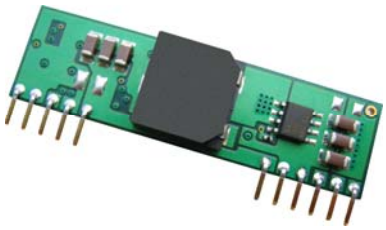
NON-ISOLATED DC/DC CONVERTERS

3.0 V-5.5 V Input 0.75 V-3.63 V/6 A Output

xRPB-06F1Ax Series RoHS Compliant

- 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 xRPB-06F1Ax modules are a series of non-isolated high density open frame dc/dc converters that can deliver up to 6 A of output current with full load efficiency of 94% at 3.3 V output. These modules provide precisely regulated voltage programmable via external resistor from 0.75 V to 3.63 V over a wide range of input voltage (Vin=3.0 V-5.5 V). 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	Model Number Active Low
0.75 V-3.63 V	3.0 V-5.5 V	6 A	22 W	94%	VRPB-06F1A0	VRPB-06F1AL	VRPB-06F1AW [1]

Notes: 1. "W" indicates special coating.
2. 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 "0" for horizontal mount package.

Absolute Maximum Ratings

Parameter	Min	Typ	Max	Notes
Input Voltage (continuous)	-0.3 V	-	5.8 V	
Output Enable Terminal Voltage	-0.3 V	-	5.5 V	
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				
Vo ≤ 2.1 V	3.0 V	-	5.5 V	
Vo>2.1 V	4.5 V	-	5.5 V	
Input Current (full load)				
Vo=3.3 V	-	4.21 A	-	
Vo=2.5 V	-	3.26 A	-	
Vo=1.8 V	-	2.43 A	-	
Vo=1.5 V	-	2.07 A	-	
Vo=1.2 V	-	1.69 A	-	
Vo=0.75 V	-	1.14 A	-	

Input Specifications (Continued)

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

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

Output Specifications

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

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

General Specifications

Parameter	Min	Typ	Max	Notes
Efficiency (Current Source)				
Vo=3.3 V	-	94%	-	Measured at Vin=5 V, full load
Vo=2.5 V	-	92%	-	
Vo=1.8 V	-	89%	-	
Vo=1.5 V	-	87%	-	
Vo=1.2 V	-	85%	-	
Vo=0.75 V	-	79%	-	
Switching Frequency	250 kHz	300 kHz	350 kHz	
Output Voltage Trim Range	0.7525 V	-	3.63 V	
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 × W × H)	2.0 x 0.55 x 0.36			
Millimeters (L × W × H)	50.80 x 13.97 x 9.14			
Weight	-	7.5 g	-	

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

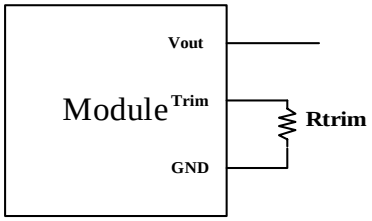
Control Specifications

Parameter	Min	Typ	Max	Notes
Remote On/Off				
Signal Low (Unit Off)	-0.2 V	-	0.3 V	xRPB-06F1A0; Active High; Remote On/Off pin open, Unit on.
Signal High (Unit On)	-	-	Vin, max	
Signal Low (Unit On)	-0.2 V	-	0.3 V	xRPB-06F1AL & xRPB-06F1AW; Active Low; Remote On/Off pin open, Unit on.
Signal High (Unit Off)	1.5 V	-	Vin, max	
Power Good Levels				
High Level	2.1 V	-	-	
Low Level	-	-	1.05 V	

Output Trim Equations

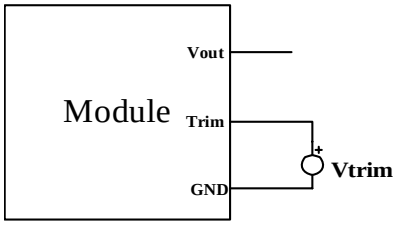
Equation for calculating the trim resistor (in kΩ) given the desired adjusted voltage (Vadj) is shown below. The Trim resistor should be connected between the Trim pin and Ground.

