0RQB-E0S11B

Isolated DC-DC Converter

0RQB-E0S11B is an isolated DC/DC converter that operates from a nominal 54 VDC source. This unit provides up to 800 W output power from a nominal 54 VDC input. This unit is designed to be highly efficient and low cost.

Features include remote on/off, short circuit protection, over current protection, under voltage lockout and over temperature protection. The converter is provided in an industry standard quarter brick package.

Key Features & Benefits

- 48 – 60 VDC Input
- 10.8 V / 74 A Output
- Basic Isolation
- Input Under-Voltage Lockout
- High Efficiency
- Fixed Frequency (300 kHz)
- Output Over-Voltage Protection
- High Power Density
- OCP/SCP
- Low Cost
- Over Temperature Protection
- Remote ON/OFF
- Approved to IEC/EN 62368-1
- Approved to UL/CSA 62368-1
- Approved to IEC/EN 60950-1
- Approved to UL/CSA 60950-1
- Class II, Category 2, Isolated DC/DC Converter (refer to IPC-9592B)

RoHS Compliant

Applications

- Networking
- Computers and Peripherals
- Telecommunications

1. MODEL SELECTION

MODEL NUMBER	OUTPUT VOLTAGE	INPUT VOLTAGE	MAX. OUTPUT CURRENT	MAX. OUTPUT POWER	TYPICAL EFFICIENCY
0RQB-E0S11BG	10.8 VDC	48 – 60 VDC	74 A	800 W	96.8%

PART NUMBER EXPLANATION

0	R	QB	-	E0	S	11	B	G
Mounting Type	RoHS Status	Series Name		Output Power	Input Range	Output Voltage	Active Logic	Package
Though Hole Mount	RoHS	1/4th Brick		800 W	48 – 60 V	10.8 V	Active Low, with Baseplate	Tray Package

2. ABSOLUTE MAXIMUM RATINGS

PARAMETER	DESCRIPTION	MIN	TYP	MAX	UNITS
Continuous non-operating Input Voltage		-0.3	-	65	V
Remote On/Off		-0.3	-	10	V
I/O Isolation Voltage		-	-	2250	V
Ambient Temperature		-40	-	85	°C
Storage Temperature		-55	-	125	°C
Altitude		-	-	4000	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		48	54	60	V
Input Current (full load)		-	-	19	A
Input Current (no load)		-	125	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^2t Inrush Current Transient		-	-	3	A^2s
Turn-on Voltage Threshold		42	43.5	45	V
Turn-off Voltage Threshold		39	40.5	42	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 25 A on system board. Refer to the fuse manufacture's datasheet for further information.

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

4. OUTPUT SPECIFICATIONS

PARAMETER	DESCRIPTION	MIN	TYP	MAX	UNIT
Output Voltage Set Point	Vin = 54 V, Io = 50% load	10.692	10.800	10.908	V
Output Voltage	Over entire operating input voltage range, resistive load and temperature conditions until end of life	10.584	-	11.016	V
Load Regulation	Vin = 48 ~ 60 V, Io = 0 ~ 100% load	-	20	70	mV
Line Regulation	Vin = 48 ~ 60 V, Io = 100% load	-	20	80	mV
Regulation Over Temperature	Vin = 54 V, Io = 100% load over all ambient temperature condition	-	100	200	mV
Output Ripple and Noise (pk-pk)	Vin = 54 V, Io = 100% load, 0 – 20 MHz BW, with a 1 µF ceramic capacitor and a 270 µF AL. cap at output	-	50	150	mV
Output Ripple and Noise (rms)		-	10	20	mV
Ripple and Noise (pk-pk) under worst case	Over entire operating input voltage range, load and ambient temperature condition	-	-	200	mV
Output Current Range		0	-	74	A
Output DC Current Limit		79	84	89	A
Short Circuit Surge Transient		-	-	4	A^2s
Rise Time		-	15	20	ms
Turn on Time	Enable form Vin	-	25	40	ms
	Enable form ON/OFF	-	25	40	
Overshoot at Turn on		-	0	3	%
Output Capacitance		270	-	10000	µF
Transient Response					
△V 50%~75% of Max Load	di/dt = 1 A/µs, Vin = 54 VDC, with a 1 µF ceramic capacitor and a 270 µF AL. cap at output.	-	350	500	mV
Settling Time		-	100	200	µs
△V 75%~50% of Max Load		-	350	500	mV
Settling Time		-	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 = 54 V, full load	95.8	96.8	-	%
Switching Frequency		280	300	320	kHz
Over Temperature Protection		-	130	-	°C
Over Voltage Protection		-	-	14	V
FIT	Calculated Per Bell Core SR-332 (Vin = 54 V, Vo = 10.8 V, Io = 74 A, FIT = 10^9/MTBF)	-	91.74	-	-
Weight		-	74	-	g
Dimensions (L × W × H)			2.30 ×1.45 × 0.57 58.42 × 36.83 × 14.48		inch mm
Isolation Characteristics					
Input to Output		-	-	2250	V
Input to Case		-	-	2250	V
Output to Case		-	-	500	V
Isolation Resistance		10M	-	-	ohm
Isolation Capacitance		-	2700	-	pF

