

## NON-ISOLATED DC/DC CONVERTER

5 V Input     $V_{ref}/2$  / 5 A Output

**bel**  
POWER PRODUCTS

### xRAH-05BT50

RoHS Compliant

- Non-Isolated
- Fixed frequency (300 kHz)
- Under-voltage lockout (UVLO)
- Current Sink Capability
- Remote On/Off
- OCP/SCP
- Low Profile Package (7.82 mm)



### Description

The Bel xRAH-05BT50 is part of the low cost non-isolated dc/dc converter series. The converter is designed specifically to provide bus termination voltage in application 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 programs its output voltage to 50% of the reference. The modules use a SMD or vertical mount package for ease of layout and space savings.

### Part Selection

Output Voltage	Input Voltage	Max. Output Current	Max. Output Power	Typical Efficiency	Part Number Surface Mount	Part Number Vertical Mount
$V_{ref}/2$	5 V	5 A	6.25 W	82%	SRAH-05BT50	VRAH-05BT50

**Note:** Add "0" suffix at the end of the model number to indicate "Tube Packaging", and "R" for "Reel Packaging", and "G" for "Tray Packaging".

### Absolute Maximum Ratings

Parameter	Min	Typ	Max	Notes
Input Voltage (continuous)	-0.3 V	-	6 V	
Output Enable Terminal Voltage	-0.3 V	-	6 V	
Ambient Temperature	-40 °C	-	85 °C	
Storage Temperature	-55 °C	-	125 °C	

### Input Specifications

Parameter	Min	Typ	Max	Notes
Input Voltage	4.5 V	5.0 V	5.5 V	
Input Current (Source)	-	-	2 A	
Input Current (Sink)	-	-	-1.5 A	
Input Current (No load)	-	-	60 mA	
Remote Off Input Current	-	9 mA	15 mA	
Input Reflected Ripple Current (rms)	-	30 mA	50 mA	Measured with simulated source impedance of 500 nH, 5 Hz to 20 MHz; & one 270 uF/16 V capacitor with ESR = 0.018 ohm max. at 100 kHz
Input Reflected Ripple Current (pk-pk)	-	110 mA	140 mA	
$I^2t$ Inrush Current Transient	-	0.02 A <sup>2</sup> s	0.05 A <sup>2</sup> s	
$V_{ref}$ Voltage	0 V	2.5 V	4 V	
Turn-on Voltage Threshold	4.19 V	4.3 V	4.5 V	
Turn Off Voltage threshold	-	3.8 V	4.49 V	

- Notes:**
1. All tests are measured at  $V_{ref} = 2.5$  V.
  2. 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	0.99* (Vref/2) V	Vref/2	1.01* (Vref/2) V	Vin=5 V, Iout=full load.
Load Regulation	-	3 mV	6 mV	
Line Regulation	-	1 mV	3 mV	
Regulation Over Temperature (-40 °C to +85 °C)	-	15 mV	20 mV	
Output Current	0 A	-	5 A	
Output Current Threshold	6.5 A	-	12.5 A	
Short Circuit Surge Transient	-	0.04 A <sup>2</sup> s	0.08 A <sup>2</sup> s	
Ripple and Noise (rms)	-	12 mV	20 mV	Tested at: 0-20 MHz BW; with 1 uF ceramic capacitor at the output
Ripple and Noise (pk-pk)	-	45 mV	90 mV	
Turn On Time	-	12 mS	20 mS	
Overshoot at Turn on	-	0%	3%	
Output Capacitance	-	-	2200 uF	

- Notes:**
1. All specifications are typical at nominal input, full load at 25 °C unless otherwise stated.
  2. The modules track the transient response of the reference input. See the figure in TR data on Page 3.
  3. The turn-off undershoot of the module is below 100mV if a 220 uF aluminum cap is added at the output.
  4. All tests are measured at Vref=2.5 V.

