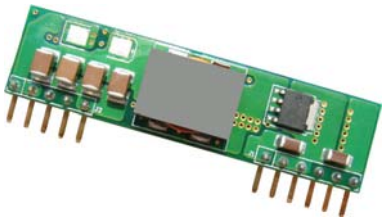
NON-ISOLATED DC/DC CONVERTERS

8.3 V-14 V Input 0.75 V-5.5 V/16 A Output

VRBC-16A2Ax Series RoHS Compliant

- Non-Isolated
- High Efficiency
- High Power Density
- Excellent Thermal Performance
- Low Cost
- Flexible Output Voltage Sequencing (option)
- Able to Sink & Source Current
- Vout Prebias
- Under-voltage Lockout (UVLO)
- Over Temperature Protection
- OCP/SCP
- Wide Input
- Wide Trim
- Remote On/Off
- Active Low/High (option)
- Remote Sense
- Industrial Temperature Range



Description

The Bel VRBC-16A2Ax is part of the non-isolated dc/dc converter series. The modules use a SIP package. These converters are available in a range of output voltages from 0.75 V to 5.5 V over a wide range of input voltage (Vin = 8.3 V-14 V). The Bel VRBC-16A2Ax has a sequencing feature that enables designers to implement various types of output voltage sequencing when powering. The efficiency is typically 92% at 3.3 V output and 12 V input 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 - 5.5 V	8.3 V - 14 V	16 A	80 W	94%	VRBC-16A2AL	VRBC-16A2A0

Notes: 1.Change the last character to “C” to indicate 0.20’’ pin length and active low.
2. Add “G” suffix at the end of the model number to indicate Tray Packaging.

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	
Sequencing Voltage [1]	-0.3 V	-	Vin	
Ambient Temperature	-40 °C	-	85 °C	
Storage Temperature	-55 °C	-	125 °C	

Notes: All specifications are typical at 25 °C unless otherwise stated.
1. VRBC-16A2Ax series of modules include a sequencing feature that enables users to implement various types of output voltage sequencing in their applications. This is accomplished via an additional sequencing pin. When not using the sequencing feature, either, tie the SEQ pin to Vin or leave it unconnected.

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Input Specifications

Parameter	Min	Typ	Max	Notes
Input Voltage Vo, set≤3.63 V Vo, set >3.63 V	 8.3 V 8.3 V	 12 V 12 V	 14 V 13.2 V	
Input Current (full load)	-	-	11 A	
Input Current (no load)	-	100 mA	-	
Remote Off Input Current	-	2 mA	-	
Input Reflected Ripple Current (pk-pk)	-	30 mA	-	Tested with one 1000 uF/25 V AL input capacitor with ESR=0.03 ohm max and 6 × 47uF/16 V tan capacitors with ESR=0.013 ohm max at 100 kHz, & simulated source impedance of 1000 nH, 5 Hz to 20 MHz.
I^2t Inrush Current Transient	-	0.2 A^2s	0.4 A^2s	
Turn-on Voltage Threshold	-	7.8 V	-	
Turn-off Voltage Threshold	-	7.3 V	-	

Output Specifications

Parameter		Min	Typ	Max	Notes
Output Voltage Set Point		-2% Vo,set	-	2% Vo,set	Vin=12 V, full load
Load Regulation		-	0.4% Vo,set	-	Io=Io, min to Io, max
Line Regulation		-	0.3% Vo,set	-	Vin=Vin, min to Vin, max
Regulation Over Temperature (-40°C to +85°C)		-	0.4% Vo,set	-	Tref=Ta, min to Ta, max
Output Current		0 A	-	16 A	
Current Limit Threshold		-	180% Io,out	-	
Short Circuit Surge Transient		-	1 A^2s	3 A^2s	
Ripple and Noise (pk-pk)		-	50 mV	100 mV	Tested with 0-20 MHz, 10 uF Tantalum capacitor &1 uF ceramic capacitor at the output
Ripple and Noise (rms)		-	30 mV	45 mV	
Turn on Time		-	8 mS	20 mS	
Overshoot at Turn on		-	-	1% Vo,set	
Output Capacitance		0 uF	-	5000 uF	ESR≥10 mohm
		0 uF	-	1000 uF	ESR≥1 mΩ
Transient Response					
50% ~ 100% Max Load	All	-	100 mV	-	di/dt=2.5 A/uS; Vin=12 V; and with 330uF Tantalum capacitors at the output
Settling Time		-	80 uS	-	
100% ~ 50% Max Load		-	100 mV	-	
Settling Time		-	80 uS	-	

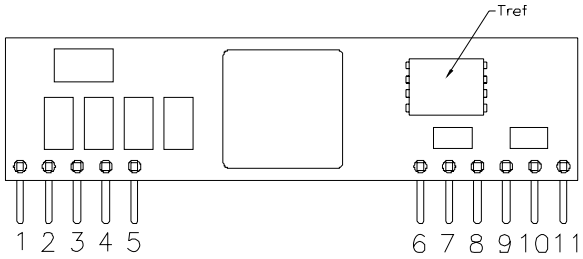
Note: All specifications are typical at nominal input, full load at 25 °C unless otherwise stated.

