

# NON-ISOLATED DC/DC CONVERTERS

4.5 Vdc - 13.8 Vdc Input

0.59 Vdc - 5.1 Vdc / 10 A Output



Dec. 31, 2015

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

## Absolute Maximum Ratings

Parameter	Min	Typ	Max	Notes
Input Supply Voltage	-0.3 V	-	15 V	
Ambient Temperature	0 °C	-	70 °C	
Storage Temperature	-55 °C	-	125 °C	
Altitude	-	-	2000 m	

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

## Input Specifications

Parameter	Min	Typ	Max	Notes
Operating Input Voltage Vo,set ≤ 3.63 V Vo,set > 3.63 V	4.5 V 7.0 V	- -	13.8 V 13.8 V	
Input Current (full load)	-	-	8.5 A	An input line fuse must always be used.
Input Current (no load)	-	-	120 mA	
Remote Off Input Current	-	10 mA	25 mA	
Input Reflected Ripple Current (pk-pk)	-	30 mA	100 mA	With simulated source impedance of 1000 nH, 5 Hz to 20 MHz. Use a 1000 uF/25 V AL-Cap with ESR=0.03 ohm max and 2*100 uF/25V Tan-Cap with ESR=0.013 ohm max at 100 kHz@25°C.
Input Reflected Ripple Current (rms)	-	15 mA	30 mA	
I <sup>2</sup> t Inrush Current Transient	-	-	1 A <sup>2</sup> s	
Turn on Voltage Threshold	4.15 V	4.3 V	4.45 V	A 30.1K resistor is connected from Enable to Vin
Turn off Voltage Threshold	3.7 V	4.1 V	4.3 V	

**Note:** All specifications are typical at normal input, full load at Ta= 25°C unless otherwise stated.

## Output Specifications

Parameter	Min	Typ	Max	Notes	
Output Voltage Set Point Accuracy	-2%Vo,set	-	2%Vo,set	Vin= 12 V, Iout=full load	
Load Regulation	-	±0.3%Vo,set	±1%Vo,set		
Line Regulation	-	±0.3%Vo,set	±1%Vo,set		
Temperature Regulation	-	0.3%Vo,set	-		
Output Current	0 A	-	10 A		
Output DC Current Limit	10.2 A	13 A	15 A		
Output Ripple and Noise (pk-pk)	-	70 mV	100 mV	0-20 MHz BW, with a 1 uF ceramic and a 10 uF tantalum capacitor at the output	
Output Ripple and Noise (rms)	-	20 mV	30 mV		
Short Circuit Surge Transient	-	-	5 A <sup>2</sup> s		
Turn on Time	-	-	7 mS		
Overshoot at Turn on	-	-	1%		
Output Capacitance	0 uF	-	1000 uF		
<b>Transient Response</b>					
50% ~ 100% Max Load	Vo = All	-	120 mV	200 mV	di/dt=0.25 A/uS; Vin= 12 V; with a 10 uF tantalum capacitor and a 1 uF ceramic capacitor at the output.
Settling Time		-	30 uS	50 uS	
100% ~ 50% Max Load		-	120 mV	200 mV	
Settling Time		-	30 uS	50 uS	

**Note:** All specifications are typical at normal input, full load at Ta= 25°C unless otherwise stated.

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### General Specifications

Parameter	Min	Typ	Max	Notes
Efficiency				Vin=12 V
Vo=5.0 V	91%	93%	-	
Vo=3.3 V	89%	91%	-	
Vo=2.5 V	87%	89%	-	
Vo=1.8 V	84%	86%	-	
Vo=1.5 V	83%	85%	-	
Vo=1.2 V	80%	82%	-	
Vo=0.9 V	73%	75%	-	
Switching Frequency	-	500 kHz	-	
Output Voltage Trim Range (Wide Trim)	0.591 V	-	5.1 V	
MTBF	7,677,401 hours			Calculated Per Bell Core SR-332 (Io = 80% load; Vin=12 V; Vo=5 V; 200 LFM; Ta = 25 °C)
Dimensions				
Inches (L × W × H)	0.65 × 0.41 × 0.32			
Millimeters (L × W × H)	16.51 × 10.41 × 8.13			
Weight	-	3.5 g	-	

