ISOLATED DC/DC CONVERTERS

48 V Input 3.3 V/50 A, 5.0 V/30 A Output

0RHB-C5T Series RoHS Compliant PRELIMINARY

- Isolated
- High Efficiency
- High Power Density
- Low Cost
- Fixed Frequency (330 kHz)
- Input Under/Over Voltage Lockout
- UL60950 Recognized (UL/cUL)
- Output Over Voltage Shutdown
- OCP/SCP
- Over Temperature Protection
- Remote On/Off
- Output Voltage Trim
- Positive/Negative Remote Sense



Description

The 0RHB-C5T Series are isolated dc/dc converters that operate from a nominal 48 V source. This unit will provide up to 165 W of output power from a nominal 48 V input. This unit is designed to be highly efficient and low cost. It is provided in an industry standard half-brick package.

Part Selection

Output Voltage	Input Voltage	Max. Output Current	Max. Output Power	Typical Efficiency	Model Number Active High	Model Number Active Low
5.0 V	48 V	30 A	150 W	93.0%	0RHB-C5T050	0RHB-C5T05L
3.3 V	48 V	50 A	165 W	92.5%	0RHB-C5T033	0RHB-C5T03L

Note: Add “G” suffix at the end of the model number 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	-	-	2000 V	
Ambient Temperature	-40 °C	-	85 °C	
Storage Temperature	-55 °C	-	125 °C	

Input Specifications

Parameter	Min	Typ	Max	Notes
Input Voltage	36V	48 V	75 V	
Input Current (full load) Vo=5.0 V Vo=3.3 V	 - -	 - -	 5.0 A 5.2 A	
Input Current (no load)	-	120 mA	180 mA	
Remote Off Input Current		5 mA	20 mA	
Input Reflected Ripple Current (pk-pk)	-	20 mA	40 mA	Tested with simulated source impedance of 10 uH, 5 Hz to 20 MHz; use a 100 uF /100 V electrolytic capacitor with ESR = 1 ohm max. at 200 kHz at 25 °C.
Input Reflected Ripple Current (rms)	-	5 mA	10 mA	
I^2t Inrush Current Transient	-	0.05 A^2s	0.1 A^2s	
Turn-on Voltage Threshold	31 V	-	35 V	
Turn-off Voltage Threshold	29 V	-	33 V	
Input Over Voltage Threshold	76 V	-	80 V	

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

Output Specifications

Parameter			Min	Typ	Max	Notes
Output Voltage Set Point						
	Vo=5.0 V		4.925 V	5.000 V	5.075 V	Vin=48 V, Io=50% load
	Vo=3.3 V		3.250 V	3.300 V	3.350 V	
Line Regulation						
	Vo=5.0 V		-	±5 mV	±10 mV	
	Vo=3.3 V		-	±3 mV	±7 mV	
Load Regulation						
	Vo=5.0 V		-	±10 mV	±20 mV	
	Vo=3.3 V		-	±7 mV	±15 mV	
Regulation Over Temperature (-40 °C to +85 °C)						
	Vo=5.0 V		-	±45 mV	±75 mV	
	Vo=3.3 V		-	±30 mV	±50 mV	
Output Current						
	Vo=5.0 V		0 A	-	30 A	
	Vo=3.3 V		0 A	-	50 A	
Current Limit Threshold						
	Vo=5.0 V		32 A	38 A	45 A	
	Vo=3.3 V		55 A	65 A	75 A	
Short Circuit Surge Transient			-	3 A^2s	5 A^2s	
Ripple and Noise (rms)						Test conditions: 0-20MHz BW, with a 1uF ceramic capacitor and a 10uF Tantalum capacitor at the output.
	Vo=5.0 V		-	25 mV	50 mV	
	Vo=3.3 V		-	15 mV	30 mV	
Ripple and Noise (pk-pk)						
	Vo=5.0 V		-	70 mV	140 mV	
	Vo=3.3 V		-	55 mV	100 mV	
Turn on Time			-	15 mS	20 mS	
Overshoot at Turn on			-	0%	5%	
Output Capacitance						
	Vo=5.0 V		0 uF	-	10000 uF	
	Vo=3.3 V		0 uF	-	20000 uF	
Transient Response						
75% ~ 50% Max Load	Overshoot	Vo=5.0 V	-	250 mV	400 mV	Test conditions: di/dt = 0.1 A/uS, Vin=48 V with a 1 uF ceramic capacitor and a 10 uF Tantalum capacitor at the output.
	Settling Time		-	250 uS	400 uS	
50% ~ 75% Max Load	Overshoot		-	250 mV	400 mV	
	Settling Time		-	250 uS	400 uS	
75% ~ 50% Max Load	Overshoot	Vo=3.3 V	-	100 mV	200 mV	
	Settling Time		-	200 uS	300 uS	
50% ~ 75% Max Load	Overshoot		-	100 mV	200 mV	
	Settling Time		-	200 uS	300 uS	

