

ISOLATED DC/DC CONVERTERS

48 Vdc Input 3.3 Vdc / 15 A Output 1/16 Brick Converter

Apr. 12, 2010

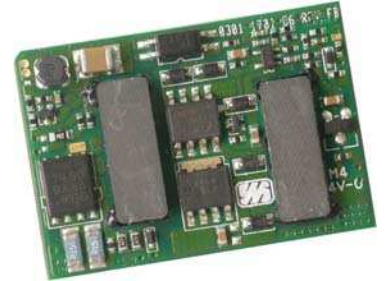
Bel Power Inc., a subsidiary of Bel Fuse Inc.

xRSB-50T03A

RoHS Compliant

Rev.B

- Isolated
- Fixed Frequency (600 kHz)
- High Efficiency
- High Power Density
- Low Cost
- Output Voltage Trim
- Basic Insulation
- Input Under Voltage Lockout
- Output Over Voltage Shutdown
- OCP/SCP
- Over Temperature Protection
- Remote On/Off
- Positive/Negative Remote Sense



Description

The xRSB-50T03A is an isolated dc/dc converter that operates from a nominal 48 Vdc source. This unit will provide up to 60 W of output power from a nominal 48 Vdc input. The unit is designed to be highly efficient and low cost. Features include remote on/off, over current protection and under-voltage lockout. The converter is provided in an industry standard sixteenth brick package.

Part Selection

Output Voltage	Input Voltage	Max. Output Current	Max. Output Power	Typical Efficiency	Model Number Through Hole	Model Number SMD
3.3 Vdc	36 Vdc - 75 Vdc	15 A	60 W	89%	0RSB-50T03A	SRSB-50T03A

- Notes:** 1. Add "G" suffix at the end of the model number to indicate 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	-	80 V	
Input Voltage Transient (100 ms)	-0.3 V		100 V	
Remote On/Off	-0.3 V	-	18 V	
I/O Isolation Voltage	-	-	1500 V	
Ambient Temperature	-40 °C	-	85 °C	
Storage Temperature	-55 °C	-	125 °C	

Input Specifications

Parameter	Min	Typ	Max	Notes
Input Voltage	36 V	48 V	75 V	
Input Current (full load)	-	-	2.0 A	
Input Current (no load)	-	50 mA	80 mA	
Remote Off Input Current	-	1 mA	3 mA	
Input Reflected Ripple Current (pk-pk)	-	20 mA	50 mA	Tested with simulated source impedance of 15 uH, 5 Hz to 20 MHz; use a 100 uF/100 V electrolytic capacitor with ESR=1 ohm max at 200 kHz at the input.
Input Reflected Ripple Current (rms)	-	3 mA	7 mA	
I ² t Inrush Current Transient	-	0.01 A ² s	0.02 A ² s	
Turn On Voltage Threshold	31 V	32 V	35 V	
Turn Off Voltage Threshold	30 V	31 V	34 V	

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

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Output Specifications

Parameter	Min	Typ	Max	Notes		
Output Voltage Set Point	3.25 V	3.3 V	3.35 V	Vin=48 V; Io=50% load		
Line Regulation	-	±3 mV	±8 mV			
Load Regulation	-	±4 mV	±9 mV			
Regulation Over Temperature (-40 °C to +85 °C)	-	±9 mV	±16 mV			
Output Current	0 A	-	15 A			
Current Limit Threshold	19 A	22 A	26 A			
Short Circuit Surge Transient	-	0.5 A ² s	1 A ² s			
Ripple and Noise (rms)	-	12 mV	25 mV	0-20 MHz BW, with a 1µF ceramic capacitor and the minimum external Tantalum cap at output.		
Ripple and Noise (pk-pk)	-	55 mV	90 mV			
Turn on Time	-	35 mS	70 mS			
Overshoot at Turn on	-	0%	5%			
Output Capacitance	220 µF	-	5600 µF			
Transient Response						
25% ~ 50% Max Load	Overshoot	Vo=3.3 V	-	150 mV	250 mV	di/dt=0.1A/us, Vin=48Vdc, Ta=25°C, with a 1µF ceramic capacitor and the minimum external Tantalum cap at output.
	Settling Time		-	120 µS	200 µS	
50% ~ 25% Max Load	Overshoot		-	150 mV	250 mV	
	Settling Time		-	120 µS	200 µS	