General Specifications

Parameter	Min	Typ	Max	Notes
Efficiency				
Vo=5.0 V	-	94%	-	Measured at Vin=12 V, full load
Vo=3.3 V	-	92%	-	
Vo=2.5 V	-	90%	-	
Vo=1.8 V	-	88%	-	
Vo=1.5 V	-	87%	-	
Vo=1.2 V	-	85%	-	
Vo=0.75 V	-	78%	-	
Switching Frequency	250 kHz	280 kHz	310 kHz	
Over Temperature Shutdown[1]	-	130 °C	-	
Output Trim Range (Wide Trim)	0.7525 V	-	5.5 V	
Remote Sense Compensation	-	-	0.5 V	
MTBF	4,619,490 hours			Calculated Per Bell Core SR-332 (Io = 80% Io,max; Vin=12 V; Vo=3.3 V; Ta = 25 °C)
Dimensions				
Inches (L × W × H)	2.0x 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:



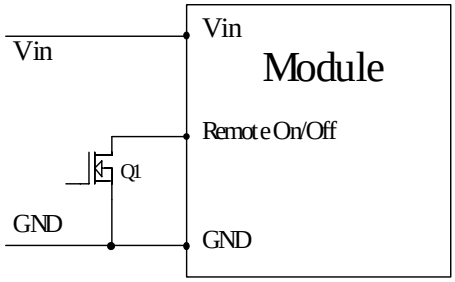
Control Specifications

Parameter	Min	Typ	Max	Notes
Remote On/Off				
Signal Low (Unit Off)	-0.2 V	-	0.3 V	VRBC-16A2A0; Remote On/Off pin open, Unit on.
Signal High (Unit On)	-	-	Vin, max	
Signal Low (Unit On)	-0.2 V	-	0.3 V	VRBC-16A2AL; Remote On/Off pin open, Unit on.
Signal High (Unit Off)	2.5 V	-	Vin, max	
Voltage Sequencing				
Sequencing Delay Time	10 mS	-	-	Delay from Vin, min to application of voltage on SEQ pin
Sequencing Slew Rate Capability	-	-	2 V/mS	Vin, min to Vin, max; Io, min to Io, max; Vseq<Vo
Tracking Accuracy				
Power-Up	-	100 mV	200 mV	
Power-Down	-	300 mV	500 mV	

Remote On/Off

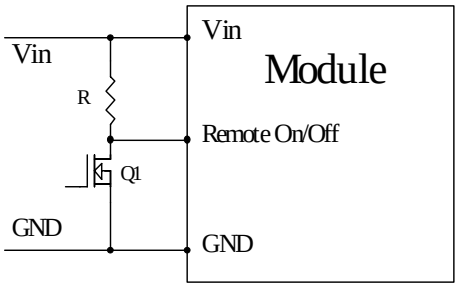
For Active High Modules (Positive Logic)

When the transistor Q1 is in the Off state, the power module is ON.
When the transistor Q1 is turned On, the power module is OFF.



For Active Low Modules (Negative Logic)

When the transistor Q1 is in the Off state, the power module is OFF.
When the transistor Q1 is turned On, the power module is ON.

