

# NON-ISOLATED DC/DC CONVERTERS

## 3.3V Input / 5V Output / 1.5A



BP05xRAH-02C

### SRAH-02C / VRAH-02C Modules

- Nonisolated
- Compact, low profile surface mount package
- Fixed frequency\*
- High efficiency means less power dissipation
- Excellent thermal performance
- Optimized for cost
- Allows burst mode operation at low load currents



### Description

The Bel SRAH-02C and VRAH-02C modules are non-isolated, step up DC/DC power converters that operate from a nominal 3.3V source with an output voltage of 5V. They are packaged in a compact, overmolded package rated at 1.5A. Optional lead forming provides a vertical mount product for minimal footprint or a surface mount option for a very low profile. Standard features include output voltage adjust and industrial temperature range (-40° to +85° C). The output is closely regulated and the efficiency is typically 87% at full load. These products may be used almost anywhere low voltage silicon is employed and a 3.3V source is available. Typical applications include file servers, routers, line cards and other computing and communications equipment.

\*Optional Burst/skip mode operating at light load or no load.

### Applications

- Distributed power architectures
- Data networking equipment
- Telecommunications
- Computers and peripherals

### Options

- Trim function

### Part Number Selection

Output Voltage	Input Voltage	Max. Output Current	Max. Output Power	Typical Efficiency	Part Number Surface Mount	Part Number Vertical Mount
5V	3.3V	1.5A	7.5W	87%	SRAH-02C500	VRAH-02C500

Note: For parts with Burst/skip mode disabled, change the last character to a B (e.g. SRAH-02C500B).

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### Absolute Maximum Ratings

Parameter	Symbol	Min	Typical	Max	Unit
Continuous Input Voltage	Vin	2.8		4	V
Output Enable Terminal Voltage	Vouten				V
Ambient Temperature	Tamb	-40		85	°C
Storage Temperature	Tstor	-40		125	°C

Note: Use beyond the maximum ratings may cause a reliability degradation of the DC/DC converter or may permanently damage the device.

### Input Specifications

Parameter	Module	Symbol	Min	Typical	Max	Units
Operating Input Voltage	All	Vin	3		3.6	V
Input Current	All	Iin			3.3	A
Input Reflected Ripple Current <sup>1</sup>	All			30	60	mA <sub>rms</sub>
Input Reflected Ripple Current (P-P) <sup>1</sup>	All			100	150	mApk
I <sup>2</sup> t Inrush Current Transient	All			0.02	0.05	A <sup>2</sup> s
Turn On Voltage Threshold	All			2.8	2.9	V

Note: Input capacitance one 270µF/16V, ESR = 0.018 Ω max at 100kHz @ 25° C.

1. With simulated source impedance of 500nH, 5Hz to 20MHz.

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### Output Specifications

Parameter	Module	Symbol	Min	Typical	Max	Units
Output Voltage Set Point <sup>1</sup>	All	Vout	4.825	5	5.175	V
Load Regulation	All			25	40	mV
Line Regulation	All			20	30	mV
Regulation Over Temperature	All			45	80	mV
Total Output Voltage Regulation	All				150	mV
Output Ripple and Noise <sup>2</sup>	All			50	100	mVp-p
Output Ripple and Noise <sup>2</sup>	All			15	25	mVrms
Output Current Range	All	Iout	0		1.5	A
Overshoot at Turn On	All			0	5	%
Output Capacitance	All	Cout	0		600	μF
<b>Transient Response</b>						
ΔV 50% to 100% of Max Load	All			100	150	mV
Settling Time		Ts		50	100	μs
ΔV 100% to 50% of Max Load				100	150	mV
Settling Time		Ts		50	100	μs

Note: All specifications are typical at nominal input, full load at 25° C unless otherwise stated.

