ISOLATED DC/DC CONVERTERS

48 Vdc Input 53 Vdc/8 A Output

Sep. 19, 2011

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

0RHB-Q2T53x RoHS Compliant PRELIMINARY Rev.D

- Isolated
- High Efficiency
- High Power Density
- Low Cost
- Input Under Voltage Lockout
- Output Over-Voltage Shut Down
- Fixed Frequency
- OCP/SCP
- Over Temperature Protection
- Remote On/Off
- Output Voltage Trim
- Basic Insulation
- Class 2, Category 2, Isolated DC/DC Converter (refer to IPC-9592)

Description

The 0RHB-Q2T53x is isolated DC/DC converters that operate from a nominal 48 Vdc source. These units will provide up to 424W 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 input undervoltage lockout. This converter 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
53 Vdc	48 Vdc	8 A	424W	94%	0RHB- Q2T530	0RHB- Q2T53L

Notes: 1. Add “G” suffix at the end of the model number to indicate Tray Packaging.
2. All part numbers above indicate RoHS 6. Change the second letter "R" to "7" for RoHS 5 part numbers.

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	-	-	1500 V	
Ambient Temperature	-40 °C	-	85 °C	
Storage Temperature	-55 °C	-	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	Notes
Input Voltage	36 V	48 V	72 V	
Input Current (full load)	-	-	12.6 A	
Input Current (no load)	-	80 mA	120 mA	
Remote Off Input Current	-	20 mA	30 mA	
Input Reflected Ripple Current (rms)	-	-	200 mA	Tested with simulated source impedance of 12 uH, 5 Hz to 20 MHz; Use 150 uF/100 V electrolytic capacitor with ESR=1 ohm max, at 200 kHz@25°C.
I^2t Inrush Current Transient	-	-	1 A^2s	
Turn-on Voltage Threshold[2]	33 V	-	35 V	
Turn-off Voltage Threshold[2]	32 V	-	34 V	

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

Output Specifications

Parameter	Min	Typ	Max	Notes
Output Voltage Set Point	52.0 V	53.0 V	54.0 V	Vin=48 V, Io=50%load
Line Regulation	-	-	100 mV	
Load Regulation	-	-	100 mV	
Regulation Over Temperature (-40deg.C-85deg.C)	-	-	600 mV	
Ripple and Noise (pk-pk)	-	-	300 mV	
Ripple and Noise (rms)	-	-	60 mV	
Output Current Range	0 A		8 A	
Output DC Current Limit	9 A	-	12A	
Turn On Time	-	80 mS	150 mS	
Overshoot at Turn on	-	0%	3%	
Output Capacitance	300 uF	-	1000 uF	
Transient Response				
50% ~ 75% of Max Load	-	-	800 mV	di/dt=0.1 A/us, Vin=48 Vdc, Ta=25°C, with a 1µF ceramic capacitor and 300 uF low ESR aluminum capacitor output.
Settling Time	-	-	800 uS	
75% ~ 50% of Max Load	-	-	800 mV	
Settling Time	-	-	800 uS	

Note: All specifications are typical at nominal input, full load at 25°C with a 1µF ceramic capacitor and a 300uF Aluminum cap at output unless otherwise stated.

General Specifications

Parameter	Min	Typ	Max	Notes
Efficiency	92.5%	94%	-	Vin=48 V, full load , Ta=25°C
Switching Frequency	-	275 kHz	-	
Input to Output	-	-	1500 V	
Input to Case	-	-	500 V	
Output to Case	-	-	1500 V	
Output Voltage Trim Range	42 V	-	56 V	
Isolation Capacitance	-	-	15 nF	
Over Temperature Protection	-	105 ℃	-	It's the temperature of baseplate.
Over Voltage Protection	57 V	-	60 V	
FIT	258			Calculated Per Bell Core SR-332 (Vin=48 V, Vo=53 V, Io=8 A, Ta = 25°C, FIT=10^9/MTBF)
Dimensions Inches millimeters	2.28 x 2.40x 0.512 57.91 x 60.96 x 13.00			
Weight	-	110 g	-	

Note: 1.When Remote On/Off pin is open, for active low option, unit is off; for active high option, unit is on.

