

NON-ISOLATED DC/DC CONVERTERS

12 Vdc Input V_{ddq}/2 8 A Output

Sep. 29, 2011

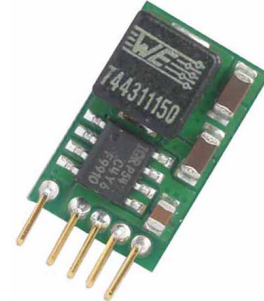
Bel Power Inc., a subsidiary of Bel Fuse Inc.

VRAF-08AT51

RoHS Compliant

Rev.D

- 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-08AT51 module is a non-isolated, step down dc/dc power converter that operates from a nominal 12 Vdc or wide range 10.8 Vdc to 13.2 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	10.8 V - 13.2 V	8 A	7.2 W	69%	VRAF-08AT51

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".

Part Number Explanation

V R AF - 08 A T5 1
1 2 3 4 5 6 7

1---Vertical Mount

2---RoHS 6, change "R" to "7" means RoHS 5

3---0.65"x0.41" DDR

4---Output current 8A

5---12V narrow range, 10.8-13.2V

6---V_{out} = 0.5V_{ddq}

7---Option

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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	10.8 V	12 V	13.2 V	
Input Current (full load)	-	-	1.05 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 ² t Inrush Current Transient	-	0.006 A ² s	0.012 A ² s	
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 13 X 10uF 0603 ceramics + 1 X 47uF 1206 ceramic at the output.
Output Ripple and Noise (rms)	-	8 mV	15 mV	
Short Circuit Surge Transient	-	1.1 A ² s	2.2 A ² s	
Turn on Time	-	2.5 mS	5 mS	Start up from ENABLE.
Overshoot at Turn on	-	0%	3%	
Output Capacitance	0 uF	-	2200 uF	

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Transient Response					
12.5% ~ 62.5%Max Load	Vo =0.9 V	-	80 mV	120 mV	di/dt=1A/uS; Vin12 V; and with 13 X 10uF 0603 ceramics + 1 X 47uF 1206 ceramic at the output. Vddq=1.5V.
Settling Time		-	30 uS	50uS	
62.5% ~ 12.5%Max Load		-	80 mV	120 mV	
Settling Time		-	30 uS	50 uS	

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

General Specifications

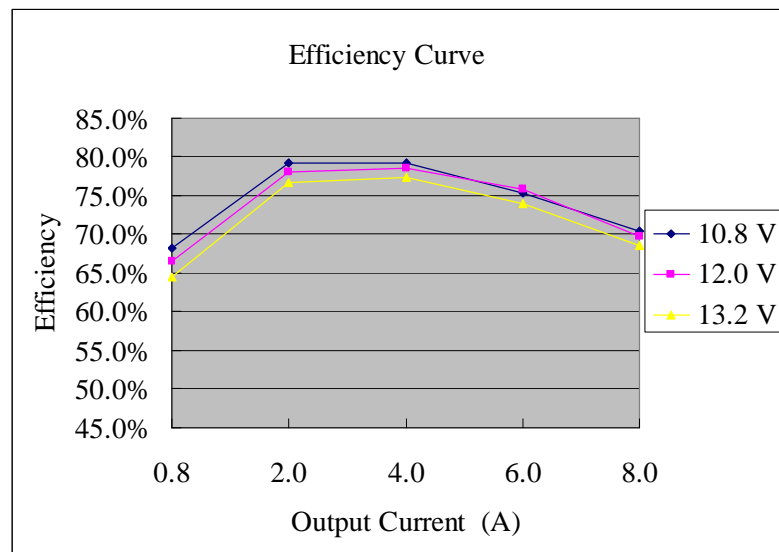
Parameter	Min	Typ	Max	Notes
Efficiency	68%	69%	-	Vin=12 V, Vddq=1.8 V, Io=8 A
Switching Frequency	260 kHz	300 kHz	340 kHz	
MTBF	6,416,286 hours			Calculated Per Bell Core SR-332 (Io = 80% load; Vin=12 V; Ta = 25 °C)
Dimensions	0.65 x 0.41 x 0.40			
Inches (L x W x H)	16.51 x 10.41 x 10.16			
Millimeters (L x W x H)				
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-08AT51

