

# NON-ISOLATED DC/DC CONVERTERS

## 5V Input / 1.5 – 3.3V Output / 10A

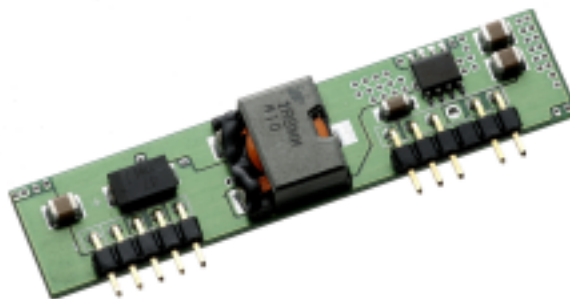
**bel**  
POWER PRODUCTS

BP06VRPC-10B

### VRPC-10B Series

### RoHS Compliant

- Nonisolated
- Industry standard pinout
- Fixed frequency
- High efficiency means less power dissipation
- High power density
- Optimized for cost
- Remote on/off
- Undervoltage lockout
- Over current and short circuit protection



## Description

The Bel VRPC-10B series modules are non-isolated DC/DC power converters that operate from a nominal 5V source. These converters are available in a range of output voltages from 1.5V to 3.3V. They are packaged in an industry standard single-in-line footprint with 10A maximum output. Standard features include remote on/off, over current and short circuit protection and output voltage adjust. Remote sense is an optional feature. These products may be used almost anywhere low voltage silicon is employed and a 5V source is available. Typical applications include file servers, routers, line cards and other computing and communications equipment.

## Applications

- Telecommunications
- Networking
- Computers and peripherals

## Options

- Remote sense

## Part Number Selection

Output Voltage	Input Voltage	Max. Output Current	Max. Output Power	Typical Efficiency	Part Number	Part Number Remote Sense Option
3.3V	5V	10A	33W	94%	VRPC-10B330	VRPC-10B33S
2.5V	5V	10A	25W	92%	VRPC-10B250	VRPC-10B25S
1.5V	5V	10A	15W	87%	VRPC-10B150	VRPC-10B15S

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## Absolute Maximum Ratings

Parameter	Symbol	Min	Typical	Max	Unit
Continuous Input Voltage	Vin	-0.3		6	V
Output Enable Terminal Voltage	Vouten	-0.3		6	V
Ambient Temperature	Tamb	0		70	°C
Storage Temperature	Tstor	-55		105	°C

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

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## Input Specifications

Parameter	Symbol	Min	Typical	Max	Units
Operating Input Voltage	Vin	4.5		5.5	V
Input Current	Iin			9.5	A
No Load Input Current			35	50	mA
Remote Off Input Current			3	10	mA
Input Reflected Ripple Current <sup>1</sup>			10	20	mA <sub>rms</sub>
Input Reflected Ripple Current (P-P) <sup>1</sup>			40	80	mApk
I <sup>2</sup> t Inrush Current Transient			0.05	0.07	A <sup>2</sup> s
Turn On Voltage Threshold			4.25		V
Turn Off Voltage Threshold			3.85		V

Note: Input capacitance 1000µF/16V, ESR = 0.078 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>	3.3V	Vout	3.234	3.3	3.366	V
	2.5V		2.450	2.5	2.550	
	1.5V		1.470	1.5	1.530	
Load Regulation	3.3V			8	16	mV
	2.5V		6	12		
	1.5V		5	10		
Line Regulation	All			5	10	mV
Regulation Over Temperature 0° - 70° C	3.3V			20	40	mV
	2.5V		17	30		
	1.5V		15	25		
Total Output Voltage Regulation	3.3V			33	66	mV
	2.5V		28	52		
	1.5V		25	45		
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		10	A
Output DC Current Limit	All	Ioutlim	13		25	A
Short Circuit Surge	3.3V	Ioutsurge		0.25	0.3	A <sup>2</sup> s
	2.5V		0.2	0.25		
	1.5V		0.1	0.15		
Turn on Time	All	Ton		11	20	ms
Overshoot at Turn On	All			0	3	%
Output Capacitance	All	Cout	0		4700	μF

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

1. Vin = 5V, Iout = full load, Ta = 25° C.

2. 0 - 20MHz BW, 0.1μF ceramic cap on output.