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

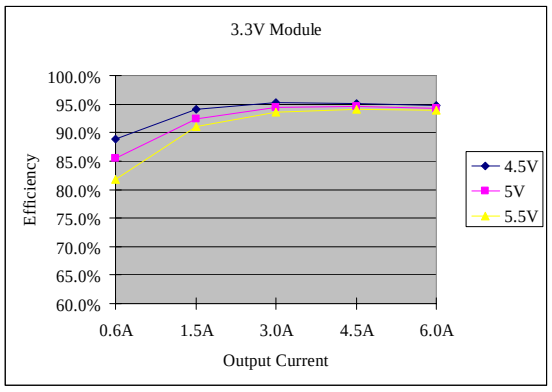


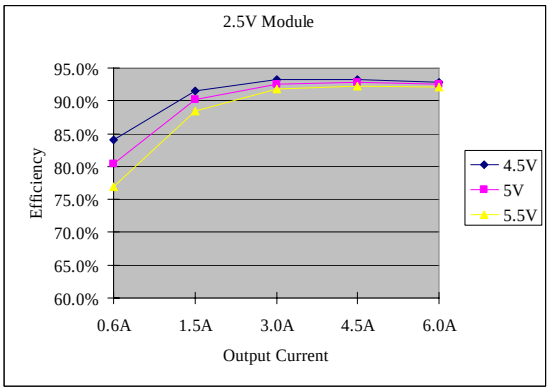
Equation for calculating the trim voltage Vtrim (in V) given the desired adjusted voltage (Vadj) is shown below.

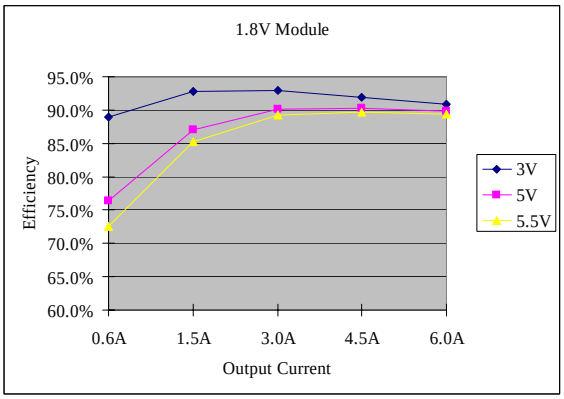
$$Vtrim = 0.7 - 0.1698 \times (V_{adj} - 0.7525)$$

