NON-ISOLATED DC/DC CONVERTERS

12 Vdc Input 0.9 Vdc / 6 A Output

VRAF-06AT50 RoHS Compliant PRELIMINARY Rev.A

- Non-Isolated
- High Efficiency
- Fixed Frequency
- Low Cost
- Tracking a Reference for Output Voltage
- High Power Density
- Under-Voltage Lockout
- Output Enable
- OCP/SCP
- Current Source/Sink Capability
- Over Voltage Protection (Hiccup Mode)

Description

The Bel VRAF-06AT50 module is a non-isolated, step down dc/dc power converter that operates from a nominal 12 Vdc source. The output is closely regulated and the efficiency is typically 73% at full load (Vin=12 Vdc).

Part Selection

Output Voltage	Input Voltage	Max. Output Current	Max. Output Power	Typical Efficiency	Model Number
0.9 V	12 V	6 A	5.4 W	73%	VRAF-06AT50

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

Absolute Maximum Ratings

Parameter	Min	Typ	Max	Notes
Input Supply Voltage	-0.5 V	-	13.2 V	
Input Signal Voltage	-0.3 V		5.25 V	
Operating Temperature	0 °C	-	65 °C	
Storage Temperature	-40 °C	-	85 °C	

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

Input Specifications

Parameter	Min	Typ	Max	Notes
Operating Input Voltage	10.8 V	12 V	13.2 V	
Input Current (full load)	-	-	1 A	
Input Current (no load)	-	-	50 mA	
Reference Voltage Range	1.6 V	1.8 V	1.89 V	
Remote Off Input Current	-	3 mA	10 mA	
Input Reflected Ripple Current (pk-pk)	-	50 mA	80 mA	With simulated source impedance of 1000 nH, 5 Hz to 20 MHz. Use a 100 uF/25 V Tan cap with ESR=0.025 ohm max, at 100 kHz@25°C.
Input Reflected Ripple Current (rms)	-	10 mA	-	
I^2t Inrush Current Transient	-	0.006 A^2s	0.012 A^2s	
Turn on Voltage Threshold	2.79 V	-	2.89 V	
Turn off Voltage Threshold	2.59 V	-	2.69 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	-	Vddq/2	-	Vin=12 V, Iout=full load
Tracking Tolerance (Vddq/2-Vout)/Vout	-1.5%	-	1.5%	
Load Regulation	-	5 mV	8 mV	
Line Regulation	-	2 mV	4 mV	
Output Current	0 A	-	6 A	
Output DC Current Limit	-	-	11 A	
Output Ripple and Noise (pk-pk)	-	20 mV	-	Test conditions: 0-20 MHz BW, with a 22 uF / 6.3 V ceramic capacitor at the output.
Output Ripple and Noise (rms)	-	5 mV	-	
Short Circuit Surge Transient	-	1.1 A^2s	2.2 A^2s	
Turn on Time	-	1 mS	2 mS	
Overshoot at Turn on	-	0%	3%	
Output Capacitance	0 uF	-	2200 uF	
Transient Response				
50% ~ 100% Max Load	Vo =0.9 V	-	50 mV	80 mV	di/dt=0.3 A/uS; Vin12 V; and with a 22 uF / 6.3 V ceramic capacitor at the output.
Settling Time		-	50 uS	80 uS	
100% ~ 50% Max Load		-	50 mV	80 mV	
Settling Time		-	50 uS	80 uS	

Note: All specifications are typical at Vin =12 V, Vddq=1.8 V, Io=6 A, Ta= 25°C unless otherwise stated.

