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 at 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 Outputs
- 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

Applications

- Networking
- Computers and Peripherals
- Telecommunications

1. MODEL SELECTION

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

NOTE: Add “G” suffix at the end of the model numbers listed above to indicate “Tray Packaging”.
All part numbers above indicate RoHS 6.

2. ABSOLUTE MAXIMUM RATINGS

PARAMETER	DESCRIPTION	MIN	TYP	MAX	UNITS
Input Voltage (Continuous)	Non-Operating Operating	-0.3 -	- -	80 75	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 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	11.820 4.925 3.251 2.455 1.773 1.448 1.182	12.00 5.00 3.30 2.50 1.80 1.50 1.20	12.180 5.075 3.360 2.545 1.827 1.523 1.218	V
Line Regulation			V_O = 12 V V_O = 5.0 V V_O = 3.3 V V_O = 2.5 V V_O = 1.8 V - 1.2 V	- - - - -	±24 ±5 ±4 ±4 ±3	±120 ±25 ±15 ±10 ±6	mV
Load Regulation			V_O = 12 V V_O = 5.0 V V_O = 3.3 V - 2.5 V V_O = 1.8 V - 1.2 V	- - - -	±30 ±10 ±8 ±5	±80 ±25 ±15 ±10	mV
Regulation Over Temperature (-40 °C to +85 °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 - 1.2 V	- - - - -	±60 ±40 ±30 ±20 ±15	±100 ±65 ±50 ±50 ±30	mV
Output Current Range			V_O = 12 V V_O = 5.0 V V_O = 3.3 V V_O = 2.5 - 1.2 V	0 0 0 0	- - - -	8.35 20 25 30	A
Current Limit Threshold			V_O = 12 V V_O = 5.0 V V_O = 3.3 V V_O = 2.5 V V_O = 1.8 V - 1.2 V	9.2 24 27 35 -	10.5 26 32 40 36	13 30 35 45 -	A
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 V_O = 5.0 V V_O = 3.3 V - 2.5 V V_O = 1.8 V - 1.2 V	- - - -	30 25 20 15	50 40 40 30	mV
	Vin = 24 V		V_O = 12 V V_O = 5.0 V V_O = 3.3 V V_O = 2.5 V - 1.2 V	- - - -	25 20 15 10	40 30 25 20	mV
Ripple and Noise* (pk-pk)	Vin = 48 V		V_O = 12 V V_O = 5.0 V V_O = 3.3 V - 2.5 V V_O = 1.8 V - 1.2 V	- - - -	100 75 50 40	150 120 100 80	mV
	Vin = 24 V		V_O = 12 V V_O = 5.0 V V_O = 3.3 V V_O = 2.5 V V_O = 1.8 V - 1.2 V	- - - - -	75 50 35 30 25	120 100 70 60 50	mV
Turn on Time				10	-	100	ms
Overshoot at Turn on				-	0	5	%
Output Capacitance			V_O = 12 V V_O = 5.0 V V_O = 3.3 V V_O = 2.5 V - 1.2 V	0 0 0 0	- - - -	1200 6800 15000 20000	μF

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	88	91	-	%
		V_O = 5.0 V	88	90	-	
		V_O = 3.3 V	88	90	-	
		V_O = 2.5 V	88	89.5	-	
		V_O = 1.8 V	-	85	-	
		V_O = 1.5 V	-	83	-	
		V_O = 1.2 V	-	80	-	
Efficiency	Vin = 24 V, full load, Ta = 25 °C	V_O = 12 V	-	92	-	%
		V_O = 5.0 V	-	91	-	
		V_O = 3.3 V	89	91	-	
		V_O = 2.5 V	-	87	-	
		V_O = 1.8 V	-	85	-	
		V_O = 1.5 V	-	83	-	
		V_O = 1.2 V	-	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
MTBF	Calculated Per Bell Core SR-332 (Io = Nominal; Ta = 25 °C)			TBD		
Weight			-	40	-	g
Dimensions (L × W × H)				2.30 x 1.45 x 0.395 58.42 x 36.83 x 10.03		inch 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

