

ISOLATED DC/DC CONVERTERS

36 Vdc - 75 Vdc Input 12 Vdc /6 A Output



May 17, 2011

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

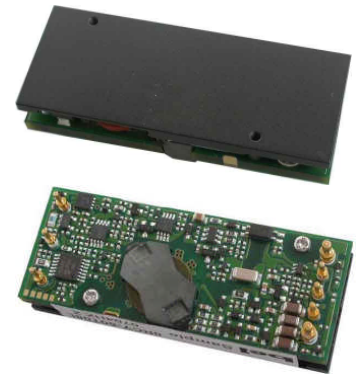
0RCY-50T12x

RoHS Compliant

Rev.E

Features

- Isolated
- High Efficiency
- High Power Density
- Fixed Frequency (330 kHz)
- Input Under-Voltage Lockout
- Output Over-Voltage Shutdown
- Pre-bias Start Up
- UL60950-1 Recognized (UL/cUL) (Pending)
- Over Temperature Protection
- OCP/SCP
- Low Cost
- Output Voltage Trim
- Positive/Negative Remote Sense
- Basic Insulation
- Remote On/Off



Applications

- Networking
- Computers and peripherals
- Telecommunications

Description

The 0RCY-50T12x is isolated dc/dc converter that operates from a wide input range (36 Vdc - 75 Vdc). This unit will provide up to 72 W of output power. The unit is designed to be highly efficient and low cost. Features include remote on/off, over current protection, over voltage shut down, over temperature protection and under-voltage lockout. This converter is provided in an industry standard 1/8 brick package.

Part Selection

| Output Voltage | Input Voltage | Max. Output Current | Max. Output Power | Typical Efficiency | Model Number Active High | Model Number Active Low |
|----------------|-----------------|---------------------|-------------------|--------------------|--------------------------|-------------------------|
| 12 Vdc | 36 Vdc - 75 Vdc | 6 A | 72 W | 92% | 0RCY-50T12L | 0RCY-50T120 |

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

Part Number Explanation

$\frac{0}{1} \frac{R}{2} \frac{CY}{3} - \frac{50}{4} \frac{T}{5} \frac{12}{6} \frac{x}{7}$

1---Through hole mount

2---RoHS 6, change "R" to "7" means RoHS 5

3---Series name

4---Series code

5---Input range (36-75V)

6---Output voltage (12V)

7---Option, "x" of the model part number to be 0-9, A-Z, which will represent the special request of customer.

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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 | 10M | - | - | 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 | |
| Max Input Current (full load) | - | - | 2.4 | A | |
| Input Current (no load) | - | 50 | 100 | mA | |
| Remote Off Input Current | - | 20 | 30 | mA | |
| Input Reflected Ripple Current (pk-pk) | - | 20 | 30 | mA | Tested with simulated source impedance of 10 uH, 5 Hz to 20 MHz; use a 47 uF/100 V electrolytic cap with ESR = 1 ohm max. at 200 kHz at 25 °C. |
| I ² t Inrush Current Transient | - | - | 0.1 | A ² s | |
| Input Fuse (not internally) | - | - | 5 | A | |
| Turn-on Voltage Threshold | 33 | 34 | 35 | V | |
| Turn-off Voltage Threshold | 31 | 32 | 33 | V | |
| Input Over Voltage Lockout | 76 | 78 | 80 | V | |

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

Output Specifications

| Parameter | Min | Typ | Max | Unit | Notes |
|--|-------|------|-------|------|--|
| Output Voltage Set Point | 11.76 | 12.0 | 12.24 | V | |
| Load Regulation | - | ±12 | ±24 | mV | |
| line Regulation | - | ±12 | ±24 | mV | |
| Regulation Over Temperature (-40deg.C-85deg.C) | - | ±80 | ±120 | mV | |
| Ripple and Noise (rms) | - | 12 | 20 | mV | Vin=72V, max load on output, 20MHz BW, with 10uF tantalum and 1uF ceramic cap at the output. |
| Ripple and Noise (pk-pk) | - | 50 | 80 | mV | |
| Output Current Range | 0 | - | 6 | A | |

