ISOLATED DC/DC CONVERTERS

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

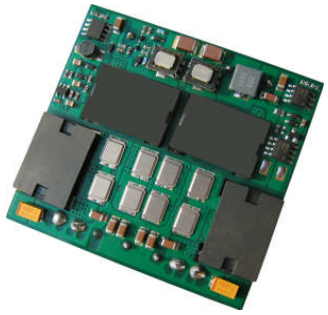
Apr. 13, 2011

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

0RHB-C5T Series RoHS Compliant Rev.B

Features

- Isolated
- High Efficiency
- High Power Density
- Fixed Frequency (300 kHz)
- Low Cost
- Input Under-Voltage Lockout
- Input Over-Voltage Lockout
- UL60950-1 Recognized (UL/cUL)
- Output Over Voltage Shutdown
- Over Temperature Protection
- OCP/SCP
- Remote On/Off
- Output Voltage Trim
- Positive/Negative Remote Sense



Applications

- Networking
- Computers and peripherals
- Telecommunications

Description

The 0RHB-C5T Series are isolated dc/dc converters that operate from a nominal 48 Vdc source. This unit will provide up to 165 W of output power from a nominal 48 Vdc 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

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

Part Number Explanation

0 R HB – C5 T xx x
1 2 3 4 5 6 7

1---Through hole
2---RoHS 6, change “R” to “7” means RoHS 5
3---Series name, 1/2 Brick
4---Series code
5---Input range 48V wide (36-75V)
6---Output voltage
7---Suffix

Absolute Maximum Ratings

Parameter	Min	Typ	Max	Unit	Notes
Input Voltage (continuous)	-0.3	-	80	V	
Remote On/Off	-0.3	-	18	V	
I/O Isolation Voltage	-	-	2000	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 Current (full load) Vo=5.0 V Vo=3.3 V	 - -	 - -	 5.0 5.2	 A A	
Input Current (no load)	-	120	180	mA	
Remote Off Input Current	-	5	20	mA	
Input Reflected Ripple Current (pk-pk)	-	20	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	10	mA	
I^2t Inrush Current Transient	-	0.05	0.1	A^2s	
Turn-on Voltage Threshold	31	-	35	V	
Turn-off Voltage Threshold	29	-	33	V	
Input Over Voltage Threshold	76	-	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 Vo=5.0 V Vo=3.3 V	 4.925 3.250	 5.000 3.300	 5.075 3.350	 V V	Vin=48V, Io=50% load
Line Regulation Vo=5.0 V Vo=3.3 V	 - -	 ±5 ±3	 ±10 ±7	 mV mV	
Load Regulation Vo=5.0 V Vo=3.3 V	 - -	 ±10 ±7	 ±20 ±15	 mV mV	
Regulation Over Temperature (-40 °C to +85 °C) Vo=5.0 V Vo=3.3 V	 - -	 ±45 ±30	 ±75 ±50	 mV mV	
Output Current Vo=5.0 V Vo=3.3 V	 0 0	 - -	 30 50	 A A	
Current Limit Threshold Vo=5.0 V Vo=3.3 V	 32 55	 38 65	 45 75	 A A	

Output Specifications (continued)

Parameter	Min	Typ	Max	Unit	Notes
Short Circuit Surge Transient	-	3	5	A^2s	
Ripple and Noise (rms) Vo=5.0 V Vo=3.3 V	 - -	 25 15	 50 30	 mV mV	Test conditions: 0-20MHz BW, with a 1uF ceramic capacitor and a 10uF Tantalum capacitor at the output.
Ripple and Noise (pk-pk) Vo=5.0 V Vo=3.3 V	 - -	 70 55	 140 100	 mV mV	
Turn on Time	-	15	20	mS	
Overshoot at Turn on	-	0	5	%	
Output Capacitance Vo=5.0 V Vo=3.3 V	 0 0	 - -	 10000 20000	 uF uF	

Transient Response

75% ~ 50% Max Load	Overshoot	Vo=5.0 V	-	250	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	400	uS	
50% ~ 75% Max Load	Overshoot		-	250	400	mV	
	Settling Time		-	250	400	uS	
75% ~ 50% Max Load	Overshoot	Vo=3.3 V	-	100	200	mV	
	Settling Time		-	200	300	mS	
50% ~ 75% Max Load	Overshoot		-	100	200	mV	
	Settling Time		-	200	300	mS	

