

## ISOLATED DC/DC CONVERTERS

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

**bel**  
POWER PRODUCTS

### 0RCY-60U12x RoHS Compliant PRELIMINARY Rev. C

- 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 (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-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	Model Number Active Low
12 Vdc	18 Vdc - 75 Vdc	7 A	84 W	92%	0RCY-60U120	0RCY-60U12L

- 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	
Input Transient Voltage	-	-	100 V	100mS maximum
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	-	6.7 A	-	
Vin=75 V	-	1.6 A	-	
Input Current (no load)	-	100 mA	180 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)		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)	-	15 mA	30 mA	
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	16.0 V	17.0 V	17.5 V	
Turn-off Voltage Threshold	15.0 V	16.0 V	16.5 V	
Input Over Voltage Lockout	76 V	78 V	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 manufacture's datasheet for further information.

**Notes:** 1. This converter has internal 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	Notes	
Output Voltage Set Point	11.76 V	12.00 V	12.24 V	Vin=48 V, Io=50% load	
Load Regulation	-	±6 mV	±12 mV		
line Regulation	-	±10 mV	±20 mV		
Regulation Over Temperature (-40deg.C ~ +85deg.C)	-	±30 mV	±50 mV		
Ripple and Noise (rms)	-	25 mV	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 mV	150 mV		
Output Current Range	0 A	-	7 A		
Output DC Current Limit	7.7 A	-	11 A	Vin=48 V, in Hiccup Mode.	
Short Circuit Surge Transient	-	3 A <sup>2</sup> s	5 A <sup>2</sup> s		
Rise time	5 mS	10 mS	15 mS		
Turn on Time	-	20 mS	25 mS	Ton(Enable form Vin)	
	-	20 mS	25 mS	Ton(Enable form ON/OFF)	
Overshoot at Turn on	-	0%	3%		
Output Capacitance	0 uF	-	1000 uF		
<b>Transient Response</b>					
75% ~ 50% Max Load	Overshoot	-	300 mV	400 mV	di/dt=0.1 A/us, Vin=24 Vdc, Ta=25 °C, with a 0.1 uF ceramic cap and a 10 uF tantalum cap at output.
	Settling Time	-	400 uS	600 uS	
50% ~ 75% Max Load	Overshoot	-	300 mV	400 mV	
	Settling Time	-	400 uS	600 uS	

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

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## General Specifications

Parameter	Min	Typ	Max	Notes
Efficiency Vin=24 V Vin=48 V	90% 90.5%	91.5% 92%	- -	Measured at normal Vin, full load.
Switching Frequency	240 kHz	258 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	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) Millimeters (L x W x H)	2.30 x 0.896 x 0.49 58.42 x 22.76 x 12.47			
Weight	-	31.2 g	-	

**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)	-0.3 V	-	0.8 V	0RCY-60U12L. The remote on/off pin open, Unit off.	
Signal High (Unit Off)					
Signal Low (Unit Off)	2.4 V	-	18 V		0RCY-60U120. The remote on/off pin open, Unit on.
Signal High (Unit On)					
Current Sink	0 mA	-	0.75 mA		

## Output Trim Equations

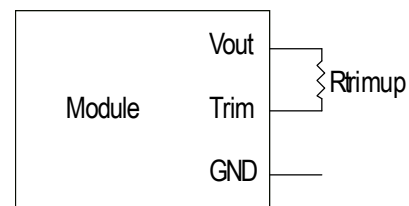
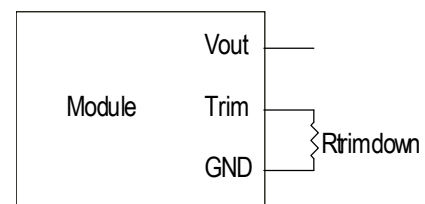
Equations for calculating the trim resistor are shown below. The Trim Down resistor should be connected between the Trim pin and GND pin. The Trim Up resistor should be connected between the Trim pin and the Vout pin. Only one of the resistors should be used for any given application.

