

ISOLATED DC/DC CONVERTERS

48 Vdc Input 3.3 Vdc /15 A Output, 1/8 Brick Converter



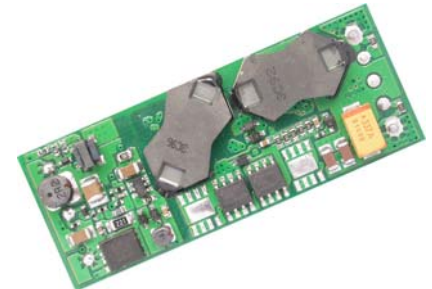
Nov. 30, 2010

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

ORCB-60T03C Rev.B RoHS Compliant File Rev.A

Features

- Isolated
- High Efficiency
- High Power Density
- Fixed Frequency (300 kHz)
- Low Cost
- Input Under-Voltage Lockout
- Pre-Bias Start Up
- UL 60950-1, 2nd Edition
- CSA C22.2 , 2nd Edition
- Output Over-Voltage Shutdown
- OCP/SCP
- Over Temperature Protection
- Remote On/Off
- Output Voltage Trim
- Positive/Negative Remote Sense
- Basic Insulation



Applications

- Networking
- Computers and peripherals
- Telecommunications

Description

The ORCB-60T03C is isolated dc/dc converter that operates from a nominal 48 Vdc source. This unit will provide up to 49.5 W of output power from a nominal 48 Vdc input. This unit is designed to be highly efficient and low cost. Features include remote on/off, over current protection and under-voltage lockout. This converter is provided in an industry standard eighth brick package.

Part Selection

Output Voltage	Input Voltage	Max. Output Current	Max. Output Power	Typical Efficiency	Model Number Active Low
3.3 Vdc	36 Vdc - 75 Vdc	15 A	49.5 W	90%	ORCB-60T03C

Notes: Add "G" suffix at the end of the model number to indicate Tray Packaging.

Part Number Explanation

0 R CB - 60 T 03 C
1 2 3 4 5 6 7

- 1---Through hole
- 2---RoHS 6, change "R" to "7" means RoHS 5
- 3---Series name
- 4---Series code
- 5---Input range (36-75V)
- 6---Output voltage 3.3V
- 7---Suffix

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Absolute Maximum Ratings

Parameter	Min	Typ	Max	Unit	Notes
Input Voltage (continuous)	-0.3	-	80	V	
Remote On/Off	-0.3	-	18	V	
I/O Isolation Voltage	-	-	1500	V	
Input to Each Output Resistance	10	-	-	M ohm	
Ambient Temperature	-40	-	85	°C	
Storage Temperature	-55	-	125	°C	

Note: Ratings used beyond the maximum ratings may cause a reliability degradation of the converter or may permanently damage the device.

Input Specifications

Parameter	Min	Typ	Max	Unit	Notes
Input Voltage	36	48	75	V	
Input Current (full load)	-	-	1.8	A	
Input Current (no load)	-	-	80	mA	
Input Reflected Ripple Current (pk-pk)	-	-	15	mA	Tested with simulated source impedance of 10 uH, 5 Hz to 20 MHz; use a 47 uF/100 V electrolytic capacitor with ESR = 1 ohm max. at 200 kHz at 25 °C.
Input Fuse (not internally)	-	-	5.0	A	
I ² t Inrush Current Transient	-	-	0.1	A ² s	
Turn-on Voltage Threshold	32	-	35	V	
Turn-off Voltage Threshold	28.5	-	31.7	V	

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

Output Specifications (continued)