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 Vo=5.0 V Vo=3.3 V	 90 90	 93.0 92.5	 - -	 % %	Vin=48V, full load
Switching Frequency	300	330	360	kHz	
Isolation capacitance	-	1500	-	pF	
Output Voltage Trim Range	80	-	110	% Vo	
Over Temperature Protection	-	120	-	°C	
Over Voltage Protection [1]	-	130	-	% Vo	
Input to Output Isolation Voltage [2]	-	-	2000	V	
Weight	-	76	-	g	
MTBF	1,113,071			Hours	Calculated Per Bell Core SR-332 (I_O = Nominal; T_a = 25 °C)
Dimensions Inches (L × W × H) Millimeters (L × W × H)	 2.28 x 2.4 x 0.42 57.51 x 60.98 x 10.67			-	

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

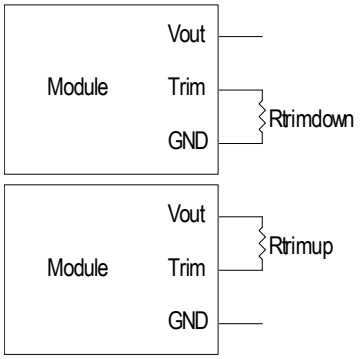
Parameter		Min	Typ	Max	Unit	Notes
Remote On/Off						
Signal Low (Unit On)	Active Low	-0.3	-	0.8	V	The remote on/off pin open, Unit off.
Signal High (Unit Off)		2.4	-	18	V	
Signal Low (Unit Off)	Active High	-0.3	-	0.8	V	The remote on/off pin open, Unit on.
Signal High (Unit On)		2.4	-	18	V	

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.

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

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



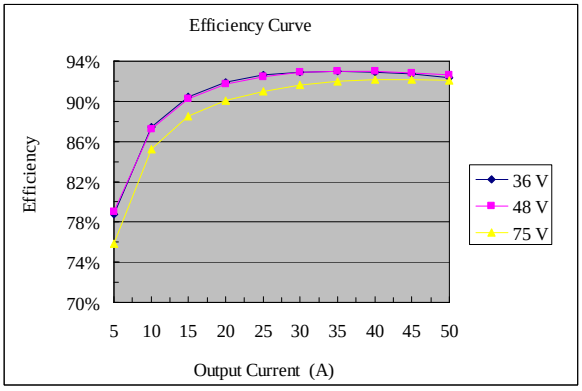
Notes:

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

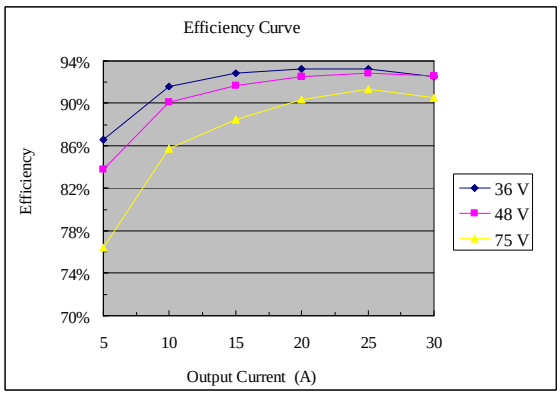
Vo_req=Desired(trimmed) output voltage[V]

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

Efficiency Data

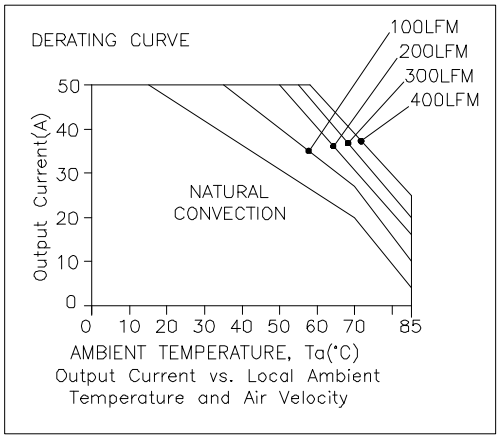


0RHB-C5T03x



0RHB-C5T05x

Thermal Derating Curves



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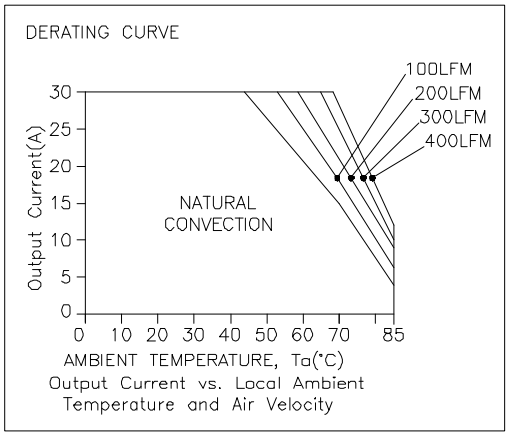