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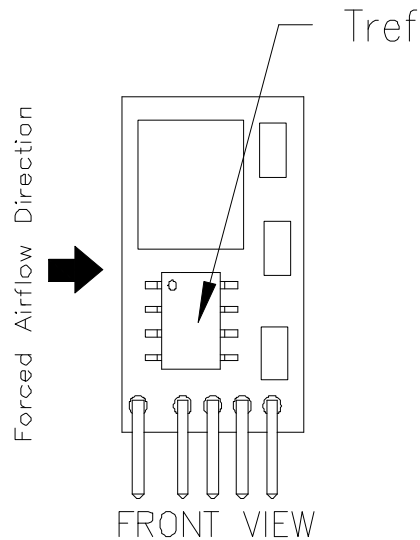
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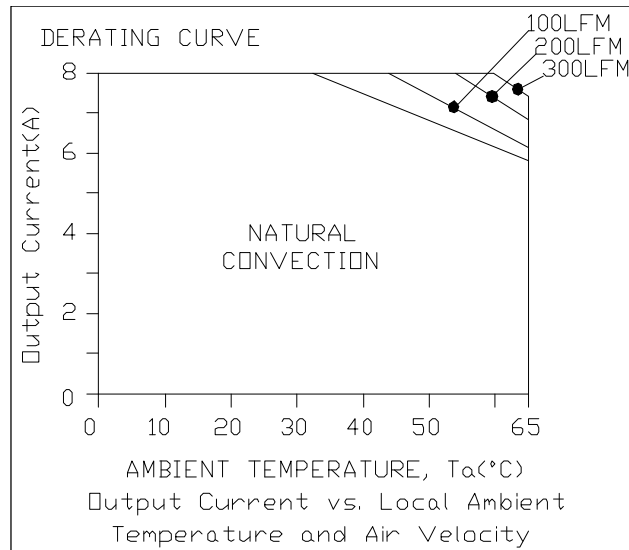
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Thermal Derating Curve



The thermal reference point T_{ref} 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.



$V_{in}=12\text{ V}$, $V_{ddq}=1.8\text{ V}$

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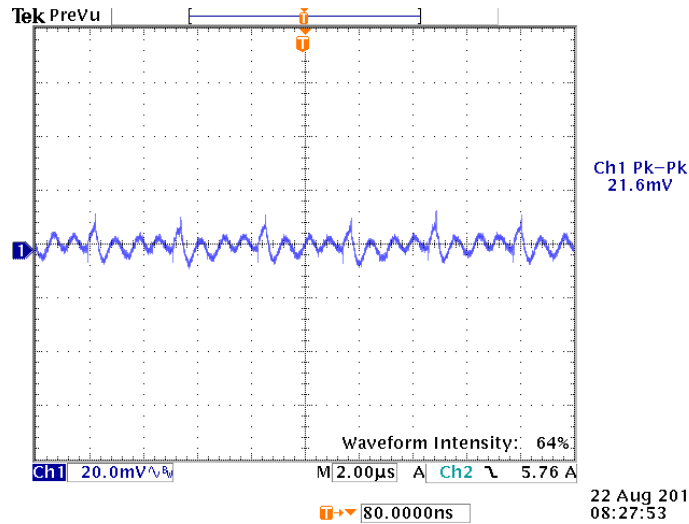
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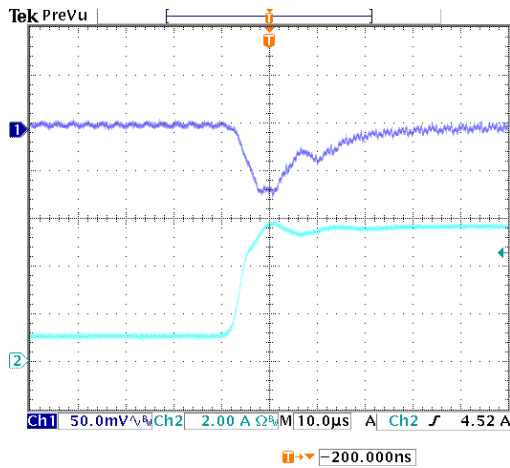
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Ripple and Noise Waveform