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

6. EFFICIENCY DATA

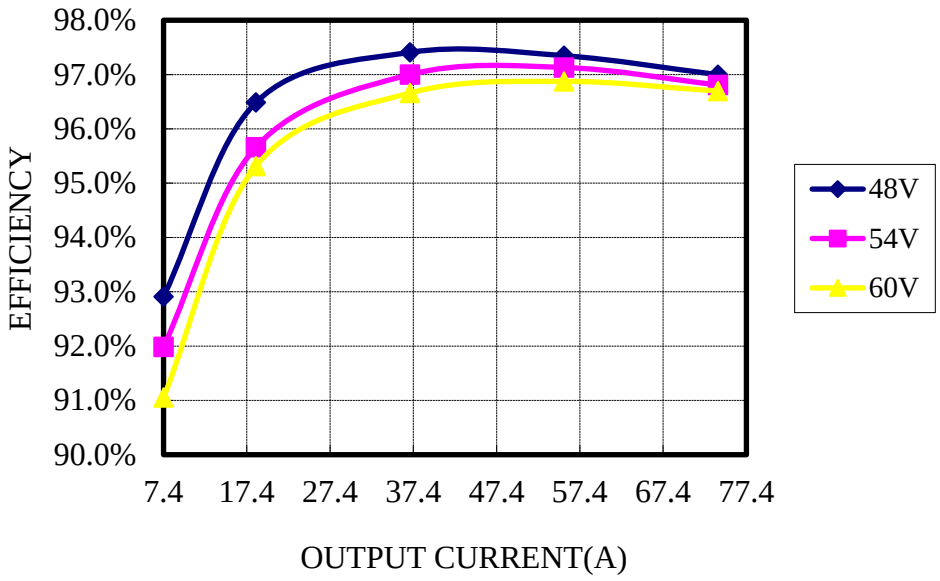

Figure 1. Efficiency vs. load current and input voltage at Ta = 25°C

7. REMOTE ON/OFF

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

Recommended Remote On/Off Circuit for Active Low

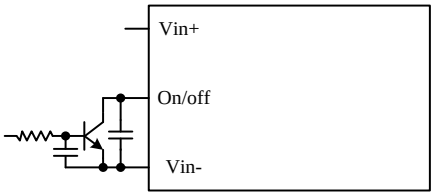

Figure 2. Control with open collector/drain circuit

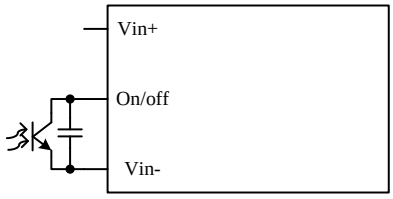

Figure 3. Control with photocoupler circuit

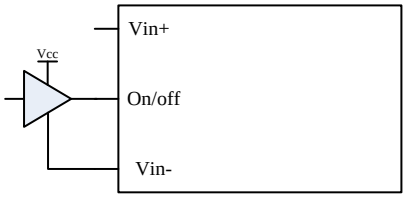

Figure 4. Control with logic circuit

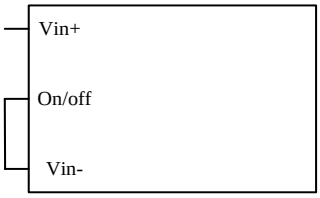

