

NON-ISOLATED DC/DC CONVERTERS

8 Vdc - 14 Vdc Input 0.8 Vdc - 3.63 Vdc / 30 A Outputs



May. 19, 2010

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

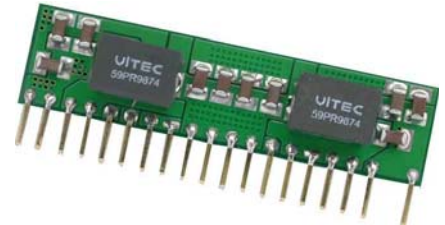
VRBG-30A1A1

RoHS Compliant

Rev.B

Features

- Non-Isolated
- Fixed Frequency
- High Efficiency
- Wide Trim
- Low Cost
- Remote Sense
- Input Under Voltage Lockout
- Over Temperature Shutdown
- Short Circuit Protection
- Remote On/Off
- Industrial Temperature Range



Applications

- Networking
- Computers and peripherals
- Telecommunications

Description

The Bel VRBG-30A1A1 is part of the non-isolated dc/dc converter Power Module series. The modules use a SIP package. These converters are available in a range of output voltages from 0.8 Vdc to 3.63 Vdc over a wide range of input voltage ($V_{in} = 8 \text{ Vdc} - 14 \text{ Vdc}$). The efficiency is typically 92.5% at 12 Vdc input and 3.3 Vdc output at full load.

Part Selection

Output Voltage	Input Voltage	Max. Output Current	Max. Output Power	Typical Efficiency	Model Number
0.8 Vdc - 3.63 Vdc	8 Vdc - 14 Vdc	30 A	99 W	92.5%	VRBG-30A1A1

Note: Add "G" or "R" suffix at the end of the model number to indicate Tray or Tape and Reel packaging.

Part Number Explanation

$\frac{V}{1} \frac{R}{2} \frac{BG}{3} - \frac{30}{4} \frac{A}{5} \frac{1A}{6} \frac{1}{7}$

- 1---Vertical mount
- 2---RoHS 6, change "R" to "7" means RoHS 5
- 3---Series name
- 4---Series code (output current 30A)
- 5---Input range (8-14V)
- 6---Output voltage, wide trim
- 7---Suffix

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Absolute Maximum Ratings

Parameter	Min	Typ	Max	Notes
Input Voltage (continuous)	-0.3 V	-	15 V	
Output Enable Terminal Voltage	-0.3 V	-	15 V	
Ambient Temperature	-40 °C	-	85 °C	
Storage Temperature	-55 °C	-	125 °C	

Input Specifications

Parameter	Min	Typ	Max	Notes
Input Voltage	8 V	12 V	14 V	
Input Current (full load)	-	-	15 A	An input line fuse must always be used.
Input Current (no load)	-	300 mA	-	
Remote Off Input Current	-	20 mA	-	
Input Reflected Ripple Current (rms)	-	-	10 mA	With a 1000 uF AL-Cap at the input.
Input Reflected Ripple Current (pk-pk)	-	-	40 mA	
I ² t Inrush Current Transient	-	-	1 A ² s	
Turn On Voltage Threshold	-	6.7 V	-	
Turn Off Voltage Threshold	-	6.3 V	-	

