

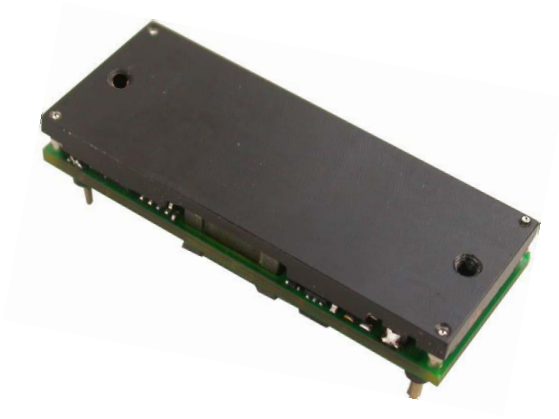
# ORCY-60U12x

## Isolated DC-DC Converter

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.



### Key Features & Benefits

- 18-75 VDC Input / 12 VDC @ 7 A Output
- 1/8th Brick Converter
- Isolated
- Fixed Frequency (258 kHz)
- High Efficiency
- High Power Density
- Input Under Voltage Lockout
- OCP/SCP
- Input Over-Voltage Lockout
- Over Temperature Protection
- Remote On/Off
- Output Over-Voltage Shutdown
- Positive/Negative Remote Sense
- Output Voltage Trim
- Basic Insulation
- Ultra Wide Input Range: 18 VDC - 75 VDC
- Low Cost
- Approved to UL/CSA 60950-1, 2nd +A2 version
- Class 2, Category 2, Isolated DC/DC Converter (refer to IPC-9592B)
- 

### Applications

- Networking
- Computers and Peripherals
- Telecommunications

## 1. MODEL SELECTION

| MODEL NUMBER | OUTPUT VOLTAGE | INPUT VOLTAGE   | MAX. OUTPUT CURRENT | MAX. OUTPUT POWER | TYPICAL EFFICIENCY |
|--------------|----------------|-----------------|---------------------|-------------------|--------------------|
| ORCY-60U12L  | 12VDC          | 18 VDC – 75 VDC | 7 A                 | 84 W              | 92%                |
| ORCY-60U120  | 12VDC          | 18 VDC – 75 VDC | 7 A                 | 84 W              | 92%                |
| ORCY-60U12B  | 12VDC          | 18 VDC – 75 VDC | 7 A                 | 84 W              | 92%                |
| ORCY-60U12W  | 12VDC          | 18 VDC – 75 VDC | 7 A                 | 84 W              | 92%                |

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

### PART NUMBER EXPLANATION

| 0                  | R           | CY          | - | 60           | U           | 12             | x                                                                                                                      | G                |
|--------------------|-------------|-------------|---|--------------|-------------|----------------|------------------------------------------------------------------------------------------------------------------------|------------------|
| Mounting Type      | RoHS Status | Series Name |   | Output Power | Input Range | Output Voltage | Active Logic                                                                                                           | Package Type     |
| Through hole mount | RoHS        | 1/8th Brick |   | 84 W         | 18 – 75V    | 12 V           | L – active low, with HSK<br>B – active low, without HSK plate<br>0 – active high, with HSK<br>W- active high, with HSK | G – Tray package |

## 2. ABSOLUTE MAXIMUM RATINGS

| PARAMETER                  | DESCRIPTION    | MIN  | TYP | MAX  | UNITS |
|----------------------------|----------------|------|-----|------|-------|
| Input Voltage (Continuous) |                | -0.3 | -   | 80   | V     |
| Input Transient Voltage    | 100 ms maximum | -    | -   | 100  | V     |
| Remote On/Off              |                | -0.3 | -   | 18   | V     |
| I/O Isolation Voltage      |                | -    | -   | 1500 | V     |
| Ambient Temperature        |                | -40  | -   | 85   | °C    |
| Altitude                   |                | -    | -   | 2000 | m     |
| 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.

## 3. INPUT SPECIFICATIONS

| PARAMETER                                 | DESCRIPTION                                                                                                                                                                                | MIN | TYP   | MAX  | UNIT             |
|-------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-------|------|------------------|
| Operating 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                  |                                                                                                                                                                                            | -   | 20    | 30   | mA               |
| Input Reflected Ripple Current (rms)      | Tested with simulated source impedance of 10 $\mu$ H, 5 Hz to 20 MHz; use a 1 $\mu$ F/100 V ceramic cap and a 100 $\mu$ F/100 V electrolytic cap with ESR = 1 ohm max. at 200 kHz at 25 °C | -   | 7     | 10   | mA               |
| Input Reflected Ripple Current (pk-pk)    |                                                                                                                                                                                            | -   | 15    | 30   | mA               |
| I <sup>2</sup> t Inrush Current Transient |                                                                                                                                                                                            | -   | 0.05  | 0.1  | A <sup>2</sup> s |
| Turn-on Voltage Threshold                 |                                                                                                                                                                                            | 16  | 17    | 17.5 | V                |
| Turn-off Voltage Threshold                |                                                                                                                                                                                            | 15  | 16    | 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 8 A on system board. Refer to the fuse manufacture's datasheet for further information.