Figure 5. Permanently on

8. RIPPLE AND NOISE WAVEFORM

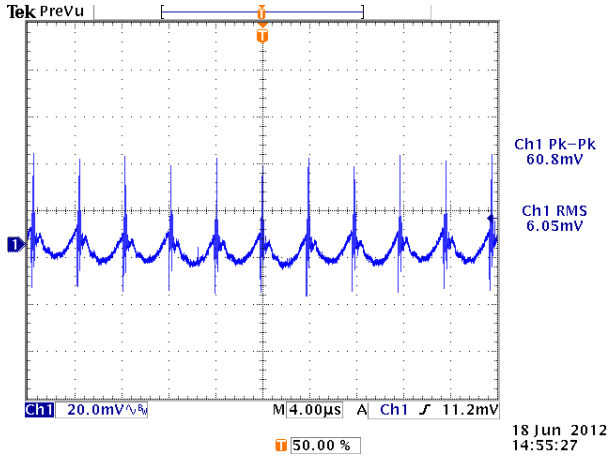

Figure 6. Ripple and noise waveform

NOTE: Ripple and noise at full load, 54 VDC input, 10.8 VDC / 74 A output and Ta = 25°C, and with a 1 µF ceramic cap and a 270 µF AL. cap at output.

9. TRANSIENT RESPONSE WAVEFORMS

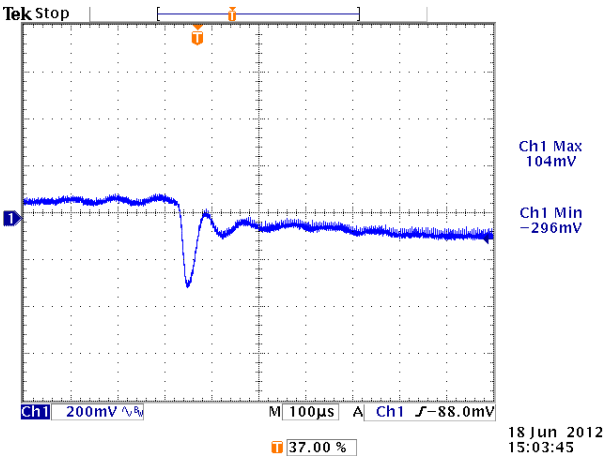

Figure 7. 50%-75% Load Transients at Vin = 54 V @ Ta = 25°C

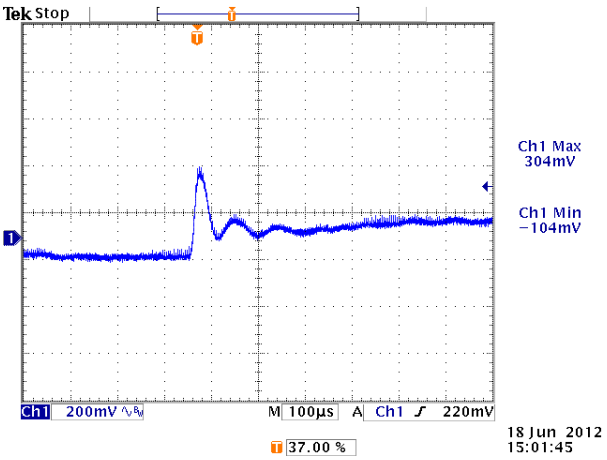

Figure 8. 75%-50% Load Transients at Vin = 54 V @ Ta = 25°C

NOTE: Transient Response at Vin = 54 V, di/dt = 1 A/µs, 1 µF ceramic cap and 270 µF AL. cap at output, Ta = 25°C.

