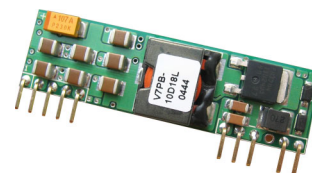


NON-ISOLATED DC/DC CONVERTERS**3.0V-13.2V Input****0.9V-5.0V/10A Output****bel**
POWER PRODUCTS**V7PB-10D Series**

- Non-Isolated
- High Efficiency
- High Power Density
- Excellent Thermal Performance
- Low Cost
- Remote On/Off
- Under-voltage Lockout (UVLO)
- OCP/SCP
- Wide Input

**Description**

The Bel V7PB-10Dxxx is part of the low cost non-isolated DC/DC power converter series. The modules use a SIP package for ease of layout and space savings. The output is closely regulated and the efficiency is typically 93% at full load. Typical features include Remote On/Off, under-voltage lockout, over-current protection and short circuit protection.

Part Selection

Output Voltage	Input Voltage	Max. Output Current	Max. Output Power	Typ. Efficiency at Vin=12V	Model Number Active Low	Model Number Active High
5.0V	8.0V – 13.2V	10A	50.0W	93%	V7PB-10D50L	V7PB-10D50S
3.3V	4.5V – 13.2V	10A	33.0W	91%	V7PB-10D33L	V7PB-10D33S
2.5V	3.1V – 13.2V	10A	25.0W	89%	V7PB-10D25L	V7PB-10D25S
1.8V	3.0V – 13.2V	10A	18.0W	86%	V7PB-10D18L	V7PB-10D18S
1.5V	3.0V – 13.2V	10A	15.0W	84%	V7PB-10D15L	V7PB-10D15S
1.2V	3.0V – 13.2V	10A	12.0W	81%	V7PB-10D12L	V7PB-10D12S
0.9V	3.0V – 13.2V	10A	9.0W	78%	V7PB-10D09L	V7PB-10D09S

Note: Add “G” suffix at the end of the model number to indicate “Tray Packaging”.

Absolute Maximum Ratings

Parameter	Min	Typ	Max	Notes
Input Voltage (continuous)	-0.3V	-	15V	
Output Enable Terminal Voltage	-0.3V	-	15V	
Ambient Temperature	-40°C	-	85°C	
Storage Temperature	-40°C	-	125°C	

Input Specifications

Parameter	Min	Typ	Max	Notes
Input Voltage				
Vo=5.0V	8V		13.2V	
Vo=3.3V	4.5V	-	13.2V	
Vo=2.5V	3.1V		13.2V	
Vo=0.9-1.8V	3.0V		13.2V	
Input Current (full load)				
Vin=3.3V	-	-	10.0A	
Vin=5.0V	-	-	8.8A	
Vin=13.2V	-	-	5.5A	
Input Current (no load)				
Vin=3.3V	-	-	200mA	
Vin=5.0V	-	-	200mA	
Vin=13.2V	-	-	150mA	

NON-ISOLATED DC/DC CONVERTERS**3.0V-13.2V Input****0.9V-5.0V/10A Output****Input Specifications (continued)**

Parameter	Min	Typ	Max	Notes
Input Reflected Ripple Current (pk-pk)	-	-	250mA	Tested with a 22uF tantalum input capacitor & simulated source impedance of 500nH, 5Hz to 20MHz.
Input Reflected Ripple Current (RMS)	-	-	70mA	
I ² t Inrush Current Transient	-	0.04A ² s	0.08A ² s	
Turn-on Voltage Threshold	-	2.9V	-	
Turn-off Voltage Threshold				
Vo=5.0V	-	-	5.5V	
Vo=3.3V	-	-	3.8V	
Vo=0.9-2.5V	-	-	2.95V	