**NOTES:** 1. This converter has internal C-L-C (2.2 $\mu$ H-2\*0.47 $\mu$ F+2.2 $\mu$ F) filter.

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



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#### 4. OUTPUT SPECIFICATIONS

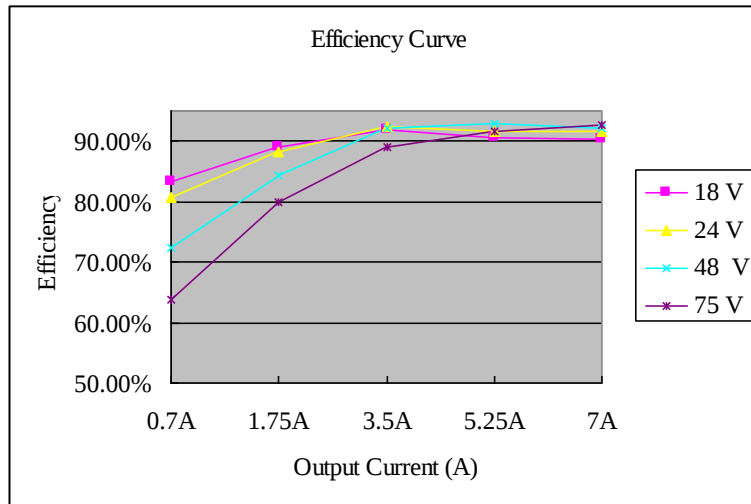
| PARAMETER                                        | DESCRIPTION                                                                                          | MIN   | TYP  | MAX   | UNIT |
|--------------------------------------------------|------------------------------------------------------------------------------------------------------|-------|------|-------|------|
| Output Voltage Set Point                         | Vin=48V, Io=50% load.                                                                                | 11.76 | 12.0 | 12.24 | V    |
| Load Regulation                                  |                                                                                                      | -     | ±6   | ±12   | mV   |
| Line Regulation                                  |                                                                                                      | -     | ±10  | ±20   | mV   |
| Regulation Over Temperature (-40°C~ +85 °C)      |                                                                                                      | -     | ±30  | ±50   | mV   |
| Ripple and Noise (pk-pk)                         | Vin=54V, Io=100%load, 0-20MHz BW, with 3 * 22 µF ceramic capacitor at output.                        | -     | 25   | 50    | mV   |
| Ripple and Noise (rms)                           |                                                                                                      | -     | 100  | 150   | mV   |
| Output Ripple and Noise (pk-pk) under worst case | 0-20 MHz BW, with a 0.1 µF ceramic cap and a 10 µF tantalum cap at the output.                       | -     | -    | 150   | mV   |
| Output Current Range                             |                                                                                                      | 0     | -    | 7     | A    |
| Output DC Current Limit                          | Vin=48 V, in Hiccup Mode.                                                                            | 7.7   | -    | 11    | A    |
| Short Circuit Surge Transient                    |                                                                                                      | -     | 3    | 5     | A²s  |
| Rise time                                        |                                                                                                      | 5     | 10   | 15    | ms   |
| Turn on Time                                     | Ton(Enable from Vin)                                                                                 | -     | 20   | 25    | ms   |
|                                                  | Ton(Enable from ON/OFF)                                                                              | -     | 20   | 25    | ms   |
| Overshoot at Turn on                             |                                                                                                      | -     | 0    | 3     | %    |
| Output Capacitance                               |                                                                                                      | 0     | -    | 1000  | µF   |
| <b>TRANSIENT RESPONSE</b>                        |                                                                                                      |       |      |       |      |
| ΔV 75%~50% of Max Load                           | di/dt=0.1 A/µs, Vin=24 VDC, Ta=25 °C, with a 0.1 µF ceramic cap and a 10 µF tantalum cap at output.. | -     | 300  | 400   | mV   |
| Settling Time                                    |                                                                                                      | -     | 400  | 600   | µs   |
| ΔV 50%~75% of Max Load                           |                                                                                                      | -     | 300  | 400   | mV   |
| Settling Time                                    |                                                                                                      | -     | 400  | 600   | 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=24 V                                                                     | 90                                           | 91.5      | -    | %          |
|                                | Vin=48 V                                                                     | 90.5                                         | 92        | -    | %          |
| Switching Frequency            |                                                                              | 240                                          | 258       | 280  | kHz        |
| Isolation Capacitance          |                                                                              | -                                            | 1500      | -    | pF         |
| Remote Sense Compensation      | The total voltage increased by trim and remote sense should not exceed 15%Vo | -                                            | -         | 10   | %          |
| Output Voltage Trim Range      |                                                                              | 80                                           | -         | 110  | %          |
| Over Temperature Protection    |                                                                              | -                                            | 125       | -    | °C         |
| Output Over Voltage Protection | Vin=48 V, full load, in Hiccup mode.                                         | -                                            | -         | 13.8 | V          |
| Weight                         |                                                                              | -                                            | 31.2      | -    | g          |
| MTBF                           | Calculated Per Bell Core SR-332 (Vo=12V, Io=80%load, Ta = 25 °C)             | -                                            | 1,867,232 | -    | Mhrs       |
| Dimensions (L × W × H)         | ORCY-60U120 & ORCY-60U12L& ORCY-60U12W                                       | 2.30 x 0.896 x 0.49<br>58.42 x 22.76 x 12.47 |           |      | inch<br>mm |
|                                | ORCY-60U12B                                                                  | 2.30 x 0.900 x 0.45<br>58.42 x 22.86 x 11.5  |           |      | inch<br>mm |

