

## ISOLATED DC/DC CONVERTERS

18 Vdc - 36 Vdc Input 12 Vdc /10 A, 3.3 Vdc/30 A Outputs

**bel**  
POWER PRODUCTS

### 0RCY-80Rxxx RoHS Compliant PRELIMINARY Rev. D

- Isolated
- High Efficiency
- High Power Density
- Fixed Frequency (300 kHz)
- Input Under-Voltage Lockout
- Output Over-Voltage Shutdown
- Basic Insulation
- Low Cost
- OCP/SCP
- Over Temperature Protection
- Output Voltage Trim
- Remote On/Off
- Positive/Negative Remote Sense



### Description

The 0RCY-80Rxxx series are isolated dc/dc converters that operate from a nominal 24 Vdc source. These units will provide up to 120 W of output power and 30 A of output current from a nominal 24 Vdc input. The unit is designed to be highly efficient and low cost. Features include remote on/off, over current protection and under-voltage lockout. This converter is provided in an industry standard eighth brick package.

### Part Selection

Output Voltage	Input Voltage	Max. Output Current	Max. Output Power	Typical Efficiency	Model Number Active High	Model Number Active Low
1.8 Vdc	18 Vdc - 36 Vdc	30 A	54 W	90%	0RCY-80RV80	0RCY-80RV8L
3.3 Vdc	18 Vdc - 36 Vdc	30 A	99 W	91%	0RCY-80R033	0RCY-80R03L
12 Vdc	18 Vdc - 36 Vdc	10 A	120 W	93%	0RCY-80R120	0RCY-80R12L

**Notes:** 1. All part numbers above indicate RoHS 6. Change the second letter "R" to "7" for RoHS 5 part numbers.  
2. Add "G" suffix at the end of the model numbers to indicate Tray Packaging.

### Absolute Maximum Ratings

Parameter	Min	Typ	Max	Notes
Input Voltage (continuous)	-0.3 V	-	40 V	
Remote On/Off	-0.3 V	-	18 V	
I/O Isolation Voltage	1500 V	-	-	
Ambient Temperature	-40 °C	-	85 °C	
Storage Temperature	-55 °C	-	125 °C	

### Input Specifications

Parameter	Min	Typ	Max	Notes
Input Voltage	18 V	24 V	36 V	
Input Current (full load)				
Vo=1.8 V	-	-	3.5 A	
Vo=3.3 V	-	-	6.2 A	
Vo=12 V	-	-	8.0 A	
Input Current (no load)	-	100 mA	200 mA	
Remote Off Input Current	-	10 mA	15 mA	

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### Input Specifications (continued)

Parameter	Min	Typ	Max	Notes
Input Reflected Ripple Current (rms)		5 mA	10 mA	Tested with simulated source impedance of 10 $\mu$ H, 5 Hz to 20 MHz; use a 100 $\mu$ F/100 V electrolytic cap with ESR = 1 ohm max. at 200 kHz at 25 °C.
Input Reflected Ripple Current (pk-pk)	-	25 mA	40 mA	
$I^2t$ Inrush Current Transient	-	0.1 A <sup>2</sup> s	0.5 A <sup>2</sup> s	
Turn-on Voltage Threshold	16 V	16.5 V	17 V	
Turn-off Voltage Threshold	15 V	15.5 V	16 V	