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## Output Specifications

Parameter	Module	Symbol	Min	Typical	Max	Units
<b>Transient Response<sup>3</sup></b>						
$\Delta V$ 50% to 100% of Max Load	3.3V			90	150	mV
Settling Time		Ts		40	80	$\mu s$
$\Delta V$ 100% to 50% of Max Load				100	150	mV
Settling Time		Ts		40	80	$\mu s$
<b>Transient Response<sup>3</sup></b>						
$\Delta V$ 50% to 100% of Max Load	2.5V			90	130	mV
Settling Time		Ts		40	80	$\mu s$
$\Delta V$ 100% to 50% of Max Load				90	130	mV
Settling Time		Ts		40	80	$\mu s$
<b>Transient Response<sup>3</sup></b>						
$\Delta V$ 50% to 100% of Max Load	1.5V			70	120	mV
Settling Time		Ts		40	80	$\mu s$
$\Delta V$ 100% to 50% of Max Load				80	120	mV
Settling Time		Ts		40	80	$\mu s$

Note: All specifications are typical at nominal input, full load at 25° C unless otherwise stated.  
 3.  $di/dt = 0.5A/\mu s$ ,  $V_{in} = 5VDC$ ,  $T_a = 25^\circ C$ , and with a 470 $\mu F$  aluminum cap on output.

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### General Specifications

Parameter	Module	Symbol	Min	Typical	Max	Units
Efficiency <sup>1</sup>	3.3V	$\eta$	92	94		%
	2.5V		90	92		
	1.5V		85	87		
Switching Frequency	All	Fsw	230	300	340	kHz
Output Voltage Trim Range	3.3V		70		110	%
	2.5V		70		110	
	1.5V		90		120	
Remote Sense Compensation	All				10	%
Weight	All			9.2		g

1. Vin=5V, full load and Ta=25° C.

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### Control Specifications

Parameter	Module	Symbol	Min	Typical	Max	Units
Remote On/Off	All	Vouten				V
Signal Low (Unit On)	All		-0.3		0.3	V
Signal High (Unit Off)	All		2.8		5.5	V

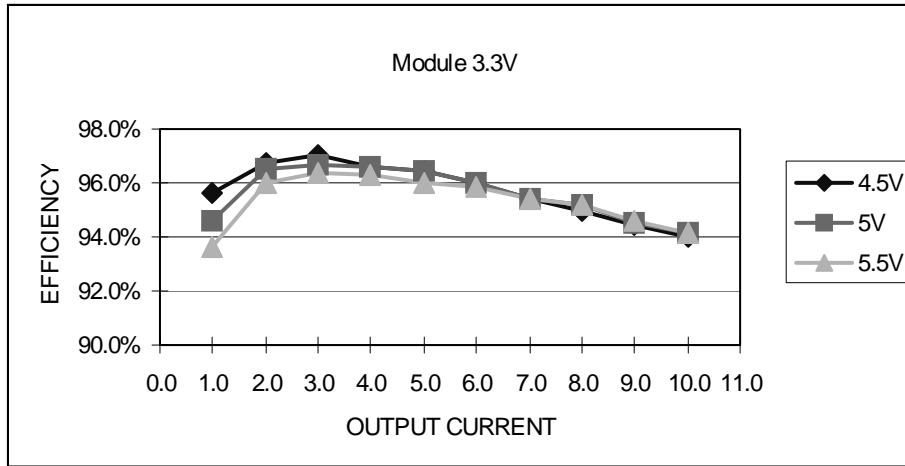


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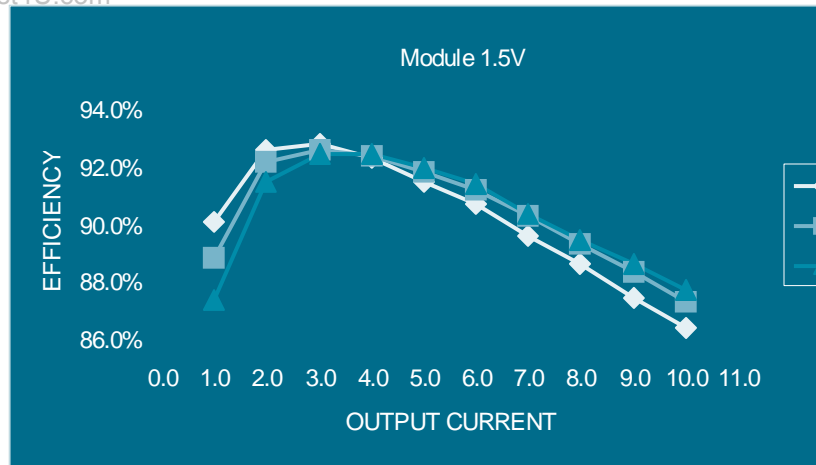
### Efficiency Data