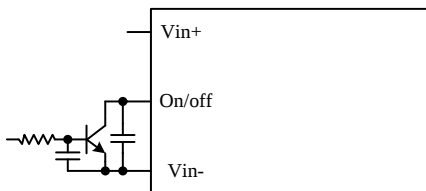
## 6. EFFICIENCY DATA



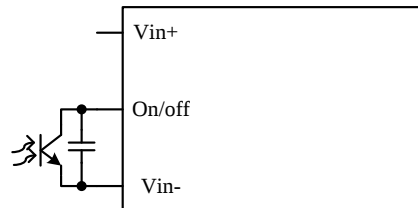
## 7. REMOTE ON/OFF

| PARAMETER              |             | DESCRIPTION                           | MIN  | TYP | MAX  | UNIT |
|------------------------|-------------|---------------------------------------|------|-----|------|------|
| Signal Low (Unit On)   | Active Low  | 0RCY-60U12L & 0RCY-60U12B             | -0.3 | -   | 0.8  | V    |
| Signal High (Unit Off) |             | The remote on/off pin open, Unit off. | 2.4  | -   | 18   | V    |
| Signal Low (Unit On)   | Active High | 0RCY-60U120 & 0RCY-60U12W             | -0.3 | -   | 0.8  | V    |
| Signal High (Unit Off) |             | The remote on/off pin open, Unit on.  | 2.4  | -   | 18   | V    |
| Current Sink           |             |                                       | 0    | -   | 0.75 | mA   |

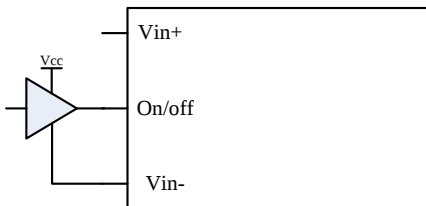
### Recommended remote on/off circuit for active low



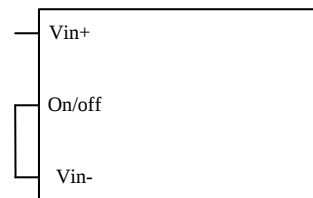
Control with open collector/drain circuit



Control with photocoupler circuit

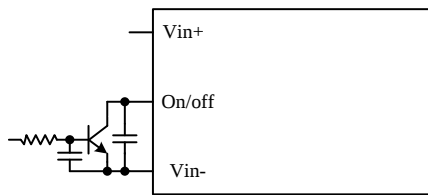


Control with logic circuit

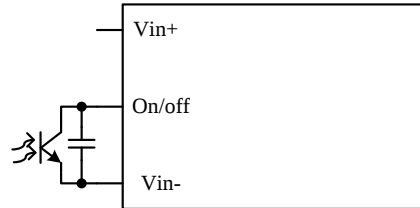


Permanently on

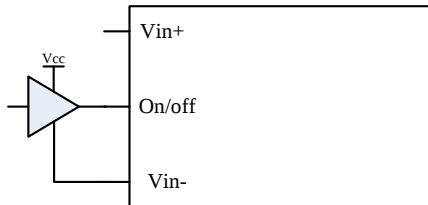
## Recommended remote on/off circuit for active high



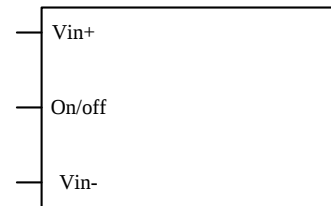
Control with open collector/drain circuit



Control with photocoupler circuit



Control with logic circuit



Permanently on

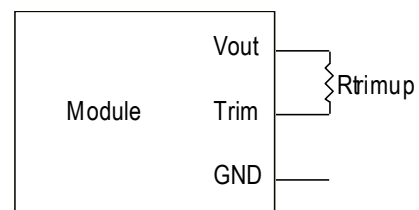
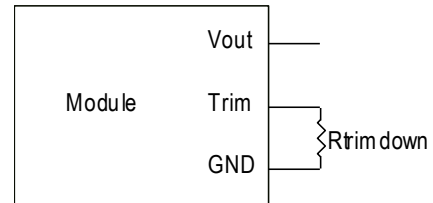
## 8. OUTPUT TRIM EQUATIONS

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.

