

0RQB-H0S12x Series

Isolated DC-DC Converter

The 0RQB-H0S12x is isolated DC/DC converter that operate from a nominal 48 VDC source. This converter is intended to provide isolation and step down to generate a regulated intermediate bus for powering non-isolated Point-of-Load (POL) converters. This unit will provide up to 600 W of output power from a nominal 48 VDC input. This converter is provided in an 1/4 brick package.



Key Features & Benefits

- 45 – 55 VDC Input
- 11.3 V / 53 A Output
- Isolated
- High Efficiency
- Fixed Frequency (250 kHz)
- High Power Density
- Low Cost
- Input Under / Over Voltage Protection
- OCP / SCP
- Over Temperature Protection
- Remote ON/OFF
- Class II, Category 2, Isolated DC/DC Converter (refer to IPC-9592B)



Applications

- Networking
- Computers and Peripherals
- Telecommunications

1. MODEL SELECTION

OUTPUT VOLTAGE	INPUT VOLTAGE	MAX. OUTPUT CURRENT	MAX. OUTPUT POWER	TYPICAL EFFICIENCY	MODEL NUMBER ACTIVE LOW
11.3 VDC	45 VDC – 55 VDC	53 A	600 W	96.5%	0RQB-H0S123
11.3 VDC	45 VDC – 55 VDC	53 A	600 W	96.5%	0RQB-H0S12D

NOTE: 1. Add “G” suffix at the end of the model number to indicate Tray Packaging.

PART NUMBER EXPLANATION

0	R	QB	-	H0	S	12	x	y
Through hole mount	RoHS	Series name		Output power	Input range	Output voltage	Option	Package
Though Hole	RoHS	1/4 th brick		600W	45-55V	11.3V	3-Base plate D-HSK	G-Tray package

2. ABSOLUTE MAXIMUM RATINGS

PARAMETER	DESCRIPTION	MIN	TYP	MAX	UNITS
Input Voltage	Continuous, non-operating	-0.3	-	65	V
Remote On/Off		-0.3	-	10	V
Ambient Temperature		-40	-	85	°C
Storage Temperature		-55	-	125	°C
Altitude		-	-	2000	m

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

3. INPUT SPECIFICATIONS

PARAMETER	DESCRIPTION	MIN	TYP	MAX	UNIT
Operating Input Voltage		45	48	55	V
Input Current (full load)		-	-	18	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	mA
I ² t Inrush Current Transient		-	-	1.5	A ² s
Turn-on Voltage Threshold		41	43	45	V
Turn-off Voltage Threshold		39	41	43	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 20 A on system board. Refer to the fuse manufacture’s datasheet for further information.

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

4. OUTPUT SPECIFICATIONS



PARAMETER	DESCRIPTION	MIN	TYP	MAX	UNIT	
Output Voltage Set Point	Vin=45~55V, Io=0 load at 25°C ambient.	10.9	-	13.3	V	
Output Voltage Range	Over all operating input voltage, load and ambient temperature condition.	10.6	-	13.3	V	
Load Regulation	Vin=45~55V, Io=0~100% load at 25°C ambient	0.3	-	0.6	V	
Line Regulation	Vin=45~55V, Io=100% load at 25°C ambient	-	-	2.2	V	
Output Ripple and Noise (pk-pk)	Vin=48V, Io=100%load, 0-20 MHz BW, with a 1µF ceramic capacitor and a 10 µF TAN cap at output.	-	70	150	mV	
Output Ripple and Noise (rms)		-	20	30	mV	
Ripple and Noise (pk-pk) under worst case	Over all operating input voltage, load and ambient temperature condition.	-	-	200	mV	
Output Current Range		0	-	53	A	
Output DC Current Limit	Vin=48V	58	63	68	A	
Short Circuit Surge Transient		-	-	2	A²s	
Rise time		-	-	15	ms	
Turn on Time	Enable from Vin	-	20	35	ms	
	Enable from ON/OFF	-	20	35	ms	
Overshoot at Turn on		-	0	3	%	
Output Capacitance		0	-	10000	µF	
TRANSIENT RESPONSE						
△V 50%~75% of Max Load	Overshoot Settling Time	di/dt=1A/us, Vin=48Vdc, Ta=25°C, with a 1µF ceramic capacitor and a 270 µF AL. cap at output.	-	350	500	mV
			-	100	200	µs
△V 75%~50% of Max Load	Overshoot Settling Time		-	350	500	mV
			-	100	200	µs