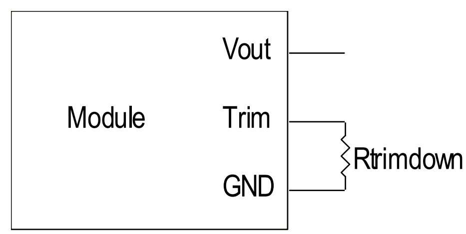
7. OUTPUT TRIM EQUATIONS

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:

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

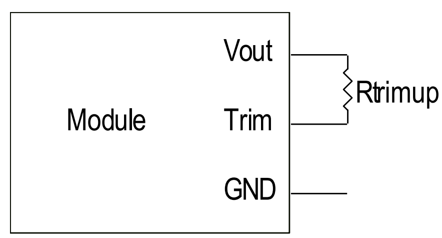
$$Rtrimup = \frac{(100 + delta) \cdot Vo \cdot 5.11 - 626}{1.225 \cdot delta} - 10.22$$



For Vo = 1.2 V:

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

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



NOTES:

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

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

8. EFFICIENCY DATA

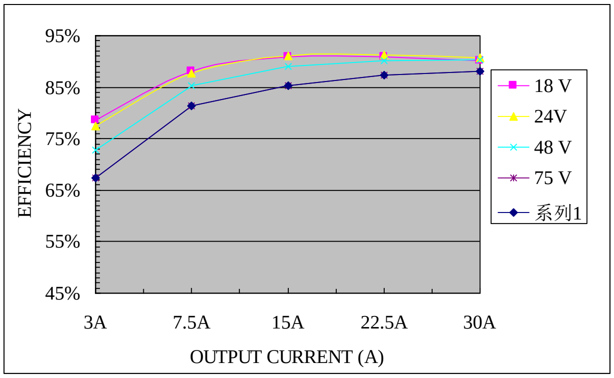


Figure 1. Vo = 2.5 V

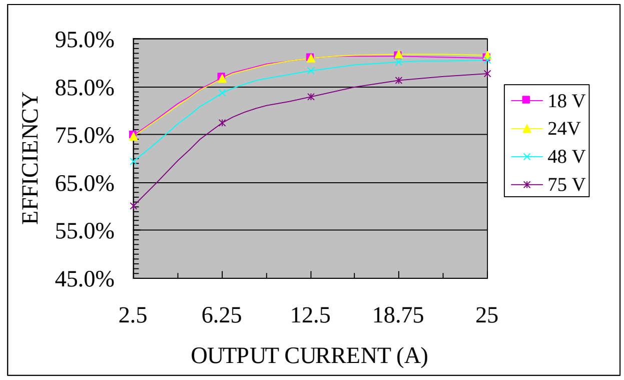


Figure 2. Vo = 3.3 V

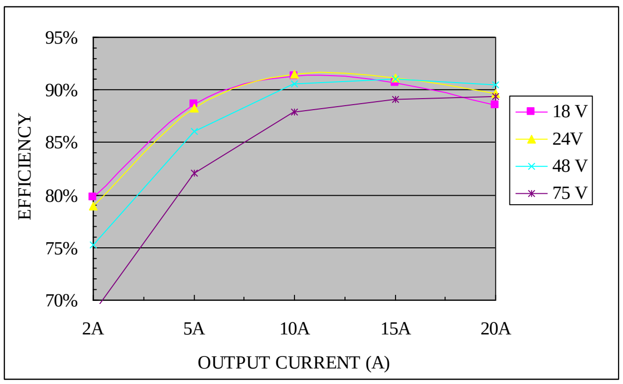


Figure 3. Vo = 5 V

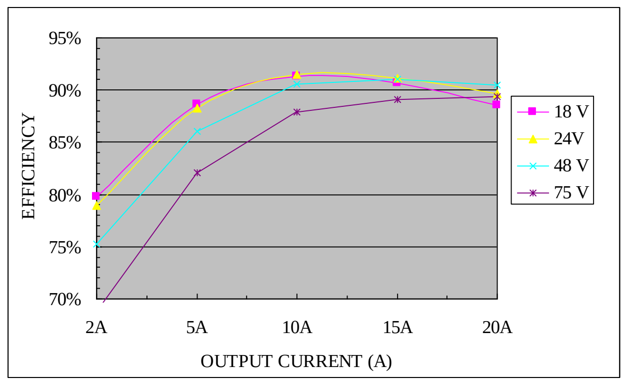


Figure 4. Vo = 12 V

9. THERMAL DERATING CURVES

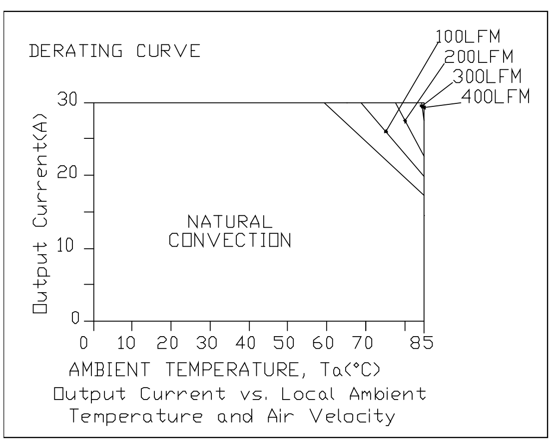


Figure 5. Vo = 2.5 V, Vin = 48 V

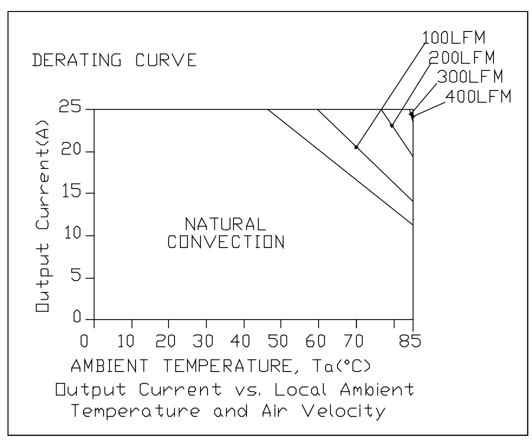


Figure 6. Vo = 3.3 V, Vin = 48 V

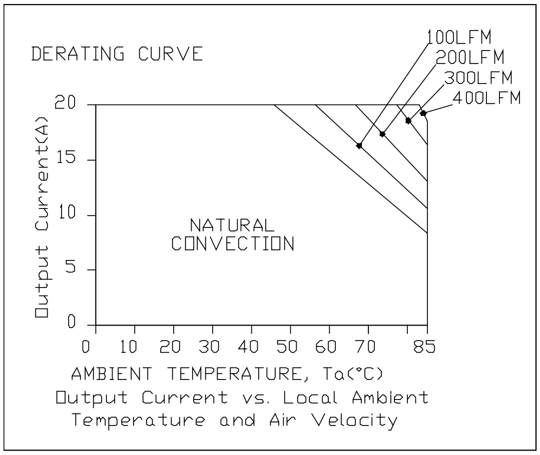


Figure 7. Vo = 5.0 V, Vin = 48 V

