NON-ISOLATED DC/DC CONVERTERS

2.5 Vdc Input 0.9 Vdc - 1.65 Vdc/10 A Output

xRAH-10J Series RoHS Compliant Rev.A

- Non-Isolated
- Low Profile Package (7.82 mm)
- Fixed Frequency (300 kHz)
- Under-Voltage Lockout (UVLO)
- UL60950-1 Recognized (UL/cUL)
- Remote On/Off
- Short Circuit Protection
- Over Current Protection
- Trim Function

Description

The Bel xRAH-10Jxx0 is part of the low cost non-isolated dc/dc power 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 of 1.5 Vdc output is typically 88% at full load. Typical features include remote on/off, input under voltage lockout, over current protection and short circuit protection.

Part Selection

Output Voltage	Input Voltage	Max. Output Current	Max. Output Power	Typical Efficiency	Part Number Surface Mount	Part Number Vertical Mount
1.5 V	2.5 V	10 A	15 W	88%	SRAH-10J150	VRAH-10J150
1.2 V	2.5 V	10 A	12 W	83%	SRAH-10J120	VRAH-10J120
1.0 V	2.5 V	10 A	10 W	80%	SRAH-10J100	VRAH-10J100

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. 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	-	6 V	
Output Enable Terminal Voltage	-0.3 V	-	7 V	
Ambient Temperature	-40 °C	-	85 °C	
Storage Temperature	-40 °C	-	125 °C	

Input Specifications

Parameter	Min	Typ	Max	Notes
Input Voltage	2.25 V	2.5 V	2.75 V	
Input Current (no load)	-	75 mA	-	
Input Current (full load) Vo=1.5 V Vo=1.2 V Vo=1.0 V	 - - -	 6.8 A 5.6 A 4.9 A	 - - -	
Remote Off Input Current	-	4 mA	8 mA	
Input Reflected Ripple Current (pk-pk)	-	80 mA	150 mA	Tested with simulated source impedance of 500 nH, 5 Hz to 20 MHz; with a 270 uF/16 V with ESR=0.018 ohm max, at 100 kHz at 25 °C
Input Reflected Ripple Current (rms)	-	25 mA	50 mA	
I^2t Inrush Current Transient	-	0.04 A^2s	0.10 A^2s	
Turn on Voltage Threshold	2 V	2.1 V	2.15 V	
Turn off Voltage Threshold	1.8 V	2 V	2.15 V	

