

ISOLATED DC/DC CONVERTERS

18 Vdc - 75 Vdc Input 12 Vdc / 7 A Output

Apr. 28, 2011

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

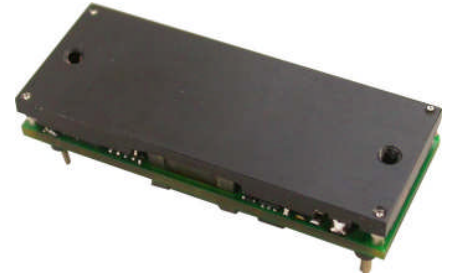
ORCY-60U12x

RoHS Compliant

Rev.D

Features

- Isolated
- High Efficiency
- High Power Density
- Fixed Frequency (258 kHz)
- Input Under-Voltage Lockout
- Input Over-Voltage Lockout
- Ultra Wide Input Range:
18 Vdc - 75 Vdc
- UL60950-1 Recognized (UL/cUL) (Pending)
- Output Over-Voltage Shutdown
- OCP/SCP
- Over Temperature Protection
- Low Cost
- Output Voltage Trim
- Positive/Negative Remote Sense
- Basic Insulation
- Remote On/Off



Applications

- Networking
- Computers and peripherals
- Telecommunications

Description

The ORCY-60U12x is part of the isolated dc/dc converters that operate from a wide input range (18 Vdc - 75 Vdc) and can cover both 24 Vin and 48 Vin input range. These units will provide up to 84 W of output power. They are designed to be highly efficient and low cost. Features include remote on/off, over current protection, over voltage shut down, over temperature protection and under-voltage lockout. These converters are provided in an industry standard 1/8 brick package.

Part Selection

Output Voltage	Input Voltage	Max. Output Current	Max. Output Power	Typical Efficiency	Model Number Active High With Heatsink	Model Number Active Low With Heatsink	Model Number Active Low Without Heatsink
12 Vdc	18 Vdc - 75 Vdc	7 A	84 W	92%	ORCY-60U120	ORCY-60U12L	ORCY-60U12B

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

Part Number Explanation

0 R CY - 60 U 12 x
1 2 3 4 5 6 7

1---Through hole

2---RoHS 6, change "R" to "7" means RoHS 5

3---Series name

4---Series code

5---Input range (18-75V)

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.

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Absolute Maximum Ratings

Parameter	Min	Typ	Max	Unit	Notes
Input Voltage (continuous)	-0.3	-	80	V	
Input Transient Voltage	-	-	100	V	100 mS maximum
Remote On/Off	-0.3	-	18	V	
I/O Isolation Voltage	-	-	1500	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
Input Voltage	18	24/48	75	V	
Input Current (full load)					
Vin=18 V	-	6.7	-	A	
Vin=75 V	-	1.6	-	A	
Input Current (no load)	-	100	180	mA	
Remote Off Input Current	-	10	15	mA	
Input Reflected Ripple Current (rms)	-	7	10	mA	Tested with simulated source impedance of 10 uH, 5 Hz to 20 MHz; use a 1 uF/100 V ceramic cap and a 100 uF/100 V electrolytic cap with ESR = 1 ohm max. at 200 kHz at 25 °C.
Input Reflected Ripple Current (pk-pk)	-	15	30	mA	
I ² t Inrush Current Transient	-	0.05	0.1	A ² s	
Turn-on Voltage Threshold	16.0	17.0	17.5	V	
Turn-off Voltage Threshold	15.0	16.0	16.5	V	
Input Over Voltage Lockout	76	78	80	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 8A on system board. Refer to the fuse manufacturer's datasheet for further information.

Notes: 1. This converter has internal C-L-C (2.2uH-2*0.47uF+2.2uF) filter.
 2. All specifications are typical at 25 °C unless otherwise stated.