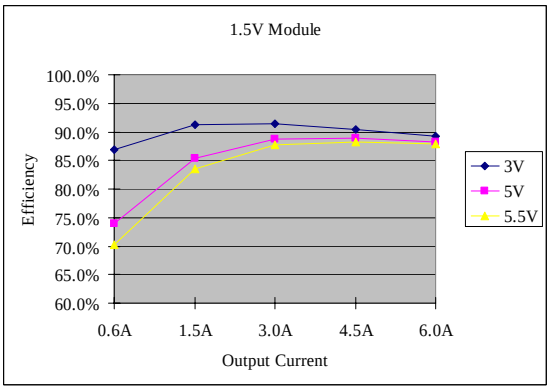


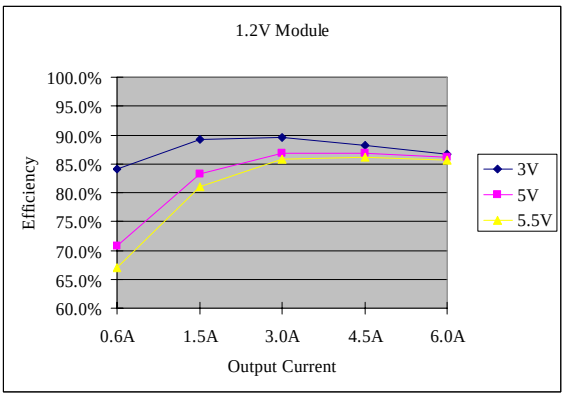
Efficiency Data

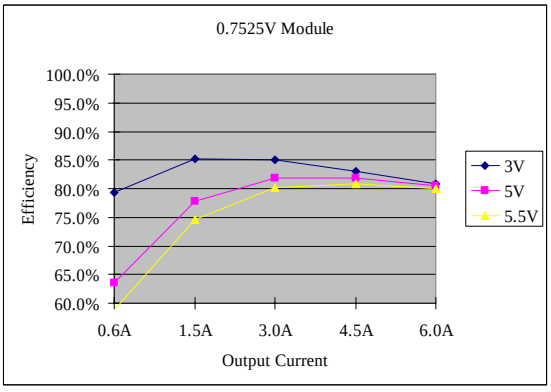




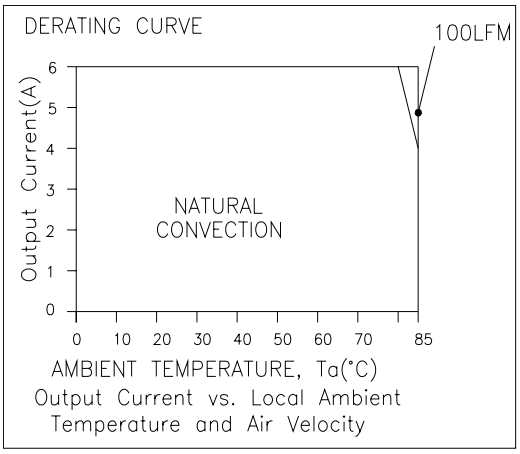




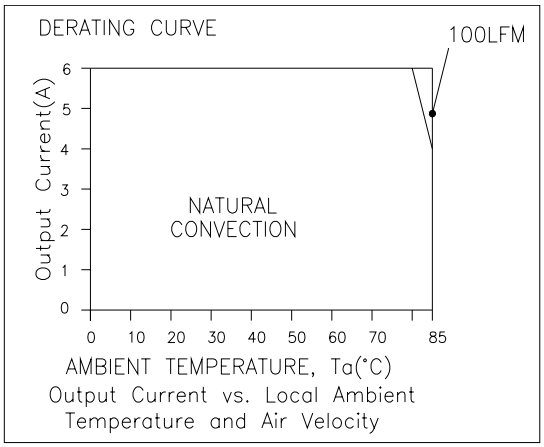




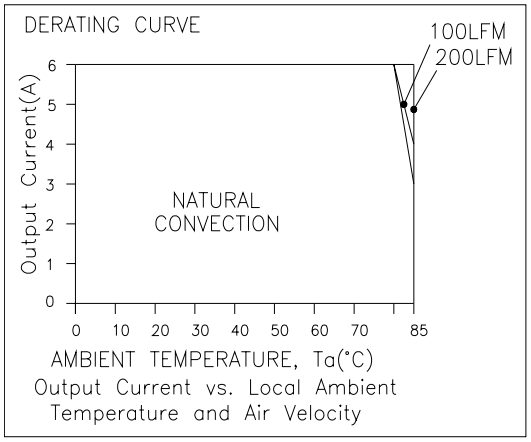
Thermal Derating Curves



Vin=5 V, Vo=0.75 V



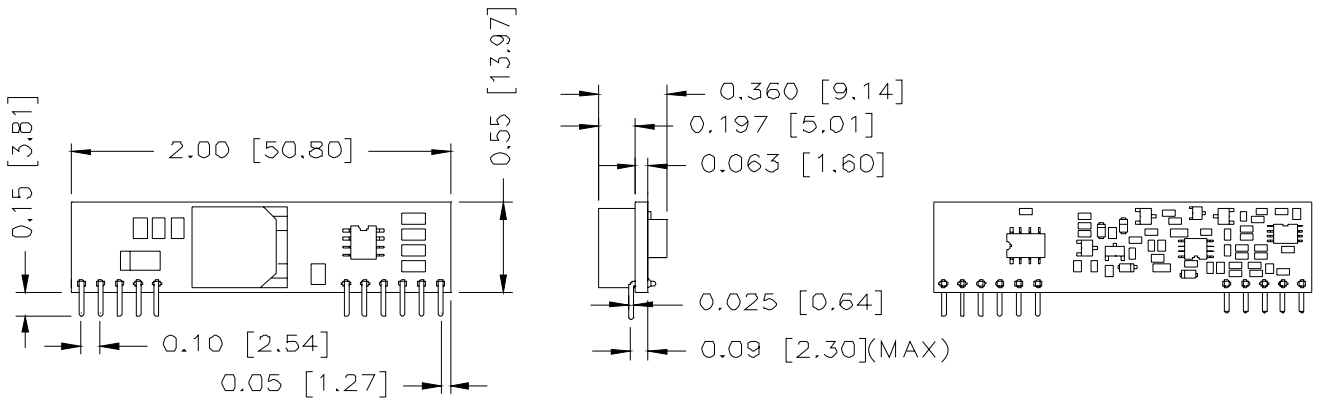
Vin=5 V, Vo=1.8 V

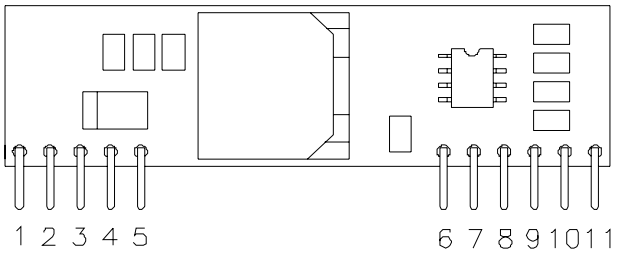


Vin=5 V, Vo=3.3 V

Mechanical Outlines