Output Specifications

Parameter			Min	Typ	Max	Notes
Output Voltage Set Point						
	Vo=1.5 V		1.470 V	1.5 V	1.530 V	Test conditions: Vin=2.5 V, Io=full load
	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	
Line Regulation						
	Vo=1.5 V		-	2 mV	5 mV	
	Vo=1.2 V		-	2 mV	5 mV	
	Vo=1.0 V		-	2 mV	5 mV	
Load Regulation						
	Vo=1.5 V		-	5 mV	10 mV	
	Vo=1.2 V		-	5 mV	10 mV	
	Vo=1.0 V		-	5 mV	10 mV	
Regulation Over Temperature (-40 °C to +85 °C)						
	Vo=1.5 V		-	13 mV	25 mV	
	Vo=1.2 V		-	10 mV	20 mV	
	Vo=1.0 V		-	9 mV	20 mV	
Output Current			0 A	-	10 A	
Current Limit Threshold			13 A	-	25 A	
Short Circuit Surge Transient						
	Vo=1.5 V		-	0.5 A^2s	1.5 A^2s	
	Vo=1.2 V		-	0.5 A^2s	1.5 A^2s	
	Vo=1.0 V		-	0.5 A^2s	1.5 A^2s	
Ripple and Noise (rms)			-	15 mV	25 mV	Test conditions: 0-20 MHz BW, with a 1 uF ceramic capacitor at the output.
Ripple and Noise (pk-pk)			-	50 mV	100 mV	
Turn on Time			-	1 mS	2 mS	
Overshoot at Turn on			-	0%	3%	
Output Capacitance			220 uF	-	4000 uF	
Transient Response						
50% ~ 100% Max Load	Overshoot	Vo=1.5 V	-	90 mV	125 mV	Test conditions: di/dt = 0.5 A/uS; Vin = 2.5 V; with a 220 uF tantalum capacitor at the output.
	Settling Time		-	30 uS	60 uS	
100% ~ 50% Max Load	Overshoot		-	90 mV	125 mV	
	Settling Time		-	30 uS	60 uS	
50% ~ 100% Max Load	Overshoot	Vo=1.2 V	-	80 mV	120 mV	
	Settling Time		-	30 uS	60 uS	
100% ~ 50% Max Load	Overshoot		-	80 mV	120 mV	
	Settling Time		-	30 uS	60 uS	
50% ~ 100% Max Load	Overshoot	Vo=1.0 V	-	80 mV	120 mV	
	Settling Time		-	30 uS	60 uS	
100% ~ 50% Max Load	Overshoot		-	80 mV	120 mV	
	Settling Time		-	30 uS	60 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=1.5 V VO=1.2 V VO=1.0 V	 85% 83% 79%	 88% 86% 82%	 - - -	Measured at Vin=2.5 V, full load and Ta=25 °C.
Switching Frequency	250 kHz	300 kHz	350 kHz	
Output Trim Range	90%Vo	-	110%Vo	
MTBF	4,447,157 hours			Calculated Per Bell Core SR-332 (IO = Nominal; Ta = 25 °C)
Dimensions (surface mount) Inches (L × W × H) Millimeters (L × W × H)	 0.78 x 0.70 x 0.32 19.81 x 17.78 x 8.13			
Dimensions (vertical) Inches (L × W × H) Millimeters (L × W × H)	 0.70 x 0.308 x 0.65 17.78 x 7.82 x 16.51			
Weight	-	4.7 g	-	

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

Control Specifications

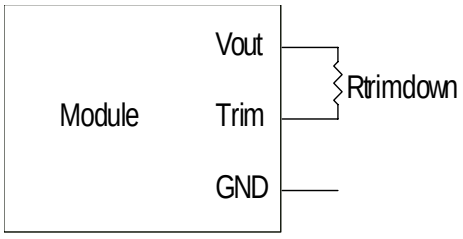
Parameter	Min	Typ	Max	Notes
Remote On/Off				
Signal Low (Unit Off)	0 V	-	0.5 V	Remote on/off pin open, the module is on.
Signal High (Unit On)	2 V	-	5.5 V	

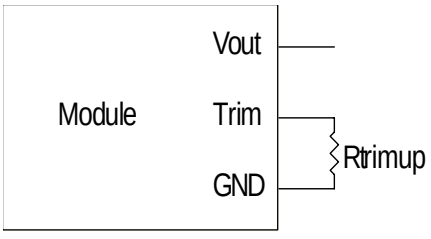
Output Trim Equations

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.

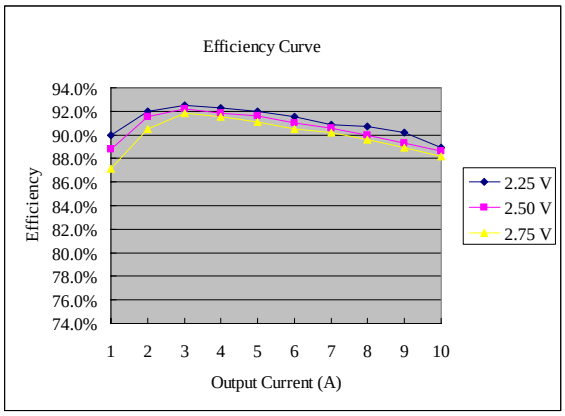
$$R_{TrimDown} = \frac{A}{V_{nom} - V_{adj}} - B \qquad R_{TrimUp} = \frac{C}{V_{adj} - V_{nom}} - D$$

