

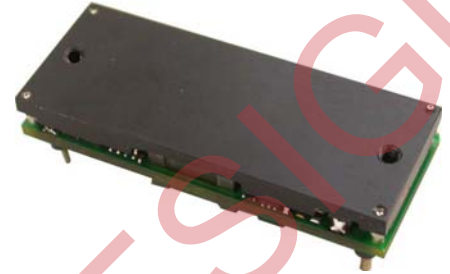
## ISOLATED DC/DC CONVERTERS

18 Vdc - 75 Vdc Input 3.3 Vdc /15 A Output

**bel**  
POWER PRODUCTS

### 0RCY-60U03x RoHS Compliant PRELIMINARY Rev. B

- Isolated
- High Efficiency
- High Power Density
- Fixed Frequency (260 kHz)
- Input Under-Voltage Lockout
- Input Over-Voltage Lockout
- Ultra Wide Input Range:  
18 Vdc - 75 Vdc
- UL60950-1 (UL/cUL) Recognized  
(Pending)
- Output Over-Voltage Shutdown
- OCP/SCP
- Over Temperature Protection
- Low Cost
- Output Voltage Trim
- Positive/Negative Remote Sense
- Basic Insulation
- Remote On/Off



### Description

The 0RCY-60U03x 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 49.5 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	Model Number Active Low
3.3 Vdc	18 Vdc - 75 Vdc	15 A	49.5 W	90%	0RCY-60U033	0RCY-60U03L

- 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	-	80 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/48 V	75 V	
Input Current (full load)				
Vin=18 V	-	3.2 A	-	
Vin=75 V	-	0.76 A	-	
Input Current (no load)	-	65 mA	100 mA	
Remote Off Input Current	-	10 mA	15 mA	
Input Reflected Ripple Current (rms)		7 mA	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)	-	30 mA	50 mA	

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### Input Specifications (continued)

Parameter	Min	Typ	Max	Notes
I <sup>2</sup> t Inrush Current Transient	-	0.05 A <sup>2</sup> s	0.1 A <sup>2</sup> s	
Turn-on Voltage Threshold	16.5 V	17.0 V	17.5 V	
Turn-off Voltage Threshold	15.5 V	16.0 V	16.5 V	
Input Over Voltage Lockout	76 V	78 V	80 V	

### Output Specifications

Parameter	Min	Typ	Max	Notes
Output Voltage Set Point	3.25 V	3.30 V	3.35 V	Vin=48 V, Io=50% load
Load Regulation	-	±5 mV	±10 mV	
Line Regulation	-	±5 mV	±10 mV	
Regulation Over Temperature (-40deg.C ~ +85deg.C)	-	±30 mV	±120 mV	
Ripple and Noise (rms)	-	10 mV	20 mV	0-20 MHz BW, with a 0.1 µF ceramic cap and a 10 µF tantalum cap at the output.
Ripple and Noise (pk-pk)	-	36 mV	60 mV	
Output Current Range	0 A	-	15 A	
Output DC Current Limit	20 A	-	25 A	Vin=48 V, in Hiccup Mode.
Short Circuit Surge Transient	-	3 A <sup>2</sup> s	5 A <sup>2</sup> s	
Turn on Time	5 mS	12 mS	20 mS	
Overshoot at Turn on	-	0%	3%	
Output Capacitance	0 uF	-	4800 uF	
<b>Transient Response</b>				
75% ~ 50% Max Load	Overshoot	-	100 mV	di/dt=0.1 A/us, Vin=24 Vdc, Ta=25 °C, with a 0.1 µF ceramic cap and a 10 µF tantalum cap at output.
	Settling Time	-	200 uS	
50% ~ 75% Max Load	Overshoot	-	100 mV	
	Settling Time	-	200 uS	

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

### General Specifications

Parameter	Min	Typ	Max	Notes
Efficiency	Vin=24 V 88.5% Vin=48 V 89%	89.6% 90.2%	- -	Measured at normal Vin, full load.
Switching Frequency	240 kHz	260 kHz	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	90%	-	110%	
Over Temperature Protection	-	125 °C	-	
Over Voltage Protection	-	4.1 V	-	Vin=48 V, full load, in Hiccup mode.
MTBF	TBD			Calculated Per Bell Core SR-332 (Io=80%load, Ta = 25 °C)
Dimensions	Inches (L × W × H) 2.30 x 0.896 x 0.49 Millimeters (L × W × H) 58.42 x 22.76 x 12.47			
Weight	-	TBD	-	

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

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## Control Specifications

Parameter	Min	Typ	Max	Notes		
<b>Remote On/Off</b>						
Signal Low (Unit On)	Active Low	-0.3 V	-	0.8 V	0RCY-60U03L. The remote on/off pin open, Unit off.	
Signal High (Unit Off)		2.4 V	-			18 V
Signal Low (Unit Off)	Active High	-0.3 V	-	0.8 V		0RCY-60U033. The remote on/off pin open, Unit on.
Signal High (Unit On)		2.4 V	-			
Current Sink	0 mA	-	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.

