ISOLATED DC/DC CONVERTERS

18 Vdc - 75 Vdc Input 5.0 Vdc /15 A Output

Sep. 21, 2010

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

0RCY-60U05x RoHS Compliant Rev.D

Features

- Isolated
- High Efficiency
- High Power Density
- Fixed Frequency (320 kHz)
- Input Under-Voltage Lockout
- Input Over-Voltage Lockout
- Output Over-Voltage Shutdown
- Over Temperature Protection
- OCP/SCP
- Low Cost
- Output Voltage Trim
- Positive/Negative Remote Sense
- Basic Insulation
- Remote On/Off
- Ultra Wide Input Range: 18 Vdc - 75 Vdc
- Class 1, Category 2, Isolated DC/DC Converter (refer to IPC-9592)
- UL60950-1 Recognized (UL/cUL) (Pending)

Applications

- Networking
- Computers and peripherals
- Telecommunications

Description

The 0RCY-60U05x 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 75 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 Pin Length 0.18"	Model Number Active Low Pin Length 0.18"	Model Number Active Low Pin Length 0.11"
5.0 Vdc	18 Vdc – 75 Vdc	15 A	75 W	92.5%	0RCY-60U050	0RCY-60U05L	0RCY-60U05A

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

Part Number Explanation

0	R	CY	–	60	U	05	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 5.0V
7---Suffix, "0" & "L" indicated the pin length of the unit is 0.18" and "A" indicated the pin length is 0.11".

Absolute Maximum Ratings

Parameter	Min	Typ	Max	Unit	Notes
Continuous Input Voltage	-0.3	-	80	V	
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
Operating Input Voltage	18	24/48	75	V	
Input Current (full load) Vin=18 V Vin=75 V	 - -	 4.8 1.12	 - -	 A A	
Input Current (no load)	-	50	90	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)	-	30	50	mA	
I^2t Inrush Current Transient	-	0.05	0.1	A^2s	
Turn-on Voltage Threshold	16.0	16.5	17.5	V	
Turn-off Voltage Threshold	14.5	15.0	16.0	V	
Input Over Voltage Lockout	76	78	80	V	

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

Output Specifications

Parameter	Min	Typ	Max	Unit	Notes
Output Voltage Set Point	4.9	5.0	5.1	V	Vin=48V, Io=50% load
Load Regulation	-	±6	±10	mV	
Line Regulation	-	±10	±15	mV	
Regulation Over Temperature (-40deg.C-85deg.C)	-	±30	±120	mV	
Ripple and Noise (rms)	-	20	30	mV	0-20 MHz BW, with a 0.1 µF ceramic cap and a 10 uF tantalum cap at the output.
Ripple and Noise (pk-pk)	-	75	120	mV	
Output Current Range	0	-	15	A	
Output DC Current Limit	16	-	30	A	Vin=48 V, in Hiccup Mode.
Short Circuit Surge Transient	-	3	5	A^2s	
Turn on Time	10	15	20	mS	

Output Specifications (continued)

Parameter		Min	Typ	Max	Unit	Notes
Overshoot at Turn on		-	0	3	%	
Output Capacitance		0	-	3300	uF	
Transient Response						
△V75%~50% of Max Load	Overshoot	-	170	250	mV	di/dt=0.1 A/us, Vin=24 Vdc, Ta=25 ℃, with a 0.1 μF ceramic cap and a 10 uF tantalum cap at output.
	Settling Time	-	120	200	uS	
△V50%~75% of Max Load	Overshoot	-	170	250	mV	
	Settling Time	-	120	200	uS	

Note: All specifications are typical at nominal input, full load at 25℃ unless otherwise stated.