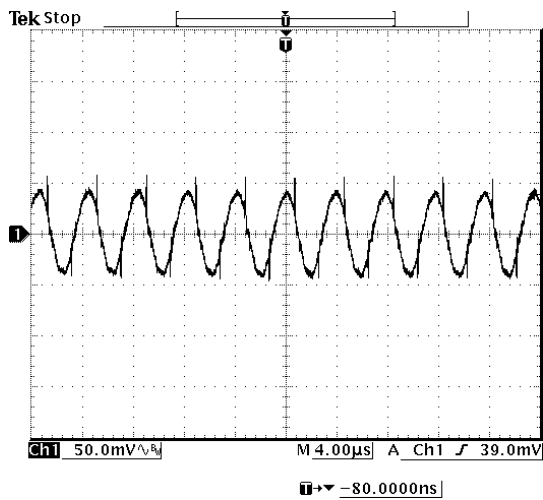
$$R_{trimdown} = \frac{511}{|\delta|} - 10.22 [k\Omega]$$

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

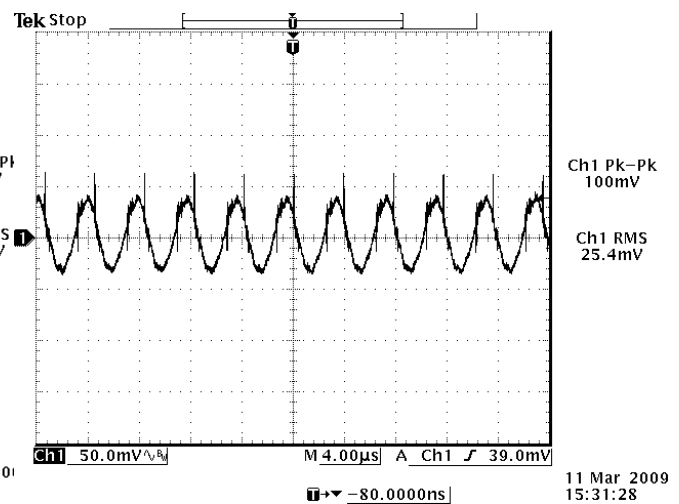
**NOTE:**  $\delta = \frac{(V_{o\_req} - V_o)}{V_o} \times 100 [\%]$



## 9. RIPPLE AND NOISE WAVEFORM



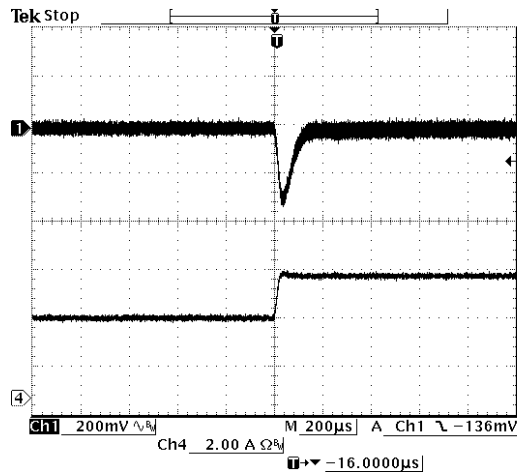
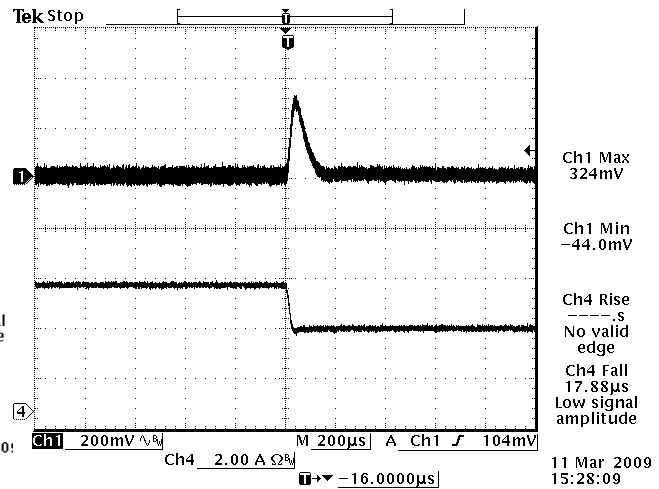
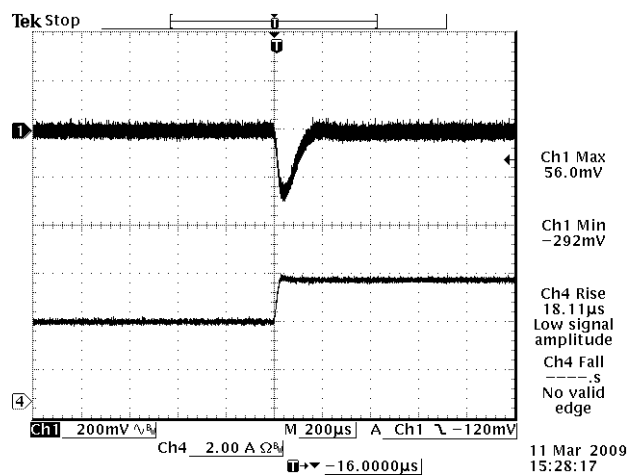
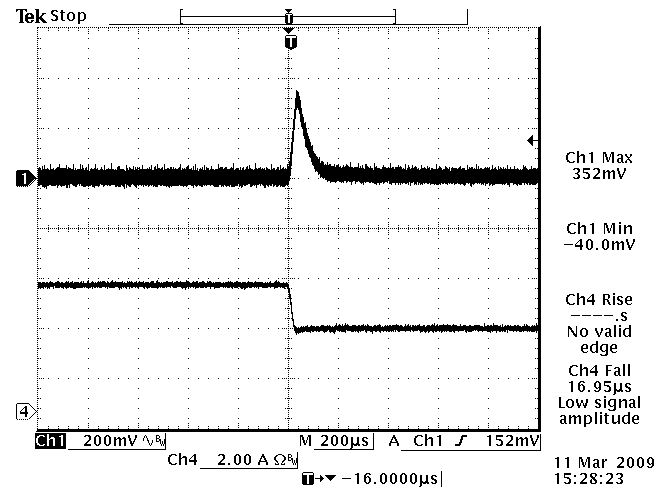
24 VDC input, 12 VDC/7 A output