Parameter	Min	Typ	Max	Unit	Notes	
Output Voltage Range	3.201	3.3	3.399	V	Over all line, load & temperature conditions.	
Output Voltage Trim Range	2.97	-	3.63	V		
Output Over-Voltage Clamp Non-Latching	3.69	-	4.62	V		
Output Current	-	-	15	A		
Current Limit Threshold	15.2	-	26	A		
External Admissible Capacitive Load	0	-	10000	uF		
Ripple and Noise (pk-pk)	-	-	130	mV	Vin=72 V, max load on output, 20 MHz BW, 10uF tantalum and 1uF ceramic capacitor.	
Turn on Time	-	-	220	mS		
Rise Time	-	-	15	mS		
Transient Response						
50% ~ 75% ~ 50% Max Load	Vpk-pk	-	-	230	mV	di/dt=0.1A/us, Vin=48Vdc, Ta=25°C, with a 1uF ceramic capacitor and a 10uF Tantalum cap at the output.cap at the output.
	Settling Time	-	-	200	uS	

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

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General Specifications

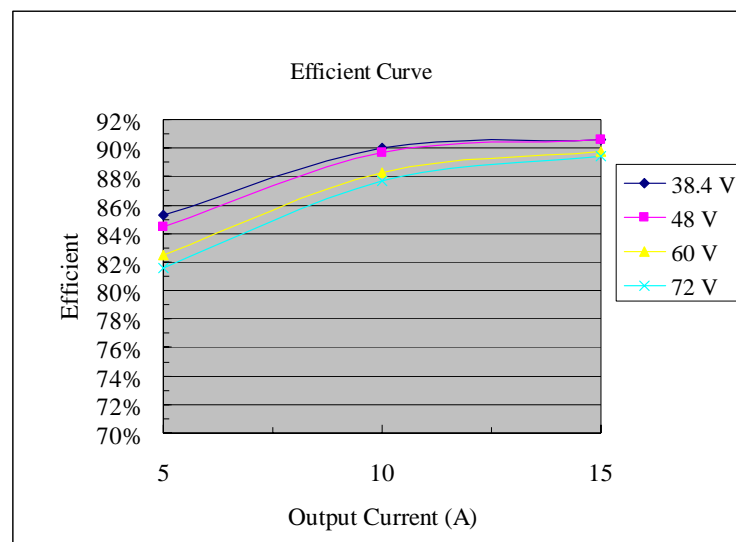
Parameter	Min	Typ	Max	Unit	Notes
Efficiency	87	90	-	%	Measured with full load at all conditions.
Switching Frequency	270	300	330	kHz	
Isolation capacitance	-	3900	-	pF	
Remote Sense Compensation	-	-	10	%	The total voltage increased by trim and remote sense should not exceed 10%Vo.
Over Temperature Protection	-	125	-	°C	
Weight	-	26	-	g	
MTBF	2,370,000			hours	Calculated Per Bell Core SR-332 (Vin=48 V, Vo=3.3 V, Io=12 A, Ta = 25 °C)
Dimensions	Inches (L x W x H)		2.30 x 0.896 x 0.374		-
	Millimeters (L x W x H)		58.42 x 22.76 x 9.50		

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

Remote On/Off

Parameter	Min	Typ	Max	Unit	Notes
Signal Low (Unit On)	-0.3	-	0.8	V	The remote on/off pin open, Unit off.
Signal High (Unit Off)					
Current Sink	0	-	1	mA	

Efficiency Data



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Output Trim Equations

Equations for calculating the trim resistor are shown below. The Trim Down resistor should be connected between the Trim pin and Sense (-) pin. The Trim Up resistor should be connected between the Trim pin and the Sense (+). Only one of the resistors should be used for any given application.

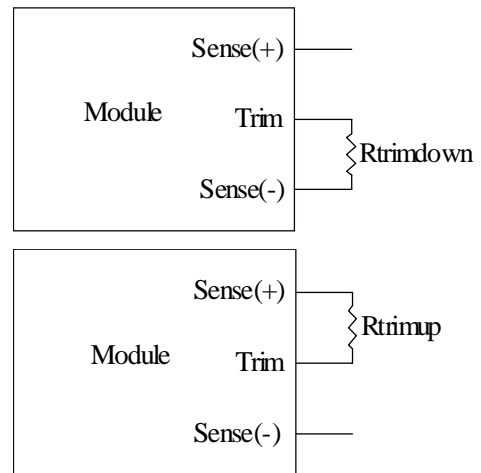
$$R_{trimdown} = \frac{511}{|\delta|} - 10.22 [k\Omega]$$

$$R_{trimup} = \left(\frac{(100 + \delta) \cdot V_o \cdot 5.11}{1.225 \cdot \delta} - \frac{511}{\delta} - 10.22 \right) [k\Omega]$$