## General Specifications

Parameter	Min	Typ	Max	Notes
Efficiency (source)	79%	82%	-	Measured at Vin=5V, Io=Io-max full load
Efficiency (sink)	78%	81%	-	Measured at Vin=5V, Io=Io-max full load
Switching Frequency	250 kHz	300 kHz	340 kHz	
MTBF	8,841,119 hours			Calculated Per Bell Core SR-332 (Io = 4 A, Vin=5 V, Vref=2.5 V; Ta = 25 °C)
Dimensions (surface mount) Inches (L x W x H) Millimeters (L x W x H)	0.78 x 0.7 x 0.32 19.812 x 17.78 x 8.128			
Dimensions (vertical) Inches (L x W x H) Millimeters (L x W x H)	0.7 x 0.308 x 0.65 17.78 x 7.82 x 16.51			
Weight	-	4.7 g	-	

**Note:** All specifications are typical at nominal input, full load at 25 °C unless otherwise stated. All tests are measured at Vref=2.5 V.

## Control Specifications

Parameter	Min	Typ	Max	Notes
<b>Remote On/Off</b>				
Signal Low (Unit Off)	-0.3 V	-	1.35V (Vin=4.5V)	Remote on/off pin open, unit on
	-0.3 V	-	1.65V (Vin=5.5V)	
Signal High (Unit On)	3.15 V(Vin=4.5V)	-	5.5 V	
	3.85 V(Vin=5.5V)	-	5.5 V	

**Note:** All tests are measured at Vref=2.5 V.

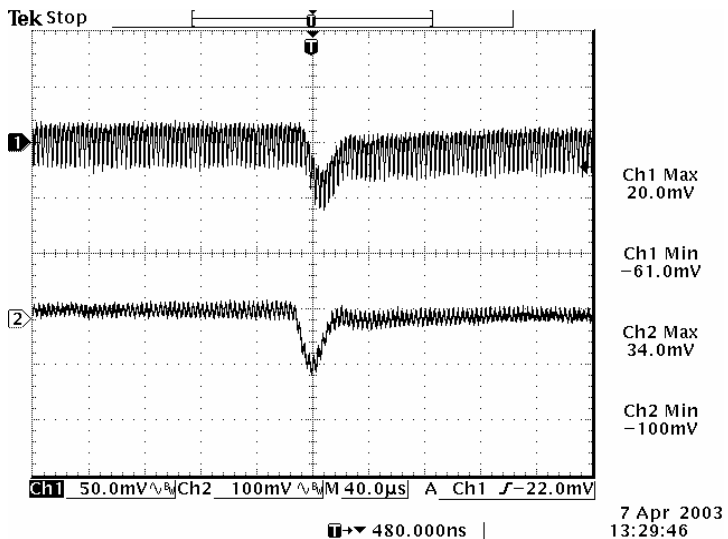
# NON-ISOLATED DC/DC CONVERTER

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## Transient Response

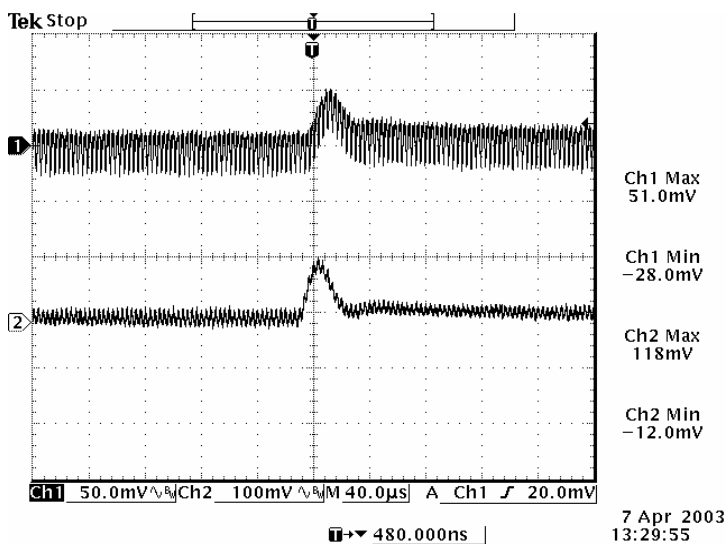
Track the transient response of the reference input. No External Load Capacitance.



Channel 1: Transient response tracking.

Channel 2: Transient response of the reference input.

