NON-ISOLATED DC/DC CONVERTERS

12 Vdc Input Vddq/2 / 8 A Output

Dec. 03, 2010

Bel Power Inc., a subsidiary of Bel Fuse Inc.

VRAF-08xT50 RoHS Compliant Rev.J

- 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-08xT50 module is a non-isolated, step down dc/dc power converter that operates from a nominal 12 Vdc or wide range 5 Vdc to 13.8 Vdc source. This converter is designed specifically to provide bus termination voltages in applications such as DDR (double data rate) memory where the bus termination voltage must closely track the I/O bus voltage. The converter accepts a reference input and uses this to program its output voltage to 50% of the reference. The unit is packaged in compact single-in-line footprint and provides a maximum 8 A output. Standard features include remote on/off, input under-voltage lockout, output over voltage protection.

Part Selection

Output Voltage	Input Voltage	Max. Output Current	Max. Output Power	Typical Efficiency	Model Number
0.9 V	5.0 V - 13.8 V	8 A	7.2 W	69%	VRAF-08AT50
0.9 V	5.0 V - 13.8 V	8 A	7.2 W	69%	VRAF-08ET50

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”.
3. Part number VRAF-08ET50 is better suited for applications where start up is guaranteed at 5V input.

Absolute Maximum Ratings

Parameter	Min	Typ	Max	Notes
Input Supply Voltage	-0.5 V	-	15 V	
Input Signal Voltage	-0.3 V		5.25 V	
Operating Temperature	0 °C	-	70 °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 VRAF-08AT50 VRAF-08ET50	 5.0 V 5.0 V	 12 V 12 V	 13.8 V 13.8 V	
Input Current (full load) VRAF-08AT50 VRAF-08ET50	 - -	 - -	 2.2 A 2.2 A	
Input Current (no load)	-	25 mA	35 mA	
Reference Voltage Range (Vddq)	1.2 V	1.8 V	1.89 V	
Remote Off Input Current	-	7 mA	10 mA	

Input Specifications (continued)

Parameter	Min	Typ	Max	Notes
Input Reflected Ripple Current (pk-pk)	-	110 mA	180 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)	-	25 mA	60 mA	
I^2t Inrush Current Transient	-	0.006 A^2s	0.012 A^2s	
Turn on Voltage Threshold	2.6 V	-	3.9 V	
Turn off Voltage Threshold	2.4 V	-	3.7 V	

Notes: 1. All specifications are typical at 25 °C unless otherwise stated.
2. This power module is not internally fused. An input line fuse must always be used.

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	-	3 mV	6 mV	
Line Regulation	-	3 mV	6 mV	
Output Current	0 A	-	8 A	
Output DC Current Limit	9.2 A	-	14 A	
Output Ripple and Noise (pk-pk)	-	25 mV	50 mV	Test conditions: 0-20 MHz BW, with a 22 uF / 6.3 V ceramic capacitor at the output.
Output Ripple and Noise (rms)	-	8 mV	15 mV	
Short Circuit Surge Transient	-	1.1 A^2s	2.2 A^2s	
Turn on Time VRAF-08AT50 VRAF-08ET50	-	 2.5 mS 5 mS	 5 mS 8 mS	Start up from ENABLE.
Overshoot at Turn on	-	0%	3%	
Output Capacitance	0 uF	-	2200 uF	
Transient Response				
50% ~ 100% Max Load	-	100 mV	200 mV	di/dt=0.3 A/uS; Vin12 V; and with a 22 uF / 6.3 V ceramic capacitor at the output.
Settling Time	-	20 uS	50 uS	
100% ~ 50% Max Load	-	100 mV	200 mV	
Settling Time	-	20 uS	50 uS	

(Vo =0.9 V)

Note: All specifications are typical at Vin =12 V, Vddq=1.8 V, Io=8 A, Ta= 25°C unless otherwise stated.

