

# ISOLATED DC/DC CONVERTERS

48 Vdc Input 1.2 Vdc /50 A Output



Aug. 10, 2010

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

0RCY-C2TV2x RoHS Compliant Rev.C

## Features

- Isolated
- High Efficiency
- Fixed Frequency (300 KHz)
- High Power Density
- Low Cost
- Remote On/Off
- Positive/Negative Remote Sense
- Class 1, Category 2, Isolated DC/DC Converter (refer to IPC-9592)
- UL60950-1 Recognized (UL/cUL) (Pending)
- Input Under/Over Voltage Lockout
- Output Voltage Trim
- Basic Insulation
- OCP/SCP
- Over Temperature Protection
- Output Over-Voltage Protection with Auto-recovery

## Applications

- Networking
- Computers and peripherals
- Telecommunications

## Description

The 0RCY-C2TV2x is isolated dc/dc converter that operates from a nominal 48 Vdc source. This unit will provide up to 60 W of output power from a nominal 48 Vdc input. This 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
1.2 Vdc	48 Vdc	50 A	60 W	86%	0RCY-C2TV20	0RCY-C2TV2L

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

## Part Number Explanation

0 R CY - C2 T V2 x  
1 2 3 4 5 6 7

- 1---Through hole mount
- 2---RoHS 6, change "R" to "7" means RoHS 5
- 3---Series name
- 4---Series code
- 5--- Input range (36-75V)
- 6---Output voltage (1.2V)
- 7---Suffix

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## Absolute Maximum Ratings

Parameter	Min	Typ	Max	Unit	Notes
Input Voltage (continuous)	-0.3	-	80	V	
Input Voltage (transient)	-	-	100	V	100mS maximum
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
Input Voltage	36	48	75	V	
Input Voltage Transient Rate	-	-	7	V/mS	
Input Current (full load)	-	-	3.0	A	
Input Current (no load)	-	-	60	mA	
Remote Off Input Current	-	10	15	mA	
Input Reflected Ripple Current (rms)	-	5	10	mA	With simulated source impedance of 10 uH, 5Hz to 20MHz. Use a 100 uF/100 V electrolytic cap with ESR=1 ohm max, at 200 KHz@25°C.
Input Reflected Ripple Current (pk-pk)	-	-	30	mA	
I <sup>2</sup> t Inrush Current Transient	-	-	0.1	A <sup>2</sup> s	
Turn-on Voltage Threshold	33	-	35.5	V	
Turn-off Voltage Threshold	32	-	34.5	V	

**CAUTION:** This converter is not internally fused. An input line fuse must be used in application.

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

## Output Specifications

Parameter	Min	Typ	Max	Unit	Notes
Output Voltage Set Point	1.176	1.20	1.224	V	Vin=48 V, Io=50%load
Load Regulation	-	±3	±6	mV	
Line Regulation	-	±3	±5	mV	
Regulation Over Temperature (-40deg.C-85deg.C)	-	±4	±9	mV	
Total Regulation	-	±10	±19	mV	
Ripple and Noise (rms)	-	-	10	mV	Vin=75 V, 0-20MHz BW, with a 1µF ceramic capacitor and a 100 µF Tantalum cap at output.
Ripple and Noise (pk-pk)	-	-	50	mV	
Output Current Range	0	-	50	A	

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## Output Specifications (continued)

Parameter		Min	Typ	Max	Unit	Notes	
Output DC Current Limit		52	-	62	A		
Short Circuit Surge Transient		-	2	4	A <sup>2</sup> s		
Turn on Time		-	-	40	mS		
Overshoot at Turn on		-	0	-	%		
Output Capacitance		0	-	20,000	uF		
<b>Transient Response</b>							
25% ~ 50% Max Load	Overshoot	Vo= 1.2V	-	-	50	mV	di/dt=0.1A/us, Vin=48Vdc, with a 1µF ceramic capacitor and a 330 µF ESR≤50mOhm cap at output.
	Settling Time		-	-	250	uS	
50% ~ 25% Max Load	Overshoot		-	-	50	mV	
	Settling Time		-	-	250	uS	

