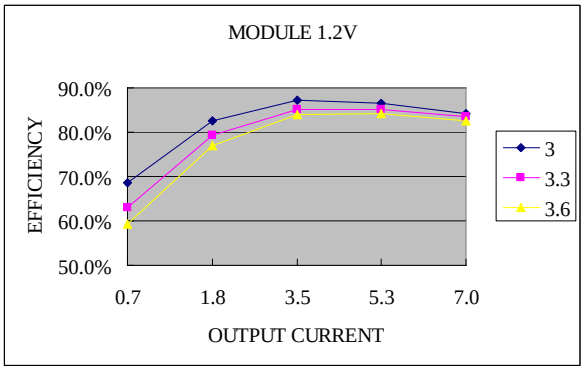
Note: Output voltage Vo=1.8 V when R_{trim} is open.

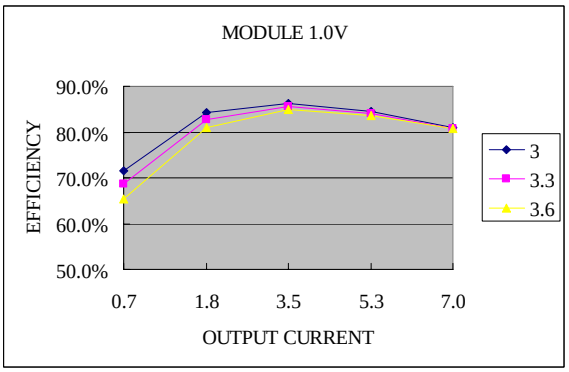
Efficiency Data

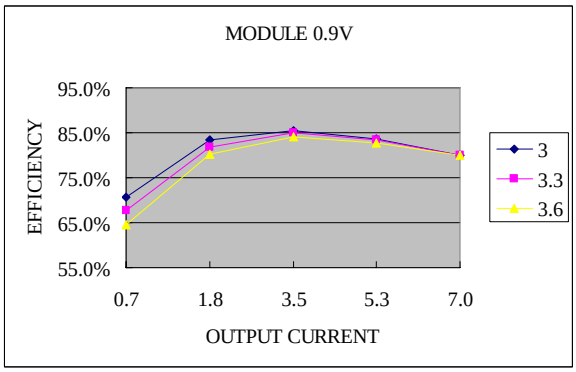




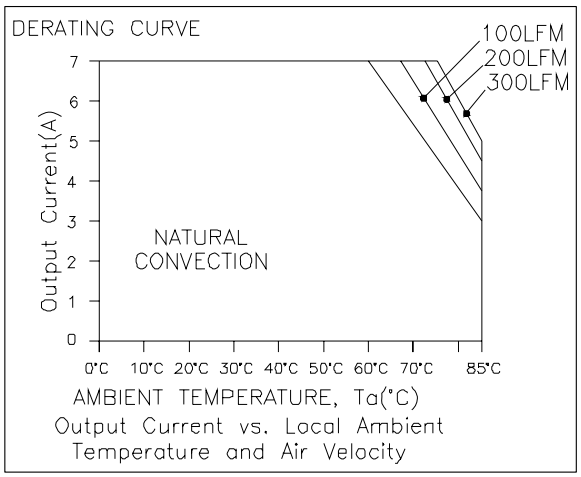








Thermal Derating Curves



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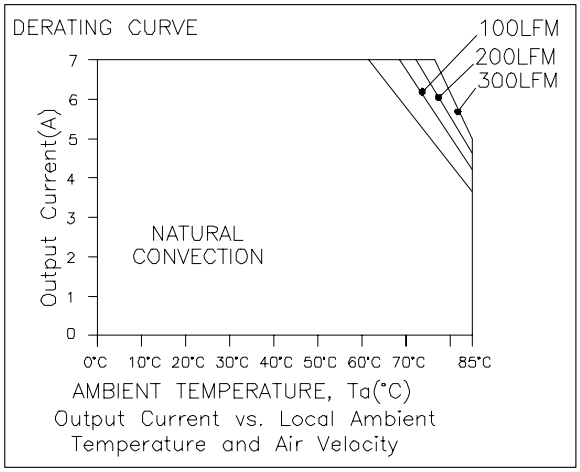