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

5. GENERAL SPECIFICATIONS

PARAMETER	DESCRIPTION	MIN	TYP	MAX	UNIT
Efficiency	Vin=48V, full load	94.6	96.5	-	%
Switching Frequency		230	250	270	kHz
Over Temperature Protection		-	125	-	°C
Over Voltage Protection		-	-	15	V
Weight	0RQB-H0S123	-	68	-	g
	0RQB-H0S12D	-	89	-	g
FIT	Calculated Per Bell Core SR-332 (Vin=48 V, Vo=11.3 V, Io=40 A, Ta = 25°C, FIT=109/MTBF)		161		-
Dimensions (L x W x H)	0RQB-H0S123		2.28 x 1.45 x 0.52		in
			57.91 x 36.83 x 13.20		mm
	0RQB-H0S12D		2.28 x 1.45 x 1.04		in
			57.91 x 36.83 x 26.5		mm
Isolation characteristics					
Input to Output		1500	-	-	V
Isolation Resistance		10M	-	-	Ohm
Isolation Capacitance		-	2700	-	pF

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

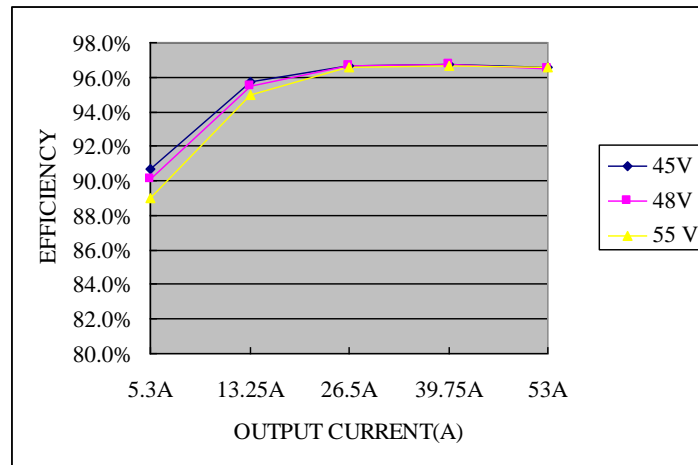
6. EFFICIENCY DATA



Asia-Pacific
+86 755 298 85888

Europe, Middle East
+353 61 225 977

North America
+1 408 785 5200

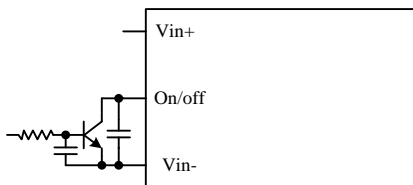


Efficiency vs. load current and input voltage at Ta=+25°C

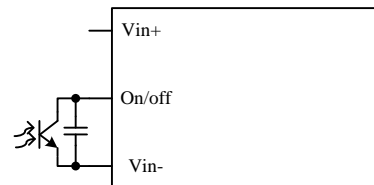
7. REMOVE ON/OFF

PARAMETER	DESCRIPTION	MIN	TYP	MAX	UNIT		
REMOTE ON/OFF							
Signal Low (Unit On)	Active Low	0RQB-H0S123/0RQB-H0S12D		-0.3	-	0.8	V
Signal High (Unit Off)		The remote on/off pin open, Unit off.		2.4	-	10	
Signal Low (Unit Off)	Active High	The remote On/Off pin open, Unit on.		-0.3	-	0.8	V
Signal High (Unit On)				2.4	-	10	
Current Sink		0	-	0.5	mA		

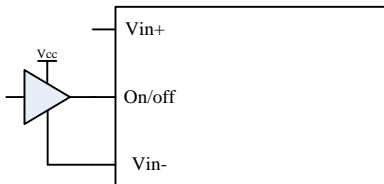
Recommended Remote On/Off Circuit for Active Low



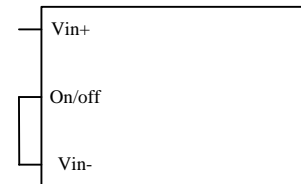
Control with open collector/drain circuit



Control with photo coupler circuit

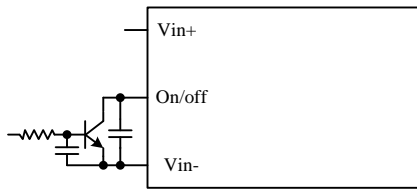


Control with logic circuit

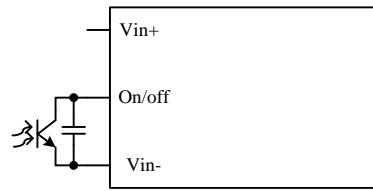


Permanently on

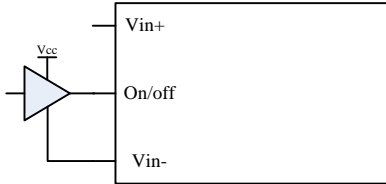
Recommended Remote On/Off Circuit for Active High