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

## General Specifications

Parameter	Min	Typ	Max	Unit	Notes
Efficiency (full load)	84	86	-	%	Measured at Vin=48 V
Efficiency (half load)	85	89	-	%	
Switching Frequency	270	300	330	kHz	
Isolation capacitance	-	2200	-	pF	
Over Voltage Trim Range	90	-	110	%	The total voltage increased by trim and remote sense should not exceed 10%Vo.
Remote Sense Compensation	-	-	10	%	
Over Temperature Protection	-	125	-	°C	
Over Voltage Protection	1.39	-	1.6	V	
Weight	-	28	-	g	
FIT	TBD			-	Calculated Per Bell Core SR-332 (Vin=48V, Io=80%load, Ta = 25 °C, FIT=10 <sup>9</sup> /MTBF)
Dimensions	Inches (L x W x H) Millimeters (L x W x H)			-	2.30 x 0.90 x 0.40 58.42 x 22.78 x 10.26

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

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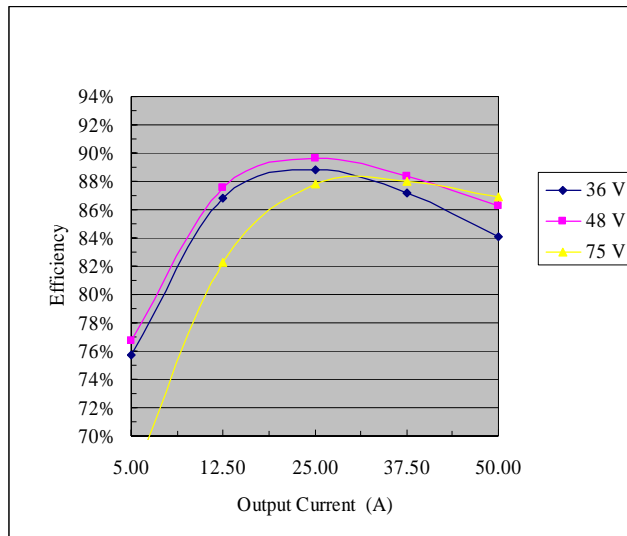
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## Remote On/Off

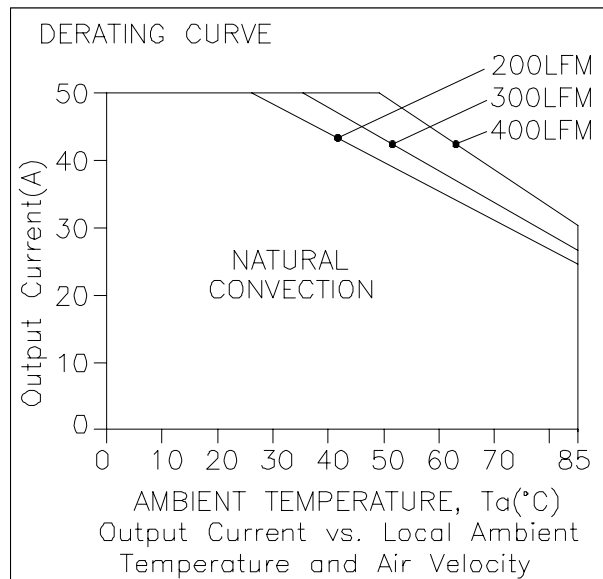
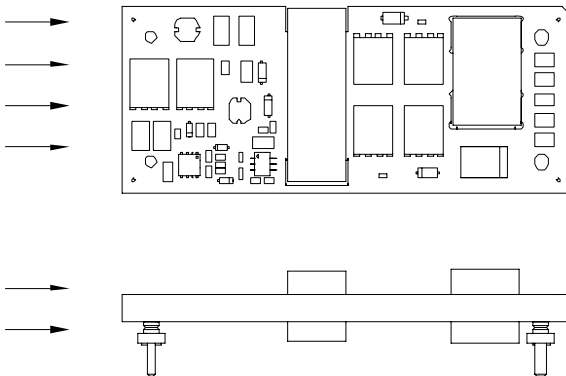
Parameter		Min	Typ	Max	Unit	Notes
Signal Low (Unit On)	Active Low	-0.7	-	0.8	V	The remote on/off pin open, Unit off.
Signal High (Unit Off)		2.4	-	18	V	
Signal Low (Unit Off)	Active High	-0.7	-	0.8	V	The remote on/off pin open, Unit on.
Signal High (Unit On)		2.4	-	18	V	
Current Sink		0	-	1	mA	

## Efficiency Data



## Thermal Derating Curve

AIR FLOW



$V_{in}=48V$ , with maximum junction temperature of semiconductors derated to 120C