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

Output Specifications

Parameter	Min	Typ	Max	Notes		
Output Voltage Set Point	-1.5%Vo, set	-	1.5%Vo, set	V _{in} =12 V, I _o =half load		
Line Regulation	-	-	0.5%Vo, set			
Load Regulation	-	-	1.5%Vo, set			
Temperature Regulation (-40 °C to +85 °C)	-	-	1%Vo, set			
Ripple and Noise (rms)	-	4 mA	20 mV	0-20 MHz BW, with a 20 μF ceramic capacitor and a 150 uF tantalum capacitor at the output.		
Ripple and Noise (pk-pk)	-	15 mV	100 mV			
Output Current	0 A	-	30 A			
Short Circuit Surge Transient	-	1 A ² s	3 A ² s			
Turn on Time	-	2 mS	10 mS			
Overshoot at Turn On	-	-	5%			
Output Capacitance	150 uF	-	10000 uF			
Transient Response						
50% ~ 75% Max Load	Overshoot	Vo=3.3 V	-	65 mV	di/dt=0.5 A/us, V _{in} =12 Vdc, with a 20 μF ceramic capacitor and a 150 uF tantalum capacitor at the output.	
	Settling Time		-	20 uS		45 uS
75% ~ 50% Max Load	Overshoot		-	65 mV		150 mV
	Settling Time		-	20 uS		45 uS

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General Specifications

Parameter	Min	Typ	Max	Notes
Efficiency				Vin=12 V, full load
Vo=0.8 V	-	80%	-	
Vo=1.8 V	-	88.5%	-	
Vo=2.5 V	-	91%	-	
Vo=3.3 V	-	92.5%	-	
Switching Frequency	-	600 kHz	-	
Output Voltage Trim Range	0.8 V	-	3.63 V	
Over Temperature Shutdown	-	130 °C	-	
Remote Sense Compensation	-	-	0.5 V	
MTBF	TBD			Calculated Per Bell Core SR-332 (Io = Nominal; Ta = 25 °C)
Dimensions				
Inches (L x W x H)	2.0 x 0.50 x 0.309			
Millimeters (L x W x H)	50.80 x 12.70 x 7.85			
Weight	-	TBD	-	

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

Control Specifications

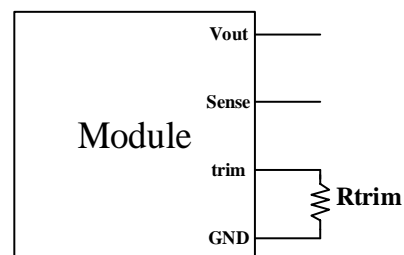
Parameter	Min	Typ	Max	Notes
Remote On/Off				
Signal Low (Unit Off)	-0.3 V	-	0.8 V	Remote on/off pin open, unit on
Signal High (Unit On)	2.8 V	-	Vin, max	

Output Trim Equations

Equations for calculating the trim resistor are shown below (Unit: Ω). The Trim resistor should be connected between the Trim pin and Ground pin.

