

NON-ISOLATED DC/DC CONVERTERS

5V Input / 1.5 – 3.3V Output / 10A



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

Absolute Maximum Ratings

Parameter	Symbol	Min	Typical	Max	Unit
Continuous Input Voltage	V _{in}	-0.3		6	V
Output Enable Terminal Voltage	V _{outen}	-0.3		6	V
Ambient Temperature	T _{amb}	0		70	°C
Storage Temperature	T _{stor}	-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.

Input Specifications

Parameter	Symbol	Min	Typical	Max	Units
Operating Input Voltage	V _{in}	4.5		5.5	V
Input Current	I _{in}			9.5	A
No Load Input Current			35	50	mA
Remote Off Input Current			3	10	mA
Input Reflected Ripple Current ¹			10	20	mA _{rms}
Input Reflected Ripple Current (P-P) ¹			40	80	mApk
I ² t Inrush Current Transient			0.05	0.07	A ² 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 ¹	3.3V 2.5V 1.5V	Vout	3.234 2.450 1.470	3.3 2.5 1.5	3.366 2.550 1.530	V
Load Regulation	3.3V 2.5V 1.5V			8 6 5	16 12 10	mV
Line Regulation	All			5	10	mV
Regulation Over Temperature 0° - 70° C	3.3V 2.5V 1.5V			20 17 15	40 30 25	mV
Total Output Voltage Regulation	3.3V 2.5V 1.5V			33 28 25	66 52 45	mV
Output Ripple and Noise ²	All			50	100	mVp-p
Output Ripple and Noise ²	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 2.5V 1.5V	Ioutsurge		0.25 0.2 0.1	0.3 0.25 0.15	A ² s
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.

Output Specifications

Parameter	Module	Symbol	Min	Typical	Max	Units
Transient Response ³						
ΔV 50% to 100% of Max Load	3.3V			90	150	mV
Settling Time		Ts		40	80	μs
ΔV 100% to 50% of Max Load				100	150	mV
Settling Time		Ts		40	80	μs
Transient Response ³						
ΔV 50% to 100% of Max Load	2.5V			90	130	mV
Settling Time		Ts		40	80	μs
ΔV 100% to 50% of Max Load				90	130	mV
Settling Time		Ts		40	80	μs
Transient Response ³						
ΔV 50% to 100% of Max Load	1.5V			70	120	mV
Settling Time		Ts		40	80	μs
ΔV 100% to 50% of Max Load				80	120	mV
Settling Time		Ts		40	80	μs

Note: All specifications are typical at nominal input, full load at 25° C unless otherwise stated.
 3. di/dt = 0.5A/ μs , Vin = 5VDC, Ta = 25° C, and with a 470 μF aluminum cap on output.

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General Specifications

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

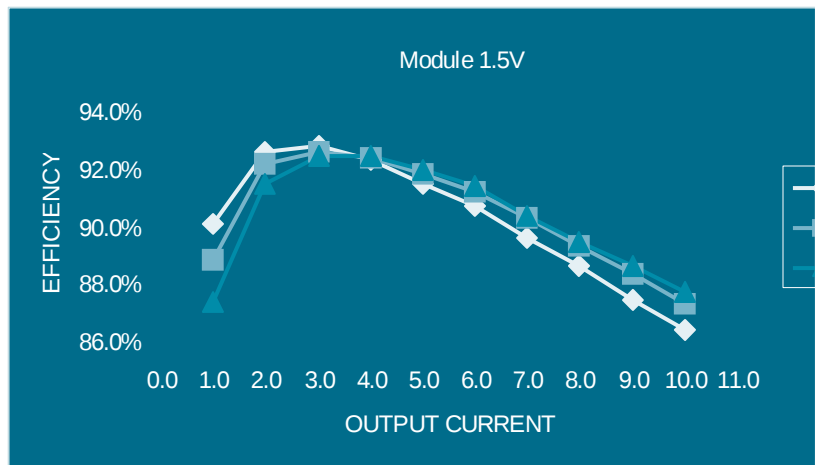
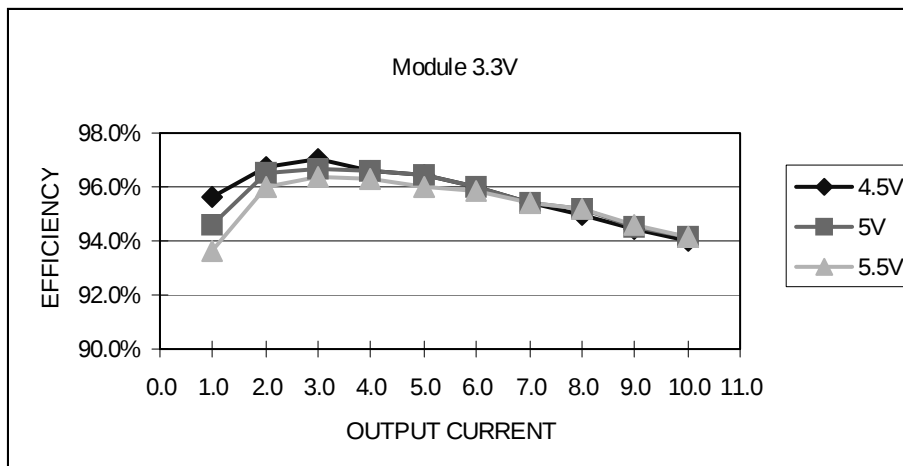
1. Vin=5V, full load and Ta=25° C.