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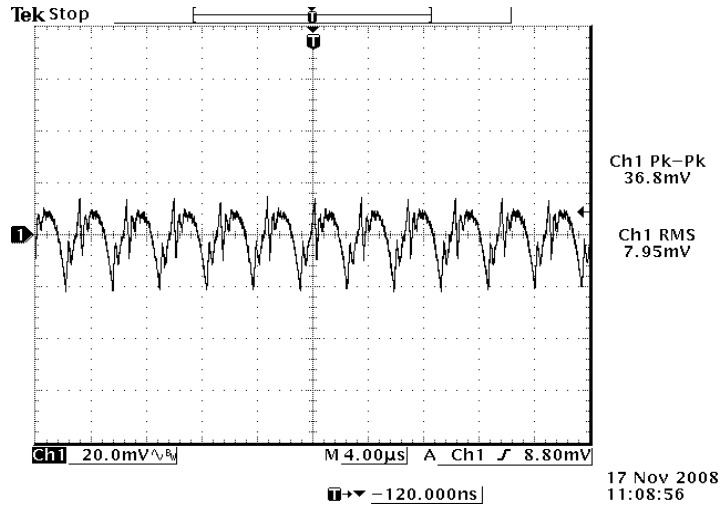
48 Vdc Input 1.2 Vdc /50 A Output



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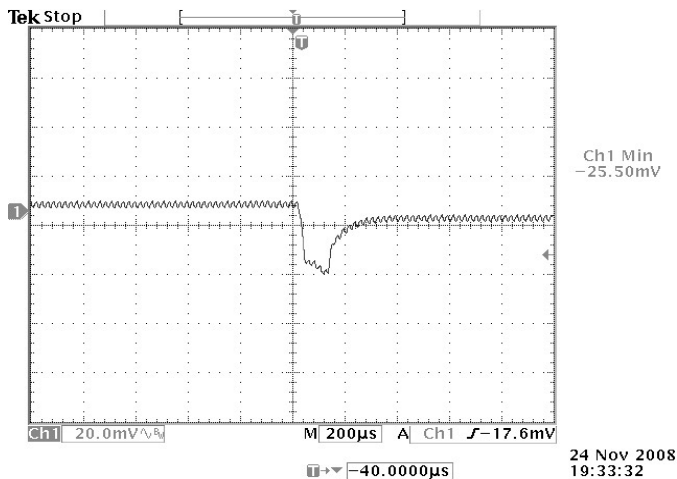
## Ripple and Noise Waveform



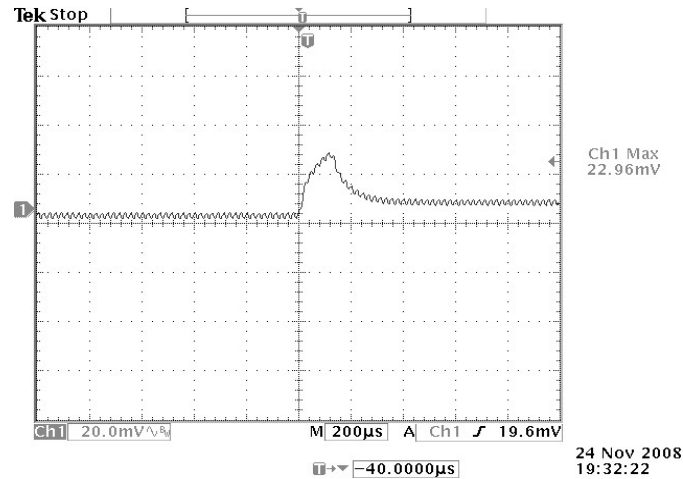
75Vdc input, 1.2Vdc/50A output

**Note:** Ripple and noise at full load, with a 1µF ceramic cap and a 100µF Tantalum cap at output, and  $T_a=25$  deg C.

## Transient Response Waveforms



Vout=1.2V, 50% to 75% Load Transients



Vout=1.2V, 75% to 50% Load Transients

**Note:** Transient response at  $di/dt=0.1A/\mu s$ ,  $V_{in}=48Vdc$ ,  $T_a=25^\circ C$ , with a 1µF ceramic capacitor and 330µF ESR  $\leq 50m\Omega$  Cap at output.