$$R_{trim} = \left[\frac{9680}{V_o - 0.8} - 715 \right]$$

Vo is the desired output voltage



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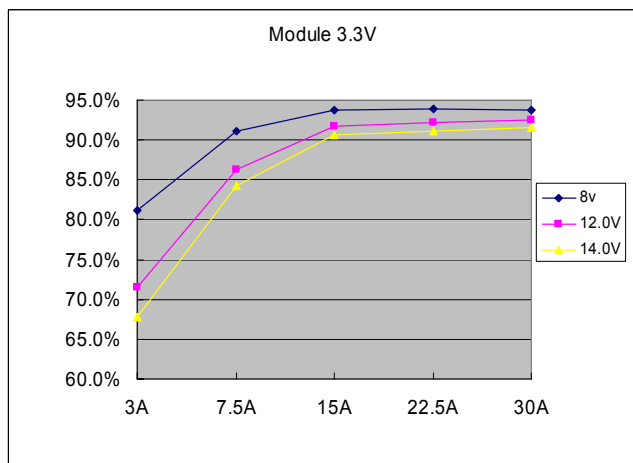
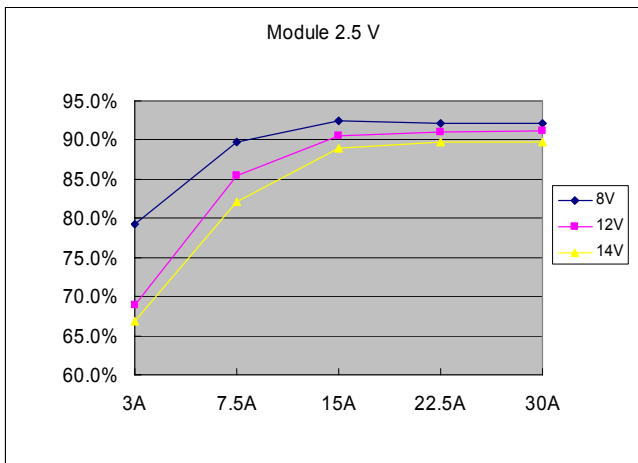
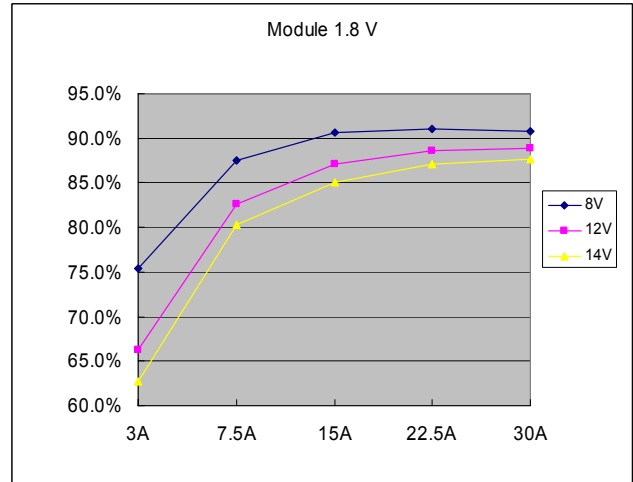
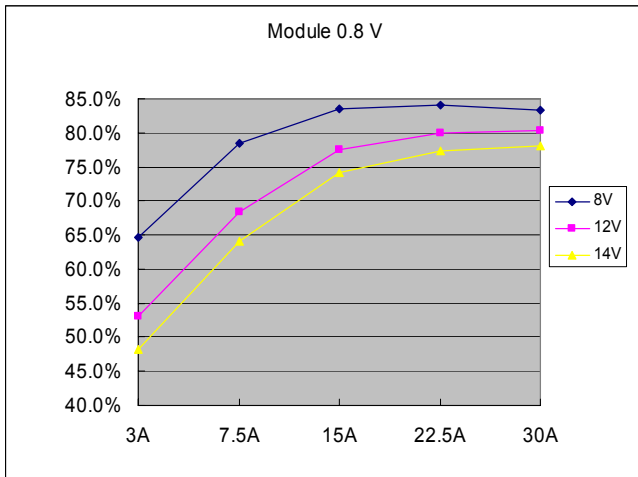
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Efficiency Data



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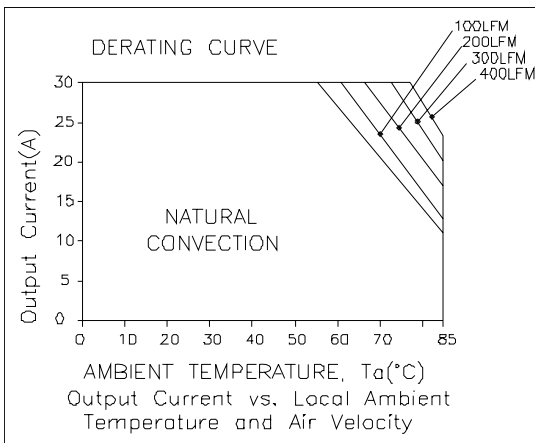
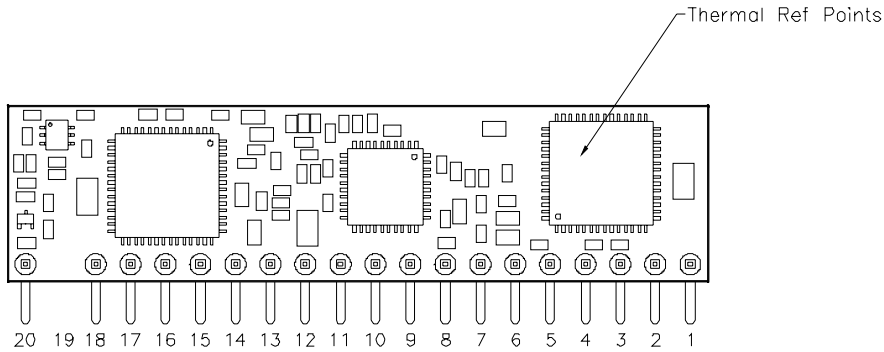