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

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

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

Vo\_req=Desired (trimmed) output voltage [V]  
Output voltage Vo=12.00 V

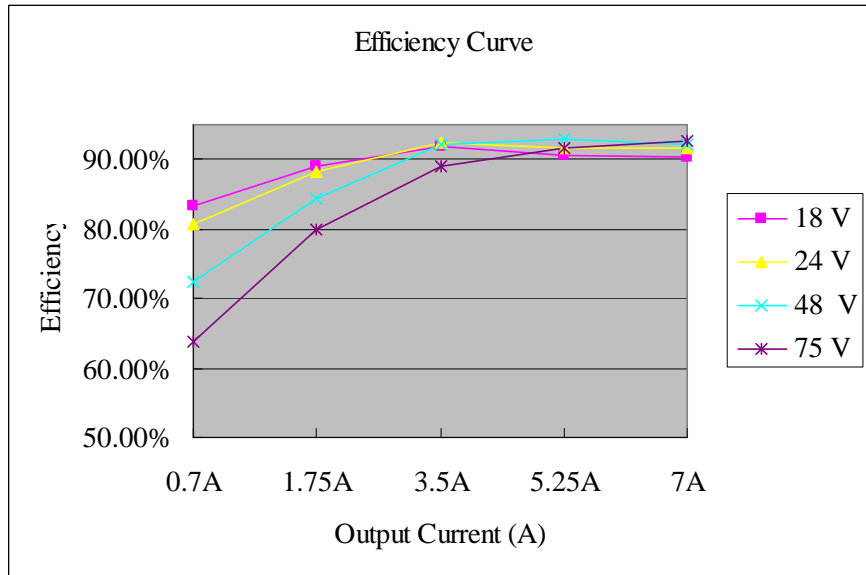


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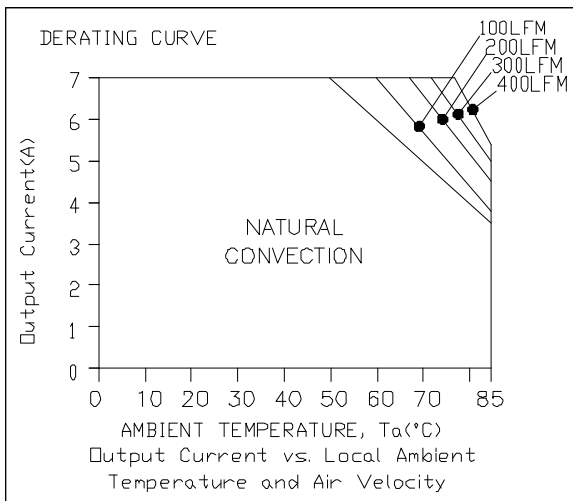


