

NON-ISOLATED DC/DC CONVERTERS

12V Input 0.9V-5.0V/20A Output



x7PF-20A1A0

- Non-Isolated
- Fixed Frequency (275KHz)
- High Efficiency
- High Power Density
- Power Good Output Signal (open collector)
- Under-Voltage Lockout (UVLO)
- Wide Trim Range
- Converter Can Sink and Source Current
- OCP/SCP
- Remote On/Off
- Low Cost



Description

The Bel x7PF-20A1A0 is a new high density open frame non-isolated converter series for space sensitive applications. Each model has a wide input range (10.2V-13.8V) and offers a wide range of output voltage (0.9V - 5.0V) with a 20A load. An external resistor adjusts the output voltage from its pre-set value of 0.9V to any value up to the 5.0V maximum. Typical efficiency is 92% at $V_o=5V$, $V_{in}=12V$ 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	Typical Efficiency	Model Number Vertical Mount	Model Number Horizontal Mount
0.9V – 5.0V	12V	20A	100W	92%	V7PF-20A1A0	07PF-20A1A0

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	-	13.8V	
Output Enable Terminal Voltage	-0.3V	-	13.8V	
Ambient Temperature	0°C	-	80°C	
Storage Temperature	-40°C	-	125°C	

Input Specifications

Parameter	Min	Typ	Max	Notes
Input Voltage	10.2V	-	13.8V	
Input Current (Source)				
$V_o=5.0V$	-	9.1A	-	
$V_o=2.5V$	-	4.9A	-	
$V_o=0.9V$	-	2.2A	-	
Input Current (Sink)				
$V_o=2.5V$	-	-3.44A	-	Able to sink 20A output current at any output voltage up to and including 2.5V.
$V_o=0.9V$	-	-0.97 A	-	
Input Current (No Load)	-	95mA	-	
Remote Off Input Current	-	5mA	10mA	

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Input Specifications (continued)

Parameter	Min	Typ	Max	Notes
Input Reflected Ripple Current (pk-pk) Vo=5.0V Vo=3.3V Vo=2.5V Vo=0.9V	- - - -	280mA 250mA 200mA 150mA	350mA 320mA 280mA 250mA	Tested with simulated source impedance of 1.5uH 5Hz to 20MHz, and 2 × 270uF/16V Oscon capacitors (ESR ≤ 20 mΩ) at the input
Input Reflected Ripple Current (RMS) Vo=5.0V Vo=3.3V Vo=2.5V Vo=0.9V	- - - -	80mA 70mA 45mA 40mA	120mA 100mA 80mA 60mA	
External Input Capacitance	-	540uF	-	
Turn-on Voltage Threshold	8.5V	9.0V	9.5V	
Turn-off Voltage Threshold	7.0V	7.6V	8.3V	

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

Output Specifications

Parameter	Min	Typ	Max	Notes
Output Voltage Set Point	-2.5%Vo,set	-	2.5%Vo,set	Vin=12V, Io=Iomax, full load
Output Voltage Set Point	-3.5%Vo,set	-	3.5%Vo,set	Over all operating input voltage, resistive load, and temperature conditions
Load Regulation Vo=5.0V Vo=3.3V Vo=2.5V Vo=0.9V	- - - -	- - - -	0.4%Vo,set 0.4%Vo,set 0.5%Vo,set 1%Vo,set	Io=Iomin to Iomax
Line Regulation	-	-	0.5%Vo,set	Vin=Vinmin to Vinmax
Output Ripple and Noise (pk-pk) Vo=5.0V Vo=3.3V Vo=2.5V Vo=0.9V	- - - -	65mV 60mV 55mV 45mV	80mV 75mV 70mV 55mV	Tested at 0-20MHz BW, with a 680uF/6.3V Oscon capacitor (ESR ≤ 12 mΩ), 10uF/16V Tantalum capacitor, and 10nF ceramic capacitor at the output.
Output Ripple and Noise (RMS) Vo=5.0V Vo=3.3V Vo=2.5V Vo=0.9V	- - - -	18mV 15mV 15mV 10mV	25mV 25mV 20mV 15mV	
Output Current	0A	-	20A	
Current Limit Threshold	25A	-	40A	
Short Circuit Surge Transient	-	-	0.1A ² s	
Turn on Time	-	5mS	10mS	
Overshoot at Turn on	-	0%Vo	3%Vo	
Output Capacitance Vo=5.0V Vo=2.5V Vo=0.9V	680uF 680uF 680uF	- - -	5080uF 7840uF 11000uF	
Transient Response				
50% ~ 75% Max Load	Vo=0.9V-5.0V	-	100mV	Test conditions: di/dt=2.5A/uS; Vin=12V; with a 680uF/6.3V Oscon capacitor (ESR ≤ 12mΩ), 10uF/16V Tantalum capacitor, and 10nF ceramic capacitor at the output.
Settling Time		-	40uS	
75% ~ 50% Max Load		-	100mV	
Settling Time		-	40uS	