Vnom	A	B	C	D
1.5 V	49.788	287.900	43.330	226.000
1.2 V	31.241	223.900	43.330	162.000
1.0 V	11.029	92.800	25.550	56.200

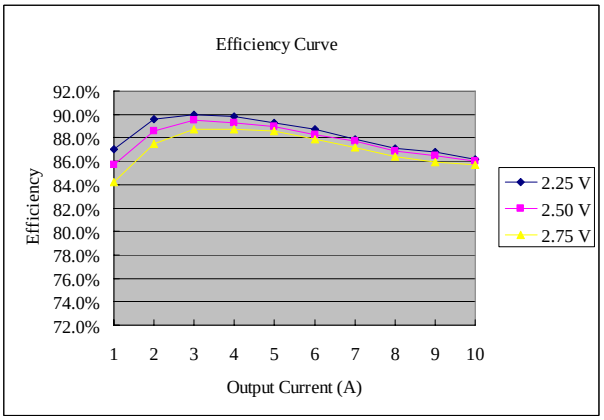




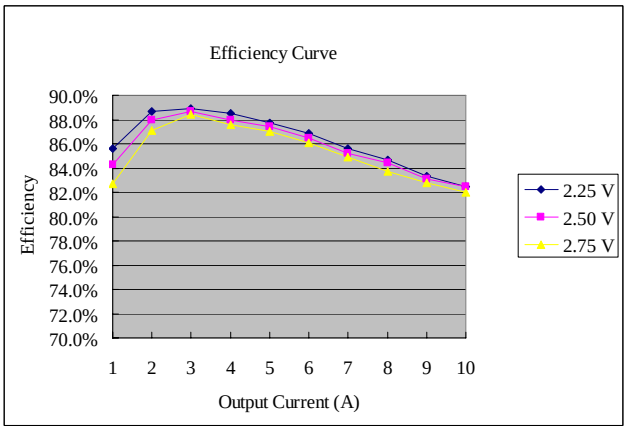
Efficiency Data



xRAH-10J150

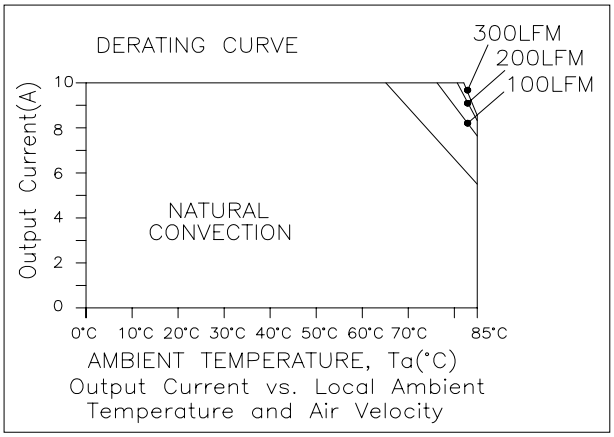


xRAH-10J120



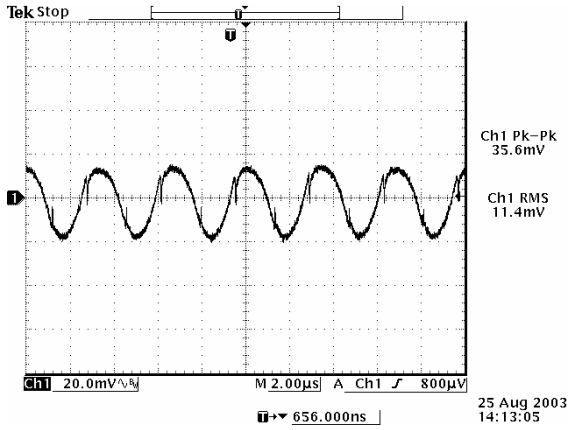
xRAH-10J100

Thermal Derating Curve