2. The efficiency is measured at Vin=48V, full load and Ta=25°C.

3.Test the temperature of baseplate.

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

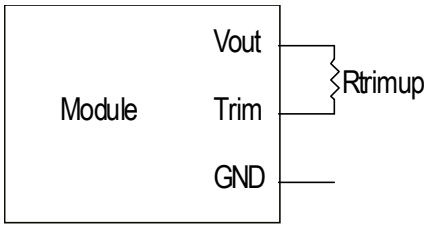
Control Specifications

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	
Current Sink		0 mA	-	2 mA	

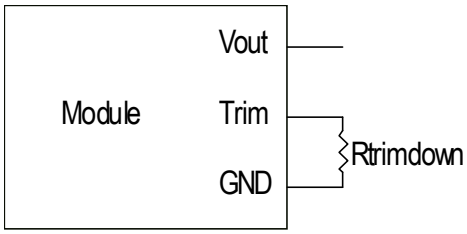
Output Trim Equations

Equations for calculating the trim resistor are shown below. The Trim Down resistor should be connected between the Trim pin and 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.

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



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

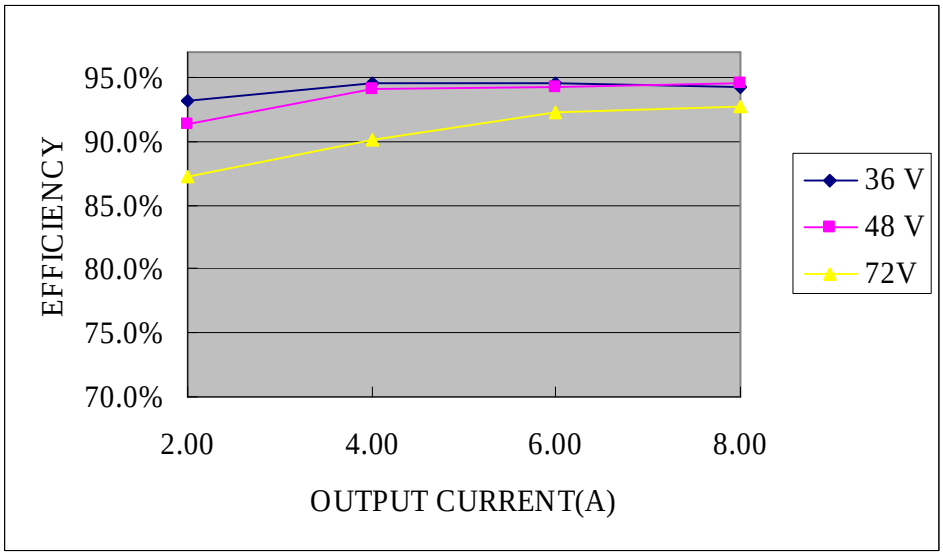


$$delta = \frac{(Vo\_req - Vo)}{Vo} \times 100[\%]$$

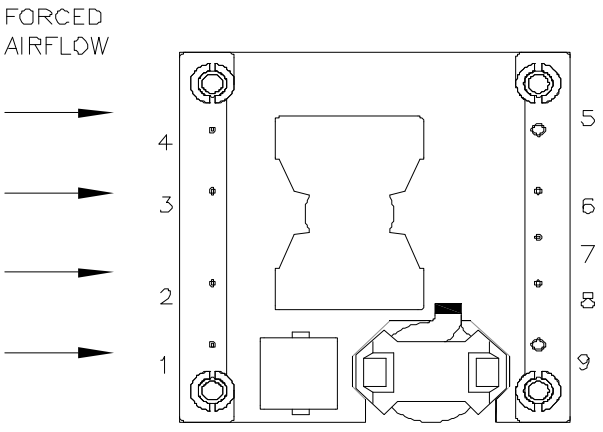
Note:Vo_req=Desired (trimmed) output voltage[V]

