

NON-ISOLATED DC/DC CONVERTERS

3.0V-5.5V Input

0.75V-3.63V/6A Output

bel
POWER PRODUCTS

x7PB-06F1Ax Series

- Non-Isolated
- High Efficiency
- High Power Density
- Excellent Thermal Performance
- Low Cost
- Remote On/Off
- Remote Sense
- Under Voltage Lockout (UVLO)
- OCP/SCP
- Over Temperature Protection
- Wide Trim Range
- Power Good Output Signal
- Can Sink & Source Current



Description

The Bel x7PB-06F1Ax modules are a series of non-isolated high density open frame DC/DC converters that can deliver up to 6A of output current with full load efficiency of 94% at 3.3V output. These modules provide precisely regulated voltage programmable via external resistor from 0.75V to 3.63V over a wide range of input voltage ($V_{in}=3.0V-5.5V$). Standard features include remote On/Off, programmable output voltage, over current protection, over thermal shutdown and short circuit protection.

Part Selection

Output Voltage	Input Voltage	Max. Output Current	Max. Output Power	Typical Efficiency	Model Number Active High	Model Number Active Low
0.75V – 3.63V	3.0V–5.5V	6A	22W	94%	V7PB-06F1A0	V7PB-06F1AL

Note: Add “G” suffix at the end of the model number listed above to indicate Tray Packaging. Change the first letter of the model number from “V” to “O” for horizontal mount package.

Absolute Maximum Ratings

Parameter	Min	Typ	Max	Notes
Input Voltage (continuous)	-0.3V	-	5.8V	
Output Enable Terminal Voltage	-0.3V	-	5.5V	
Ambient Temperature	-40°C	-	85°C	
Storage Temperature	-40°C	-	125°C	

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

Input Specifications

Parameter	Min	Typ	Max	Notes
Input Voltage				
$V_o \leq 1.8V$	3.0V	-	5.5V	
$V_o = 2.5V-3.3V$	4.5V	-	5.5V	
Input Current (full load)				
$V_{in}=4.5-5.5V; V_o=3.3V$	-	4.21A	-	
$V_{in}=4.5-5.5V; V_o=2.5V$	-	3.26A	-	
$V_{in}=3.0-5.5V; V_o=1.8V$	-	2.43A	-	
$V_{in}=3.0-5.5V; V_o=1.5V$	-	2.07A	-	
$V_{in}=3.0-5.5V; V_o=1.2V$	-	1.69A	-	
$V_{in}=3.0-5.5V; V_o=0.75V$	-	1.14A	-	

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Input Specifications (Continued)

Parameter	Min	Typ	Max	Notes
Input Current (no load)				
$V_o=3.3V$	-	100mA	-	
$V_o=0.75V$	-	50mA	-	
Remote Off Input Current	-	10mA	-	
Input Reflected Ripple Current (pk-pk)	-	120mA	-	Tested with simulated source impedance of 1uH, 5Hz to 20MHz.
Input Reflected Ripple Current (RMS)	-	35mA	-	
I^2t Inrush Current Transient	-	-	0.04A ² s	
Turn-on Voltage Threshold	-	2.7V	3.0V	
Turn-off Voltage Threshold	1.8V	2.6V	-	