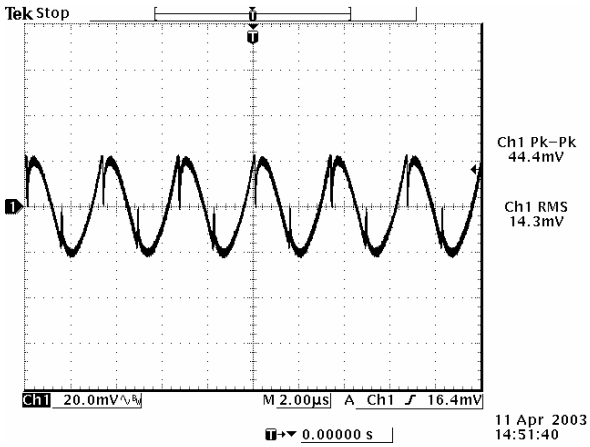


Note: Derating curve is for 1.2 V output and tested at nominal input voltage.

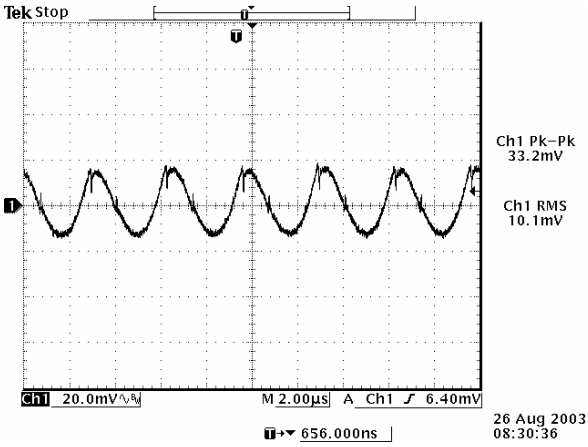
Ripple and Noise Waveforms



Ripple and Noise at max Load 1.0 Vdc Output



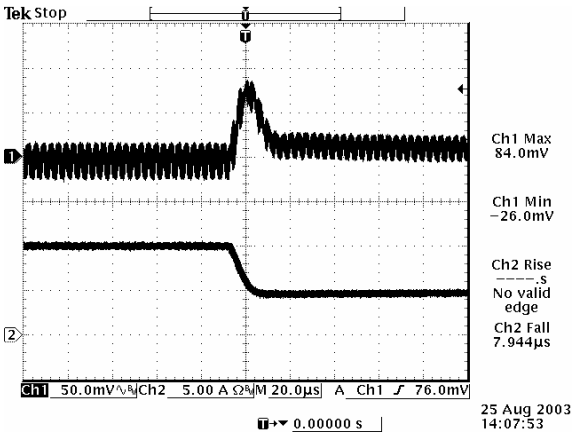
Ripple and Noise at max Load 1.2 Vdc Output



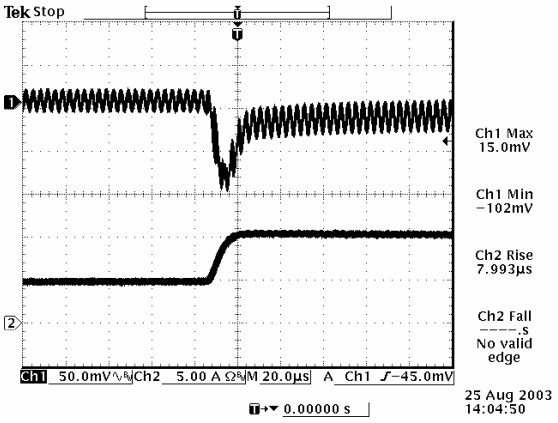
Ripple and Noise at max Load 1.5 Vdc Output

