

# NON-ISOLATED DC/DC CONVERTERS

12V Input / 1.5 – 3.3V Output / 10A

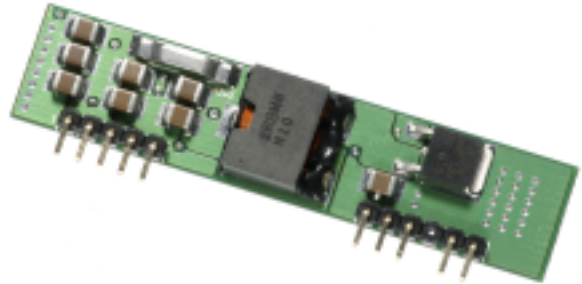


BP06VRPC-10A

## VRPC-10A Series

## RoHS Compliant

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



## Description

The Bel VRPC-10A series modules are non-isolated, step down DC/DC power converters that operate from a nominal 12V 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 and provide a maximum 10A output. Standard features include remote on/off, over current 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 12V 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	12V	10A	33W	91%	VRPC-10A330	VRPC-10A33S
2.5V	12V	10A	25W	89%	VRPC-10A250	VRPC-10A25S
1.5V	12V	10A	15W	85%	VRPC-10A150	VRPC-10A15S

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### Absolute Maximum Ratings

Parameter	Symbol	Min	Typical	Max	Unit
Continuous Input Voltage	V <sub>in</sub>	-0.3		15	V
Output Enable Terminal Voltage	V <sub>outen</sub>	-0.3		15	V
Ambient Temperature	T <sub>amb</sub>	0		70	°C
Storage Temperature	T <sub>stor</sub>	-40		100	°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	Symbol	Min	Typical	Max	Units
Operating Input Voltage	V <sub>in</sub>	10.8		13.2	V
Input Current	i <sub>in</sub>			3.8	A
No Load Input Current				50	mA
Remote Off Input Current			3	15	mA
Input Reflected Ripple Current <sup>1</sup>				50	mA <sub>rms</sub>
Input Reflected Ripple Current (P-P) <sup>1</sup>				180	mApk
I <sup>2</sup> t Inrush Current Transient			0.08	0.16	A <sup>2</sup> s
Turn On Voltage Threshold			9.7		V
Turn Off Voltage Threshold		8.0	8.8	10.0	V

Note: Input capacitance 470µF/16V, ESR = 0.03 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	3.247	3.3	3.353	V
	2.5V					
	1.5V					
Load Regulation	3.3V			7	16	mV
	2.5V			5	10	
	1.5V			3	10	
Line Regulation	All			3	10	mV
Regulation Over Temperature 0° - 70° C	3.3V			5	46	mV
	2.5V			5	35	
	1.5V			5	20	
Total Output Voltage Regulation	3.3V			15	72	mV
	2.5V			10	55	
	1.5V			10	40	
Output Ripple and Noise <sup>2</sup>	3.3V			55	100	mVp-p
	2.5V			50	100	
	1.5V			45	100	
Output Ripple and Noise <sup>2</sup>	3.3V			17	25	mVrms
	2.5V			15	25	
	1.5V			10	25	
Output Current Range	All	Iout	0		10	A
Output DC Current Limit	All	Ioutlim	13		22	A
Short Circuit Surge	3.3V	Ioutsurge		0.35	0.7	A <sup>2</sup> s
	2.5V			0.40	0.8	
	1.5V			0.35	0.7	
Turn on Time	All	Ton		50	80	ms
Overshoot at Turn On	All			0	3	%
Output Capacitance	All	Cout	100		3300	µF

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

1. Vin = 12V, 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			100	150	mV
Settling Time		Ts		40	70	$\mu s$
$\Delta V$ 100% to 50% of Max Load				100	150	mV
Settling Time		Ts		40	70	$\mu s$
<b>Transient Response <sup>3</sup></b>						
$\Delta V$ 50% to 100% of Max Load	2.5V			80	150	mV
Settling Time		Ts		30	70	$\mu s$
$\Delta V$ 100% to 50% of Max Load				80	150	mV
Settling Time		Ts		30	70	$\mu s$
<b>Transient Response <sup>3</sup></b>						
$\Delta V$ 50% to 100% of Max Load	1.5V			60	150	mV
Settling Time		Ts		30	70	$\mu s$
$\Delta V$ 100% to 50% of Max Load				60	150	mV
Settling Time		Ts		30	70	$\mu s$