1. Vin = 3.3V, Iout = full load, Ta = 25° C.
2. 0 - 20MHz, 1μF ceramic cap on output.

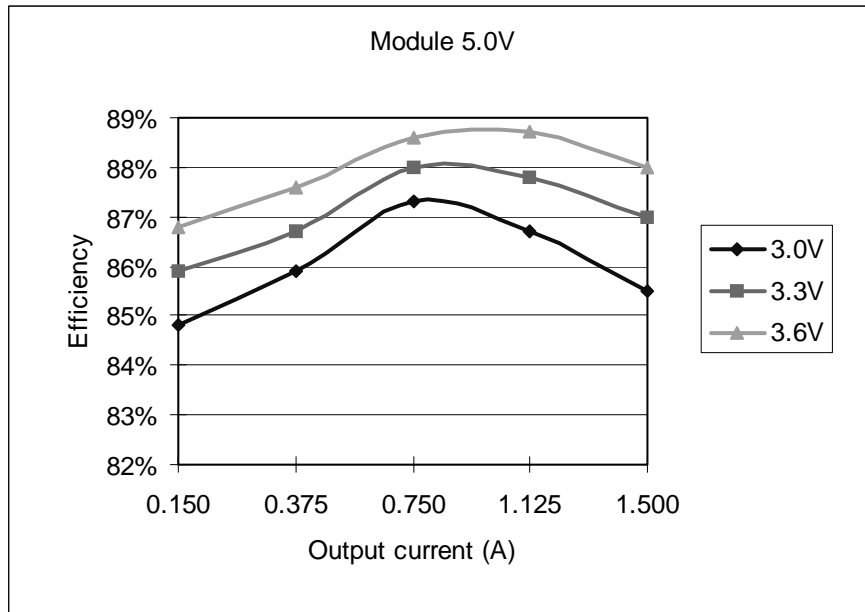
### General Specifications

Parameter	Module	Symbol	Min	Typical	Max	Units
Efficiency <sup>1</sup>	All	η	84	87		%
Switching Frequency	All	Fsw	500	550	650	kHz
Output Voltage Trim Range <sup>2</sup>	All		95		110	%
Weight	All			5.2		g

1. Vin=3.3V, full load and Ta=25° C.
2. See graphs on page 6.

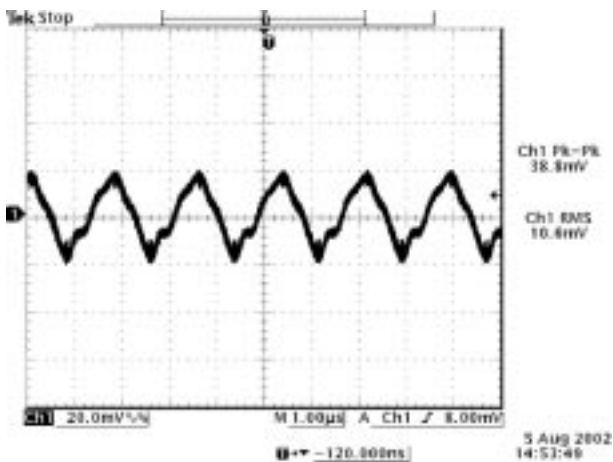
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**Efficiency Data**

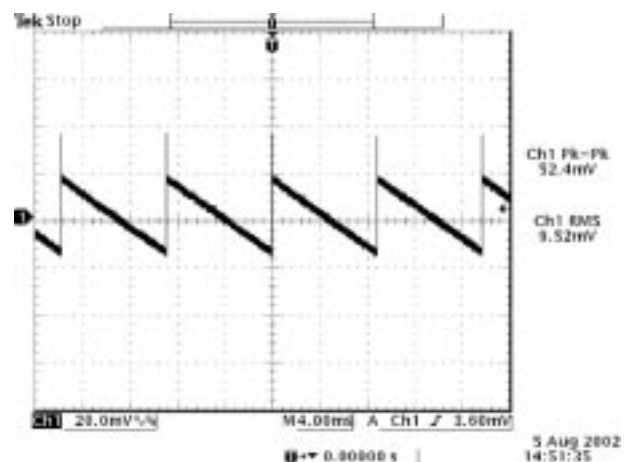


**Ripple and Noise**

1µF ceramic cap at the output.



Ripple and noise at full load and 3.3Vdc input, 5Vdc output and Ta=25° C



Ripple and noise when operating in burst mode at no load and 3.3Vdc input, 5Vdc output and Ta=25° C