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

### Output Specifications

Parameter	Min	Typ	Max	Notes
Output Voltage Set Point				$V_{in}=24$ V, $I_o=50\%$ load
$V_o=1.8$ V	1.773 V	1.80 V	1.827 V	
$V_o=3.3$ V	3.250 V	3.30 V	3.350 V	
$V_o=12$ V	11.76 V	12.0 V	12.24 V	
Load Regulation				
$V_o=1.8$ V	-	$\pm 6$ mV	$\pm 12$ mV	
$V_o=3.3$ V	-	$\pm 8$ mV	$\pm 16$ mV	
$V_o=12$ V	-	$\pm 12$ mV	$\pm 24$ mV	
line Regulation				
$V_o=1.8$ V	-	$\pm 6$ mV	$\pm 12$ mV	
$V_o=3.3$ V	-	$\pm 8$ mV	$\pm 16$ mV	
$V_o=12$ V	-	$\pm 12$ mV	$\pm 24$ mV	
Regulation Over Temperature (-40deg.C ~ +85deg.C)				
$V_o=1.8$ V	-	$\pm 15$ mV	$\pm 30$ mV	
$V_o=3.3$ V	-	$\pm 20$ mV	$\pm 40$ mV	
$V_o=12$ V	-	$\pm 30$ mV	$\pm 60$ mV	
Ripple and Noise (rms)				0-20 MHz BW, with a 1 $\mu$ F ceramic cap and a 10 $\mu$ F tantalum cap at the output.
$V_o=1.8$ V	-	30 mV	50 mV	
$V_o=3.3$ V	-	30 mV	50 mV	
$V_o=12$ V	-	30 mV	50 mV	
Ripple and Noise (pk-pk)				
$V_o=1.8$ V	-	60 mV	100 mV	
$V_o=3.3$ V	-	80 mV	120 mV	
$V_o=12$ V	-	100 mV	150 mV	
Output Current Range				
$V_o=1.8$ V	0 A	-	30 A	
$V_o=3.3$ V	0 A	-	30 A	
$V_o=12$ V	0 A	-	10 A	
Output DC Current Limit				
$V_o=1.8$ V	33 A	39 A	45 A	
$V_o=3.3$ V	33 A	39 A	45 A	
$V_o=12$ V	11 A	13 A	15 A	
Short Circuit Surge Transient	-	2 A <sup>2</sup> s	4 A <sup>2</sup> s	
Turn on Time	-	60 mS	100 mS	
Overshoot at Turn on	-	0%	5%	
Output Capacitance				
$V_o=1.8$ V	0 $\mu$ F	-	20000 $\mu$ F	
$V_o=3.3$ V	0 $\mu$ F	-	10000 $\mu$ F	
$V_o=12$ V	0 $\mu$ F	-	1500 $\mu$ F	

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### Output Specifications (continued)

Parameter		Min	Typ	Max	Notes	
<b>Transient Response</b>						
50% ~ 75% Max Load	Overshoot	Vo=1.8 V	-	140 mV	180 mV	
	Settling Time		-	150 $\mu$ S	250 $\mu$ S	
75% ~ 50% Max Load	Overshoot		-	140 mV	180 mV	
	Settling Time		-	150 $\mu$ S	250 $\mu$ S	
50% ~ 75% Max Load	Overshoot		Vo=3.3 V	-	200 mV	300 mV
	Settling Time			-	200 $\mu$ S	300 $\mu$ S
75% ~ 50% Max Load	Overshoot	-		200 mV	300 mV	
	Settling Time	-		200 $\mu$ S	300 $\mu$ S	
50% ~ 75% Max Load	Overshoot	Vo=12 V		-	350 mV	500 mV
	Settling Time			-	200 $\mu$ S	300 $\mu$ S
75% ~ 50% Max Load	Overshoot		-	350 mV	500 mV	
	Settling Time		-	200 $\mu$ S	300 $\mu$ S	

di/dt=0.1 A/ $\mu$ s, Vin=24 Vdc, Ta=25 °C, with a 1  $\mu$ F ceramic cap and a 10  $\mu$ F tantalum cap at output.