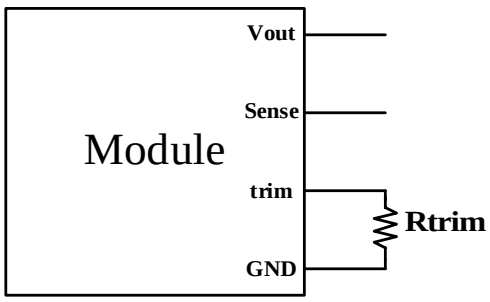


Output Trim Equations

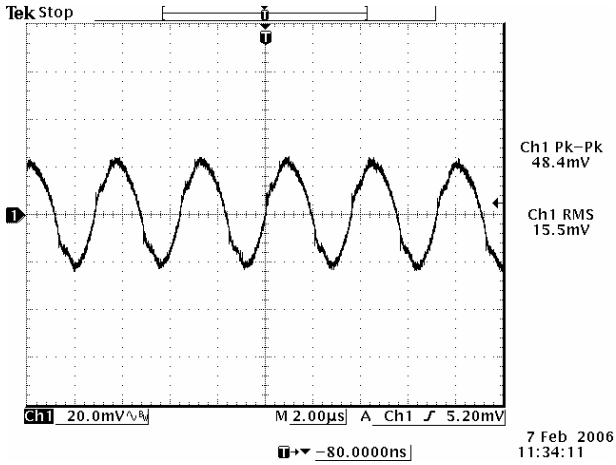
Equation for calculating the trim resistor given the desired output voltage (Vo) is shown below. The Trim Up resistor should be connected between the Trim pin and Ground.

$$R_{trim} = \frac{10500}{Vo - 0.7525} - 1000(\Omega)$$

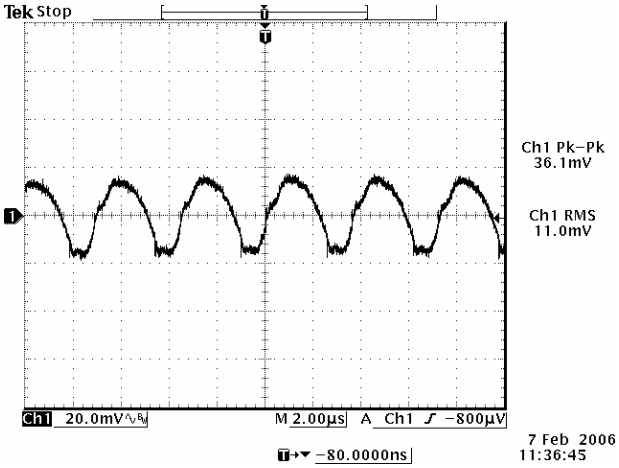
Vo (V)	Rtrim (KΩ)
0.7525	Open
1.2	22.46
1.5	13.05
1.8	9.024
2.5	5.009
3.3	3.122
5.0	1.472



