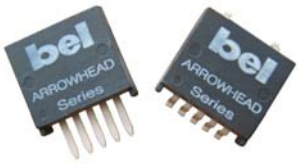
NON-ISOLATED DC/DC CONVERTERS

3.0 Vdc - 5.5 Vdc Input 12 Vdc/0.8 A & 15 Vdc/0.6 A Output

xRAH-01FXx0 Series RoHS Compliant Rev.A

- Non-Isolated
- Fixed Frequency (550 kHz)
- High Efficiency
- Low Profile Package
- Trim Function (option)
- Allows Burst Mode Operation at Low Load Currents
- UL60950-1 Recognized (UL/cUL)



Description

The Bel xRAH-01FXx0 is part of the low cost non-isolated dc/dc converter series. The modules use a surface mount package or vertical package for ease of layout and space savings. The output is closely regulated and the efficiency of 12 Vdc output module is typically 88% at full load. Typical features include burst mode operation at light load and trim function (option).

Part Selection

Output Voltage	Input Voltage	Max. Output Current	Max. Output Power	Typical Efficiency	Part Number Surface Mount	Part Number Vertical Mount
12 Vdc	3.0 Vdc - 5.5 Vdc	0.8 A	9.6 W	88%	SRAH-01FX20	VRAH-01FX20
15 Vdc	3.0 Vdc - 5.5 Vdc	0.6 A	9.0 W	88%	SRAH-01FX50	VRAH-01FX50

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)	2.8 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	-	5.5 V	
Input Current (full load) VO=12 V VO=15 V	 - -	 - -	 4.3 A 4.0 A	
Input Reflected Ripple Current (pk-pk)	-	100 mA	150 mA	With simulated source impedance of 500 nH, 5 Hz to 20 MHz; Use 270 uF/16 V Oscon capacitor with ESR = 0.018 ohm max. at 100 kHz
Input Reflected Ripple Current (rms)	-	30 mA	60 mA	
I^2t Inrush Current Transient	-	0.02 A^2s	0.05 A^2s	
Turn-on Voltage Threshold	-	2.8 V	2.9 V	

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

Output Specifications

Parameter		Min	Typ	Max	Notes
Output Voltage Set Point					
	Vo=12 V	11.580 V	12 V	12.420 V	Test condition: Vin=5 V, Iout=full load
	Vo=15 V	14.475 V	15 V	15.525 V	
Line Regulation					
	Vo=12 V	-	20 mV	40 mV	
	Vo=15 V	-	20 mV	40 mV	
Load Regulation					
	Vo=12 V	-	60 mV	120 mV	
	Vo=15 V	-	75 mV	150 mV	
Regulation Over Temperature (-40 °C to +85 °C)					
	Vo=12 V	-	45 mV	80 mV	
	Vo=15 V	-	60 mV	100 mV	
Output Current					
	Vo=12 V	0 A	-	0.8 A	
	Vo=15 V	0 A	-	0.6 A	
Ripple and Noise (rms)					
	Vo=12 V; Io=0 A	-	5 mV	10 mV	Test conditions: BW = 0-20 MHz; 1uF ceramic cap and 33 uF Tantalum capacitor at the output.
	Vo=15 V; Io=0 A	-	5 mV	10 mV	
	Vo=12 V; Io=0.8 A	-	20 mV	40 mV	
	Vo=15 V; Io=0.6 A	-	30 mV	50 mV	
Ripple and Noise (pk-pk)					
	Vo=12 V; Io=0 A	-	20 mV	40 mV	
	Vo=15 V; Io=0 A	-	20 mV	40 mV	
	Vo=12 V; Io=0.8 A	-	60 mV	100 mV	
	Vo=15 V; Io=0.6 A	-	80 mV	120 mV	
Rise Time		-	5 mS	-	
Overshoot at Turn on		-	0%	5%	
Output Capacitance		33 uF	-	330 uF	The min output capacitance is 33 uF Tantalum capacitor at the output
Transient Response					
50% ~ 100% Max Load	Overshoot	All Outputs	-	130 mV	200 mV	di/dt = 0.1 A/uS; Vin = 5 V; and with 33 uF Tantalum capacitor at the output.
	Settling Time		-	100 uS	200 uS	
100% ~ 50% Max Load	Overshoot		-	130 mV	200 mV	
	Settling Time		-	100 uS	200 uS	

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

General Specifications

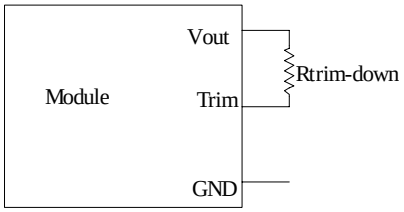
Parameter	Min	Typ	Max	Notes
Efficiency Vo=12 V Vo=15 V	 84% 84%	 88% 88%	 - -	Measured at Vin=5 V, full load
Switching Frequency	500 kHz	550 kHz	650 kHz	
Output Trim Range	90% Vo	-	110% Vo	
MTBF	13,684,605 hours			Calculated Per Bell Core SR-332 (Vin= 5 V; Vo=12 V; Io = 0.64 A; Ta = 25 °C)
Dimensions (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 25 °C unless otherwise stated.