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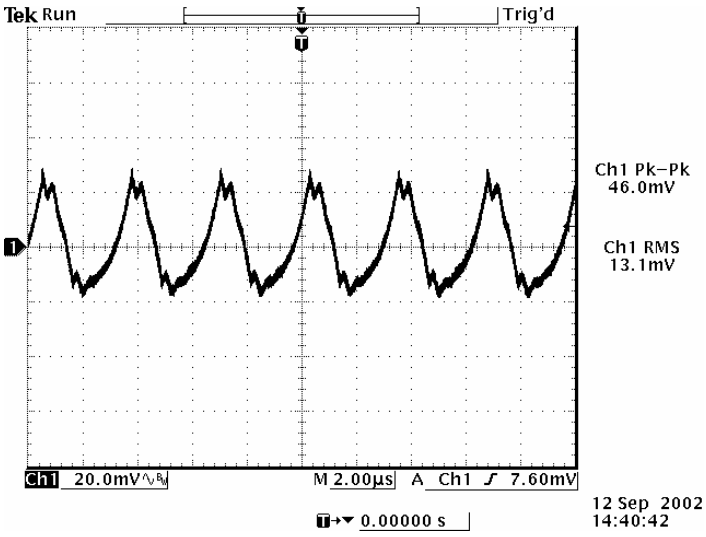
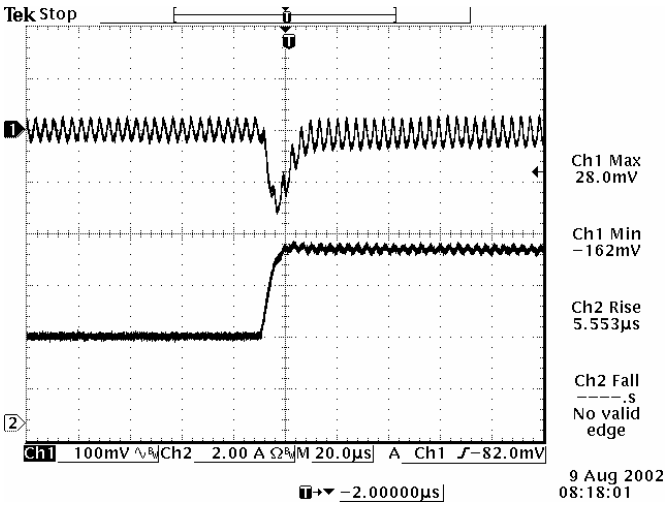
Ripple and Noise Waveforms

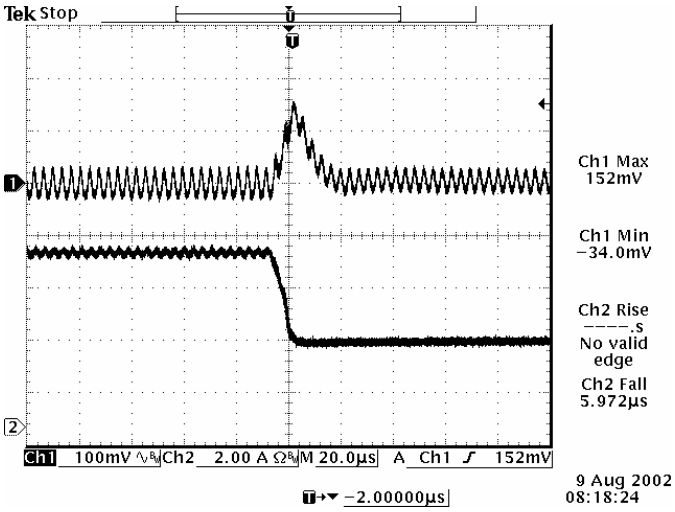


Note: Ripple and noise at full load, 3.3 Vdc input, 1.8 Vdc output and Ta=25 deg C, with 1 uF ceramic capacitor and 10 uF aluminum capacitor at the output.

Transient Response Waveforms



50% to 100% load Transient at Vin=3.3 V, Vo=1.8 V



100% to 50% load Transient at Vin=3.3 V, Vo=1.8 V

Note: Transient Response at di/dt=0.5 A/uS, external load capacitance Co=0uF (electrolytic), Ta=25 deg C.