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

### General Specifications

Parameter	Min	Typ	Max	Notes
Efficiency				Vin=24 V, full load
	Vo=1.8 V	88%	90%	
	Vo=3.3 V	90%	91%	
	Vo=12 V	91%	93%	
Switching Frequency	270 kHz	300 kHz	330 kHz	
Isolation capacitance	-	3900 pF	-	
Remote Sense Compensation	-	-	10%	The total voltage increased by trim and remote sense should not exceed 10%Vo.
Output Voltage Trim Range	80%	-	110%	
Over Temperature Protection	-	125 °C	-	
Over Voltage Protection	-	125%Vo	-	Vin=24 V, full load, in Hiccup mode.
MTBF	TBD			Calculated Per Bell Core SR-332 (Io=80%load, Ta = 25 °C)
Dimensions				0RCY-80RV8x
	Inches (L x W x H)	2.30 x 0.896 x 0.50		
	Millimeters (L x W x H)	58.42 x 22.76 x 12.70		
Dimensions				0RCY-80R03x & 0RCY-80R12x
	Inches (L x W x H)	2.30 x 0.90 x 0.50		
	Millimeters (L x W x H)	58.42 x 22.91 x 12.70		
Weight	-	TBD	-	

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

### Control Specifications

Parameter	Min	Typ	Max	Notes
<b>Remote On/Off</b>				
Signal Low (Unit On)	Active Low	-0.3 V	-	The remote on/off pin open, Unit off.
Signal High (Unit Off)		2.4 V	-	
Signal Low (Unit Off)	Active High	-0.3 V	-	The remote on/off pin open, Unit on.
Signal High (Unit On)		2.4 V	-	
Current Sink	0 mA	-	1 mA	

# ISOLATED DC/DC CONVERTERS

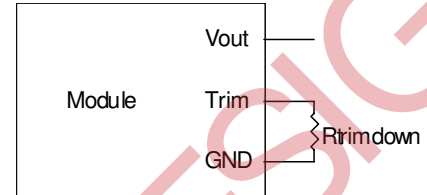
18 Vdc - 36 Vdc Input 12 Vdc /10 A, 3.3 Vdc/30 A Outputs



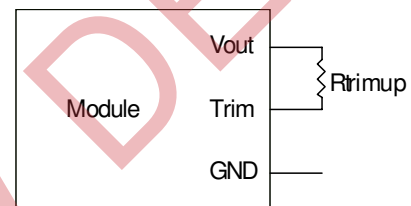
## Output Trim Equations

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.

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



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



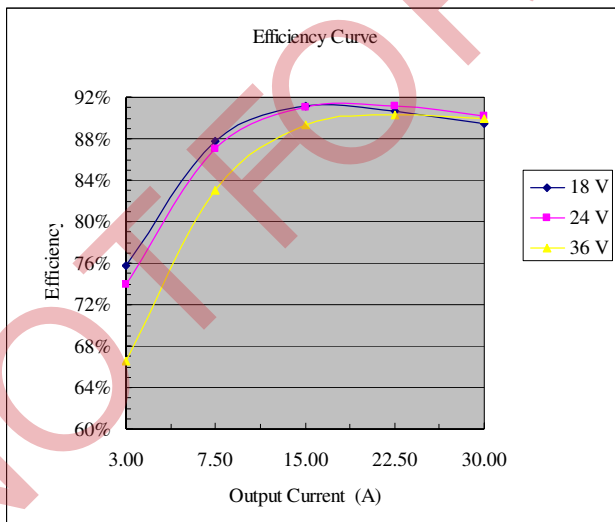
**Note:**

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

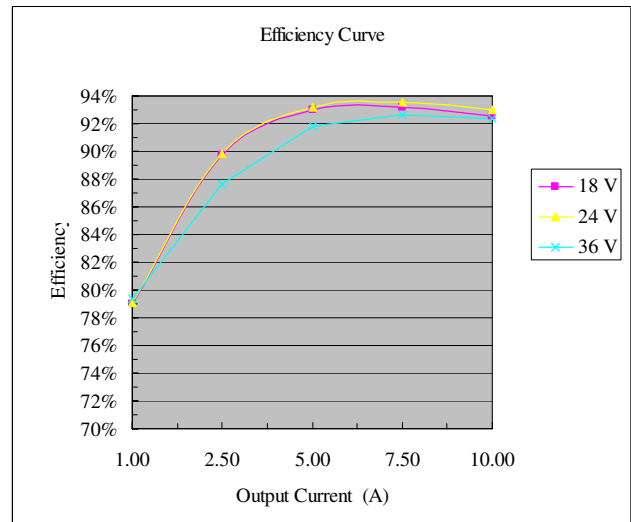
$V_o_{req}$  = Desired (trimmed) output voltage [V]