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

Output Specifications

Parameter	Min	Typ	Max	Notes
Output Voltage Set Point	-2% $V_{o,set}$	-	2% $V_{o,set}$	$V_{in}=5V$, 50% full load
Output Voltage Set Point	-3% $V_{o,set}$	-	3% $V_{o,set}$	Over all operating input voltages, resistive loads and temperature conditions
Adjustment Range	0.7525V	-	3.63V	Selected by external resistor or voltage
Load Regulation	-	0.4% $V_{o,set}$	-	$I_o=I_o$, min to 50% I_o , max
Line Regulation	-	0.3% $V_{o,set}$	-	$V_{in}=V_{in}$, min to V_{in} , max
Temperature Regulation	-	0.4% $V_{o,set}$	-	$T_{ref}=T_{amin}$ to T_{amax}
Output Current	0A	-	6A	
Current Limit Threshold	9A	-	18A	
Short Circuit Surge Transient	-	0.32A ² s	-	
Ripple and Noise (pk-pk)	-	40mV	70mV	Tested with 0-20MHz, with external 10uF Tantalum capacitor and 1uF/10V TDK ceramic capacitor at the output.
Ripple and Noise (RMS)	-	10mV	30mV	
Turn on Time	-	6mS	10mS	
Overshoot at Turn on	-	-	3% V_o	
External Load Capacitance				
Min ESR \geq 1mohm	0uF		1000uF	
Max ESR \geq 10mohm	0uF		3000uF	
Transient Response				
50% ~ 100% Max Load	$V_o = 0.75V - 3.63V$	-	150mV	Test conditions: $di/dt=2.5A/uS$; $V_{in}=5V$; with external 10uF Tantalum capacitor and 1uF/10V TDK ceramic capacitor at the output.
Settling Time		-	25uS	
100% ~ 50% Max Load		-	150mV	
Settling Time		-	25uS	

Note: All specifications are typical at nominal input ($V_{in}=5V$), full load at 25°C unless otherwise stated.

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General Specifications

Parameter	Min	Typ	Max	Notes
Efficiency (Current Source)				Measured at Vin=5V, full load
Vo=3.3V	-	94%	-	
Vo=2.5V	-	92%	-	
Vo=1.8V	-	89%	-	
Vo=1.5V	-	87%	-	
Vo=1.2V	-	85%	-	
Vo=0.75V	-	79%	-	
Switching Frequency	250KHz	300KHz	350KHz	
Output Voltage Trim Range	0.7525V	-	3.63V	
Remote Sense Compensation	-	-	10%Vo	
Over Temperature Shutdown	-	125°C	-	
MTBF	6,929,838 hours			Calculated Per Bell Core SR-332 (Io = Nominal; Ta = 25°C)
Dimensions				
Inches (L x W x H)	2.0 x 0.55 x 0.36			
Millimeters (L x W x H)	50.80 x 13.97 x 9.14			
Weight	-	7.5g	-	

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

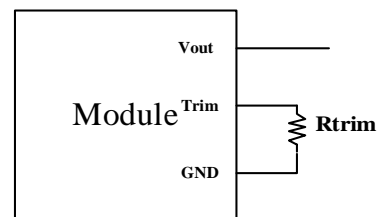
Control Specifications

Parameter	Min	Typ	Max	Notes
Remote On/Off				
Signal Low (Unit Off)	-0.2V	-	0.3V	x7PB-06F1A0; Active High; Remote On/Off pin open, Unit on.
Signal High (Unit On)	-	-	Vin, max	
Signal Low (Unit On)	-0.2V	-	0.3V	x7PB-06F1AL; Active Low; Remote On/Off pin open, Unit on.
Signal High (Unit Off)	1.5V	-	Vin, max	
Power Good Levels				
High Level	2.1V	-	-	
Low Level	-	-	1.05V	

Output Trim Equations

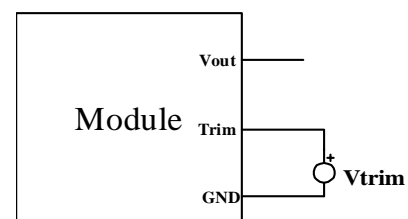
Equation for calculating the trim resistor (in kΩ) given the desired adjusted voltage (Vadj) is shown below. The Trim resistor should be connected between the Trim pin and Ground.

$$R_{Trim} = \frac{21.07}{V_{adj} - 0.7525} - 5.11$$



Equation for calculating the trim voltage Vtrim (in V) given the desired adjusted voltage (Vadj) is shown below.

