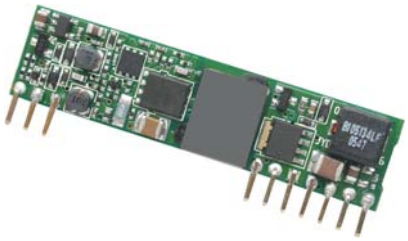
ISOLATED DC/DC CONVERTERS

48 Vdc Input 3.3 Vdc /12 A Output

VRYB-40T03x RoHS Compliant Rev.A

- Isolated
- High Efficiency
- High Power Density
- Fixed Frequency (400 kHz)
- Low Cost
- Input Under-Voltage Lockout
- Output Over-Voltage Shutdown
- OCP/SCP
- Over Temperature Protection
- Remote On/Off
- Output Voltage Trim
- Positive/Negative Remote Sense



Description

The VRYB-40T03x is isolated dc/dc converter that operates from a nominal 48 Vdc source. This unit will provide up to 40 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 SIP package.

Part Selection

Output Voltage	Input Voltage	Max. Output Current	Max. Output Power	Typical Efficiency	Model Number Active High	Model Number Active Low
3.3 Vdc	36 Vdc - 75 Vdc	12 A	40 W	89%	VRYB-40T033	VRYB-40T03L

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	

Input Specifications

Parameter	Min	Typ	Max	Notes
Input Voltage	36 V	48 V	75 V	
Input Current (full load)	-	-	1.5 A	
Input Current (no load)	-	40 mA	60 mA	
Remote Off Input Current	-	8 mA	15 mA	
Input Reflected Ripple Current (rms)	-	4 mA	8 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 (pk-pk)	-	25 mA	50 mA	
I^2t Inrush Current Transient	-	0.01 A^2s	0.02 A^2s	
Turn-on Voltage Threshold	32 V	34 V	35 V	
Turn-off Voltage Threshold	30 V	32 V	33 V	

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

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Output Specifications

Parameter		Min	Typ	Max	Notes
Output Voltage Set Point		3.250 V	3.300 V	3.350 V	Vin=48 V, Io=50%Load
Output Voltage Regulation (Load)		-	±6 mV	±12 mV	
Output Voltage Regulation (Line)		-	±2 mV	±5 mV	
Regulation Over Temperature (-40 deg.C - 85 deg.C)		-	±20 mV	±40 mV	
Output Current		0 A	-	12 A	
Current Limit Threshold		14 A	18 A	21 A	
Ripple and Noise (pk-pk)		-	40 mV	80 mV	0-20 MHz BW, with a 1 uF ceramic capacitor and a 220 uF tantalum capacitor at the output.
Ripple and Noise (rms)		-	7 mV	15 mV	
Short Circuit Surge Transient		-	3 A^2s	5 A^2s	
Turn on Time		-	-	40 mS	
Overshoot at Turn On		-	0%	5%	
Output Capacitance		220 uF	-	10000 uF	
Transient Response					
25% - 50% Max Load	Vo=3.3 V		120 mV	160 mV	di/dt=0.1 A/us, Vin=48 Vdc, Ta=25°C, with a 1 µF ceramic capacitor and a 220 uF Tantalum capacitor at the output.
Settling Time			100 uS	150 uS	
50% - 25% Max Load		-	120 mV	160 mV	
Settling Time		-	100 uS	150 uS	

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

General Specifications

Parameter	Min	Typ	Max	Notes
Efficiency	86%	89%	-	Vin=48 V, full load
Switching Frequency	360 kHz	400 kHz	440 kHz	
Isolation capacitance	-	1000 pF	-	
Output Voltage Trim Range	-	80%	110%	
Remote Sense Compensation	-	-	10%	The total voltage increased by trim and remote sense should not exceed 10%Vo.
Over Temperature Protection	-	125 °C	-	
Over Voltage Protection	115%	140%	-	
MTBF	TBD			Calculated Per Bell Core SR-332 (Vin=48 V, Vo=3.3 V, Io=9.6 A, T_a = 25 °C)
Dimensions Inches (L × W × H) Millimeters (L × W × H)	2.0 x 0.5 x 0.348 50.80 x 12.70 x 8.84			
Weight	-	10.5 g	-	

