0RQB-C0U Series
Isolated DC-DC Converter

The 0RQB-C0U Series are isolated DC/DC converters that operate from a nominal 48 VDC source. These units will provide up to 100 W of output power from a nominal 48 VDC input. These units are designed to be highly efficient and low cost. Typical efficiency of 12 VDC output at 48 VDC input and full load is 91%.

Features include remote on/off, over current protection and under-voltage lockout. These converters are provided in an industry standard quarter brick package.

RoHS Compliant

Key Features & Benefits

- 48 VDC Input
- 12 VDC/8.35 A, 5 VDC/20 A, 3.3 VDC/25 A, 1.2-2.5 VDC/30 A Output
- Isolated
- High Efficiency
- High Power Density
- Low Cost
- Input Over / Under Voltage Lockout
- Fixed Frequency (285 kHz)
- Active Low/High (Option)
- Output Over-Voltage Shutdown
- OCP/SCP
- Over Temperature Protection
- Remote On/Off
- Output Voltage Trim
- Positive/Negative Remote Sense
- Basic Isolation
- Approved to UL/CSA 60950-1
- Approved to UL/CSA 62368-1 (pending)

Applications

- Networking
- Computers and Peripherals
- Telecommunications

1. MODEL SELECTION

MODEL NUMBER ACTIVE HIGH	MODEL NUMBER ACTIVE LOW	OUTPUT VOLTAGE	INPUT VOLTAGE	MAX. OUTPUT CURRENT	MAX. OUTPUT POWER	TYPICAL EFFICIENCY
0RQB-C0U120	0RQB-C0U12L	12 VDC	18 V - 75 V	8.35 A	100 W	91%
0RQB-C0U050	0RQB-C0U05L	5.0 VDC	18 V - 75 V	20 A	100 W	90%
0RQB-C0U033	0RQB-C0U03L	3.3 VDC	18 V - 75 V	25 A	82.5 W	90%
0RQB-C0U025	0RQB-C0U02L	2.5 VDC	18 V - 75 V	30 A	75 W	89.5%
0RQB-C0UV80	0RQB-C0UV8L	1.8 VDC	18 V - 75 V	30 A	54 W	85%
0RQB-C0UV50	0RQB-C0UV5L	1.5 VDC	18 V - 75 V	30 A	45 W	83%
0RQB-C0UV20	0RQB-C0UV2L	1.2 VDC	18 V - 75 V	30 A	36 W	80%

NOTE: Add “G” suffix at the end of the model numbers listed above to indicate “Tray Package”.

2. ABSOLUTE MAXIMUM RATINGS

PARAMETER	DESCRIPTION	MIN	TYP	MAX	UNITS
Input Voltage (Continuous)	Non-Operating Operating	-0.3 -	- -	80 75	V V
Remote On/Off		-0.3	-	18	V
I/O Isolation Voltage		-	-	2000	V
Ambient Temperature		-40	-	85	°C
Storage Temperature		-55	-	125	°C

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

3. INPUT SPECIFICATIONS

PARAMETER	DESCRIPTION	MIN	TYP	MAX	UNIT
Input Voltage		18	48	75	V
Input Current (full load)	V_O = 12 V V_O = 5.0 V V_O = 3.3 V V_O = 2.5 V V_O = 1.8 V V_O = 1.5 V V_O = 1.2 V	- - - - - - -	- - - - - - -	7.0 7.0 6.0 5.5 4.0 3.5 3.0	A
Input Current (no load)		-	100	180	mA
Remote Off Input Current		-	10	15	mA
Input Reflected Ripple Current (pk-pk)	Tested with simulated source impedance of 10 µH, 5 Hz to 20 MHz BW; use a 0.47 µF/100 V ceramic cap and a 100 µF /100 V electrolytic cap with ESR = 1 ohm max. at 200 kHz at 25 °C.	-	20	40	mA
Input Reflected Ripple Current (rms)		-	5	10	mA
I^2t Inrush Current Transient		-	0.05	0.1	A^2s
Turn-on Voltage Threshold		16.5	17.0	17.5	V
Turn-off Voltage Threshold		15.5	16.0	16.5	V
Input Over Voltage Lockout		76	78	80	V