# NON-ISOLATED DC/DC CONVERTERS

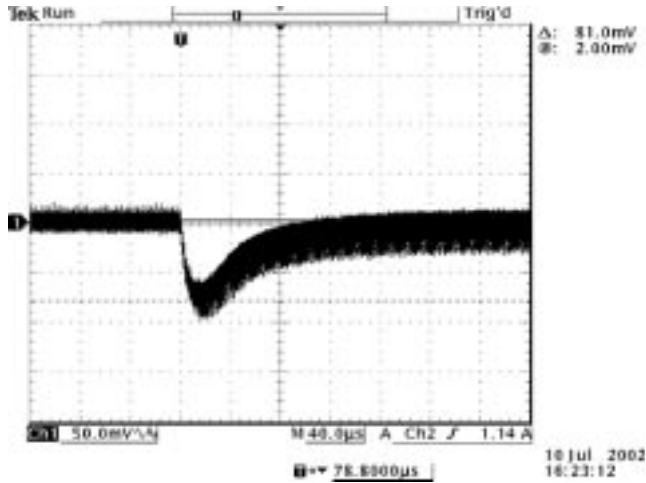
## 3.3V Input / 5V Output / 1.5A



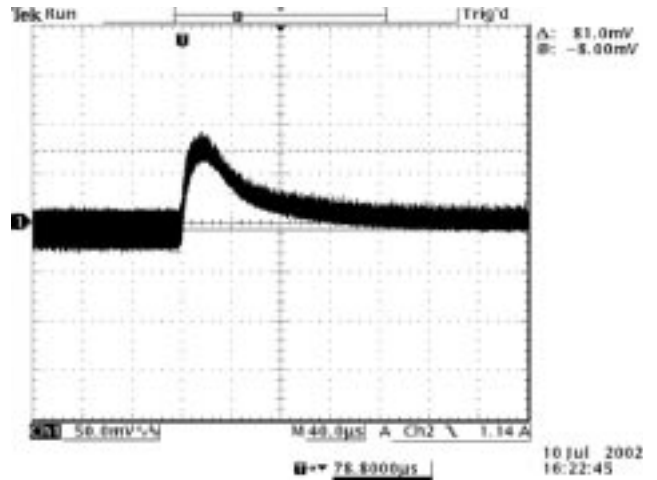
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### Transient Response

Transient response:  $di/dt = 0.5A/\mu S$ , no external load capacitance



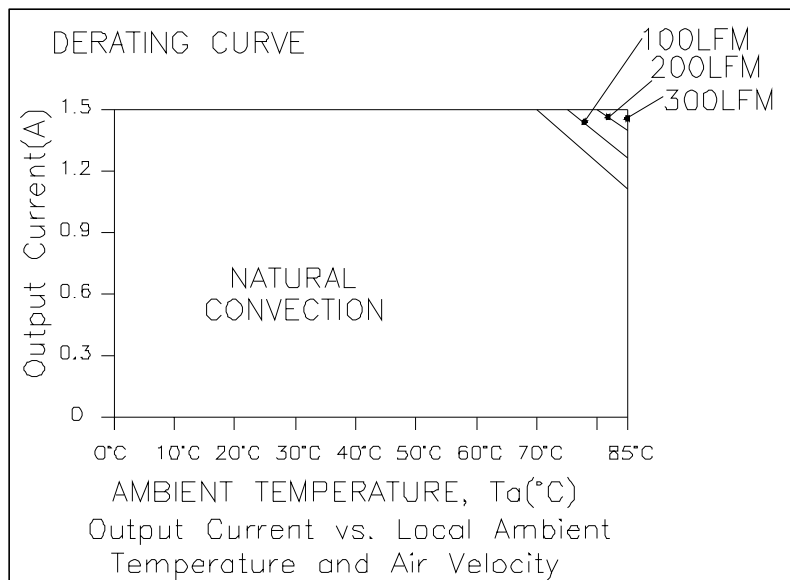
Vout=5V  
50% to 100% load transients at 3.3V input and Ta=25° C



Vout=5V  
100% to 50% load transients at 3.3V input and Ta=25° C

### Thermal Considerations

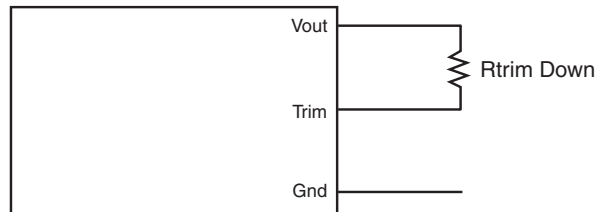
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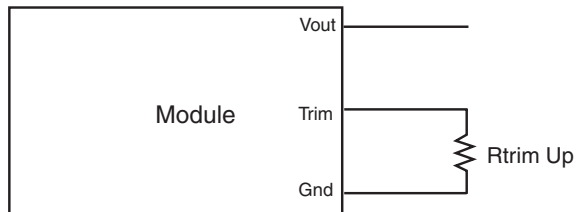
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**Output Voltage Set-Point Adjustment**