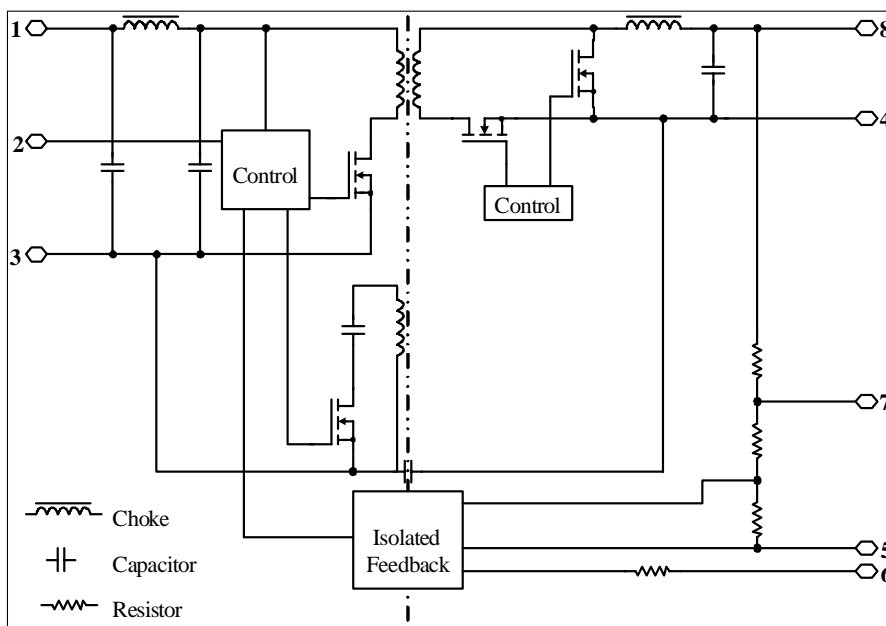
Note:

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

V_o_{req} = Desired (trimmed) output voltage [V]
 Output voltage V_o = 3.305 V



Fundamental Circuit Diagram



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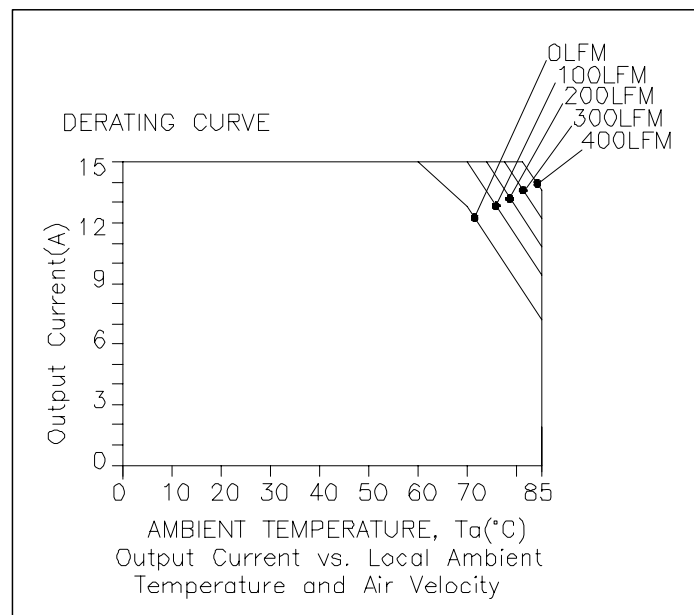
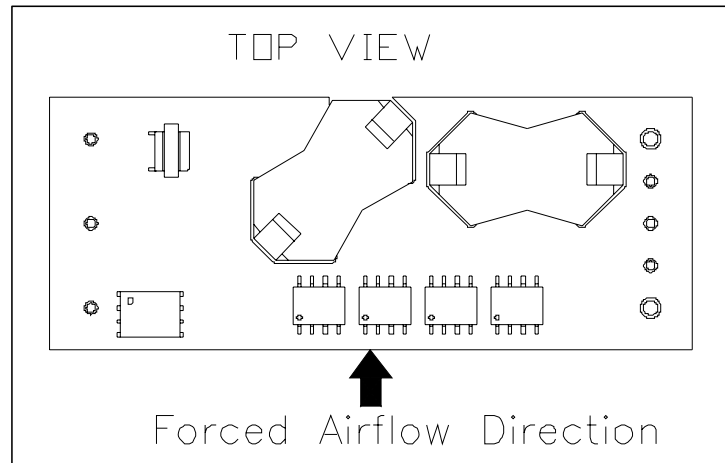


