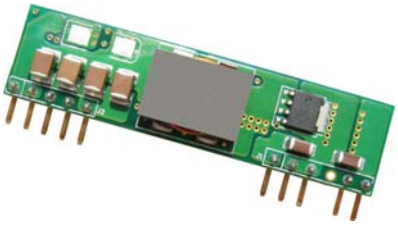
NON-ISOLATED DC/DC CONVERTERS

8.3 Vdc - 14 Vdc Input 0.75 Vdc - 5.0 Vdc/10 A Output

VRBC-10A1Ax RoHS Compliant Rev.A

- Non-Isolated
- High Efficiency
- Fixed Frequency
- Low Cost
- Industrial Temperature Range
- Over Temperature Shutdown
- Wide Input
- Under Voltage Lockout (UVLO)
- OCP/SCP
- Remote Sense
- Wide Trim
- Remote On/Off
- Remote On/Off Logic
- Output Voltage Prebias



Description

The Bel VRBC-10A1Ax modules are series of the non-isolated dc/dc converters. The modules use a SIP package. These converters are available in a range of output voltages from 0.75 Vdc to 5.0 Vdc over a wide range of input voltage (Vin = 8.3 Vdc - 14 Vdc).The efficiency is typically 95%@5.0 Vout at full load.

Part Selection

Output Voltage	Input Voltage	Max. Output Current	Max. Output Power	Typical Efficiency	Model Number Active Low	Model Number Active High
0.75 V - 5.0 V	8.3 V - 14 V	10 A	50.0 W	95%	VRBC-10A1AL	VRBC-10A1A0

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	-	15 V	
Output Enable Terminal Voltage	-0.3 V	-	15 V	
Ambient Temperature	-40 °C	-	85 °C	
Storage Temperature	-55 °C	-	125 °C	

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

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Input Specifications

Parameter	Min	Typ	Max	Notes
Operating Input Voltage Vo≤ 3.63 V Vo > 3.63 V	 8.3 V 8.3 V	 12 V 12 V	 14 V 13.2 V	
Input Current (full load)	-	-	6.5 A	An input line fuse must always be used.
Input Current (no load)	-	80 mA	-	
Remote Off Input Current	-	2 mA	-	
Input Reflected Ripple Current (pk-pk)	-	100 mA	-	Tested with one 1000 uF/25 V Aluminum capacitor with ESR=0.03 ohm max and 4 × 47 uF/16 V Tantalum capacitors with ESR=0.013 ohm max at 100 kHz, & simulated source impedance of 1000 nH, 5 Hz to 20 MHz.
Input Reflected Ripple Current (rms)	-	30 mA	-	
I^2t Inrush Current Transient	-	0.2 A^2s	0.4 A^2s	
Turn-on Voltage Threshold	-	7.9 V	-	
Turn-off Voltage Threshold	-	7.8 V	-	

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

Output Specifications

Parameter	Min	Typ	Max	Notes
Output Voltage Set Point	-2% Vo,set	-	2% Vo,set	Vin=12 V, full load
Load Regulation	-	0.3% Vo,set	-	
Line Regulation	-	0.2% Vo,set	-	
Regulation Over Temperature (-40 °C to +85 °C)	-	0.4% Vo,set	-	Tref=Tamin to Tamax
Output Current	0 A	-	10 A	
Current Limit Threshold	-	200% Io	-	
Short Circuit Surge Transient	-	1 A^2s	3 A^2s	
Ripple and Noise (pk-pk)	-	40 mV	100 mV	0-20 MHz BW, with 10 uF tantalum capacitor & 1 uF ceramic capacitor
Ripple and Noise (rms)	-	20 mV	40 mV	
Turn on Time	-	8 mS	20 mS	
Overshoot at Turn on	-	-	1% Vo,set	
Output Capacitance	0 uF	-	5000 uF	
Transient Response				
50% ~ 100% Max Load	Vo = 0.75 V -5 V	-	100 mV	-	di/dt=2.5 A/uS; Vin=12 V; and with 470 uF Tantalum capacitors at the output
Settling Time		-	50 uS	-	
100% ~ 50% Max Load		-	100 mV	-	
Settling Time		-	50 uS	-	

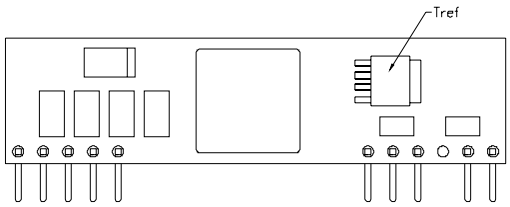
Note: All specifications are typical at nominal input, full load at 25 °C unless otherwise stated.