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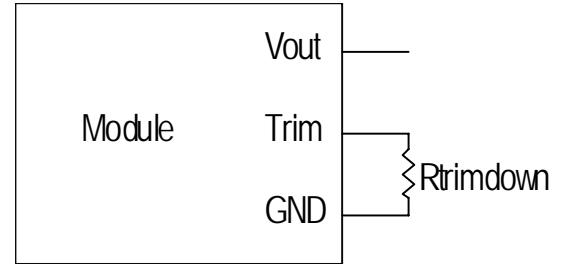
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## Output Trim Equations

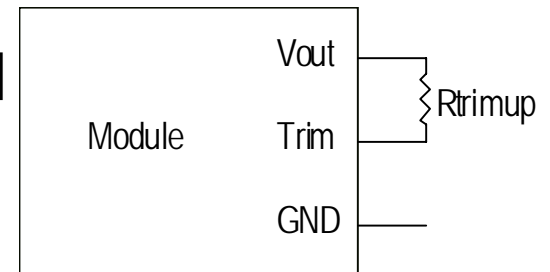
Equations for calculating the trim resistor are shown below. The Trim Down resistor should be connected between the Trim pin and Sense(-) pin. The Trim Up resistor should be connected between the Trim pin and the Sense(+) pin. Only one of the resistors should be used for any given application.

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



**Connecting** an external resistor between the TRIM pin and the Sense (-) pin decreases the output voltage set point.

$$R_{trimup} = \frac{(100 + \delta) \cdot V_o \cdot 5.11}{0.6125 \cdot \delta} - \frac{511}{\delta} - 10.22 [k\Omega]$$



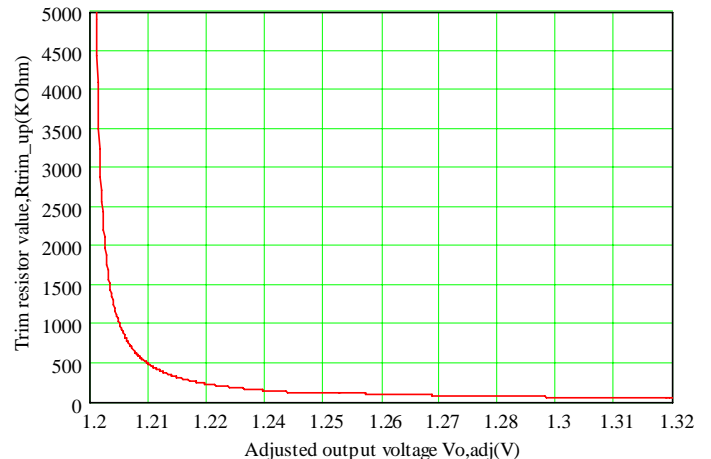
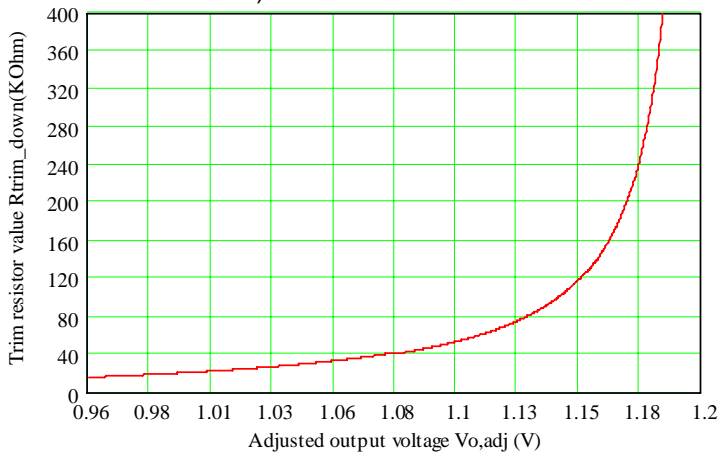
**Connecting** an external resistor between the TRIM pin and the Sense (+) pin increases the output voltage set point.

### Note:

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

$V_o_{req}$  = Desired (trimmed) output voltage [V]  
Output voltage  $V_o = 1.2$  V

Remote sense minimizes the effects of distribution losses by regulating the voltage at the remote-sense connections. The voltage between the remote-sense pins and the output terminals must not exceed the output voltage sense range:  $\leq 10\% \times V_{out}$ . If not using the remote-sense feature to regulate the output voltage at the point of load, connect SENSE (+) to Vout and SENSE (-) to GND at the module. The tracks, that connect the sense pins to the load, must have a resistance  $\ll$  than 10 ohm (for example maximum 100 mOhm).



