



VRAF-08xT50 Series

Non-Isolated DC-DC Converter

MicroSIP Series

The Bel VRAF-08xT50 series 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.

Key Features & Benefits

- Input Voltage Range 5.0 V - 13.8 V
- V_{ddq}/2 / 8 A Output
- Non-Isolated
- High Efficiency
- Fixed Frequency
- Low Cost
- Reference Tracking for Output Voltage
- High Power Density
- Under-Voltage Lockout
- Output Enable
- OCP/SCP
- Current Source / Sink Capability
- Over Voltage Protection (Hiccup Mode)



bel POWER
SOLUTIONS &
PROTECTION

a bel group

belfuse.com/power-solutions

1. MODEL SELECTION

PART NUMBER	OUTPUT VOLTAGE	INPUT VOLTAGE	MAX. OUTPUT CURRENT	MAX. OUTPUT POWER	TYPICAL EFFICIENCY
VRAF-08AT50 VRAF-08ET50*	0.9 V VDC	5.0 - 13.8 VDC	8 A	7.2 W	68%

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

PART NUMBER EXPLANATION

V	R	AF	-	08	A	T5	x	x
Mount Type	RoHS	Series Name		Output Current	Input Range	Output Voltage	Suffix	Package
Vertical Mount	RoHS 6 Compliant	SIP		8 A	5.0 - 13.8 V	Vddq/2	0 – Active High	G – Tray Packaging

2. ABSOLUTE MAXIMUM RATINGS

PARAMETER	DESCRIPTION	MIN	TYP	MAX	UNITS
Input Supply Voltage		-0.5	-	15	V
Ambient Temperature		-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.

3. INPUT SPECIFICATIONS

PARAMETER	DESCRIPTION	MIN	TYP	MAX	UNIT
Operating Input Voltage	VRAF-08AT50 / VRAF-08ET50	5	12	13.8	V
Input Current (Full load)	VRAF-08AT50 / VRAF-08ET50	-	-	2.2	A
Input Current (No load)		-	25	35	mA
Reference Voltage Range (Vddq)		1.2	1.8	1.89	V
Remote Off Input Current		-	7	10	mA
Input Reflected Ripple Current (pk-pk)	With simulated source impedance of 1000 nH, 5 Hz to 20 MHz. Use a 100 µF / 25 V Tan cap with ESR = 0.025 ohm max, at 100 kHz @ 25°C.	-	110	180	mA
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

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

4. OUTPUT SPECIFICATIONS

PARAMETER	DESCRIPTION	MIN	TYP	MAX	UNIT	
Output Voltage Set Point Accuracy	Vin = 12 V, Iout = full load	-	Vddq/2	-		
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)	Test conditions: 0 – 20 MHz BW, with a 22 µF / 6.3 V ceramic capacitor at the output	-	25	50	mV	
Output Ripple and Noise (rms)		-	8	15	mV	
Short Circuit Surge Transient		-	1.1	2.2	A ² s	
Turn-on Time	Start up from ENABLE.					
			VRAF-08AT50	2.5	5	ms
			VRAF-08ET50	5	8	
Overshoot at Turn-on		-	-	3	%	
Output Capacitance		0	-	2200	µF	
TRANSIENT RESPONSE						
50% ~ 100% Max Load		-	100	200	mV	
Settling Time	di/dt = 0.3 A/µs; Vin = 12 V; and with a 22 µF / 6.3 V ceramic capacitor at the output.	-	20	50	µs	
100% ~ 50% Max Load	Vo = 0.9 V	-	100	200	mV	
Settling Time		-	20	50	µs	

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

5. GENERAL SPECIFICATIONS

PARAMETER	DESCRIPTION	MIN	TYP	MAX	UNIT
Efficiency	Vin = 12 V, Vddq = 1.8 V, Io = 8 A	68	69		%
Switching Frequency		260	300	340	kHz
Output Voltage Trim Range	Wide Trim	0.591	-	5.1	V
MTBF	Calculated Per Bell Core SR-332 (Io = 80% load; Vin = 12 V; Ta = 25 °C)		6 416 286		h
Weight		-	2.5	-	g
Dimensions (L x W xH)			0.65 x 0.41 x 0.40		in
			16.51 x 10.41 x 10.16		mm

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

6. CONTROL SPECIFICATIONS

PARAMETER	DESCRIPTION	MIN	TYP	MAX	UNIT
<i>Output Enable</i>					
ENABLE High	Enable Pin open, the module is off.	2	-	5.5	V
ENABLE Low		0	-	0.8	V