10. STARTUP & SHUTDOWN

Rise time

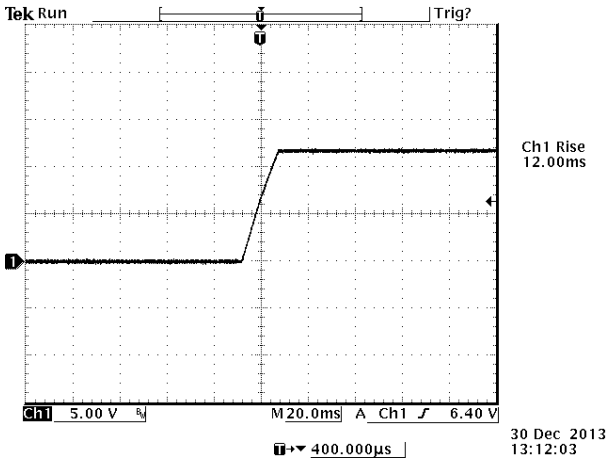

Figure 9. Vout = 10.8 V / 74 A @ Vin = 54V, Ta = 25°C, Cext = 0

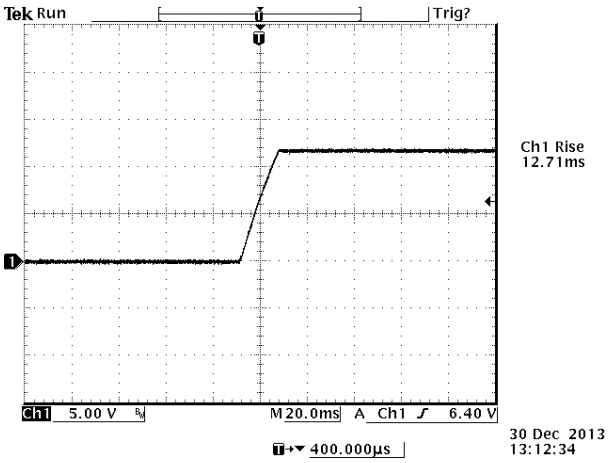

Figure 10. Vout = 10.8 V / 74 A @ Vin = 54 V, Ta = 25°C, Cext = 10000 µF

Startup time

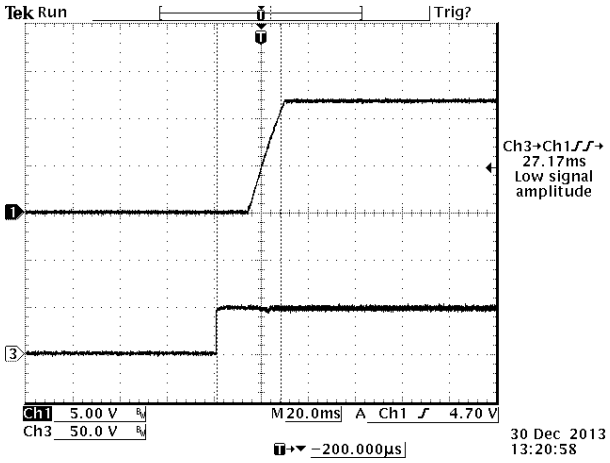

Figure 11. Startup from Vin
Ch1: Vo
Ch2: Vin
Vout = 10.8 V / 74 A @ Vin = 54 V, Ta = 25°C

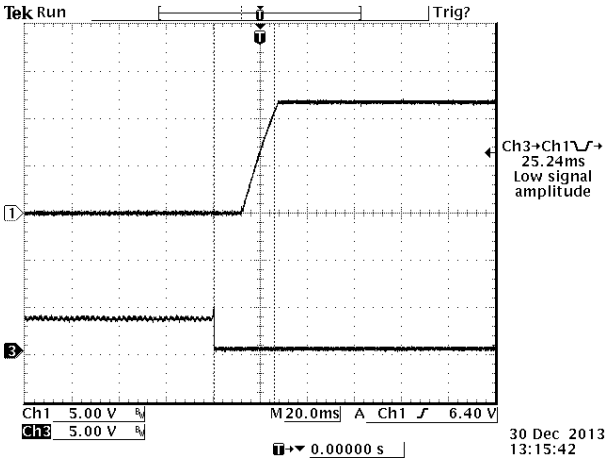

Figure 12. Startup from ON/OFF
Ch1: Vo
Ch2: ON/OFF
Vout = 10.8 V / 74 A @ Vin = 54 V, Ta = 25°C