Note: All specifications are typical at nominal input, full load at 25° C unless otherwise stated.  
 3. di/dt = 0.5A/ $\mu s$ , Vin = 12VDC, Ta = 25° 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>	c	$\eta$	88 86 82	91 89 85		%
Switching Frequency	All	Fsw	180	200	220	kHz
Output Voltage Trim Range	3.3V 2.5V 1.5V		85 70 90		110 120 120	%
Remote Sense Compensation	All				0.5	V
Weight	All			9.5		g

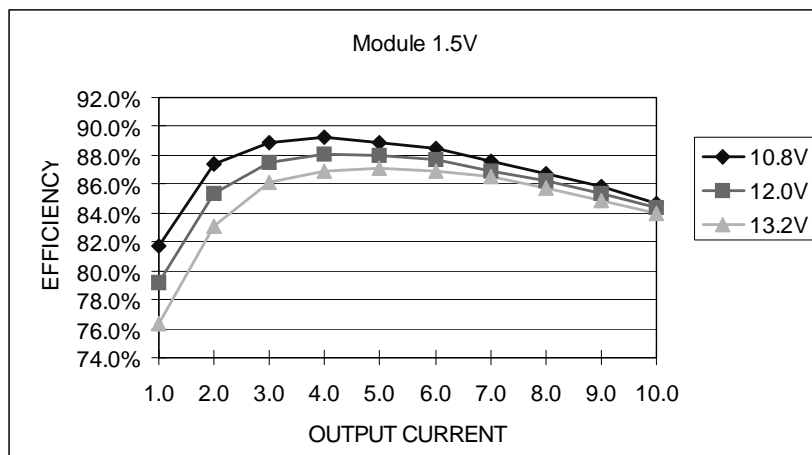
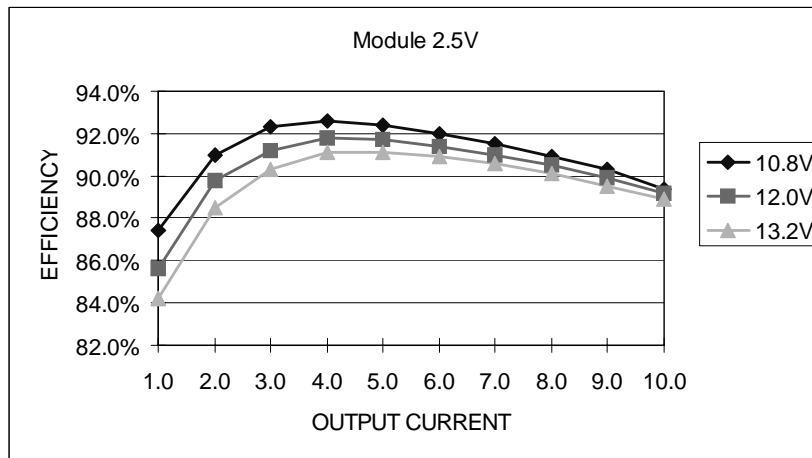
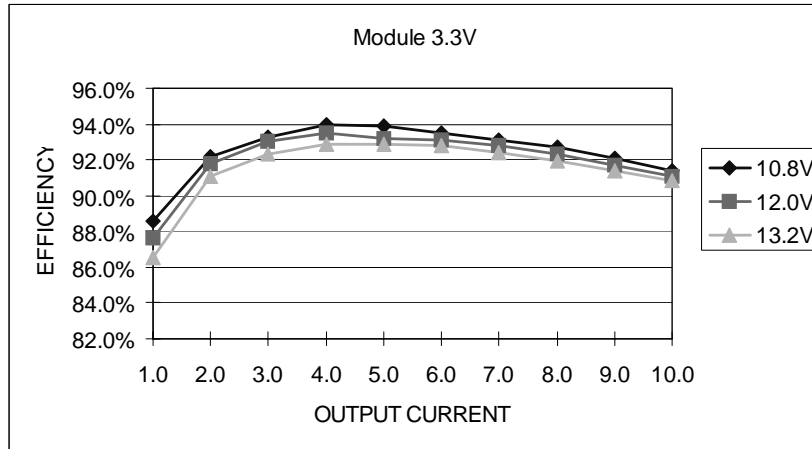
1. Vin=12V, full load and Ta=25° C.