Ta = 25°C

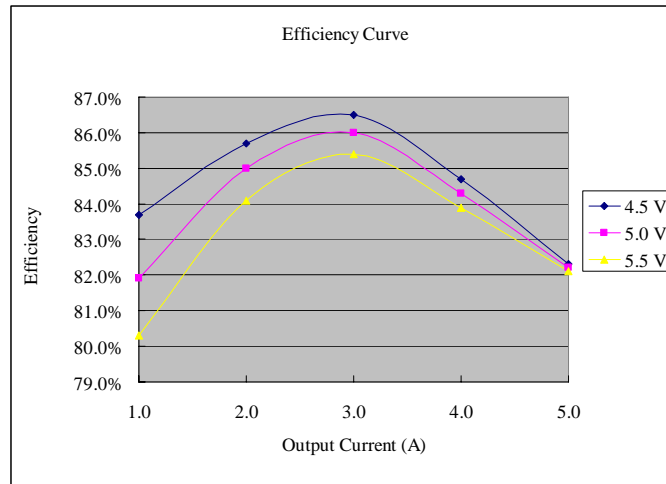


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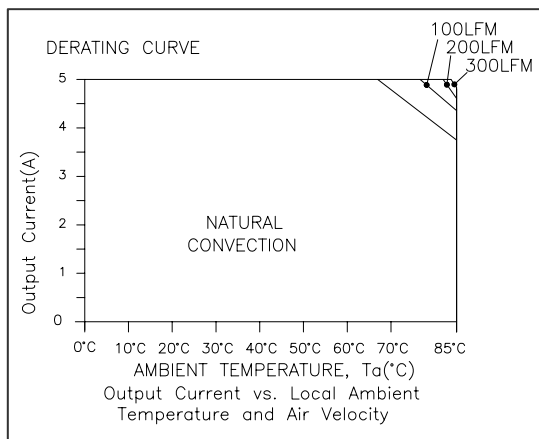