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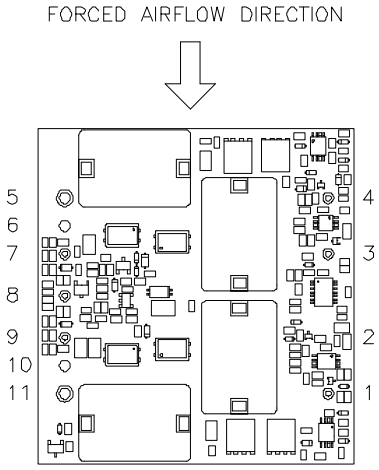
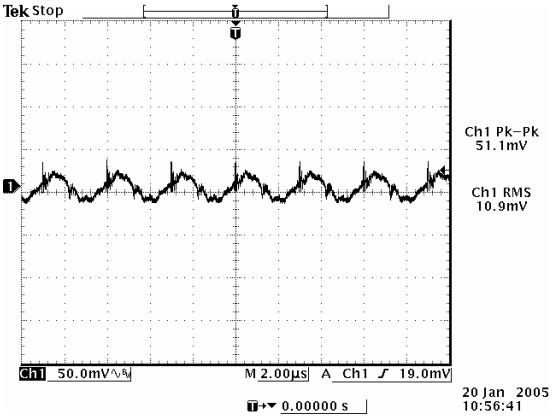
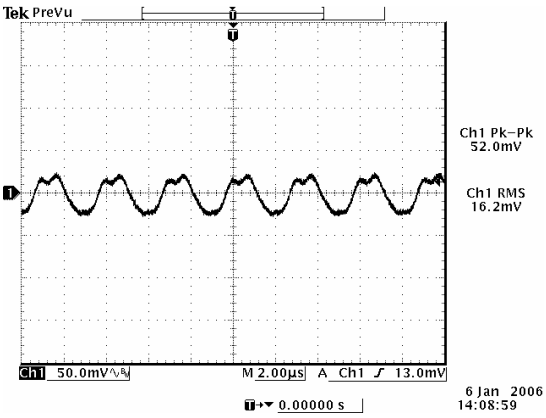


Ripple and Noise Waveforms



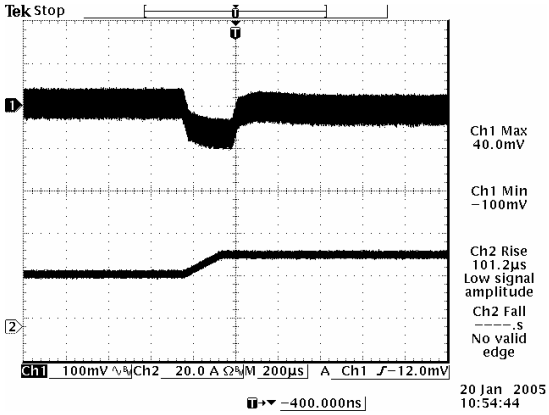
Ripple and noise at full load 3.3 V/50 A output



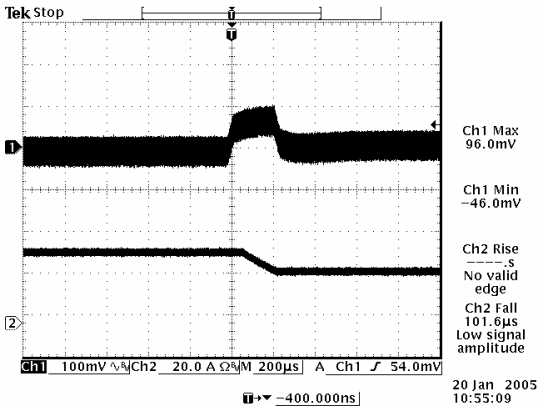
Ripple and noise at full load 5.0 V/30 A output

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.