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Thermal Derating Curves

Vin=48V, with maximum junction temperature of semiconductors derated to 120 degree C.



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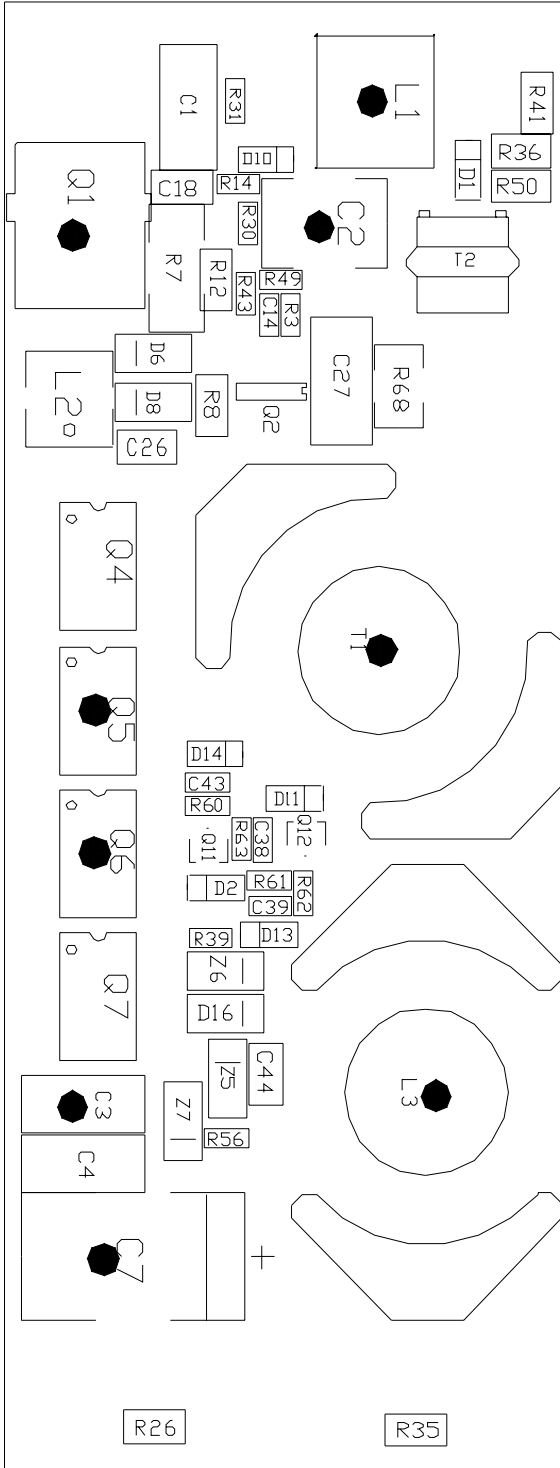
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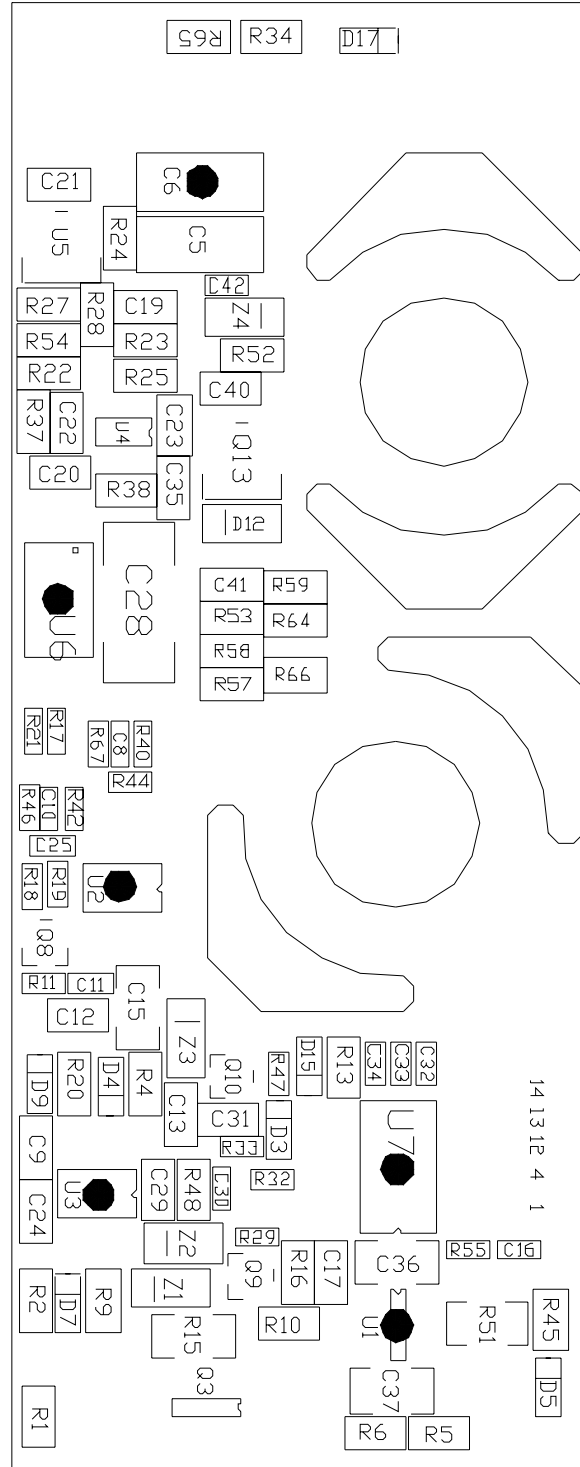
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Thermal Derating Curves (continued)



