ISOLATED DC/DC CONVERTERS

38 Vdc - 55 Vdc Input, 12 Vdc/40 A Output

Aug. 19, 2011

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

0RQB-Q8S12x RoHS Compliant PRELIMINARY Rev.B

Features

- Isolated
- High Efficiency
- Fixed Frequency (300 KHz)
- High Power Density
- Low Cost
- Input Under-voltage Protection
- Output Over-voltage Protection
- OCP/SCP
- Over Temperature Protection
- Remote ON/OFF
- Class 2, Category 2, Isolated DC/DC Converter (refer to IPC-9592)

Applications

- Networking
- Computers and peripherals
- Telecommunications

Description

The 0RQB-Q8S12x is an isolated dc/dc converter that operates from a nominal 50 Vdc source. This converter is intended to provide isolation and step down to generate a regulated intermediate bus for the purpose of powering non-isolated Point-of-Load (POL) converters. This unit will provide up to 480 W of output power from a nominal 50 Vdc input.

Part Selection

Output Voltage	Input Voltage	Max. Output Current	Max. Output Power	Typical Efficiency	Model Number Active Low	Model Number Active High
12 Vdc	38 Vdc - 55 Vdc	40 A	480 W	96.7%	0RQB-Q8S12L	0RQB-Q8S120

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

Part Number Explanation

0	R	QB	–	Q8	S	12	x
1	2	3		4	5	6	7

1---Through hole mount
2---RoHS 6, change “R” to “7” means RoHS 5
3---Series name
4---Series code
5---Input range (38-55V)
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.

Absolute Maximum Ratings

Parameter	Min	Typ	Max	Unit	Notes
Continuous non-operating Input Voltage	-0.3	-	60	V	
Remote On/Off	-0.3	-	10	V	
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
Operating Input Voltage	38	50	55	V	
Input Current (full load)	-	-	12.5	A	
Input Current (no load)	-	140	200	mA	
Remote Off Input Current	-	4	8	mA	
Input Reflected Ripple Current (rms)	-	450	600	mA	
Input Reflected Ripple Current (pk-pk)	-	1.6	2.4	A	
I^2t Inrush Current Transient	-	-	1	A^2s	
Turn-on Voltage Threshold	34	35.5	37	V	
Turn-off Voltage Threshold	32	33.5	35	V	

CAUTION: This converter is not internally fused. An input line fuse must be used in application.
Recommend a fast-acting fuse with maximum rating of 20A on system board. Refer to the fuse manufacture's datasheet for further information.