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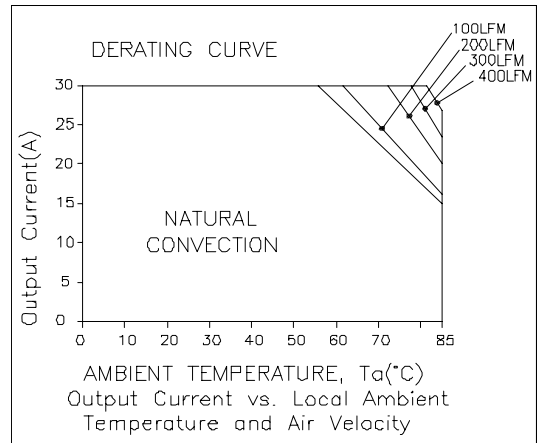
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Thermal Derating Curves

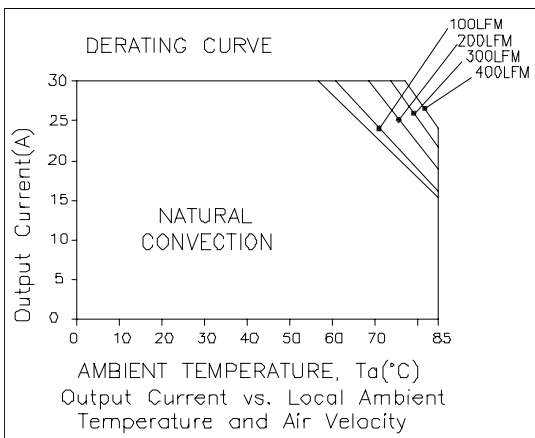
The maximum acceptable temperature measured at the thermal ref points is 110 deg, the thermal ref point is shown in Figure. All the derating curves were tested with two electronic loads connected in parallel.