Temperature reference points on top side



Temperature reference points on bottom side

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Safety

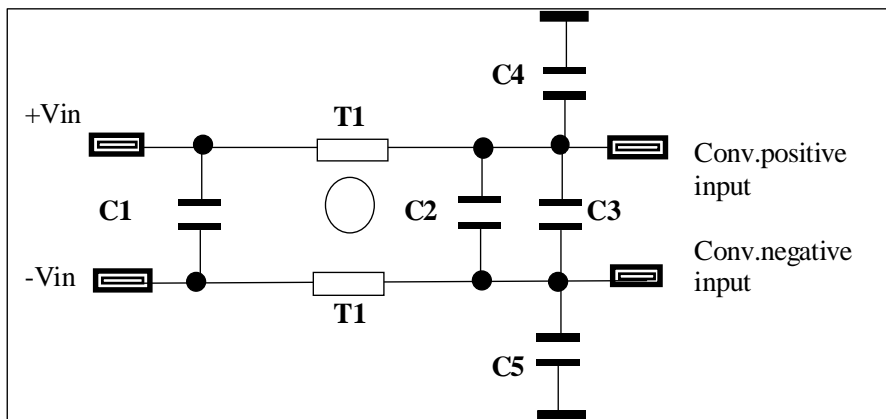
Material flammability: UL94V-0

Electromagnetic Compatibility EMC

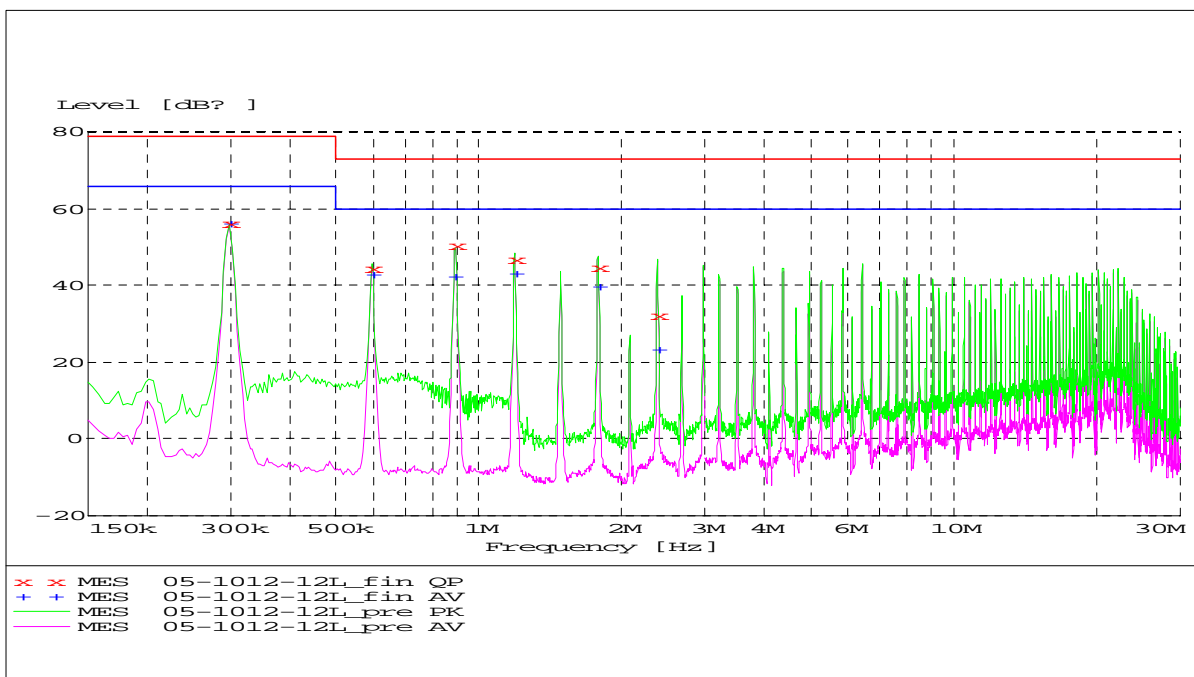
1. Electric field IEC801-3(1984), IEC1000-4-3
2. Fast transient/burst IEC801-4(1988), IEC1000-4-4

Input RFI level conducted and radiated (subject to test by customer)