General Specifications

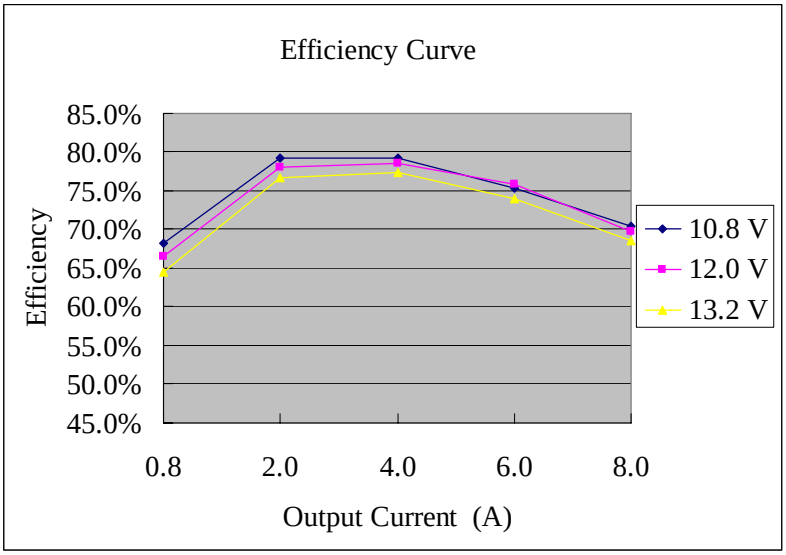
Parameter	Min	Typ	Max	Notes
Efficiency	68%	69%	-	Vin=12 V, Vddq=1.8 V, Io=8 A
Switching Frequency	260 kHz	300 kHz	340 kHz	
MTBF	6,416,286 hours			Calculated Per Bell Core SR-332 (Io = 80% load; Vin=12 V; Ta = 25 °C)
Dimensions Inches (L × W × H) Millimeters (L × W × H)	0.65 x 0.41 x 0.40 16.51 x 10.41 x 10.16			
Weight	-	2.5 g	-	