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

4. OUTPUT SPECIFICATIONS

PARAMETER	DESCRIPTION		MIN	TYP	MAX	UNIT
Output Voltage Set Point	Vin = 48 V, Io = 50% full load	V_O = 12 V	11.820	12.00	12.180	V
		V_O = 5.0 V	4.925	5.00	5.075	
		V_O = 3.3 V	3.251	3.30	3.360	
		V_O = 2.5 V	2.455	2.50	2.545	
		V_O = 1.8 V	1.773	1.80	1.827	
		V_O = 1.5 V	1.448	1.50	1.523	
		V_O = 1.2 V	1.182	1.20	1.218	
Line Regulation		V_O = 12 V	-	±24	±120	mV
		V_O = 5.0 V	-	±5	±25	
		V_O = 3.3 V	-	±4	±15	
		V_O = 2.5 V	-	±4	±10	
		V_O = 1.8 V - 1.2 V	-	±3	±6	
Load Regulation		V_O = 12 V	-	±30	±80	mV
		V_O = 5.0 V	-	±10	±25	
		V_O = 3.3 V - 2.5 V	-	±8	±15	
		V_O = 1.8 V - 1.2 V	-	±5	±10	
Regulation Over Temperature (-40 °C to +85 °C)		V_O = 12 V	-	±60	±100	mV
		V_O = 5.0 V	-	±40	±65	
		V_O = 3.3 V	-	±30	±50	
		V_O = 2.5 V	-	±20	±50	
		V_O = 1.8 V - 1.2 V	-	±15	±30	
Output Current Range		V_O = 12 V	0	-	8.35	A
		V_O = 5.0 V	0	-	20	
		V_O = 3.3 V	0	-	25	
		V_O = 2.5 - 1.2 V	0	-	30	
Current Limit Threshold		V_O = 12 V	9.2	10.5	13	A
		V_O = 5.0 V	24	26	30	
		V_O = 3.3 V	27	32	35	
		V_O = 2.5 V	35	40	45	
		V_O = 1.8 V - 1.2 V	-	36	-	
Short Circuit Surge Transient			-	3	5	A^2s
Ripple and Noise* (rms)	Vin = 48 V; Test conditions: 0-20 MHz BW, with a 1 µF ceramic capacitor and a 10 µF Tantalum capacitor at the output.	V_O = 12 V	-	30	50	mV
		V_O = 5.0 V	-	25	40	
		V_O = 3.3 V - 2.5 V	-	20	40	
		V_O = 1.8 V - 1.2 V	-	15	30	
	Vin = 24 V	V_O = 12 V	-	25	40	mV
		V_O = 5.0 V	-	20	30	
		V_O = 3.3 V	-	15	25	
		V_O = 2.5 V - 1.2 V	-	10	20	
Ripple and Noise* (pk-pk)	Vin = 48 V	V_O = 12 V	-	100	150	mV
		V_O = 5.0 V	-	75	120	
		V_O = 3.3 V - 2.5 V	-	50	100	
		V_O = 1.8 V - 1.2 V	-	40	80	
	Vin = 24 V	V_O = 12 V	-	75	120	mV
		V_O = 5.0 V	-	50	100	
		V_O = 3.3 V	-	35	70	
		V_O = 2.5 V	-	30	60	
		V_O = 1.8 V - 1.2 V	-	25	50	
Turn on Time			10	-	100	ms
Overshoot at Turn on			-	0	5	%
Output Capacitance		V_O = 12 V	0	-	1200	µF
		V_O = 5.0 V	0	-	6800	
		V_O = 3.3 V	0	-	15000	
		V_O = 2.5 V - 1.2 V	0	-	20000	

TRANSIENT RESPONSE							
50% ~ 75% Max Load	Overshoot	Test conditions: di/dt = 0.1 A/ µs, Vin = 48 V, with a 1 µF ceramic capacitor and a 10 µF Tantalum capacitor at the output.	V_O = 12.0 V	-	360	480	mV
	Settling Time			-	100	250	µs
75% ~ 50% Max Load	Overshoot			-	360	480	mV
	Settling Time			-	150	250	µs
50% ~ 75% Max Load	Overshoot		V_O = 5.0 V	-	200	300	mV
	Settling Time			-	100	150	µs
75% ~ 50% Max Load	Overshoot			-	200	300	mV
	Settling Time			-	100	150	µs
50% ~ 75% Max Load	Overshoot		V_O = 3.3 V	-	150	200	mV
	Settling Time			-	100	100	µs
75% ~ 50% Max Load	Overshoot			-	150	200	mV
	Settling Time			-	100	100	µs
50% ~ 75% Max Load	Overshoot		V_O = 2.5 V	-	150	200	mV
	Settling Time			-	85	100	µs
75% ~ 50% Max Load	Overshoot			-	150	200	mV
	Settling Time			-	85	100	µs
50% ~ 75% Max Load	Overshoot		V_O = 1.8 V – 1.2 V	-	50	80	mV
	Settling Time			-	100	150	µs
75% ~ 50% Max Load	Overshoot			-	50	80	mV
	Settling Time			-	100	150	µs