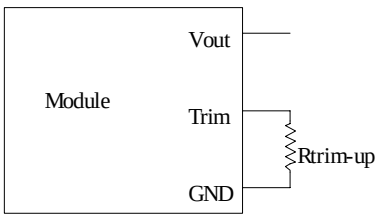
Output Trim Equations

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.

$$R_{trim-down} = \frac{A}{V_{nom} - V_{adj}} - B$$

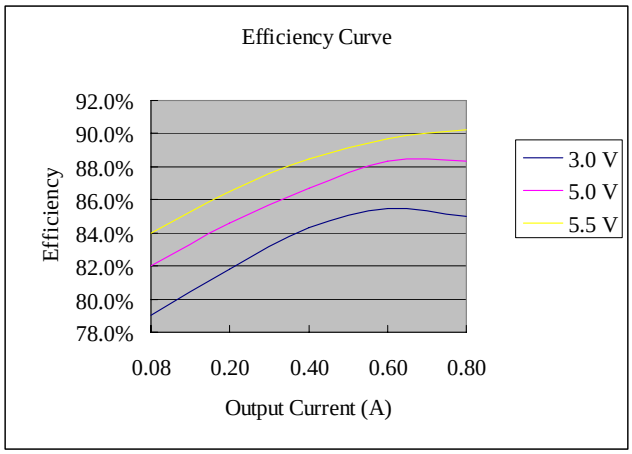


$$R_{trim-up} = \frac{C}{V_{adj} - V_{nom}} - D$$

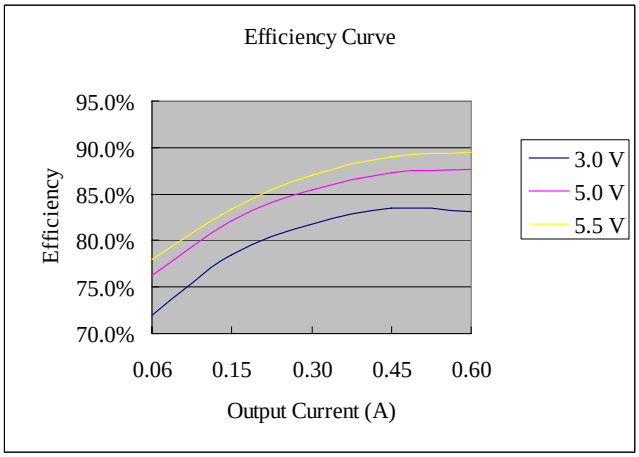


Vnom	A	B	C	D
12	164.640	21.850	11.760	7.150
15.055	209.542	20.600	11.760	5.900

Efficiency Data