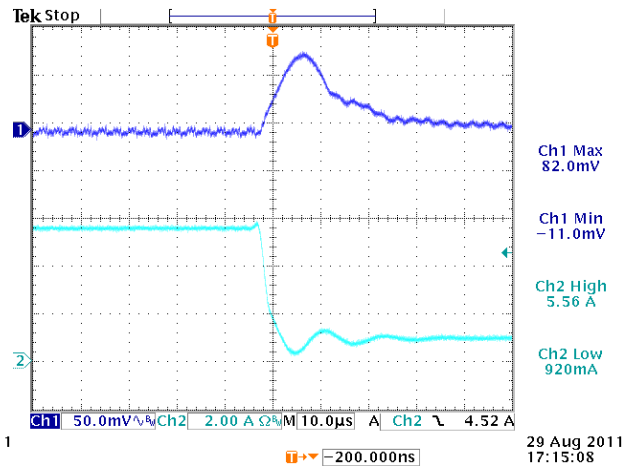


Note: Ripple and noise at $V_{in}=12$ V, $V_{ddq}=1.5$ V, $I_o=8$ A, with 13 X 10uF 0603 ceramics + 1 X 47uF 1206 ceramic at the output, $T_a=25$ °C.

Transient Response Waveforms



12.5% to 62.5% load step at $V_{in}=12$ V, $V_{ddq}=1.5$ V



62.5% to 12.5% load step at $V_{in}=12$ V, $V_{ddq}=1.5$ V

Note: Transient response at $di/dt=1A/uS$, with 13 X 10uF 0603 ceramics + 1 X 47uF 1206 ceramic at the output, $T_a=25$ °C.

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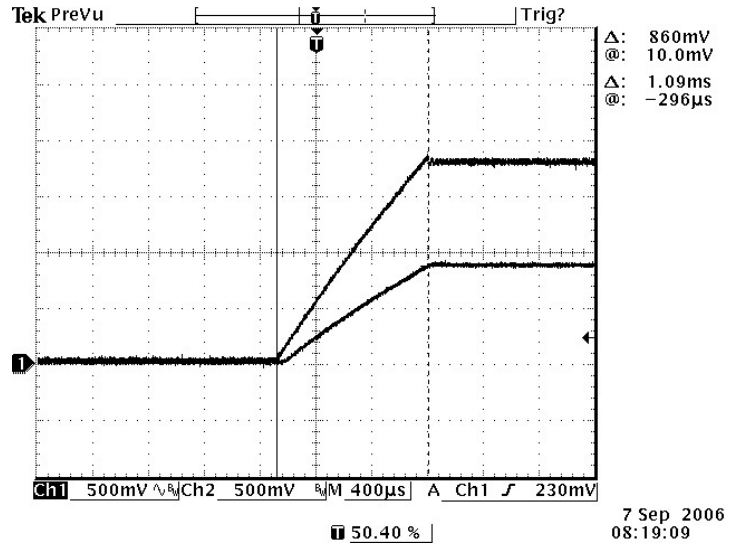
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Output Tracking



Test condition: $V_{in}=12\text{ V}$, $V_{ddq}=1.8\text{ V}$, $I_o=8\text{ A}$.