Asia-Pacific
+86 755 298 85888

Europe, Middle East
+353 61 225 977

North America
+1 408 785 5200

7. EFFICIENCY DATA

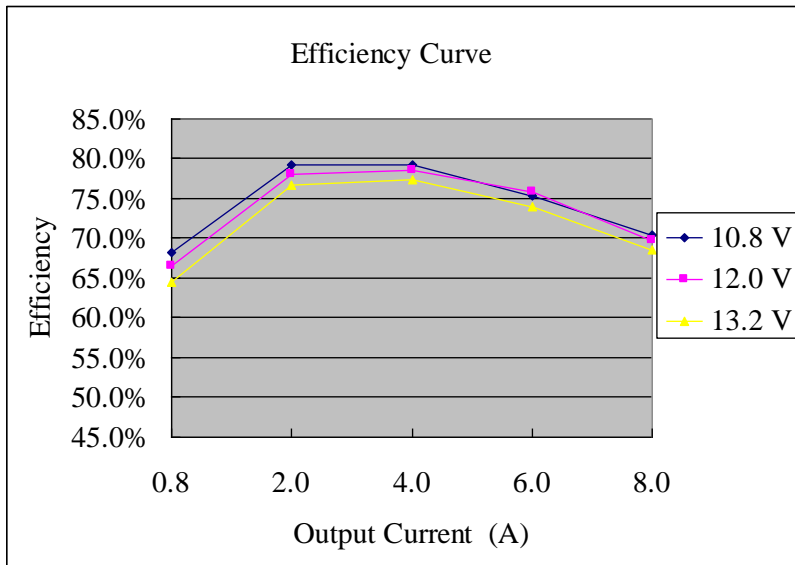


Figure 1. VRAF-08AT50

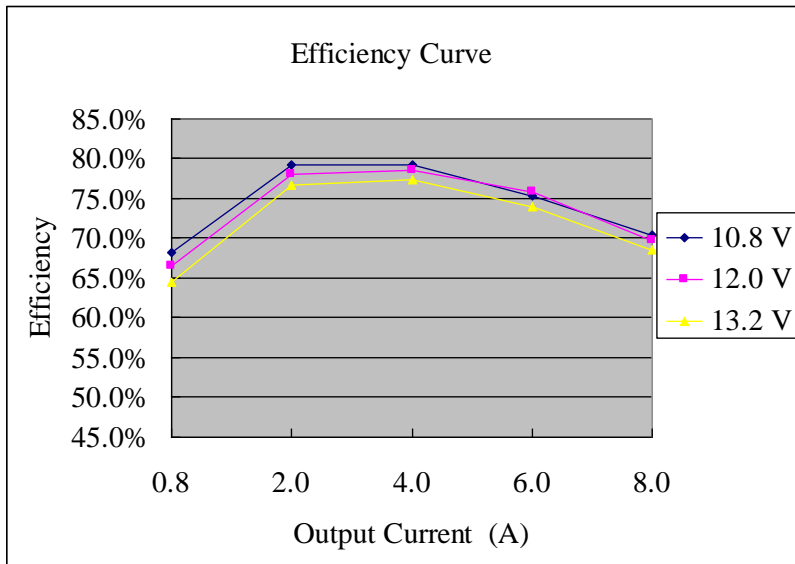


Figure 2. VRAF-08ET50

8. THERMAL DERATING CURVES

The thermal reference point T_{ref} is shown below. 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.

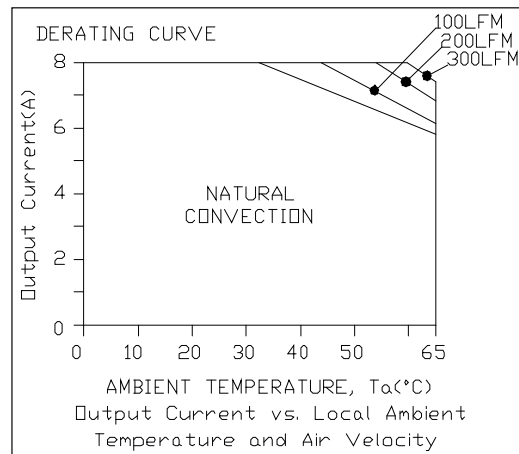
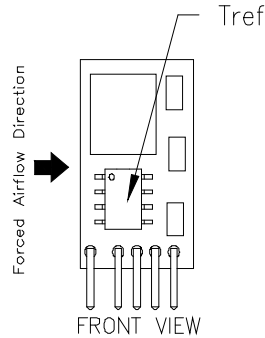
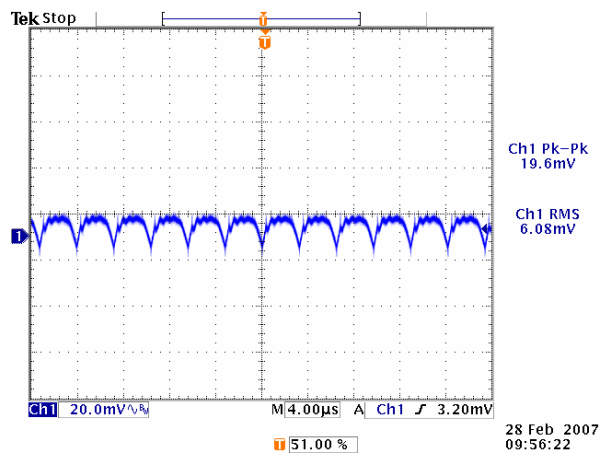