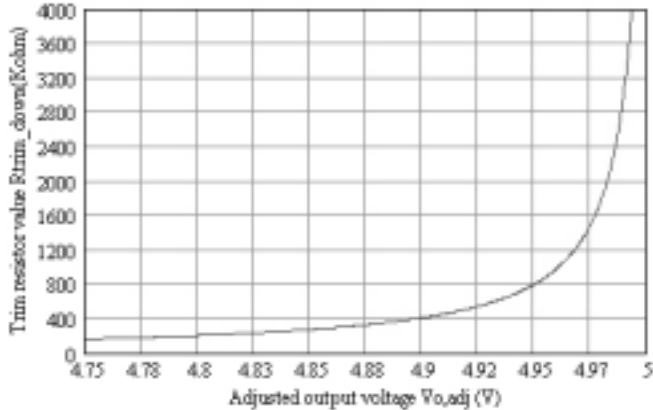
Trim Down Circuit



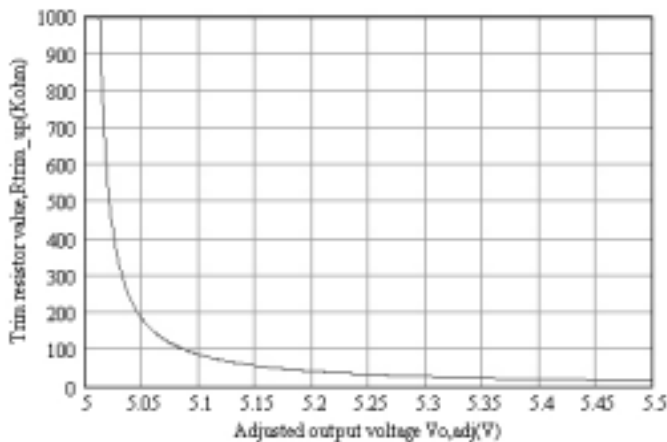
Trim Up Circuit



**xRAH-02C Trim Resistor Calculation**



$$R_{trim\ down} = \left( \frac{44.144}{V_o - V_{o, adj}} - 12.5 \right) \text{ Kohm}$$