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

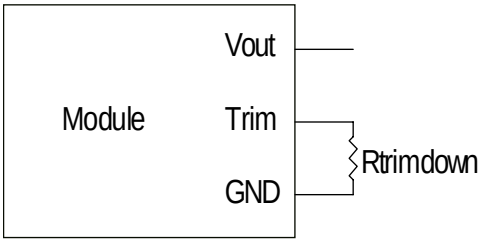
Control Specifications

Parameter		Min	Typ	Max	Notes
Remote On/Off					
Signal Low (Unit On)	Active Low	-0.3 V	-	0.8 V	VRYB-40T03L. 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	VRYB-40T033. The remote on/off pin open, Unit on.
Signal High (Unit On)		2.4 V	-	18 V	
Current Sink		0 mA	-	0.75 mA	

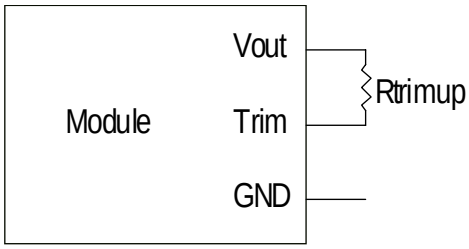
Output Trim Equations

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

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



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

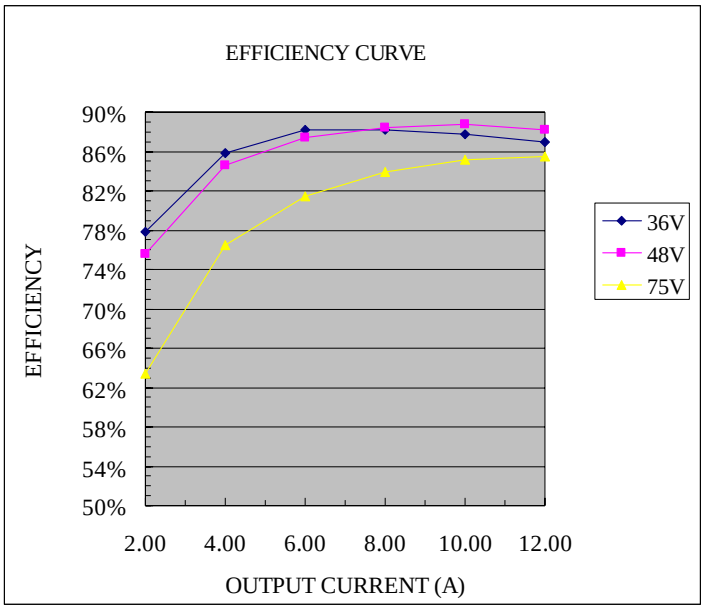


Note:

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

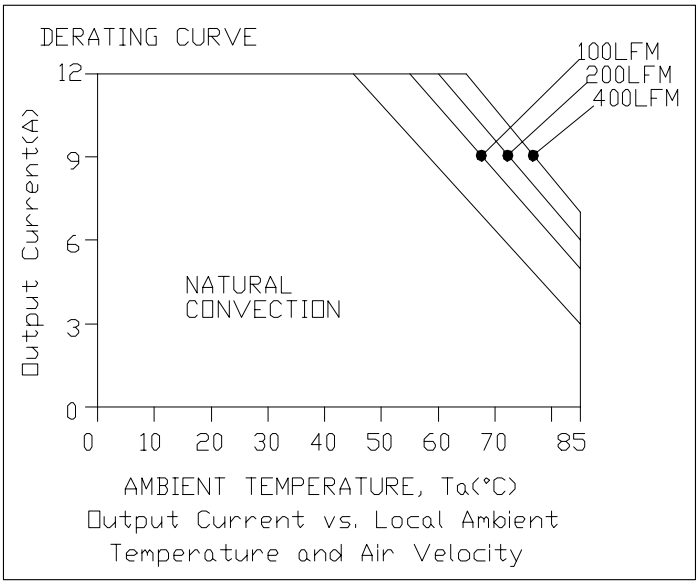
Vo_req=Desired (trimmed) output voltage [V]
Output voltage Vo=3.308 V