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

General Specifications

Parameter	Min	Typ	Max	Notes
Efficiency	86%	89%	-	Vin=48 V, full load
Switching Frequency	540 kHz	600 kHz	660 kHz	
Isolation Capacitance	-	3900 pF	-	
Output Voltage Trim Range	90% Vo	-	110% Vo	
Over Temperature Protection	120 °C	-	140 °C	
Over Voltage Protection	-	130% Vo	160% Vo	Test conditions: Vin=48 V, full load and short the feedback optocoupler.
MTBF	TBD			Calculated Per Bell Core SR-332 (Io=80% load, Vin=48 V, Vo=3.3 V; Ta = 25 °C)
Dimensions Inches (L × W × H) Millimeters (L × W × H)	1.3 x 0.9 x 0.364 33.02 x 22.86 x 9.24			SMD Package
Dimensions Inches (L × W × H) Millimeters (L × W × H)	1.3 x 0.9 x 0.388 33.02 x 22.86 x 9.85			Through Hole Package
Weight	-	13 g	-	

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

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Control Specifications

Parameter	Min	Typ	Max	Notes
Remote On/Off				
Signal Low (Unit On)	Active Low	-0.3 V	-	When Remote On/Off pin is open, unit off.
Signal High (Unit Off)		2.95 V	-	
Current Sink	-	0 mA	-	1 mA

Output Trim Equations

Equations for calculating the trim resistor are shown below (Unit: kΩ). The Trim Down resistor should be connected between the Trim pin and Ground pin. The Trim Up resistor should be connected between the Trim pin and the Vout. Only one of the resistors should be used for any given application.

$$R_{trimdown} = \frac{511}{|\delta|} - 10.22$$

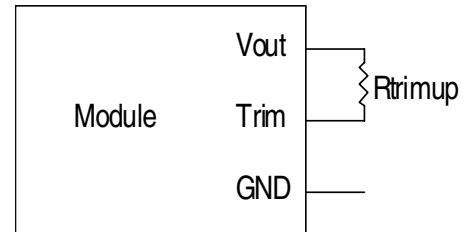
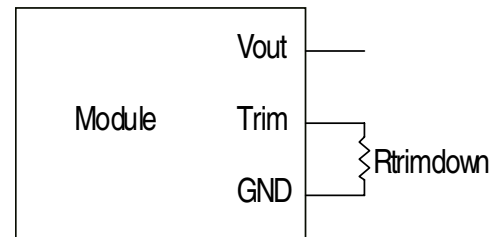
$$R_{trimup} = \frac{(100 + \delta) \cdot V_o \cdot 5.11 - 626}{1.225 \cdot \delta} - 10.22$$

Note:

$$\delta = \frac{(V_o_{req} - V_o)}{V_o} \times 100 [\%]$$

V_{o_req}=Desired (trimmed) output voltage [V]