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

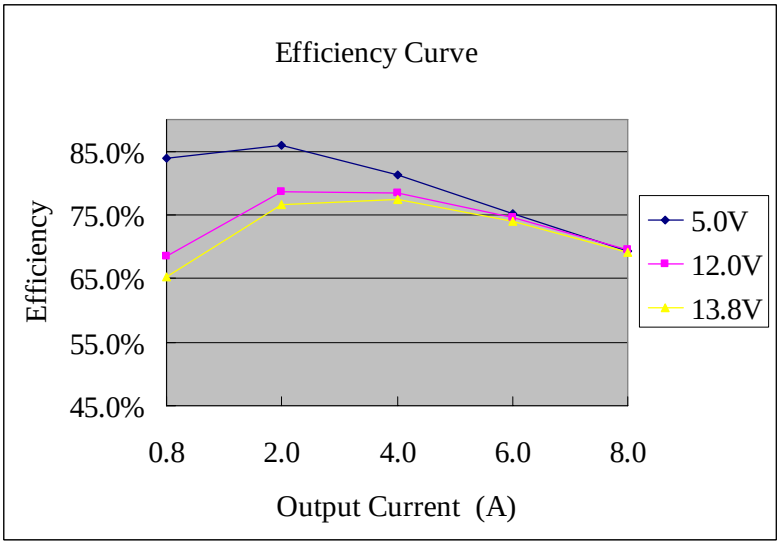
Control Specifications

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

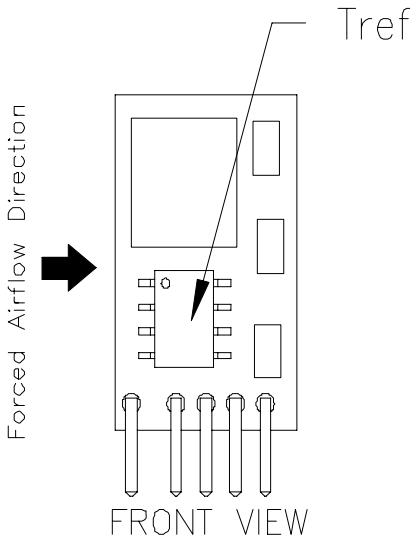


VRAF-08AT50

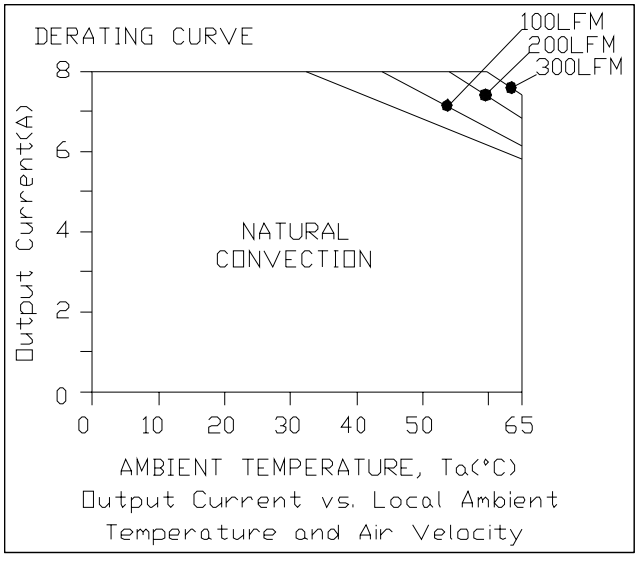


VRAF-08ET50

Thermal Derating Curve

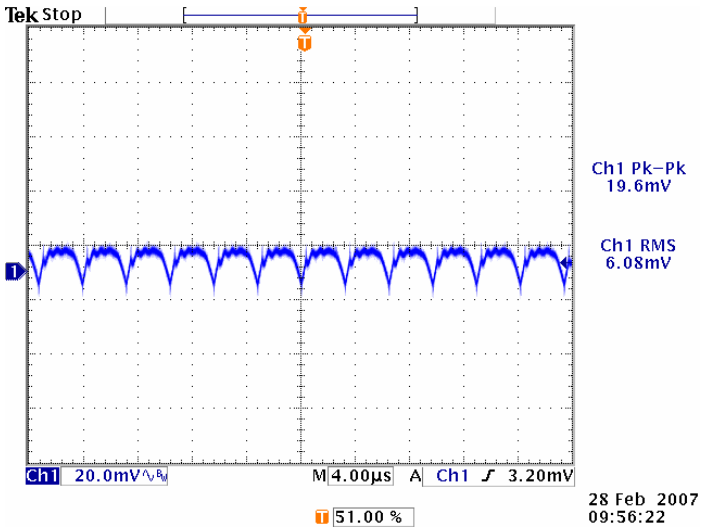


The thermal reference point Tref is shown above. For reliable operation this temperature should not exceed 115°C. The output power of the module should not exceed the rated power for the module.