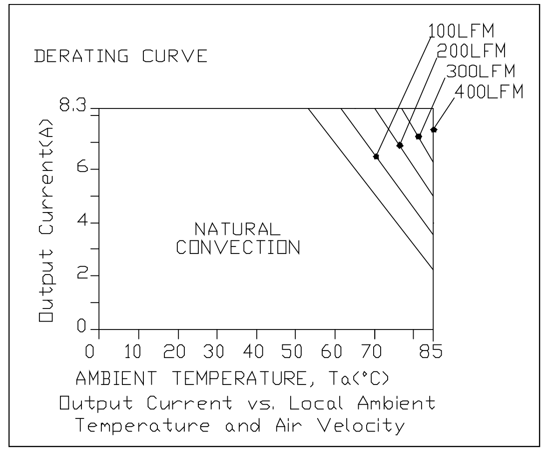


Figure 8. Vo = 12 V, Vin = 48 V

10. RIPPLE AND NOISE WAVEFORMS

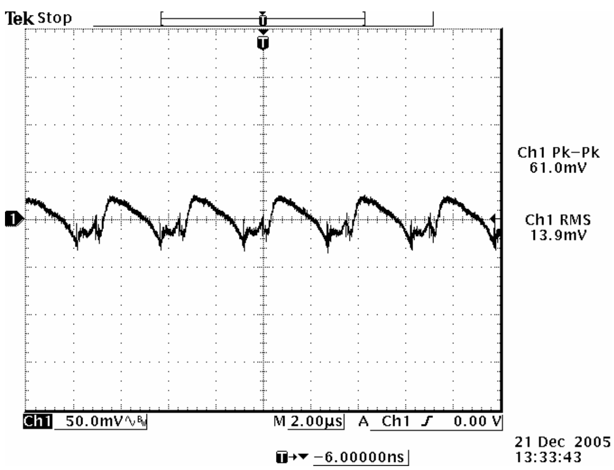


Figure 9. 2.5 V/30 A output

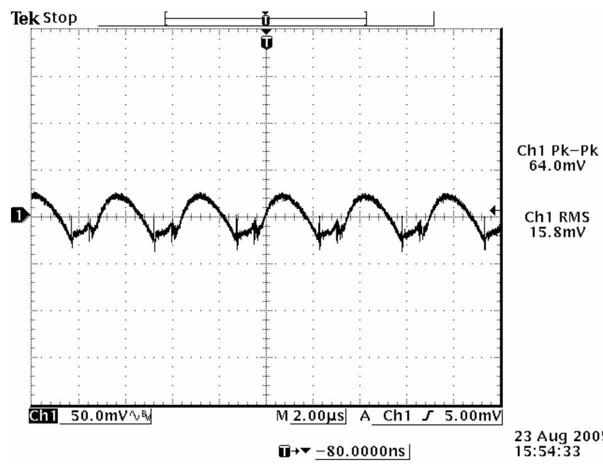


Figure 10. 3.3 V/25 A output

Asia-Pacific
+86 755 298 85888

Europe, Middle East
+353 61 225 977

North America
+1 408 785 5200

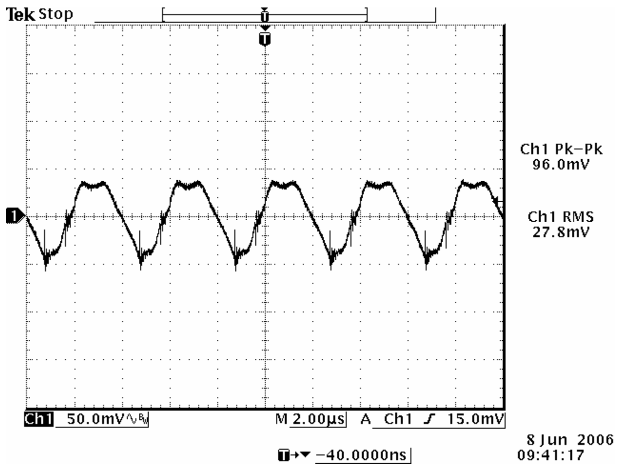


Figure 11. 5.0 V/20 A output

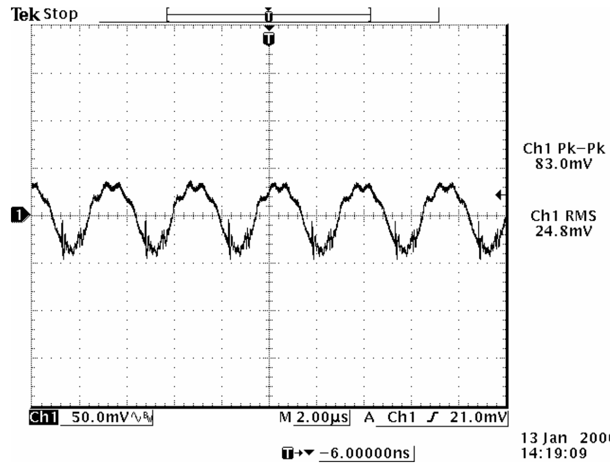


Figure 12. 12 V/8.35 A output

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