Output Specifications

Parameter	Min	Typ	Max	Notes
Output Voltage Set Point				Test condition: Vin=12V, Iout=full load
Vo=5.0V	4.900V	5.0V	5.100V	
Vo=3.3V	3.247V	3.3V	3.353V	
Vo=2.5V	2.460V	2.5V	2.540V	
Vo=1.8V	1.772V	1.8V	1.828V	
Vo=1.5V	1.476V	1.5V	1.524V	
Vo=1.2V	1.181V	1.2V	1.219V	
Vo=0.9V	0.886V	0.9V	0.914V	
Load Regulation				
Vo=5.0V	-	10mV	20mV	
Vo=3.3V	-	6mV	16mV	
Vo=2.5V	-	6mV	12mV	
Vo=1.8V	-	5mV	9mV	
Vo=1.5V	-	3mV	7mV	
Vo=1.2V	-	3mV	6mV	
Vo=0.9V	-	3mV	5mV	
Line Regulation				
Vo=5.0V	-	2mV	10mV	
Vo=3.3V	-	2mV	10mV	
Vo=2.5V	-	2mV	8mV	
Vo=1.8V	-	2mV	5mV	
Vo=1.5V	-	2mV	5mV	
Vo=1.2V	-	2mV	5mV	
Vo=0.9V	-	2mV	5mV	
Regulation Over Temperature (-40°C to 85 °C)				
Vo=5.0V	-	8mV	35mV	
Vo=0.9-3.3V	-	5mV	35mV	
Output Current	0A	-	10A	
Current Limit Threshold	13A	-	25A	
Short Circuit Surge Transient	-	0.8A ² s	1.5A ² s	
Ripple and Noise Vin=12V (Test condition: 0-20MHz BW, 22uF tan. capacitor on output)				
Vo=5.0V	-	75mV	120mV	Pk-pk
Vo=3.3V	-	75mV	100mV	
Vo=2.5V	-	60mV	80mV	
Vo=1.5-1.8V	-	45mV	60mV	
Vo=0.9-1.2V	-	40mV	55mV	
Vo=5.0V	-	25mV	50mV	RMS
Vo=3.3V	-	25mV	40mV	
Vo=2.5V	-	20mV	35mV	
Vo=1.5-1.8V	-	15mV	25mV	
Vo=0.9-1.2V	-	12mV	20mV	

NON-ISOLATED DC/DC CONVERTERS**3.0V-13.2V Input****0.9V-5.0V/10A Output****Output Specifications (continued)**

Parameter	Min	Typ	Max	Notes
Ripple and Noise Vin=5.0V (Test condition: 0-20MHz BW, 22uF tan. capacitor on output)				
Vo=1.5-3.3V	-	35mV	70mV	Pk-pk
Vo=0.9-1.2V	-	30mV	70mV	
Vo=0.9-3.3V	-	10mV	15mV	RMS
Ripple and Noise Vin=3.3V (Test condition: 0-20MHz BW, 22uF tan. capacitor on output)				
Vo=2.5V	-	15mV	70mV	Pk-pk
Vo=1.8V	-	20mV	70mV	
Vo=1.2-1.5V	-	25mV	70mV	
Vo=0.9V	-	30mV	70mV	
Vo=2.5V	-	5mV	15mV	RMS
Vo=1.8V	-	6mV	15mV	
Vo=0.9-1.5V	-	8mV	15mV	
Turn on Time	-	-	80mS	
Overshoot at Turn on	-	-	5%Vo,set	
Output Capacitance	0uF	-	3300uF	
Transient Response Vin=12V				
50% ~ 100% Max Load	Vo=5V	-	100mV	150mV
Settling Time		-	50uS	80uS
100% ~ 50% Max Load		-	100mV	150mV
Settling Time		-	50uS	80uS
50% ~ 100% Max Load	Vo=3.3V	-	80mV	120mV
Settling Time		-	40uS	80uS
100% ~ 50% Max Load		-	60mV	100mV
Settling Time		-	40uS	80uS
50% ~ 100% Max Load	Vo=2.5V	-	60mV	100mV
Settling Time		-	40uS	80uS
100% ~ 50% Max Load		-	40mV	80mV
Settling Time		-	40uS	80uS
50% ~ 100% Max Load	Vo=1.8V	-	60mV	100mV
Settling Time		-	40uS	80uS
100% ~ 50% Max Load		-	40mV	80mV
Settling Time		-	40uS	80uS
50% ~ 100% Max Load	Vo=1.5V	-	60mV	90mV
Settling Time		-	50uS	80uS
100% ~ 50% Max Load		-	40mV	80mV
Settling Time		-	50uS	80uS
50% ~ 100% Max Load	Vo=1.2V	-	60mV	90mV
Settling Time		-	40uS	80uS
100% ~ 50% Max Load		-	40mV	80mV
Settling Time		-	40uS	80uS
50% ~ 100% Max Load	Vo=0.9V	-	40mV	80mV
Settling Time		-	40uS	80uS
100% ~ 50% Max Load		-	40mV	80mV
Settling Time		-	40uS	80uS

di/dt = 0.5A/uS; Vin = 12V;
Ta = 25°C and with a 470uF
Aluminum capacitor at the
output