Shutdown

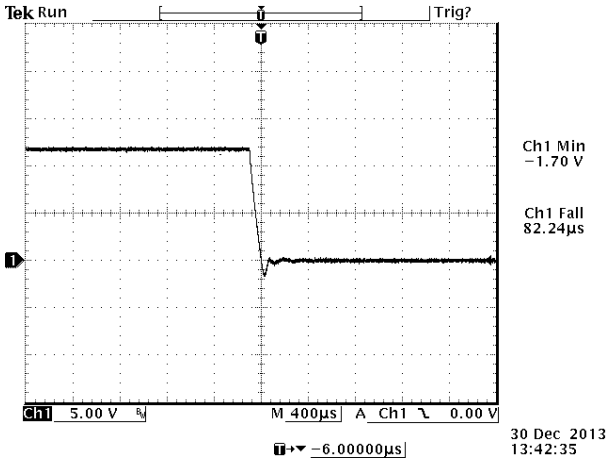

Figure 13. Vout = 10.8 V / 74 A @ Vin = 54 V, Ta = 25°C

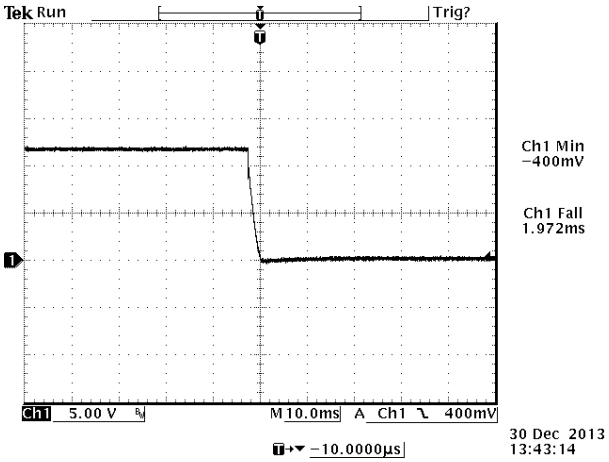

Figure 14. Vout = 10.8 V / 74 A @ Vin = 54 V, Ta = 25°C, Cext = 10000 µF

11. OVER CURRENT PROTECTION

To provide protection in a fault output overload condition, the module is equipped with internal current-limiting circuitry which can endure current limiting for a few milliseconds. If the over current 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.

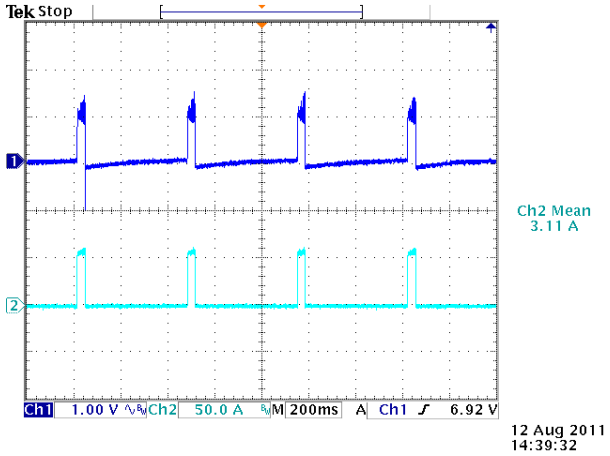

Figure 15. CH1: Output Voltage
CH2: Output Current Waveform
***Test condition:** Vin = 54 V @ Ta = 25°C*

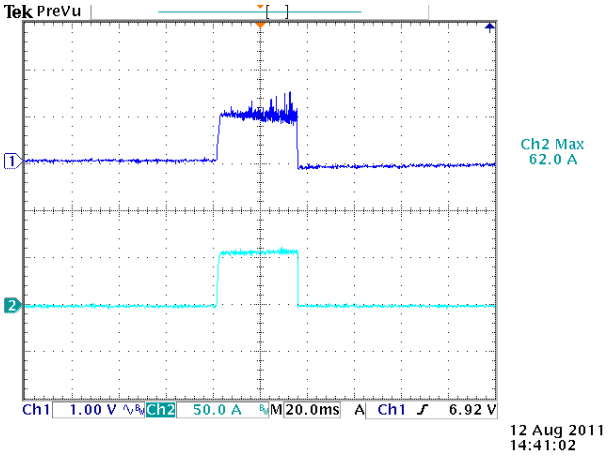

Figure 16. CH1: Output Voltage
CH2: Output Current Waveform
Expansion of on time portion of above figure