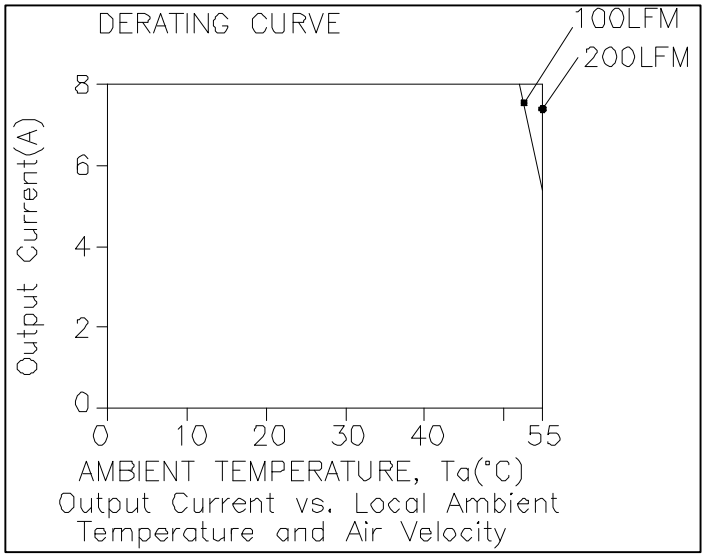
Output voltage Vo=53.000 V

Efficiency Data



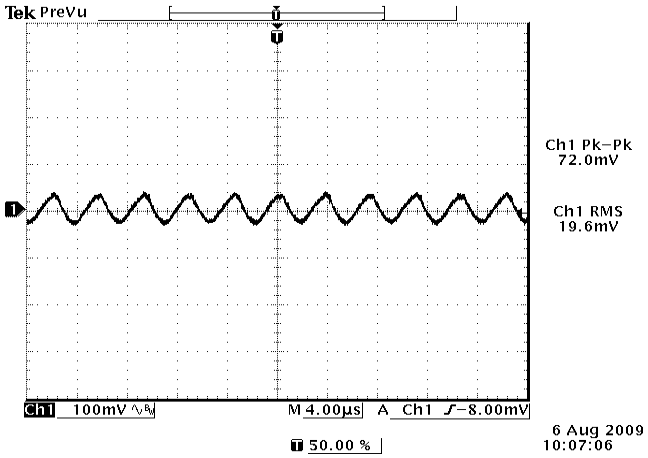
Thermal Derating Curve



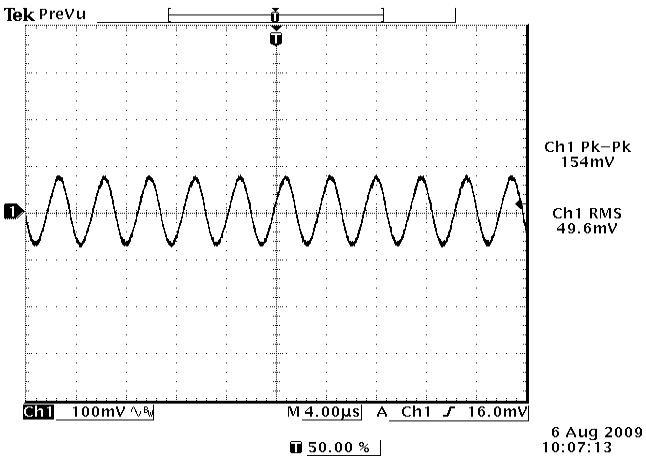


Vin=48V, with addition heatsink and with maximum junction temperature of semiconductors derated to 120C.