Output Specifications

Parameter	Min	Typ	Max	Unit	Notes
Output Voltage Set Point	11.76	12.00	12.24	V	Vin=48 V, Io=50% load
Load Regulation	-	±6	±12	mV	
Line Regulation	-	±10	±20	mV	
Regulation Over Temperature (-40deg.C~ +85deg.C)	-	±30	±50	mV	
Ripple and Noise (rms)	-	25	50	mV	0-20 MHz BW, with a 0.1 uF ceramic cap and a 10 uF tantalum cap at the output.
Ripple and Noise (pk-pk)	-	100	150	mV	

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Output Specifications (continued)

Parameter	Min	Typ	Max	Unit	Notes	
Output Current Range	0	-	7	A		
Output DC Current Limit	7.7	-	11	A	Vin=48 V, in Hiccup Mode.	
Short Circuit Surge Transient	-	3	5	A ² s		
Rise Time	5	10	15	mS		
Turn on Time	-	20	25	mS	Ton(Enable from Vin)	
	-	20	25	mS	Ton(Enable from ON/OFF)	
Overshoot at Turn on	-	0	3	%		
Output Capacitance	0	-	1000	uF		
Transient Response						
75% ~ 50% Max Load	Overshoot	-	300	400	mV	di/dt=0.1 A/us, Vin=24 Vdc, Ta=25 °C, with a 0.1 µF ceramic cap and a 10 uF tantalum cap at output.
	Settling Time	-	400	600	uS	
50% ~ 75% Max Load	Overshoot	-	300	400	mV	
	Settling Time	-	400	600	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	Vin=24 V	90	91.5	-	%	Measured at normal Vin, full load.
	Vin=48 V	90.5	92	-	%	
Switching Frequency	240	258	280	kHz		
Isolation Capacitance	-	1500	-	pF		
Remote Sense Compensation	-	-	10	%	The total voltage increased by trim and remote sense should not exceed 15%Vo.	
Output Voltage Trim Range	80	-	110	%		
Over Temperature Protection	-	125	-	°C		
Over Voltage Protection	-	-	13.8	V	Vin=48 V, full load, in Hiccup mode.	
MTBF	1,867,232			hours	Calculated Per Bell Core SR-332 (Vo=12V, Io=80%load, Ta = 25 °C)	
Dimensions	Inches (L x W x H)	2.30 x 0.896 x 0.49		-	0RCY-60U120 & 0RCY-60U12L	
	Millimeters (L x W x H)	58.42 x 22.76 x 12.47				
Dimensions	Inches (L x W x H)	2.30 x 0.900 x 0.45		-	0RCY-60U12B	
	Millimeters (L x W x H)	58.42 x 22.86 x 11.50				
Weight	-	31.2	-	g	0RCY-60U120 & 0RCY-60U12L	

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

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Remote On/Off

Parameter		Min	Typ	Max	Unit	Notes
Signal Low (Unit On)	Active Low	-0.3	-	0.8	V	0RCY-60U12L & 0RCY-60U12B. The remote on/off pin open, Unit off.
Signal High (Unit Off)		2.4	-	18	V	
Signal Low (Unit Off)	Active High	-0.3	-	0.8	V	0RCY-60U120. The remote on/off pin open, Unit on.
Signal High (Unit On)		2.4	-	18	V	
Current Sink		0	-	0.75	mA	

Output Trim Equations

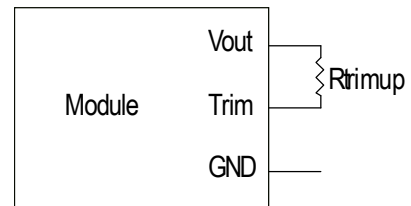
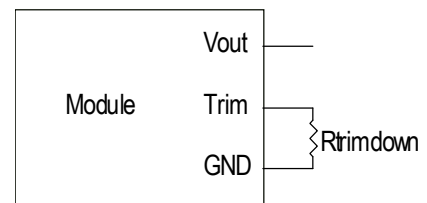
Equations for calculating the trim resistor are shown below. The Trim Down resistor should be connected between the Trim pin and GND pin. The Trim Up resistor should be connected between the Trim pin and the Vout pin. Only one of the resistors should be used for any given application.