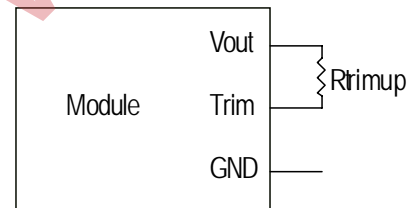
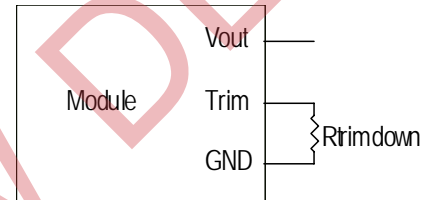
$$R_{trimdown} = \frac{511}{|\delta|} - 10.22 [k\Omega]$$

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

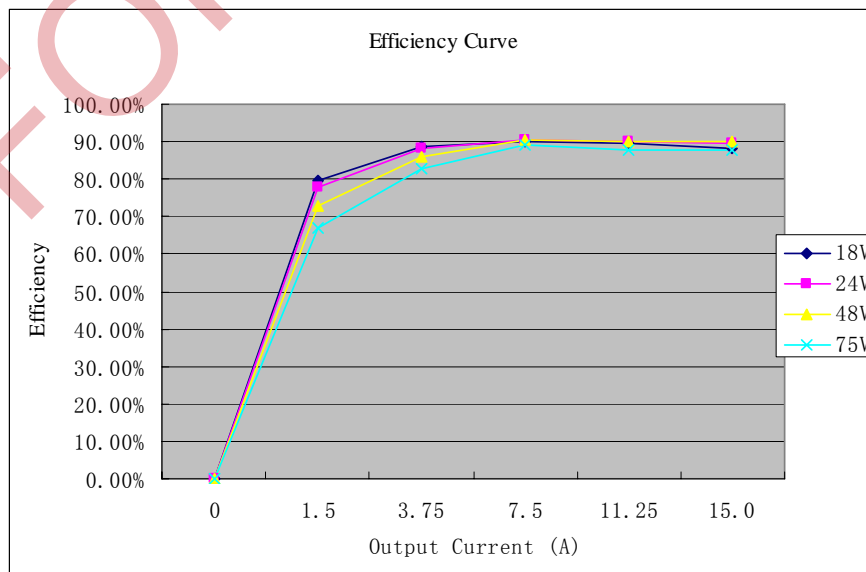
**Note:**

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

$V_o_{req}$  = Desired (trimmed) output voltage [V]  
 Output voltage  $V_o$  = 3.3 V



## Efficiency Data



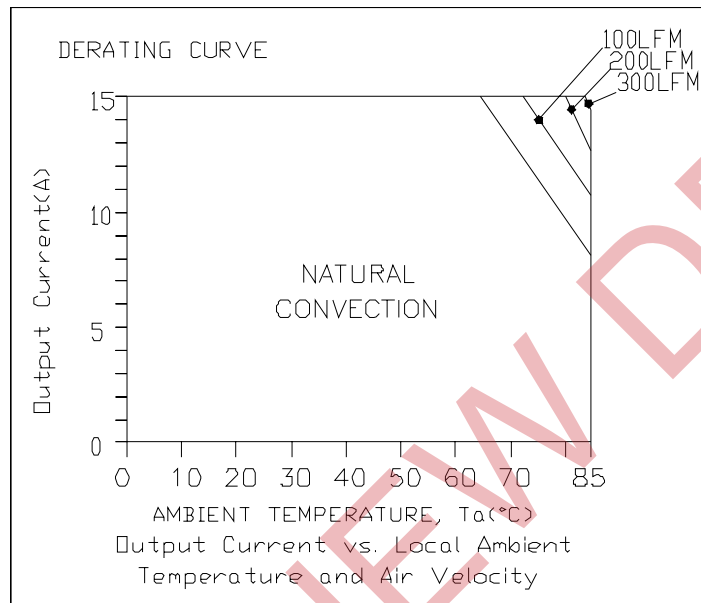
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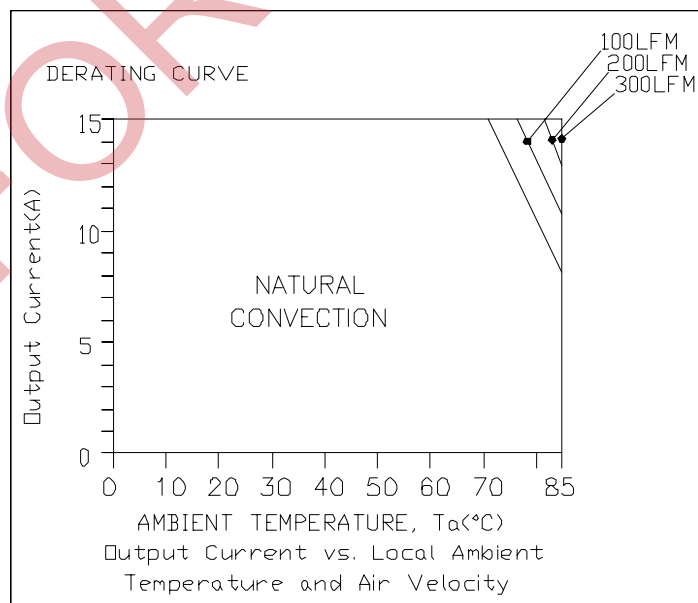
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### Thermal Derating Curves