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

General Specifications

Parameter	Min	Typ	Max	Notes
Efficiency Vo=5.0 V Vo=3.3 V	 90% 90%	 93.0% 92.5%	 - -	Vin=48V, full load , Ta=25°C
Switching Frequency	300 kHz	330 kHz	360 kHz	
Isolation capacitance	-	1500 pF	-	
Output Voltage Trim Range	80% Vo	-	110% Vo	
Over Temperature Protection	-	120 °C	-	
Over Voltage Protection [1]	-	130% Vo	-	
Input to Output Isolation Voltage [2]	-	-	2000 V	
MTBF	TBD			Calculated Per Bell Core SR-332 (I_O = Nominal; T_a = 25 °C)
Dimensions Inches millimeters	 2.28 x 2.4 x 0.42 57.51 x 60.98 x 10.67			
Weight	-	76 g	-	

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

1. OVP is tested under 48 Vin and full load with photo coupler short. The output will be latched off if the output voltage exceeds over voltage specification. To turn the converter on requires either cycling the ON/OFF pin or power to the converter.
2. Isolation between input and output is basic isolation, test duration is 60 seconds.

Control Specifications

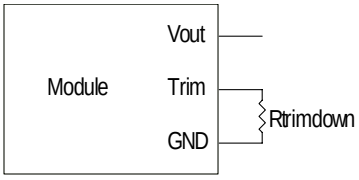
Parameter		Min	Typ	Max	Notes
Remote On/Off					
Signal Low (Unit On)	Active Low	-0.3 V	-	0.8 V	The remote on/off pin open, Unit off.
Signal High (Unit Off)		2.4 V	-	18 V	
Signal Low (Unit Off)	Active High	-0.3 V	-	0.8 V	The remote on/off pin open, Unit on.
Signal High (Unit On)		2.4 V	-	18 V	

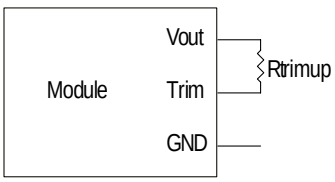
Output Trim Equations

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

$$Rtrimdown = \frac{100}{|delta|} - 2[k\Omega]$$

$$Rtrimup = \frac{(100 + delta) \cdot Vo - 122.5}{1.225 \cdot delta} - 2[k\Omega]$$





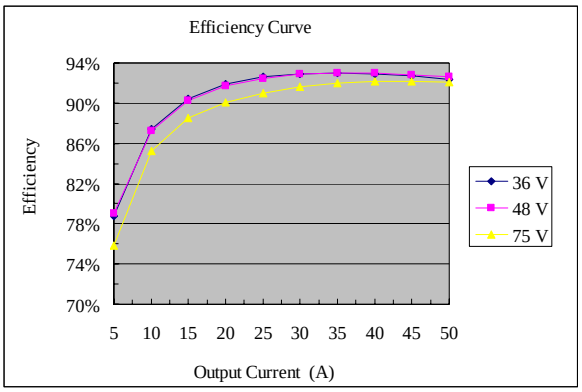
Notes:

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

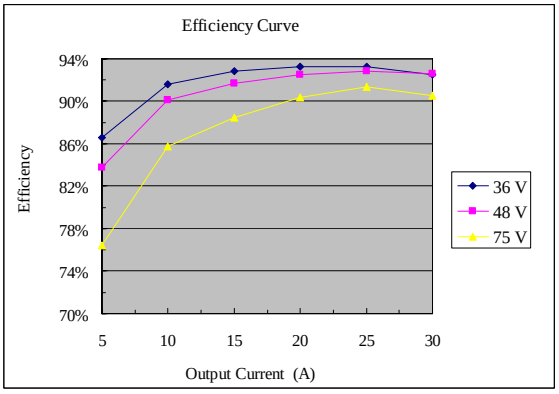
Vo_req=Desired(trimmed) output voltage[V]

Output voltage Vo=3.304 V for 3.3 V; Vo=5.008 V for 5 V.