$$R_{trimdown} = \frac{511}{|\delta|} - 10.22 [k\Omega]$$

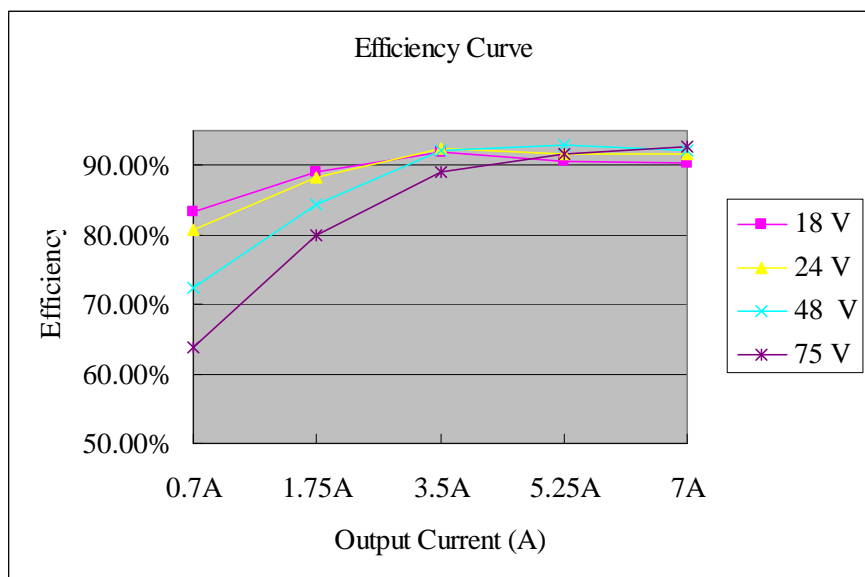
$$R_{trimup} = \frac{(100 + \delta) \cdot V_o \cdot 5.11 - 626}{1.225 \cdot \delta} - 10.22 [k\Omega]$$