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

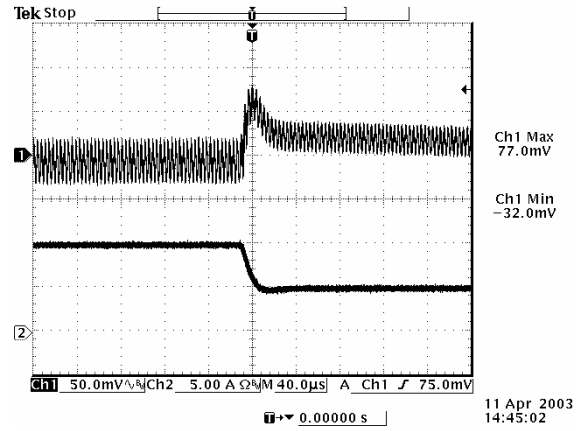
Transient Response Waveforms



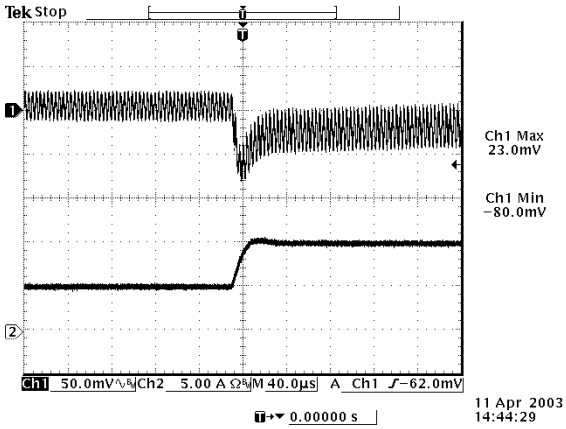
Transients 100% to 50% load 1.0 Vdc output



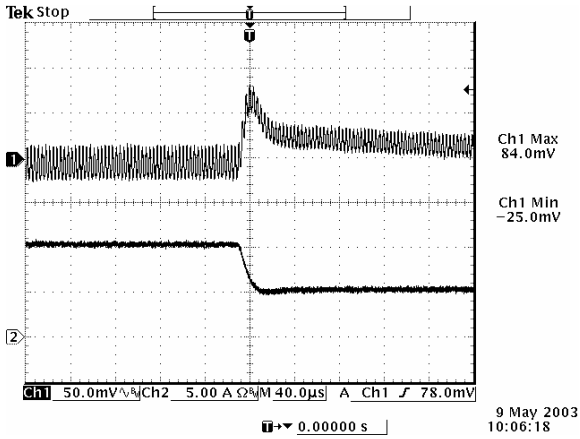
Transients 50% to 100% load 1.0 Vdc output



Transients 100% to 50% load 1.2 Vdc output



Transients 50% to 100% load 1.2 Vdc output



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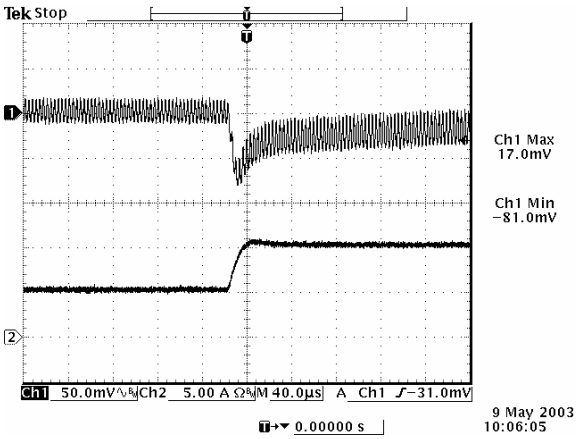