General Specifications

Parameter	Min	Typ	Max	Unit	Notes
Efficiency	92	92.5	-	%	Vin=48V, full load,
	90	91	-	%	Vin=24V, full load
Switching Frequency	300	320	340	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	-	-	6.5	V	Vin=48 V, full load, in Hiccup mode.
Weight	-	TBD	-	g	
FIT	TBD			-	Calculated Per Bell Core SR-332 (Io=80%load, T_a = 25 °C, FIT=10^9/MTBF)
Dimensions Inches (L × W × H) Millimeters (L × W × H)	2.30 x 0.896 x 0.49 58.42 x 22.76 x 12.47			-	

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

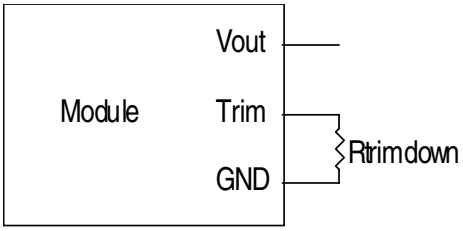
Control Specifications

Parameter		Min	Typ	Max	Unit	Notes
Remote On/Off						
Signal Low (Unit On)	Active Low	-0.3	-	0.8	V	0RCY-60U05L & 0RCY-60U05A. 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-60U050. The remote on/off pin open, Unit on.
Signal High (Unit On)		2.4	-	18	V	
Current Sink		0	-	0.75	mA	

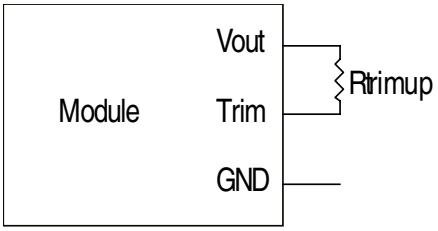
Output Trim Equations

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.

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



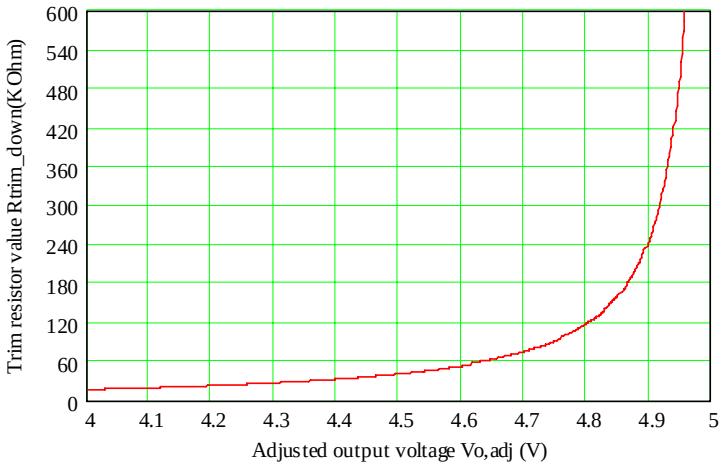
$$Rtrimup = \frac{(100 + delta) \cdot Vo \cdot 5.11 - 626}{1.225 \cdot delta} - 10.22[k\Omega]$$

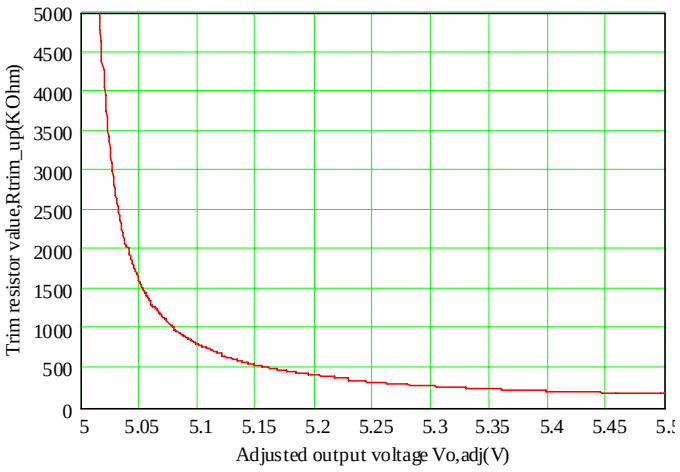


Note:

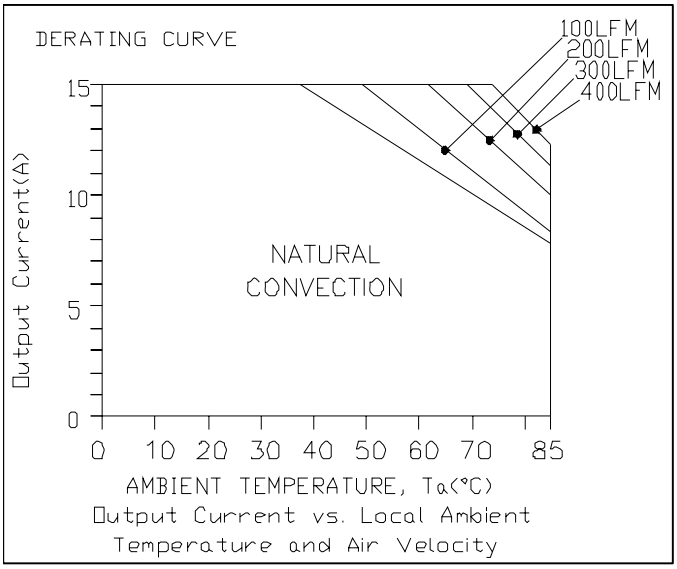
$$delta = \frac{(Vo\_req - Vo)}{Vo} \times 100[\%]$$