Note: $\delta = \frac{(V_o_{req} - V_o)}{V_o} \times 100 [\%]$

V_o_{req} = Desired (trimmed) output voltage [V]
Output voltage V_o = 12.00 V



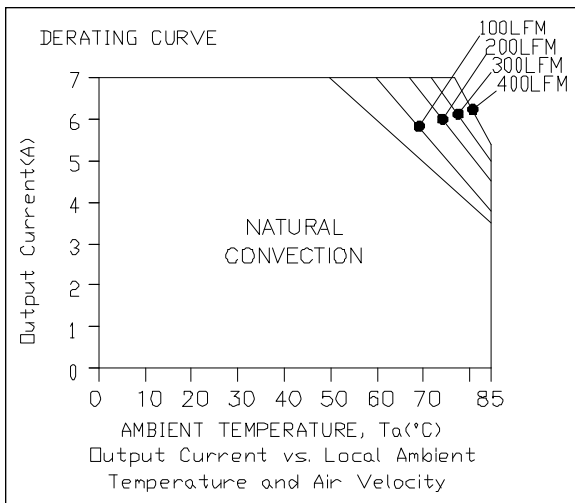
Efficiency Data



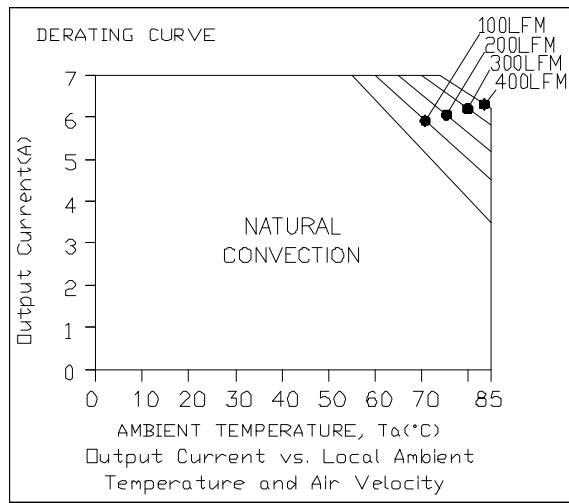
Thermal Derating Curves

Maximum FET junction temperature derated to 120 C

ORCY-60U120 & ORCY-60U12L

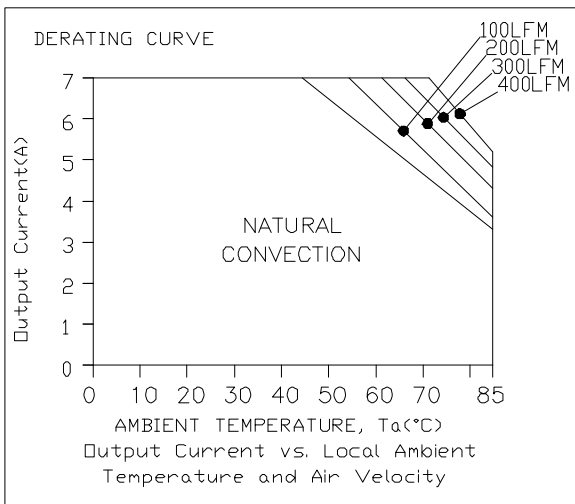


Vin=24 V, Vo=12 V

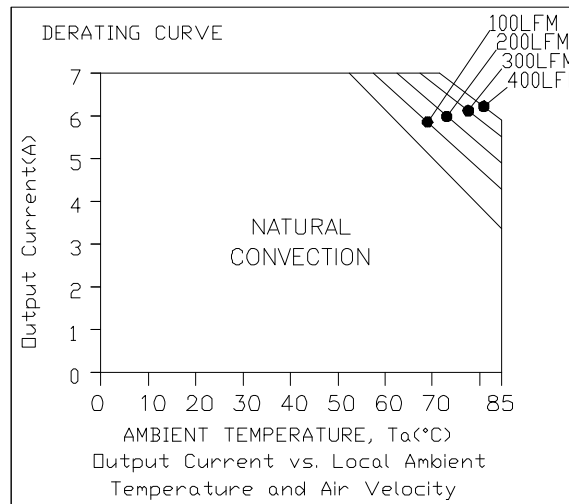


Vin=48 V, Vo=12 V

ORCY-60U12B



Vin=24 V, Vo=12 V



Vin=48 V, Vo=12 V

ISOLATED DC/DC CONVERTERS

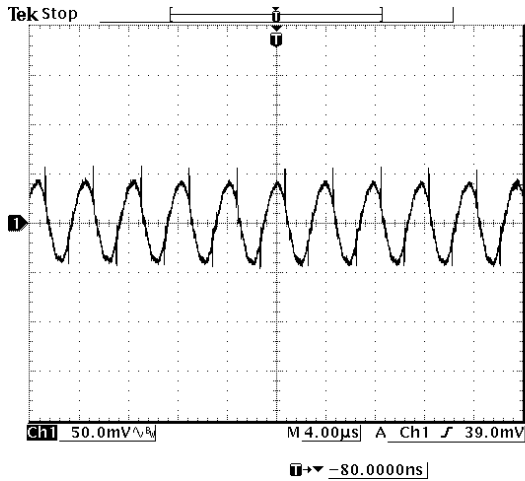
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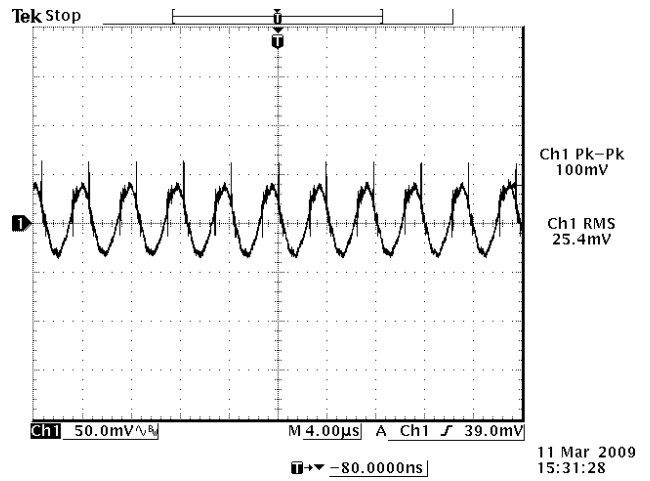
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Ripple and Noise Waveforms