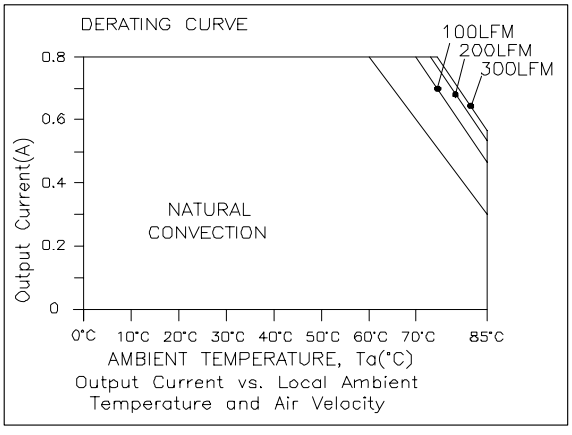


xRAH-01FX20

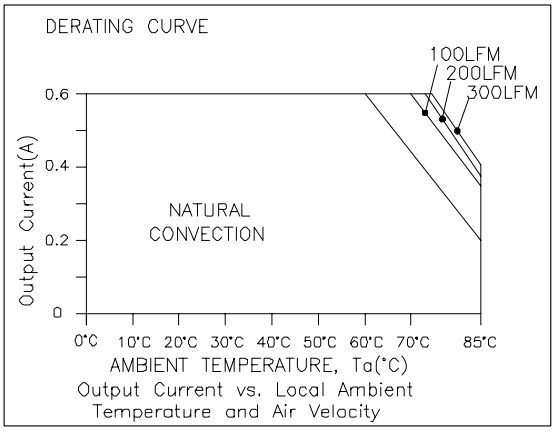


xRAH-01FX50

Thermal Derating Curves

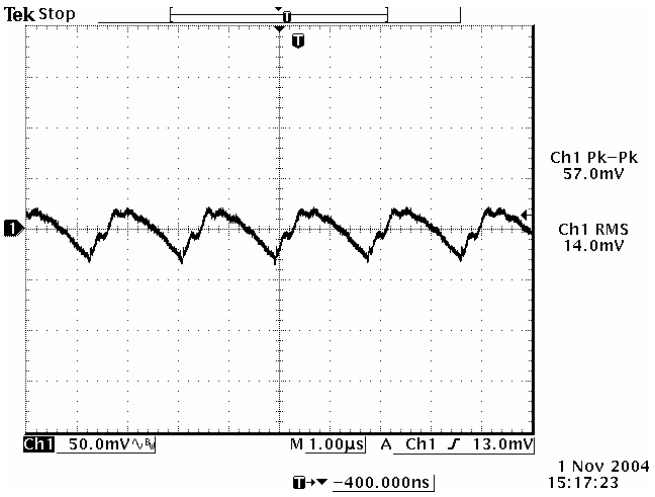


xRAH-01FX20

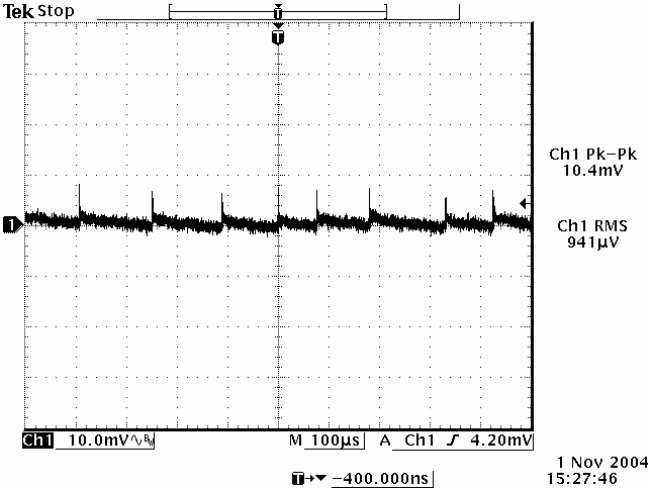


xRAH-01FX50

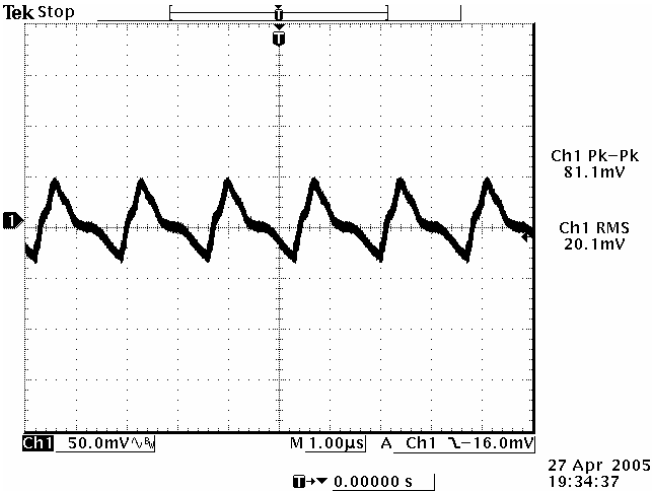
Ripple and Noise Waveforms



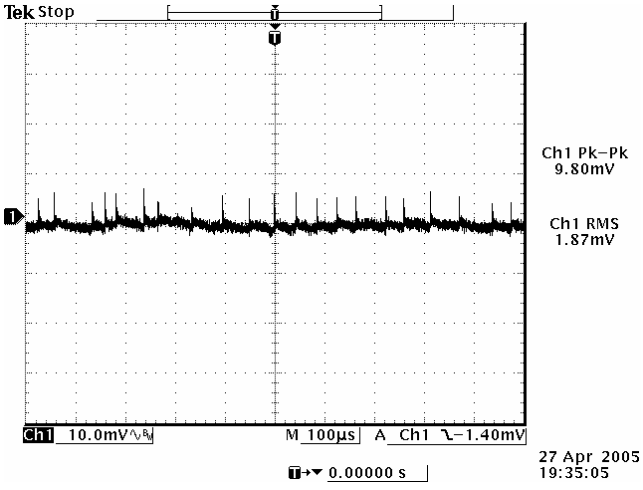
Ripple and noise at full load, Vin=5 V, Vo=12 V