General Specifications

Parameter	Min	Typ	Max	Notes
Efficiency				
Vo=5.0 V	-	95%	-	Measured at Vin=12 V, full load
Vo=3.3 V	-	93%	-	
Vo=2.5 V	-	92%	-	
Vo=1.8 V	-	90%	-	
Vo=1.5 V	-	89%	-	
Vo=1.2 V	-	87.5%	-	
Vo=0.75 V	-	81%	-	
Switching Frequency	265 kHz	300 kHz	335 kHz	
Over Temperature Shutdown[1]	-	130 °C	-	
Output Voltage Trim Range	0.7525 V	-	5.0 V	
Remote Sense Compensation	-	-	0.5 V	
MTBF	5,114,191 hours			Calculated Per Bell Core SR-332 (Io = 80% Load; Vo=3.3 V; Vin=12 V; Ta = 25°C)
Dimensions				
Inches (L × W × H)	2.0 x 0.5 x 0.32			
Millimeters (L × W × H)	50.8 x 12.7 x 8.13			
Weight	-	7.1 g	-	

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

1. The Tref temperature measurement location:



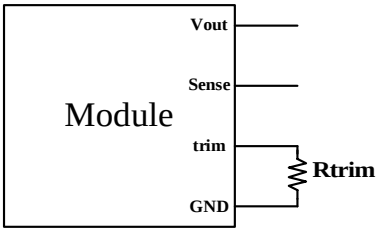
Control Specifications

Parameter	Min	Typ	Max	Notes
Remote On/Off				
Signal Low (Unit Off)	-0.2 V	-	0.3 V	VRBC-10A1A0; Remote On/Off pin open, Unit on.
Signal High (Unit On)	-	-	Vin, max	
Signal Low (Unit On)	-0.2 V	-	0.3 V	VRBC-10A1AL; Remote On/Off pin open, Unit on.
Signal High (Unit Off)	2.5 V	-	Vin, max	

Output Trim Equations

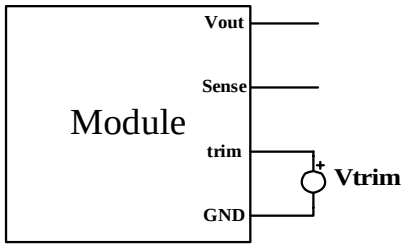
Equation for calculating the trim resistor (in Ω) given the desired adjusted voltage (Vo) is shown below. The Trim Up resistor should be connected between the Trim pin and Ground.

$$R_{trim} = \left[\frac{10500}{Vo - 0.7525} - 1000 \right]$$

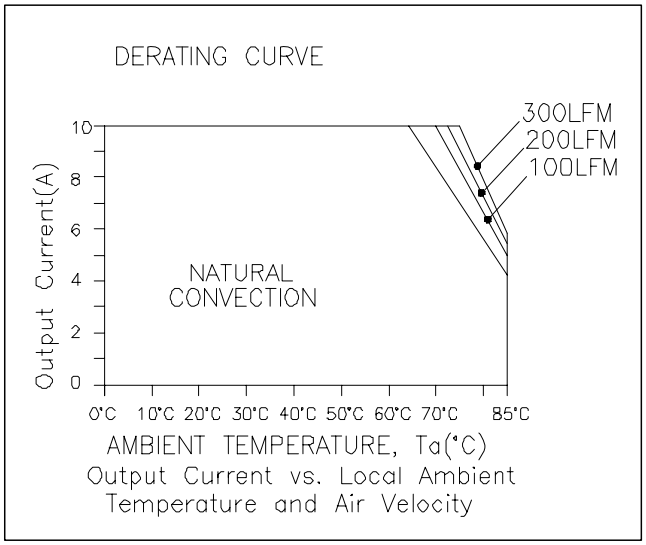


Equation for calculating the trim voltage (in V) given the desired adjusted voltage (Vadj) is shown below. The Trim Up voltage should be connected between the Trim pin and Ground.