$$V_{trim} = 0.7 - 0.1698 \times (V_{adj} - 0.7525)$$



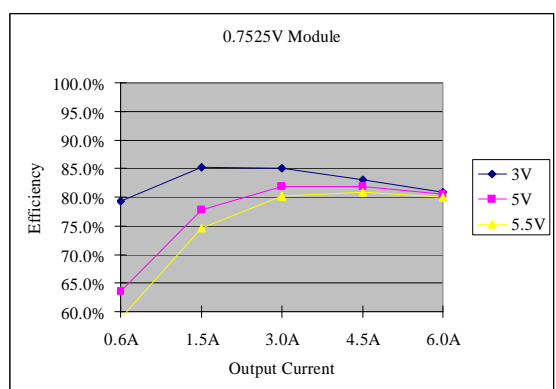
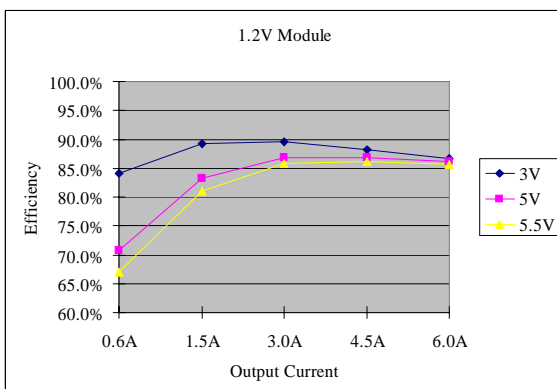
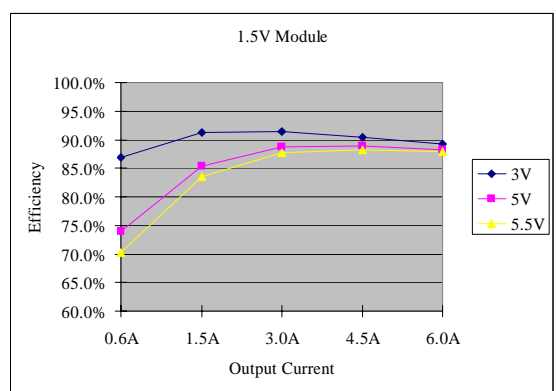
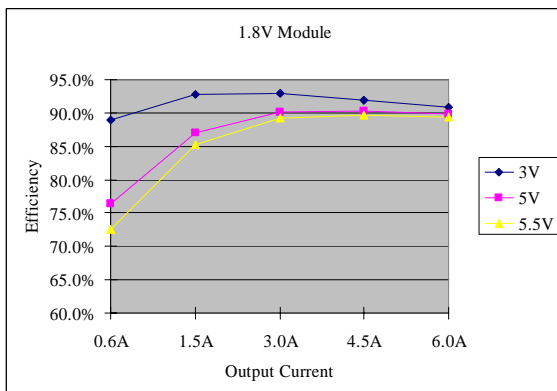
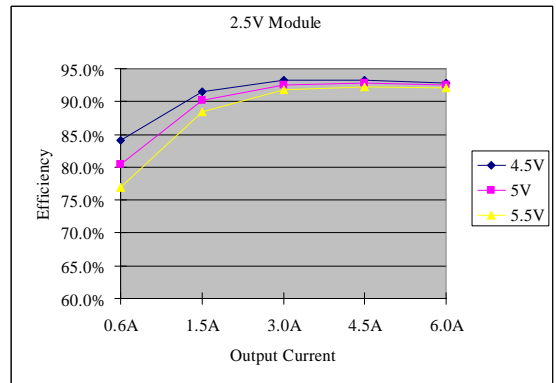
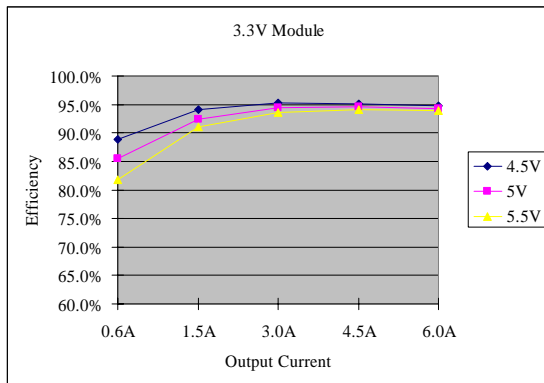
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Efficiency Data