Output voltage V_o=3.308 V



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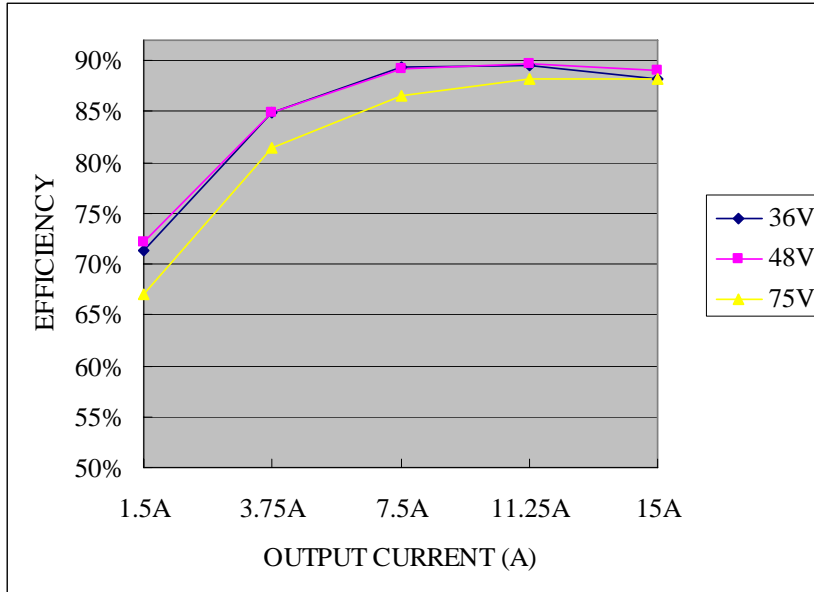
48 Vdc Input 3.3 Vdc / 15 A Output 1/16 Brick Converter



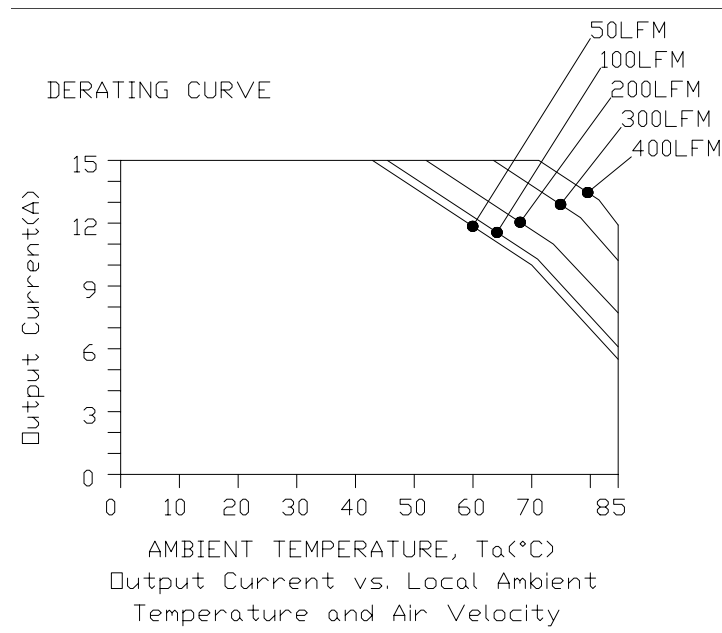
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Efficiency Data



Thermal Derating Curve



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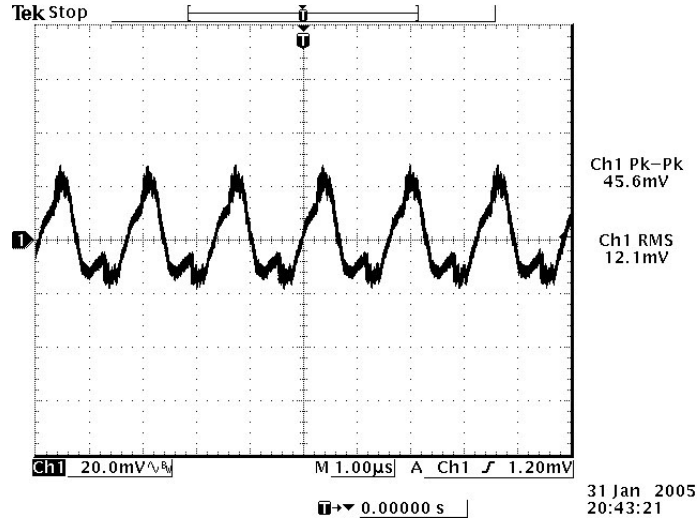
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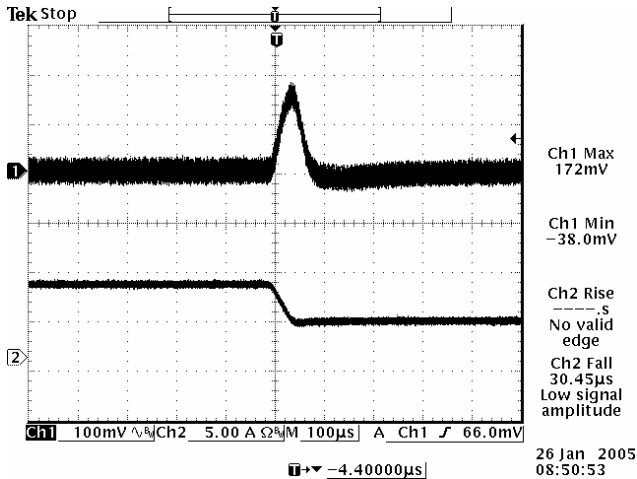
Ripple and Noise Waveform