$$Vtrim = \{0.7 - 0.0667 \times (Vo - 0.7525)\}$$

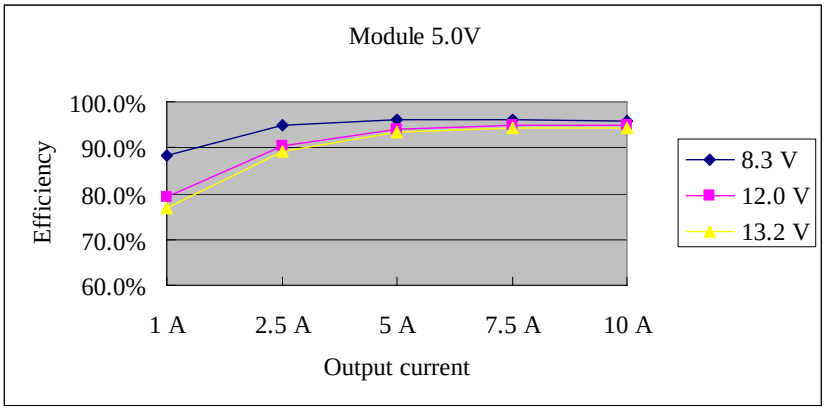


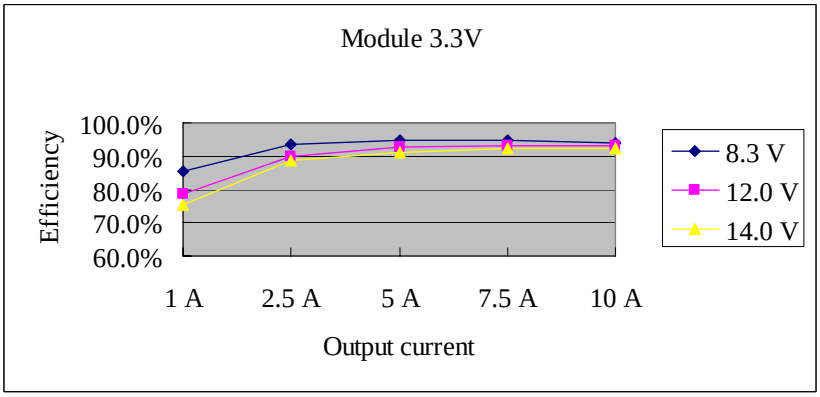
Thermal Derating Curve

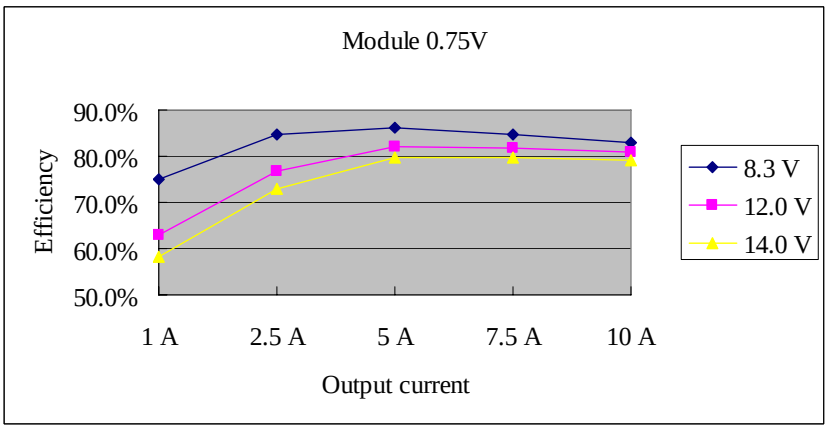


Vin=12.0 V, Vo = 3.3 V

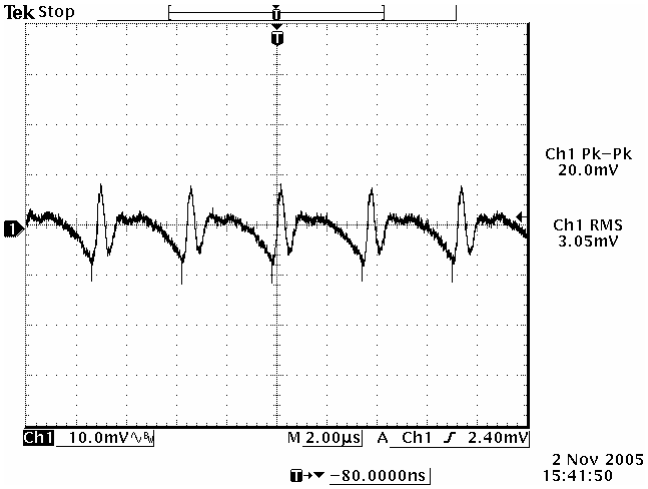