Efficiency Data

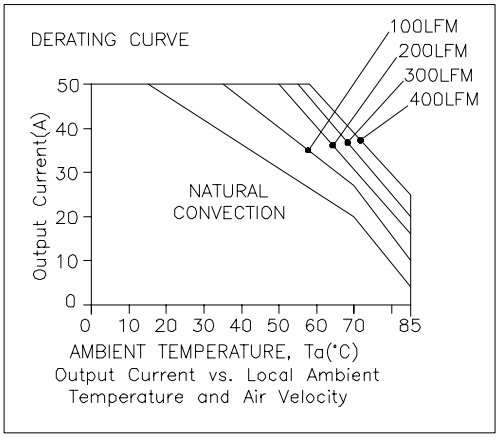


0RHB-C5T03x

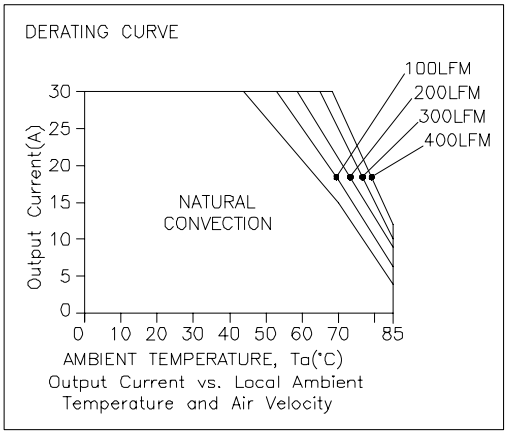


0RHB-C5T05x

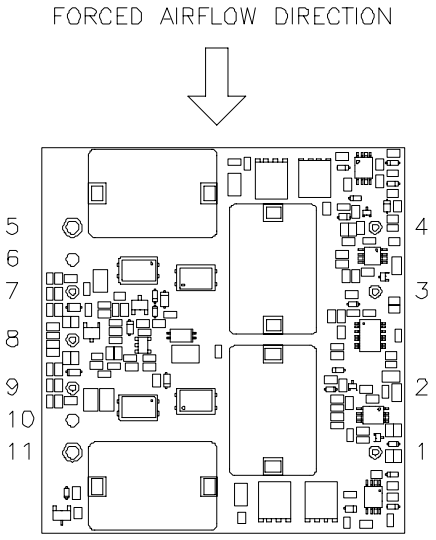
Thermal Derating Curves



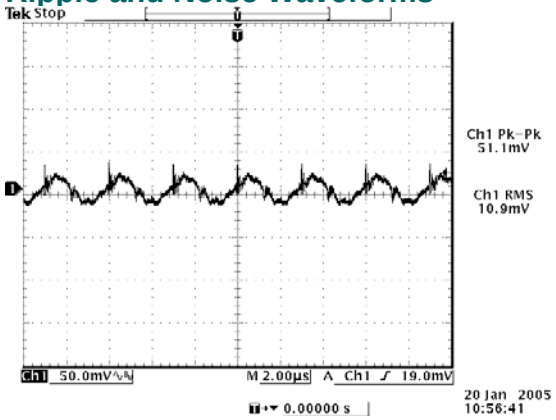
0RHB-C5T03x



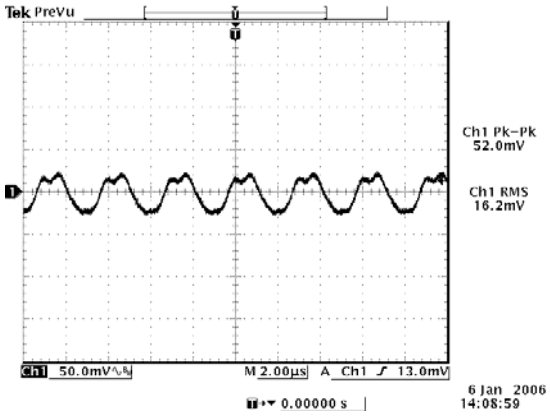
0RHB-C5T05x



Ripple and Noise Waveforms



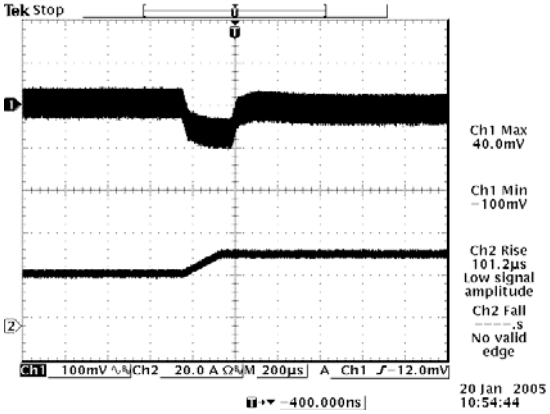
Ripple and noise at full load 3.3 V/50 A output



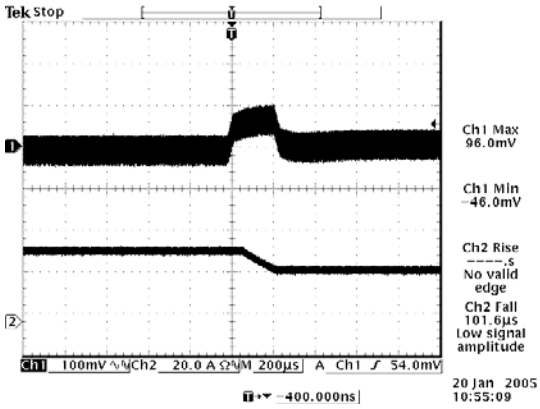
Ripple and noise at full load 5.0 V/30 A output

Note: Ripple and noise at 48 V input, with a 1 uF ceramic capacitor and a 10 uF tantalum capacitor at the output and Ta=25 deg C,.