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

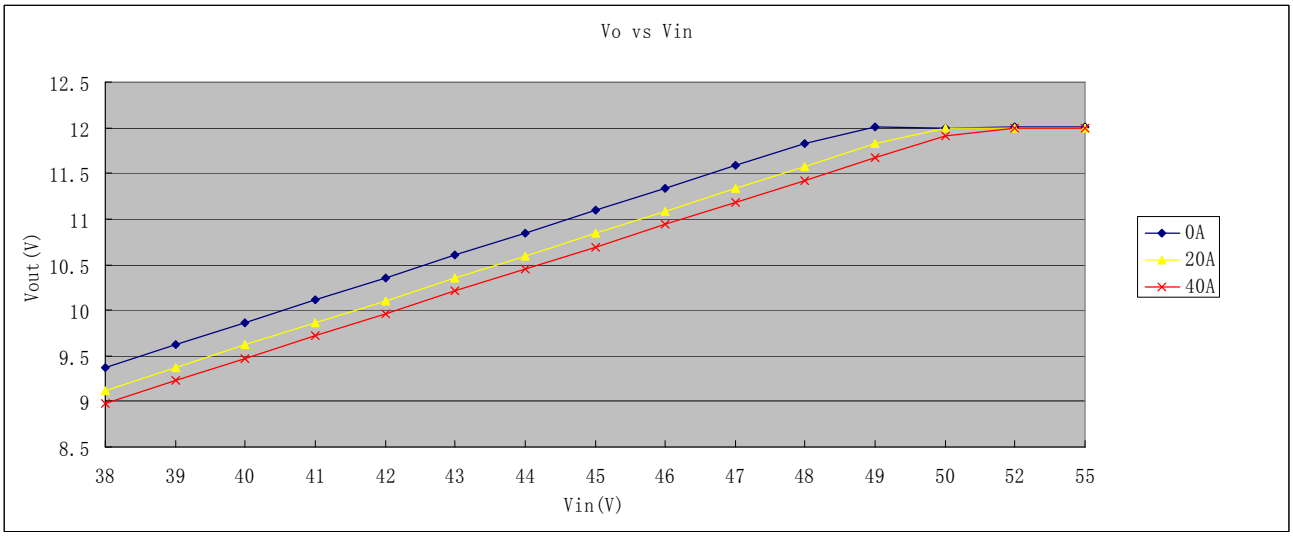
Output Specifications

Parameter	Min	Typ	Max	Unit	Notes
Output Voltage Set Point Vin＞49V Vin≤49V	 - -	 12 $\frac{Vin}{4}$	 - -	 V V	Please see the figure about Vo set point below.
Load Regulation Vin=38-49V Vin=49-55V	 - -	 0.4 30	 0.7 50	 V mV	Io=0~100% load
Line Regulation Vin=38-49V Vin=49-55V	 - -	 2.7 25	 3.5 40	 V mV	Io=100% load
Output Ripple and Noise (pk-pk)	-	50	150	mV	Vin=50V, Io=100%load, 0-20MHz BW, with a 1μF ceramic capacitor and a 10uF TAN cap at output.
Output Ripple and Noise (rms)	-	10	30	mV	
Ripple and Noise (pk-pk) under worst case	-	-	200	mV	Over all operating input voltage, load and ambient temperature condition.
Output Current Range Vin=38V Vin=48V Vin=55V	 0 0 0	 - - -	 40 40 40	 A A A	

Output Specifications (continued)

Parameter		Min	Typ	Max	Unit	Notes
Output DC Current Limit		48	52	56	A	Vin=50V
Short Circuit Surge Transient		-	-	2	A^2s	
Rise time		-	-	15	mS	
Turn on Time		-	30	35	mS	Enable from Vin
		-	30	35	mS	Enable from ON/OFF
Overshoot at Turn on		-	0	3	%	
Output Capacitance		0	-	6000	uF	
Transient Response						
△V 50%~75% of Max Load	Overshoot	Vo= 12 V	-	250	350	mV	di/dt=1A/us, Vin=50Vdc, Ta=25°C, with a 1µF ceramic capacitor and a 100uF AL. cap at output.
	Settling Time		-	100	200	uS	
△V 75%~50% of Max Load	Overshoot		-	250	350	mV	
	Settling Time		-	100	200	uS	