Ripple and noise at no load, Vin=5 V, Vo=12 V



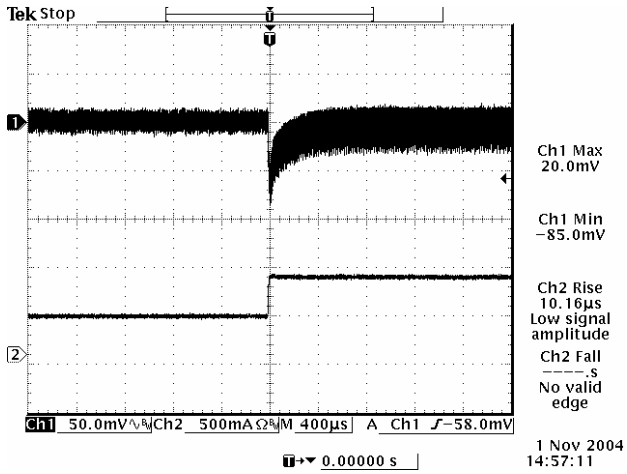
Ripple and noise at full load, Vin=5 V, Vo=15 V



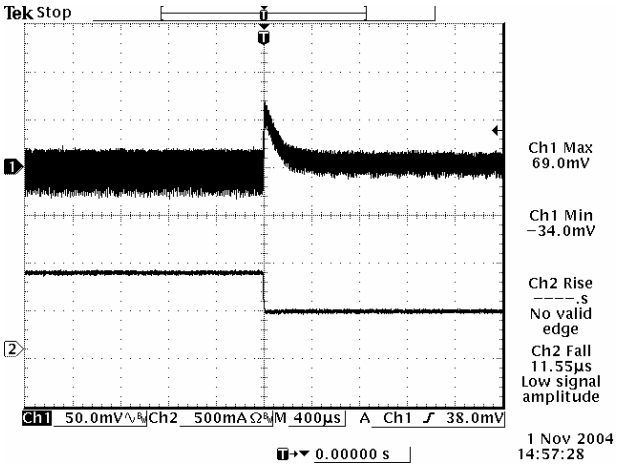
Ripple and noise at no load, Vin=5 V, Vo=15 V

Note: Ripple and noise tested with 1 uF ceramic capacitor and 33 uF tantalum capacitor at the output, Ta=25 deg C.

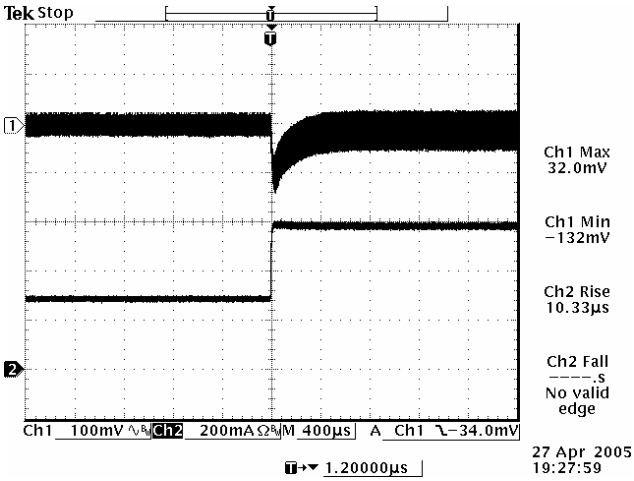
Transient Response Waveforms



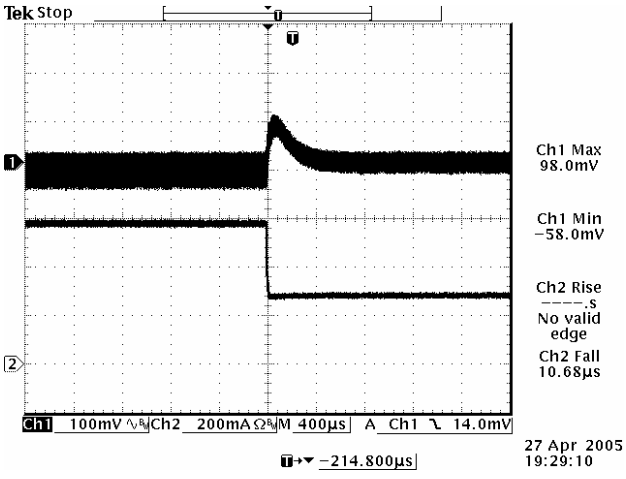
50% to 100% load transient at Vin=5 V, Vo=12 V



100% to 50% load transient at Vin=5 V , Vo=12 V



50% to 100% load transient at Vin=5 V, Vo=15 V



100% to 50% load transient at Vin=5 V , Vo=15 V

Note: Transient response tested at di/dt=0.1 A/uS, with an external 33 uF tantalum load capacitor at the output, and Ta=25 deg C.

