

ISOLATED DC/DC CONVERTERS

24 Vdc Input 12 Vdc /20 A Output

bel
POWER PRODUCTS

0RQB-T0R12x RoHS Compliant PRELIMINARY Rev.C

- Isolated
- Fixed Frequency (500 kHz)
- High Efficiency
- High Power Density
- Input Under Voltage Lockout
- Input Over Voltage Lockout
- Positive/Negative Remote Sense
- Output Voltage Trim
- SCP/OCF
- Remote On/Off
- Over Temperature Protection
- Output Over Voltage Shutdown
- Basic Insulation



Description

The 0RQB-T0R12x is isolated dc/dc converter that operates from a nominal 24 Vdc source. This unit will provide up to 240 W output power from a nominal 24 Vdc input. These units are 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 quarter brick package.

Part Selection

Output Voltage	Input Voltage	Max. Output Current	Max. Output Power	Typical Efficiency	Model Number Active High	Model Number Active Low
12 Vdc	18 Vdc - 36 Vdc	20 A	240 W	94.5%	0RQB-T0R120	0RQB-T0R12L

- 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	-	40 V	
Remote On/Off	-0.3 V	-	12 V	
I/O Isolation Voltage	-	-	1500 V	
Ambient Temperature	-40 °C	-	85 °C	
Storage Temperature	-55 °C	-	125 °C	

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

Input Specifications

Parameter	Min	Typ	Max	Notes
Input Voltage	18 V	24 V	36 V	
Input Current (no load)	-	200 mA	240 mA	
Input Current (full load)	-	-	15 A	
Remote Off Input Current	-	15 mA	25 mA	
Input Reflected Ripple Current (pk-pk)	-	20 mA	40 mA	With simulated source impedance of 10 uH, 5 Hz to 20 MHz; use a 1uF ceramic cap and a 100uF/100V electrolytic cap with ESR = 1 ohm max, at 200 kHz.
Input Reflected Ripple Current (rms)	-	5 mA	10 mA	
I ² t Inrush Current Transient	-	0.05 A ² s	0.1 A ² s	
Turn-on Voltage Threshold	16.0 V	16.8 V	17.5 V	
Turn-off Voltage Threshold	15.0 V	18.8 V	16.5 V	
Input over Voltage Lockout	-	38 V	40 V	

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

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Output Specifications

Parameter	Min	Typ	Max	Notes		
Output Voltage Set Point	11.79 V	12.04 V	12.28 V	V _{in} =24 V, I _o =50%Load.		
Line Regulation	-0.3%V _{o,set}	-	0.3%V _{o,set}			
Load Regulation	-0.5%V _{o,set}	-	0.5%V _{o,set}			
Regulation Over Temperature (-40 °C to 85 °C)	-1%V _{o,set}	-	1%V _{o,set}			
Output Current	0 A	-	20 A			
Current Limit Threshold	22 A	-	30 A			
Ripple and Noise (rms)	-	25 mV	40 mV	0 - 20 MHz BW, with 1 uF ceramic load capacitor and a 10 uF tantalum capacitor at the output.		
Ripple and Noise (pk-pk)	-	85 mV	120 mV			
Short Circuit Surge Transient	-	TBD	-			
Turn on Time	-	20 mS	30 mS			
Overshoot at Turn on	-	0%	3%			
Output Capacitance	0 uF	-	5000 uF			
Transient Response						
50% ~ 75% Max Load	Overshoot	V _o =12 V	-	250 mV	350 mV	di/dt=0.1A/us, V _{in} =24Vdc, Ta=25 °C.
	Settling Time		-	120 uS	200 uS	
75% ~ 50% Max Load	Overshoot		-	250 mV	350 mV	
	Settling Time		-	120 uS	200 uS	

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

General Specifications

Parameter	Min	Typ	Max	Notes
Efficiency	93%	94.5%	-	V _{in} =24 V, full load.
Switching Frequency	450 kHz	500 kHz	550 kHz	
Isolation Capacitance	1500 pF	-	-	
Input to Output Isolation Voltage	-	-	1500 V	
Remote Sense Compensation	-	-	10%	The total voltage increased by trim and remote sense should not exceed 10%V _o .
Output Voltage Trim Range	90%	-	110%	
Over Voltage Protection	13.9 V	14.2 V	15.0 V	Latch
Over Temperature Protection	-	110 °C	-	
MTBF	-	TBD	-	Calculated Per Bell Core SR-332 (V _{in} =24 V, V _o =12 V, I _o =20 A, T _a = 25 °C)
Dimensions Inches (L × W × H) Millimeters (L × W × H)	2.30 x 1.45 x 0.50 58.42 x 36.83 x 12.70			
Weight	-	75 g	-	