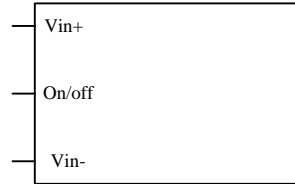
Control with open collector/drain circuit



Control with photo coupler circuit



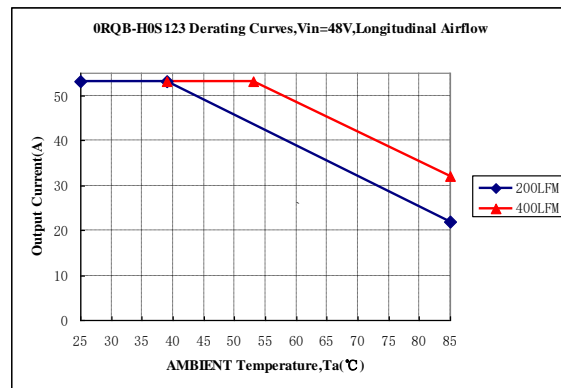
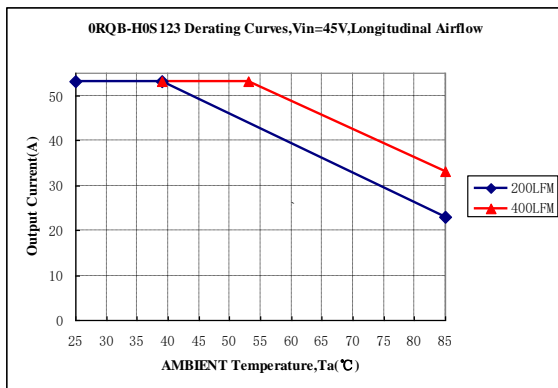
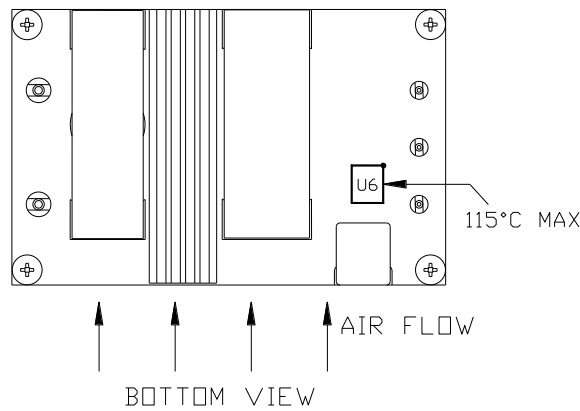
Control with logic circuit

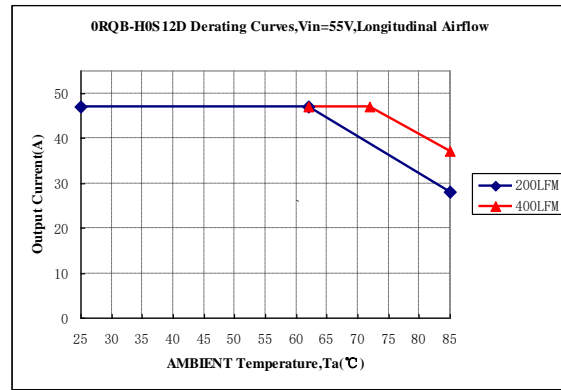
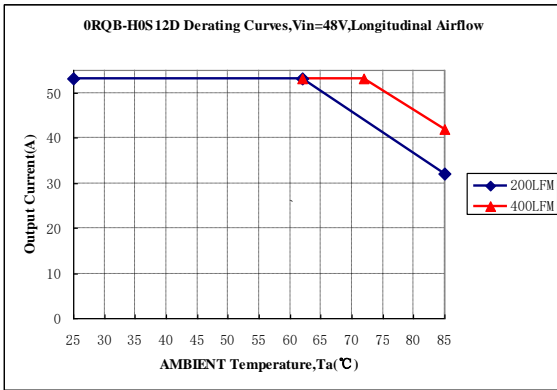
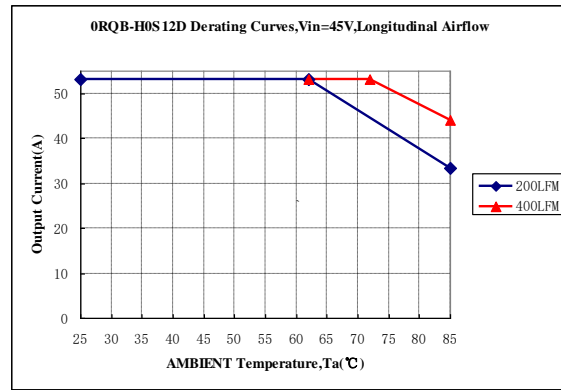
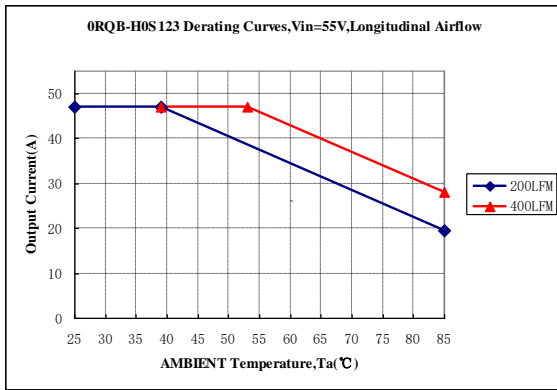