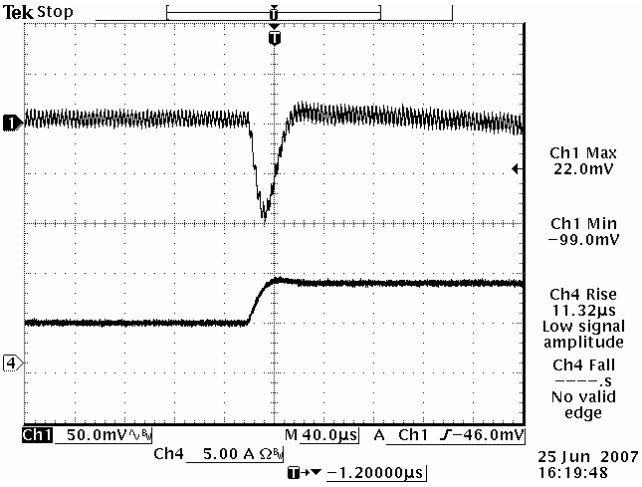
Vin=12 V, Vddq=1.8 V

Ripple and Noise Waveform

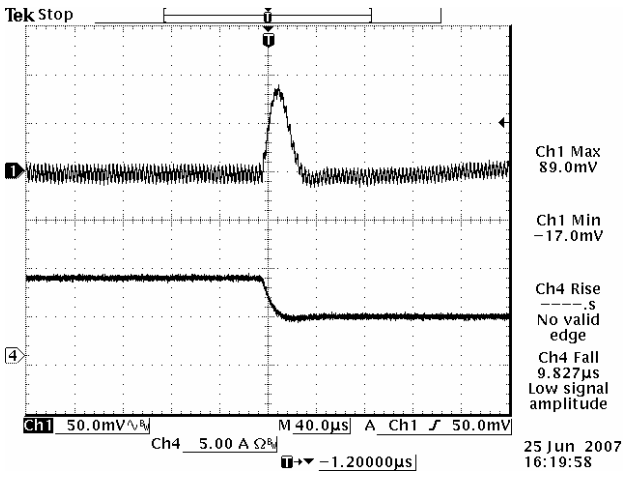


Note: Ripple and noise at Vin=12 V, Vddq=1.8 V, Io=8 A, with a 22 uF/6.3 V X5R ceramic capacitor at the output, Ta=25 °C.

Transient Response Waveforms



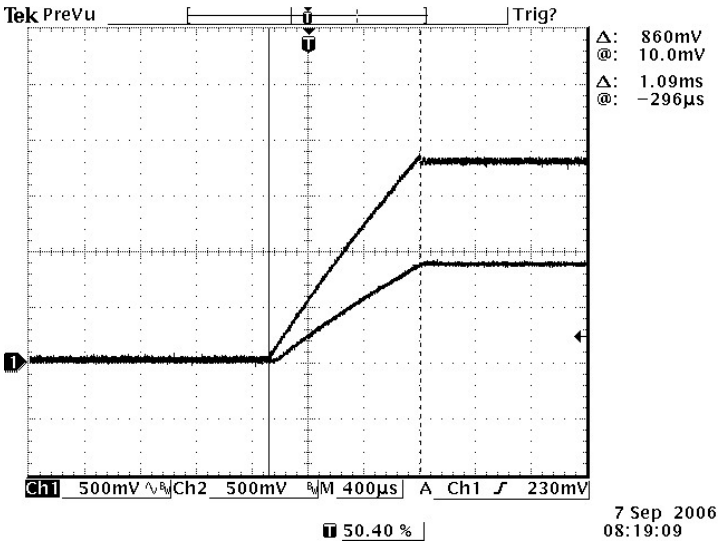
50% to 100% load step at Vin=12 V, Vddq=1.8 V