VRPB-06F1Ax





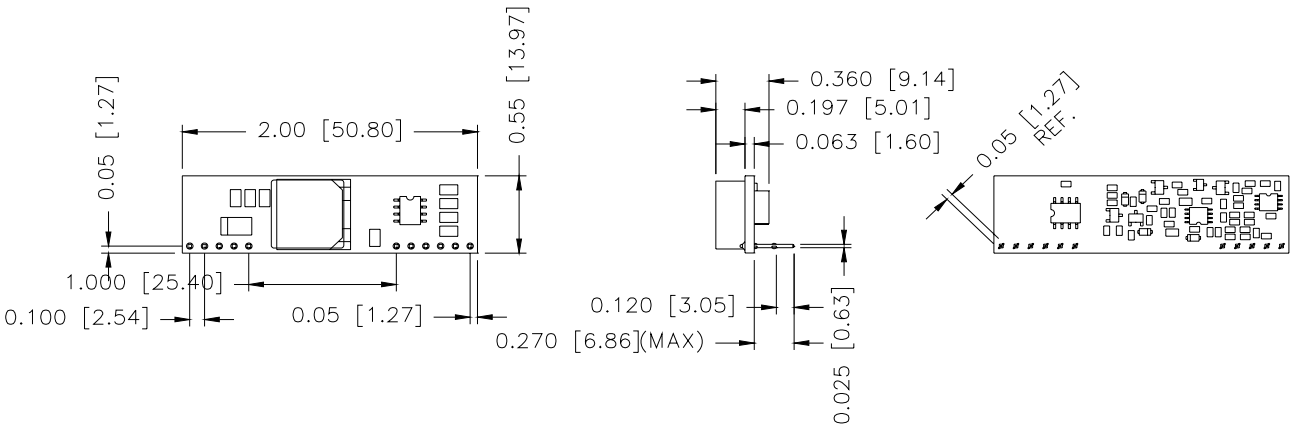
Pin Connections

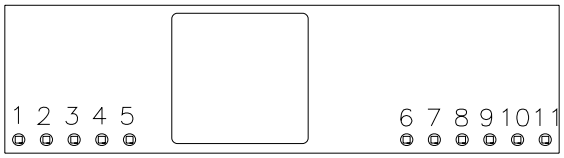
Pin	Function
1	+Vout
2	+Vout
3	Remote Sense
4	+Vout
5	Ground
6	Ground
7	+Vin
8	+Vin
9	Power Good
10	Trim
11	Remote On/Off

NON-ISOLATED DC/DC CONVERTERS

3.0 V-5.5 V Input 0.75 V-3.63 V/6 A Output

0RPB-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

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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