Permanently on

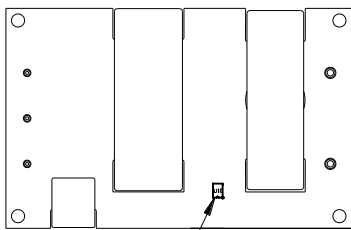
8. THERMAL DERATING CURVES

Maximum junction temperature of semiconductors derated to 120°C.

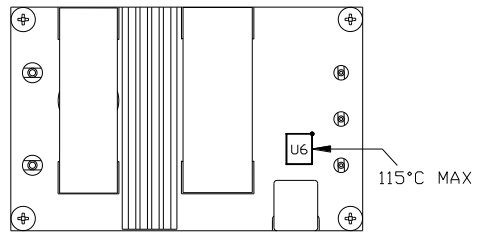




The OTP is achieved by temperature sensor U10 and it is in non-latch mode when the hottest component U6 reaches 115°C with 200LFM air flow correspondingly. It will restart automatically when the temperature falls down to 105°C. The protecting point will be varied a little under different conditions (air flow, ambient temperature, input voltage, load...).

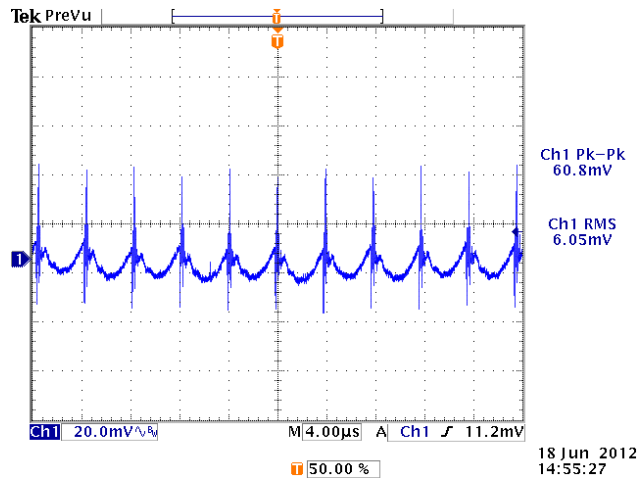


Temperature reference points on top side



Temperature reference points on bottom side

9. RIPPLE AND NOISE WAVEFORM



NOTE: Ripple and noise at full load, with a 1µF ceramic cap and a 10 µF Tan cap at output, Ta=25°C.