12. INPUT UNDER-VOLTAGE LOCKOUT

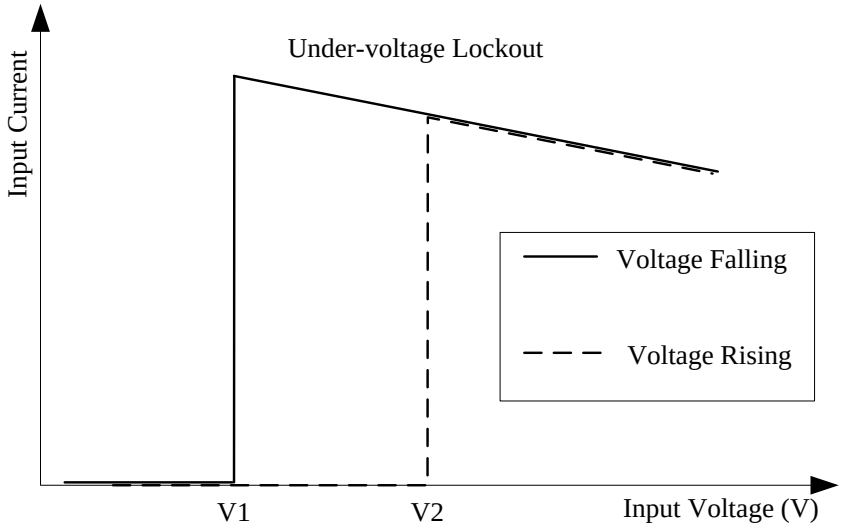

Figure 17. Input under-voltage lockout

V1 = 40.5 V

V2 = 43.5 V

13. THERMAL DERATING CURVE

The OTP is achieved by temperature sensor U10 and it's in non-latch mode when the hottest component Q9 reaches 130°C with 400 LFM air flow correspondingly. It will restart automatically when the temperature falls to 120°C. The protecting point will be varied a little under different conditions (air flow, ambient temperature, input voltage, load...).

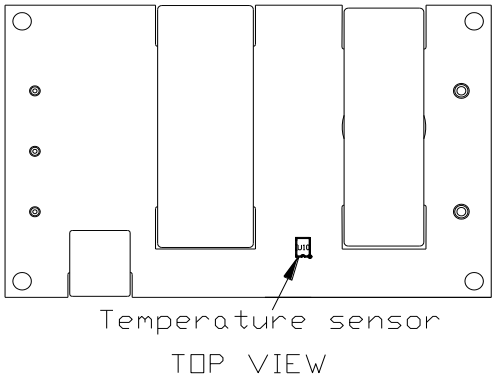

Figure 18. Temperature reference points on top side

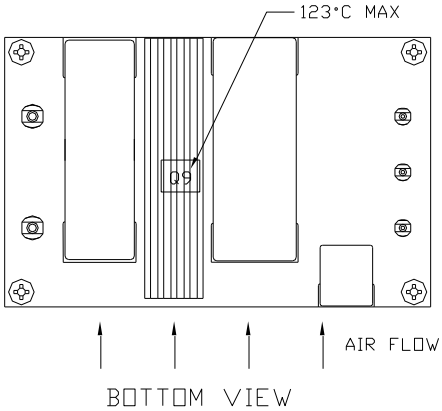

Figure 19. Airflow direction and Temperature reference points on bottom side

Thermal derating curves for 0RQB-E0S11B (without extra heat sink)

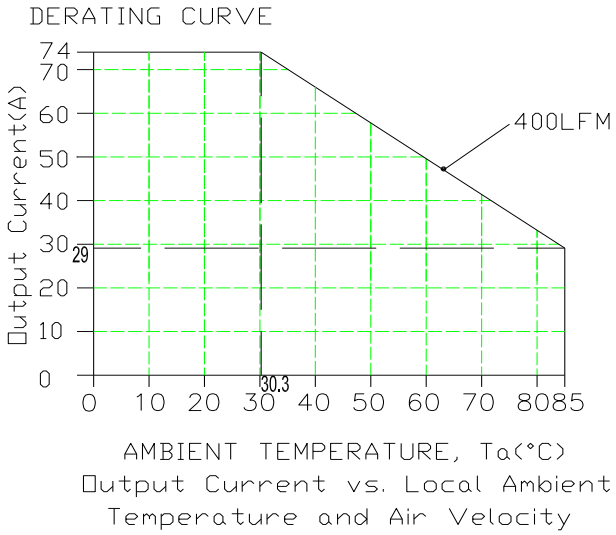

Figure 20. Thermal derating curve for 0RQB-E0S11B (without extra heat sink)

NOTE: Output power vs. ambient temperature and air velocity @ Vin = 54 V (Airflow direction from Vin(-) to Vin(+)).