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

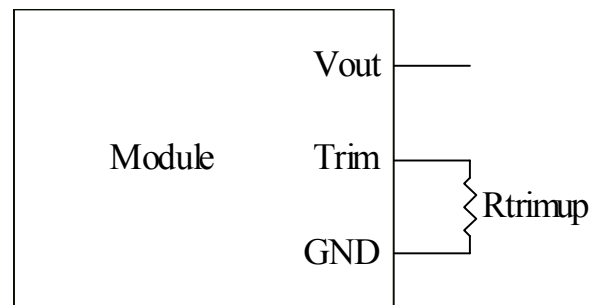
### Control Specifications

Parameter	Min	Typ	Max	Notes
<b>Remote On/Off</b>				
Signal Low (Unit Off)	-0.3 V	-	0.4 V	Remote On/Off Pin is open, the unit is on.
Signal High (Unit On)	2.0 V	-	5.5 V	

### Output Trim Equations

Equation for calculating the trim resistor given the desired output voltage (Vo) is shown below. The Rtrim resistor should be connected between the trim pin and GND pin.

$$R_{trim} = \frac{1.182}{V_o - 0.591} k\Omega$$



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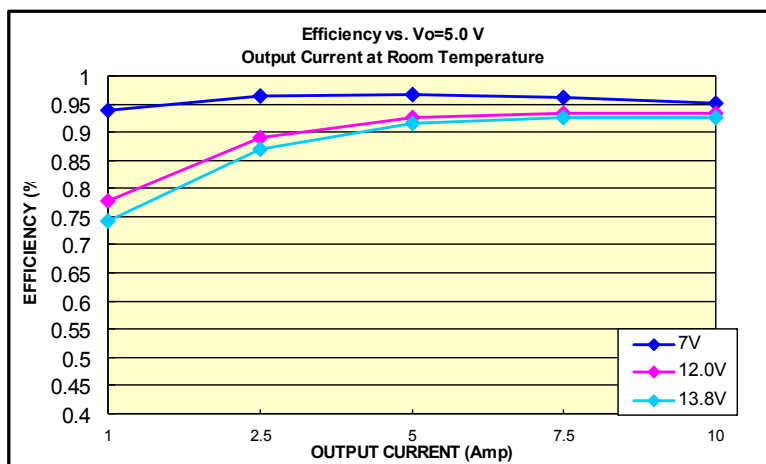
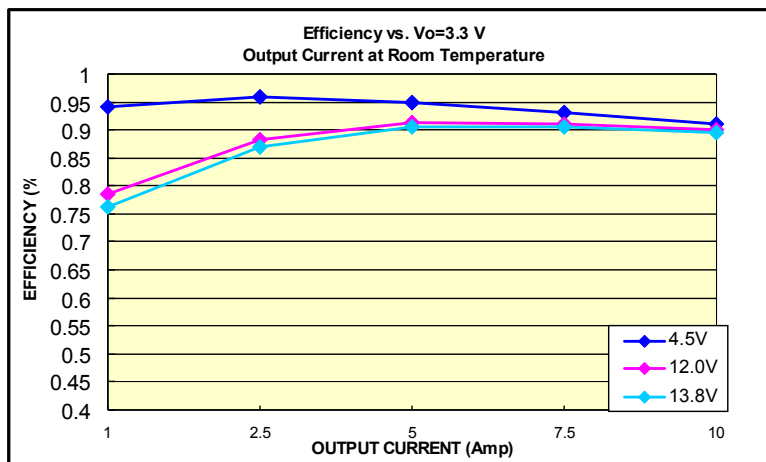
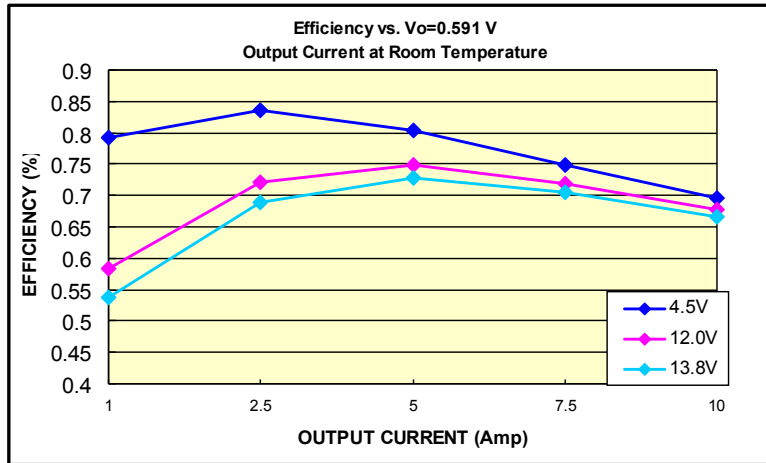
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## Efficiency Data