10. TRANSIENT RESPONSE WAVEFORMS

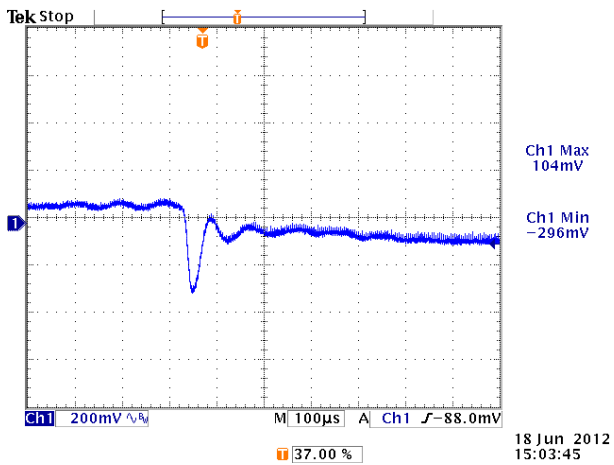


Figure 1. Vin= 48V 50%-75% Load Transients

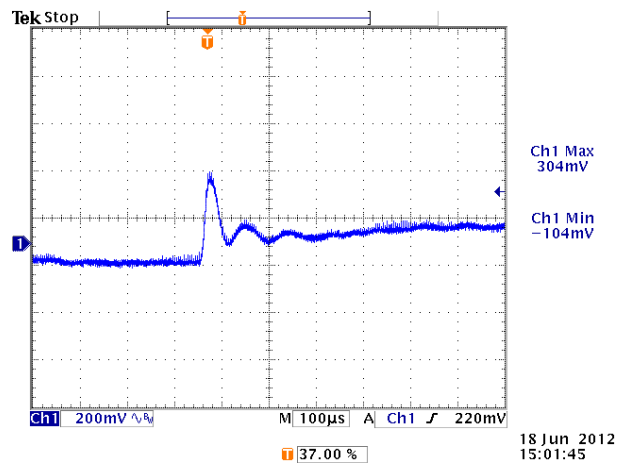


Figure 2. Vin= 48V 75%-50% Load Transients

NOTE: Transient Response at di/dt=1A/µs, with a 1µF ceramic capacitor and a 270µF AL. cap at output, Ta=25°C.

11. STARTUP & SHUTDOWN

TURN ON RISE TIME

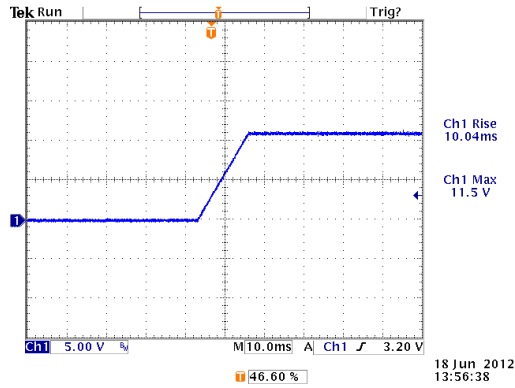


Figure 3. Test Condition: $V_{in}=48V$, $V_o=11.3V$, $I_o=53A$

TURN ON DELAY TIME

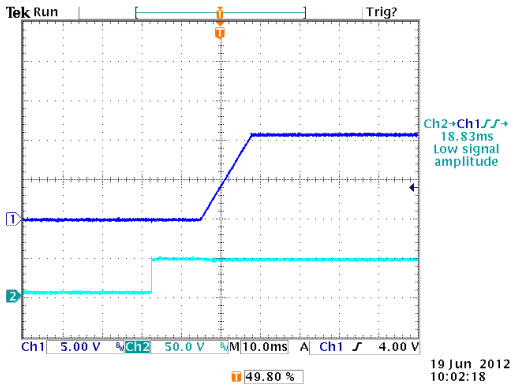


Figure 5. Startup from V_{in}
Ch1: V_o
Ch2: V_{in}
Test Condition: $V_{in}=48V$, $V_o=11.3V$, $I_o=53A$

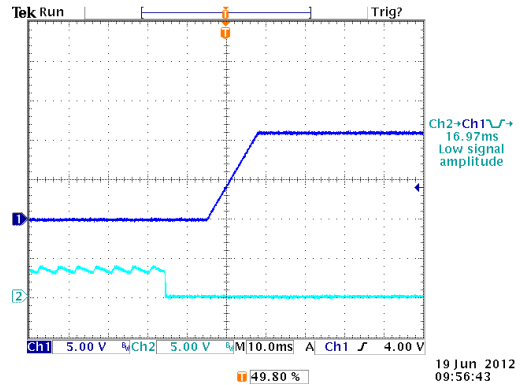


Figure 6. Startup from on/off
Ch1: V_o
Ch2: on/off
Test Condition: $V_{in}=48V$, $V_o=11.3V$, $I_o=53A$

SHUTDOWN

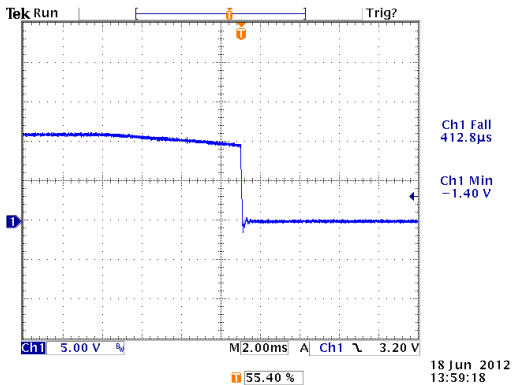


Figure 7. Shut down from V_{in}
Test Condition: $V_{in}=48V$, $V_o=11.3V$, $I_o=53A$