Figure 3. $V_{in} = 12\text{ V}$, $V_{dq} = 1.8\text{ V}$

9. RIPPLE AND NOISE WAVEFORM



NOTE: Ripple and noise at $V_{in}=12\text{ V}$, $V_{dq}=1.8\text{ V}$, $I_o=8\text{ A}$, with a 22 $\mu\text{F}/6.3\text{ V}$ X5R ceramic capacitor at the output, $T_a=25\text{ }^\circ\text{C}$.

10. TRANSIENT RESPONSE WAVEFORMS

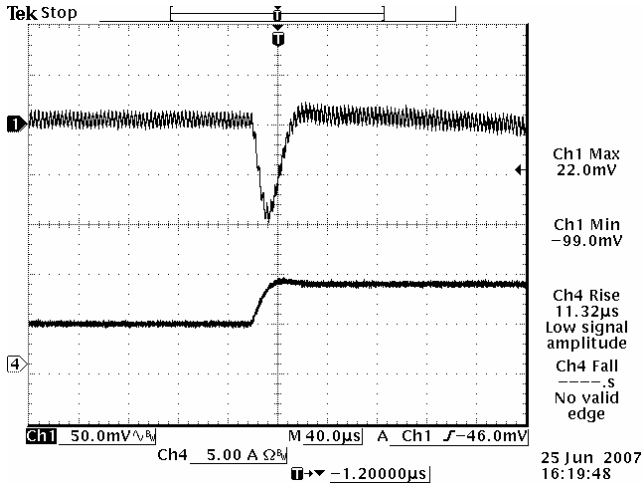


Figure 4. 50% to 100% load step at $V_{in}=12\text{ V}$, $V_{ddq}=1.8\text{ V}$

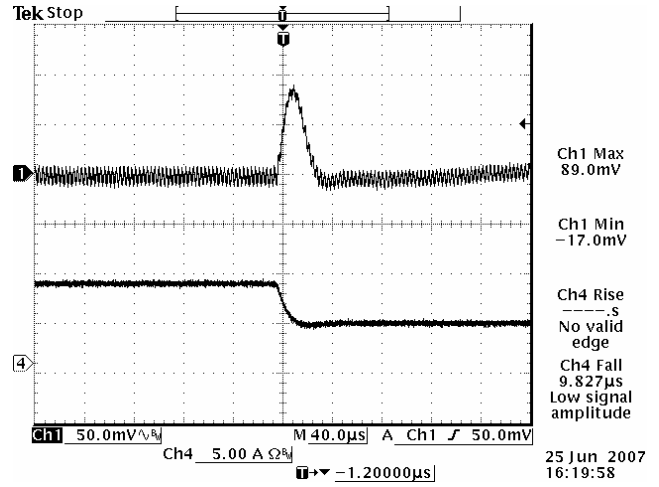


Figure 5. 100% to 50% load step at $V_{in}=12\text{ V}$, $V_{ddq}=1.8\text{ V}$

NOTE: Transient response at $di/dt = 0.3\text{ A}/\mu\text{s}$, with a $22\ \mu\text{F} / 6.3\text{ V X5R}$ ceramic capacitor at the output $T_a = 25^\circ\text{ C}$.