Derating curves for 0RQB-E0S11B (with extra heat sink)

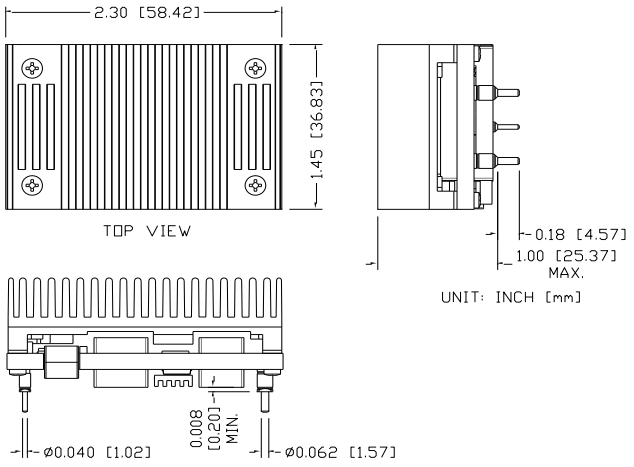

Figure 21. 0RQB-E0S11B with extra heat sink

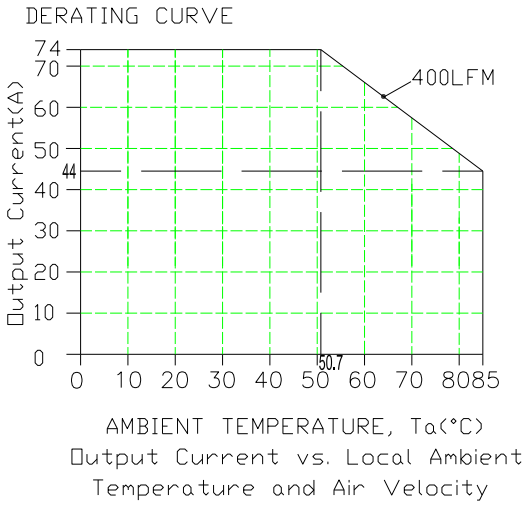

Figure 22. Derating curves for 0RQB-E0S11B (with extra heat sink)

NOTE: Output power vs. ambient temperature and air velocity @ Vin = 54 V (Airflow direction from Vin(-) to Vin(+)).