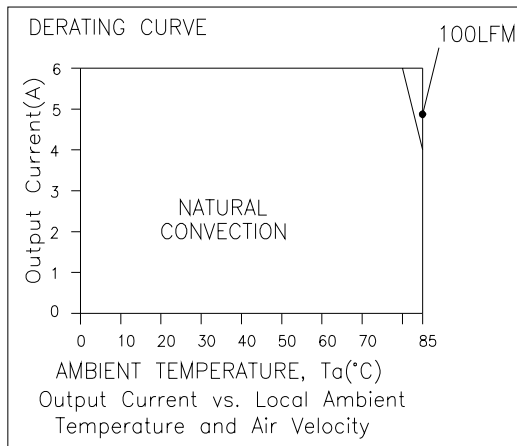
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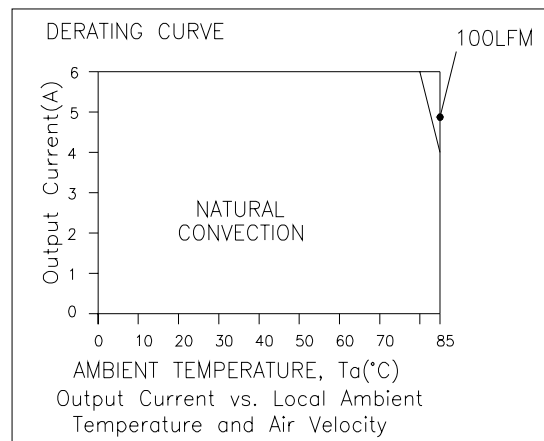
0.75V-3.63V/6A Output