Vo_req=Desired (trimmed) output voltage [V]
Output voltage Vo=5.000 V

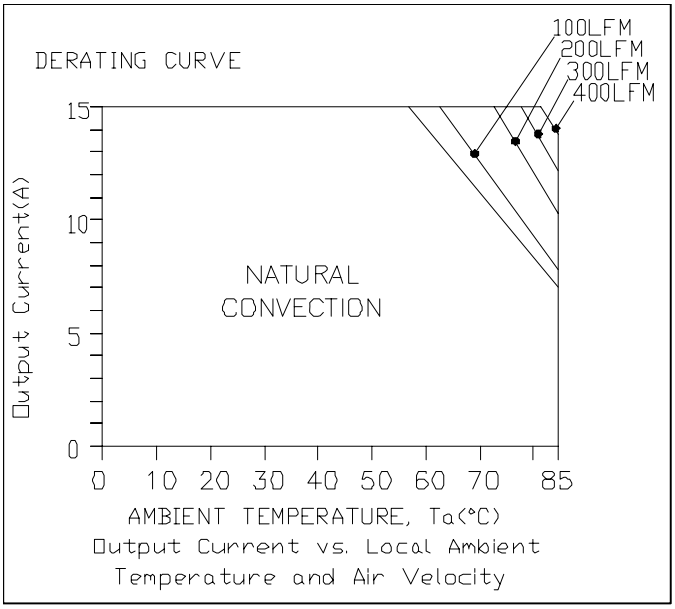




Thermal Derating Curves

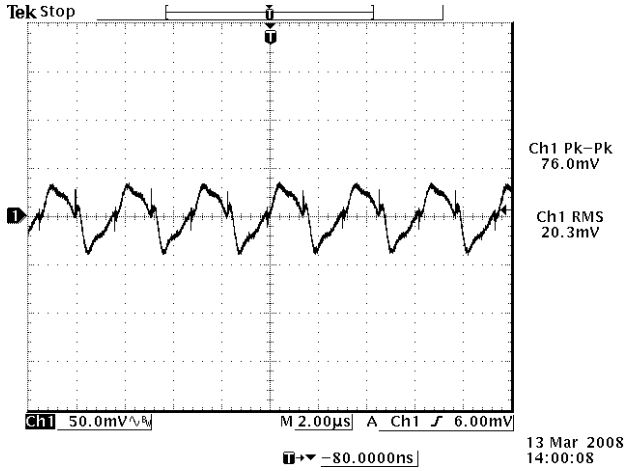


Vin=24 V, Vo=5 V; Maximum FET junction temperature derated to 120C

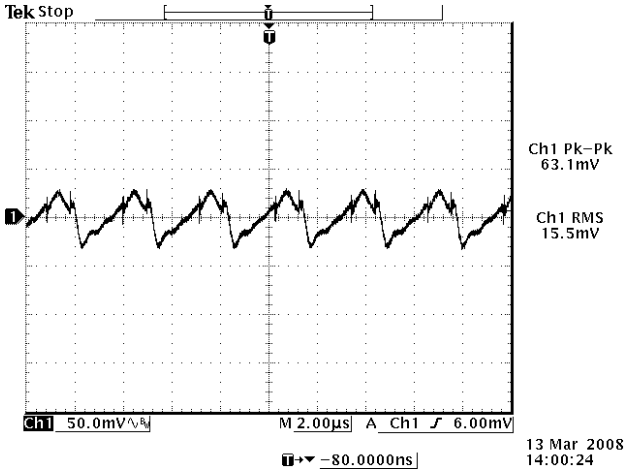


Vin=48 V, Vo=5 V; Maximum FET junction temperature derated to 120C

Ripple and Noise Waveforms



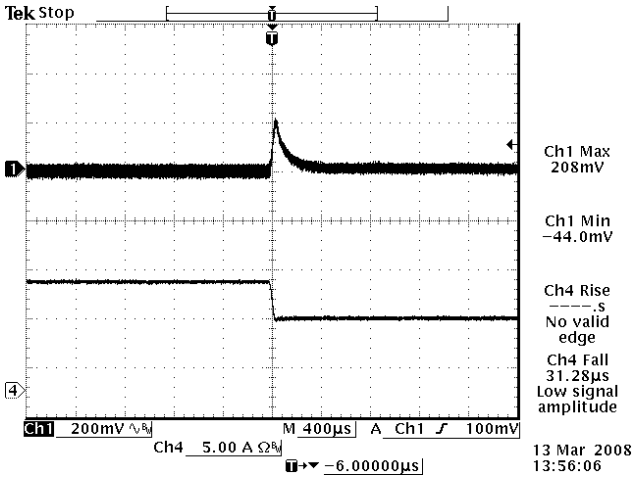