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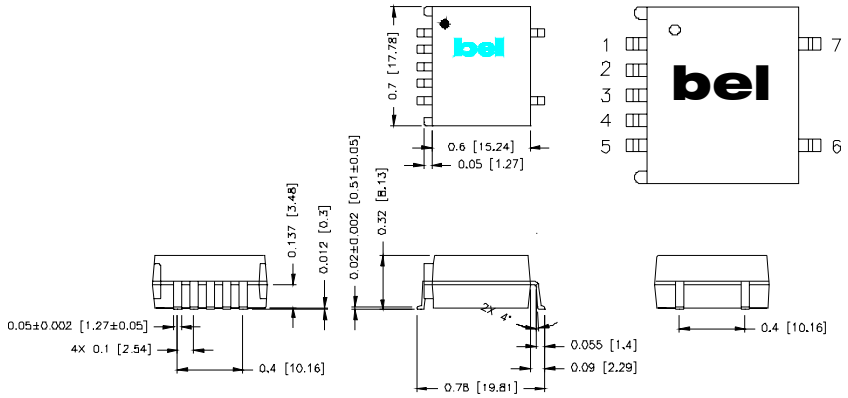
3.0 Vdc - 5.5 Vdc Input 12 Vdc/0.8 A & 15 Vdc/0.6 A Output

Mechanical Outline

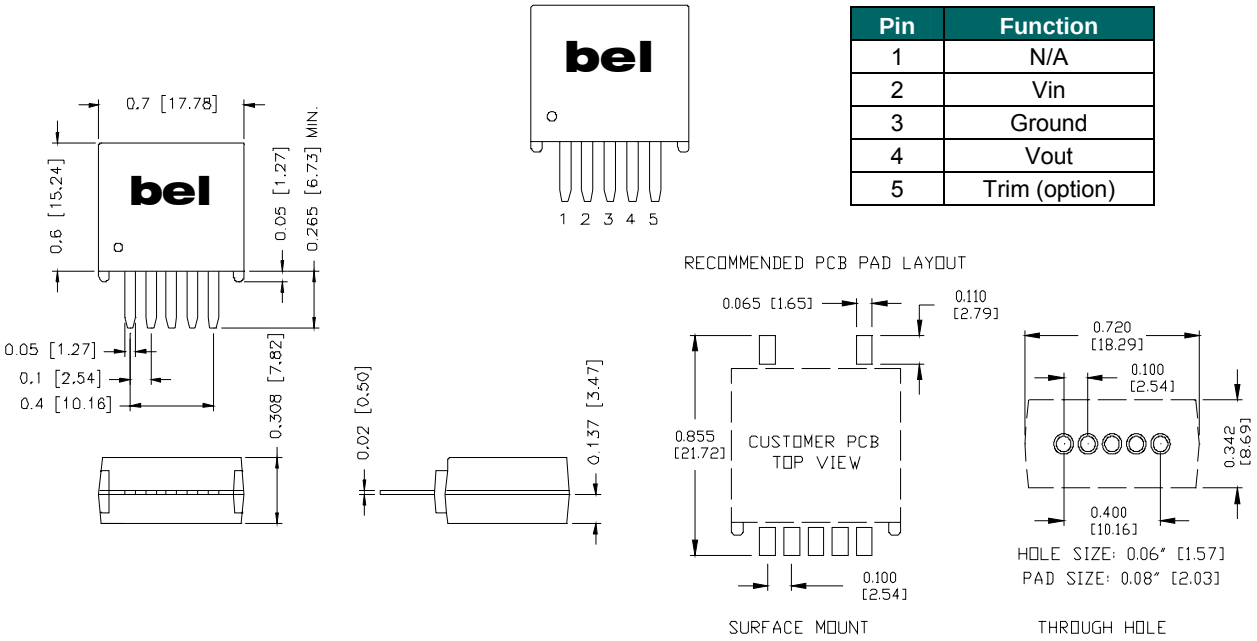
SRAH-01FXx0



Pin Connections

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

VRAH-01FXx0



Pin Connections

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

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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