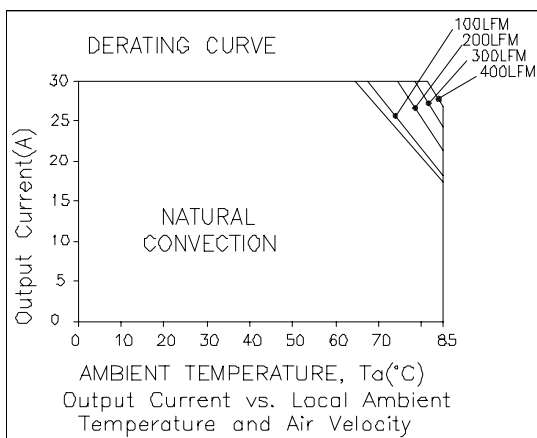
$V_{in}=12\text{ V}, V_o=3.3\text{ V}$



$V_{in}=12\text{ V}, V_o=2.5\text{ V}$



$V_{in}=12\text{ V}, V_o=1.8\text{ V}$



$V_{in}=12\text{ V}, V_o=0.8\text{ V}$

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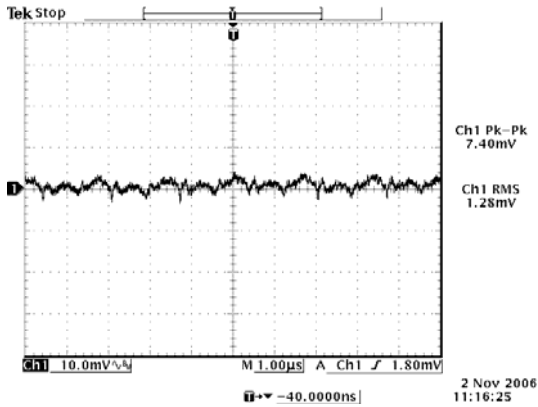
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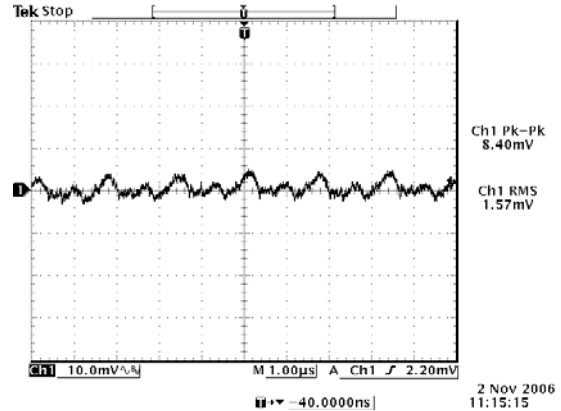
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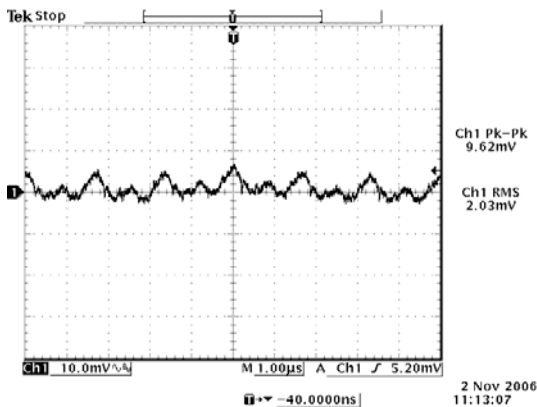
Ripple and Noise Waveforms