11. TRANSIENT RESPONSE WAVEFORMS

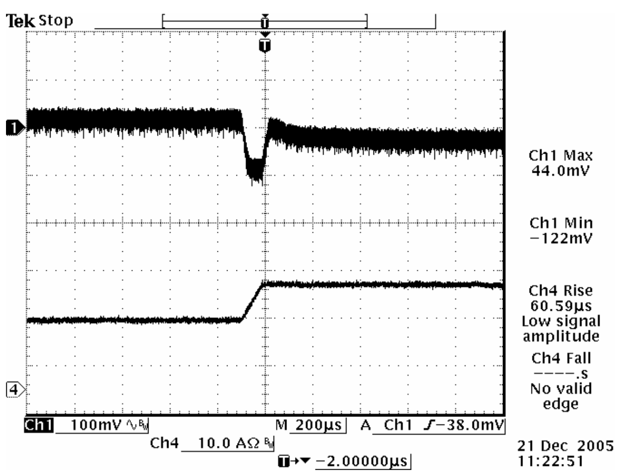


Figure 13. Vout = 2.5 V 50%-75% Load Transients at Vin=48 V

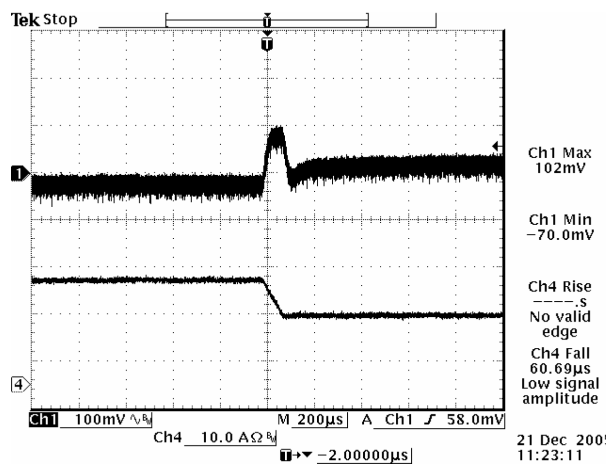


Figure 14. Vout = 2.5 V 75%-50% Load Transients at Vin=48 V

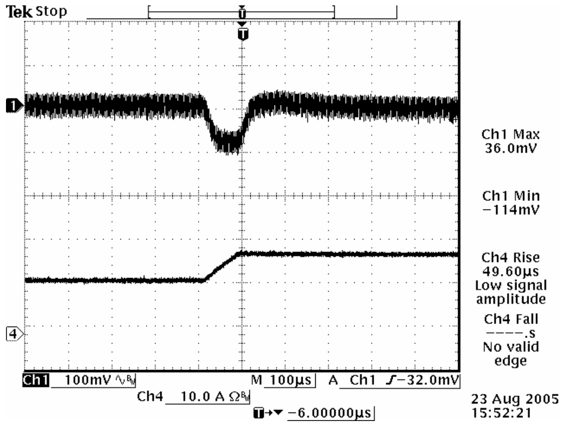


Figure 15. Vout = 3.3 V 50%-75% Load Transients at Vin=48 V

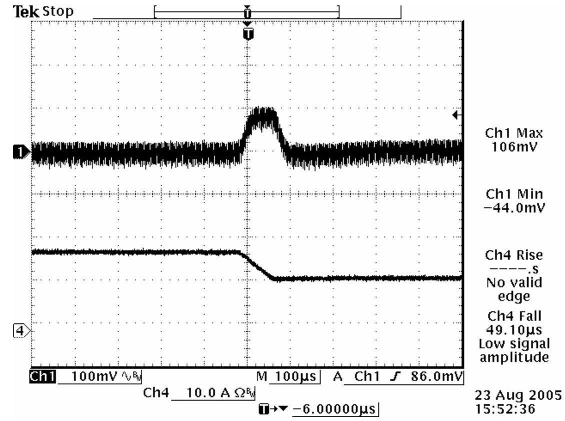


Figure 16. Vout = 3.3 V 75%-50% Load Transients at Vin=48 V

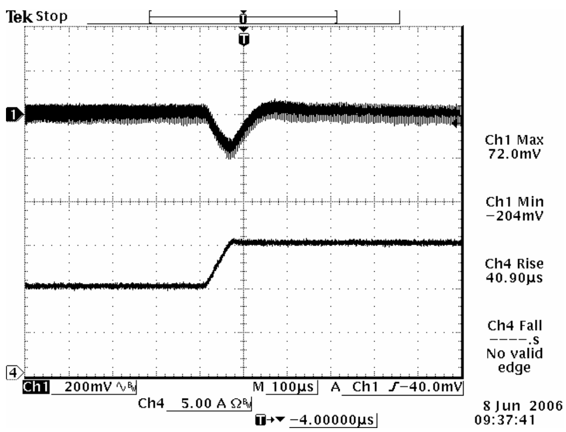


Figure 17. Vout = 5.0 V 50%-75% Load Transients at Vin=48 V

