

NON-ISOLATED DC/DC CONVERTERS

12 Vdc Input

Vddq/2 / 8 A Output

bel

Nov. 10, 2010

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

VRAF-08AT5E

RoHS Compliant

Rev.A

Features

- Non-Isolated
- High Efficiency
- Fixed Frequency
- Current Source/Sink Capability
- Tracking a Reference for Output Voltage
- Over Voltage Protection (Hiccup Mode)
- Class 1, Category 2, Non-Isolated DC/DC Converter (refer to IPC-9592)
- Under-Voltage Lockout
- Output Enable
- OCP/SCP
- Low Cost
- High Power Density



Applications

- Networking
- Computers and peripherals
- Telecommunications

Description

The Bel VRAF-08AT5E 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 Vdc	5.0 Vdc - 13.8 Vdc	8 A	7.2 W	69%	VRAF-08AT5E

Notes: Add "G" suffix at the end of the model number to indicate Tray Packaging.

Part Number Explanation

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

1---Vertical mount

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

3---Series name (SIP)

4---Series code (output current 8A)

5---Input range (5.0-13.8V)

6---Output voltage (Vddq/2)

7---Suffix

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Absolute Maximum Ratings

Parameter	Min	Typ	Max	Unit	Notes
Input Supply Voltage	-0.5	-	15	V	
Input Signal Voltage	-0.3	-	5.25	V	
Operating Temperature	0	-	70	°C	
Storage Temperature	-40	-	85	°C	

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

Input Specifications

Parameter	Min	Typ	Max	Unit	Notes
Operating Input Voltage	5.0	12	13.8	V	
Input Current (full load)	-	-	2.2	A	
Input Current (no load)	-	25	35	mA	
Reference Voltage Range (Vddq)	1.2	1.8	2.0	V	
Remote Off Input Current	-	7	10	mA	
Input Reflected Ripple Current (pk-pk)	-	110	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	60	mA	
I ² t Inrush Current Transient	-	0.006	0.012	A ² s	
Turn-on Voltage Threshold	2.6	-	3.9	V	
Turn-off Voltage Threshold	2.4	-	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	Unit	Notes
Output Voltage Set Point	-	Vddq/2	-	V	Vin=12 V, Iout=full load
Tracking Tolerance (Vddq/2-Vout)/Vout	-1.5	-	1.5	%	
Load Regulation	-	3	6	mV	
Line Regulation	-	3	6	mV	
Output Current	0	-	8	A	
Output DC Current Limit	9.2	-	14	A	
Output Ripple and Noise (pk-pk)	-	25	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	15	mV	
Short Circuit Surge Transient	-	1.1	2.2	A ² s	
Turn on Time	-	2.5	5	mS	Start up from ENABLE.

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Output Specifications (continued)

Parameter		Min	Typ	Max	Unit	Notes
Overshoot at Turn on		-	0	3	%	
Output Capacitance		0	-	2200	uF	
Transient Response						
$\Delta V_{50\% \sim 100\%}$ of Max Load	Overshoot	-	100	200	mV	di/dt=0.3 A/uS; Vo =0.9 V; Vin12 V; and with a 22 uF / 6.3 V ceramic capacitor at the output.
	Settling Time	-	20	50	uS	
$\Delta V_{100\% \sim 50\%}$ of Max Load	Overshoot	-	100	200	mV	
	Settling Time	-	20	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	Unit	Notes
Efficiency	68	69	-	%	Vin=12 V, Vddq=1.8 V, Io=8 A
Switching Frequency	260	300	340	kHz	
Weight	-	2.5	-	g	
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 16.51 x 10.41 x 10.16			-	
Inches (L x W x H)					
Millimeters (L x W x H)					