## Efficiency Data

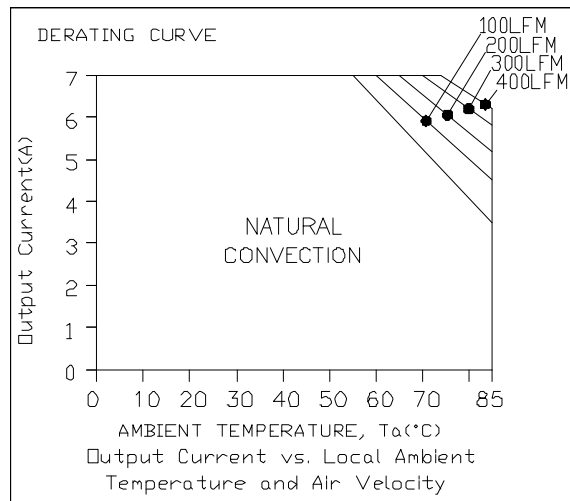


## Thermal Derating Curves

Maximum FET junction temperature derated to 120 C



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



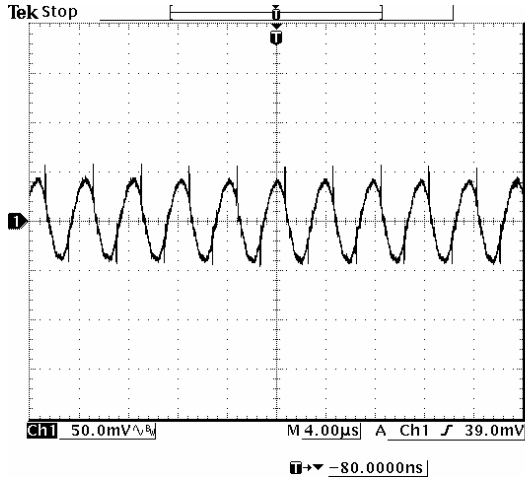
$V_{in}=48\text{ V}, V_o=12\text{ V}$

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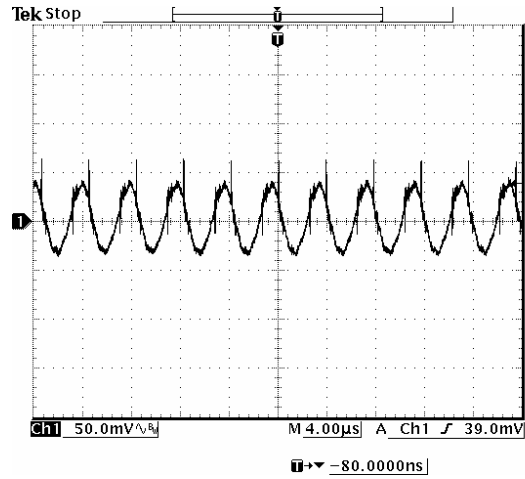
18 Vdc - 75 Vdc Input 12 Vdc / 7 A Output