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

5. GENERAL SPECIFICATIONS

PARAMETER	DESCRIPTION		MIN	TYP	MAX	UNIT
Efficiency	Vin = 48 V, full load, Ta = 25 °C	V_O = 12 V V_O = 5.0 V V_O = 3.3 V V_O = 2.5 V V_O = 1.8 V V_O = 1.5 V V_O = 1.2 V	88 88 88 88 - - -	91 90 90 89.5 85 83 80	- - - - - - -	%
Efficiency	Vin = 24 V, full load, Ta = 25 °C	V_O = 12 V V_O = 5.0 V V_O = 3.3 V V_O = 2.5 V V_O = 1.8 V V_O = 1.5 V V_O = 1.2 V	- - 89 - - - -	92 91 91 87 85 83 80	- - - - - - -	%
Switching Frequency			240	285	320	kHz
Isolation Capacitance			-	1500	-	pF
Input to Output Isolation Voltage			-	-	2000	V
Remote Sense Compensation	The total voltage increased by trim and remote sense should not exceed 10% Vo.		-	-	10	% Vo
Output Voltage Trim Range			80	-	110	% Vo
Over Temperature Protection			-	-	125	°C
Over Voltage Protection	Vin = 48 V, full load, Hiccup mode		-	130	-	% Vo
Weight			-	40	-	g
Dimensions (L × W × H)				2.30 x 1.45 x 0.395		inch
				58.42 x 36.83 x 10.04		mm

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

6. CONTROL SPECIFICATIONS

PARAMETER		DESCRIPTION	MIN	TYP	MAX	UNIT
REMOTE ON/OFF						
Signal Low (Unit On)	Active Low	0RQB-C0UxxL. The remote on/off pin open, Unit off.	-0.3	-	0.8	V
Signal High (Unit Off)			2.4	-	18	
Signal Low (Unit Off)	Active High	0RQB-C0Uxx0. The remote on/off pin open, Unit on.	-0.3	-	0.8	V
Signal High (Unit On)			2.4	-	18	
Current Sink			0	-	0.75	mA

7. OUTPUT TRIM EQUATIONS

Equations for calculating the trim resistor are shown below (Unit: kΩ). The Trim Down resistor should be connected between the Trim pin and Ground pin. The Trim Up resistor should be connected between the Trim pin and the Vout. Only one of the resistors should be used for any given application.

For Vo = 1.5 V – 12 V:

$$Rtrimdown = \frac{511}{|delta|} - 10.22$$

$$Rtrimup = \frac{(100 + delta) \cdot Vo \cdot 5.11 - 626}{1.225 \cdot delta} - 10.22$$

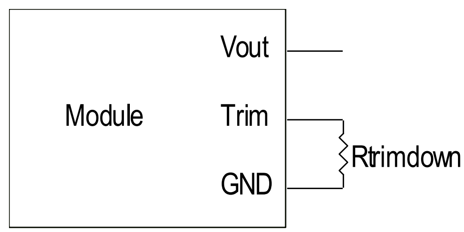

Figure 1. Trim down circuit

For Vo = 1.2 V:

$$Rtrimdown = \frac{511}{|delta|} - 10.22$$

$$Rtrimup = \frac{(100 + delta) \cdot Vo \cdot 5.11 - 313}{0.6125 \cdot delta} - 10.22$$

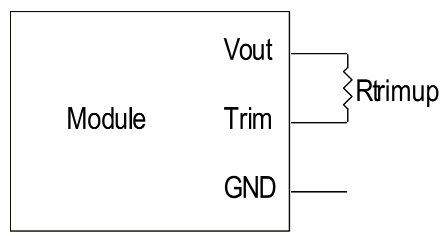

Figure 2. Trim up circuit

NOTES:

$$delta = \frac{(Vo\_req - Vo)}{Vo} \times 100[\%]$$

Vo_req = Desired (trimmed) output voltage [V]; Vo = output voltage

8. EFFICIENCY DATA

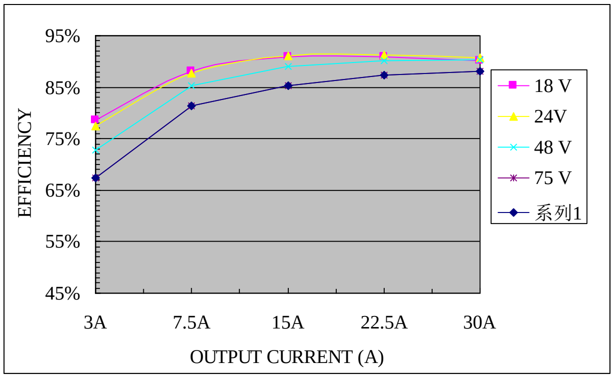

Figure 3. Vo = 2.5 V

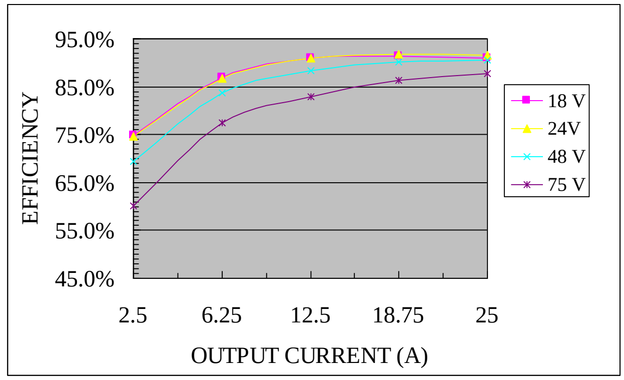

Figure 4. Vo = 3.3 V

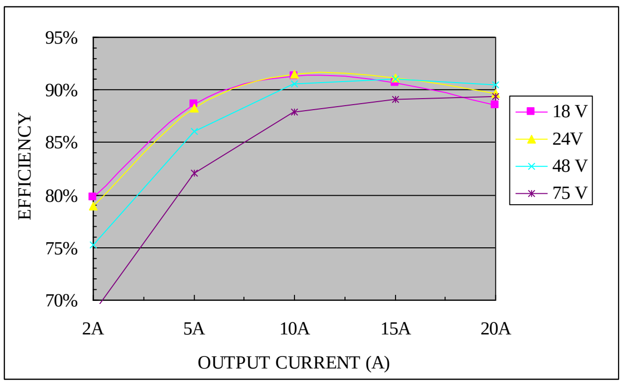

Figure 5. Vo = 5 V

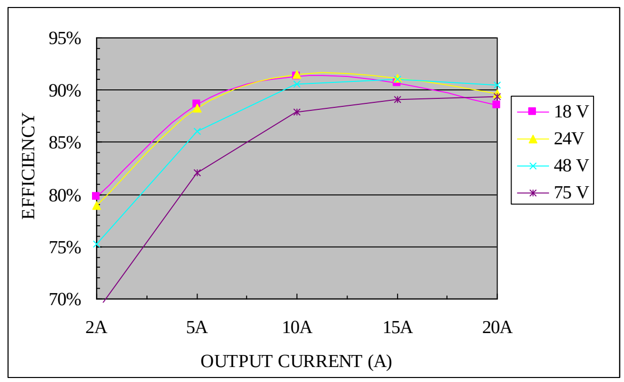

Figure 6. Vo = 12 V

9. THERMAL DERATING CURVES

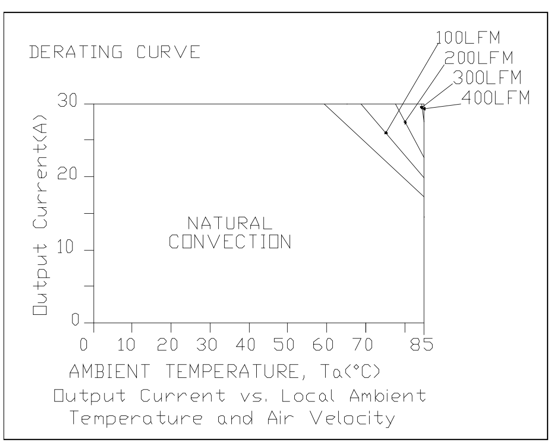

Figure 7. Vo = 2.5 V, Vin = 48 V

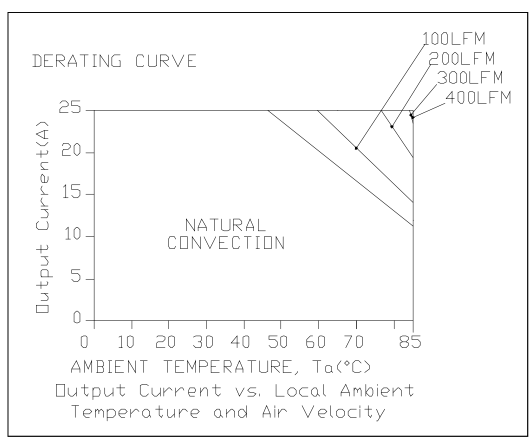

Figure 8. Vo = 3.3 V, Vin = 48 V