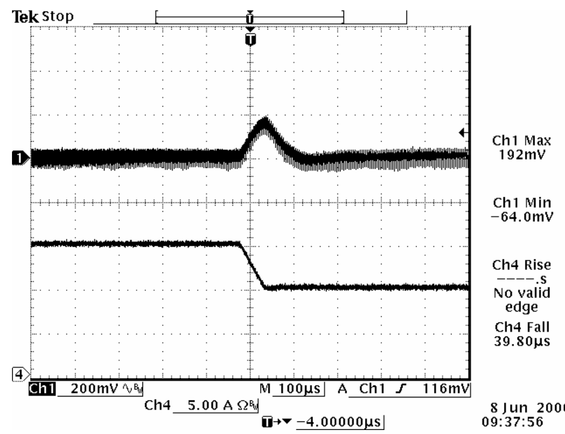


Figure 18. Vout = 5.0 V 75%-50% Load Transients at Vin=48 V

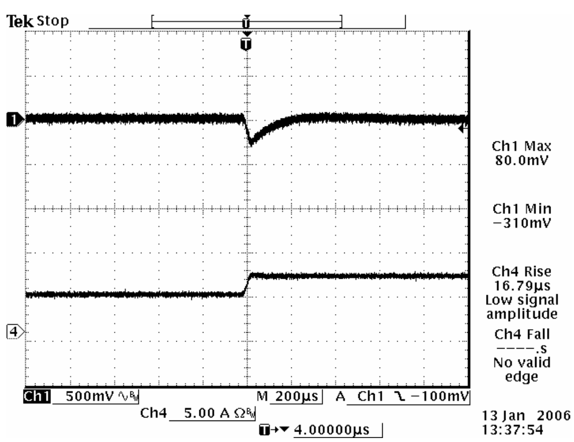


Figure 19. Vout = 12 V 50%-75% Load Transients at Vin=48 V

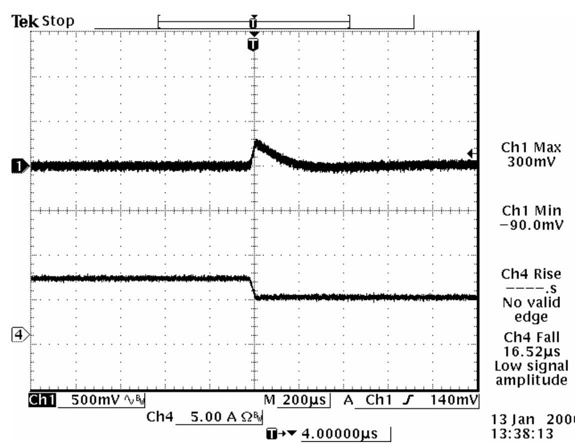
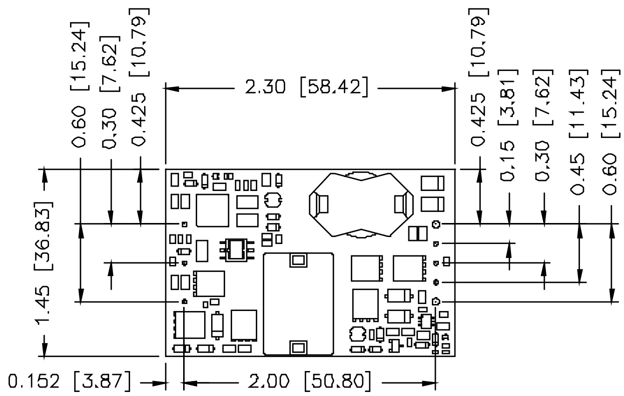


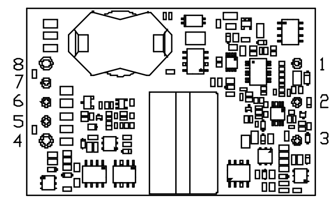
Figure 20. Vout = 12 V 75%-50% Load Transients at Vin=48 V

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

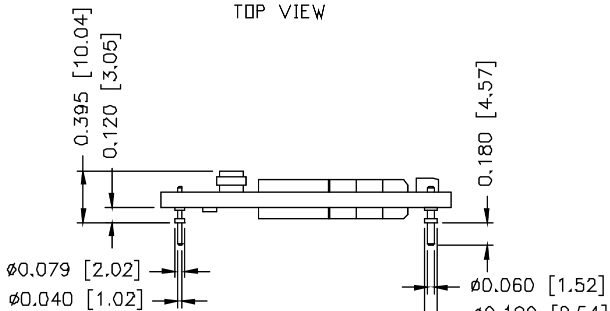
12. MECHANICAL DIMENSIONS



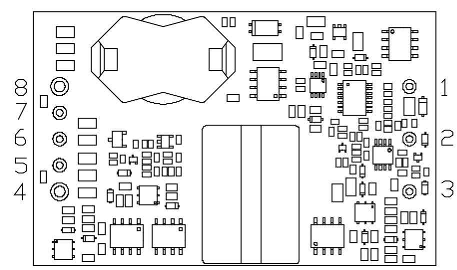