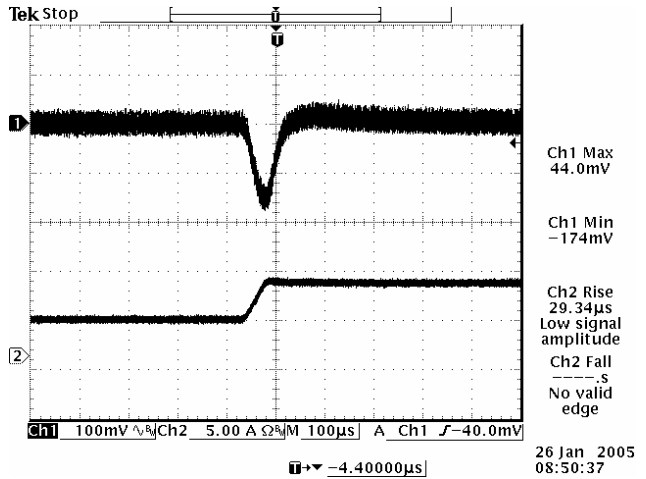
48 Vdc input, 3.3 V output

Note: Ripple and Noise at full load, with a 1µF ceramic cap and a 220 µF Tantalum cap at output, Ta=25 deg C.

Transient Response Waveforms



Vo=3.3 V 50% to 25% Load Transients



Vo=3.3 V 25% to 50% Load Transients

Note: Transients Response at Vin=48 V, di/dt=0.1A/µs, External 220µF Tantalum Cap and 1µF Ceramic Cap, Ta=25 deg C.