General Specifications

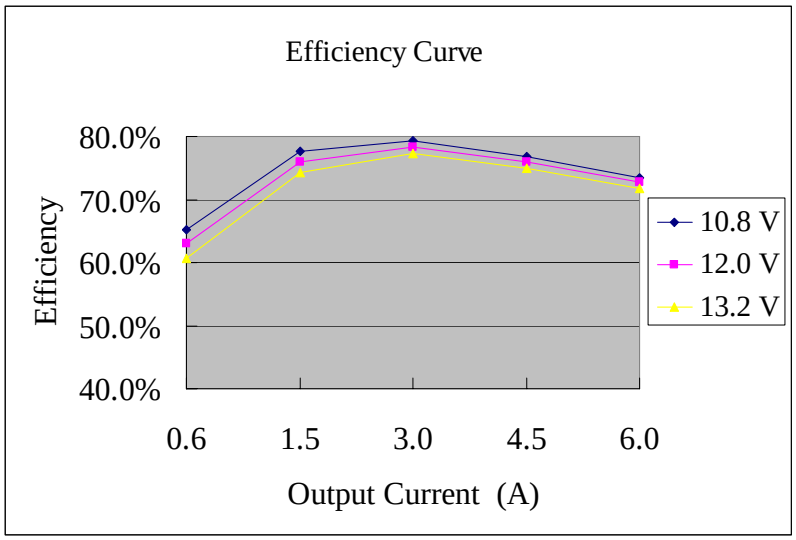
Parameter	Min	Typ	Max	Notes
Efficiency	-	73%	-	Vin=12 V, Vddq=1.8 V, Io=6 A
Switching Frequency	260 kHz	300 kHz	340 kHz	
MTBF	TBD			Calculated Per Bell Core SR-332 (Io = 80% load; Vin=12 V; Ta = 25 °C)
Dimensions Inches (L × W × H) Millimeters (L × W × H)	0.65 x 0.41 x 0.40 16.51 x 10.41 x 10.16			
Weight	-	2.5 g	-	

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

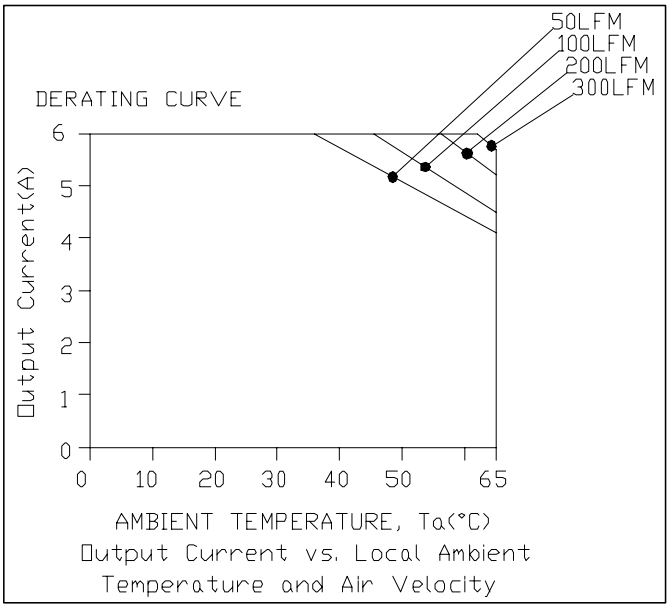
Control Specifications

Parameter	Min	Typ	Max	Notes
Output Enable				
ENABLE High	2 V	-	5.5 V	Enable Pin open, the module is off.
ENABLE Low	0 V	-	0.8 V	