11. OUTPUT TRACKING

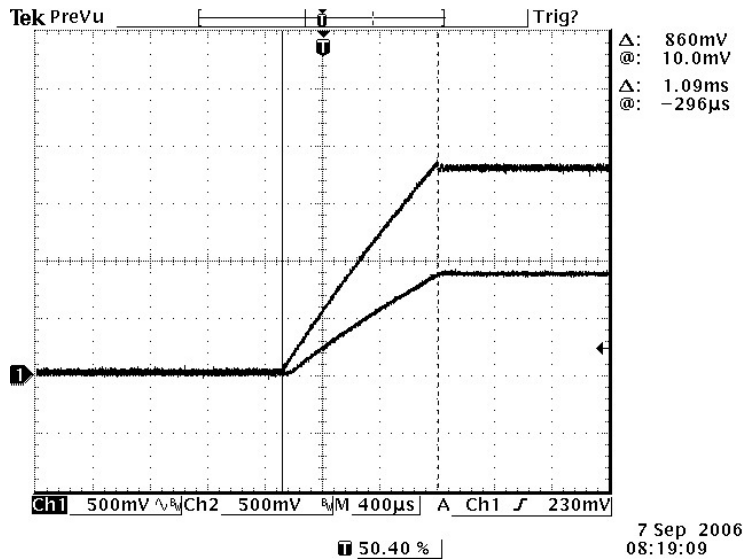
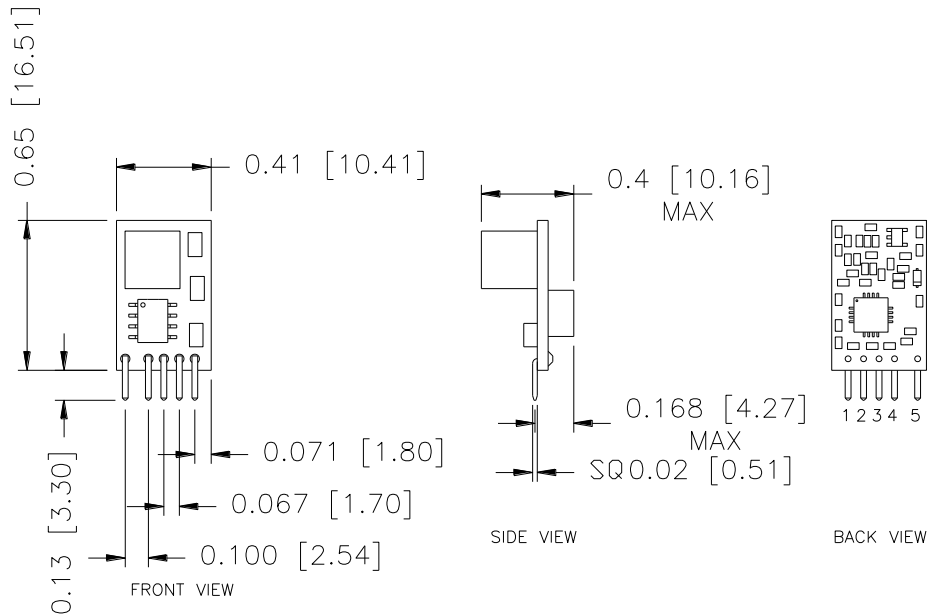
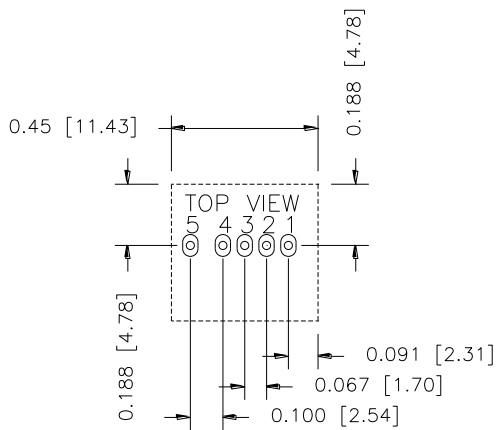


Figure 6. Test condition: $V_{in} = 12\text{ V}$, $V_{ddq} = 1.8\text{ V}$, $I_o = 8\text{ A}$

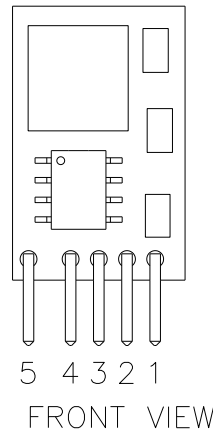
12. MECHANICAL OUTLINE



RECOMMENDED PAD LAYOUT



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



PIN CONNECTIONS

PIN	NAME
1	Vin
2	Vddq
3	Vout
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.

NOTES:

- 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[0.5mm]. x.xxx +/-0.010 in[0.25mm].

13. 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
2013-05-31	K	Add Mechanical tolerance.	XF
2017-12-15	L	Datasheet updated to the new Bel template	

For more information on these products consult: tech.support@psbel.com

NUCLEAR AND MEDICAL APPLICATIONS - Products are not designed or intended for use as critical components in life support systems, equipment used in hazardous environments, or nuclear control systems.

TECHNICAL REVISIONS - The appearance of products, including safety agency certifications pictured on labels, may change depending on the date manufactured. Specifications are subject to change without notice.