$$R_{trim\ up} = \left( \frac{8.4}{V_{o, adj} - V_o} - 2 \right) \text{ Kohm}$$

# NON-ISOLATED DC/DC CONVERTERS

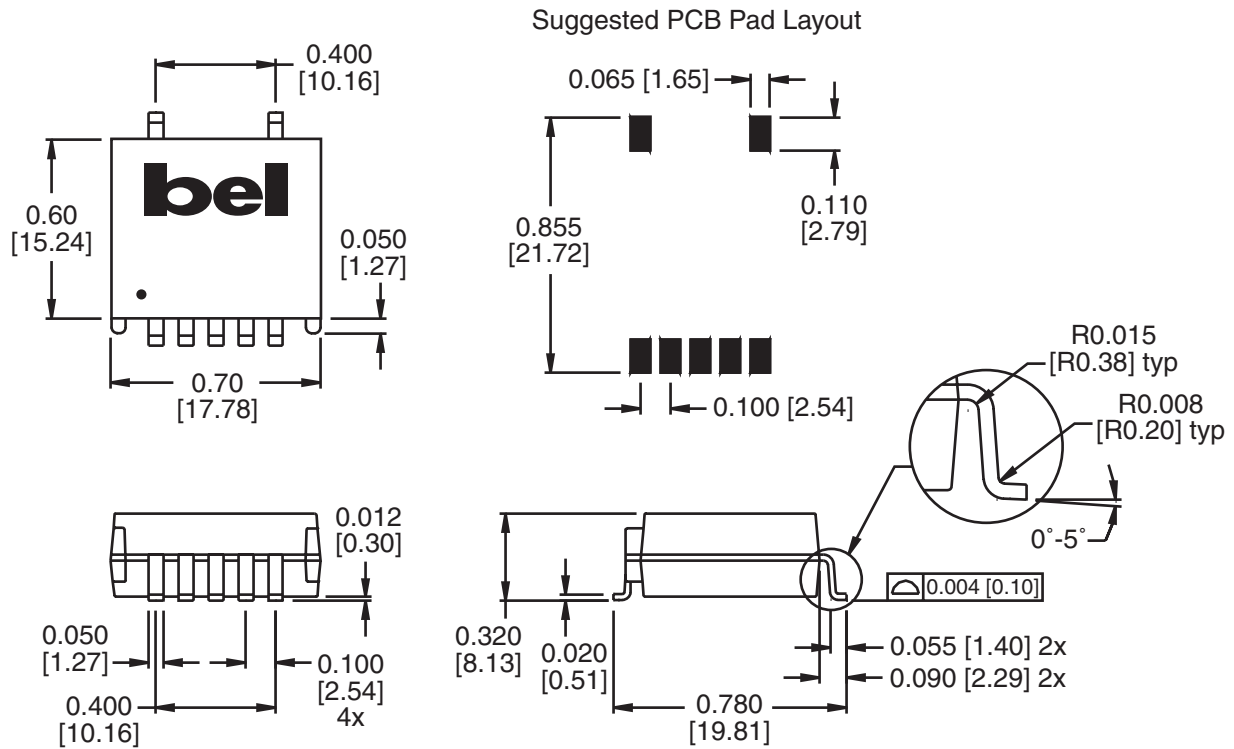
3.3V Input / 5V Output / 1.5A



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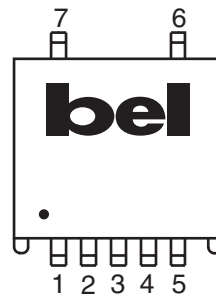
## Mechanical

SRAH-02C



Dimensions are in inches [millimeters].  
Standard dimension tolerance is  $\pm 0.005$  [0.13] unless otherwise noted.

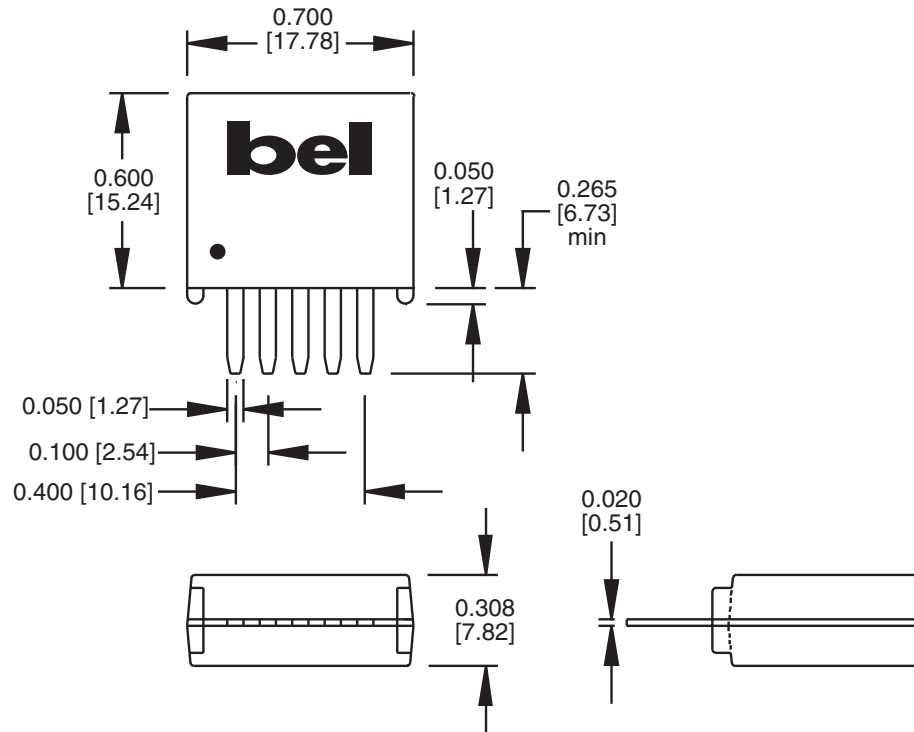
Pin	Function
1	N/A
2	+Vin
3	Ground
4	+Vo
5	Trim
6	N/A
7	N/A



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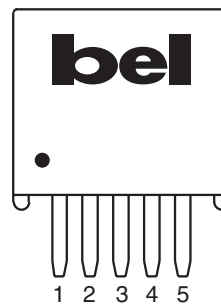
### Mechanical

VRAH-02C



Dimensions are in inches [millimeters].  
Standard dimension tolerance is  $\pm 0.005$  [0.13] unless otherwise noted.

Pin	Function
1	N/A
2	+Vin
3	Ground
4	+Vo
5	Trim



### 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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