$V_{in}=24\text{ V}$ ,  $V_o=3.3\text{ V}$ ; Maximum FET junction temperature derated to 120 C



$V_{in}=48\text{ V}$ ,  $V_o=3.3\text{ V}$ ; Maximum FET junction temperature derated to 120 C

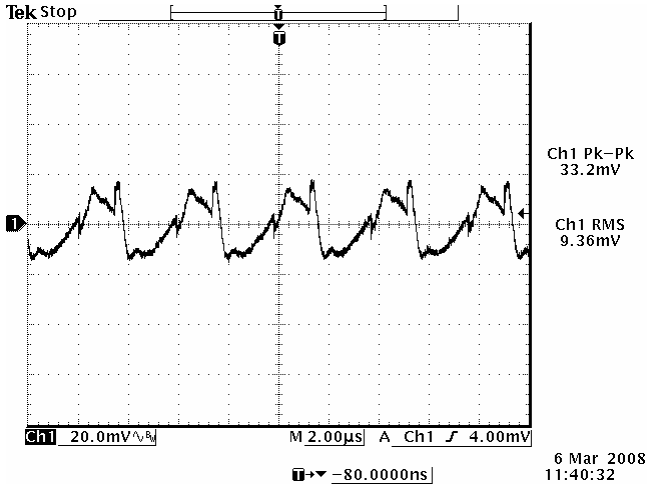


# ISOLATED DC/DC CONVERTERS

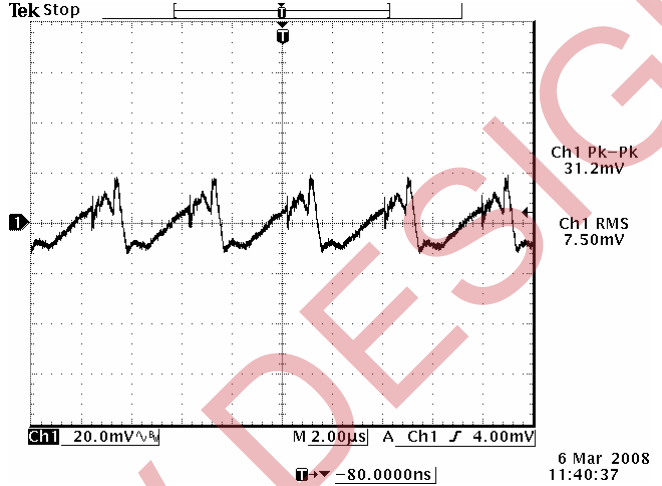
18 Vdc - 75 Vdc Input 3.3 Vdc /15 A Output



