NON-ISOLATED DC/DC CONVERTERS

3.0 Vdc - 3.6 Vdc Input 5.0 Vdc/1.5 A Output

xRAH-02C50x RoHS Compliant Rev.A

- Non-Isolated
- High Efficiency
- Fixed Frequency (550 kHz)
- Low Profile Package
- Trim Function (Option)
- Allows Burst Mode Operation at Low Load Currents for xRAH-02C500, Burst Mode Operation Disabled for Lower Output Ripple at Light Loads for xRAH-02C50B
- UL60950-1 Recognized (UL/cUL)

Description

The Bel xRAH-02C50x is a part of the low cost non-isolated dc/dc converter series. The modules use a SMD or SIP package for ease of layout and space savings. The output is closely regulated and the efficiency is typically 87% 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
5.0 Vdc	3.0 Vdc - 3.6 Vdc	1.5 A	7.5 W	87%	SRAH-02C50x	VRAH-02C50x

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. Replace “x” with “0” to allow burst mode operation at low load currents, or with “B” to disable burst mode operation at light loads.
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)	2.8 V	-	4.0 V	
Ambient Temperature	-40 °C	-	85 °C	
Storage Temperature	-40 °C	-	125 °C	

Input Specifications

Parameter	Min	Typ	Max	Notes
Input Voltage	3.0 V	-	3.6 V	
Input Current	-	-	3.3 A	
Input Reflected Ripple Current (rms)	-	30 mA	60 mA	With simulated source impedance of 500 nH, 5 Hz to 20 MHz; Use one 270 uF/16 V capacitor with ESR = 0.018 ohm max. at 100 kHz
Input Reflected Ripple Current (pk-pk)	-	100 mA	150 mA	
I^2t Inrush Current Transient	-	0.02 A^2s	0.05 A^2s	
Turn-on Voltage Threshold	-	2.8 V	2.9 V	

Output Specifications

Parameter		Min	Typ	Max	Notes
Output Voltage Set Point		4.825 V	5.0 V	5.175 V	Vin=3.3V, Io= full load
Load Regulation		-	25 mV	40 mV	
Line Regulation		-	20 mV	30 mV	
Regulation Over Temperature (0 °C to 70 °C)		-	45 mV	80 mV	
Output Current		0 A	-	1.5 A	
Ripple and Noise (RMS)		-	15 mV	25 mV	0-20MHz BW, with1uF ceramic capacitor at the output.
Ripple and Noise (pk-pk)		-	50 mV	100 mV	
Ripple and Noise (pk-pk) (No Load)	xRAH-02C500 xRAH-02C50B	- -	50 mV 18 mV	- -	
Overshoot at Turn on		-	0%	5%	
Output Capacitance		0 uF	-	600 uF	
Transient Response					
50% ~ 100% Max Load	Vo=5 V	-	100 mV	150 mV	di/dt = 0.5 A/uS; Vin = 3.3 V; Ta = 25 °C without external capacitor
Settling Time		-	50 uS	100 uS	
100% ~ 50% Max Load		-	100 mV	150 mV	
Settling Time		-	50 uS	100 uS	

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

General Specifications

Parameter	Min	Typ	Max	Notes
Efficiency	84%	87%	-	Vin=3.3V, full load
Switching Frequency	500 kHz	550 kHz	650 kHz	
Output Trim Range	95% Vo	-	110% Vo	
MTBF	14,455,458 hours			Calculated Per Bell Core SR-332 (Vin=3.3 V; Vo=5 V; Io = 1.2 A; 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	-	5.2 g	-	

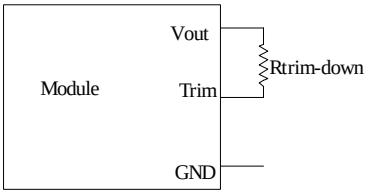
Note: All specifications are typical at nominal input, full load at 25 °C unless otherwise stated.