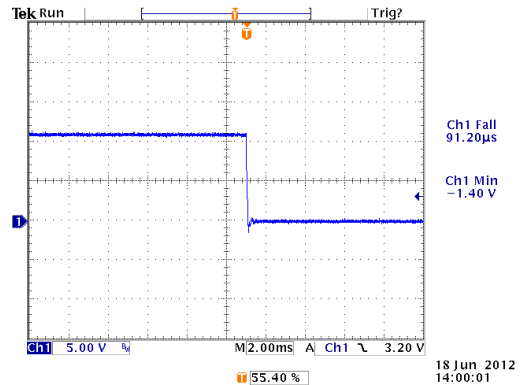


Figure 8. Shut down from on/off
Test Condition: $V_{in}=48V$, $V_o=11.3V$, $I_o=53A$

12. 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 milli-seconds. If the overcurrent condition persists beyond a few milliseconds, the module will shut down into hiccup mode and restart once every 400 ms. The module operates normally when the output current goes into specified range. The typical average output current is 3.11 A during hiccup.

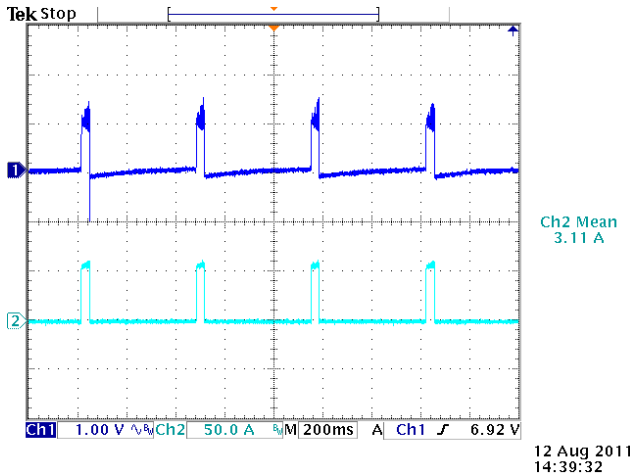


Figure 9. CH1: Output Voltage
CH2: Output Current Waveform
Test condition: $V_{in}=48V$

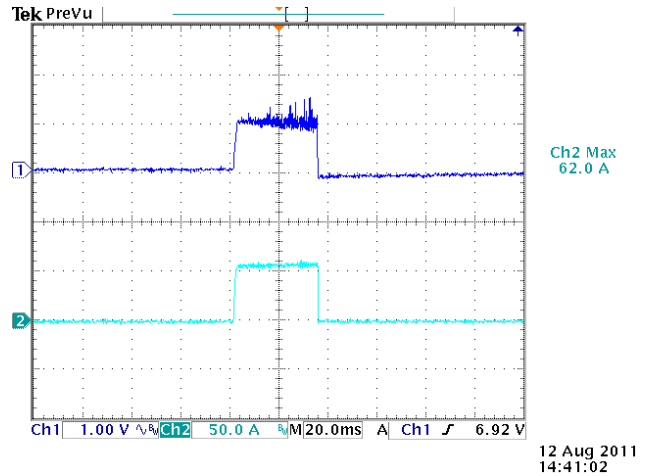
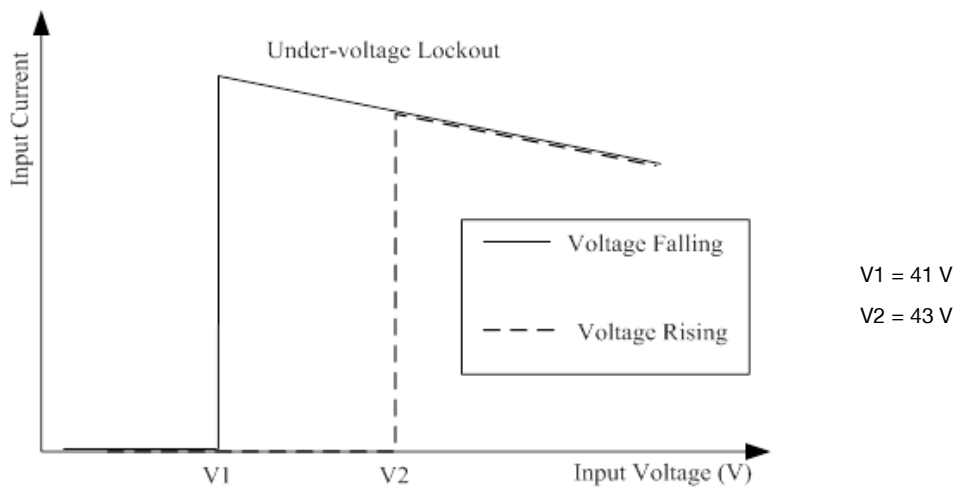