Transients 50% to 100% load 1.5 Vdc output

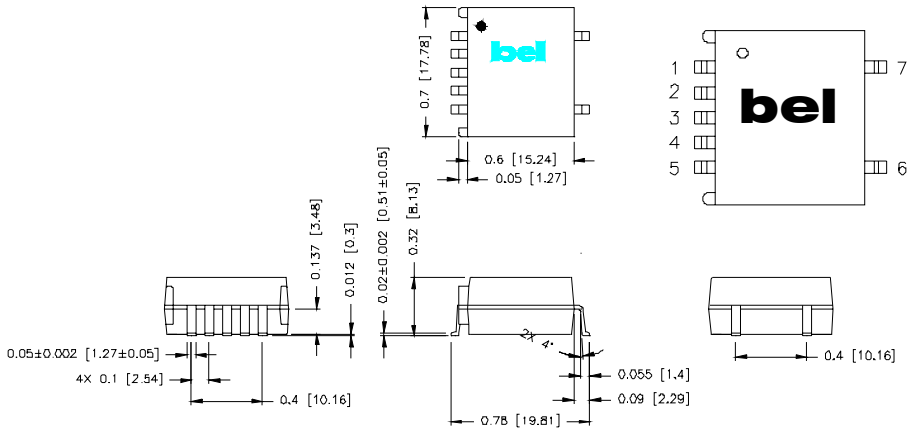
Note: Transient response at 2.5 V input, di/dt=0.5 A/uS, with 220 uF tantalum cap at the output, Ta=25 deg C.

NON-ISOLATED DC/DC CONVERTERS

2.5 Vdc Input 0.9 Vdc - 1.65 Vdc/10 A Outputt

Mechanical Outline

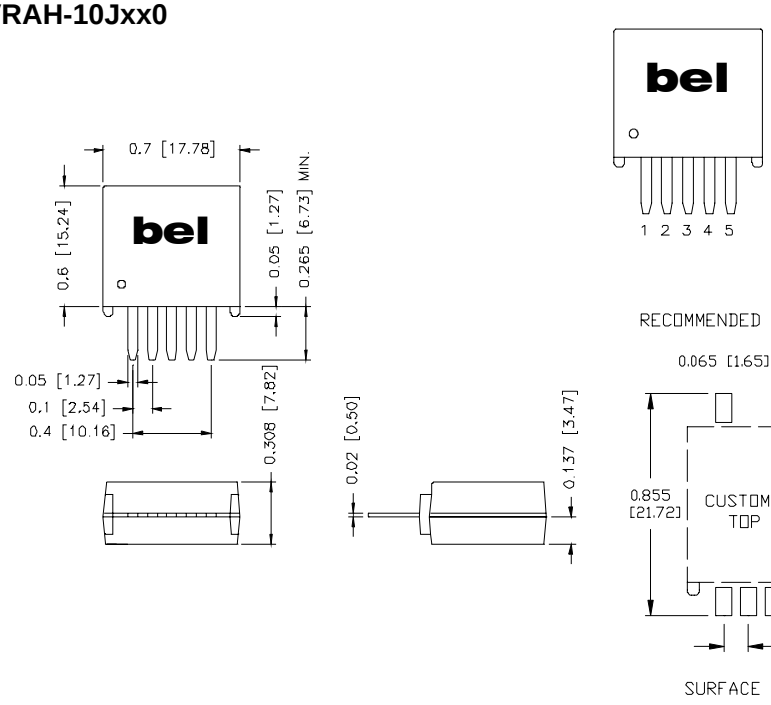
SRAH-10Jxx0



Pin Connections

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

VRAH-10Jxx0



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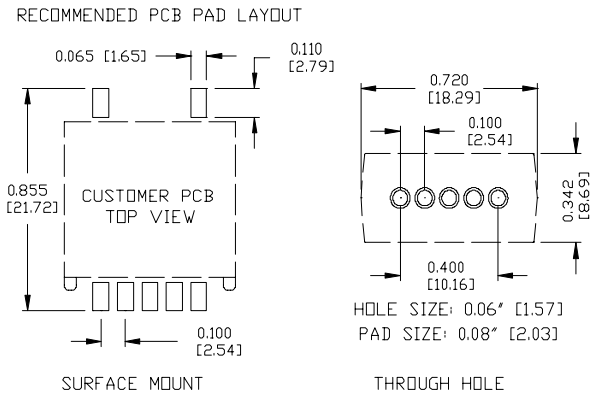

RoHS Compliance

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 ºC.

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