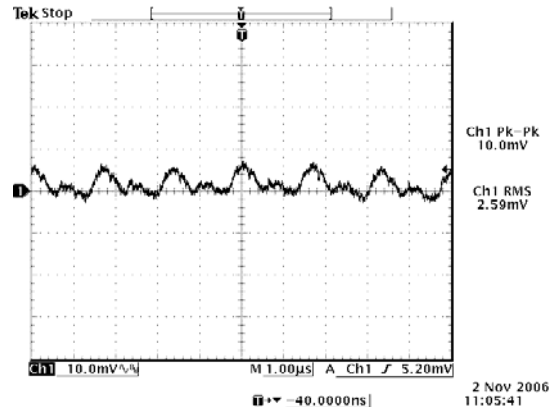
12 Vdc input, 0.8 Vdc output



12 Vdc input, 1.8 Vdc output



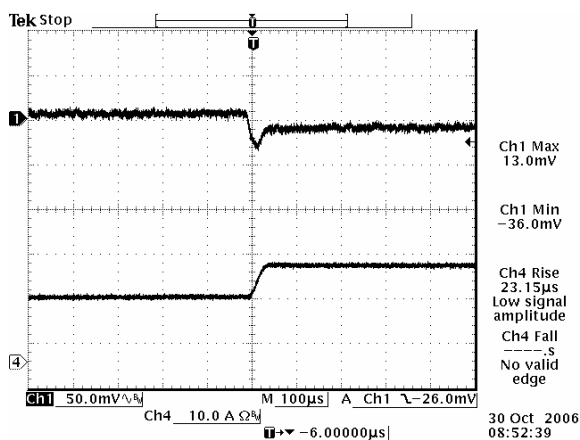
12 Vdc input, 2.5 Vdc output



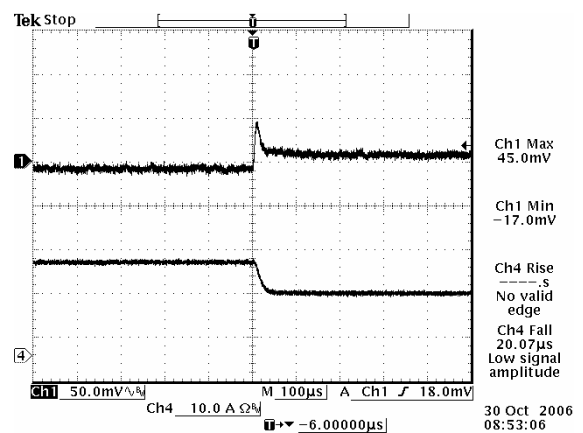
12 Vdc input, 3.3 Vdc output

Note: Ripple and noise at full load, external load with 150 uF tantalum cap and 20 uF ceramic at the output, and Ta=25 deg C.

Transient Response Waveforms



50% to 75% load Transient at 0.8 Vdc output



75% to 50% load Transient at 0.8 Vdc output

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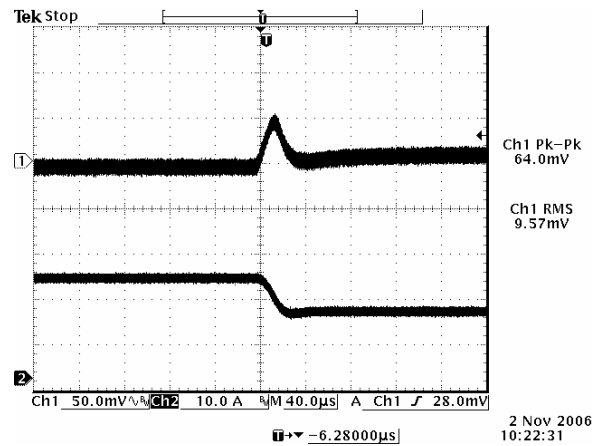
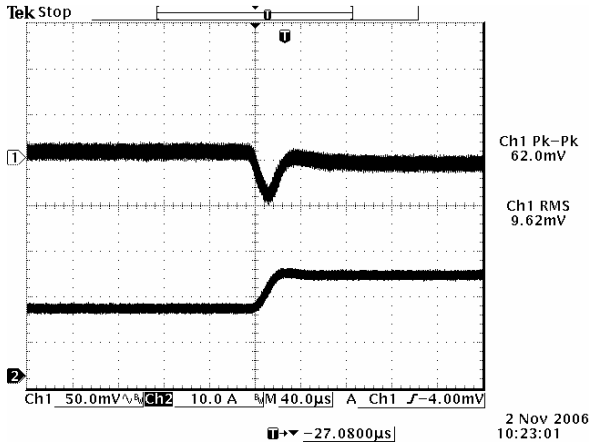
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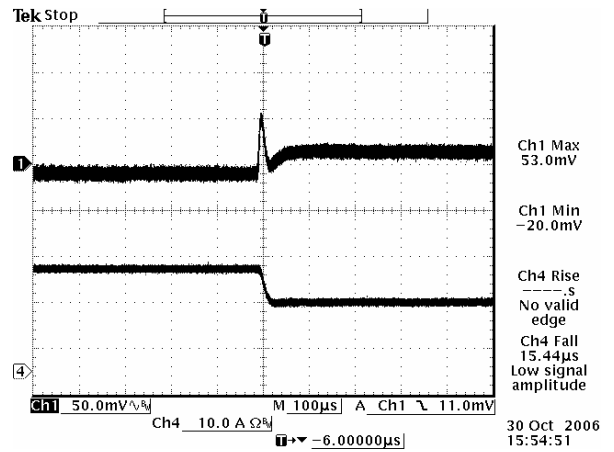
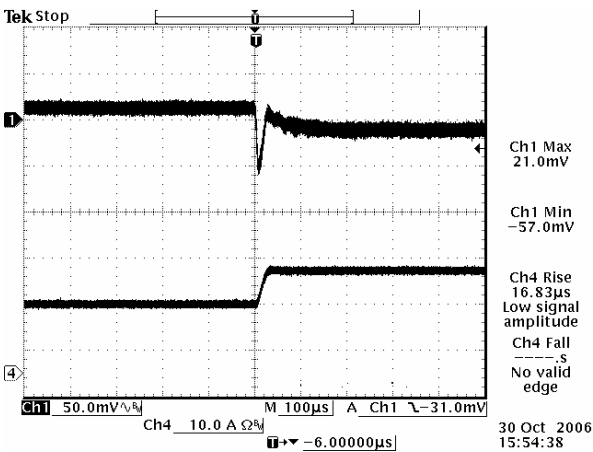
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Transient Response Waveforms (continued)