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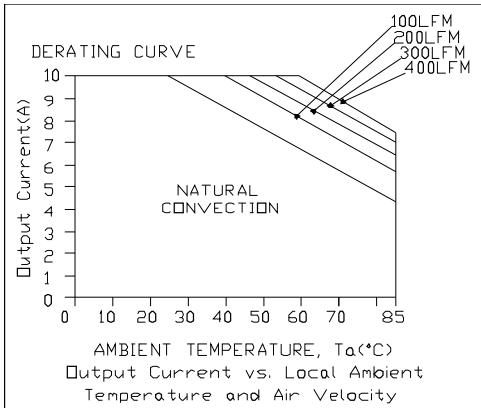
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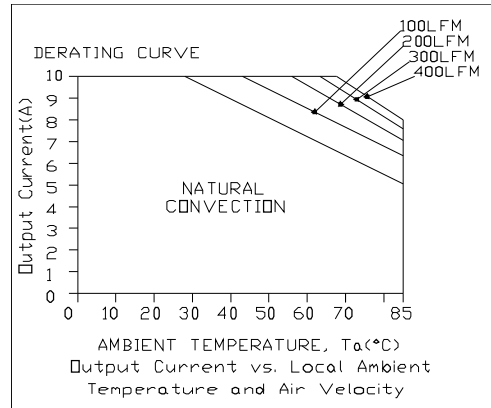
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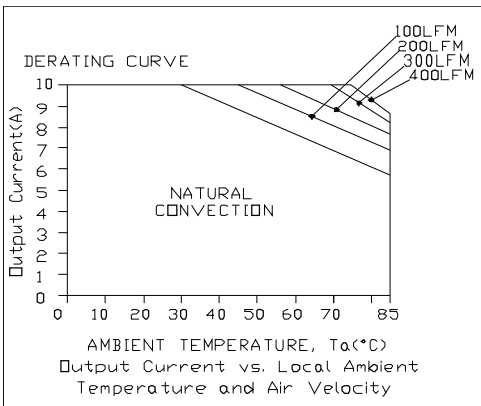
## Thermal Derating Curves