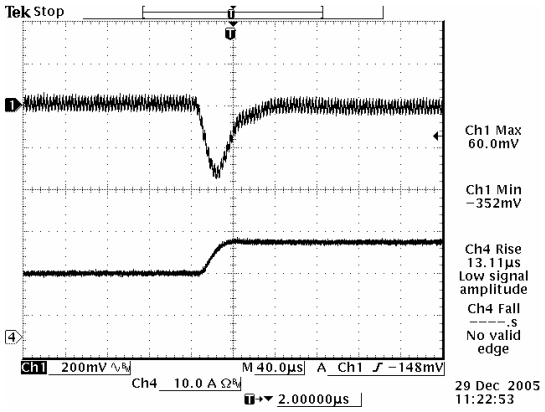
Transient Response Waveforms



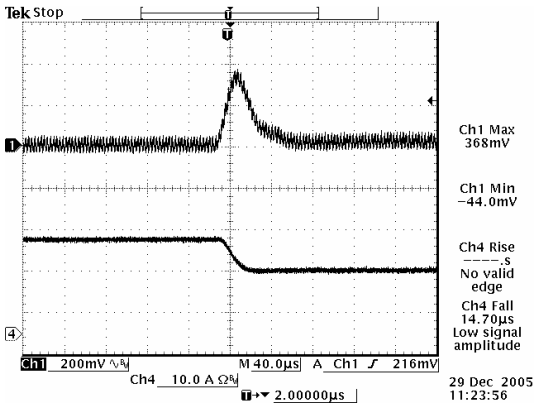
Vout=3.3 V, 50% to 75% Load Transients



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



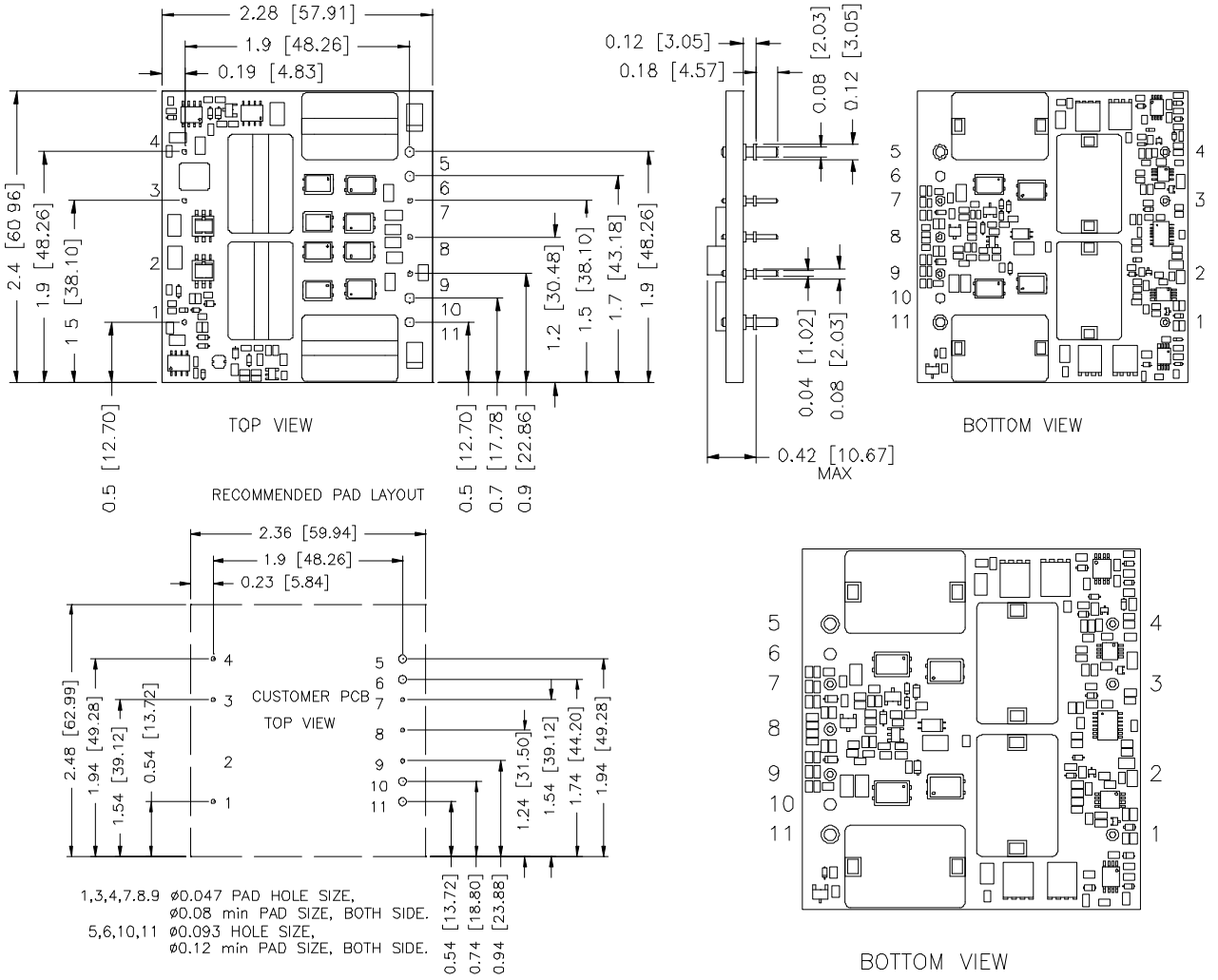
Vout=5.0 V, 50% to 75% Load Transients



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.

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"

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
2010-04-13	B	Updated MTBF.	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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