14. MECHANICAL DIMENSIONS

OUTLINE

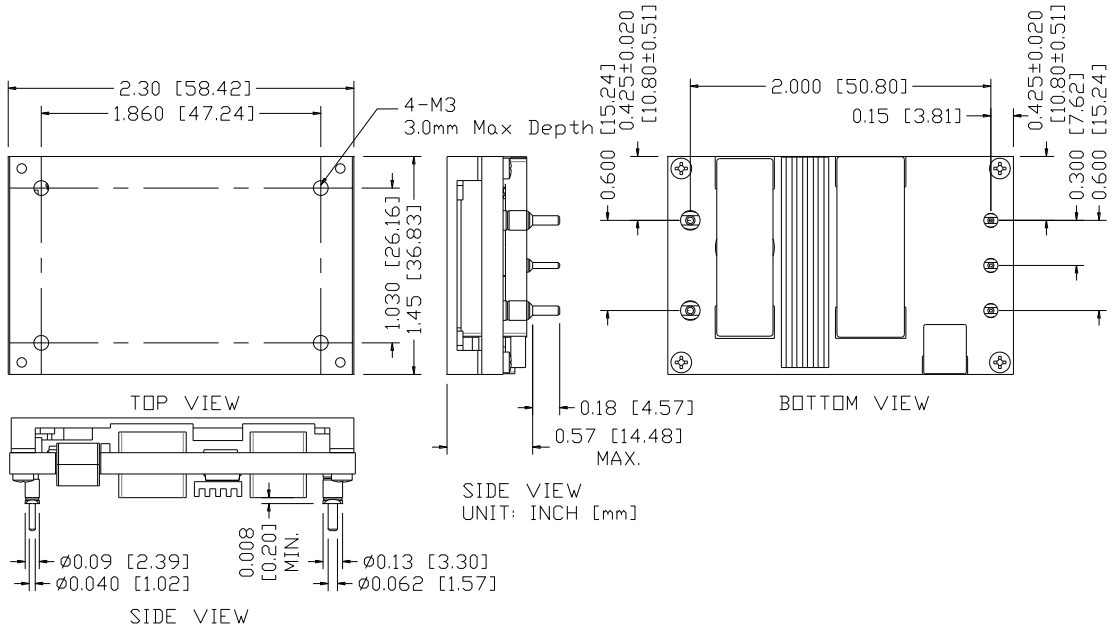

Figure 23. Outline

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:

1) All Pins: Material – Copper Alloy;
Finish – 3 micro inches minimum Gold over 50 micro inches minimum Nickel plate.
2) Un-dimensioned components are shown for visual reference only.
3) All dimensions in inch [mm]; Tolerances: x.xx +/-0.020 inch [0.51 mm]; x.xxx +/-0.010 inch [0.25 mm].

PIN DEFINITIONS

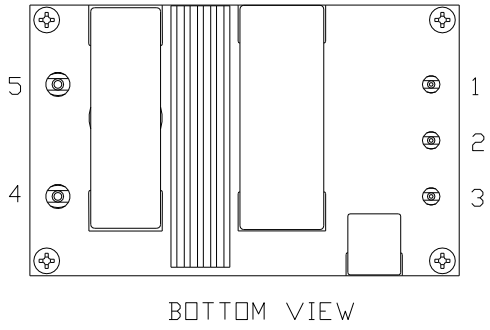

Figure 24. Pins

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''

RECOMMENDED PAD LAYOUT

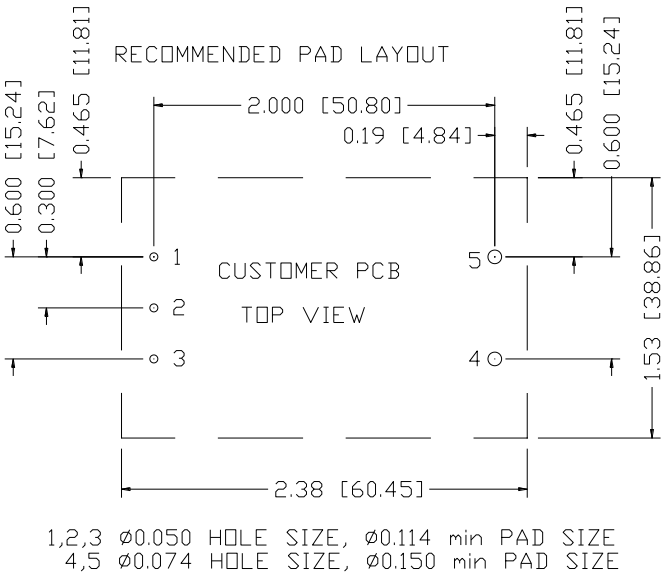

Figure 25. Recommended pad layout

15. REVISION HISTORY

DATE	REVISION	CHANGES DETAIL	APPROVAL
2014-10-17	A	First release	Z.Tang
2015-3-19	B	Add FIT, Weight and Thermal Derating Curve	S.Wang
2016-03-15	C	Update I/O Isolation Voltage to 2250V max	S.Wang
2018-05-28	AD	Update Key Features, PN. Explanation, Output Specs, General Specs, Remote Off	S.Wang
2019-06-18	AE	Update safety certification.	F.Tao
2020-10-14	AF	Delete 0RQB-E0S11D. Update safety information and altitude.	XF.Jiang
2021-05-20	AG	Add object ID. Update outline and recommended pad layout. Add thermal derating curve notes about airflow direction information.	XF.Jiang

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

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