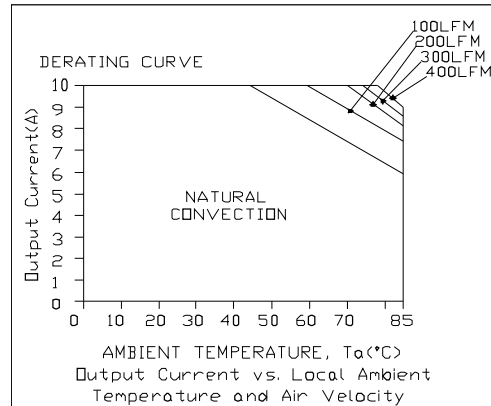
Vin=12 V, Vout=5 V



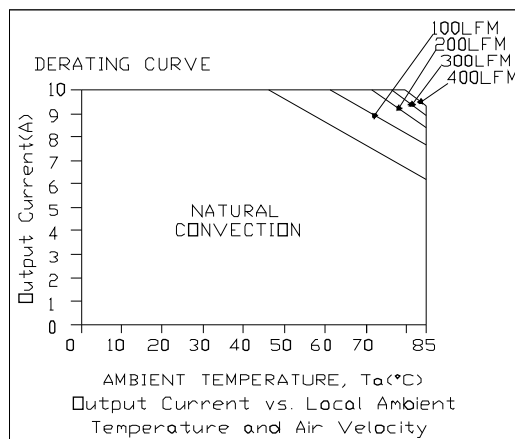
Vin=12 V, Vout=3.3 V



Vin=12 V, Vout=2.5 V



Vin=12 V, Vout=1.2 V



Vin=12 V, Vout=0.59 V

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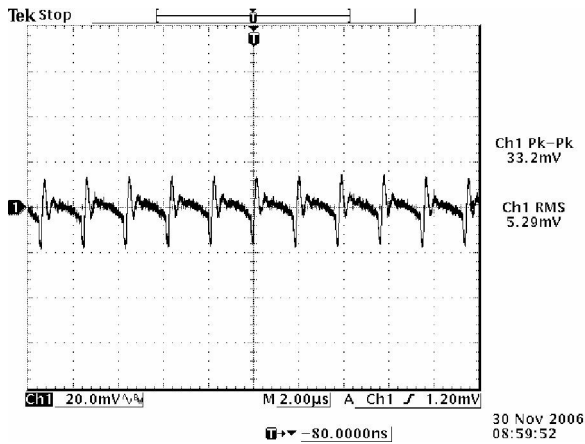
0.59 Vdc - 5.1 Vdc / 10 A Output



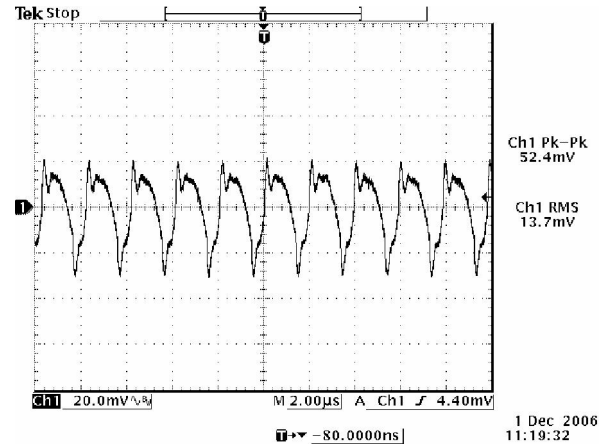
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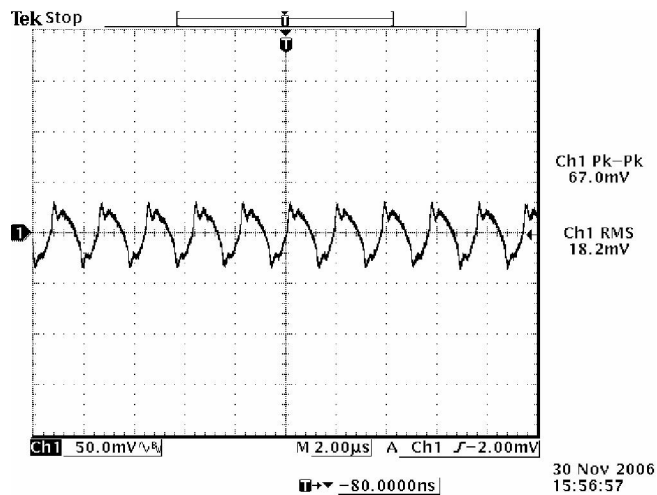
## Ripple and Noise Waveforms



12 V input, 0.591 V output



12 V input, 3.3 V output



12 V input, 5.0 V output

**Note:** Ripple and noise at full load, 0-20MHz BW, with a 1 uF ceramic and a 10 uF tantalum capacitor at the output, Ta=25 deg C.