Efficiency Data



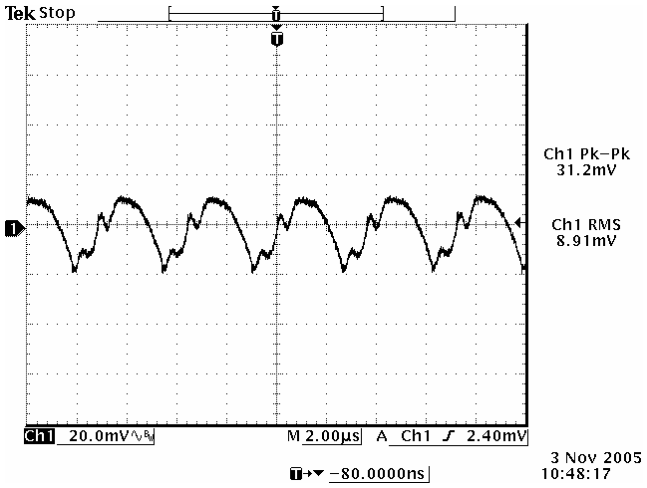




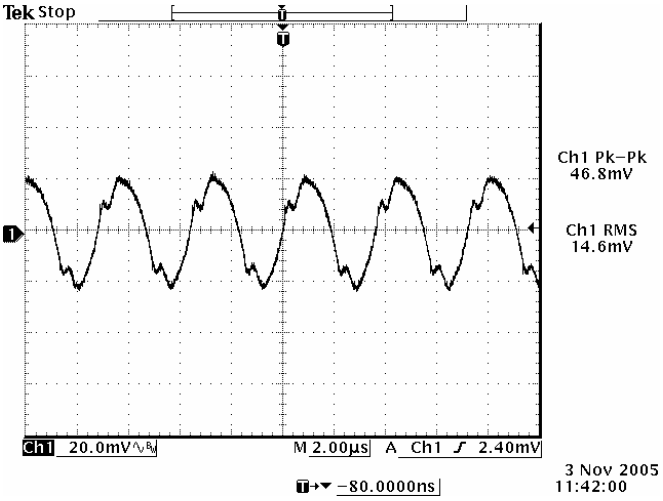
Ripple and Noise Waveforms



Ripple and noise at full load, 0.75 V output



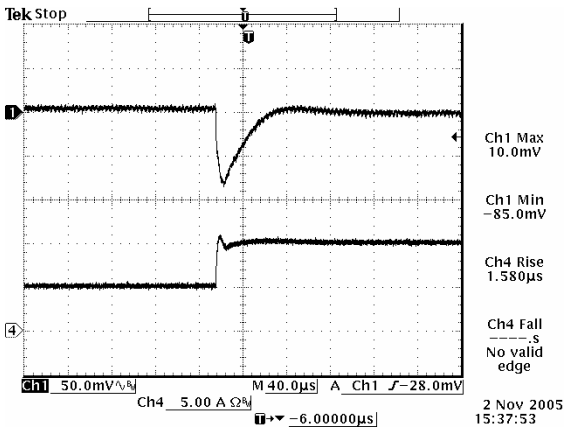
Ripple and noise at full load, 3.3 V output