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Output Specifications (continued)

| Parameter | | Min | Typ | Max | Unit | Notes | |
|-------------------------------------|---------------|------------|-----|------|------|--------------|---|
| Output DC Current Limit | | 7.0 | - | 10 | A | | |
| Output Over Voltage Clamp | | 13.6 | - | 15.6 | V | Non-latching | |
| Turn on Time | | - | 50 | 80 | mS | | |
| Rise Time | | - | 30 | 40 | mS | | |
| External Admissible Capacitive Load | | 0 | - | 1000 | uF | | |
| Transient Response | | | | | | | |
| 50% ~ 75% Max Load | Overshoot | Vo= 12V | - | 200 | 300 | mV | di/dt=0.1 A/us, Vin=48 Vdc, Ta=25 °C, with a 1 uF ceramic cap and a 10 uF tantalum cap at output. |
| | Settling Time | | - | 150 | 250 | uS | |
| 75% ~ 50% Max Load | Overshoot | | - | 200 | 300 | mV | |
| | Settling Time | | - | 150 | 250 | uS | |

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

General Specifications

| Parameter | Min | Typ | Max | Unit | Notes |
|-----------------------------|-------------------------|-----------------------|------|------|---|
| Efficiency | 90 | 92 | - | % | Measured at Vin=48 V, full load |
| Switching Frequency | 310 | 330 | 350 | kHz | |
| Isolation capacitance | - | 1500 | - | pF | |
| Remote Sense Compensation | - | - | 10 | % | The total voltage increased by trim and remote sense should not exceed 10%Vo. |
| Output Voltage Trim Range | 9.6 | - | 13.2 | V | |
| Over Temperature Protection | - | 120 | - | °C | |
| Weight | - | 40 | - | g | |
| MTBF | TBD | | | - | Calculated Per Bell Core SR-332 (Io=80%load, Ta = 25 °C) |
| Dimensions | | | | - | |
| | Inches (L x W x H) | 2.30 x 0.896 x 0.490 | | | |
| | Millimeters (L x W x H) | 58.41 x 22.76 x 12.44 | | | |

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

Remote On/Off

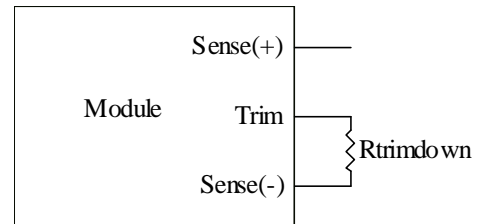
| Parameter | Min | Typ | Max | Unit | Notes |
|------------------------|------|-----|-----|------|---|
| Signal Low (Unit On) | -0.3 | - | 0.8 | V | 0RCY-50T12L. The remote on/off pin open, Unit off. |
| Signal High (Unit Off) | | | | V | |
| Signal Low (Unit Off) | -0.3 | - | 0.8 | V | 0RCY-50T120. The remote on/off pin open, Unit on. |
| Signal High (Unit On) | | | | V | |
| Current Sink | 0 | - | 1 | mA | |

Output Trim Equations

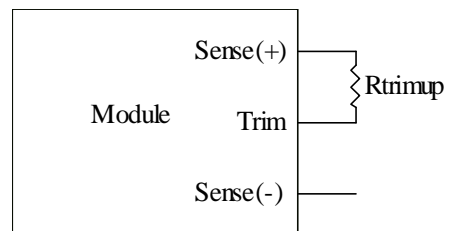
Trim Resistor Calculate

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(+) pin. Only one of the resistors should be used for any given application.