NON-ISOLATED DC/DC CONVERTERS**3.0V-13.2V Input****0.9V-5.0V/10A Output****Output Specifications (continued)**

Parameter		Min	Typ	Max	Notes
Transient Response Vin=5.0V					
50% ~ 100% Max Load	Vo=2.5-3.3V	-	120mV	160mV	di/dt = 0.5A/uS; Vin = 5V; Ta = 25°C and with a 470uF Aluminum capacitor at the output
Settling Time		-	50uS	80uS	
100% ~ 50% Max Load		-	120mV	160mV	
Settling Time		-	50uS	80uS	
50% ~ 100% Max Load	Vo=1.8V	-	110mV	150mV	
Settling Time		-	50uS	80uS	
100% ~ 50% Max Load		-	110mV	150mV	
Settling Time		-	50uS	80uS	
50% ~ 100% Max Load	Vo=0.9-1.5V	-	80mV	120mV	
Settling Time		-	50uS	80uS	
100% ~ 50% Max Load		-	80mV	120mV	
Settling Time		-	50uS	80uS	
Transient Response Vin=3.3V					
50% ~ 100% Max Load	Vo=2.5V	-	150mV	200mV	di/dt = 0.5A/uS; Vin = 3.3V; Ta = 25°C and with a 470uF Aluminum capacitor at the output
Settling Time		-	50uS	80uS	
100% ~ 50% Max Load		-	150mV	200mV	
Settling Time		-	50uS	80uS	
50% ~ 100% Max Load	Vo=1.8V	-	130mV	180mV	
Settling Time		-	50uS	80uS	
100% ~ 50% Max Load		-	130mV	180mV	
Settling Time		-	50uS	80uS	
50% ~ 100% Max Load	Vo=1.5V	-	120mV	160mV	
Settling Time		-	50uS	80uS	
100% ~ 50% Max Load		-	120mV	160mV	
Settling Time		-	50uS	80uS	
50% ~ 100% Max Load	Vo=1.2V	-	140mV	180mV	
Settling Time		-	50uS	80uS	
100% ~ 50% Max Load		-	140mV	180mV	
Settling Time		-	50uS	80uS	
50% ~ 100% Max Load	Vo=0.9V	-	120mV	160mV	
Settling Time		-	50uS	80uS	
100% ~ 50% Max Load		-	120mV	160mV	
Settling Time		-	50uS	80uS	

Note: All specifications are typical at 25°C unless otherwise stated.

NON-ISOLATED DC/DC CONVERTERS**3.0V-13.2V Input****0.9V-5.0V/10A Output****General Specifications**

Parameter	Min	Typ	Max	Notes
Efficiency (Vin=12V, Io=Io-max)				
Vo=5.0V	90%	93%	-	
Vo=3.3V	87%	91%	-	
Vo=2.5V	85%	89%	-	
Vo=1.8V	81%	86%	-	
Vo=1.5V	80%	84%	-	
Vo=1.2V	77%	81%	-	
Vo=0.9V	73%	78%	-	
Efficiency (Vin=5.0V, Io=Io-max)				
Vo=3.3V	89%	92%	-	
Vo=2.5V	87%	90%	-	
Vo=1.8V	83%	87%	-	
Vo=1.5V	82%	85%	-	
Vo=1.2V	78%	81%	-	
Vo=0.9V	74%	77%	-	
Efficiency (Vin=3.3V, Io=Io-max)				
Vo=2.5V	89%	92%	-	
Vo=1.8V	84%	88%	-	
Vo=1.5V	82%	86%	-	
Vo=1.2V	80%	84%	-	
Vo=0.9V	77%	80%	-	
Switching Frequency				
Vo=0.9V	163KHz	170KHz	187KHz	
Vo=1.2-5.0V	180KHz	200KHz	220KHz	
Output Trim Range				
Vo=0.9V	-	-	120%Vo	
Vo=1.2-5.0V	90%Vo	-	110%Vo	
MTBF	2,140,721 hours			Calculated Per Bell Core TR-332 (Io =80%Io,max; Vo=1.8V; Vin=12V; Ta = 25°C)
Dimensions				
Inches (L × W × H)	2.0 x 0.55 x 0.387			
Millimeters (L × W × H)	50.8 x 13.97 x 9.84			
Remote sense compensation	-	-	10%	
Weight	-	10g	-	