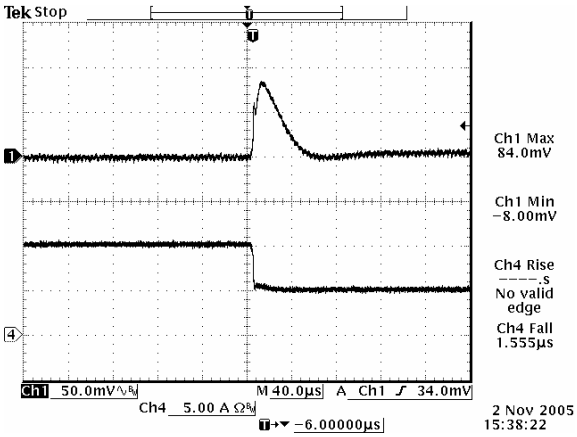
Ripple and noise at full load, 5.0 V output

Note: Ripple and Noise at external load with 10 uF tantalum capacitor and 1 uF ceramic on output, Ta=25 deg C.

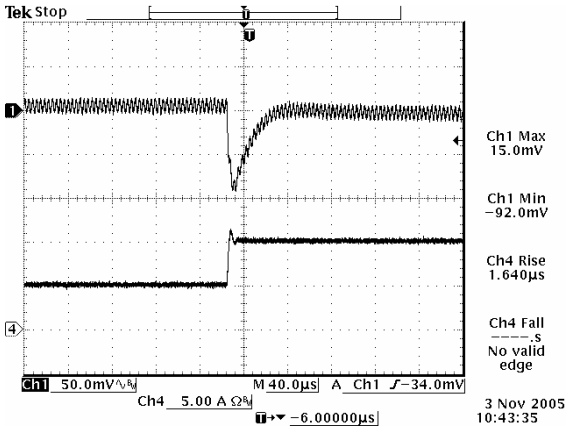
Transient Response Waveforms



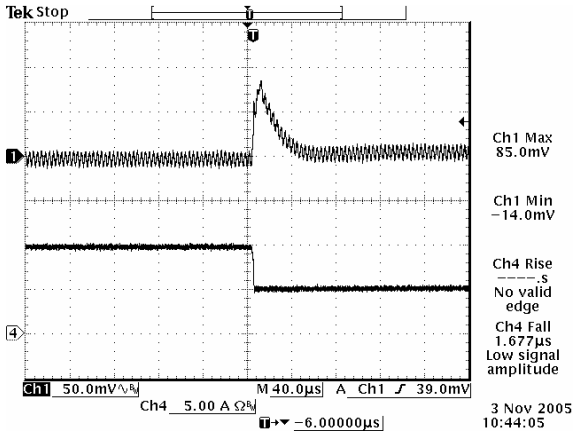
50% to 100% load transient at 0.75 Vdc output



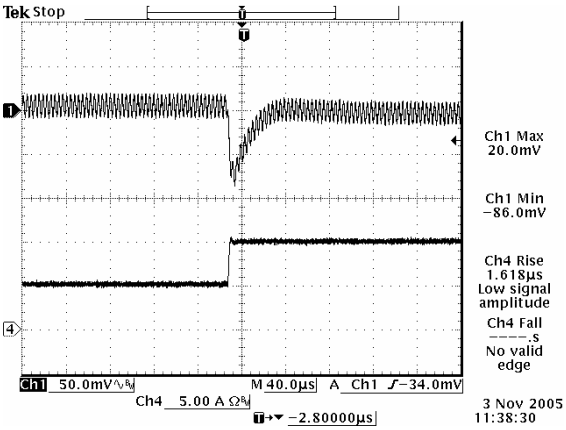
100% to 50% load transient at 0.75 Vdc output