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



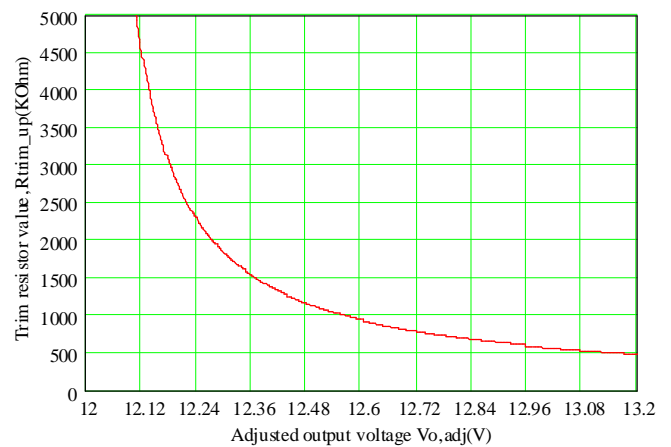
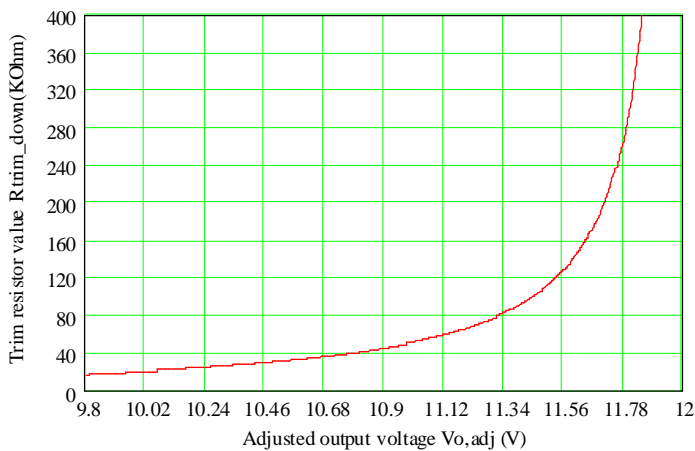
$$R_{trimup} = \left(\frac{(100 + \delta) \cdot V_o \cdot 5.11}{1.225 \cdot \delta} - \frac{511}{\delta} - 10.22 \right) [k\Omega]$$



Note:

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

V_o_{req} =Desired (trimmed) output voltage [V]
Output voltage V_o =12 V



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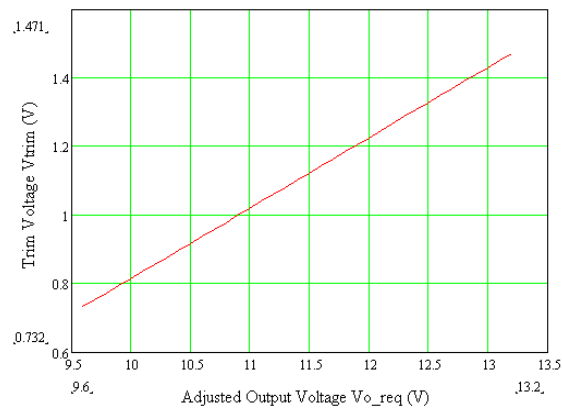
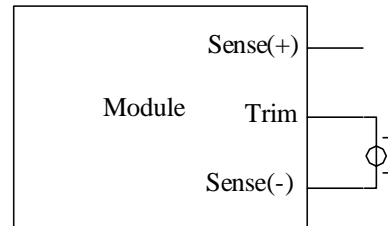
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Output Trim Equations (continued)