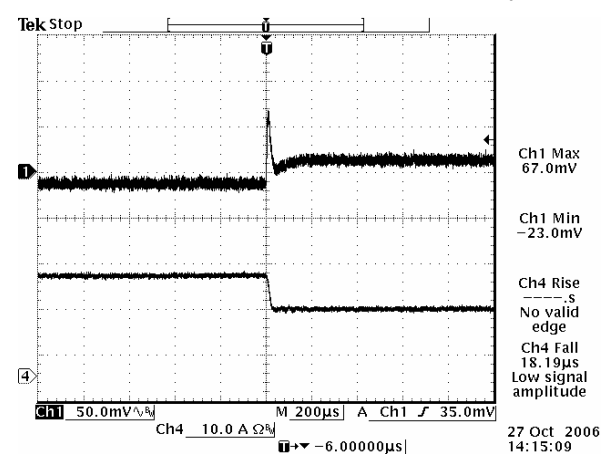
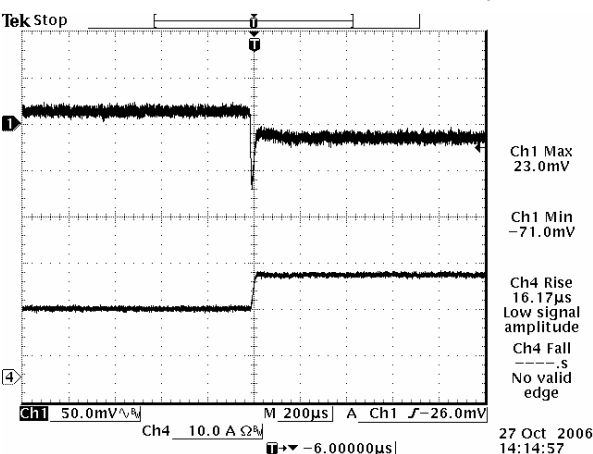
50% to 75% load Transient at 1.8 Vdc output

75% to 50% load Transient at 1.8 Vdc output



50% to 75% load Transient at 2.5 Vdc output

75% to 50% load Transient at 2.5 Vdc output



50% to 75% load Transient at 3.3 Vdc output

75% to 50% load Transient at 3.3 Vdc output

Note: Transient response at 12 Vdc input, di/dt=0.5 A/uS, with a 20 µF ceramic capacitor and a 150 uF tantalum capacitor at the output, Ta=25 deg C.