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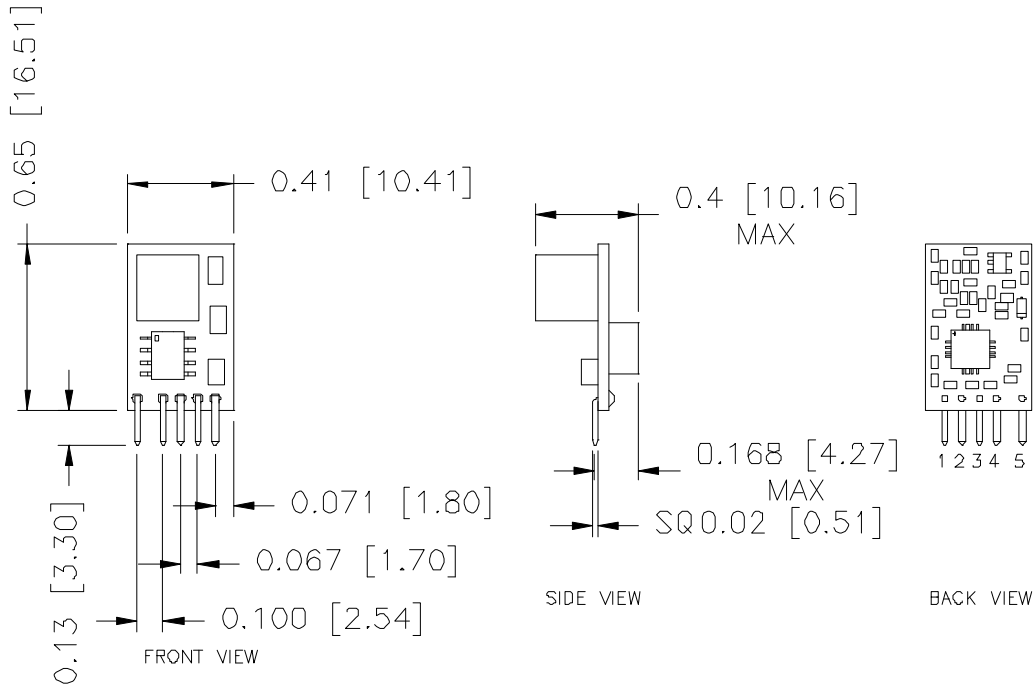
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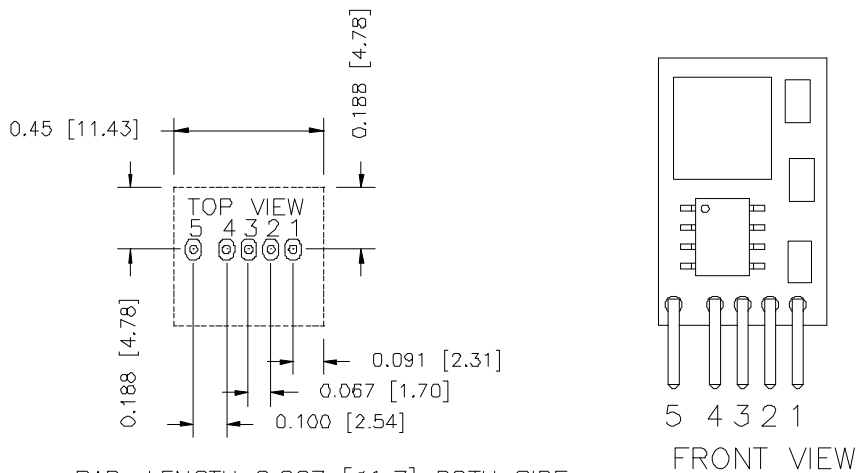
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Mechanical Outline



RECOMMENDED PAD LAYOUT



PAD: LENGTH 0.067 [ϕ 1.7] BOTH SIDE
 WIDTH 0.047 [ϕ 1.2] BOTH SIDE
 HOLE: ϕ 0.032 [ϕ 0.8] BOTH SIDE

Pin Connections

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

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Revision History

Date	Revision	Changes Detail	Approval
2011-08-19	A	First Release	HL
2011-8-23	B	Update transient response	HL
2011-8-30	C	Update transient response	HL
2011-9-29	D	Update input range	HL

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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