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Control Specifications

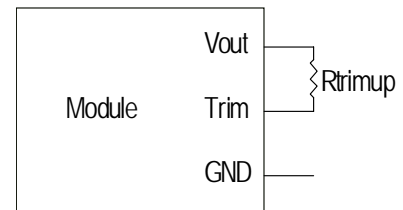
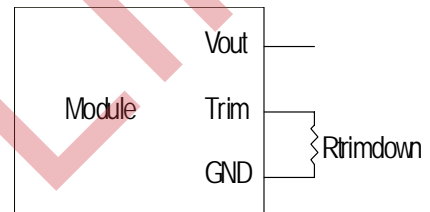
Parameter	Min	Typ	Max	Notes	
Remote On/Off					
Signal Low (Unit On)	Active Low	-0.3 V	-	0.8 V	The Remote On/Off pin is open, Unit off.
Signal High (Unit Off)		2.4 V	-		
Signal Low (Unit Off)	Active High	-0.3 V	-	0.8 V	The Remote On/Off pin is open, Unit on.
Signal High (Unit On)		2.4 V	-		

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.

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

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

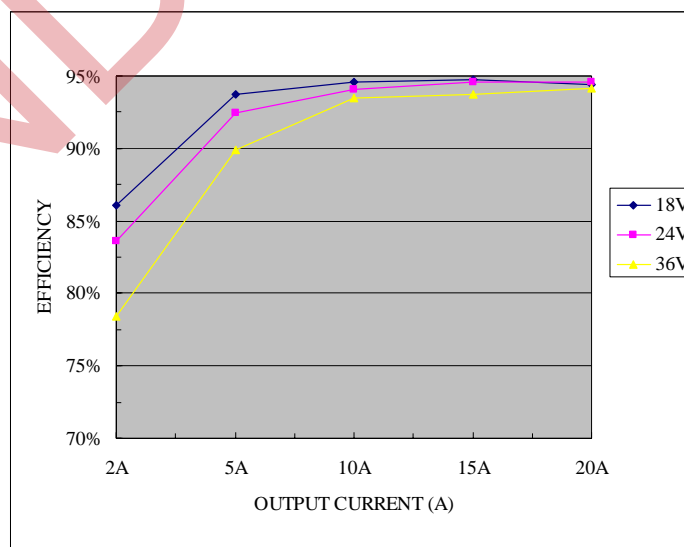


Note:

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

V_o_{req} = Desired (trimmed) output voltage [V]
Output voltage V_o = 12.036 V

Efficiency Data

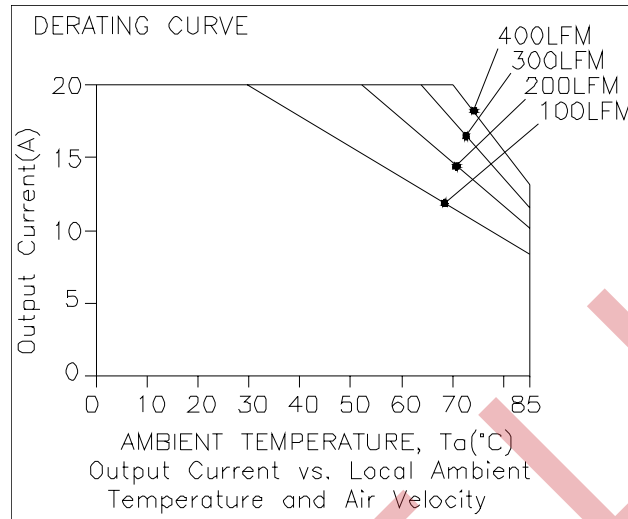


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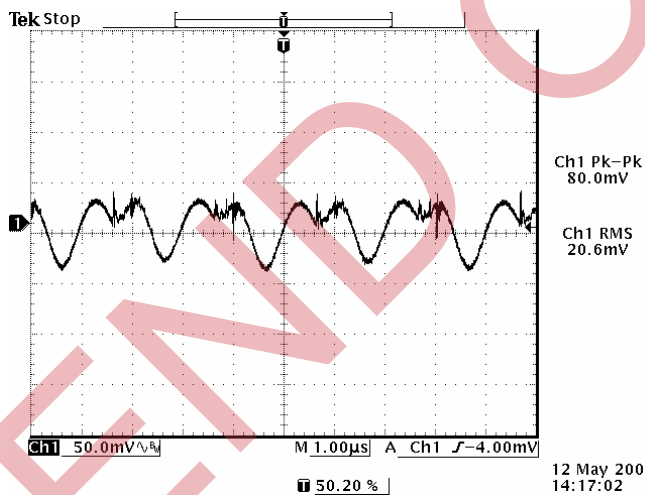
24 Vdc Input 12 Vdc /20 A Output