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

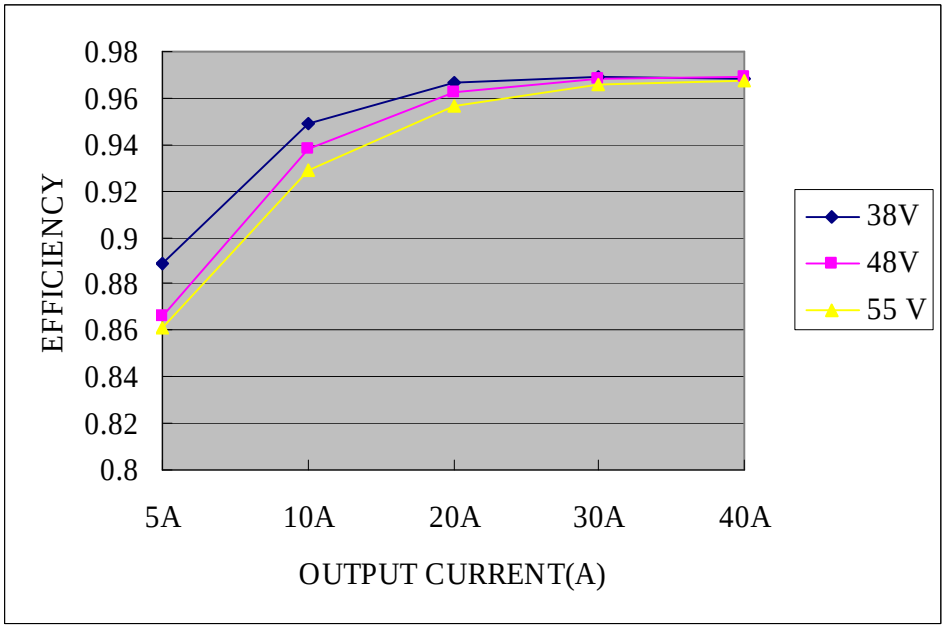


General Specifications

Parameter	Min	Typ	Max	Unit	Notes
Efficiency	94.7	96.7	-	%	Vin=50V, full load
Switching Frequency	280	300	320	kHz	
Over Temperature Protection	-	125	-	℃	
Over Voltage Protection	-	-	14	V	
Weight	-	65	-	g	
FIT		161		-	Calculated Per Bell Core SR-332 (Vin=50 V, Vo=12 V, Io=32 A, Ta = 25°C, FIT=10^9/MTBF)
Isolation characteristics					
Input to Output	-	-	1500	V	
Isolation Resistance	10M	-	-	Ohm	
Isolation Capacitance	-	2700	-	pF	

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

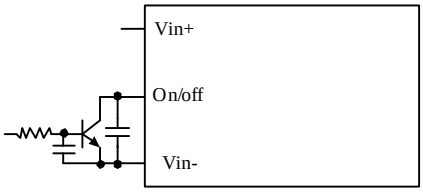
Efficiency Data



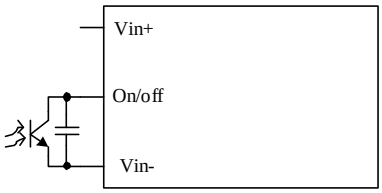
Remote On/Off

Parameter		Min	Typ	Max	Unit	Notes
Signal Low (Unit On)	Active Low	-0.3	-	0.8	V	0RQB-Q8S12L The remote on/off pin open, Unit off.
Signal High (Unit Off)		2.4	-	10	V	
Signal Low (Unit Off)	Active High	-0.3	-	0.8	V	0RQB-Q8S120 The remote on/off pin open, Unit on.
Signal High (Unit On)		2.4	-	10	V	
Current Sink		0	-	0.3	mA	

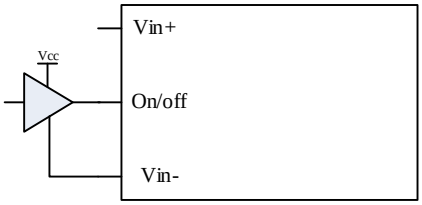
Recommended remote on/off circuit for active low



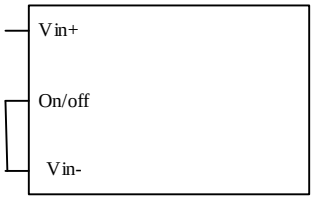
Control with open collector/drain circuit



Control with photocoupler circuit

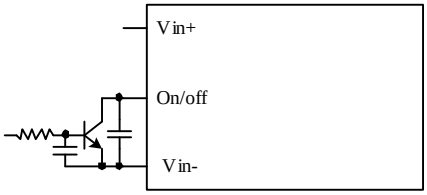


Control with logic circuit

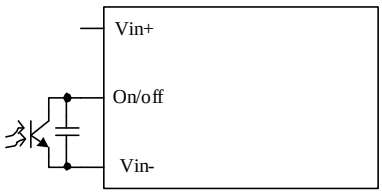


Permanently on

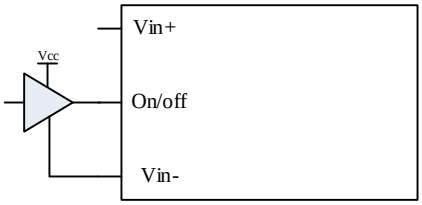
Recommended remote on/off circuit for active high