Mechanical Outline

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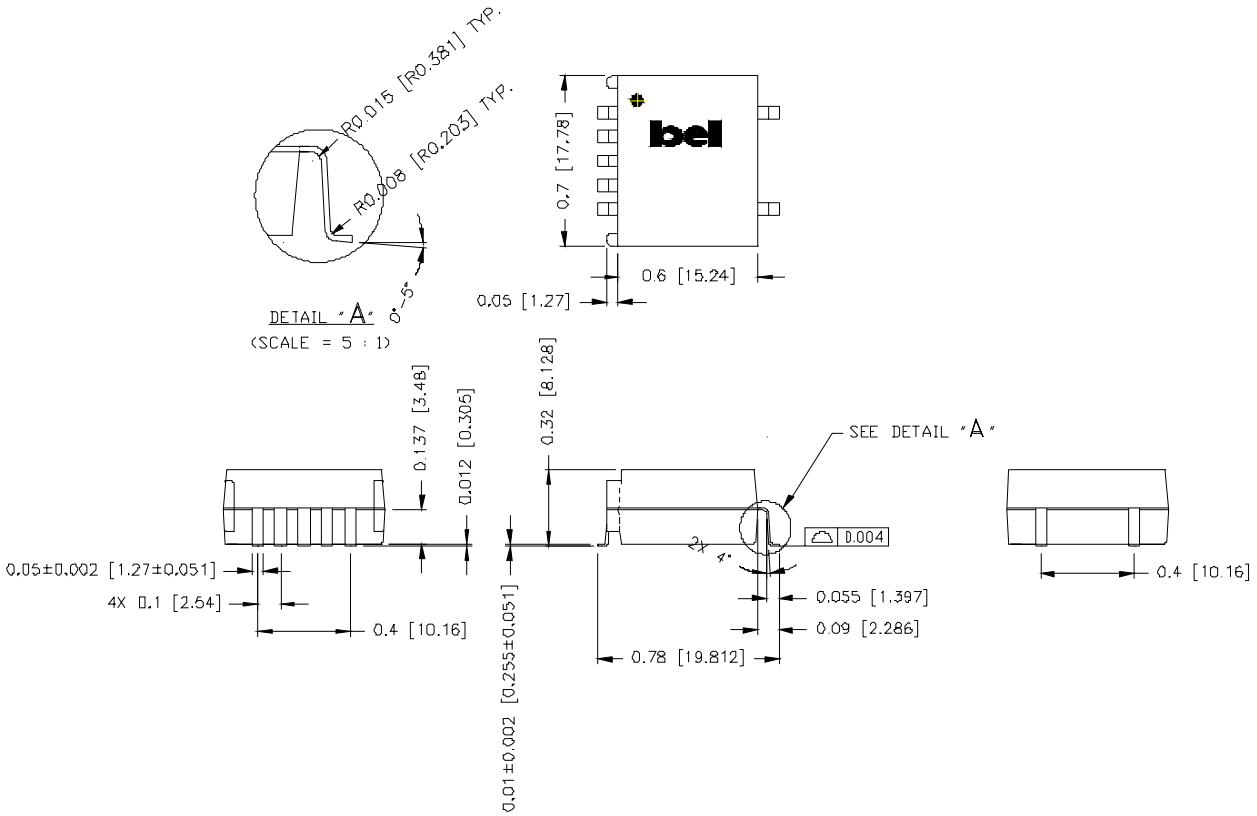

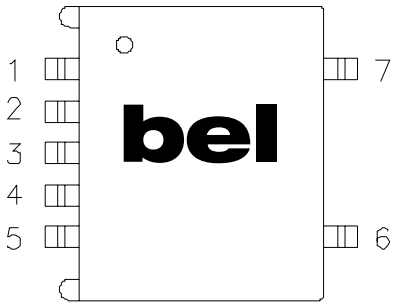

Pin Connections

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

Mechanical Outline (continued)

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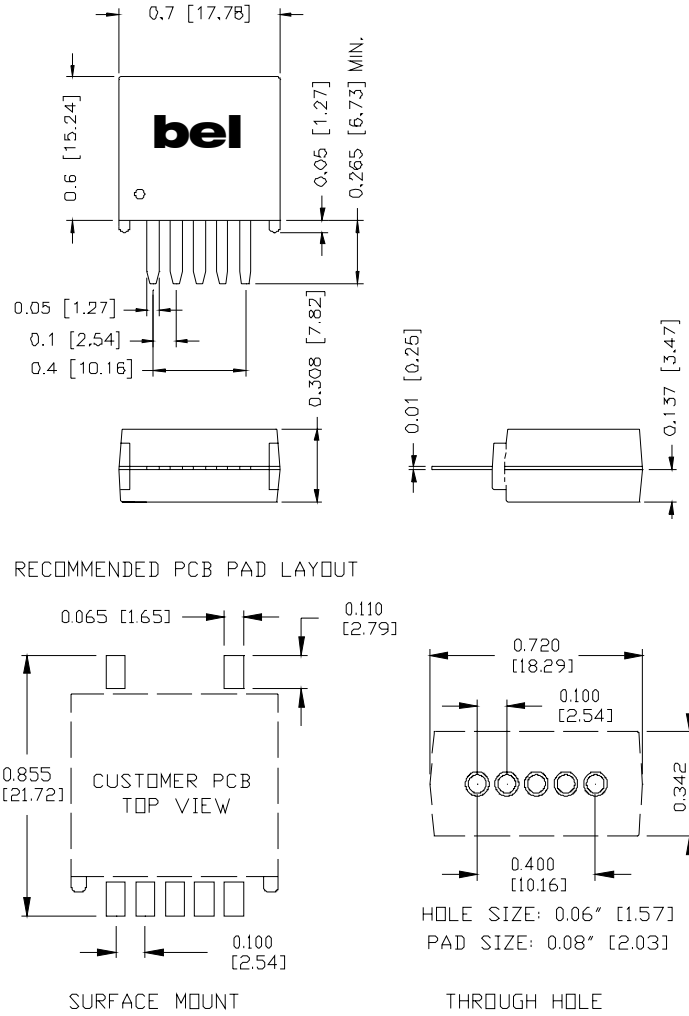

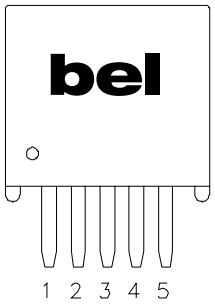

Pin Connections

Pin	Function
1	Remote On/Off
2	Vin
3	Ground
4	Vout
5	Trim

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.

RoHS 2002/95/EC

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