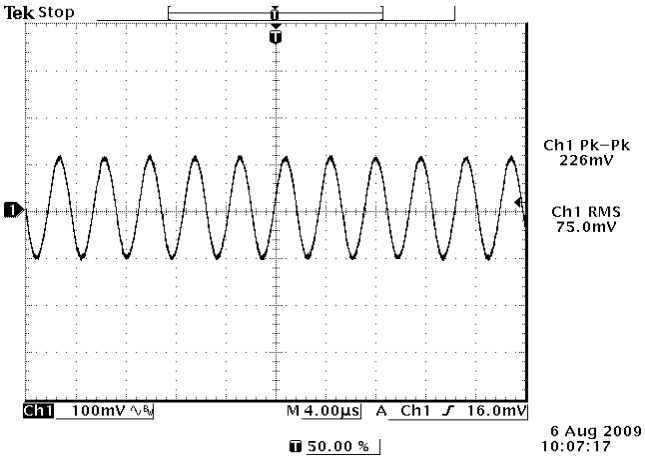
Ripple and Noise Waveforms



36 Vdc input, 53 Vdc/8 A output



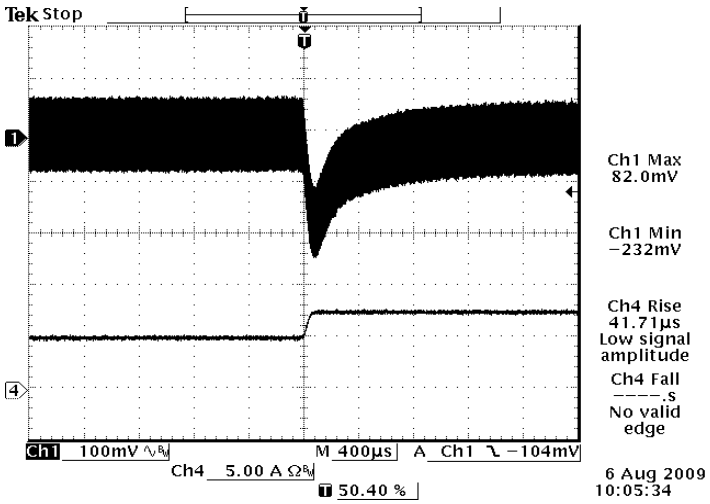
48 Vdc input, 53 Vdc/8 A output



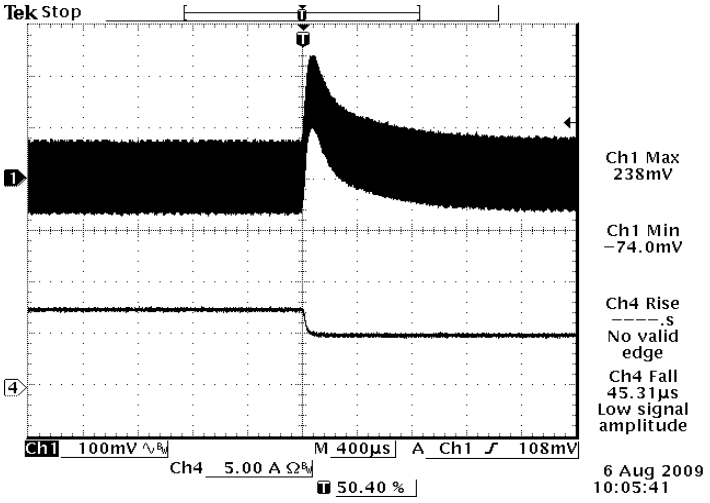
72 Vdc input, 53 Vdc/8 A output

Note: Ripple and noise at full load, with a 1uF ceramic cap and a 300 uF AL cap at output, and Ta=25 deg C.