### Control Specifications

Parameter	Module	Symbol	Min	Typical	Max	Units
Remote On/Off	All	Vouten				V
Signal Low (Unit Off)	All		-0.3		0.3	V
Signal High (Unit On)	All		2.8		13.2	V

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**Efficiency Data**



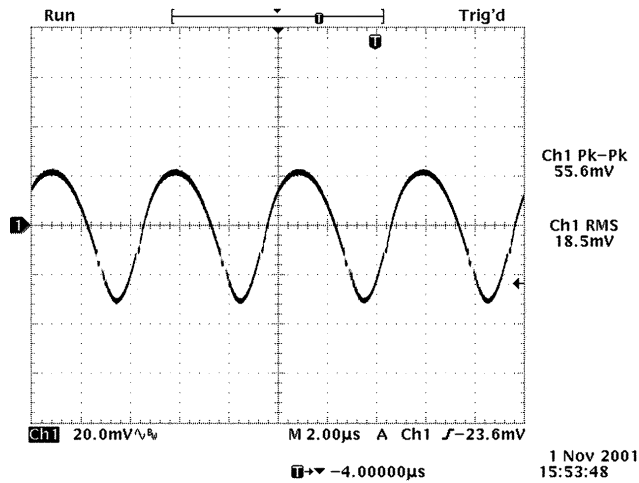
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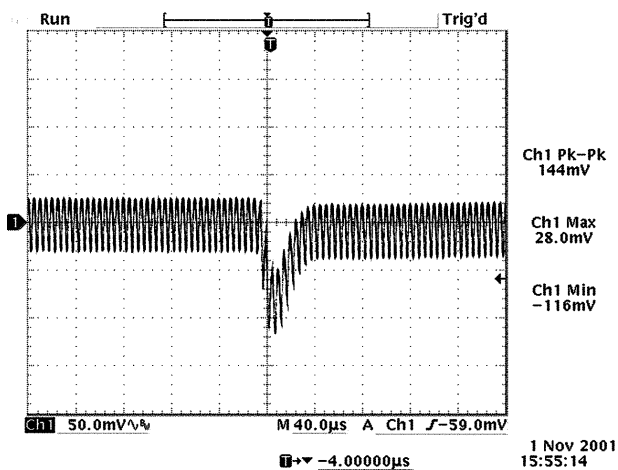
## Ripple and Noise



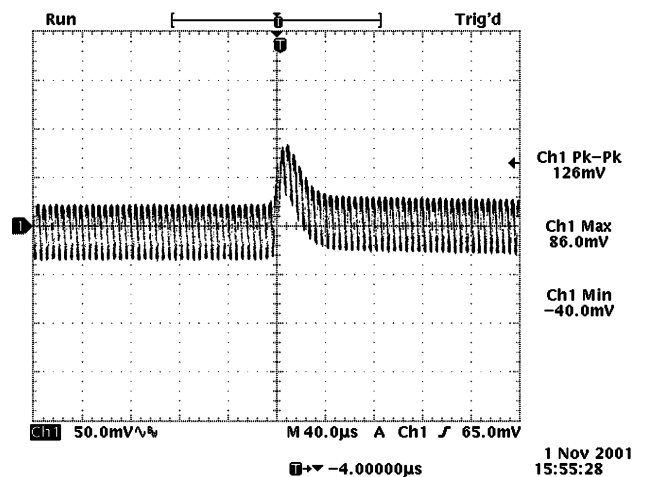
Ripple and noise at full load and 12Vdc input and  $T_a=25^\circ\text{C}$

## Transient Response

Transient response:  $di/dt = 0.5A/\mu\text{S}$ , external load capacitance  $C_o = 470\mu\text{F}$  (electrolytic)