Compliance to EN55022 class A (both q.peak and average) with the following inductive and capacitive filter



C1=3.3 uF /100 V;
C2=C3= 47 uF/100 V;
C4=C5=1000 pF/250 Volt;
T1=3 mH.



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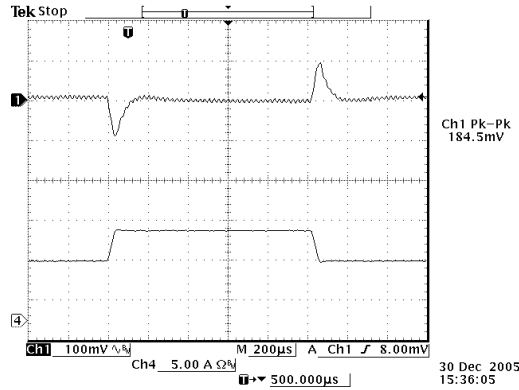
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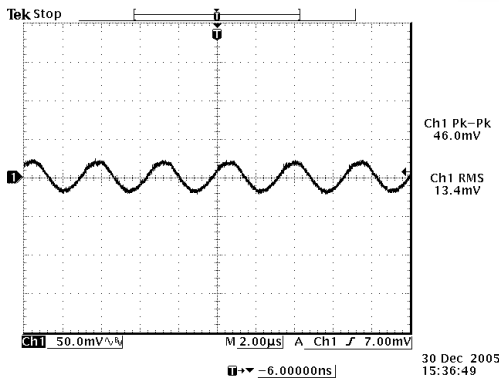
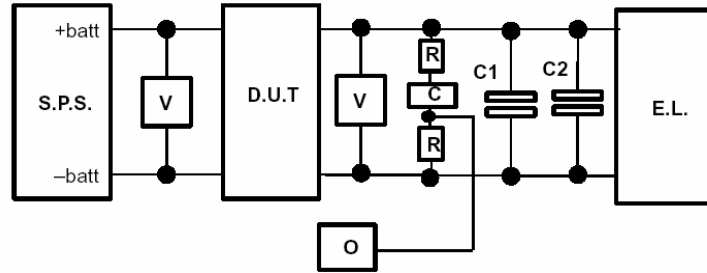
Transient Response Waveforms