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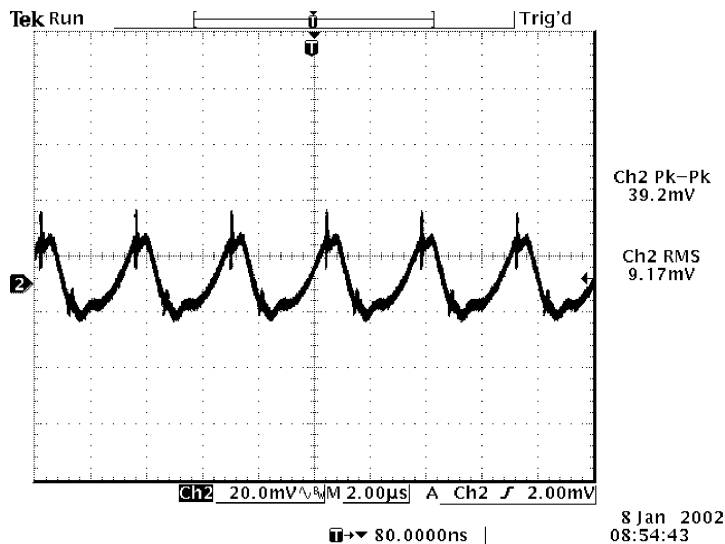
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## Ripple and Noise

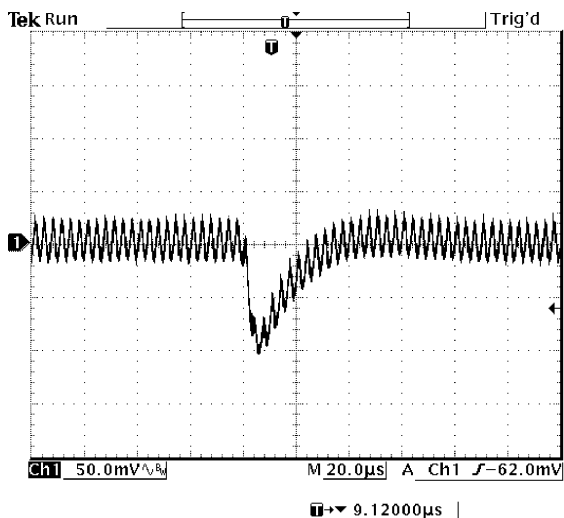


Ripple and noise at full load and 5Vdc input and Ta=25° C

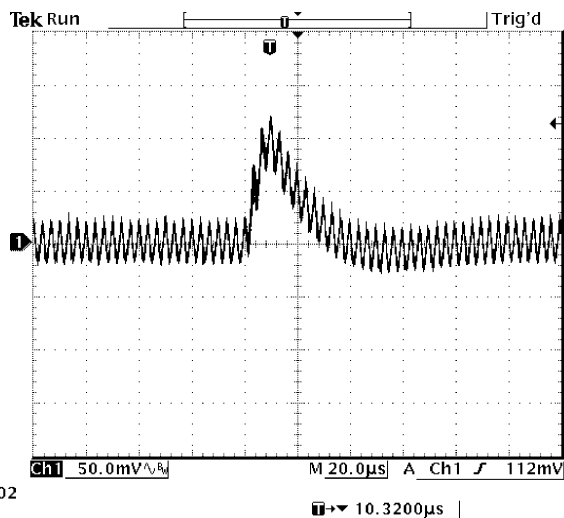
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## Transient Response

Transient response: di/dt = 0.5A/µS, external load capacitance Co = 470µF (electrolytic)