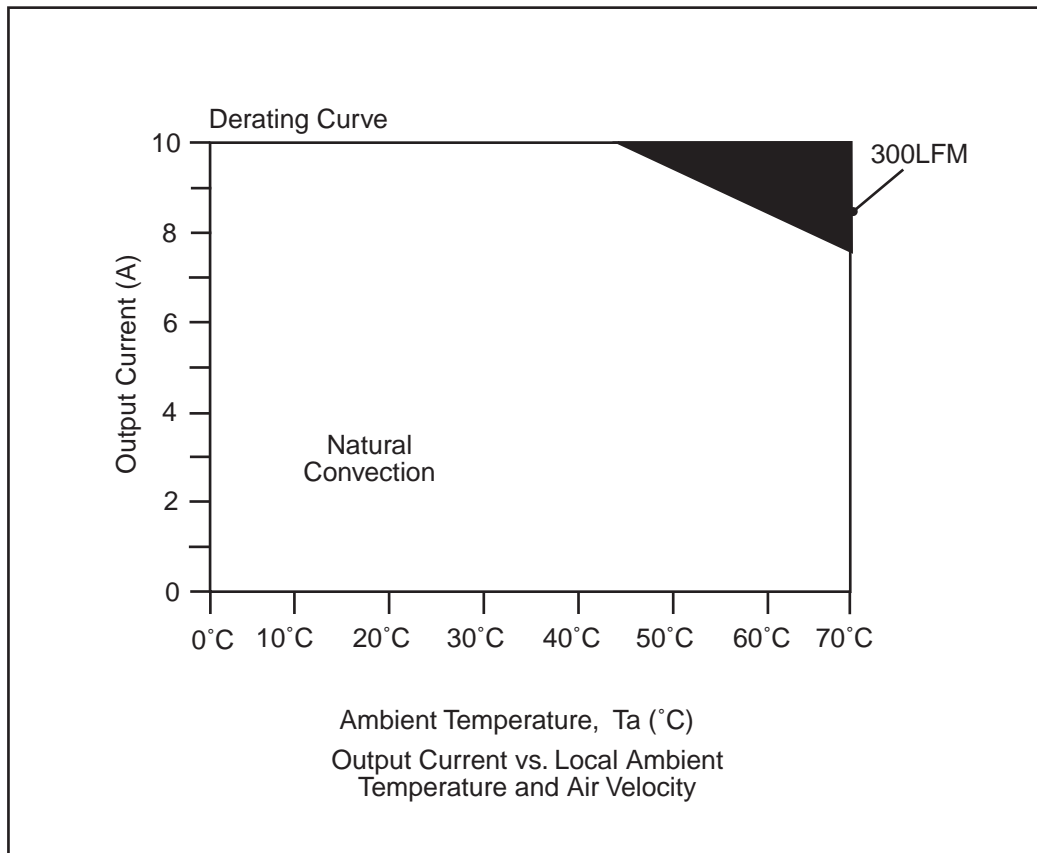
50% to 100% load transients at 12V input and  $T_a=25^\circ\text{C}$



100% to 50% load transients at 12V input and  $T_a=25^\circ\text{C}$

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### Thermal Considerations





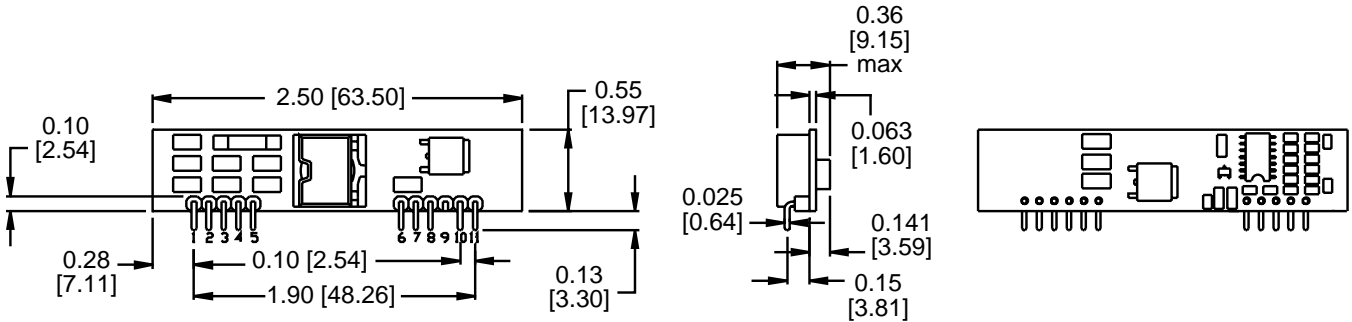
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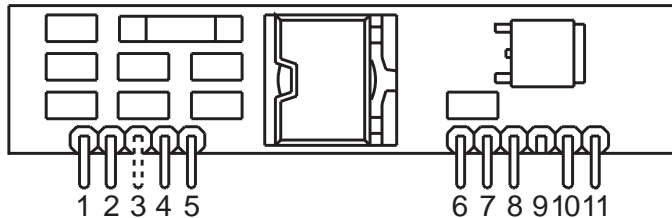
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## Mechanical



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



\*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. 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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