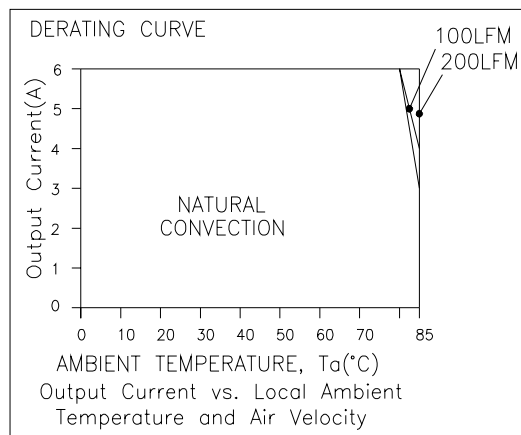
Thermal Derating Curves



Vin=5V, Vo=0.75V



Vin=5V, Vo=1.8V



Vin=5V, Vo=3.3V

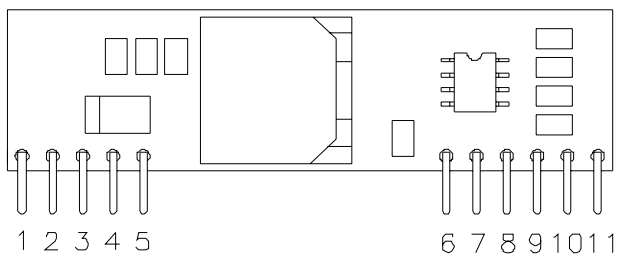
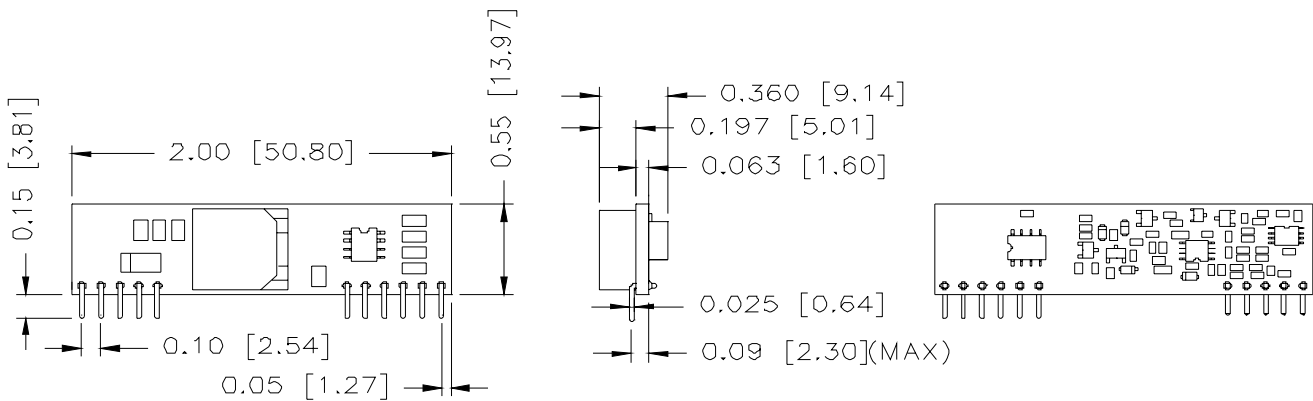
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V7PB-06F1Ax



Pin Connections

Pin	Function
1	+Vout
2	+Vout
3	Remote Sense
4	+Vout
5	Ground
6	Ground
7	+Vin
8	+Vin
9	Power Good
10	Trim
11	Remote On/Off

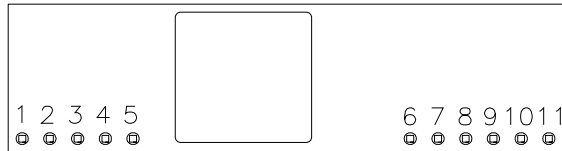
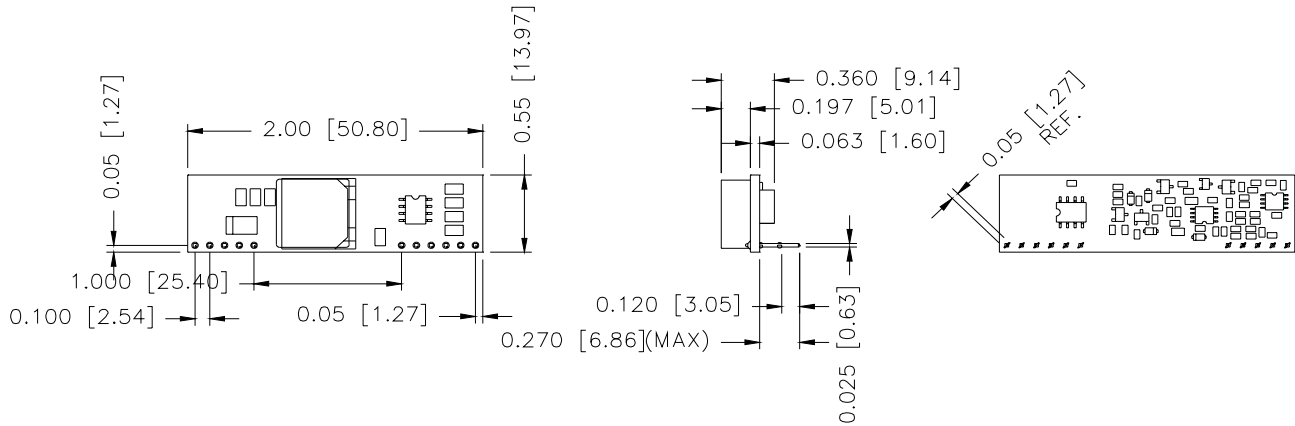
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07PB-06F1Ax



Pin Connections

Pin	Function
1	+Vout
2	+Vout
3	Sense
4	+Vout
5	Ground
6	Ground
7	+Vin
8	+Vin
9	Power Good
10	Trim
11	Remote On/Off

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