48 VDC input, 12 VDC/7 A output

**Note:** Ripple and noise at full load, 0-20 MHz BW, with a 0.1  $\mu$ F ceramic cap and a 10  $\mu$ F tantalum cap at the output, and  $T_a=25^\circ\text{C}$ .

## 10. TRANSIENT RESPONSE WAVEFORMS

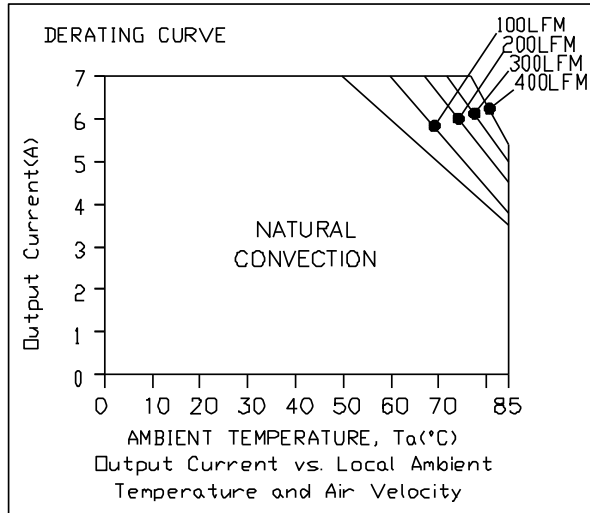
50%-75% Load Transients at  $V_{in}=24$  V75%-50% Load Transients at  $V_{in}=48$  V50%-75% Load Transients at  $V_{in}=24$  V75%-50% Load Transients at  $V_{in}=48$  V

**NOTE:** Transients Response at  $V_o=12$ V,  $di/dt=0.1$  A/ $\mu$ s, with a 0.1  $\mu$ F ceramic cap and a 10  $\mu$ F tantalum cap at output, and  $T_a=25^\circ$  C.