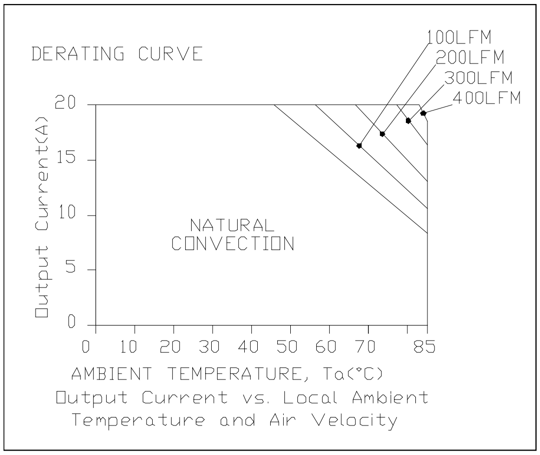

Figure 9. Vo = 5.0 V, Vin = 48 V

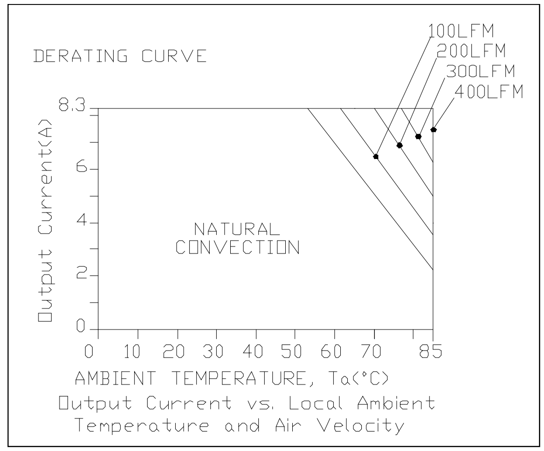

Figure 10. Vo = 12 V, Vin = 48 V

10. RIPPLE AND NOISE WAVEFORMS

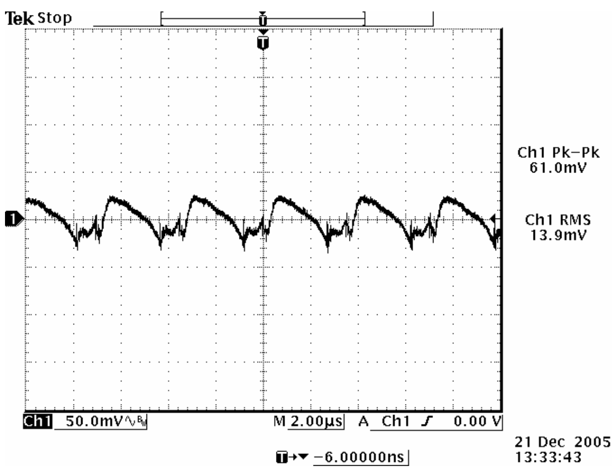

Figure 11. 2.5 V / 30 A output

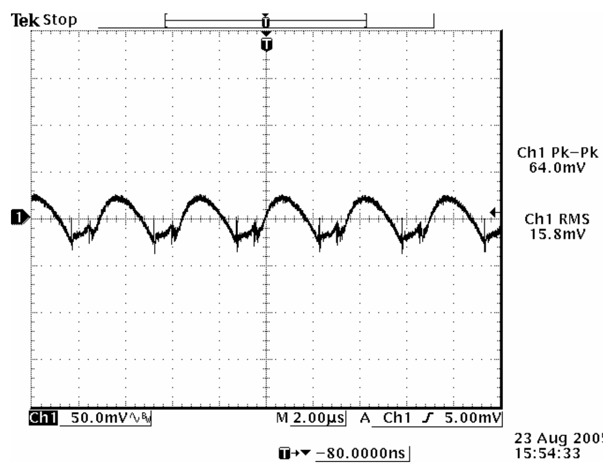

Figure 12. 3.3 V / 25 A output

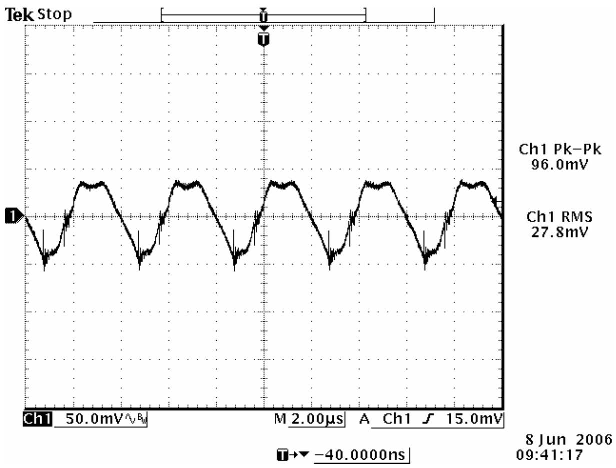

Figure 13. 5.0 V / 20 A output

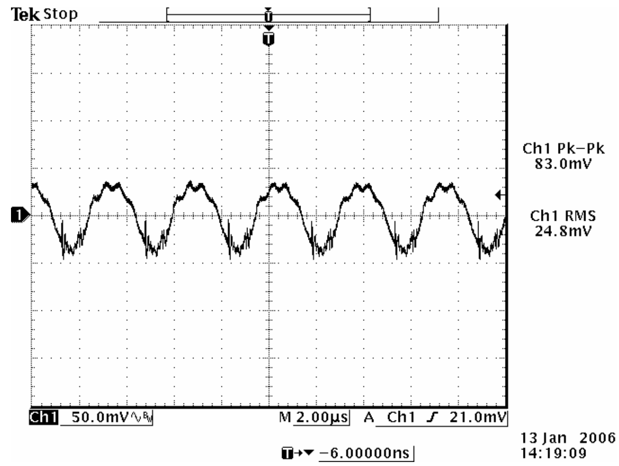

Figure 14. 12 V / 8.35 A output

NOTE: Ripple & noise at full load, 48 V input, with a 1 µF ceramic capacitor and a 10 µF tantalum capacitor at the output, Ta = 25°C.