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

Control Specifications

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

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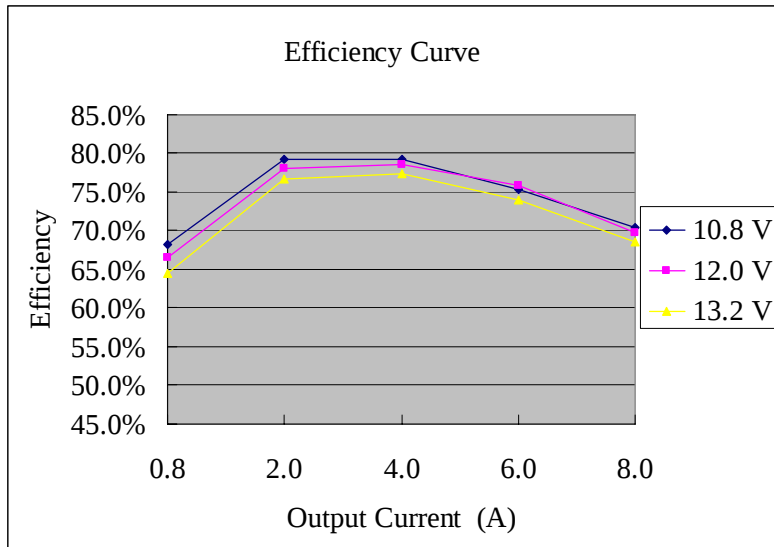
Vddq/2 / 8 A Output



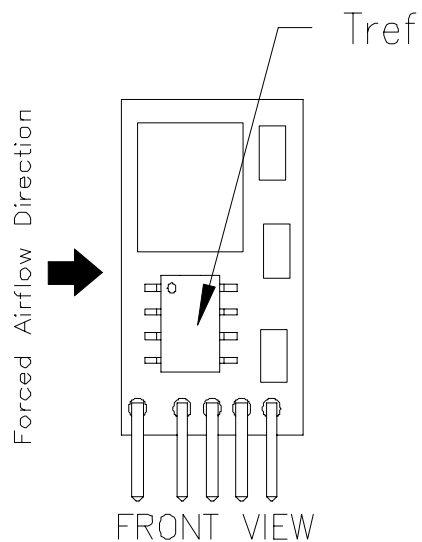
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Efficiency Data



Thermal Derating Curves



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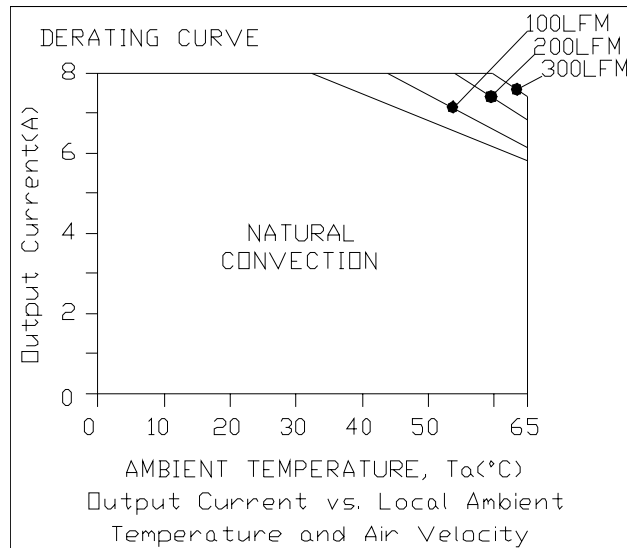