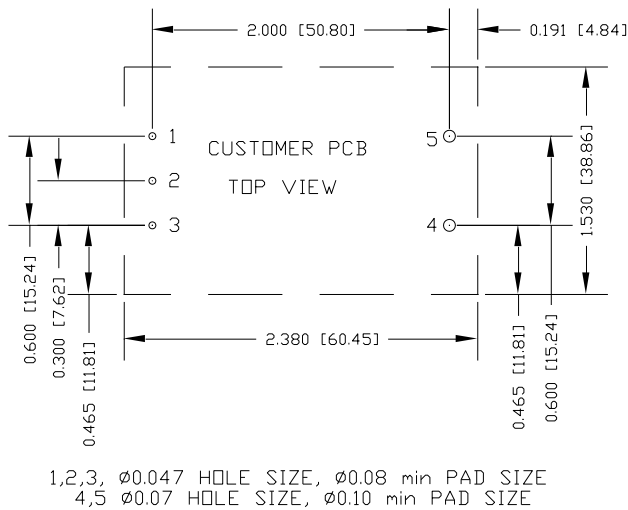
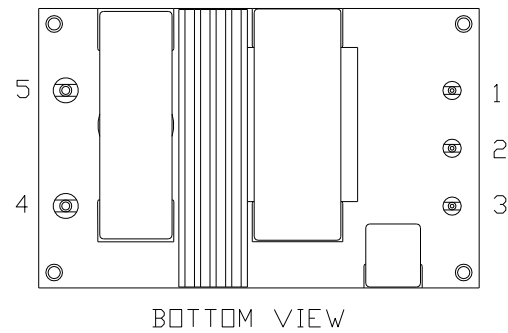
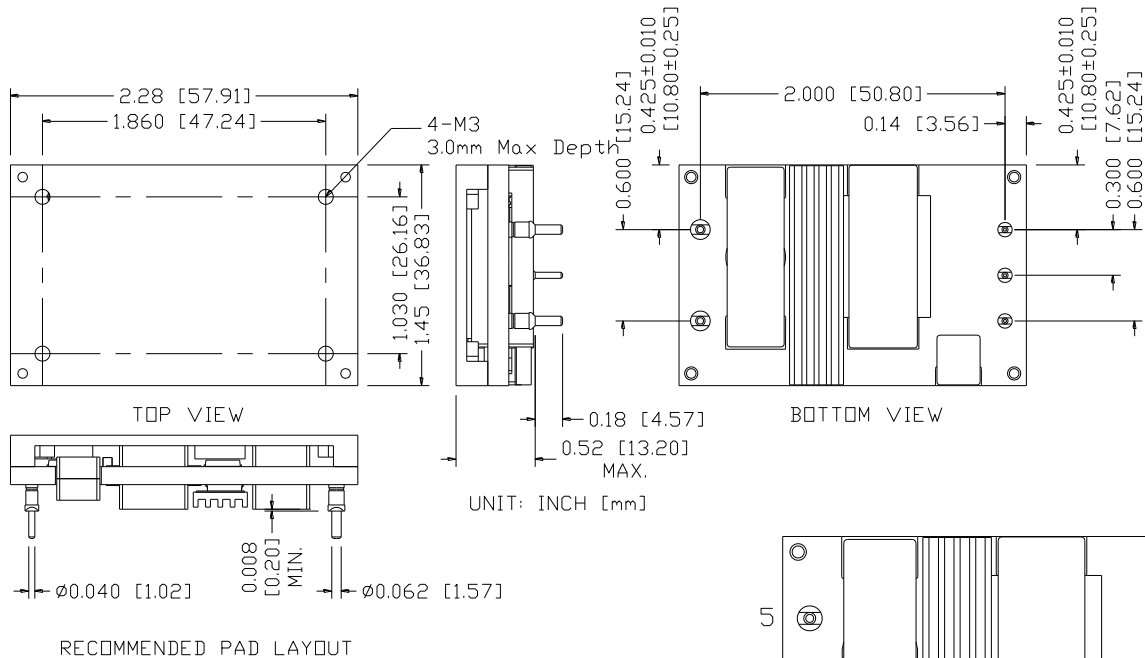
Figure 10. CH1: Output Voltage
CH2: Output Current Waveform
Expansion of on time portion of above figure