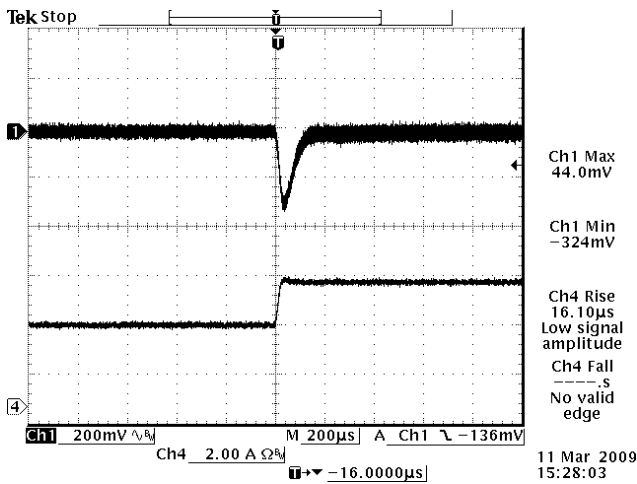
24 Vdc input, 12 Vdc/7 A output



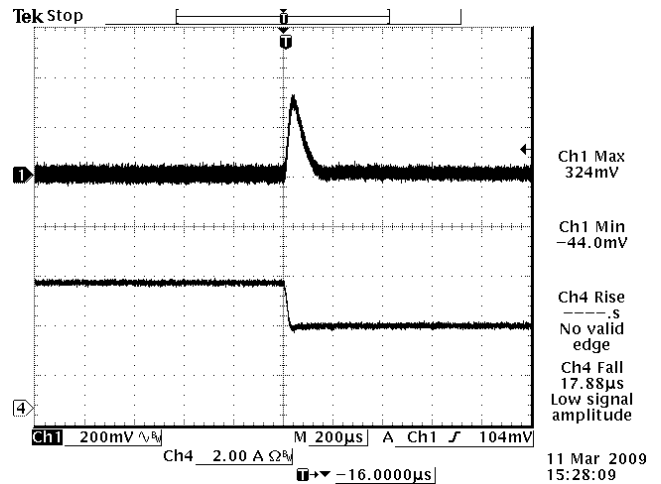
48 Vdc input, 12 Vdc/7 A output

Note: Ripple and noise at full load, 0-20 MHz BW, with a 0.1 µF ceramic cap and a 10 µF tantalum cap at the output, and Ta=25 deg C.

Transient Response Waveforms



50%-75% Load Transients at Vin=24 V



75%-50% Load Transients at Vin=48 V

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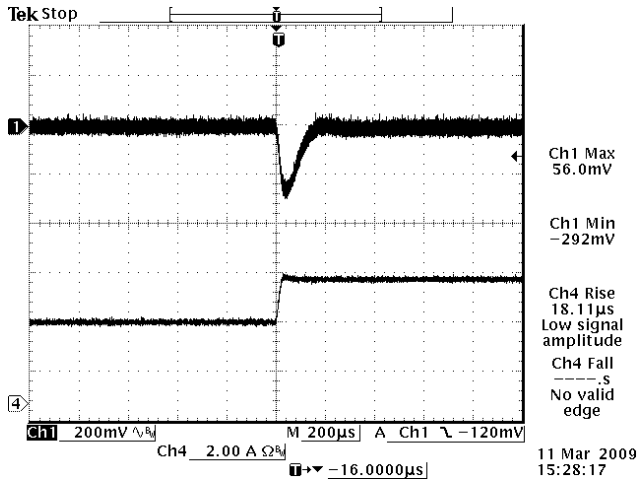
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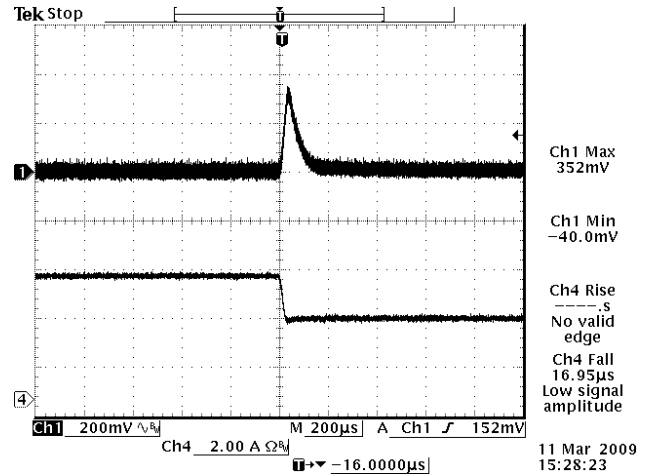
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Transient Response Waveforms (continued)



50%-75% Load Transients at $V_{in}=24$ V



75%-50% Load Transients at $V_{in}=48$ V

Note: Transients Response at $V_o=12$ V, $di/dt=0.1$ A/us, with a 0.1 μ F ceramic cap and a 10 μ F tantalum cap at output, and $T_a=25$ deg C.