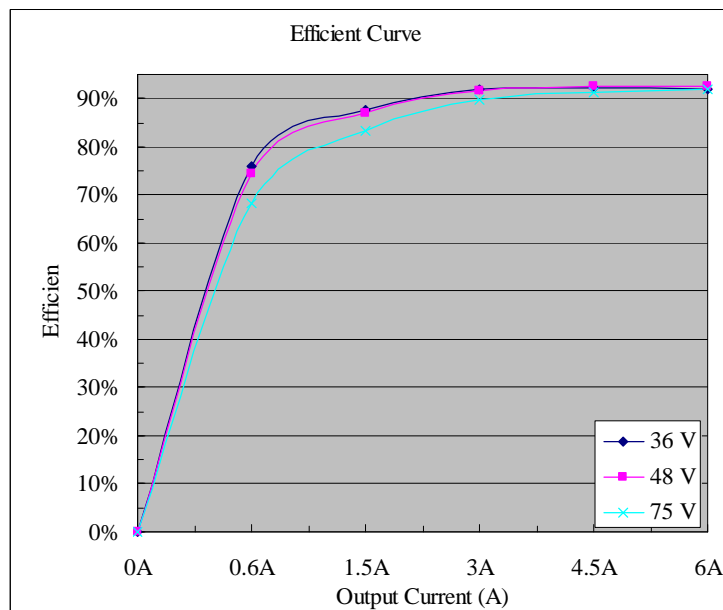
Trim Voltage Calculate

Equations for calculating the trim voltage are shown below. V_{trim} is the required voltage between TRIM and Sense(-).

$$V_{trim} = \left(\frac{V_{o_req}}{V_o} \bullet 2.464 - 1.24 \right) [V]$$



Efficiency Data



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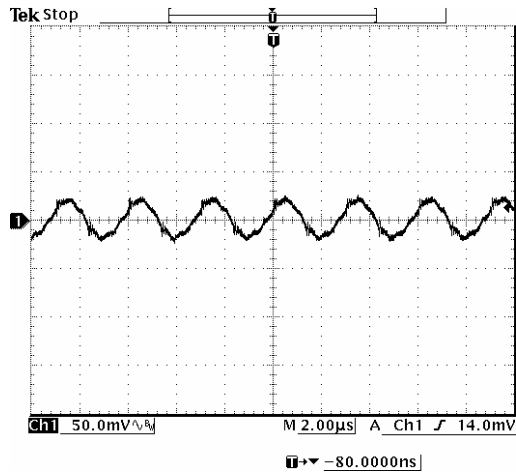
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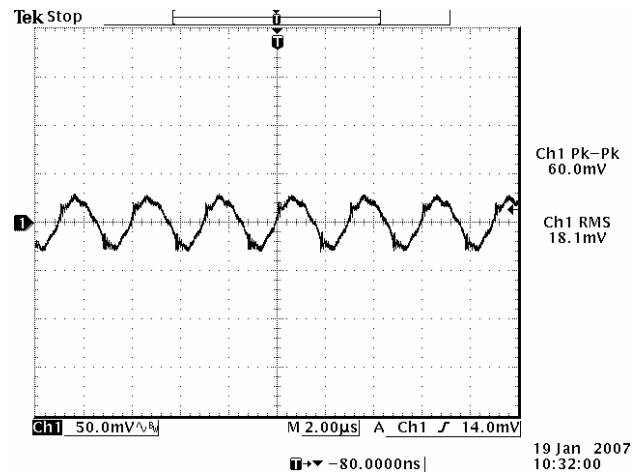
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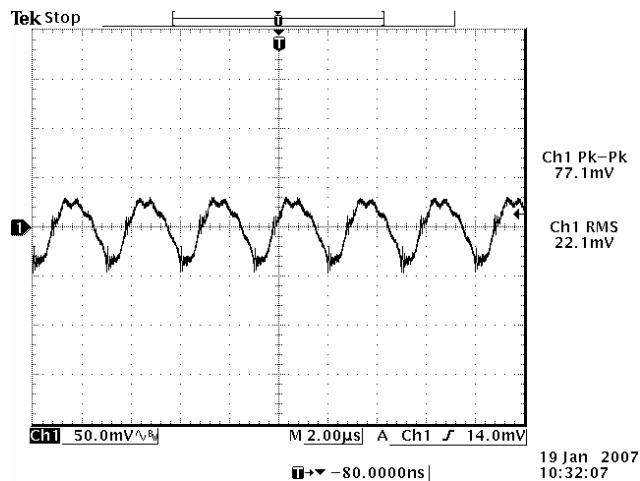
Ripple and Noise Waveforms



36 Vdc input, 12 Vdc/6 A output



48 Vdc input, 12 Vdc/6 A output



75 Vdc input, 12 Vdc/6 A output

Note: Ripple and noise at full load, 0-20 MHz BW, $T_a=25$ deg C, with a 0.1µF ceramic cap and a 10 µF Tantalum cap at output.