Note: All specifications are typical at 25°C unless otherwise stated.**Control Specifications**

Parameter	Min	Typ	Max	Notes
Remote On/Off				
Signal Low (Unit Off)	-0.3V	-	0.4V	V7PB-10DxxS
Signal High (Unit On)	2.8V	-	13.2V	
Signal Low (Unit On)	-0.3V	-	0.4V	V7PB-10DxxL
Signal High (Unit Off)	2.8V	-	13.2V	

NON-ISOLATED DC/DC CONVERTERS

3.0V-13.2V Input

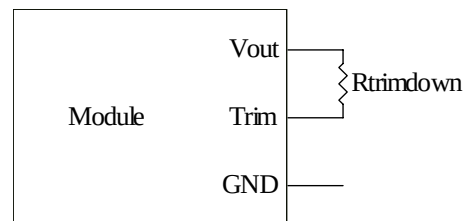
0.9V-5.0V/10A Output



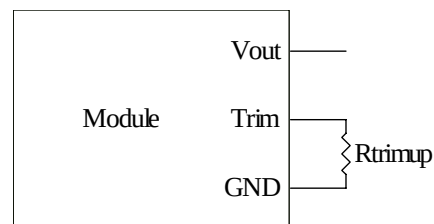
Output Trim Equations

Equations for calculating the trim resistor (in kΩ) given the desired adjusted voltage (V_{adj}) and the nominal output voltage of the converter (V_{nom}) are shown below. The Trim Down resistor should be connected between the Trim pin and Vout. The Trim Up resistor should be connected between the Trim pin and Ground. Only one of the resistors should be used for any given application.

$$R_{TrimDown} = \frac{A}{V_{nom} - V_{adj}} - B$$



$$R_{TrimUp} = \frac{C}{V_{adj} - V_{nom}} - D$$



Vnom	A	B	C	D
5.5	31.58	17.51	6.01	10.00
3.3	11.63	13.74	3.72	9.09
2.5	7.92	13.74	3.72	9.09
1.8	4.69	21.55	3.72	16.90
1.5	3.25	21.55	3.72	16.90
1.2	1.78	9.07	3.54	4.64
0.9	-	-	1.46	0.909