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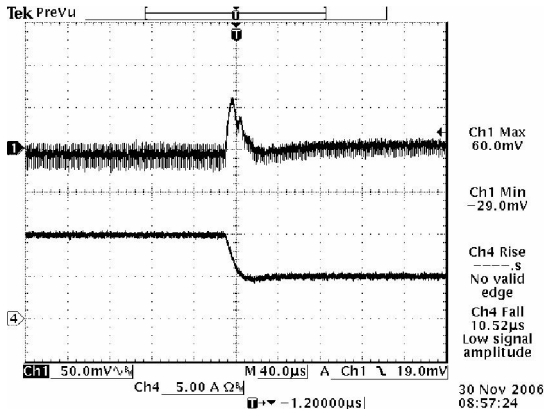
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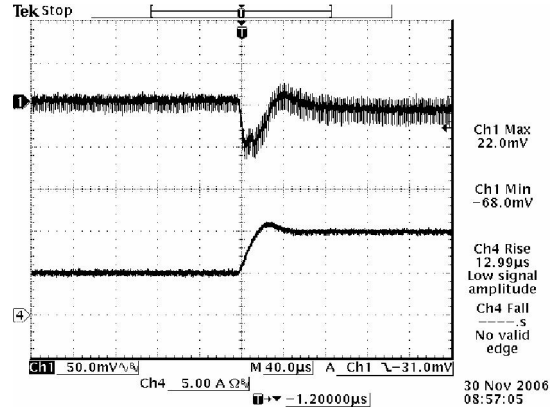
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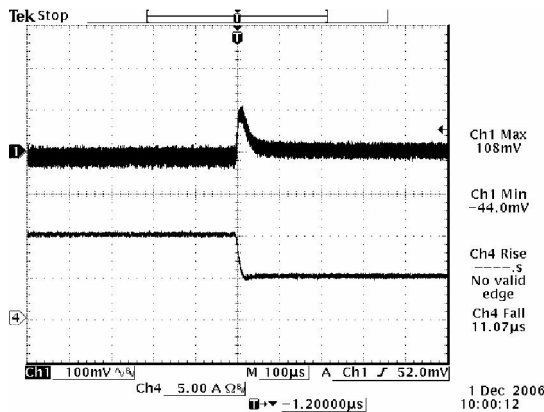
## Transient Response Waveforms



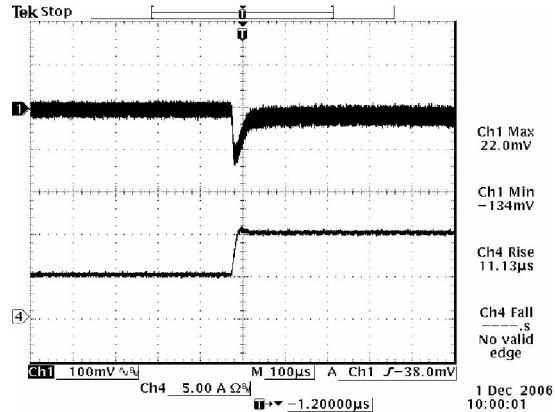
100% to 50% load step at 12 V input, 0.591 V output



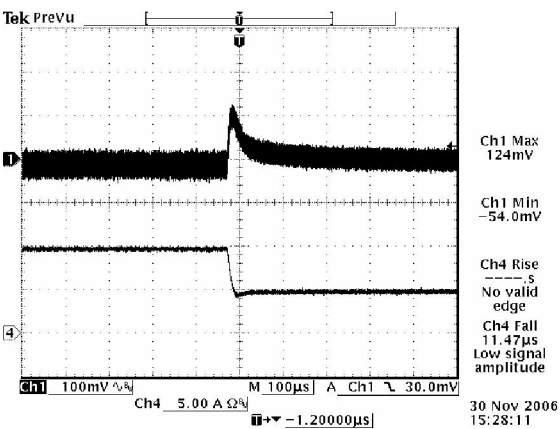
50% to 100% load step at 12 V input, 0.591 V output



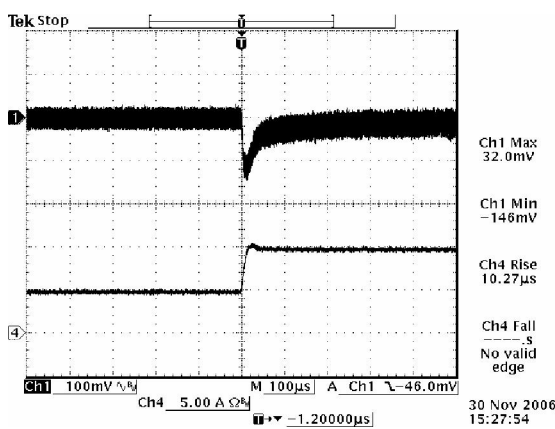
100% to 50% load step at 12 V input, 3.3 V output



50% to 100% load step at 12 V input, 3.3 V output



100% to 50% load step at 12 V input, 5.0 V output



50% to 100% load step at 12 V input, 5.0 V output

**Note:** Transient response at  $di/dt=0.25$  A/ $\mu$ S, with a 1 $\mu$ F ceramic cap and a 10  $\mu$ F tantalum cap at the output, and  $T_a=25$  deg C.