Nov. 10, 2010

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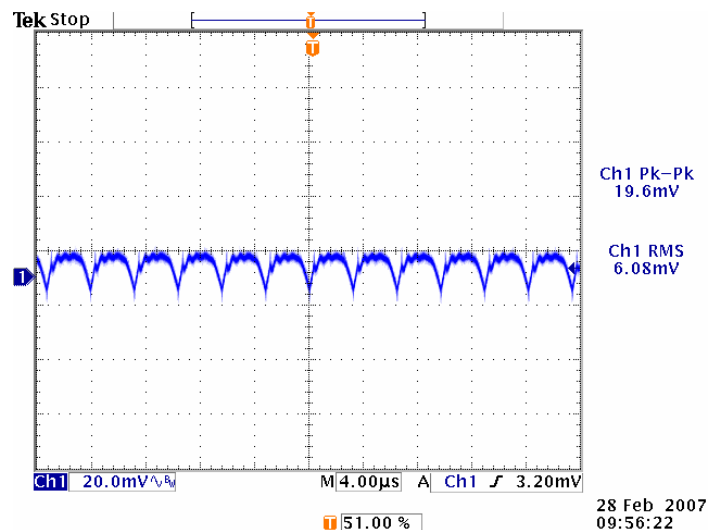
Thermal Derating Curve (continued)

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.

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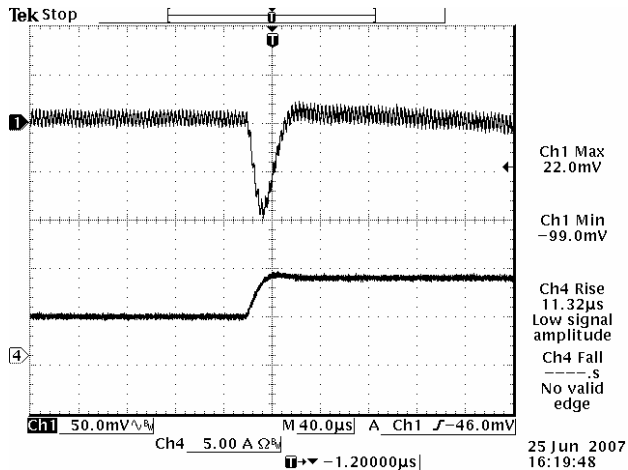
Vddq/2 / 8 A Output



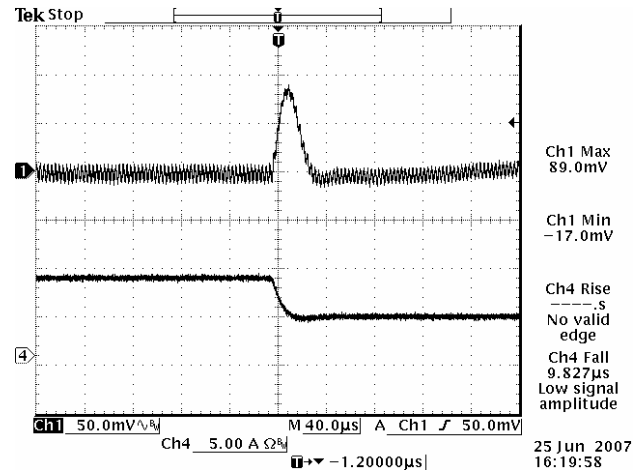
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Transient Response Waveforms



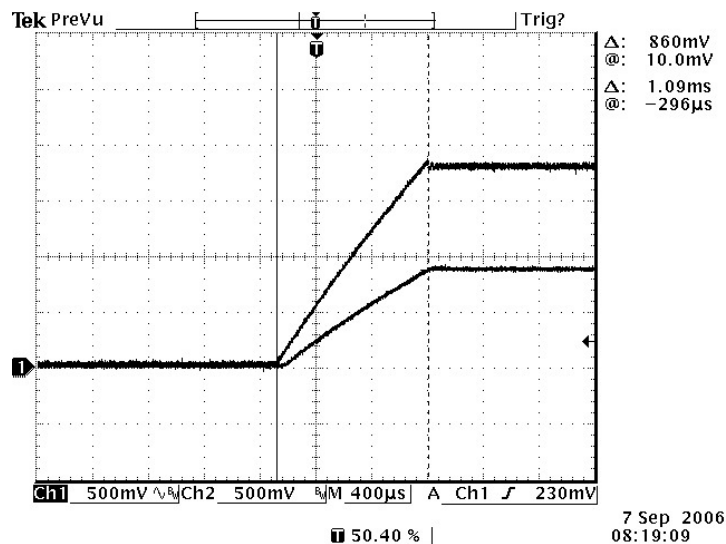
50% to 100% load step at Vin=12 V, Vddq=1.8 V



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.