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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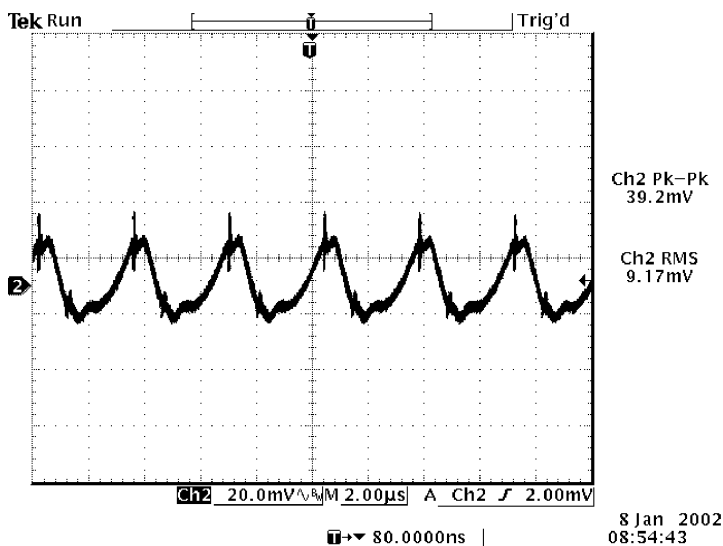
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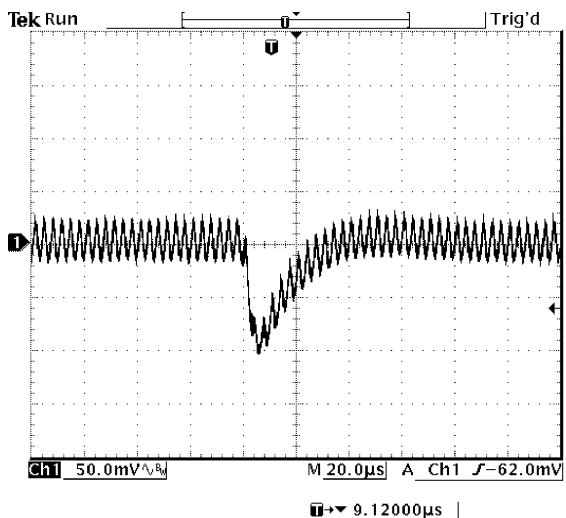
Ripple and Noise



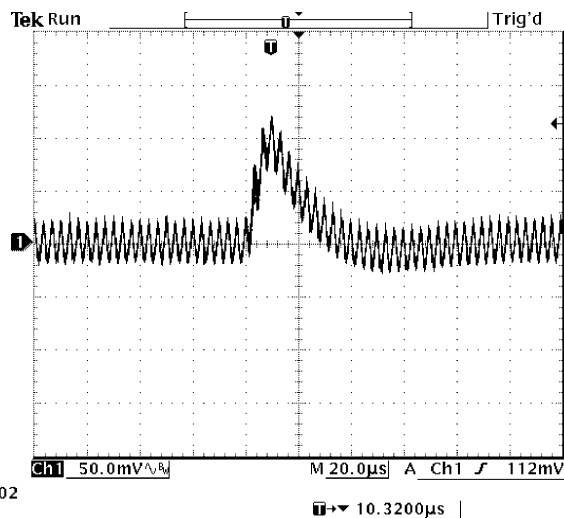
Ripple and noise at full load and 5Vdc input and $T_a=25^\circ\text{C}$