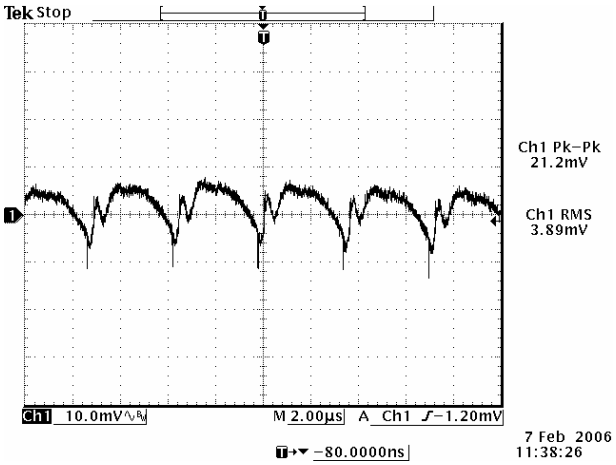
Ripple and Noise



Ripple and noise at full load, 12Vdc input, 5.0V output and Ta=25 deg C



Ripple and noise at full load, 12Vdc input, 3.3V output and Ta=25 deg C

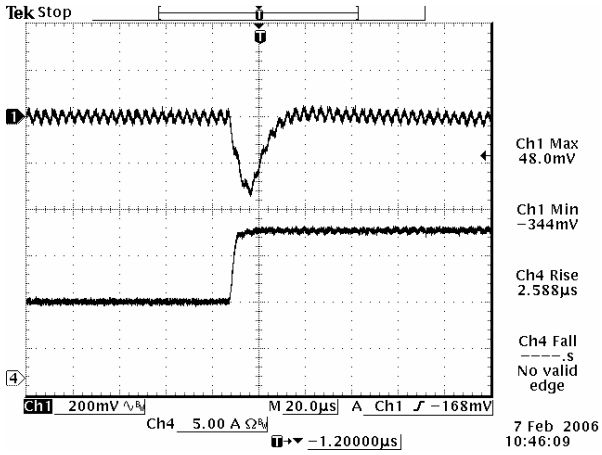


Ripple and noise at full load, 12Vdc input, 0.75V output and Ta=25 deg C

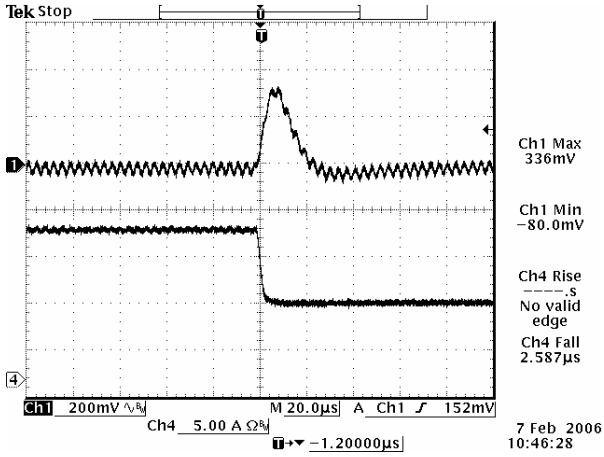
Note: External load with 10uF tantalum capacitor and 1uF ceramic at the output.

Transient Response

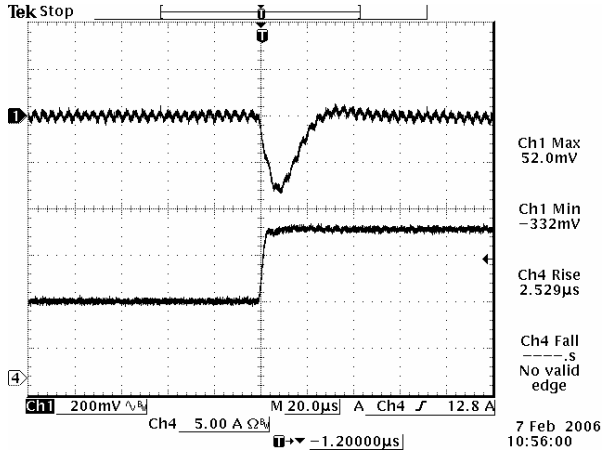
External load capacitor Cext=0uF, di/dt=2.5A/us



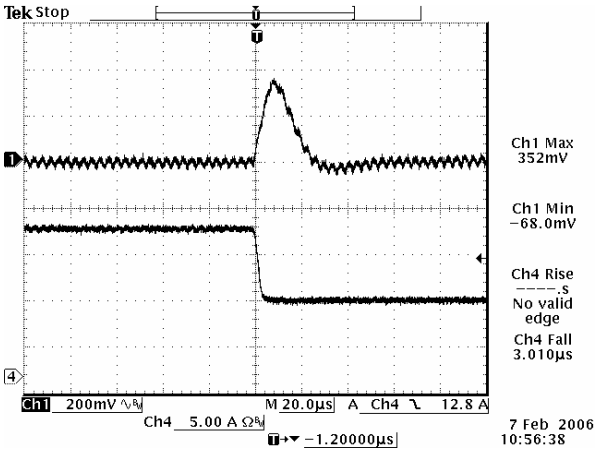
50% to 100% load Transient at 5.0Vdc output



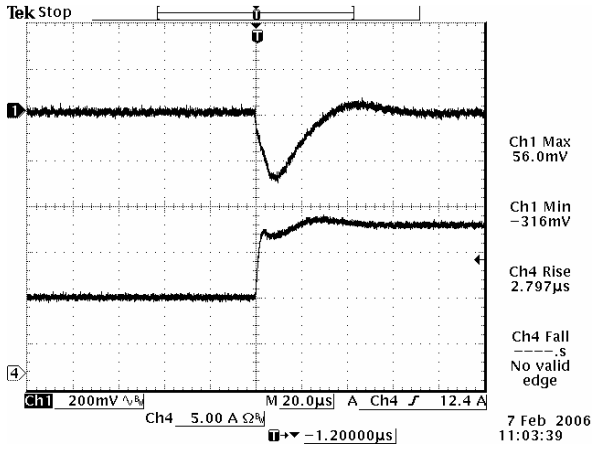
100% to 50% load Transient at 5.0Vdc output



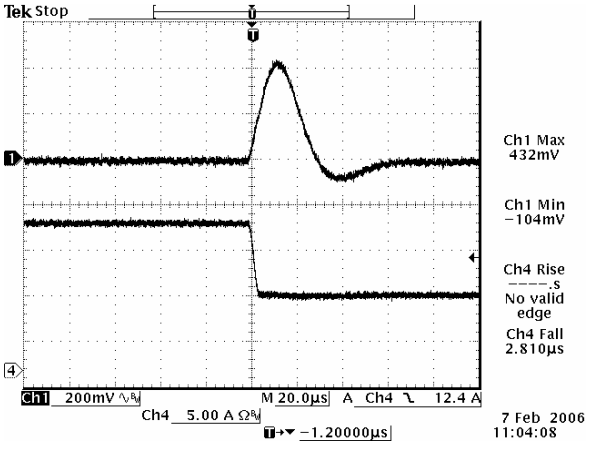
50% to 100% load Transient at 3.3Vdc output