TOP VIEW



BOTTOM VIEW

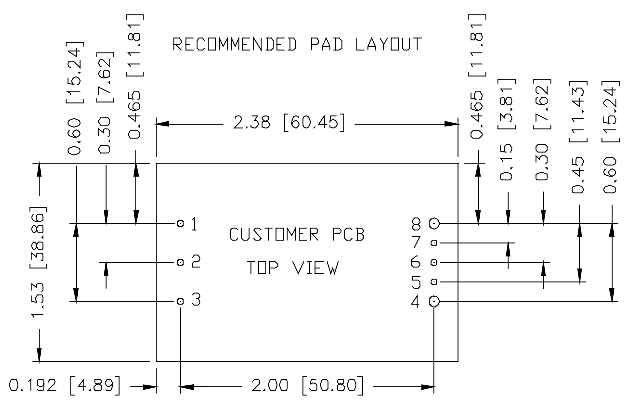


SIDE VIEW



BOTTOM VIEW

RECOMMENDED PAD LAYOUT



1,2,3,5,6,7 ø0.047 HOLE SIZE, ø0.08 min PAD SIZE
4,8 ø0.07 HOLE SIZE, ø0.10 min PAD SIZE

PIN CONNECTIONS

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”

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 – Tin plated
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).

13. REVERSION HISTORY

DATE	REVISION	CHANGES DETAIL	APPROVAL
2013-06-17	PA	First release	XF Jiang

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