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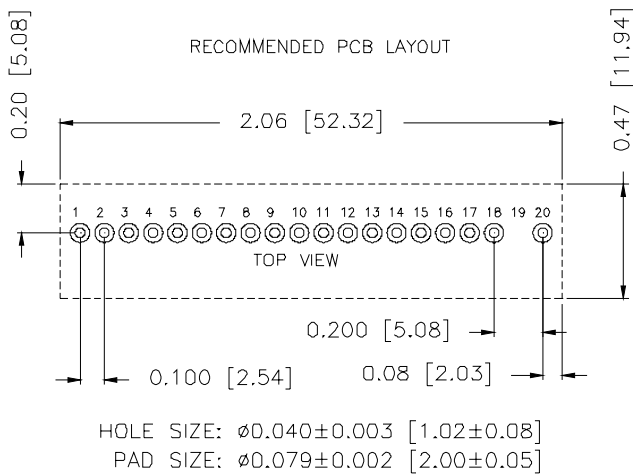
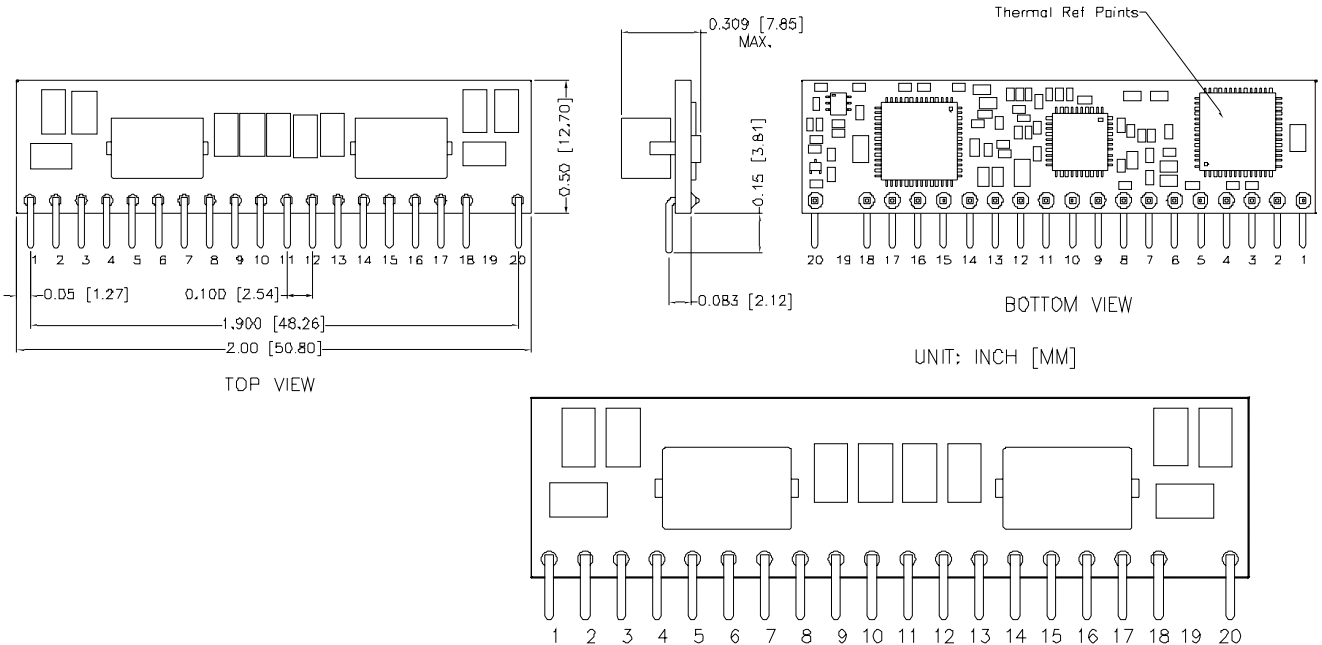
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Mechanical Outline



Pin Connections

Pin	Function	Pin	Function
1	Vin	11	Vout
2	Vin	12	Vout
3	Ground	13	Remote On/Off
4	Ground	14	Ground
5	Trim	15	Ground
6	Remote Sense+	16	Ground
7	Ground	17	Ground
8	Ground	18	Vin
9	Vout	19	N/C
10	Vout	20	Vin

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
2010-3-29	A	First release	Jack Fan
2010-5-19	B	Update efficiency data	JZ Wang

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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