100% to 50% load Transient at 3.3Vdc output



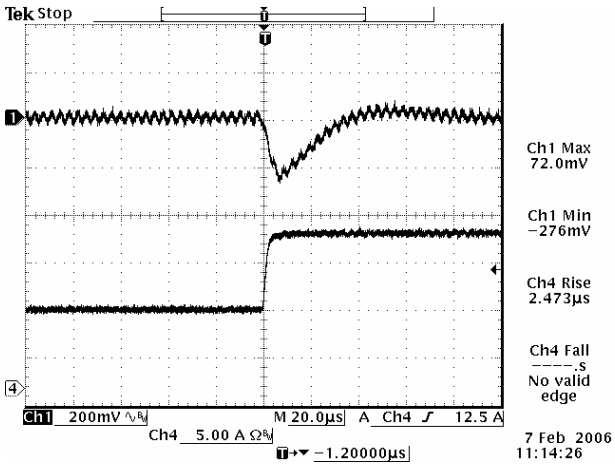
50% to 100% load Transient at 0.75Vdc output



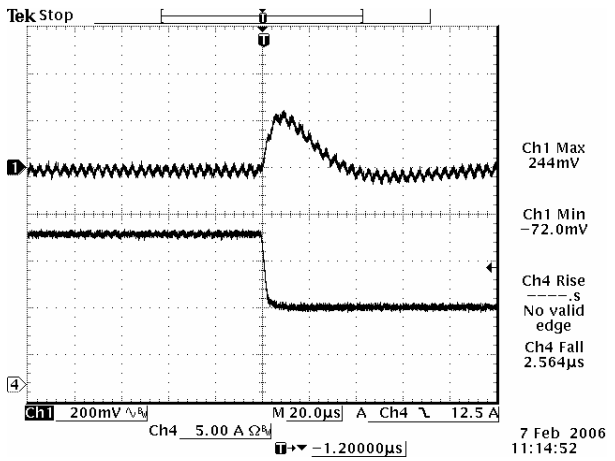
100% to 50% load Transient at 0.75Vdc output

Transient Response (continued)

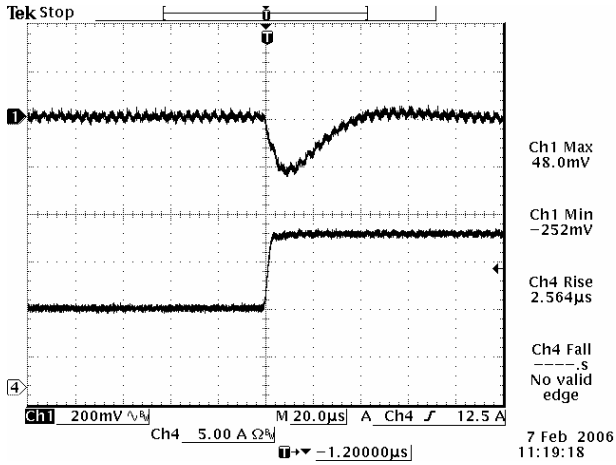
External load capacitor Cext=330uF Tantalum capacitor, di/dt=2.5A/us



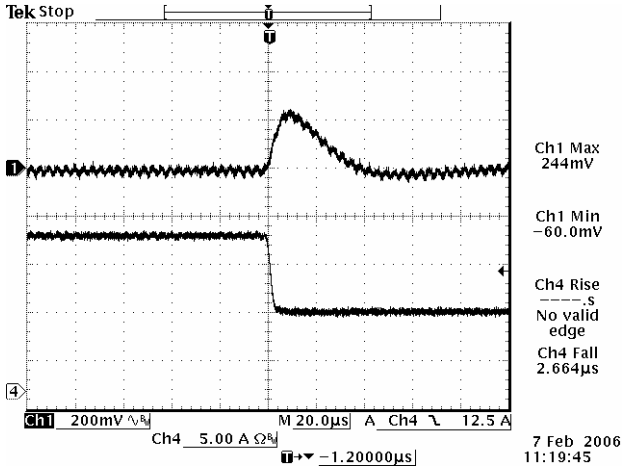
50% to 100% load Transient at 5.0Vdc output