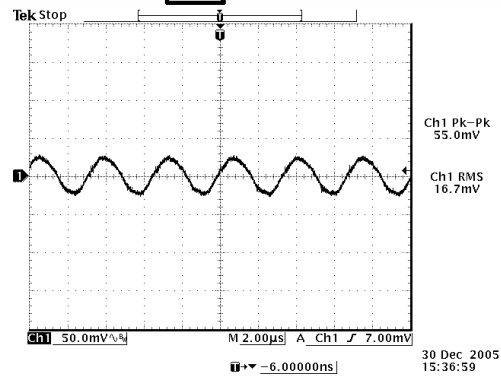
Note: Dynamic load transient at $V_{in} = 48\text{ V}$, $T_a = 25\text{ }^\circ\text{C}$, $I_o = (50\% \sim 75\% \sim 50\%) I_{onom}$, $di/dt = 0.1\text{ A}/\mu\text{S}$.

Ripple and Noise Waveforms

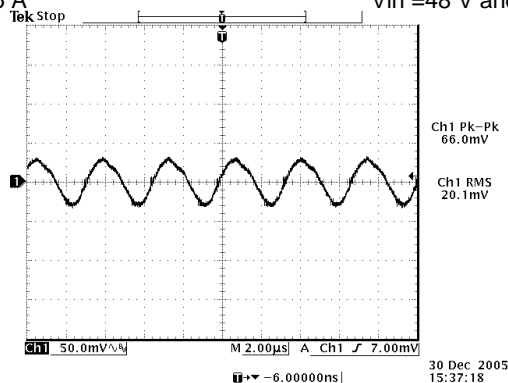
$C1 = 10\text{ }\mu\text{F}$ tantalum, $C2 = 1\text{ }\mu\text{F}$ ceramic;
 $R = 50\text{ }\Omega$;
 $C = 220\text{ nF}$



$V_{in} = 38.4\text{ V}$ and $I_{out} = 15\text{ A}$



$V_{in} = 48\text{ V}$ and $I_{out} = 15\text{ A}$



$V_{in} = 72\text{ V}$ and $I_{out} = 15\text{ A}$

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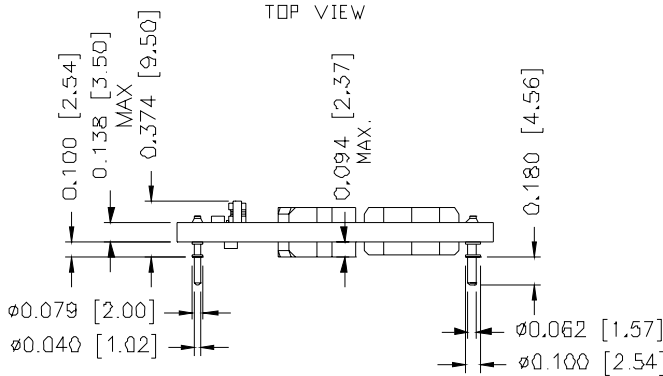
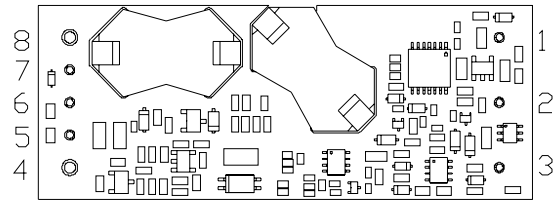
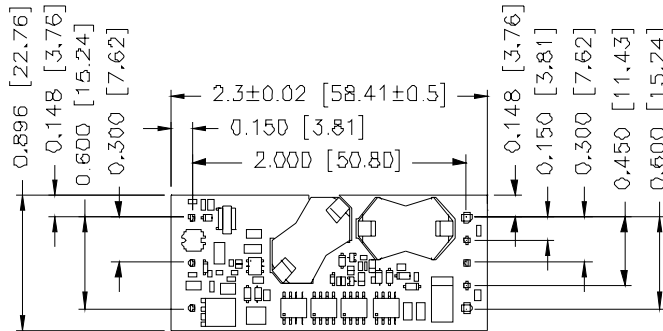
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Mechanical Outline