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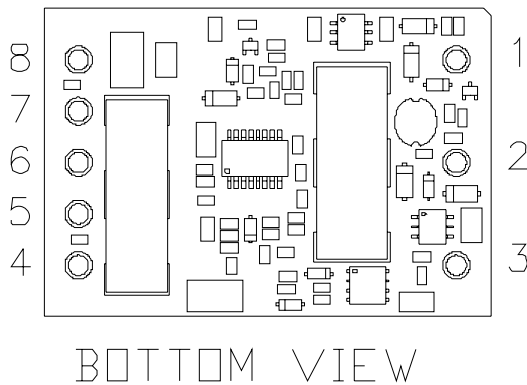
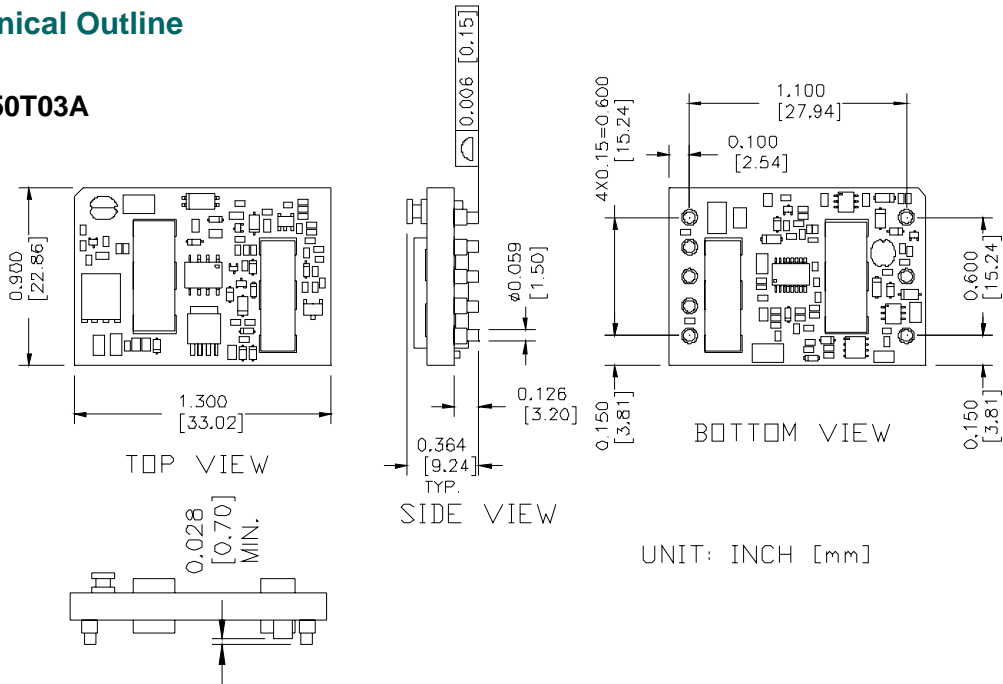


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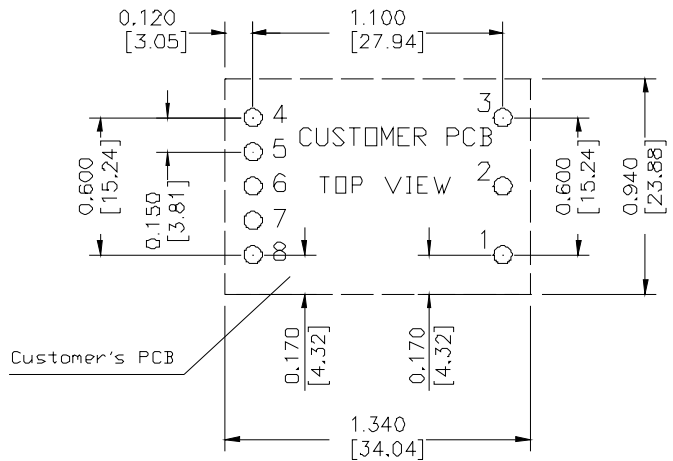
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Mechanical Outline

SRSB-50T03A



RECOMMENDED PCB PAD LAYOUT



Recommended Surface Mount Pads
 Min. $\phi 0.080$ " [2.03]
 Max. $\phi 0.092$ " [2.34]

Pin Connections

Pin	Function
1	Vin (+)
2	Remote On/Off
3	Vin (-)
4	Vout-
5	Remote Sense (-)
6	Trim
7	Remote Sense (+)
8	Vout (+)