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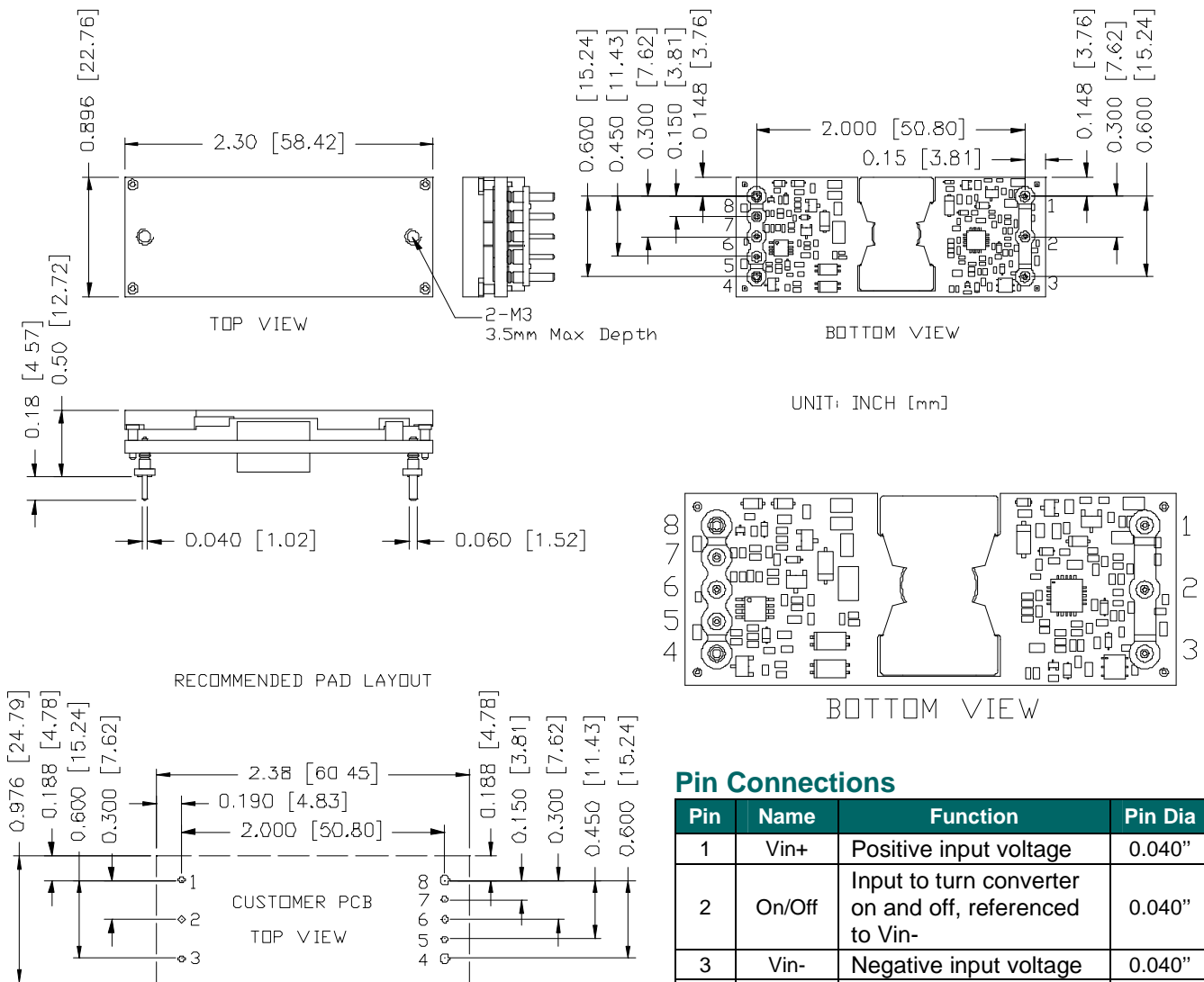


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Mechanical Outline

ORCY-60U120 & ORCY-60U12L



Pin Connections

Pin	Name	Function	Pin Dia
1	Vin+	Positive input voltage	0.040"
2	On/Off	Input to turn converter on and off, referenced to Vin-	0.040"
3	Vin-	Negative input voltage	0.040"
4	Vout-	Negative output voltage	0.062"
5	Sense-	Negative remote sense	0.040"
6	Trim	Output voltage trim	0.040"
7	Sense+	Positive output voltage	0.040"
8	Vout+	Positive output voltage	0.062"

- Notes:**
- Pin 5 must be connected to Vout-.
 - Leave Pin 6 open for nominal voltage.
 - Pin 7 must be connected to Vout+.