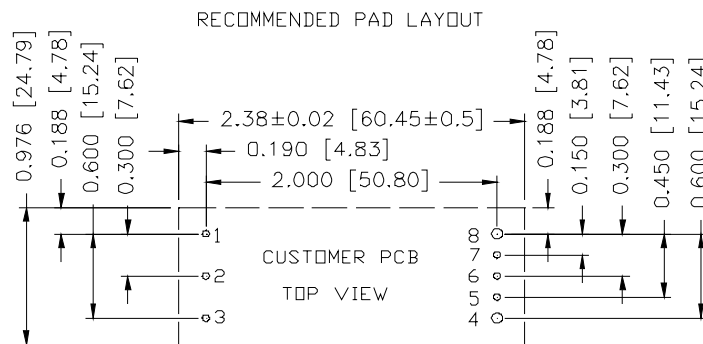


Pin Connections

Pin	Name	Function	Pin Dia
1	Vin+	Positive input voltage	0.040"
2	On/Off	Input to turn converter on and off, referenced to Vin-	0.040"
3	Vin-	Negative input voltage	0.040"
4	Vout-	Negative output voltage	0.062"
5	Sense-	Negative remote sense	0.040"
6	Trim	Output voltage trim	0.040"
7	Sense+	Positive output voltage	0.040"
8	Vout+	Positive output voltage	0.062"

Note: The module doesn't guarantee at least 0.7mm as clearance distance on bottom side. This issue should be considered if any copper traces are on the top side of the user's board.

Notes: 1. Pin 5 must be connected to Vout-.
2. Leave Pin 6 open for nominal voltage.
3. Pin 7 must be connected to Vout+.



1,2,3,5,6,7 Ø0.047 HOLE SIZE, Ø0.08 min PAD SIZE
4,8 Ø0.07 HOLE SIZE, Ø0.10 min PAD SIZE

Note: This module is recommended and compatible with Pb-Free Wave Soldering and must be soldered using a peak solder temperature of no more than 260 °C for less than 5 seconds.

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 (mm); Tolerances: x.xx +/-0.02 in. (x.x +/-0.5mm) x.xxx +/-0.010 in. (x.xx +/-0.25mm).

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Revision History

Date	Revision	Changes Detail	Approval
2009-11-26	A	First Release	XF Jiang
2010-11-30	B	Add UL 60950-1, 2 nd Edition and CSA C22.2, 2 nd Edition in the first page.	XF Jiang

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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CORPORATE

Bel Fuse Inc.
206 Van Vorst Street
Jersey City, NJ 07302
Tel 201-432-0463
Fax 201-432-9542
www.belfuse.com

FAR EAST

Bel Fuse Ltd.
8F/ 8 Luk Hop Street
San Po Kong
Kowloon, Hong Kong
Tel 852-2328-5515
Fax 852-2352-3706
www.belfuse.com

EUROPE

Bel Fuse Europe Ltd.
Preston Technology Management Centre
Marsh Lane, Suite G7, Preston
Lancashire, PR1 8UD, U.K.
Tel 44-1772-556601
Fax 44-1772-888366
www.belfuse.com