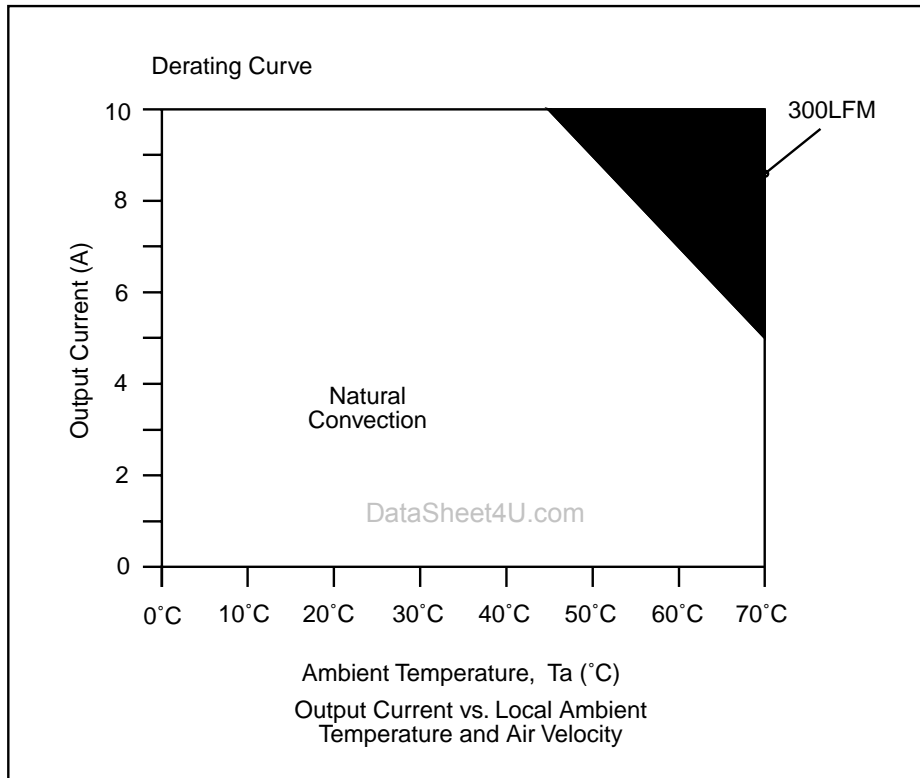
50% to 100% load transients at 5V input and Ta=25° C



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

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### Thermal Considerations



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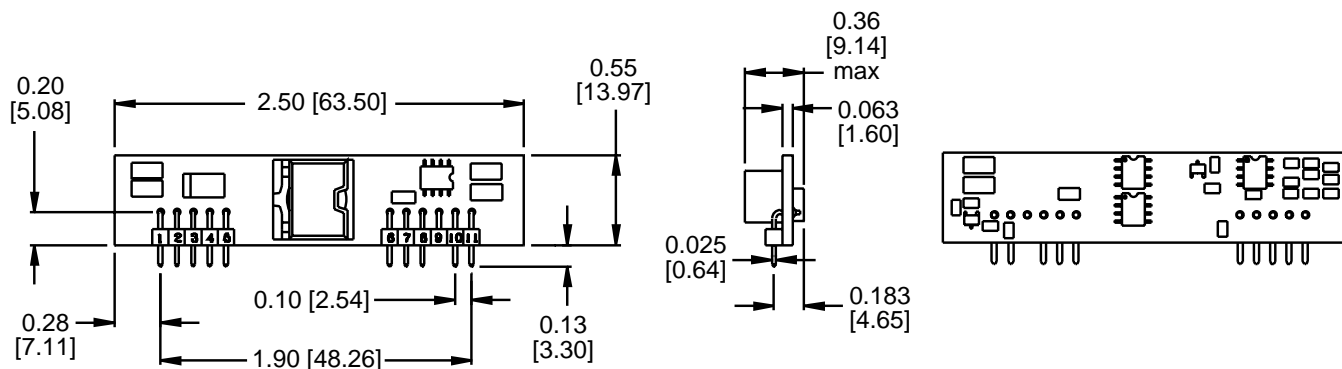
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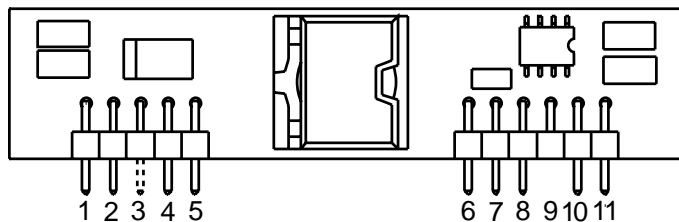
### Mechanical



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

Pin	Function
1	+Vo
2	+Vo
3*	No Pin
4	+Vo
5	Ground
6	Ground
7	+Vin
8	+Vin
9	No Pin
10	Trim
11	Remote On/Off

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\*Pin 3 used for remote sense option.

### 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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