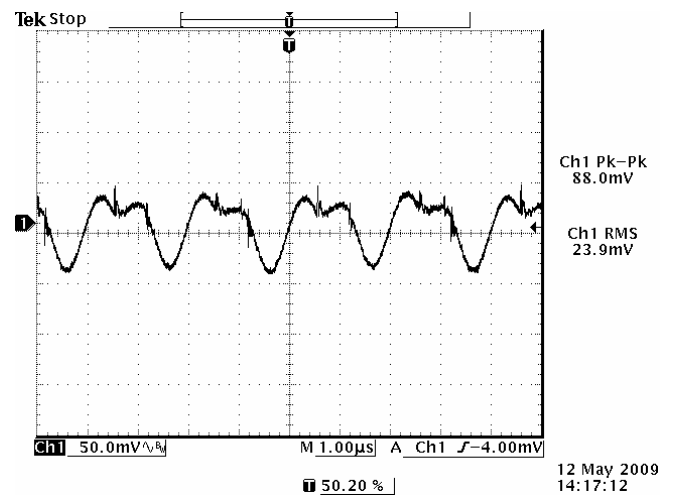
Thermal Derating Curve



Ripple and Noise Waveforms



18 Vdc input, 12 Vdc/20 A output



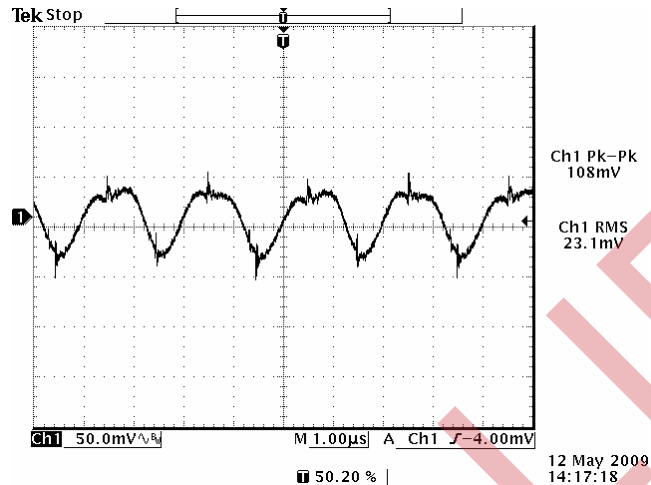
24 Vdc input, 12 Vdc/20 A output

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24 Vdc Input 12 Vdc /20 A Output



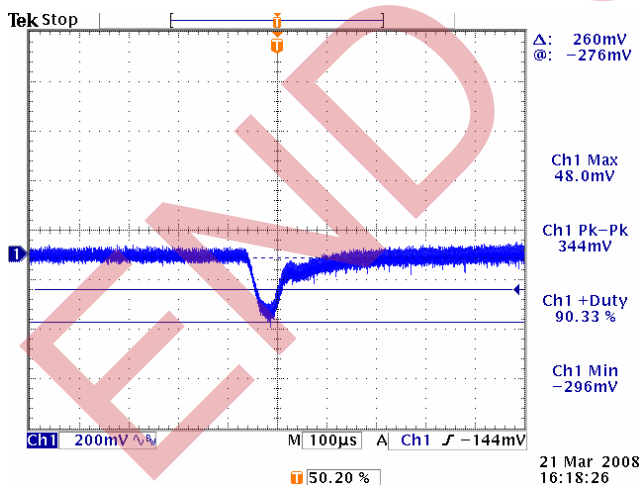
Ripple and Noise Waveforms (continued)



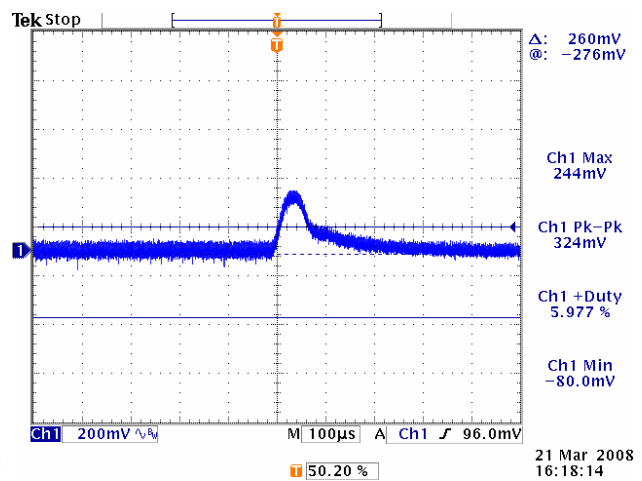
36 Vdc input, 12 Vdc/20 A output

Note: Ripple and noise at full load, 0-20MHz BW, with 10 uF Tan Cap and 1uF ceramic cap at the output, Ta=25 deg C.