## Ripple and Noise Waveforms



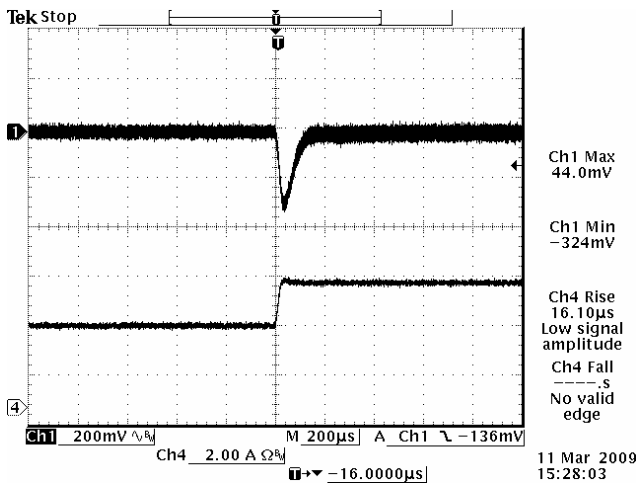
24 Vdc input, 12 Vdc/7 A output



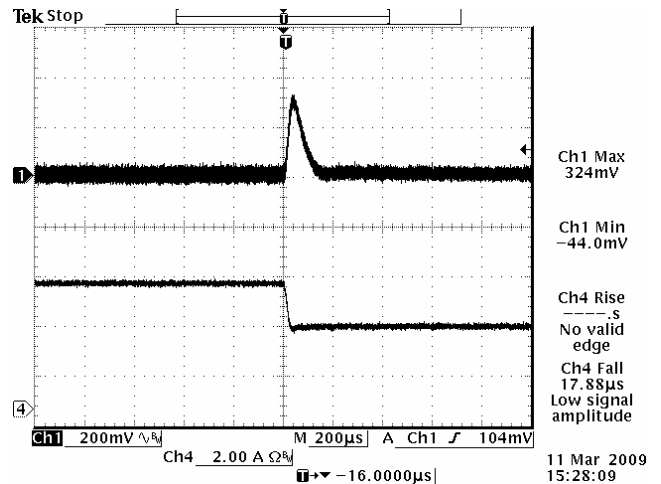
48 Vdc input, 12 Vdc/7 A output

**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



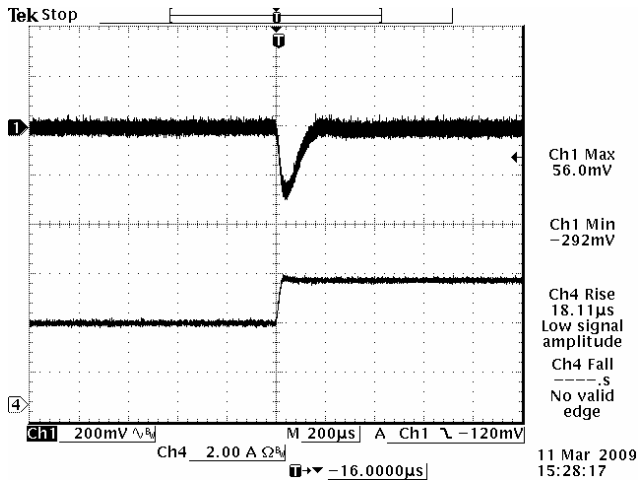
75%-50% Load Transients at Vin=48 V

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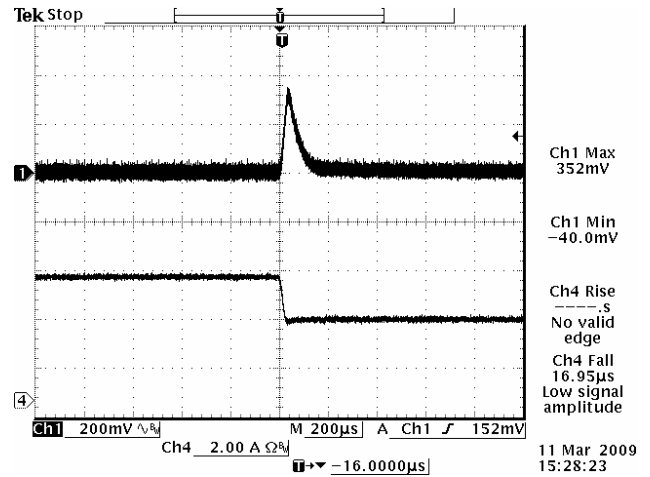
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## Transient Response Waveforms (continued)



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



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

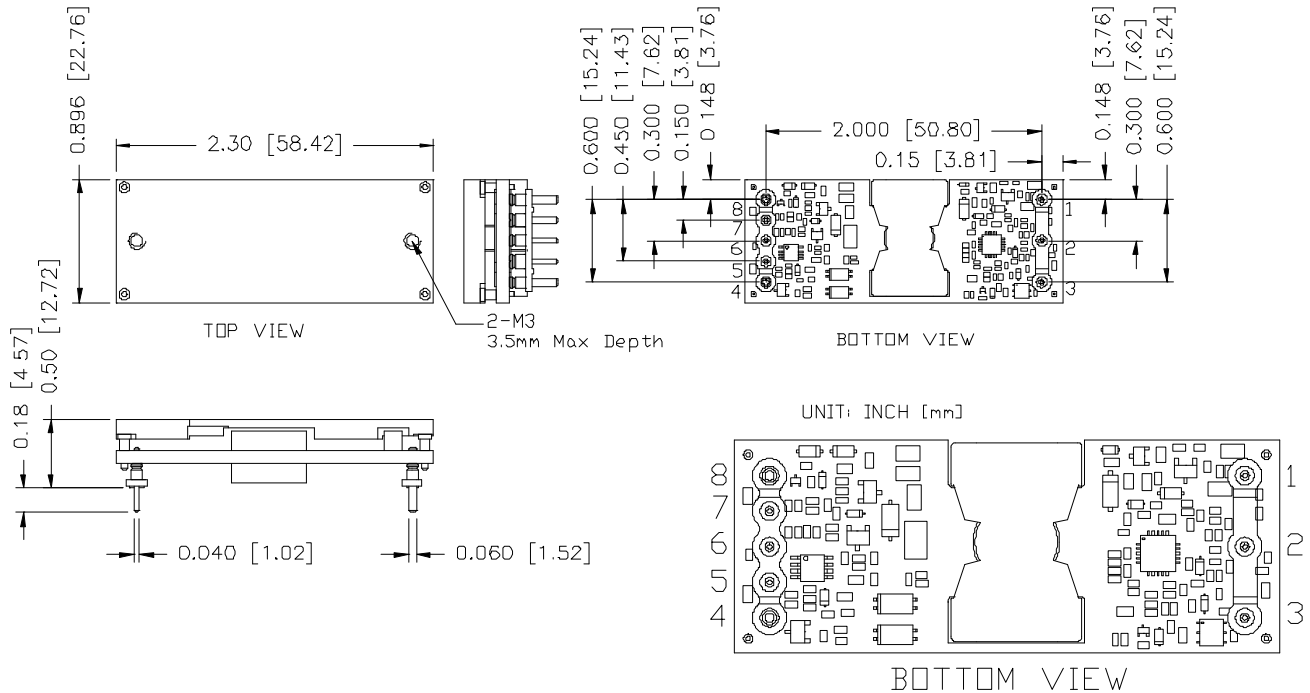
**Note:** Transients Response at  $V_o=12$ V,  $di/dt=0.1$  A/ $\mu$ s, with a 0.1  $\mu$ F ceramic cap and a 10  $\mu$ F tantalum cap at output, and  $T_a=25$  deg C.

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## Mechanical Outline



## 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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