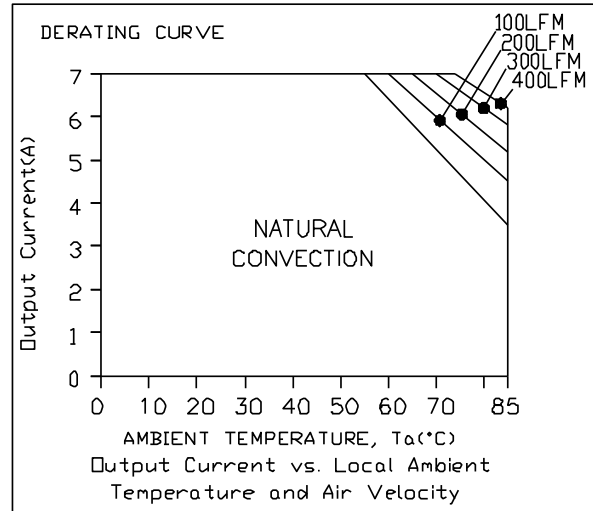
## 11. THERMAL DERATING CURVE

Maximum FET junction temperature derated to 120°C

### ORCY-60U120 & ORCY-60U12L & ORCY-60U12

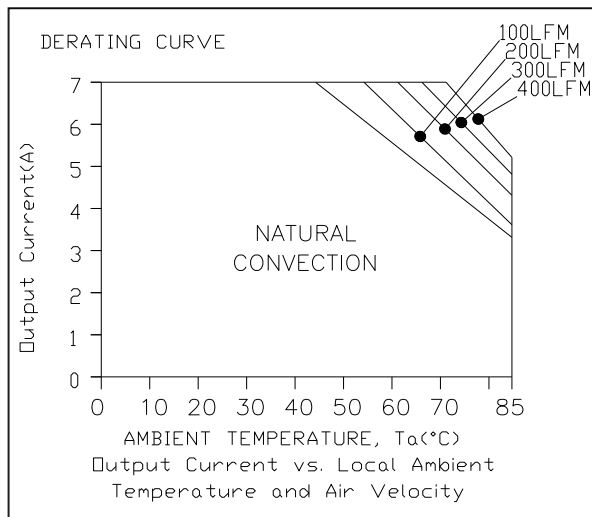


$V_{in}=24\text{ V}$ ,  $V_o=12\text{ V}$

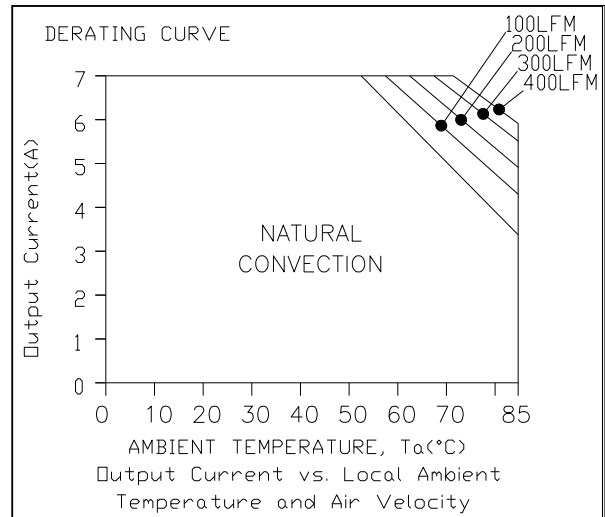


$V_{in}=48\text{ V}$ ,  $V_o=12\text{ V}$

### ORCY-60U12B



$V_{in}=24\text{ V}$ ,  $V_o=12\text{ V}$

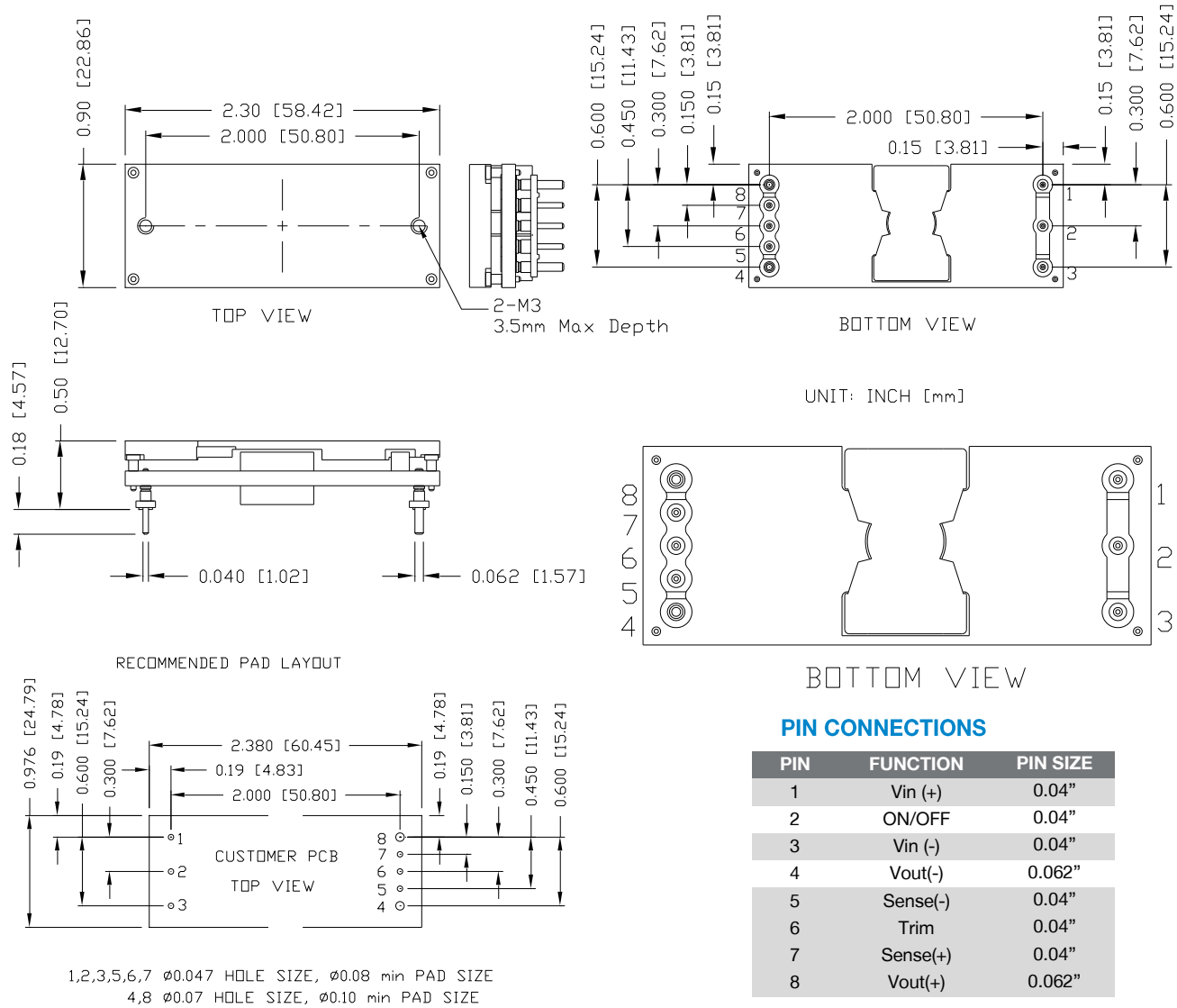


$V_{in}=48\text{ V}$ ,  $V_o=12\text{ V}$

**Note:** Output power vs. ambient temperature and air velocity @ $V_{in}=56\text{V}$ (Longitudinal Orientation, airflow from  $V_{out}$  to  $V_{in}$ )