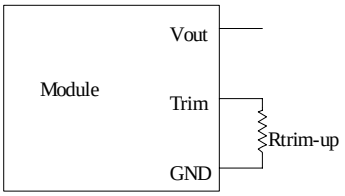
Output Trim Equations

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 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.

$$Rtrim\_down = (\frac{44.144}{Vo - Vo,adj} - 12.5)Kohm$$

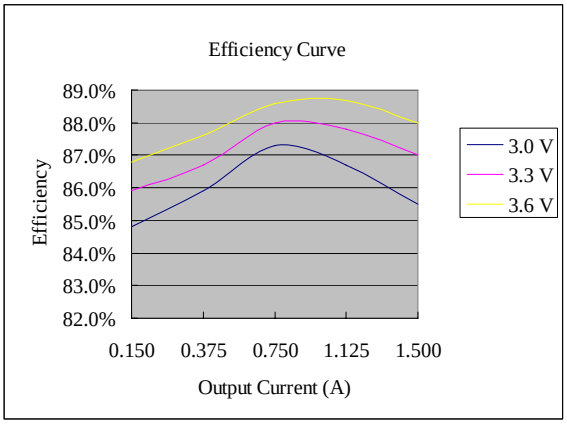
$$Rtrim\_up = (\frac{8.4}{Vo,adj - Vo} - 2)Kohm$$



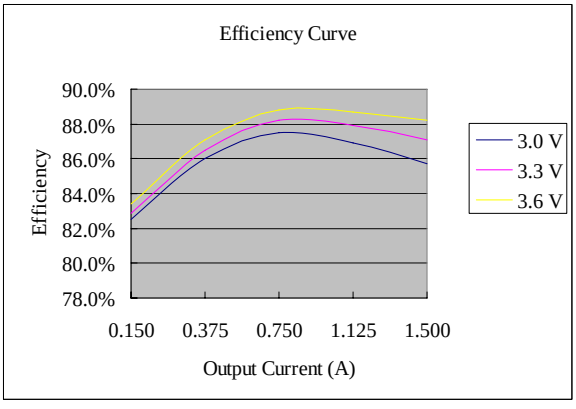


Note: Output voltage Vo=5.004 V when Rtrim is open.