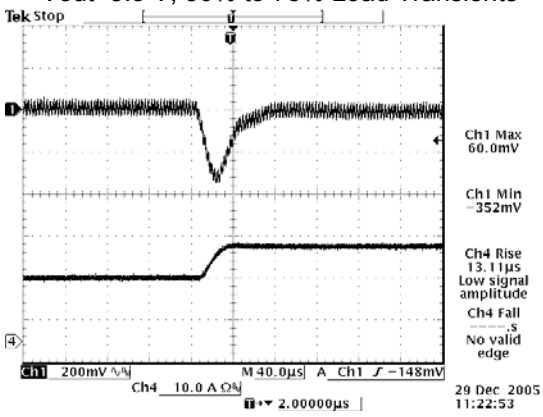
Transient Response Waveforms



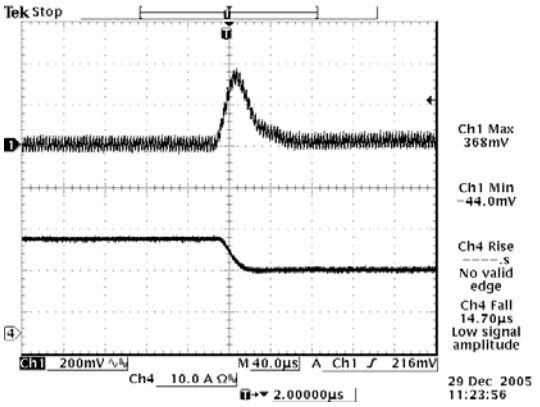
Vout=3.3 V, 50% to 75% Load Transients



Vout=3.3 V, 75% to 50% Load Transients



Vout=5.0 V, 50% to 75% Load Transients



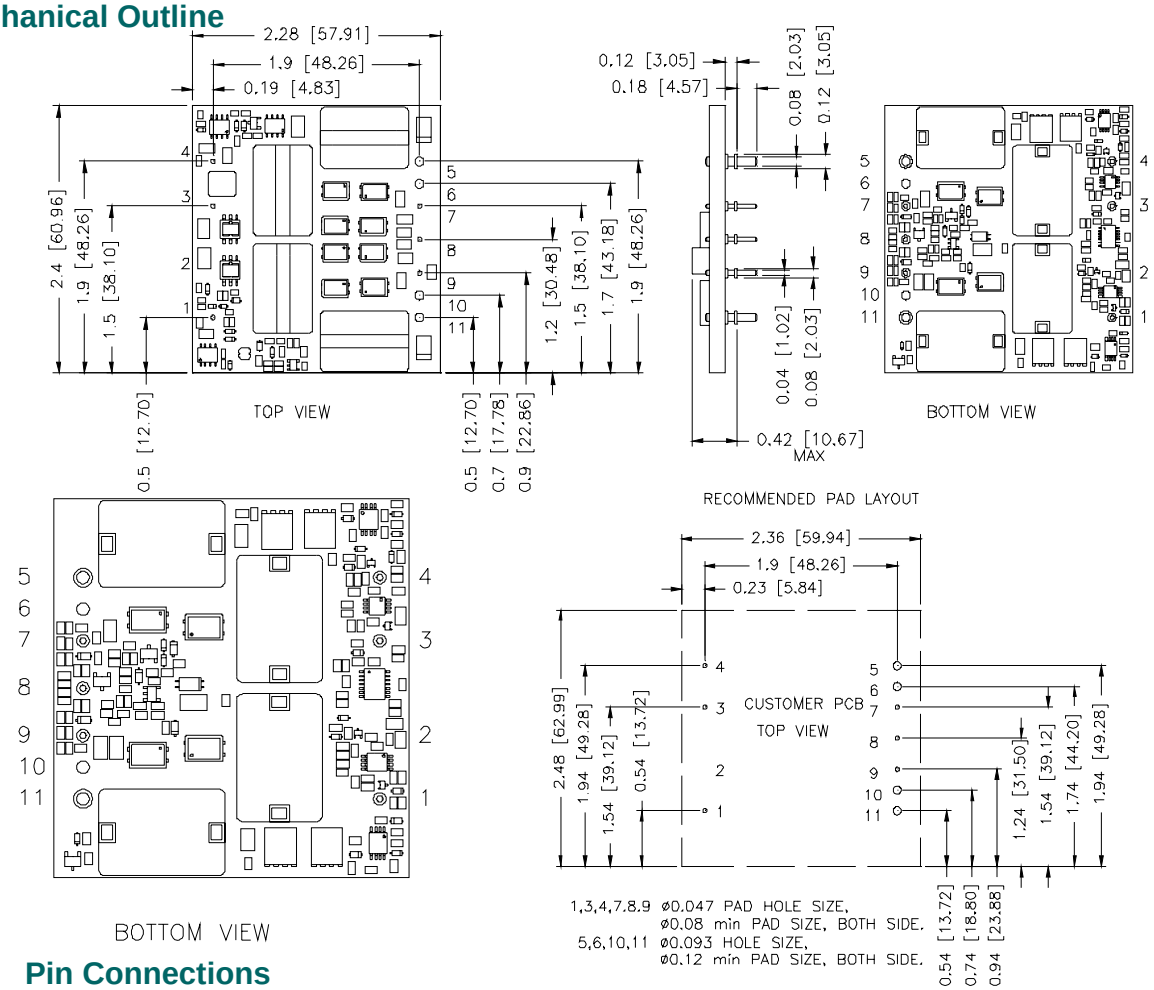
Vout=5.0 V, 75% to 50% Load Transients

Note: Transient Response is tested at di/dt=0.1 A/us (Vo=3.3 V), di/dt=0.5 A/us (Vo=5.0 V), Vin=48 V, Ta=25°C, with a 1 µF ceramic capacitor and a 10 µF tantalum capacitor at the output.

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48 V Input 3.3 V/50 A, 5.0 V/30 A Output

Mechanical Outline



Pin Connections

pin#	function	pin size	pin#	function	pin size
1	-Input	0.04"	6	N/A	
2	N/A		7	+Sense	0.04"
3	On/Off	0.04"	8	Trim	0.04"
4	+Input	0.04"	9	-Sense	0.04"
5	+Output	0.08"	10	N/A	
			11	-Output	0.08"

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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