11. TRANSIENT RESPONSE WAVEFORMS

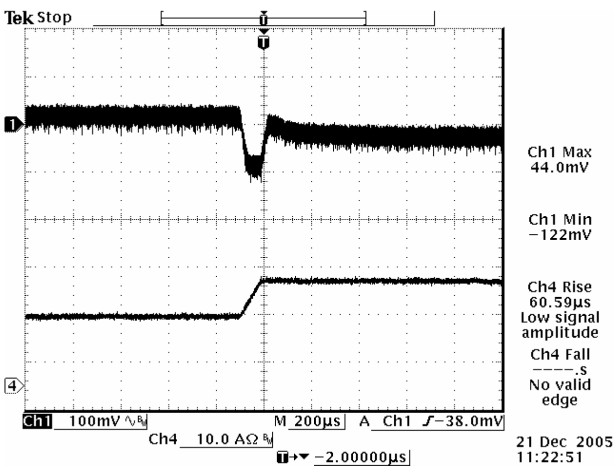

Figure 15. Vout = 2.5 V, 50%-75% Load Transients at Vin = 48 V

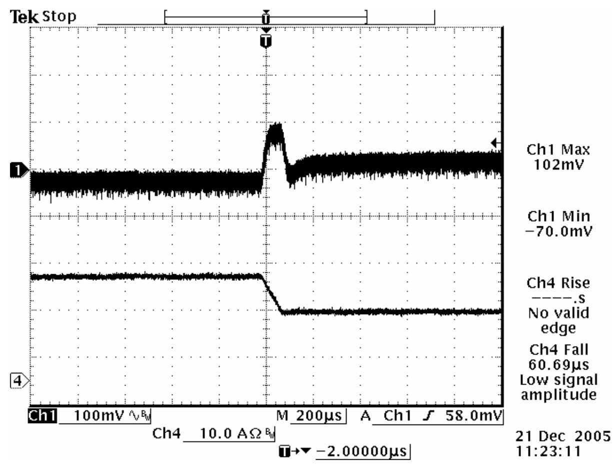

Figure 16. Vout = 2.5 V, 75%-50% Load Transients at Vin = 48 V

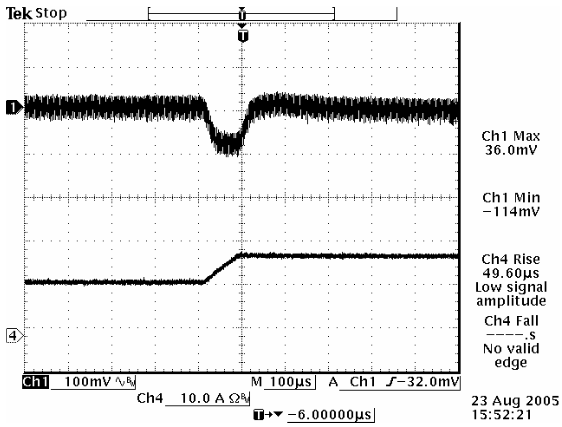

Figure 17. Vout = 3.3 V, 50%-75% Load Transients at Vin = 48 V

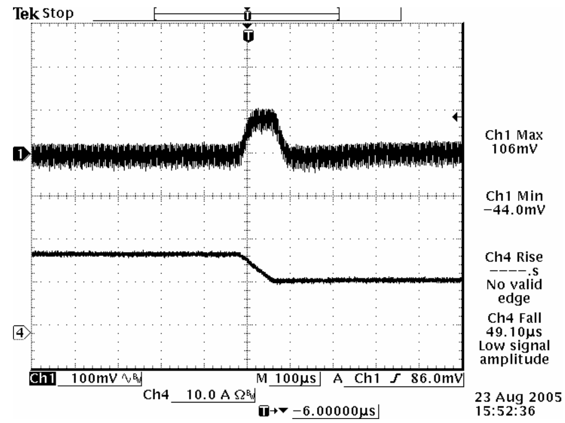

Figure 18. Vout = 3.3 V, 75%-50% Load Transients at Vin = 48 V

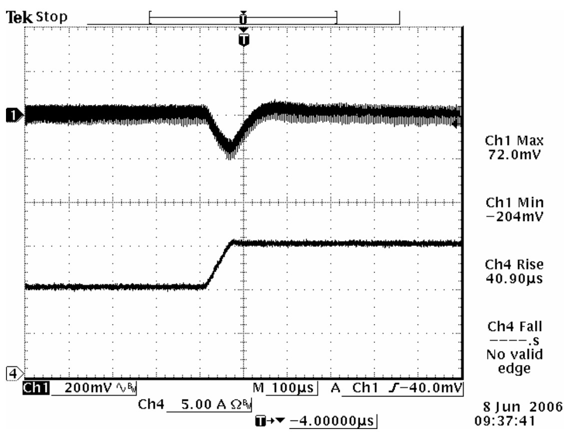