Efficiency Data



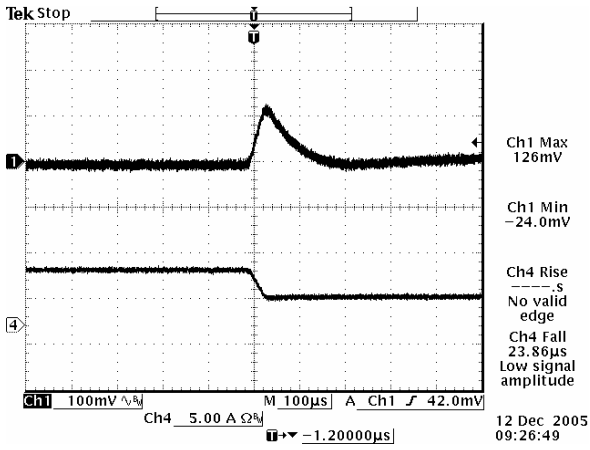
VRYB-40T03x

Thermal Derating Curve

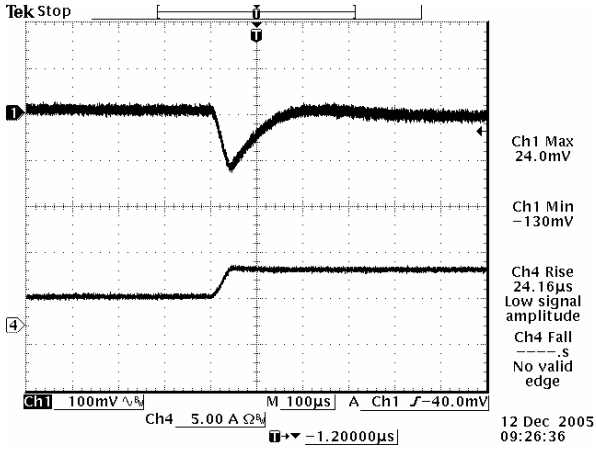


VRYB-40T03x

Transient Response Waveforms



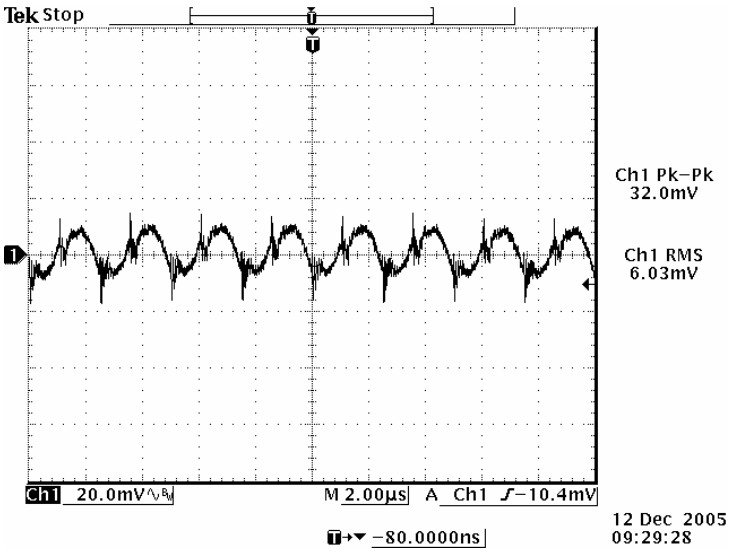
Vout=3.3 V 50% to 25% Load Transients



Vout=3.3 V 25% to 50% Load Transients

Note: Transient Response at Vin=48 V, di/dt=0.1 A/uS, with external 220 uF tantalum capacitor and 1 uF ceramic capacitor at the output, Ta=25 deg C.