For 0RCY-80RV8x, Output voltage  $V_o=1.8$  V; For 0RCY-80R03x, Output voltage  $V_o=3.3$  V; For 0RCY-80R12x, Output voltage  $V_o=12$  V;

## Efficiency Data



$V_o=1.8$  V



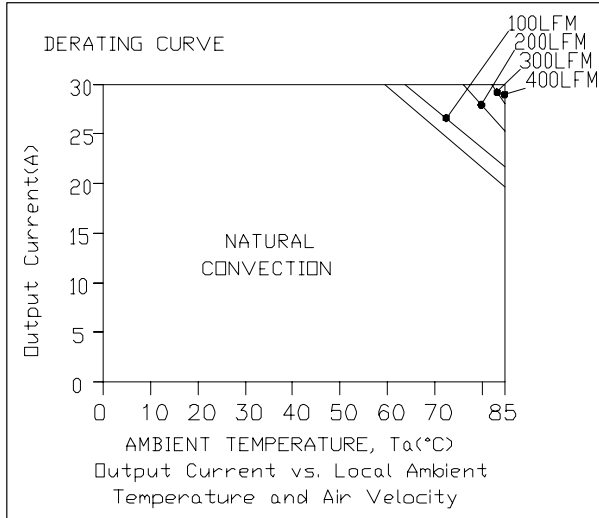
$V_o=12$  V

# ISOLATED DC/DC CONVERTERS

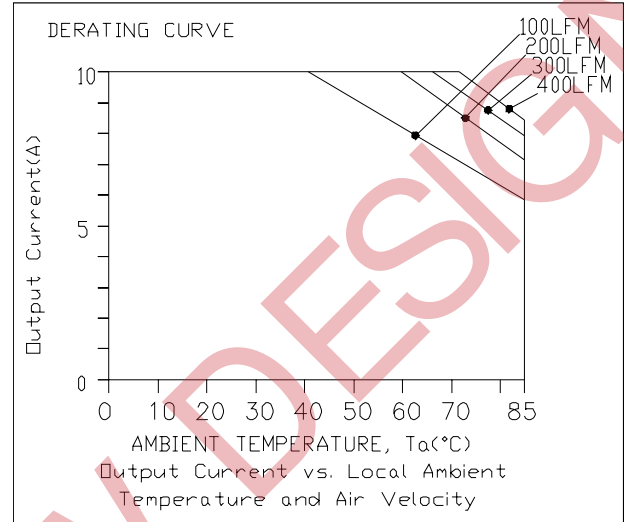
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## Thermal Derating Curves