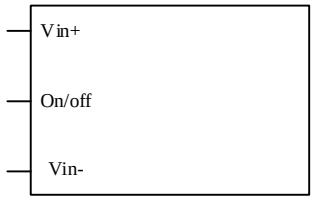
Control with open collector/drain circuit



Control with photocoupler circuit



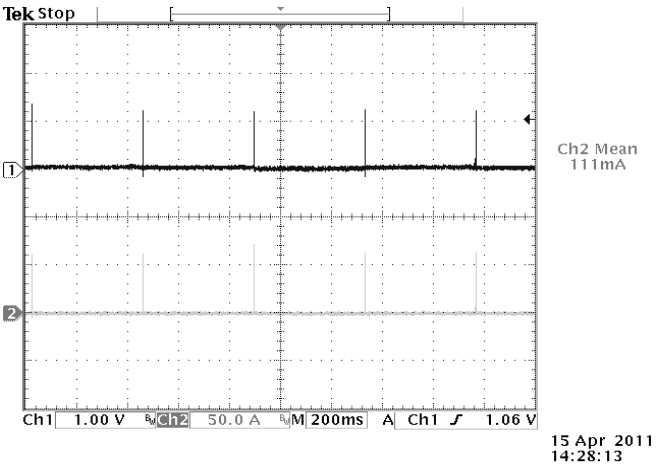
Control with logic circuit



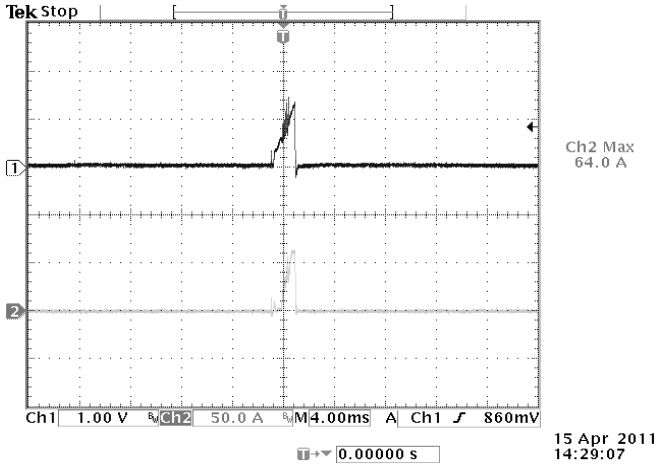
Permanently on

Over Current Protection

To provide protection in a fault output overload condition, the module is equipped with internal current-limiting circuitry and can endure current limiting for a few mili-seconds. If the over current condition persists beyond a few milliseconds, the module will shut down into hiccup mode and restart once every 400mS. The module operates normally when the output current goes into specified range. The typical average output current is 3.8A during hiccup.

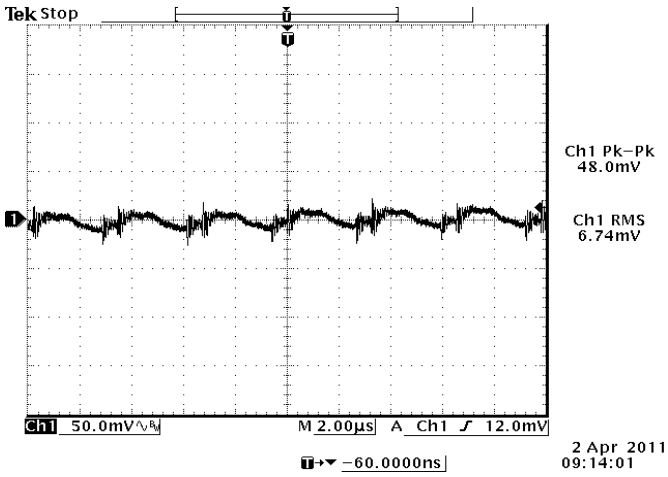


CH1: Output Voltage
CH2: Output Current Waveform
Test condition: Vin=50V



CH1: Output Voltage
CH2: Output Current Waveform
Expansion of on time portion of above figure