Ripple and Noise Waveform



Note: Ripple and noise at full load, 48 Vdc input, 3.3 Vdc/12 A output and Ta=25 deg C, and with a 1uF ceramic capacitor and a 220 uF tantalum capacitor at the output.

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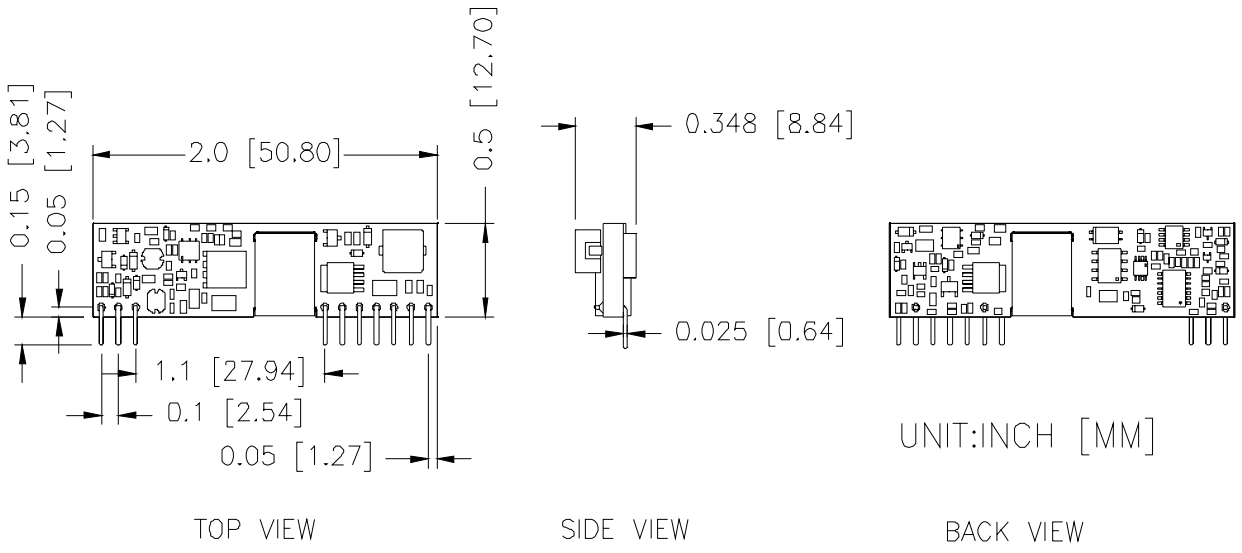
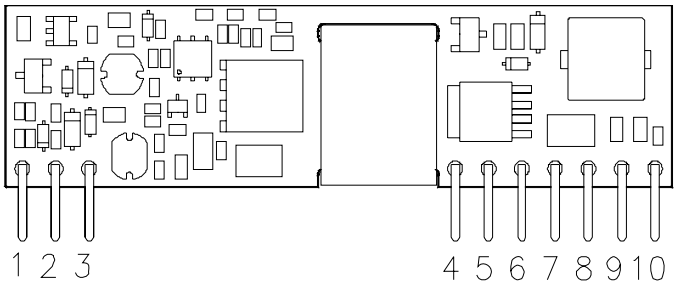
Mechanical Outline





Pin Connections

Pin	Function
1	Vin(+)
2	On/Off
3	Vin(-)
4	Sense(-)
5	Vout(-)
6	Vout(-)
7	Trim
8	Vout(+)
9	Vout(+)
10	Sense(+)

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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