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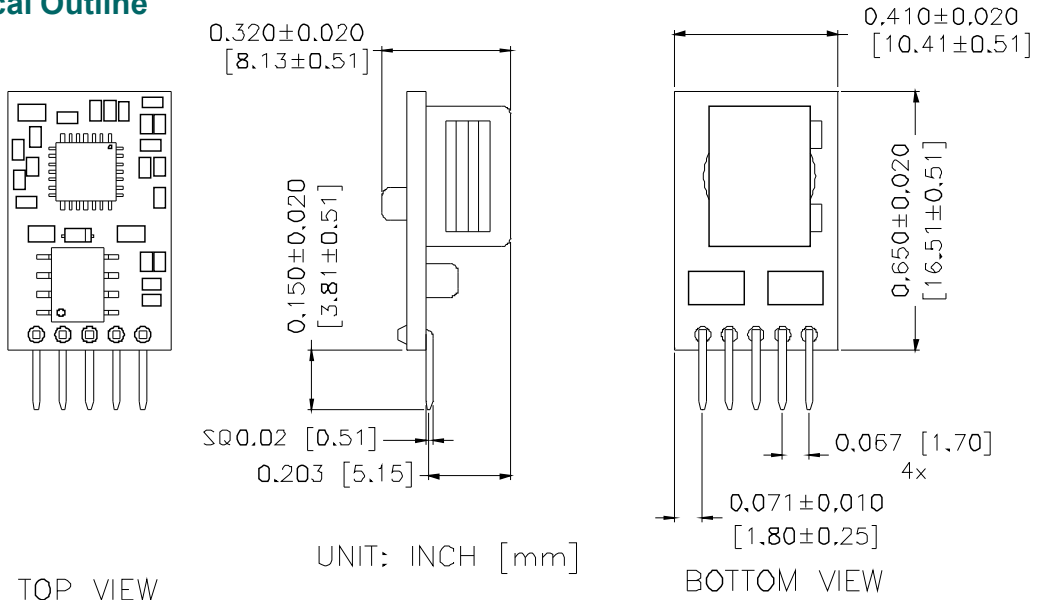
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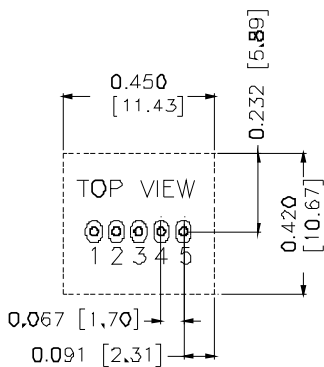
## Assembly Note

Modules were designed for vertical insertion into host board. Experiments should be performed to make sure that the units meet the intended tilt specification. A fixture may be needed to make the module stand upright in assembly

## Mechanical Outline



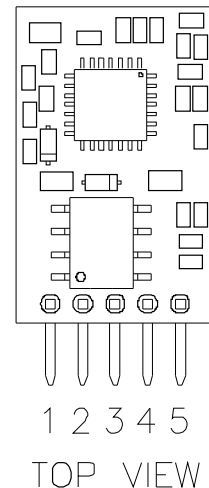
### RECOMMENDED PAD LAYOUT



PAD: LENGTH 0.067 [ø1.7] BOTH SIDE  
 WIDTH 0.047 [ø1.2] BOTH SIDE  
 HOLE: ø0.035 [ø0.89] BOTH SIDE

### Pin Connections

Pin	Function
1	ENABLE
2	Vin
3	GND
4	Vout
5	Trim



**Note: 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 245 °C.**

### 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[0.5mm]. x.xxx +/-0.010 in[0.25mm].

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### Revision History

Date	Revision	Changes Detail	Approval
2008-08-21	A	First release	HL
2009-04-15	B	Update MD.	HL
2012-07-05	C	Adding the 7C-III compliance suffix statement.	HL
2015-12-31	D	Add Assembly Note. Update mechanical drawing	HL

### RoHS Compliance

Complies with the European Directive 2011/65/EU, calling for the elimination of lead and other hazardous substances from electronic products.



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