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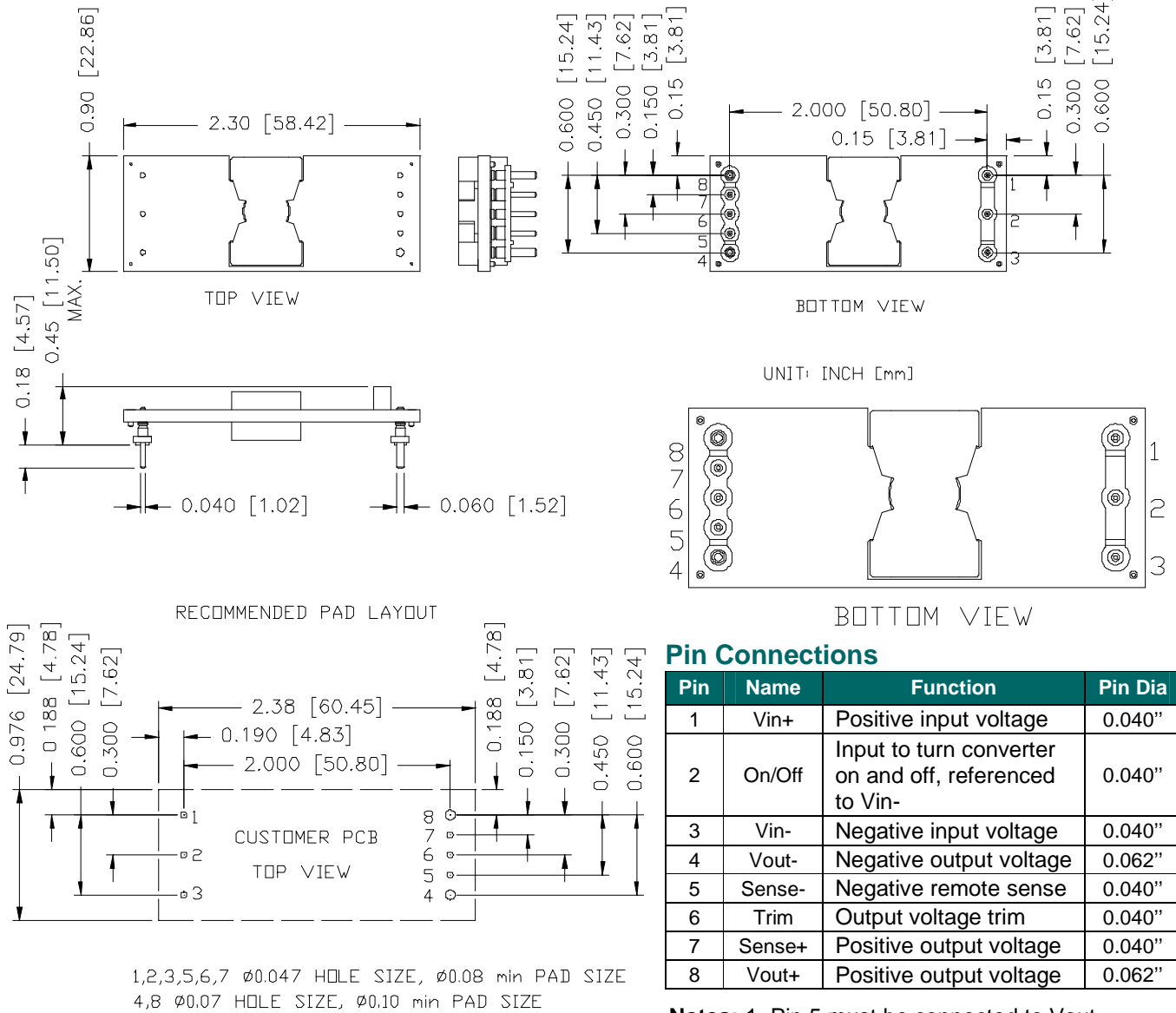


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Mechanical Outline (continued)

ORCY-60U12B



Pin Connections

Pin	Name	Function	Pin Dia
1	Vin+	Positive input voltage	0.040"
2	On/Off	Input to turn converter on and off, referenced to Vin-	0.040"
3	Vin-	Negative input voltage	0.040"
4	Vout-	Negative output voltage	0.062"
5	Sense-	Negative remote sense	0.040"
6	Trim	Output voltage trim	0.040"
7	Sense+	Positive output voltage	0.040"
8	Vout+	Positive output voltage	0.062"

- Notes:**
1. Pin 5 must be connected to Vout-.
 2. Leave Pin 6 open for nominal voltage.
 3. Pin 7 must be connected to Vout+.

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 – 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).

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Revision History

Date	Revision	Changes Detail	Approval
2011-04-28	D	Add P/N 0RCY-60U12B without heatsink.	XF Jiang

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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10

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