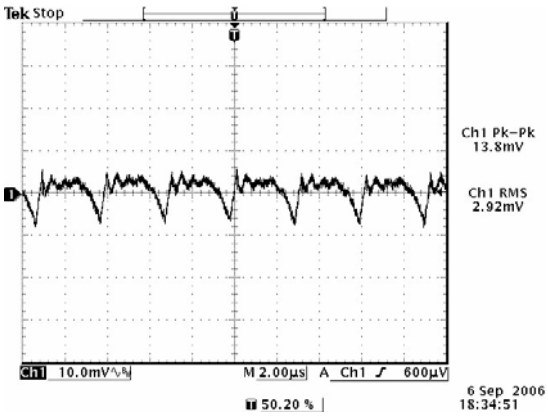
Efficiency Data



Thermal Derating Curve

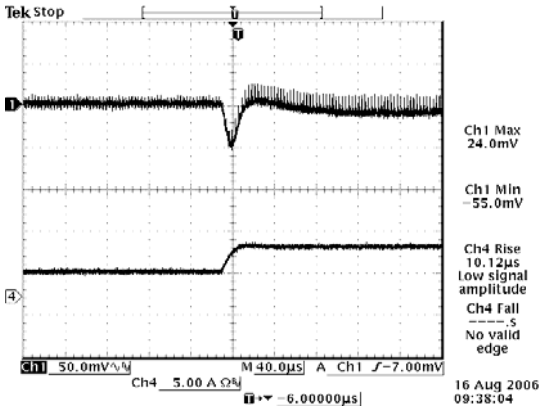


Ripple and Noise Waveform

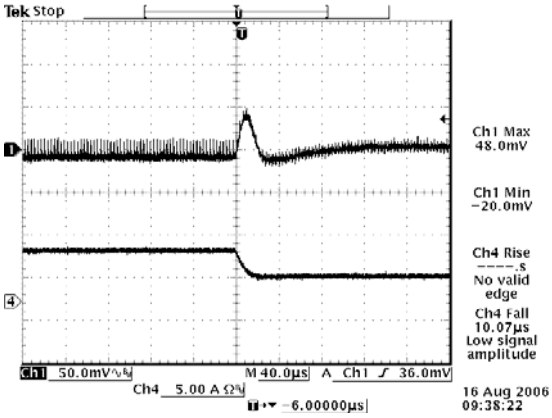


Note: Ripple and noise at Vin=12 V, Vddq=1.8 V, Io=6 A, with a 22 uF/6.3 V X5R ceramic capacitor at the output, Ta=25 °C.

Transient Response Waveforms



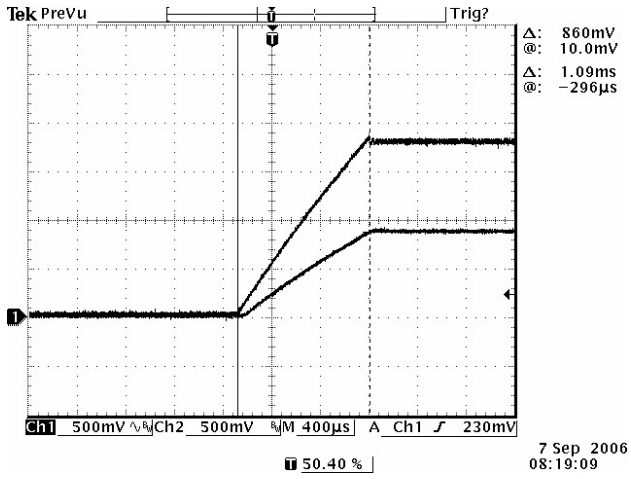
50% to 100% load step at 12 V input, 0.9 V output



100% to 50% load step at 12 V input, 0.9 V output

Note: Transient response at di/dt=0.3 A/uS, with 22 uF/6.3 V X5R ceramic capacitor at the output, Ta=25 °C.

Output Tracking



Test condition: Vin=12 V, Vddq=1.8 V, Io=6 A.

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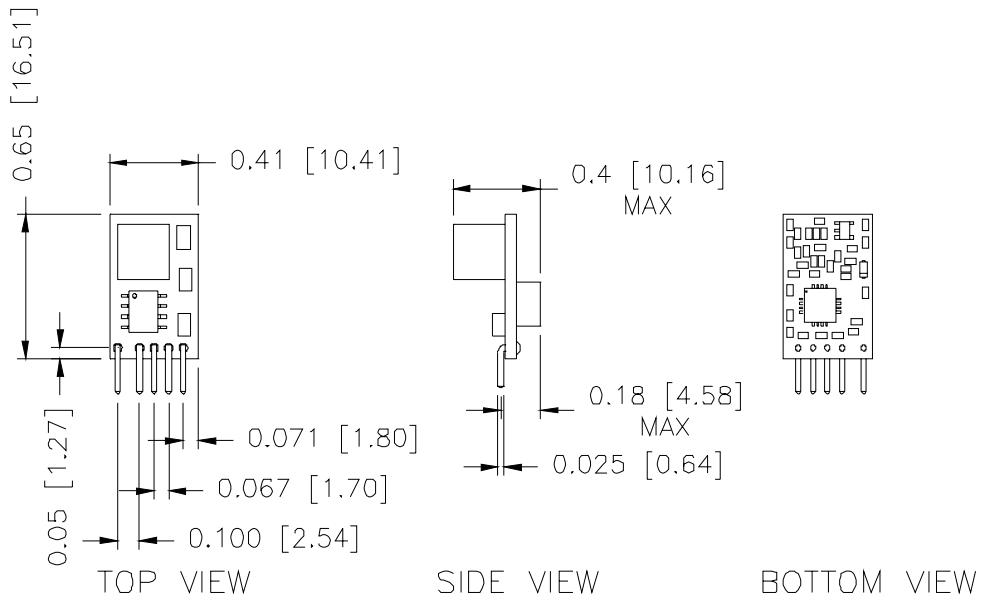
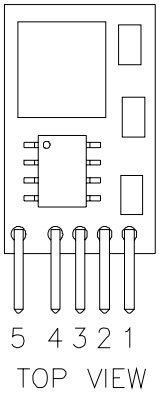
Mechanical Outline





Pin Connections

Pin	Function
1	Vin
2	Vddq
3	Vout (Vtt)
4	GND
5	Enable

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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