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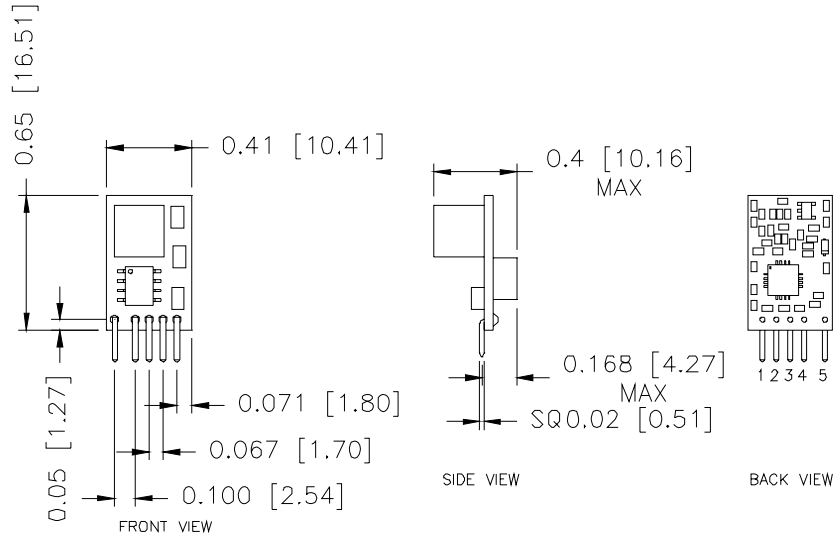
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Nov. 10, 2010

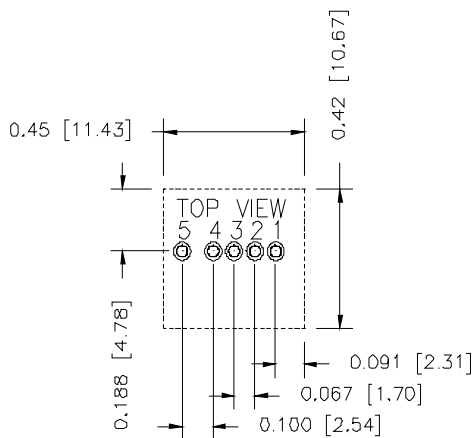
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Mechanical Outline



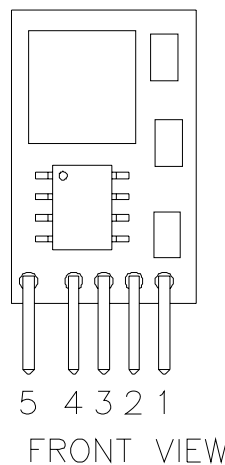
UNIT: INCH [MM]

RECOMMENDED PAD LAYOUT



HOLE SIZE: $\varnothing 0.035 \pm 0.003$ [0.89 $\pm$ 0.08]

PAD SIZE: $\varnothing 0.055 \pm 0.002$ [1.40 $\pm$ 0.05]



Pin Connections

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

Note: This module is recommended and compatible with Pb-Free Wave Soldering and must be soldered using a peak solder temperature of no more than 260 °C for less than 5 seconds.

Note:

1) All Pins: Material - Copper Alloy;

Finish – 3 micro inches minimum Gold over 50 micro inches minimum Nickel plate.

2) Undimensioned components are shown for visual reference only.

3) All dimensions in inches (mm); Tolerances: x.xx +/-0.02 in. (x.x +/-0.5mm) x.xxx +/-0.010 in. (x.xx +/-0.25mm).

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Revision History

Date	Revision	Changes Detail	Approval
2010-11-10	A	First release	HL Lu

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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8

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