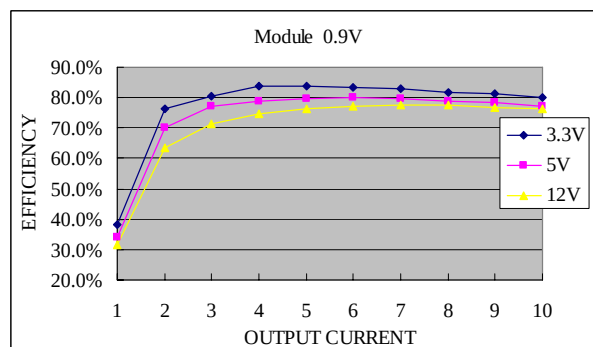
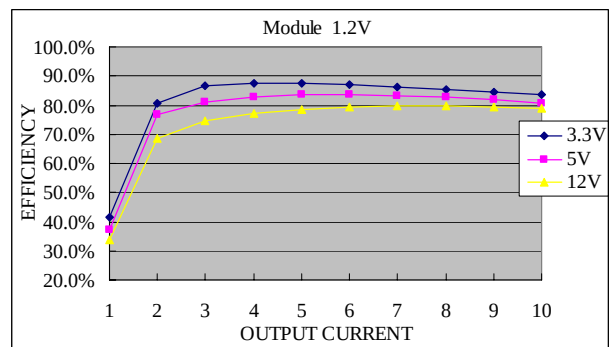
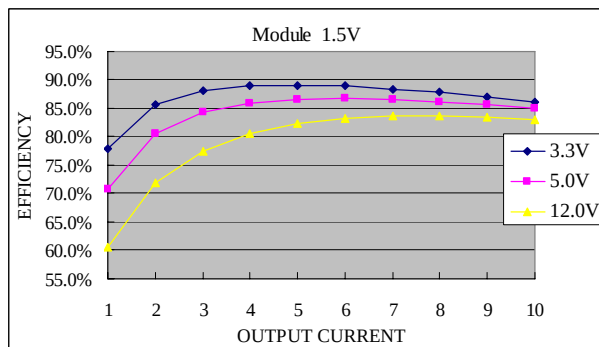
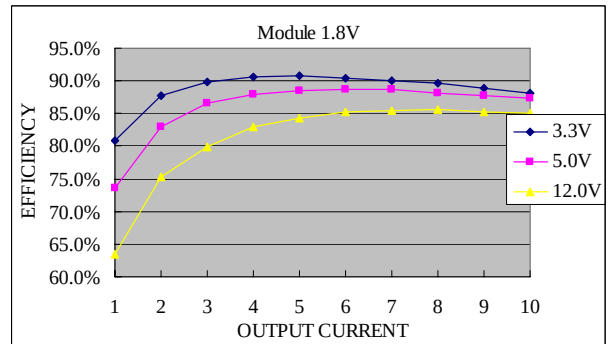
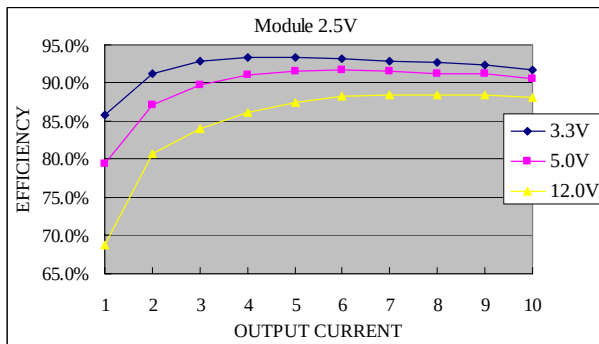
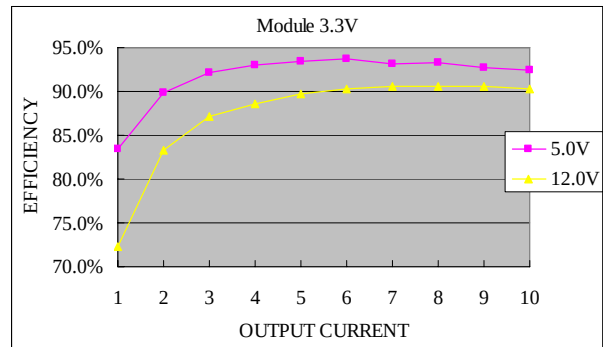
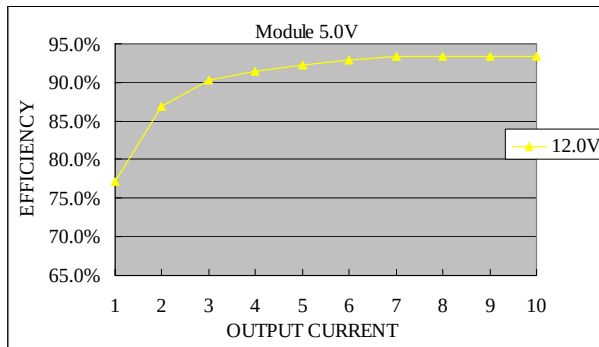
NON-ISOLATED DC/DC CONVERTERS