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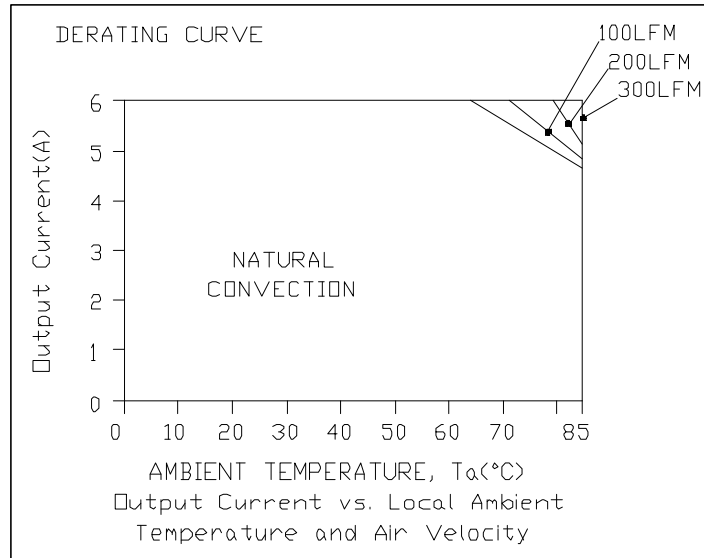
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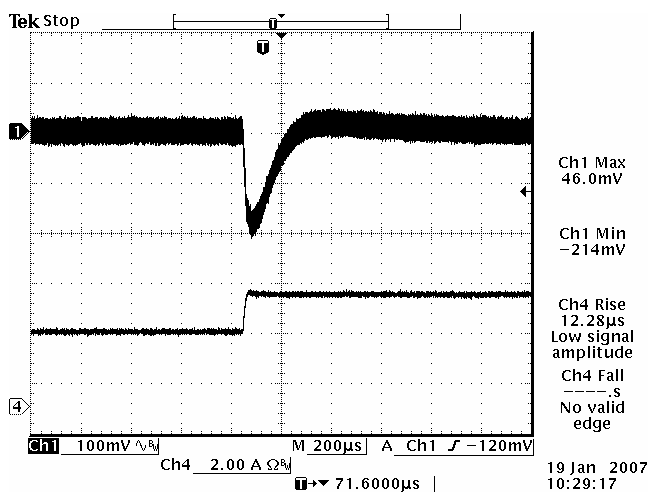
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Thermal Derating Curve

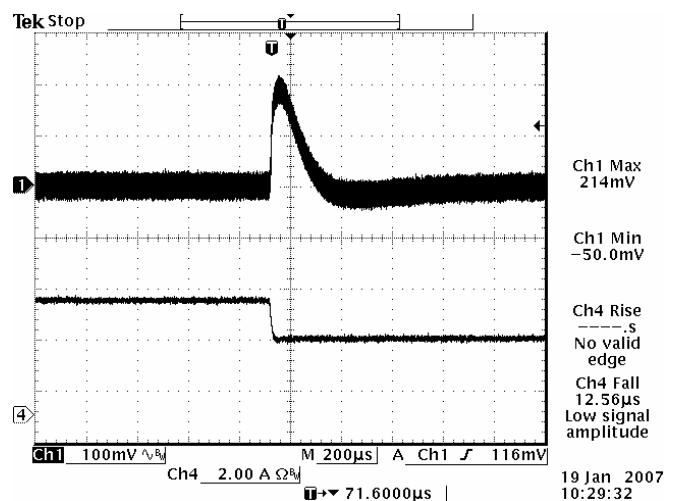


$V_{in}=48$ V, with maximum junction temperature of semiconductors derated to 120 degree C.