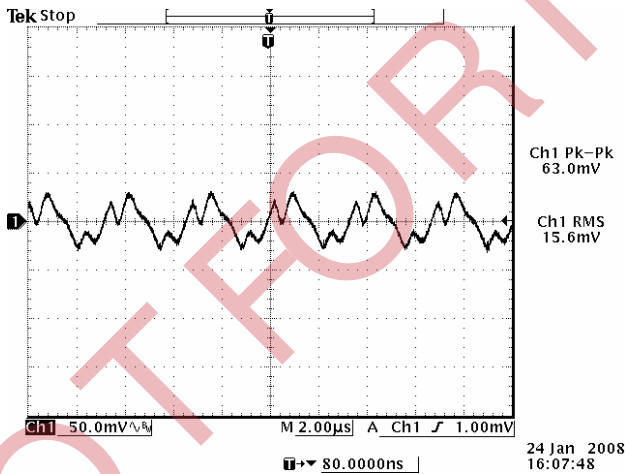
Vo=1.8 V



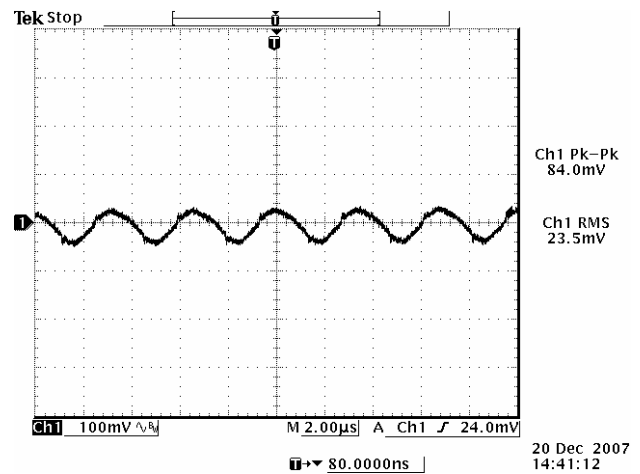
Vo=12 V

**Note:** Vin=24 V, with maximum junction temperature of semiconductors derated to 120 degree C.

## Ripple and Noise Waveforms



24 Vdc input, 1.8 Vdc/30 A output



24 Vdc input, 12 Vdc/10 A output

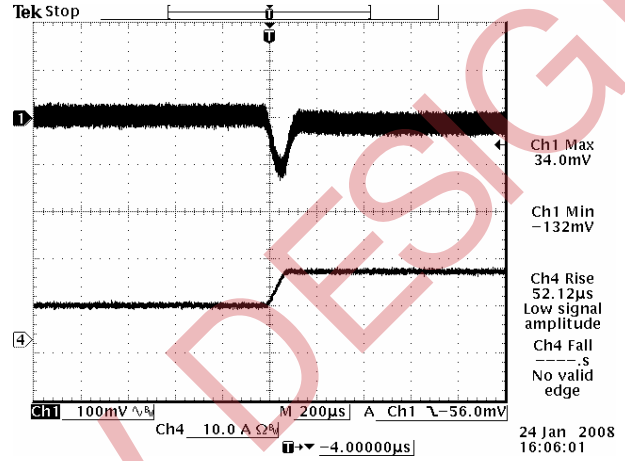
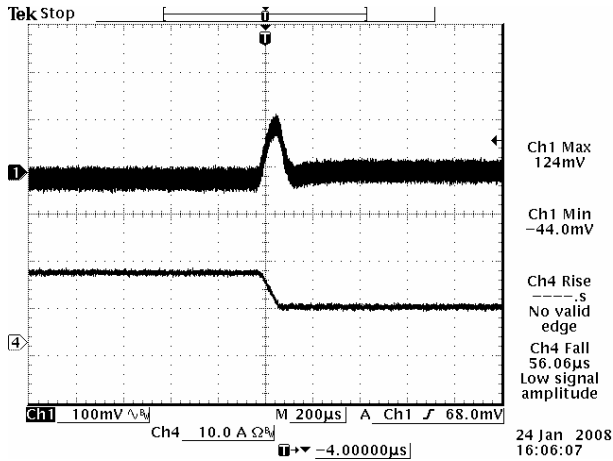
**Note:** Ripple and noise at full load, with a 1uF ceramic cap and a 10 uF Tantalum cap at output, and Ta=25 deg C.