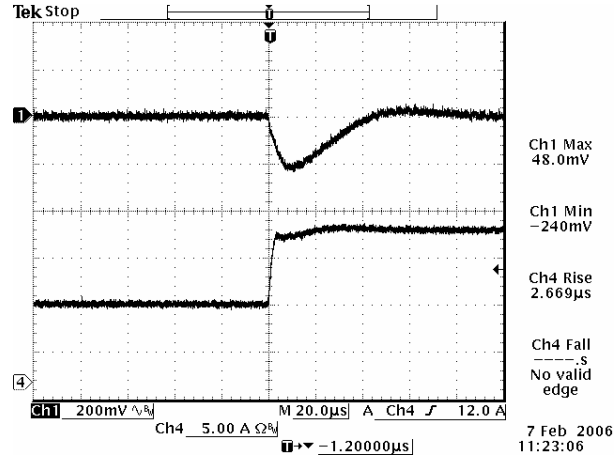
100% to 50% load Transient at 5.0Vdc output



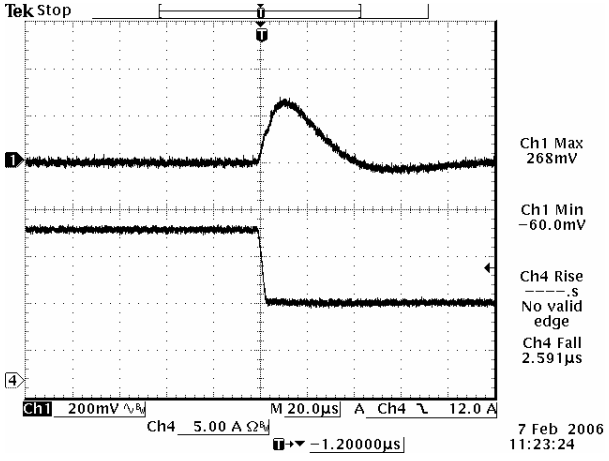
50% to 100% load Transient at 3.3Vdc output



100% to 50% load Transient at 3.3Vdc output



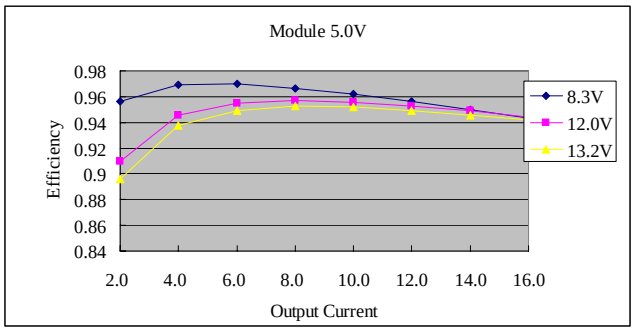
50% to 100% load Transient 0.75Vdc output

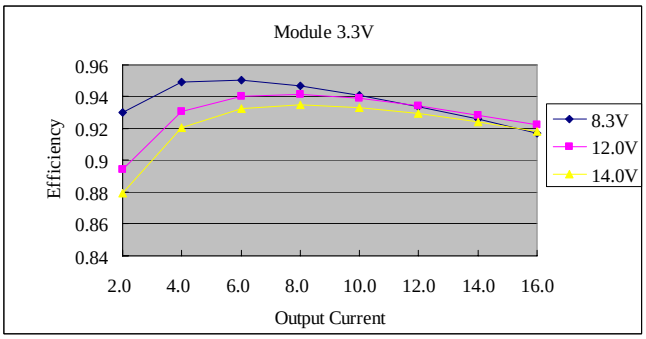


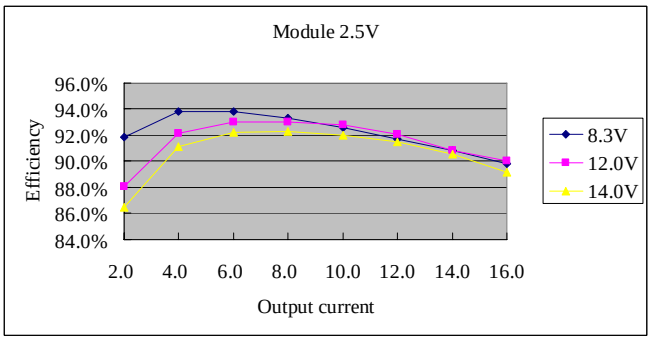
100% to 50% load Transient at 0.75Vdc output

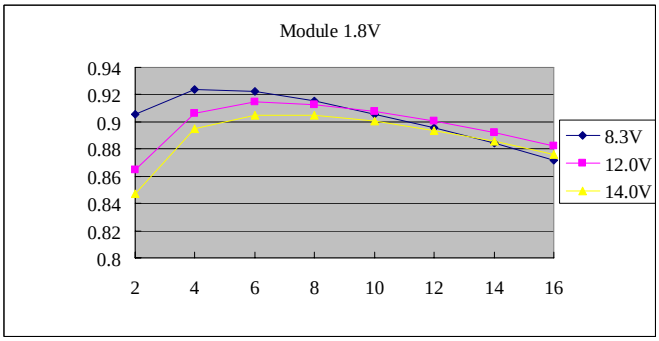
Note: All specifications are typical at 12Vdc input and Ta=25 deg C.