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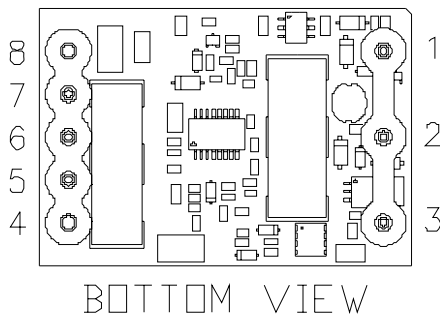
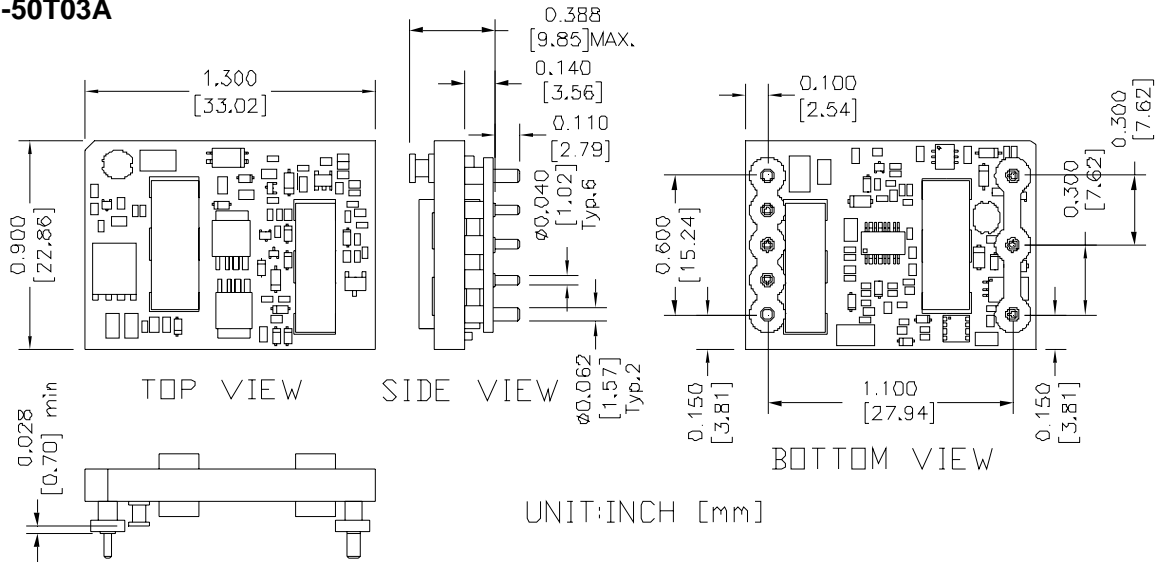


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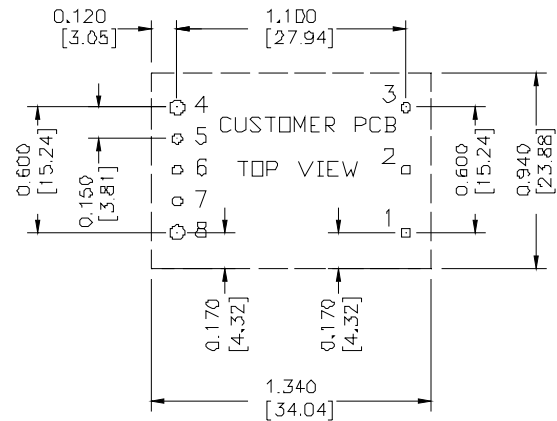
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Mechanical Outline (continued)

ORSB-50T03A



RECOMMENDED PCB PAD LAYOUT



HOLE SIZE: 1-3, 5-7 \varnothing 0.047[1.19],
4,8 \varnothing 0.07 [1.78]
PAD SIZE: 1-3, 5-7 \varnothing 0.08[2.03]
4,8 \varnothing 0.10 [2.54]

Pin Connections

Pin	Function
1	Vin (+)
2	Remote On/Off
3	Vin (-)
4	Vout-
5	Remote Sense (-)
6	Trim
7	Remote Sense (+)
8	Vout (+)

Note:

- 1) All Pins: Material - Copper Alloy;
Finish – 3 micro inches minimum Gold over 50 micro inches minimum Nickel plate.
- 2) Undimensioned components are shown for visual reference only.
- 3) All dimensions in inches; Tolerances: x.xx +/-0.02 in. x.xxx +/-0.010 in. unless otherwise stated.

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Revision History

Date	Revision	Changes Detail	Approval
2010-4-12	B	Update the 0RSB-50T03A product height from 0.378" to 0.388".	Jack Fan

RoHS Compliance

Complies with the European Directive 2002/95/EC, calling for the elimination of lead and other hazardous substances from electronic products.



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