24 V input, 5.0 V/15 A output



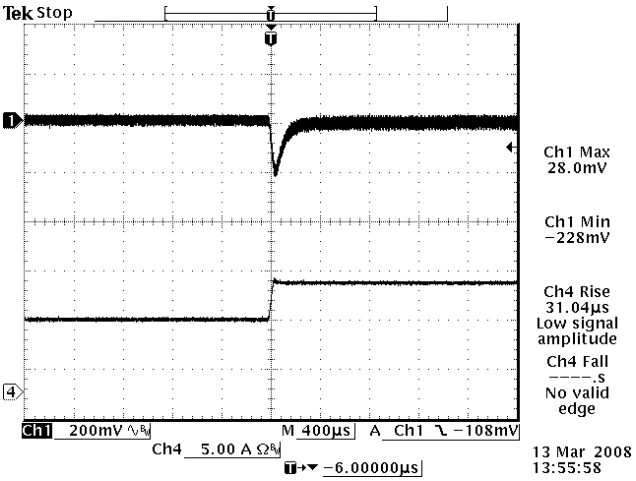
48 V input, 5.0 V/15 A output

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

Transient Response Waveforms

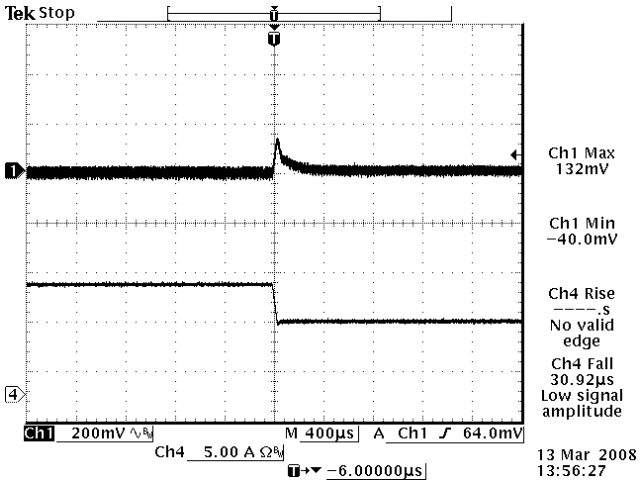


75%-50% Load Transients at Vin=24 V

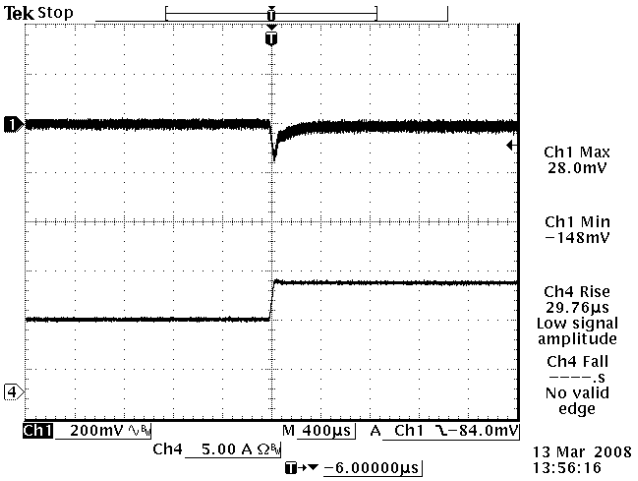


50%-75% Load Transients at Vin=24 V

Transient Response Waveforms (continued)