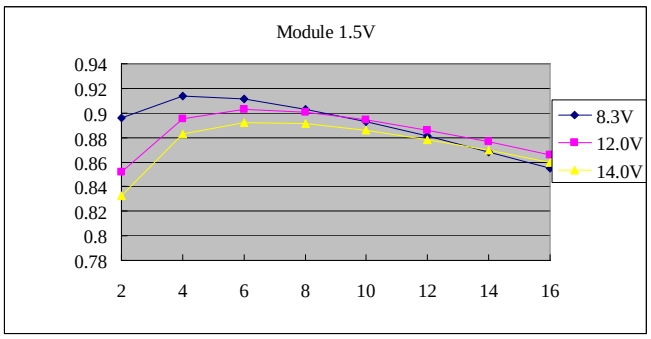
Efficiency Data

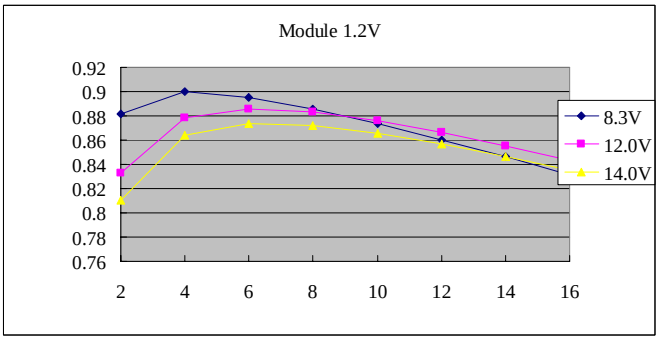


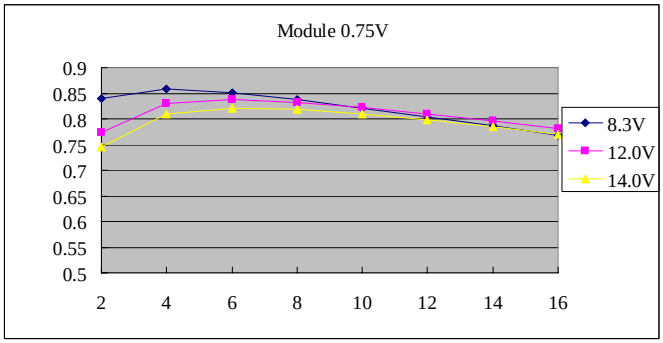




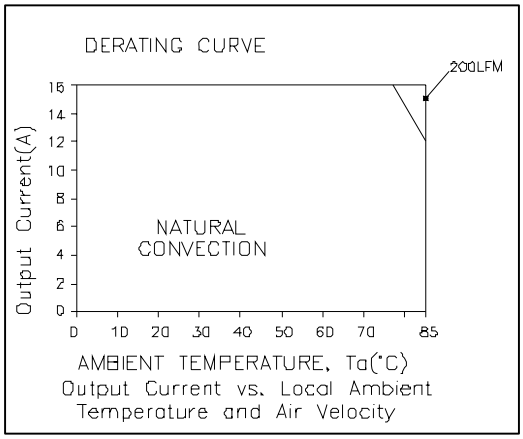




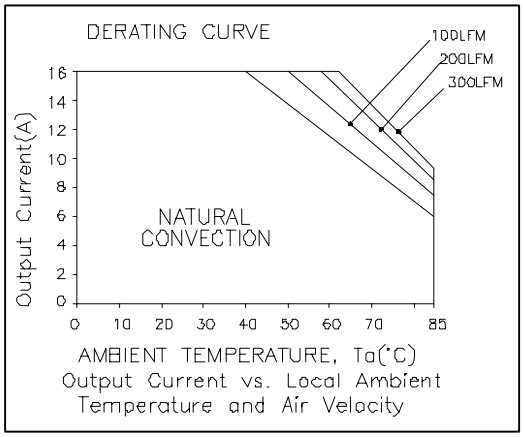




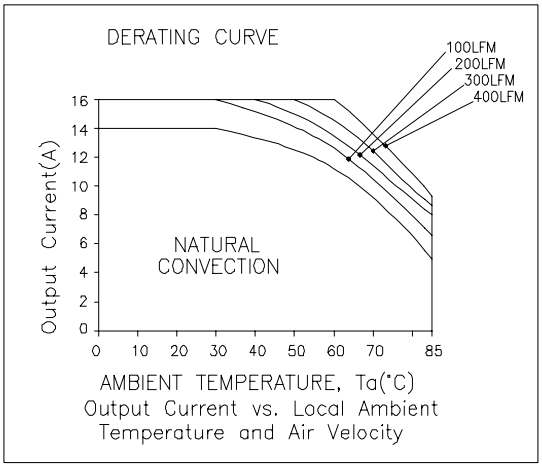
Thermal Derating Curves



Vo=0.75 V; Vin=12.0 V



Vo=1.8 V; Vin=12.0 V



Vo=3.3 V; Vin=12.0 V

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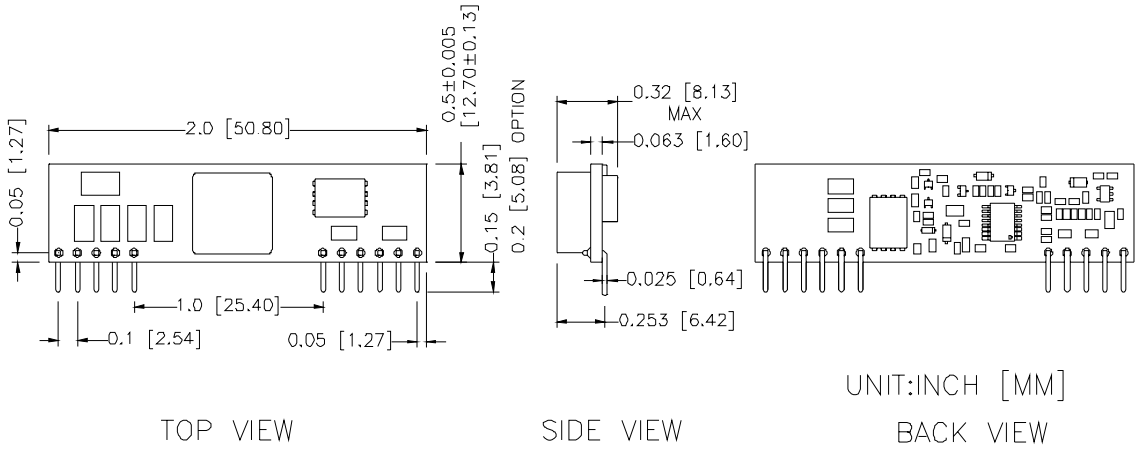