Efficiency Data

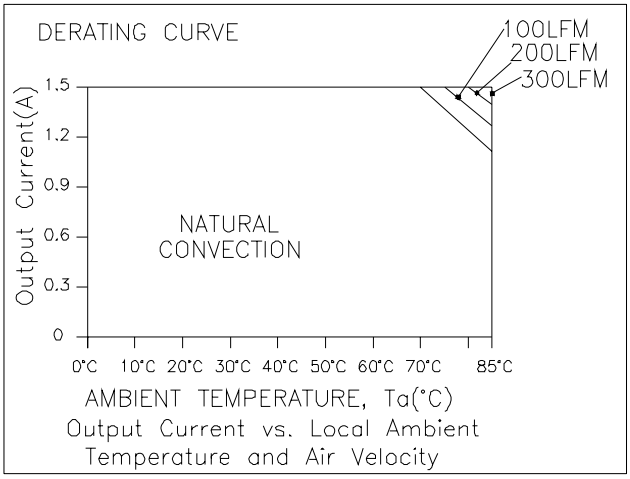


xRAH-02C500



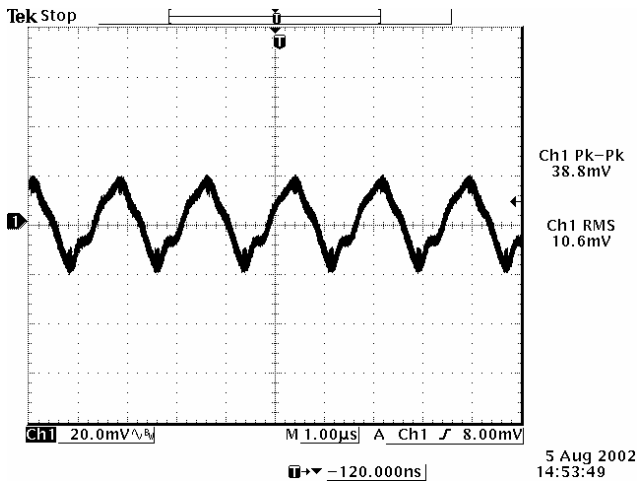
xRAH-02C50B

Thermal Derating Curve

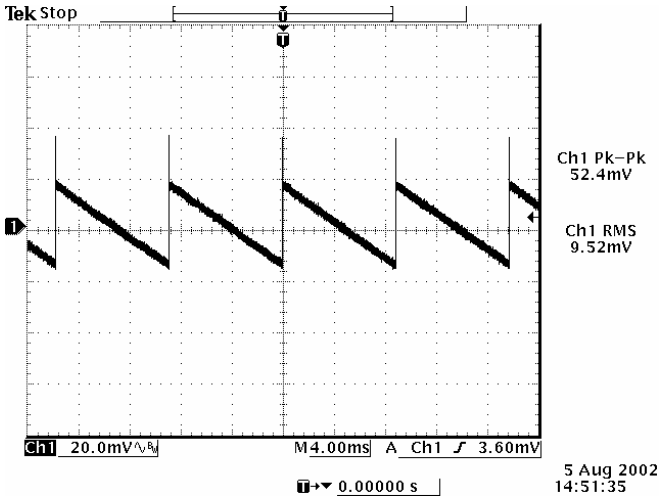


xRAH-02C50x

Ripple and Noise Waveforms



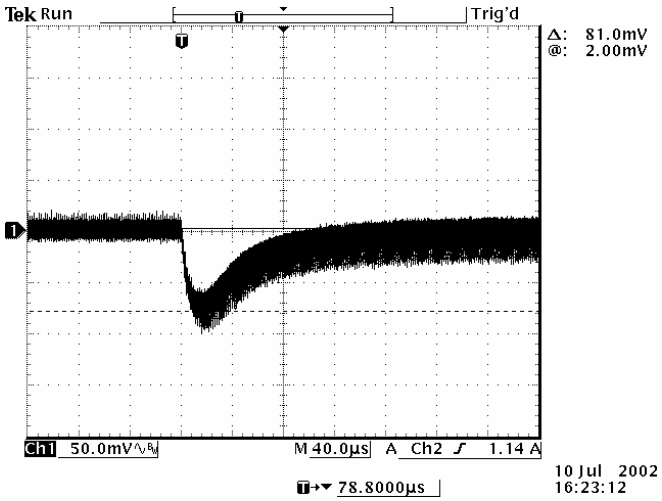
Ripple and noise at full load, Vin=3.3 V, Vo=5 V



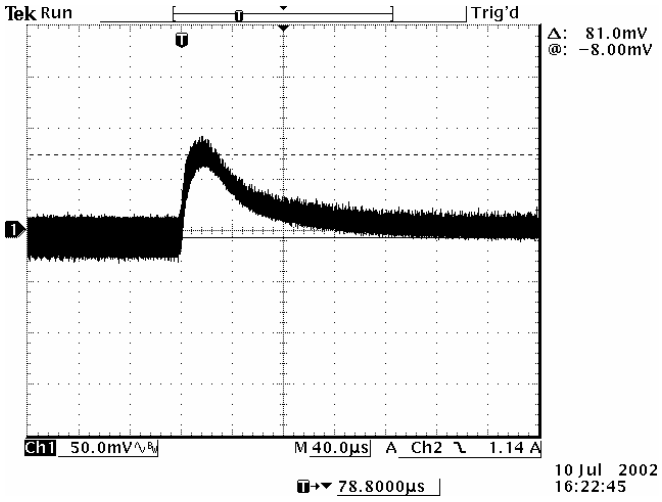
Ripple and noise at no load, Vin=3.3 V, Vo=5 V

Note: Ripple and noise tested with 1 uF ceramic capacitor at the output, Ta=25 deg C.

Transient Response Waveforms



50% to 100% load transient at Vin=3.3 V, Vo=5 V



100% to 50% load transient at Vin=3.3 V, Vo=5 V

Note: Transient response at di/dt=0.5 A/uS, no external load capacitor, Ta=25 deg C.