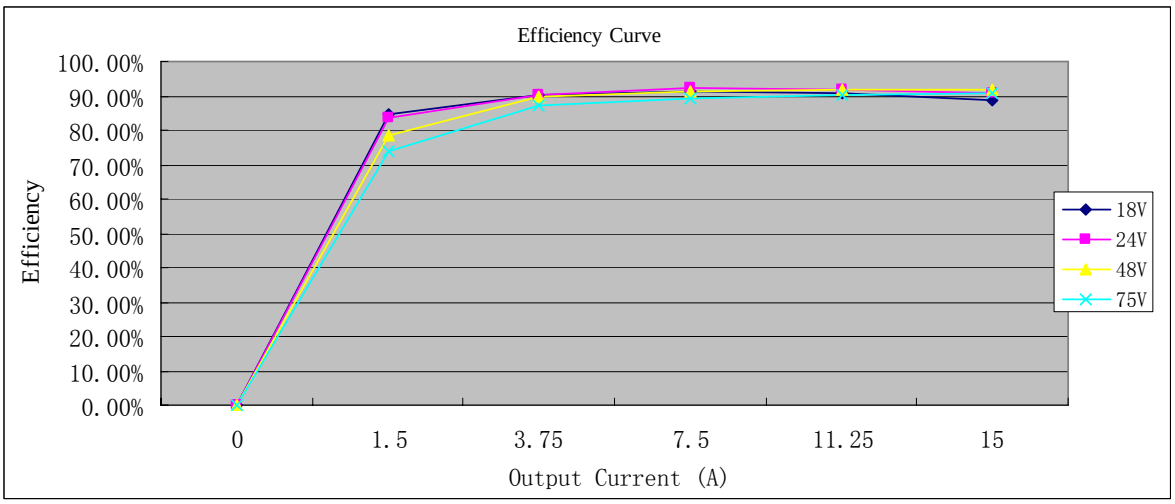
75%-50% Load Transients at Vin=48 V



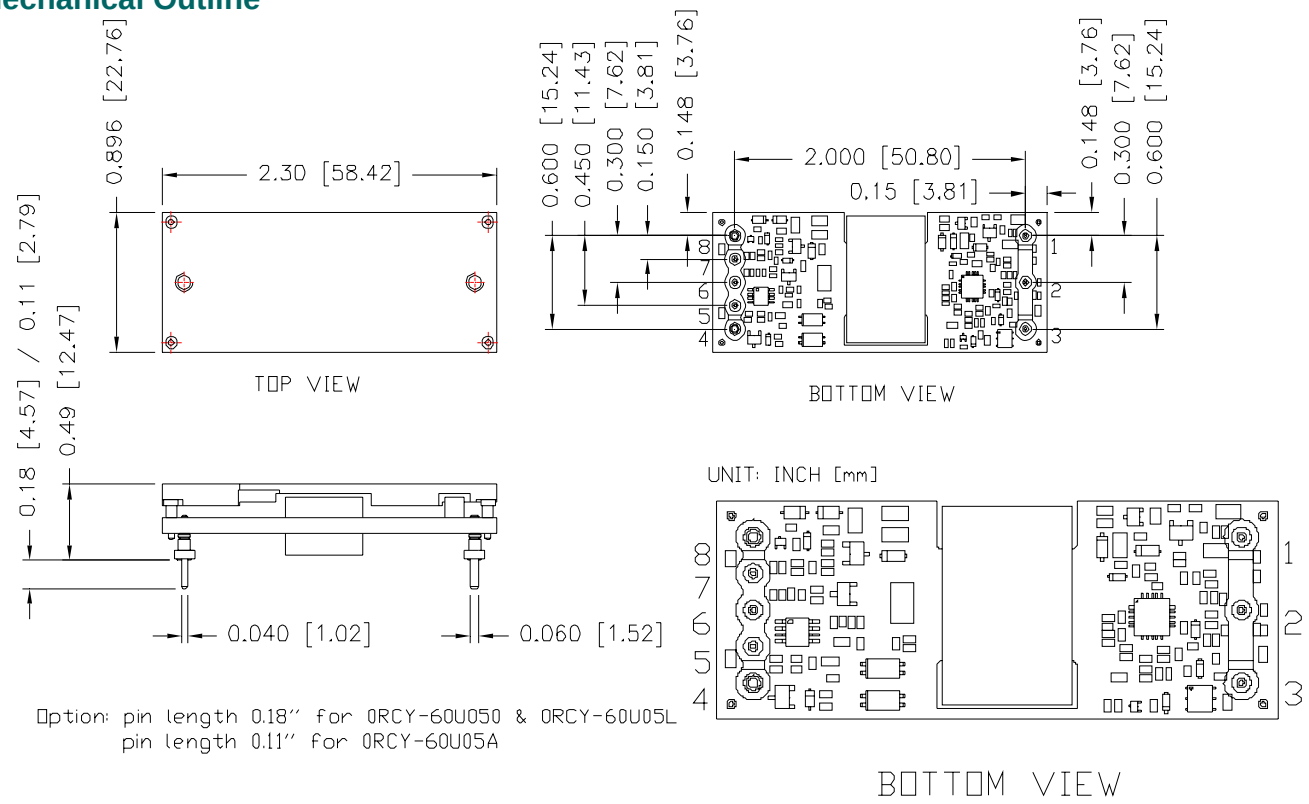
50%-75% Load Transients at Vin=48 V

Note: Transients Response at di/dt=0.1 A/us, with a 0.1 µF ceramic cap and a 10 uF tantalum cap at output, and Ta=25 deg C.

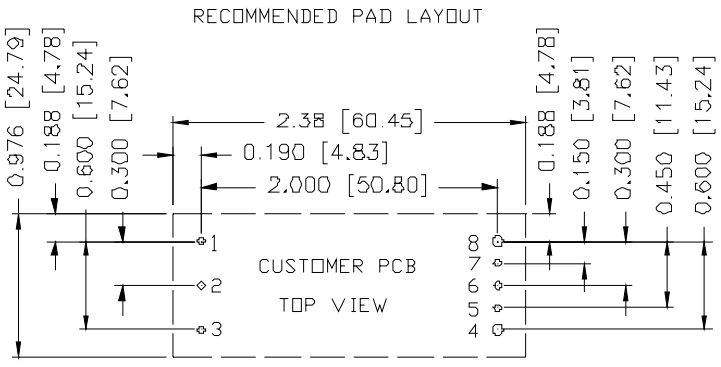
Efficiency Data



Mechanical Outline



Option: pin length 0.18" for ORCY-60U050 & ORCY-60U05L
pin length 0.11" for ORCY-60U05A



1,2,3,5,6,7 ø0.047 HOLE SIZE, ø0.08 min PAD SIZE
4,8 ø0.07 HOLE SIZE, ø0.10 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	0.060"
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	0.060"

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 ºC 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).

Revision History

Date	Revision	Changes Detail	Approval
2008-01-22	PA	First release.	XQ Han
2008-04-02	PB	Add thermal derating curve, dynamic plot, mechanical outline and ripple wavefrom.	XQ Han
2009-02-20	PC	Update noload input current, load regulation, line regulation, output ripple and noise, output DC current limit, turn on time, transient response, switching frequency, derating, efficiency typical value and efficiency data.	XQ Han
2010-09-21	D	Add P/N 0RCY-60U05A with 0.11” pin length.	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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