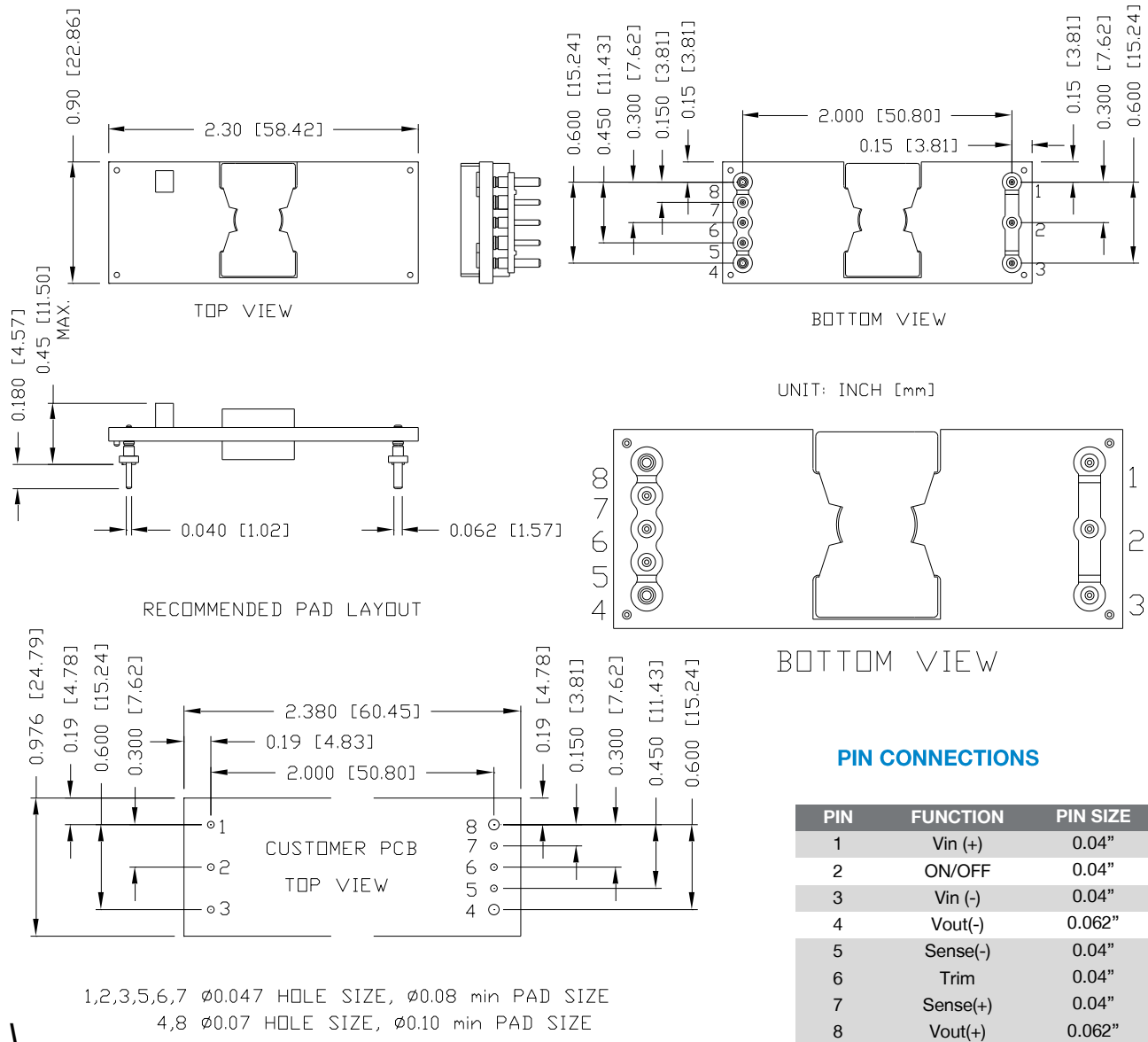
## 12. MECHANICAL DIMENSIONS

### ORCY-60U120 & ORCY-60U12L



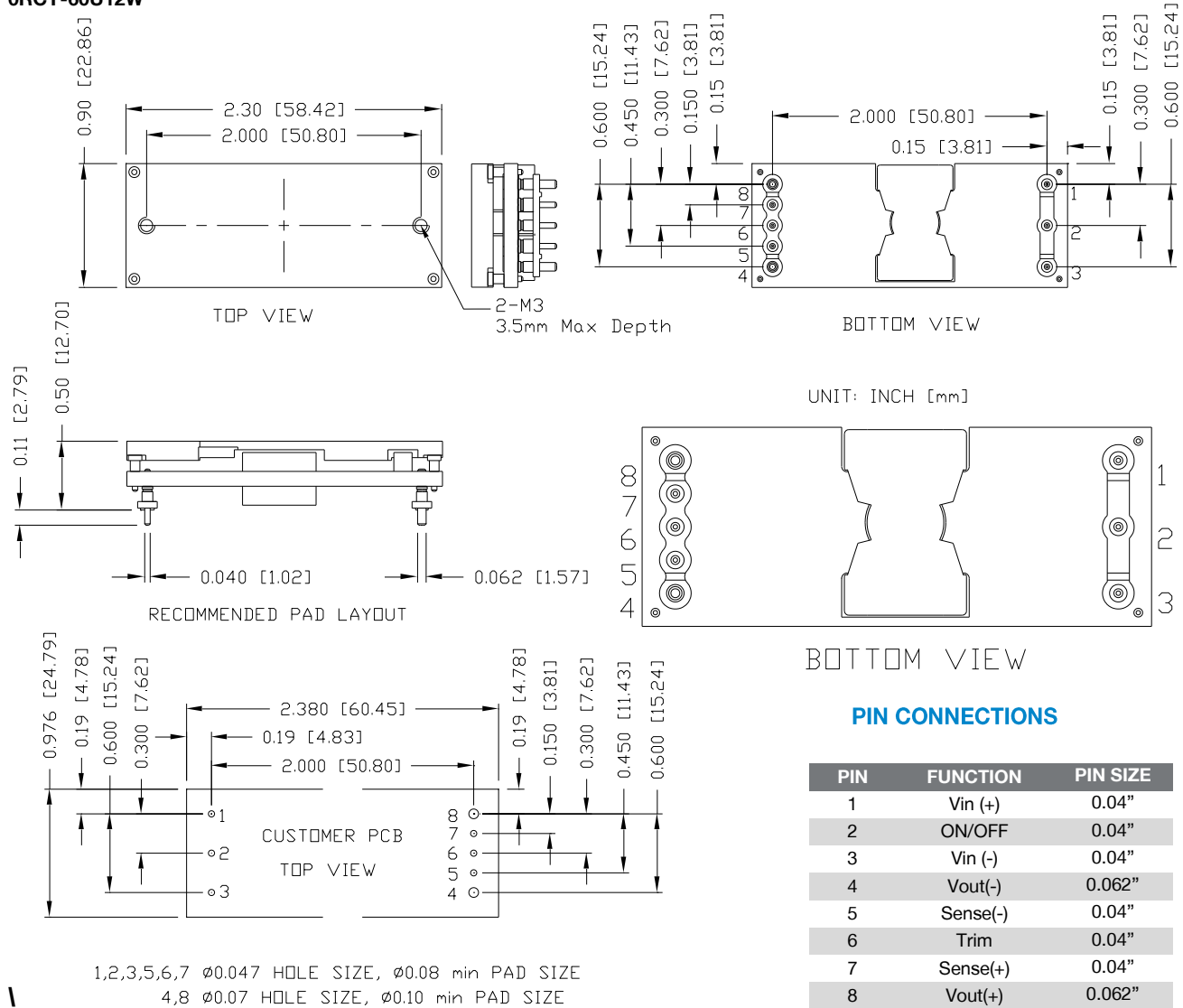
**NOTES:** 1. Pin 5 must be connected to Vout-  
2. Leave Pin 6 open for nominal voltage.  
3. Pin 7 must be connected to Vout+

## ORCY-60U12B



**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+

## 0RCY-60U12W



**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.

### NOTES:

- 1) All Pins: Material - Copper Alloy;  
Finish - Tin plated
  - 2) Undimensioned components are shown for visual reference only.
- All dimensions in inches; Tolerances: x.xx +/-0.02 in [0.51 mm]. x.xxx +/-0.010 in [0.25 mm].

### 13. REVISION HISTORY

| DATE       | REVISION | CHANGES DETAIL                                   | APPROVAL    |
|------------|----------|--------------------------------------------------|-------------|
| 2017-02-09 | AA       | First release                                    | Jessica Yan |
| 2017-05-24 | AC       | Updated the version, add the new P/N ORCY-60212W | XF Jiang    |

**For more information on these products consult: [tech.support@psbel.com](mailto: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.



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