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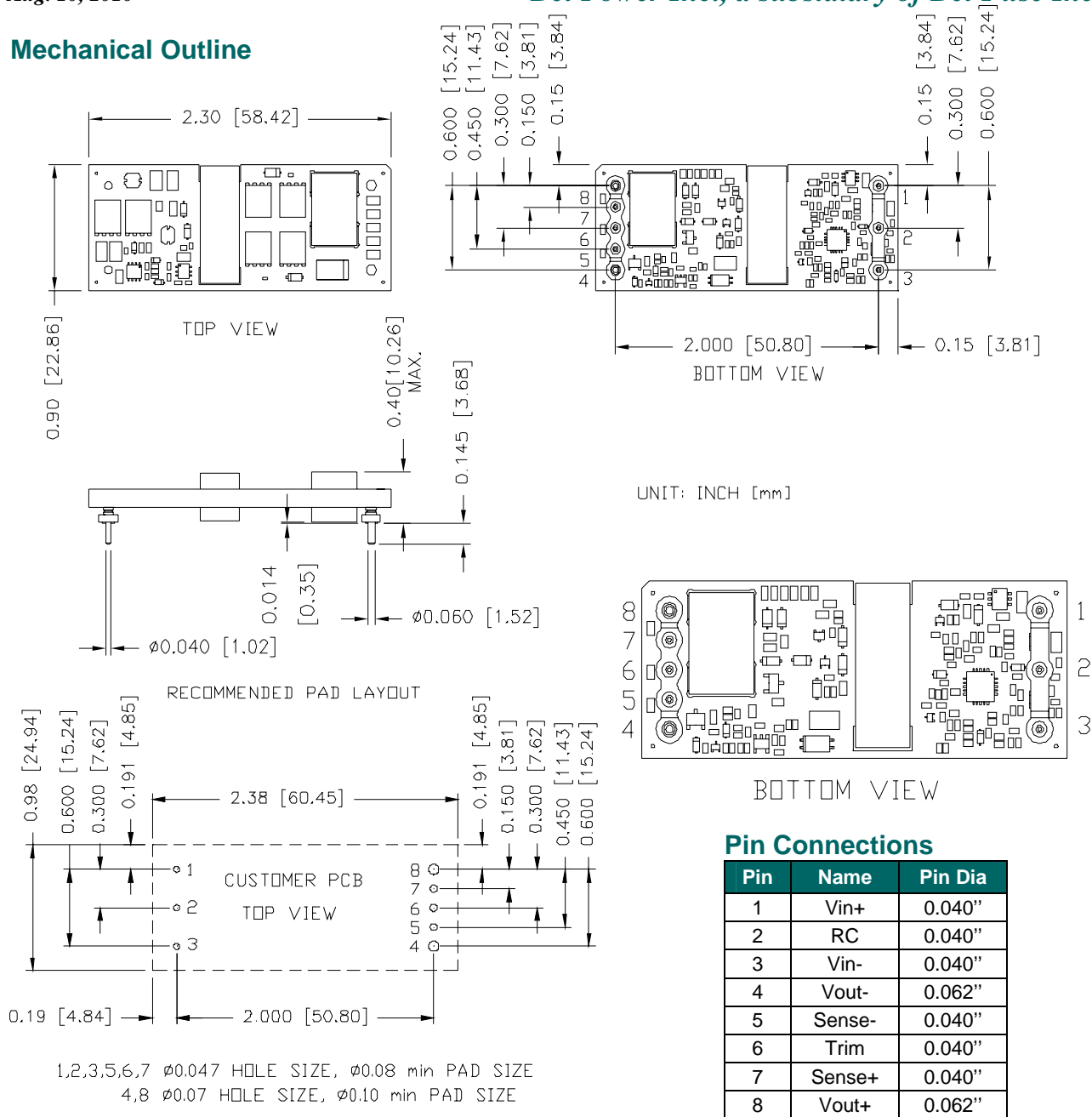
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## Mechanical Outline



**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.

### 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).

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### Revision History

Date	Revision	Changes Detail	Approval
2008-04-21	PA	First release	HF Fan
2008-11-25	B	Update load regulation, output noise, OCP, turn on time, transient, TD, NR, TR, MD and trim down	HF Fan
2010-08-10	C	update TR, cover, TD, MD and No load input current	JZ Wang

### 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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