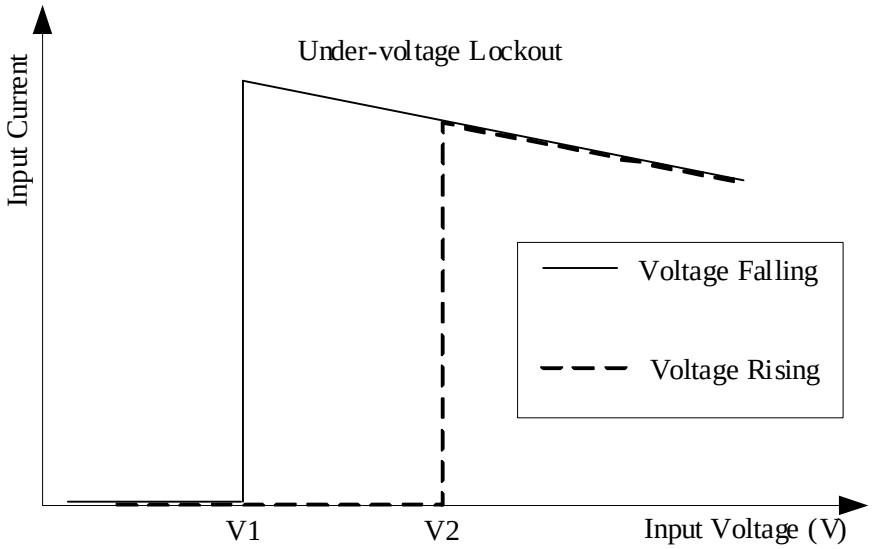
Ripple and Noise Waveform



50Vdc input, 12Vdc/40A output

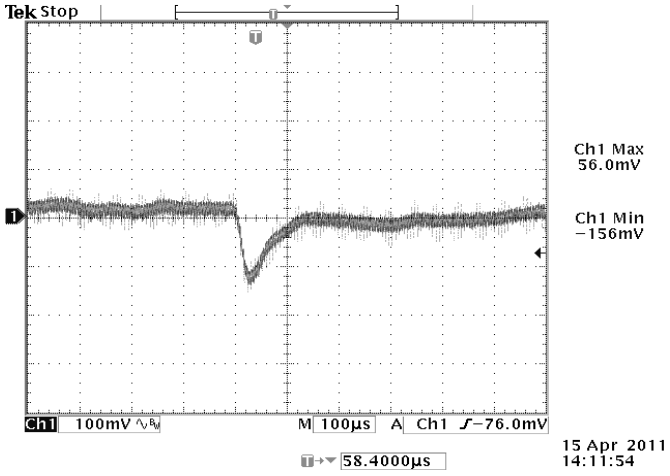
Note: Ripple and noise at full load, with a 1uF ceramic cap and a 10uF Tan cap at output, Ta=25 deg C.