13. INPUT UNDER-VOLTAGE LOCKOUT



14. MECHANICAL OUTLINE

ORQB-HOS123



PIN CONNECTIONS

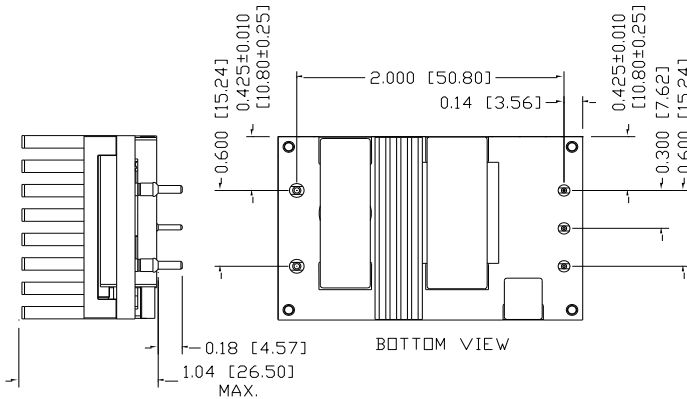
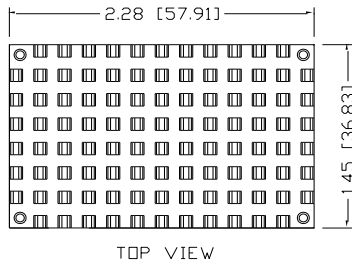
PIN	FUNCTION	PIN SIZE	PIN LENGTH
1	Vin(+)	0.040"	0.180"
2	Enable	0.040"	0.180"
3	Vin(-)	0.040"	0.180"
4	Vout(-)	0.062"	0.180"
5	Vout(+)	0.062"	0.180"

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.

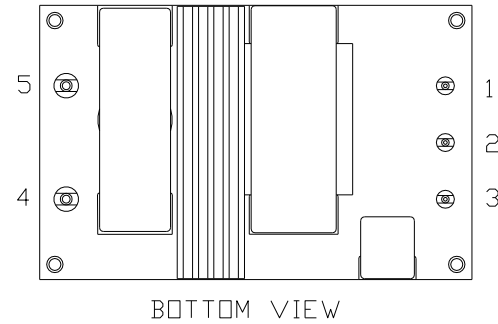
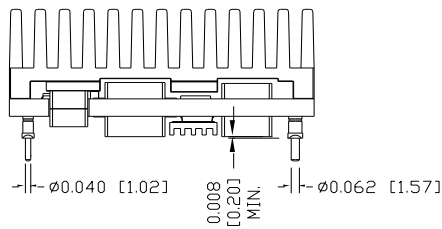
NOTES:

- 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).

ORQB-H0S12D

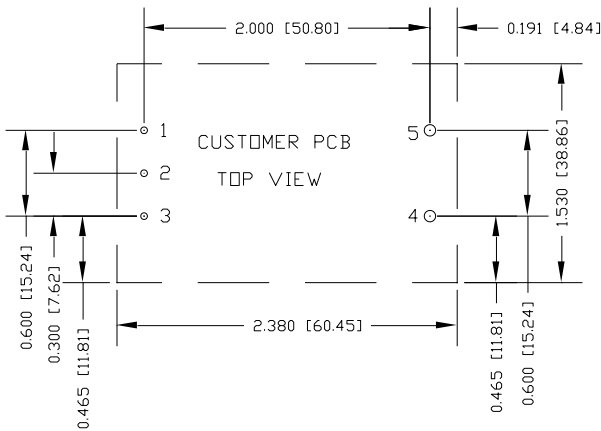


UNIT: INCH [mm]



PIN CONNECTIONS

PIN	FUNCTION	DIA.	LENGTH
1	Vin(+)	0.040"	0.180"
2	Enable	0.040"	0.180"
3	Vin(-)	0.040"	0.180"
4	Vout(-)	0.062"	0.180"
5	Vout(+)	0.062"	0.180"



1,2,3, Ø0.047 HOLE SIZE, Ø0.08 min PAD SIZE
4,5 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.

NOTES:

- 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).



Asia-Pacific
+86 755 298 85888

Europe, Middle East
+353 61 225 977

North America
+1 408 785 5200

15. REVISION HISTORY

DATE	REVISION	CHANGES DETAIL	APPROVAL
2012-07-26	A	First release	Zhao Tang
2012-08-16	B	Update Description, Output Voltage Set Point, Dimensions, Isolation characteristics and MD.	Zhao Tang
2012-09-21	C	Update Description, Output Current Range, Efficiency Data, and TD.	Zhao Tang
2012-12-12	D	Update TD.	Zhao Tang
2013-04-12	E	Add Output Voltage Range, Update Temperature Reference Points.	Zhao Tang
2014-09-10	F	Update Weight	Zhao Tang

For more information on these products consult: tech.support@psbel.com

NUCLEAR AND MEDICAL APPLICATIONS - Products are not designed or intended for use as critical components in life support systems, equipment used in hazardous environments, or nuclear control systems.

TECHNICAL REVISIONS - The appearance of products, including safety agency certifications pictured on labels, may change depending on the date manufactured. Specifications are subject to change without notice.



tech.support@psbel.com
belfuse.com/power-solutions