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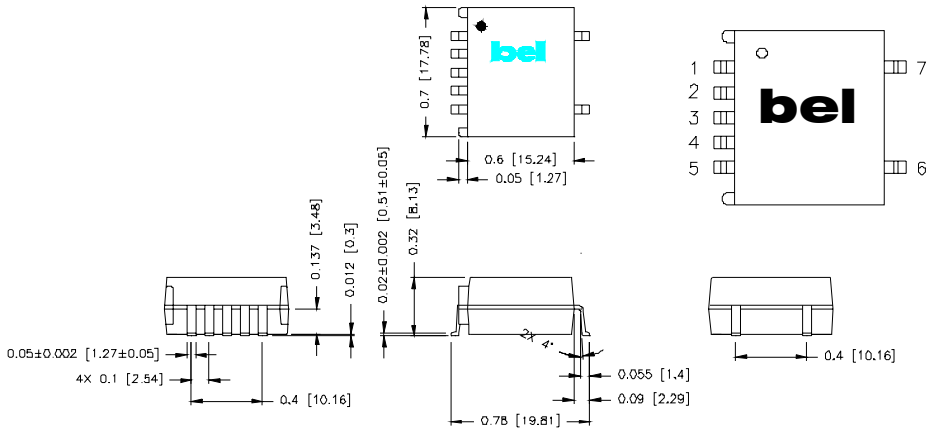
Mechanical Outline

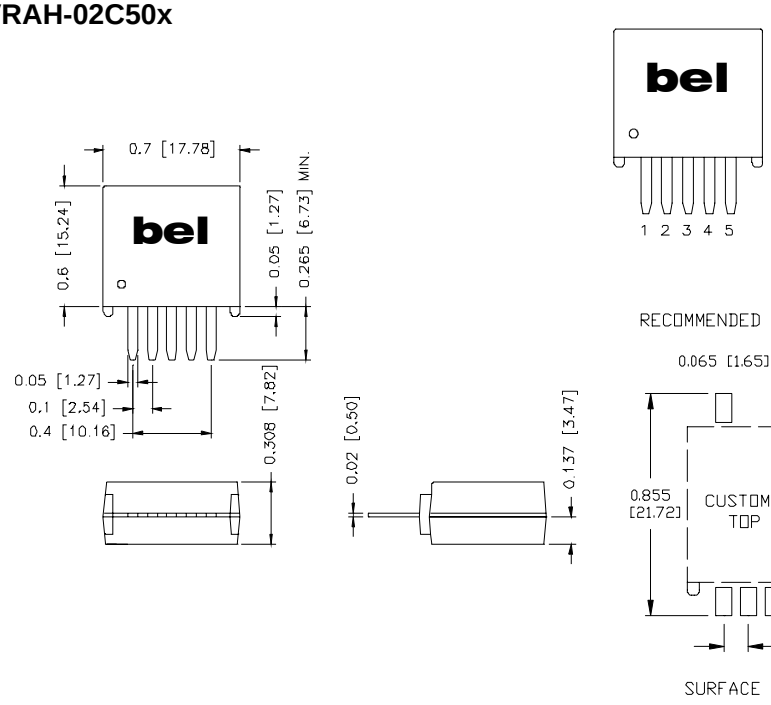
SRAH-02C50x



Pin Connections

Pin	Function
1	N/A
2	Vin
3	Ground
4	Vout
5	Trim (option)
6	N/A
7	N/A

VRAH-02C50x



Pin Connections

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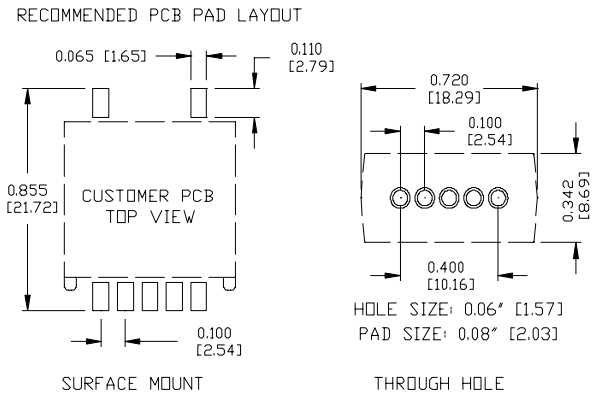

RoHS Compliance

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.

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