Figure 19. Vout = 5.0 V, 50%-75% Load Transients at Vin=48 V

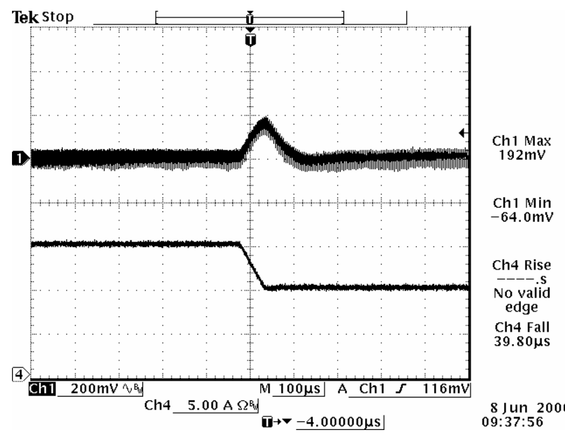

Figure 20. Vout = 5.0 V, 75%-50% Load Transients at Vin=48 V

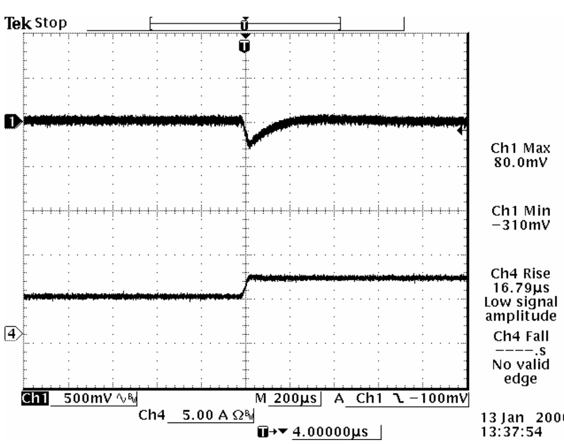

Figure 21. Vout = 12 V, 50%-75% Load Transients at Vin = 48 V

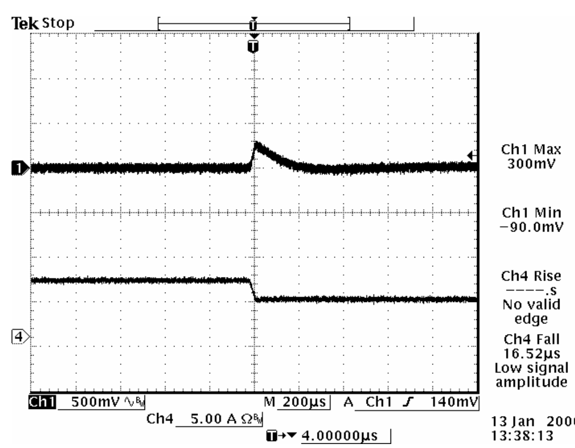

Figure 22. Vout = 12 V, 75%-50% Load Transients at Vin = 48 V

NOTE: Transients at di/dt = 0.1 A/µs, Vin = 48 V, with a 1 µF ceramic capacitor & a 10 µF Tantalum capacitor at the output, Ta = 25°C