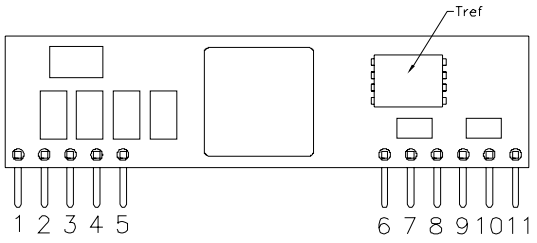
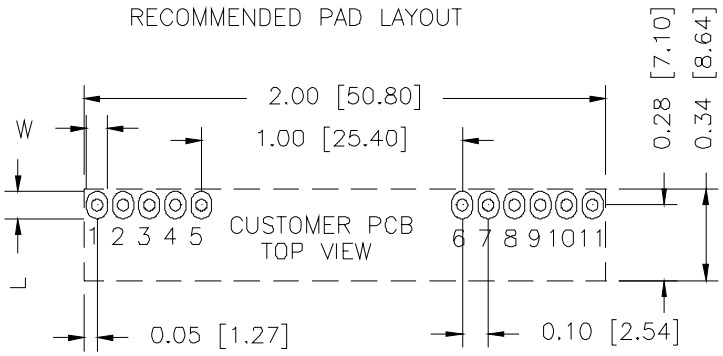
Mechanical Outline





RECOMMENDED PAD LAYOUT



HOLE SIZE: ø0.043±0.003 [1.08±0.08]
PAD SIZE: W 0.063±0.002 [1.63±0.05]
L 0.10±0.004 [2.54±0.10] BOTH SIDE

Pin Connections

Pin	Function
1	Vo
2	Vo
3	Sense+
4	Vo
5	Ground
6	Ground
7	Vin
8	Vin
9	SEQ
10	Trim
11	Remote 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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