Input Under-voltage Lockout

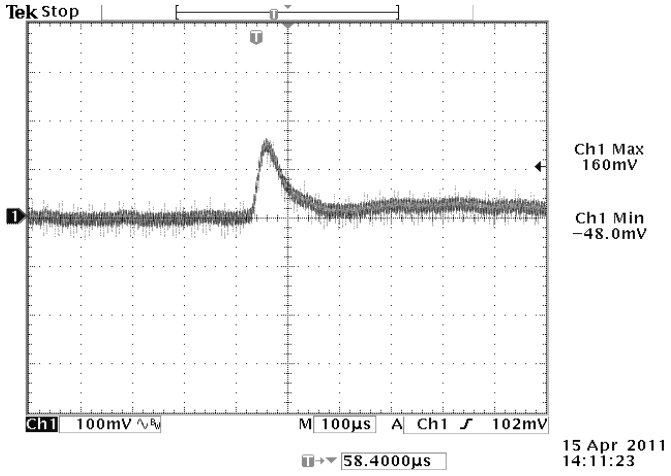


V1=33.5V
V2=35.5V

Transient Response Waveforms



Vin= 50V 50%-75% Load Transients

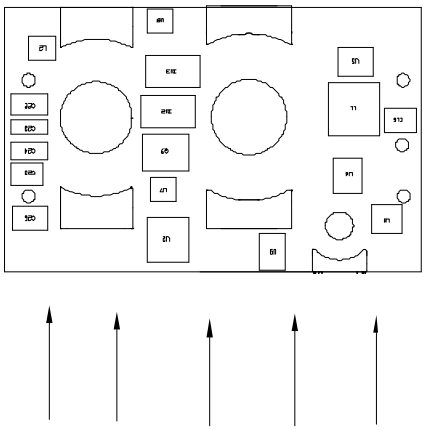


Vin= 50V 75%-50% Load Transients

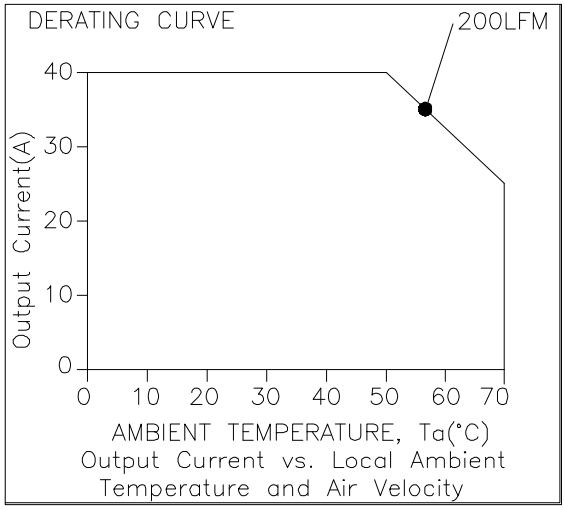
Note: Transient Response at di/dt=1A/uS, with a 1µF ceramic capacitor and a 100uF AL. cap at output, Ta=25 deg C.

Thermal Derating Curve

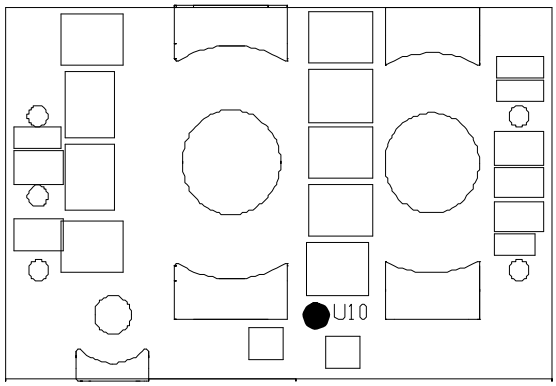
Maximum junction temperature of semiconductors derated to 120 degree C.



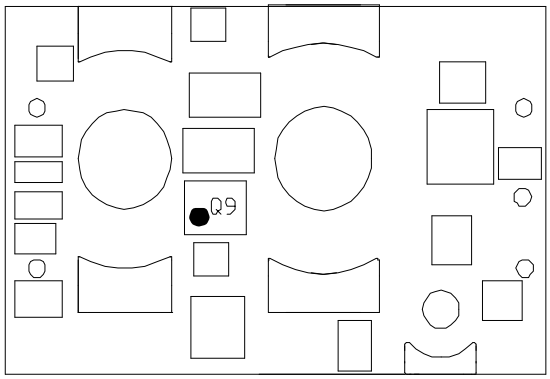
Bottom view



The OTP is achieved by temperature sensor U10 and it is in non-latch mode when the hottest component Q9 reaches 125°C with 200LFM air flow correspondingly. It will restart automatically when the temperature falls down to 105°C. The protecting point will be varied a little under different conditions (air flow, ambient temperature, input voltage, load...).