## Efficiency Data

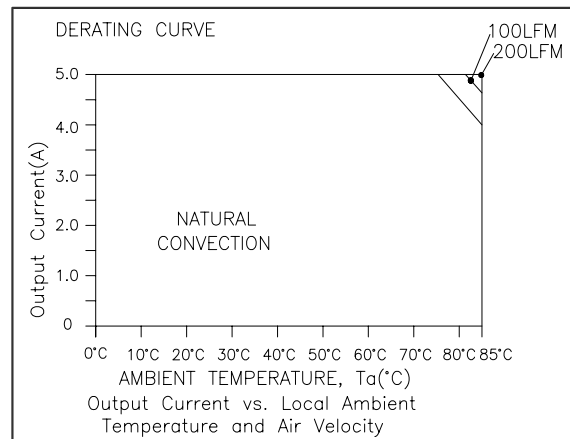


Efficiency is tested at Vref=2.5 V

## Thermal Derating Curves



VRAH-05BT50



SRAH-05BT50

**Test Condition:** Derating curves are tested at nominal input voltage and Vref=2.5V.

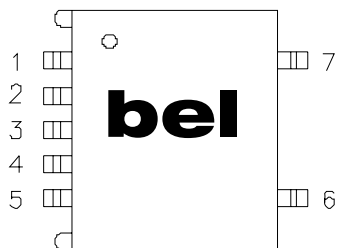
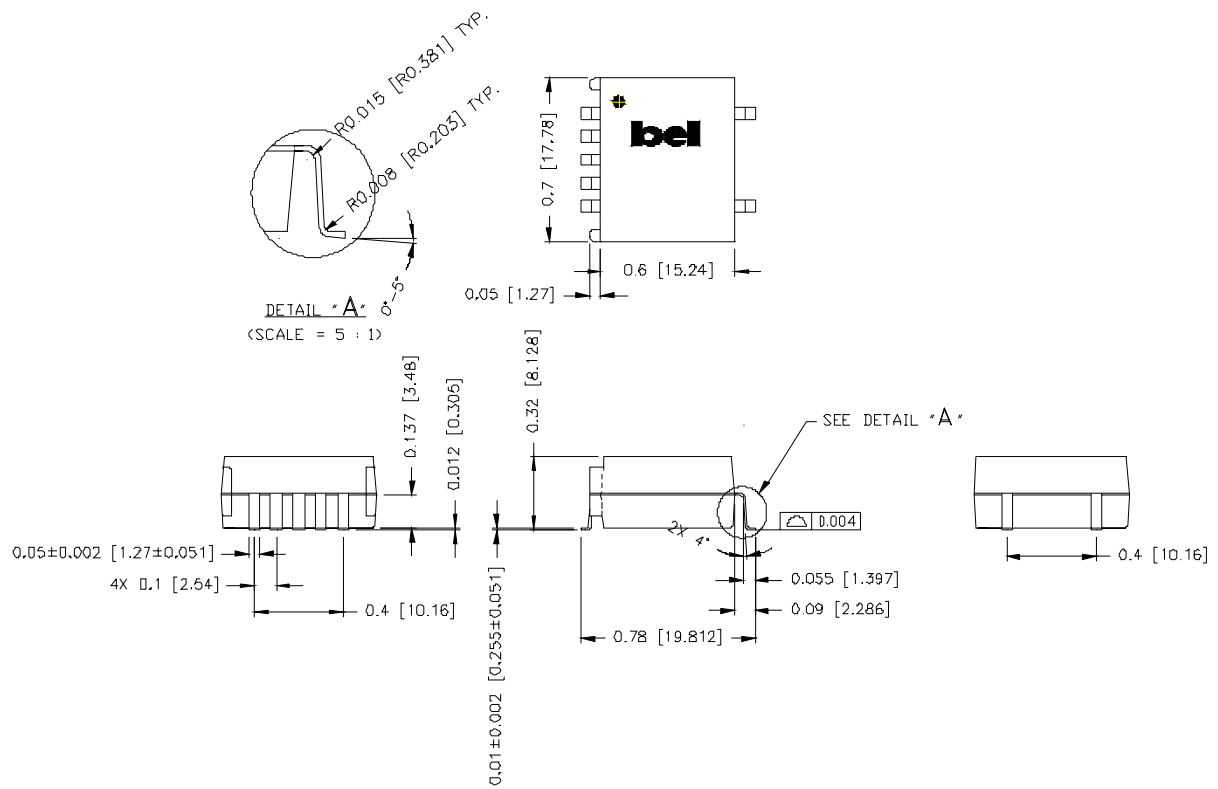
# NON-ISOLATED DC/DC CONVERTER

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## Mechanical Outline

SRAH-05BT50



## Pin Connections

Pin	Function
1	Remote On/Off (option)
2	Vin
3	Ground
4	Vout
5	Vref (option)
6	N/A
7	N/A

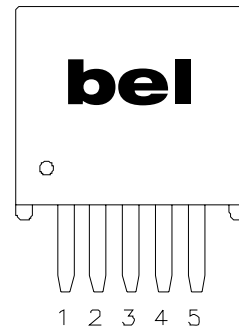
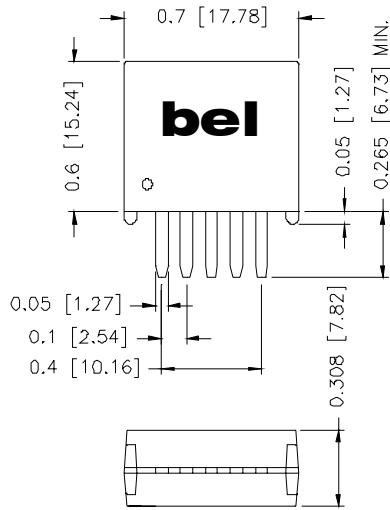
# NON-ISOLATED DC/DC CONVERTER

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## Mechanical Outline (continued)

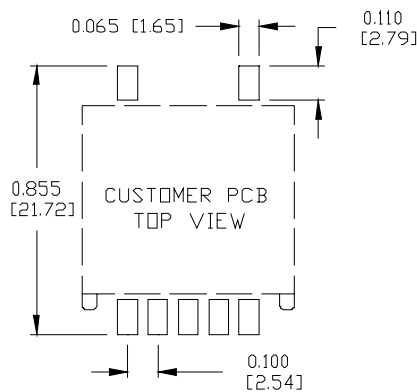
VRAH-05BT50



### Pin Connections

Pin	Function
1	Remote On/Off (option)
2	Vin
3	Ground
4	Vout
5	Vref (option)

### RECOMMENDED PCB PAD LAYOUT



SURFACE MOUNT

THROUGH HOLE

### RoHS Compliance

Complies with the European Directive 2002/95/EC, calling for the elimination of lead and other hazardous substances from electronic products. These parts are not however compatible with the higher temperatures associated with lead free solder processes and must be soldered using a reflow profile with a peak temperature of no more than 240 °C.



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