Transient Response Waveforms



Vout=12 V 50%-75% Load Transients



Vout=12 V 75%-50% Load Transients

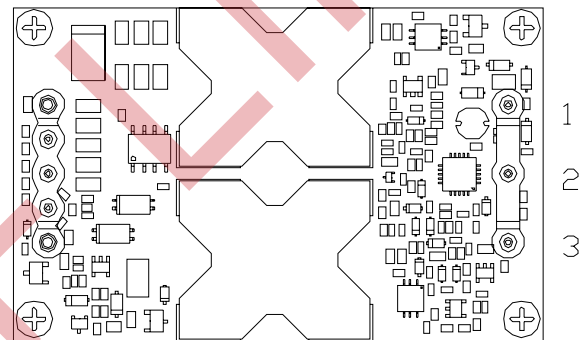
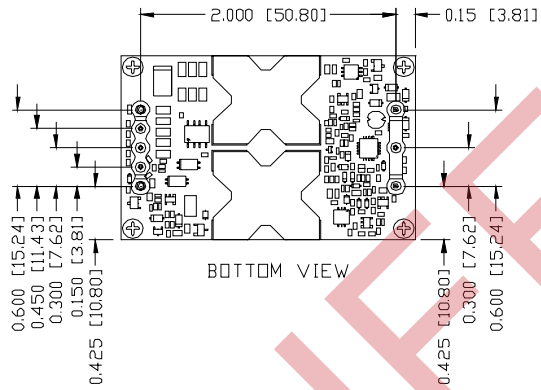
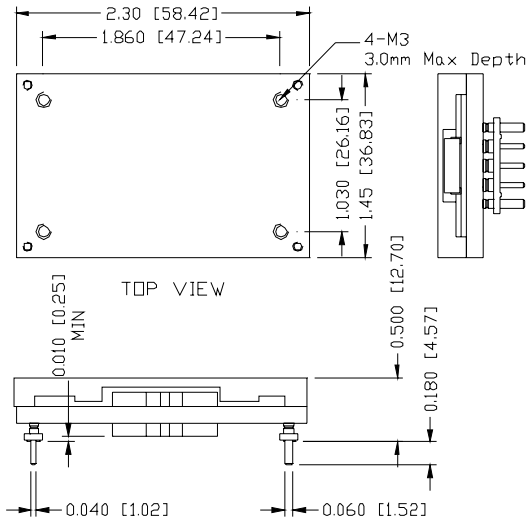
Note: Transient response at di/dt=0.1A/uS, with 10 uF tantalum cap and 1uF ceramic cap at the output, Ta=25 deg C.

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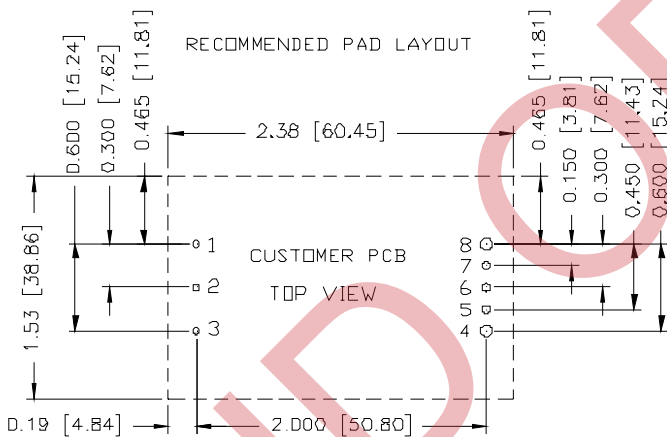
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Mechanical Outline



RECOMMENDED PAD LAYOUT



1,2,3,5,6,7 ϕ 0.047 HOLE SIZE, ϕ 0.08 min PAD SIZE
4,8 ϕ 0.07 HOLE SIZE, ϕ 0.10 min PAD SIZE

BOTTOM VIEW

Pin Connections

pin#	function	pin size
1	Vin (+)	0.04"
2	On/Off	0.04"
3	Vin (-)	0.04"
4	Vo (-)	0.06"
5	Sense (-)	0.04"
6	Trim	0.04"
7	Sense (+)	0.04"
8	Vo (+)	0.06"

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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