12. MECHANICAL DIMENSIONS

OUTLINE

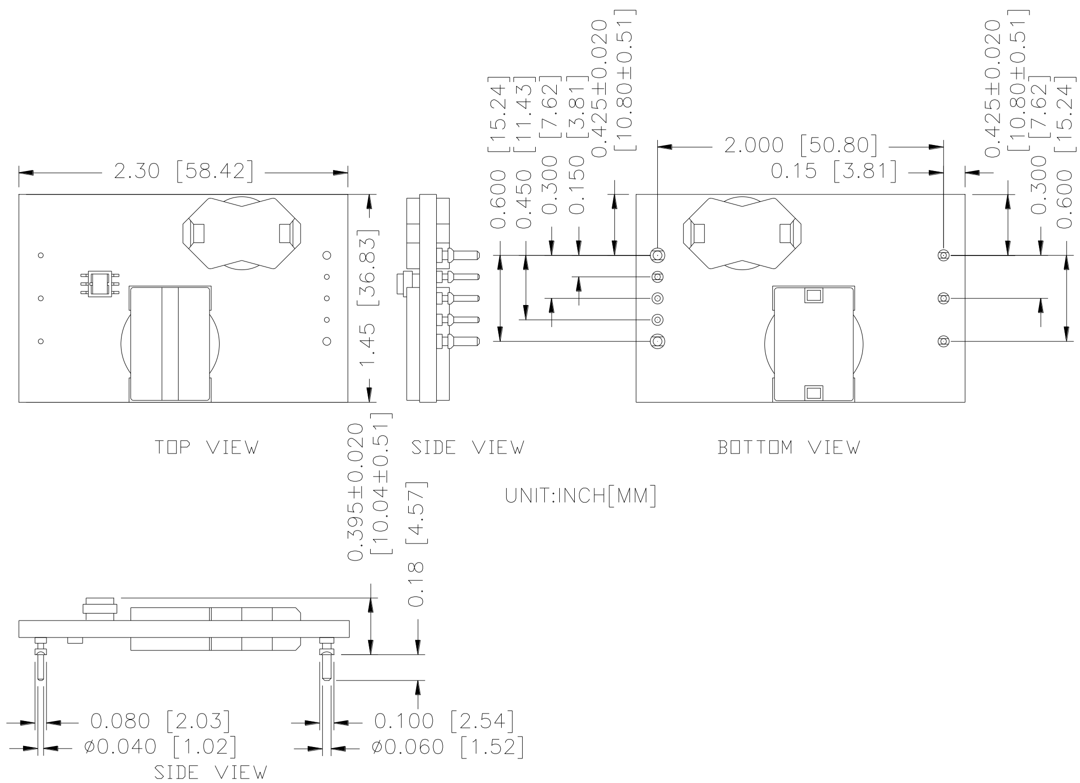

Figure 23. Outline

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 – Gold plated
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

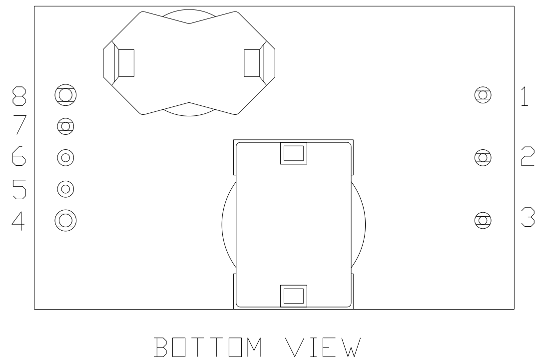

Figure 24. Pins

PIN	FUNCTION	PIN SIZE
1	Vin (+)	0.040”
2	Remote On/Off	0.040”
3	Vin (-)	0.040”
4	Vout (-)	0.062”
5	Remote Sense (-)	0.040”
6	Trim	0.040”
7	Remote Sense (+)	0.040”
8	Vout (+)	0.062”

RECOMMENDED PAD LAYOUT

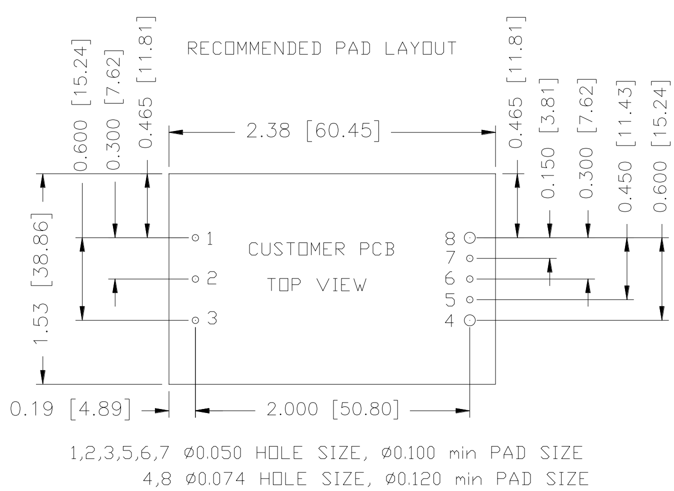

Figure 25. Recommended pad layout

13. REVERSION HISTORY

DATE	REVISION	CHANGES DETAIL	APPROVAL
2013-06-17	PA	First release.	XF.Jiang
2021-05-20	AA	Add object ID and safety certificate. Update mechanical outline and recommended pad layout.	XF.Jiang

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