Transient Response

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

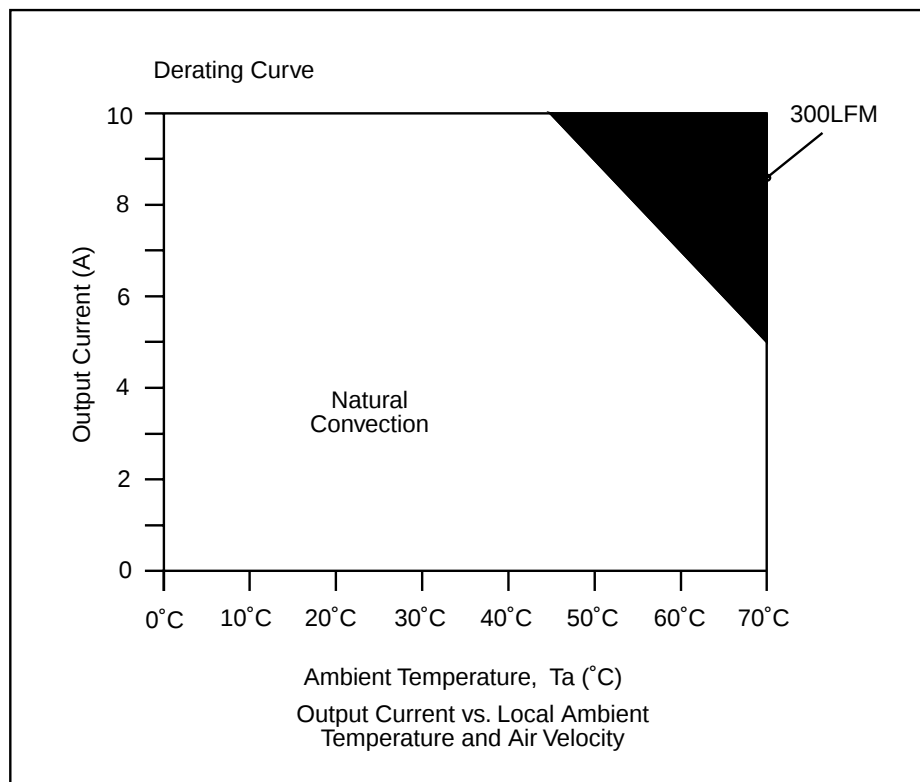


50% to 100% load transients at 5V input and $T_a=25^\circ\text{C}$



100% to 50% load transients at 5V input and $T_a=25^\circ\text{C}$

Thermal Considerations



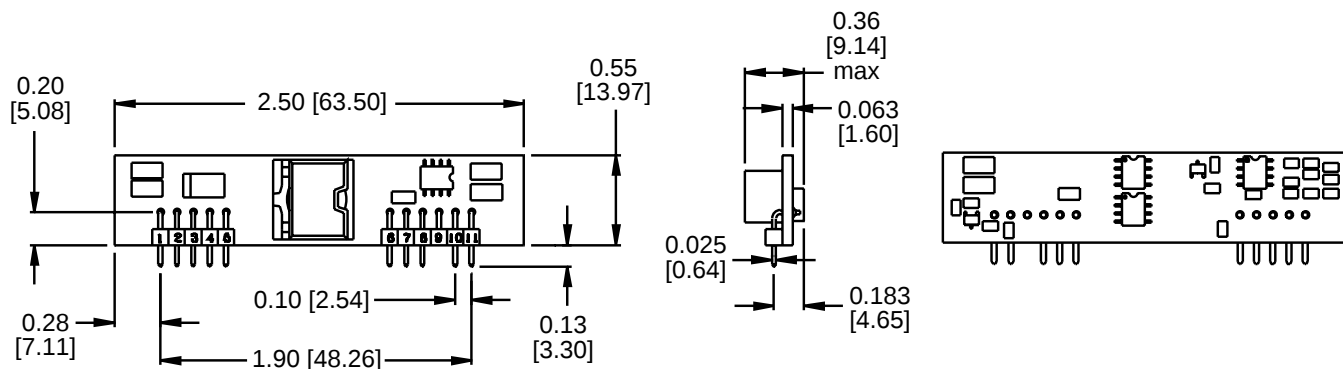
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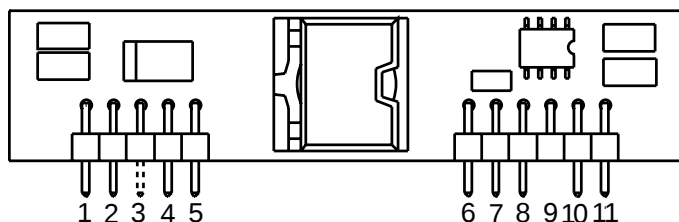
Mechanical



Dimensions are in inches [millimeters].

Standard dimension tolerance is ± 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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