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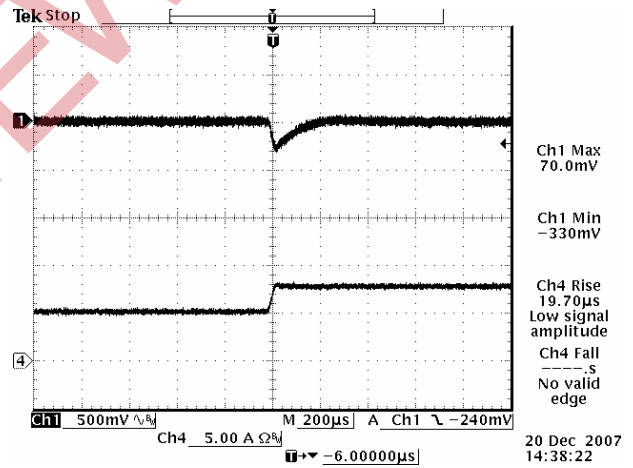
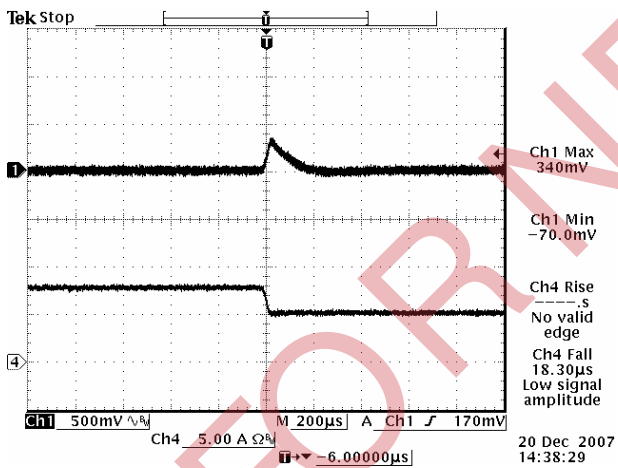


## Transient Response Waveforms



Vo=1.8 V 75% to 50% Load Transients

Vo=1.8 V 50% to 75% Load Transients



Vo=12 V 75% to 50% Load Transients

Vo=12 V 50% to 75% Load Transients

**Note:** Transients Response at di/dt=0.1 A/µs, with a 10 µF Tantalum Cap and 1µF Ceramic Cap at output, and Ta=25 deg C.