3.0V-13.2V Input

0.9V-5.0V/10A Output



Efficiency Data



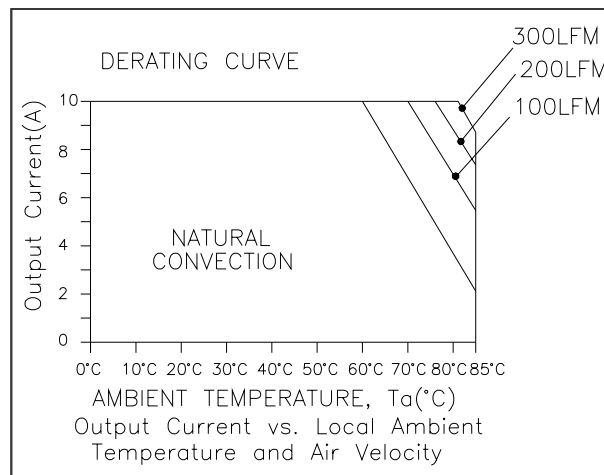
NON-ISOLATED DC/DC CONVERTERS

3.0V-13.2V Input

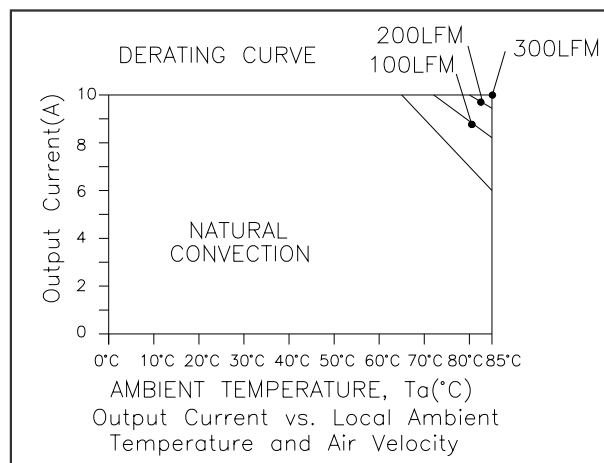
0.9V-5.0V/10A Output



Thermal Derating Curves



$V_{in}=13.2\text{V}$

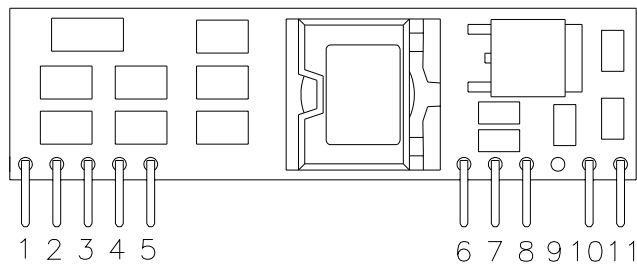
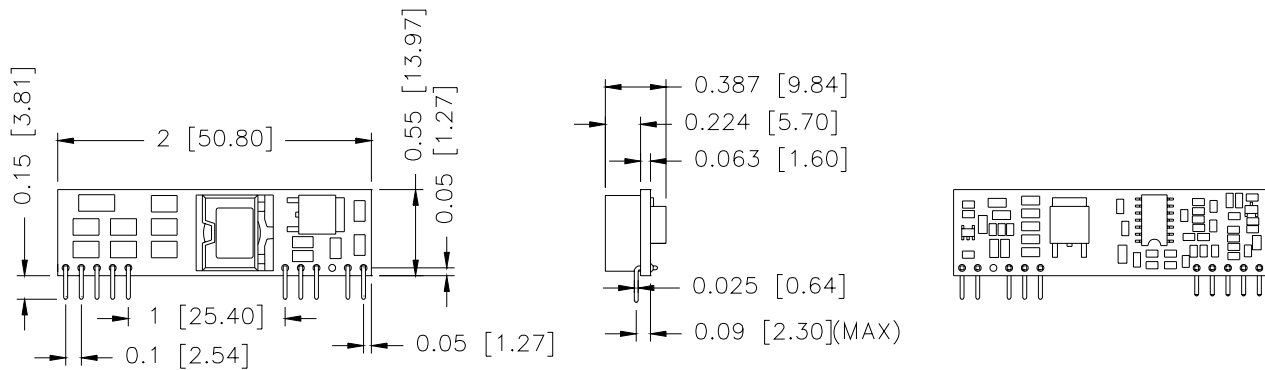


$V_{in}=5.5\text{V}$ & $V_{in}=3.63\text{V}$

NON-ISOLATED DC/DC CONVERTERS

3.0V-13.2V Input

0.9V-5.0V/10A Output



Pin Connections

Pin	Function
1	Vo+
2	Vo+
3	Opt. Remote Sense (+)
4	Vo+
5	Ground
6	Ground
7	Vin+
8	Vin+
9	Not used
10	Trim
11	Remote On/Off

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