Transient Response Waveforms



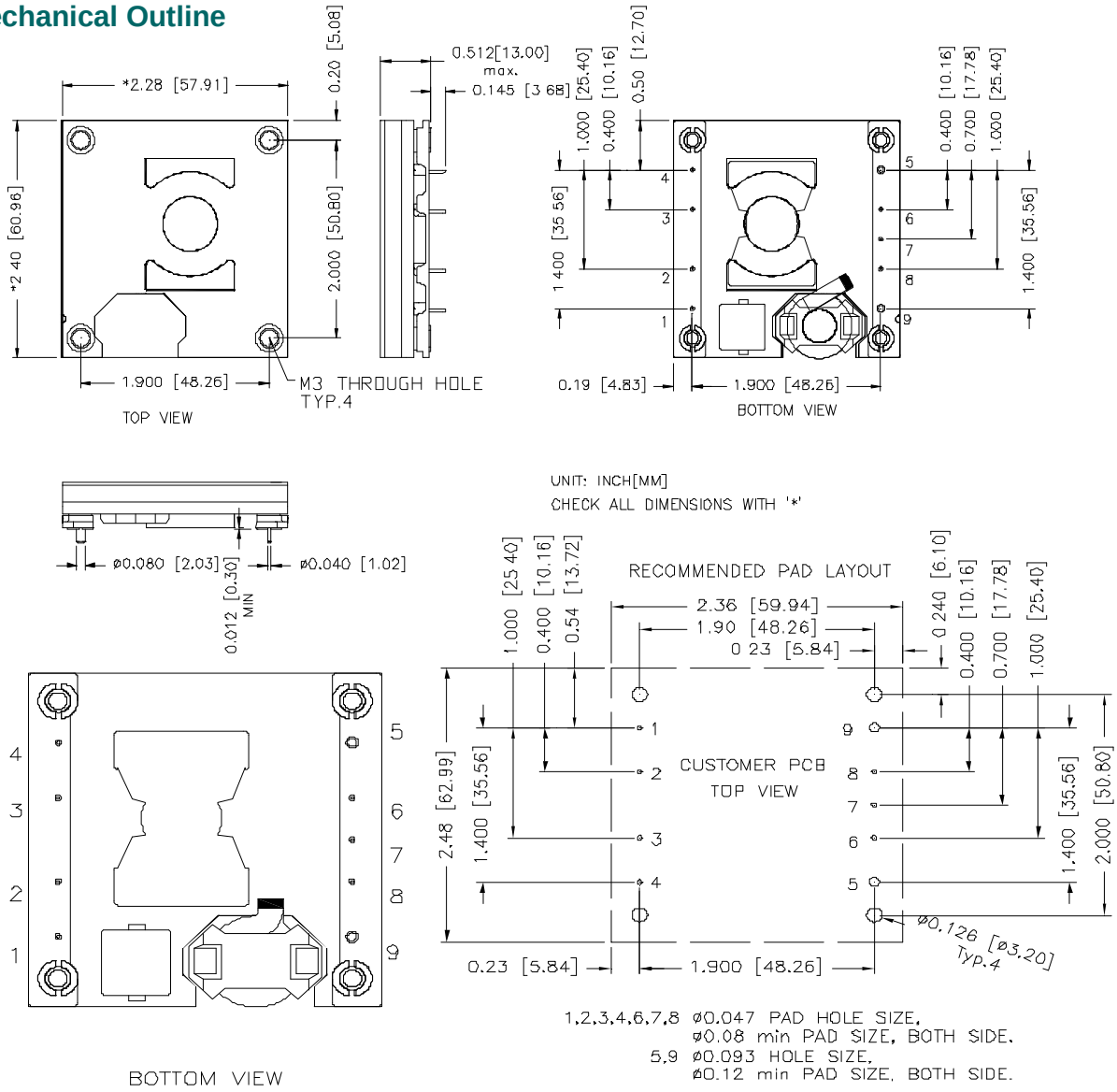
Vout=53V, 50% to 75% Load Transients



Vout=53 V, 75% to 50% Load Transients

Note: Transient response at di/dt=0.1 A/uS, with external 300uF AL Cap and 1uF Ceramic Cap.

Mechanical Outline



Pin Connections

pin	function	pin size	pin	function	pin size
1	Vin(+)	0.040"	5	Vo(-)	0.080"
2	Enable	0.040"	6	NC	0.040"
3	Case	0.040"	7	Trim	0.040"
4	Vin(-)	0.040"	8	NC	0.040"
			9	Vo(+)	0.080"

Note: Pin 6 and 8 are reserved for differential remote sense (+/- sense). No connection is needed to the pins if this feature is not needed. They are connected internal to the units respective output nodes thru low impedance resistors.

Revision History

Date	Revision	Changes Detail	Approval
2011-07-22	PA	First release	YF Sun
2011-07-28	PB	Change Pin6 and Pin8 to NC. Change the ambient temperature.	YF Sun
2011-08-29	PC	Updated maximum height to 13mm and change in mechanical drawing in the bottom of figure.	YF Sun
2011-09-19	PD	Updata the Ripple and Noise, Input current (no load), Mechanical Outline, Output Trim Equations and Vout setpoint	YF Sun

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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