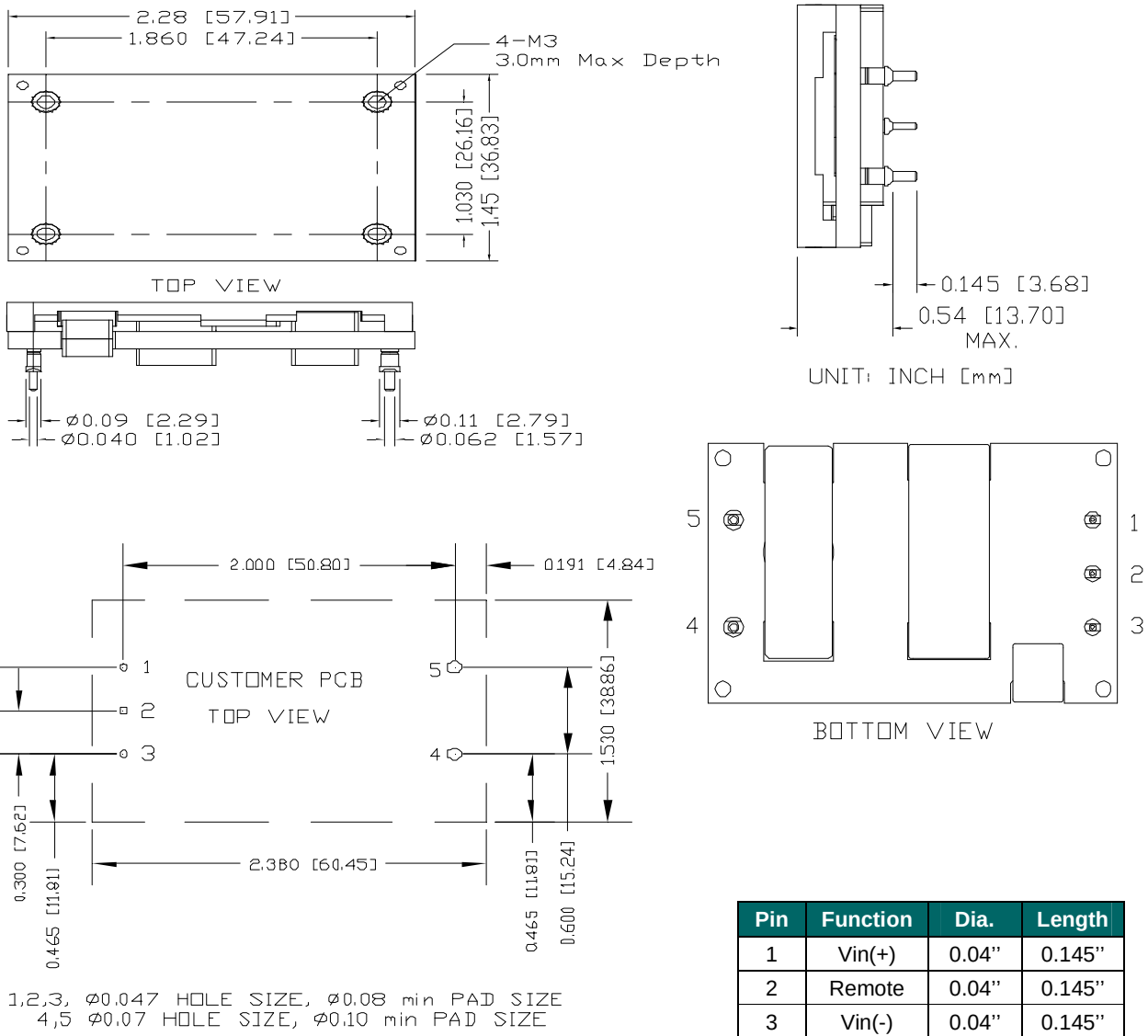


Temperature reference points on top side



Temperature reference points on bottom side

Mechanical Outline



Pin	Function	Dia.	Length
1	Vin(+)	0.04”	0.145”
2	Remote	0.04”	0.145”
3	Vin(-)	0.04”	0.145”
4	Vout(-)	0.06”	0.145”
5	Vout(+)	0.06”	0.145”

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 ºC 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).

Revision History

Date	Revision	Changes Detail	Approval
2011-07-07	PA	First release	YF Sun
2011-08-19	PB	Updated mechanical outline	XJ Sun

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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