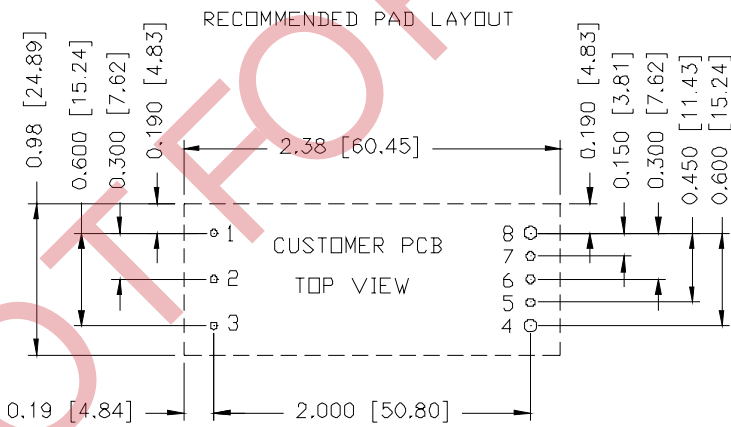
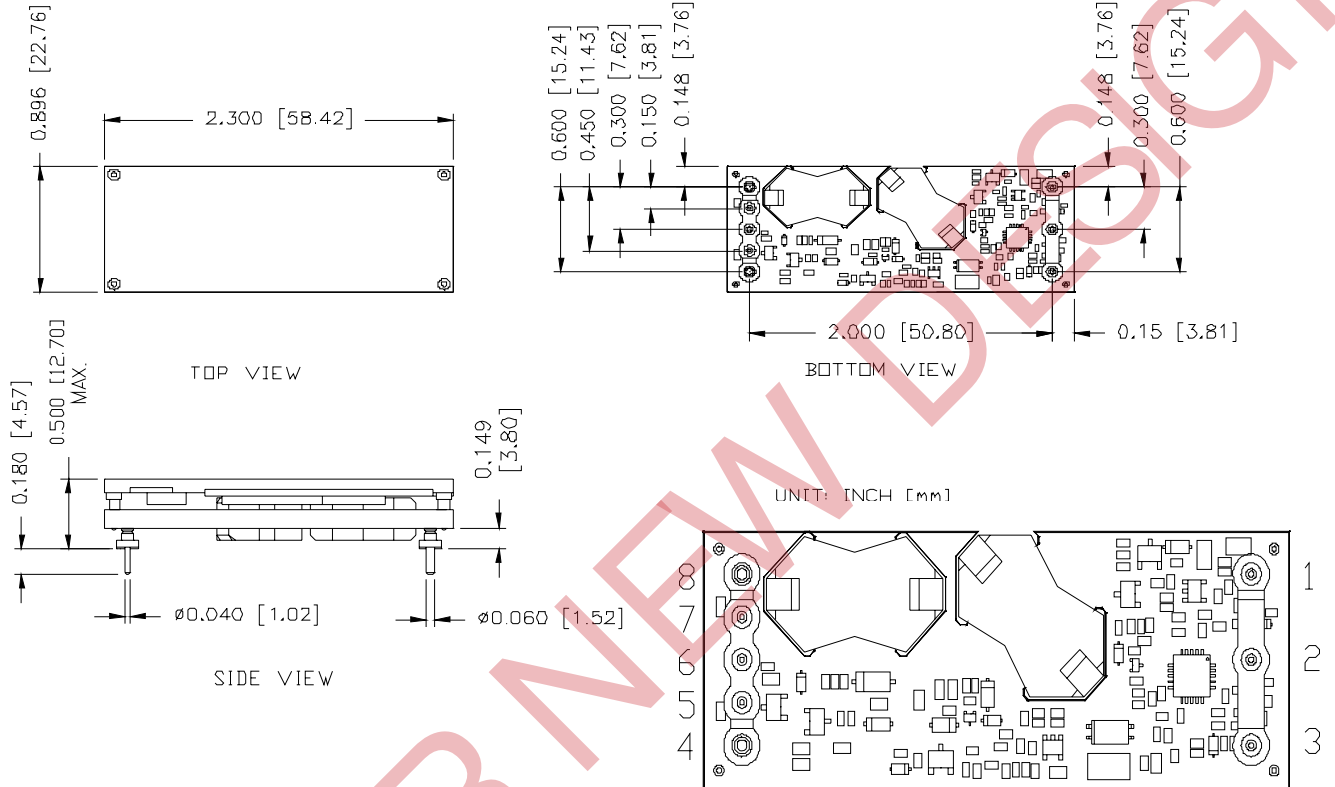
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## Mechanical Outline

### ORCY-80RV8x



1,2,3,5,6,7  $\varnothing$ 0.047 HOLE SIZE,  $\varnothing$ 0.08 min PAD SIZE  
 4,8  $\varnothing$ 0.07 HOLE SIZE,  $\varnothing$ 0.10 min PAD SIZE

BOTTOM VIEW

### Pin Connections

Pin	Name	Pin Dia
1	Vin+	0.040"
2	RC	0.040"
3	Vin-	0.040"
4	Vout-	0.060"
5	RS-	0.040"
6	Trim	0.040"
7	RS+	0.040"
8	Vout+	0.060"