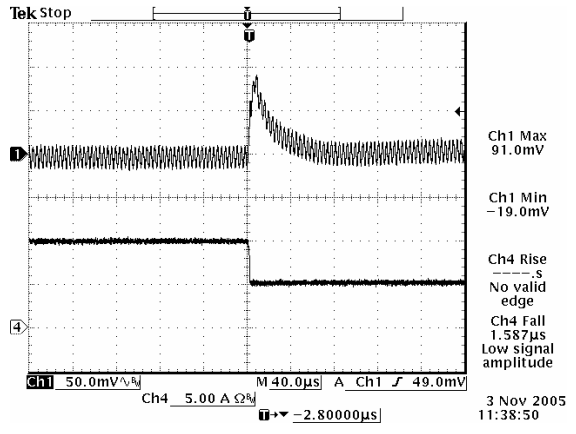
50% to 100% load transient at 3.3 Vdc output



100% to 50% load transient at 3.3 Vdc output



50% to 100% load transient at 5.0 Vdc output



100% to 50% load transient at 5.0 Vdc output

Note: Transient response at Vin=12 V, di/dt=2.5 A/uS, external load with 470 uF tantalum capacitor at the output, and Ta=25 deg C.

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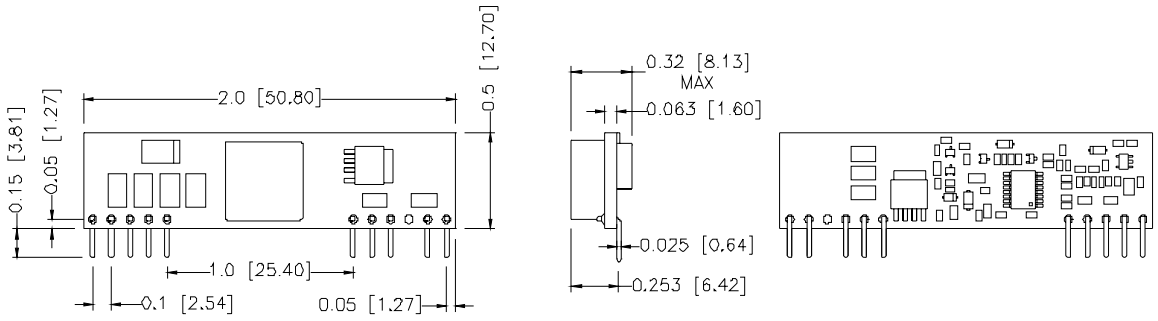
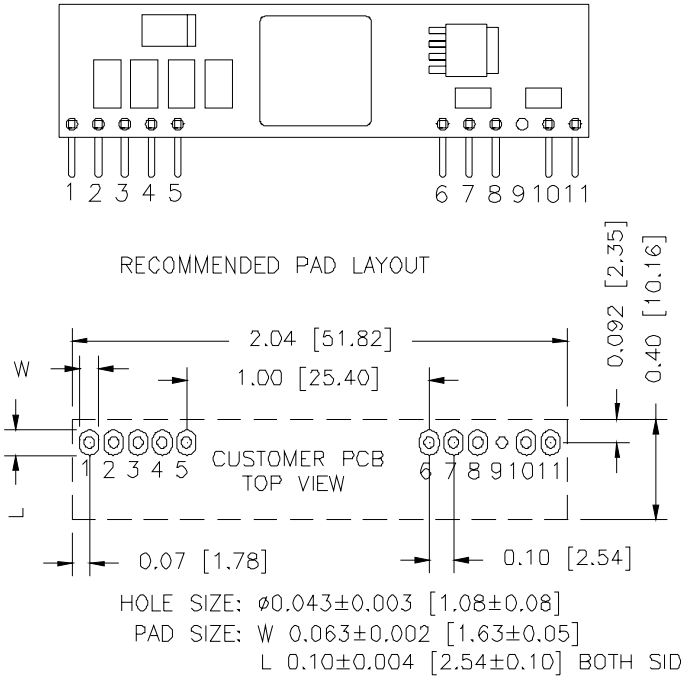
Mechanical Outline





Pin Connections

Pin	Function
1	Vo
2	Vo
3	Vo, sense
4	Vo
5	GND
6	GND
7	Vin
8	Vin
9	N/A
10	Trim
11	On/Off

RoHS Compliance

Complies with the European Directive 2002/95/EC, calling for the elimination of lead and other hazardous substances from electronic products.

CORPORATE

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