Transient Response Waveforms



50%-75% Load



75%-50% Load

Note: Transients at $V_{in}=48$ V, $di/dt=0.1$ A/ μ s@ $T_a=25^\circ$ C

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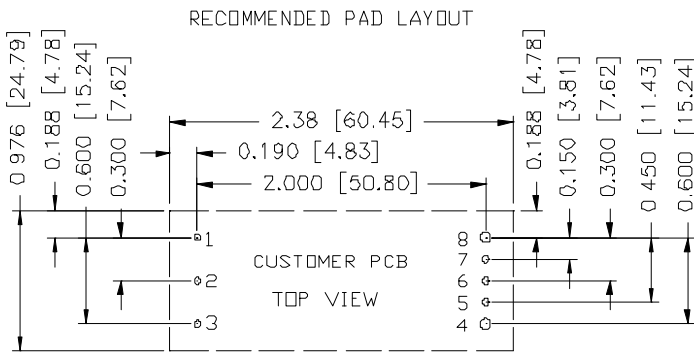
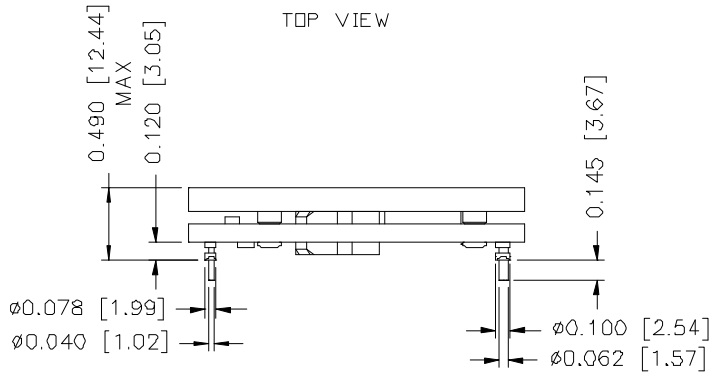
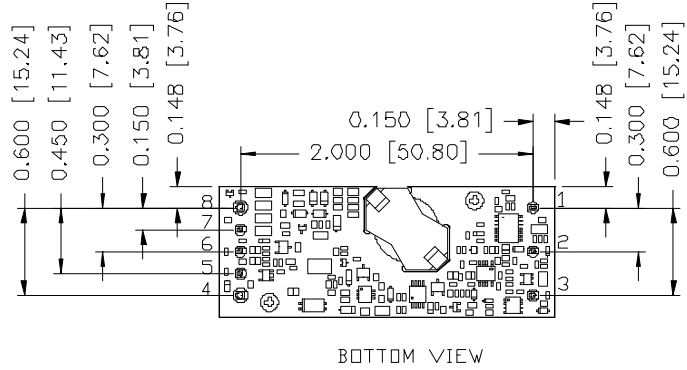
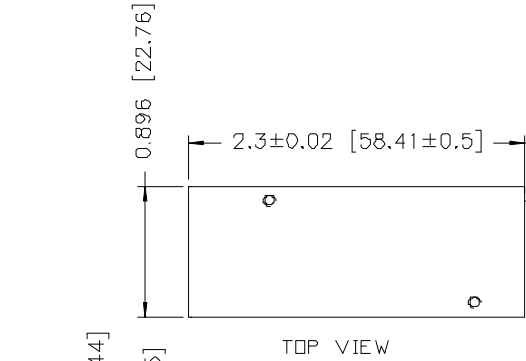
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Mechanical Outline



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

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" |

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

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:

- All Pins: Material - Copper Alloy;
Finish – 3 micro inches minimum Gold over 50 micro inches minimum Nickel plate.
- Undimensioned components are shown for visual reference only.
- 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 |
|------------|----------|-------------------------------------|----------|
| 2011-05-17 | E | Add trim equation for trim voltage. | 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