## Ripple and Noise Waveforms



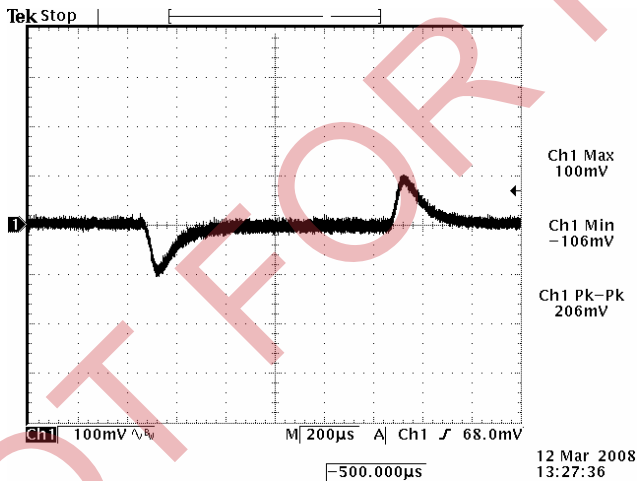
24 Vdc input, 3.3 Vdc/15 A output



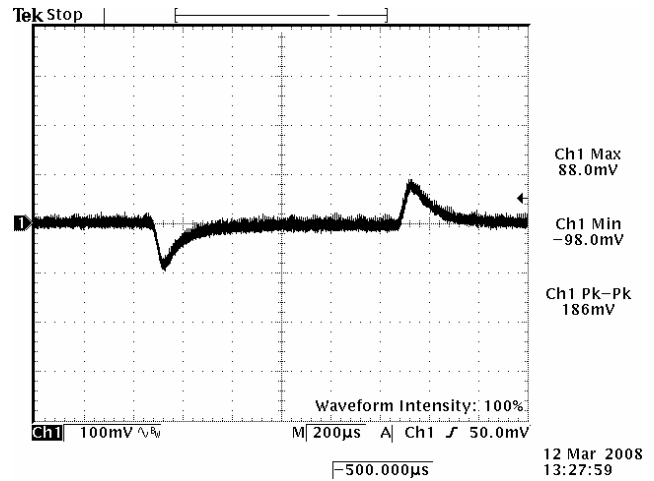
48 Vdc input, 3.3 Vdc/15 A output

**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  $T_a=25$  deg C.

## Transient Response Waveforms



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



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

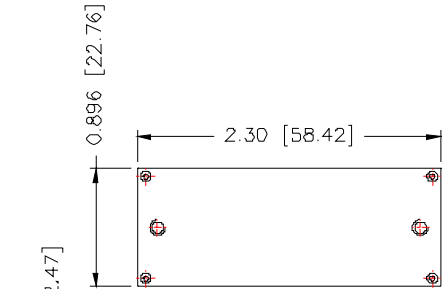
**Note:** Transients Response at  $di/dt=0.1$  A/ $\mu$ s, with a 0.1  $\mu$ F ceramic cap and a 10  $\mu$ F tantalum cap at output, and  $T_a=25$  deg C.

# ISOLATED DC/DC CONVERTERS

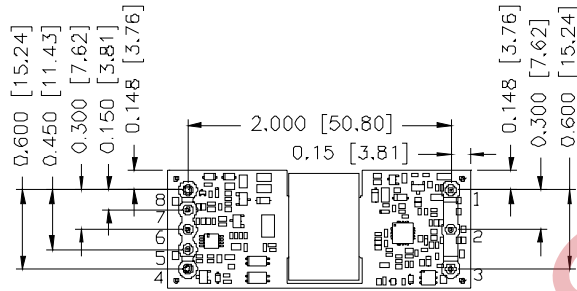
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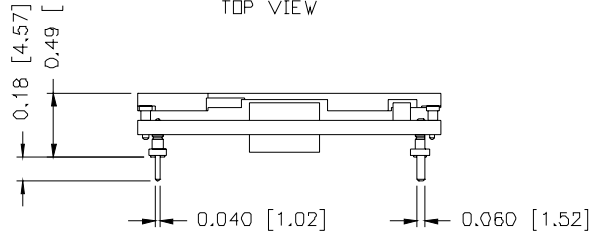
## Mechanical Outline



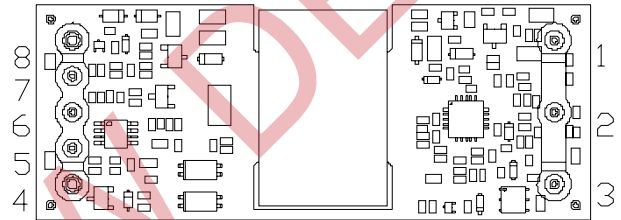
TOP VIEW



BOTTOM VIEW

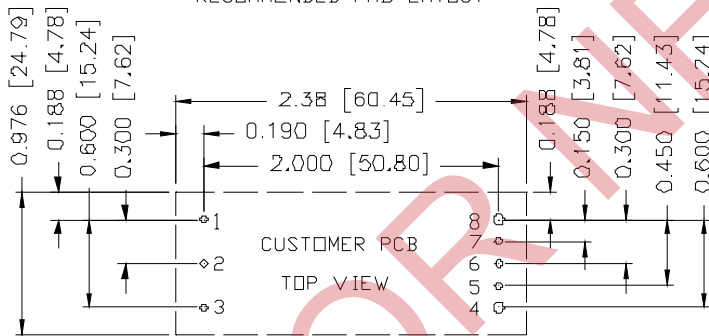


UNIT: INCH [mm]



BOTTOM VIEW

### RECOMMENDED PAD LAYOUT



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

## 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+.

## 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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