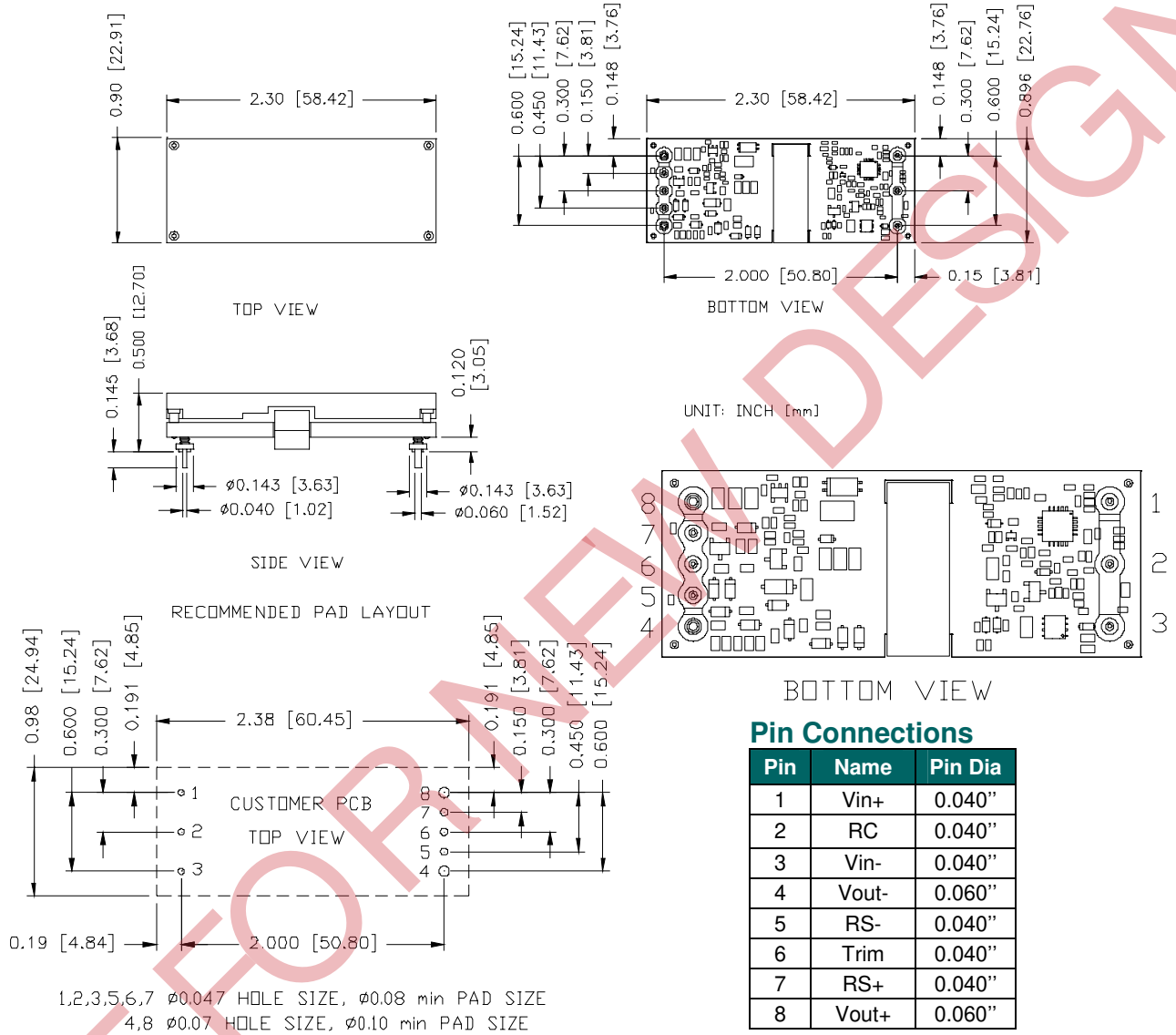
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## Mechanical Outline

0RCY-80R03x & 0RCY-80R12x



**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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### CORPORATE

**Bel Fuse Inc.**  
 206 Van Vorst Street  
 Jersey City, NJ 07302  
 Tel 201-432-0463  
 Fax 201-432-9542  
[www.belfuse.com](http://www.belfuse.com)

### FAR EAST

**Bel Fuse Ltd.**  
 8F/ 8 Luk Hop Street  
 San Po Kong  
 Kowloon, Hong Kong  
 Tel 852-2328-5515  
 Fax 852-2352-3706  
[www.belfuse.com](http://www.belfuse.com)

### EUROPE

**Bel Fuse Europe Ltd.**  
 Preston Technology Management Centre  
 Marsh Lane, Suite G7, Preston  
 Lancashire, PR1 8UD, U.K.  
 Tel 44-1772-556601  
 Fax 44-1772-888366  
[www.belfuse.com](http://www.belfuse.com)