100% to 50% load step at Vin=12 V, Vddq=1.8 V

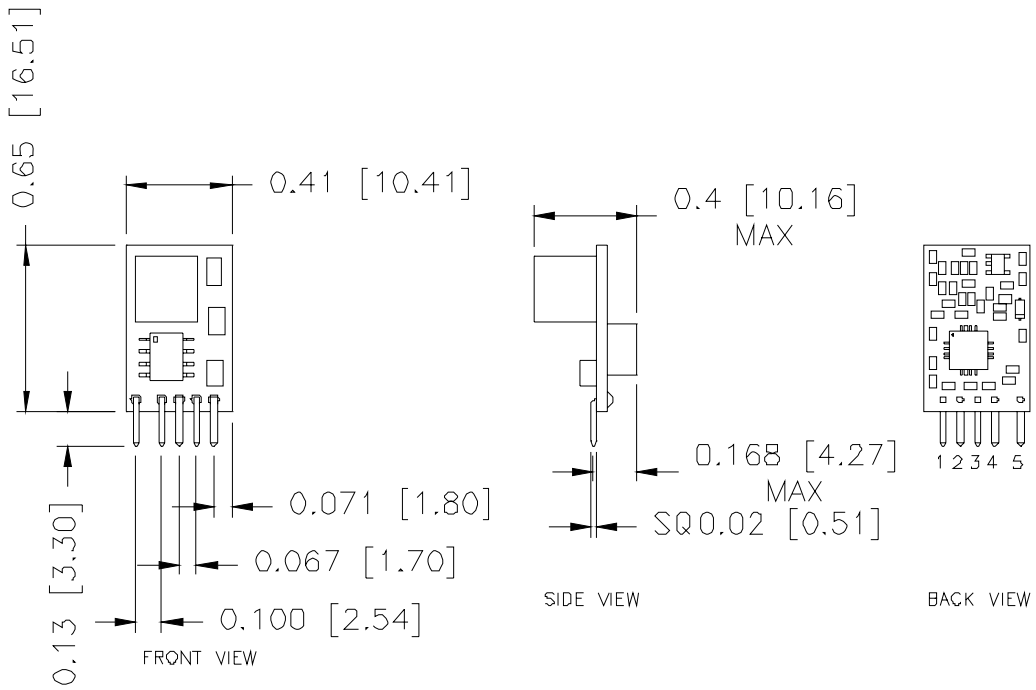
Note: Transient response at di/dt=0.3 A/uS, with 22 uF/6.3 V X5R ceramic capacitor at the output, Ta=25 °C.

Output Tracking

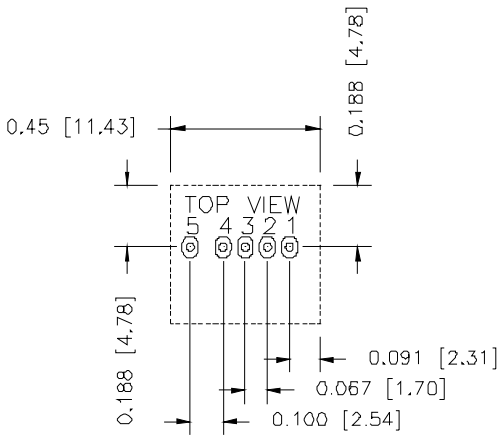


Test condition: Vin=12 V, Vddq=1.8 V, Io=8 A.

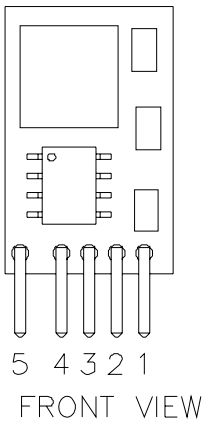
Mechanical Outline



RECOMMENDED PAD LAYOUT



PAD: LENGTH 0.067 [ø1.7] BOTH SIDE
WIDTH 0.047 [ø1.2] BOTH SIDE
HOLE: ø0.032 [ø0.8] BOTH SIDE



Pin Connections

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

Revision History

Date	Revision	Changes Detail	Approval
2010-02-26	I	Update the input range for VRAF-08AT50 and add note 3 for VRAF-08ET50 on first page.	HL
2010-12-03	J	Add pin length in the MD.	XF

RoHS Compliance

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

CORPORATE

Bel Fuse Inc.
206 Van Vorst Street
Jersey City, NJ 07302
Tel 201-432-0463
Fax 201-432-9542
www.belfuse.com

FAR EAST

Bel Fuse Ltd.
8F/ 8 Luk Hop Street
San Po Kong
Kowloon, Hong Kong
Tel 852-2328-5515
Fax 852-2352-3706
www.belfuse.com

EUROPE

Bel Fuse Europe Ltd.
Preston Technology Management Centre
Marsh Lane, Suite G7, Preston
Lancashire, PR1 8UD, U.K.
Tel 44-1772-556601
Fax 44-1772-888366
www.belfuse.com