Note: All specifications are typical at nominal input, 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=12V, full load.
Vo=5.0V	89%	92%	-	
Vo=3.3V	86%	89%	-	
Vo=2.5V	83%	86%	-	
Vo=0.9V	65%	69%	-	
Efficiency (Current Sink)				
Vo=2.5V	79%	82%	-	
Vo=0.9V	60%	63%	-	
Switching Frequency	240KHz	275KHz	310KHz	
Output Voltage Trim Range	0.9V	-	5.0V	Vo=0.9V when the Trim pin is open.
MTBF	5,570,000 hours			Calculated Per Bell Core TR-332 (Io = Nominal; Ta = 25°C)
Dimensions				V7PF-20A1A0
Inches (L × W × H)	1.2 x 1.1 x 0.457			
Millimeters (L × W × H)	30.48 x 27.94 x 11.6			
Dimensions				07PF-20A1A0
Inches (L × W × H)	1.2 x 1.1 x 0.508			
Millimeters (L × W × H)	30.48 x 27.94 x 12.91			
Weight	-	15g	-	

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	-	0.8V	Remote On/Off pin open, unit on.
Signal High (Unit On)	2.4V	-	13.8V	
Power Good				
Power Good Delay ¹	-	-	8mS	

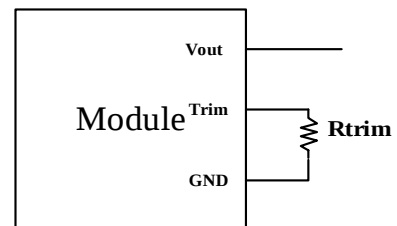
Note: All specifications are typical at 25°C unless otherwise stated.

1. the power good signal is an open collector output. When the output of the module reaches 90% of the nominal set point, the power good pin is set high.

Output Trim Equations

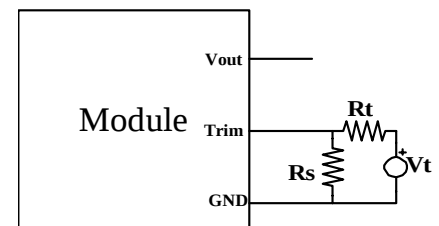
Equation for calculating the trim resistor (in kΩ) given the desired adjusted voltage (Vadj) is shown below. The Trim Up resistor should be connected between the Trim pin and Ground. Trim values should not be less than 280Ω.

$$R_{trim} = \frac{1.17}{V_{adj} - 0.9}$$



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

$$R_t = \frac{R_s \times (1.3V_t - 1.17)}{1.17 - R_s \times (V_{adj} - 0.9)}$$

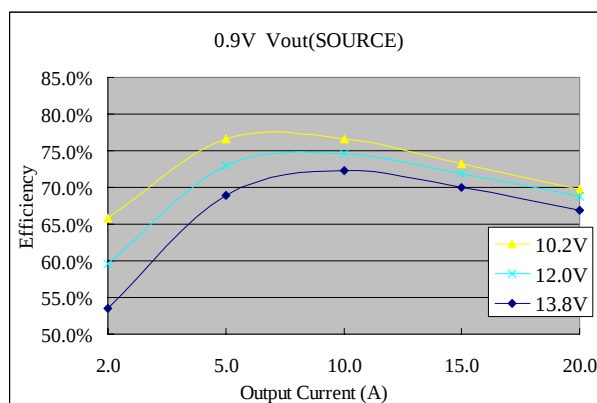
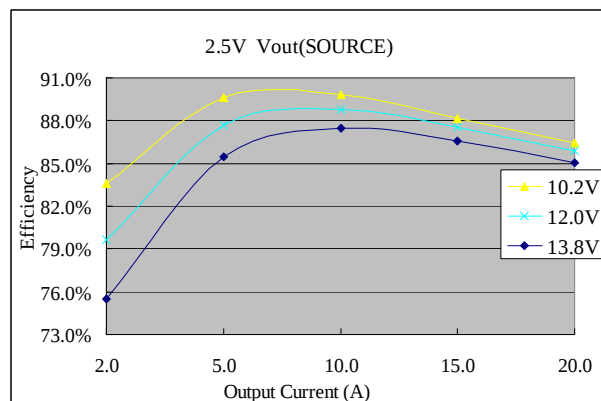
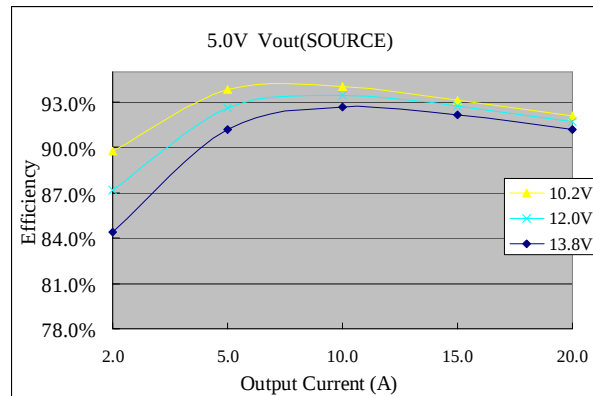


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Efficiency Data

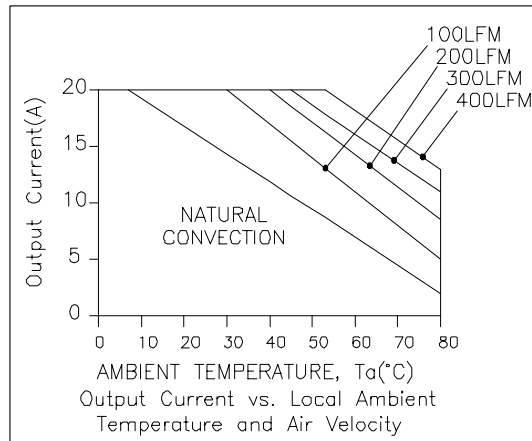


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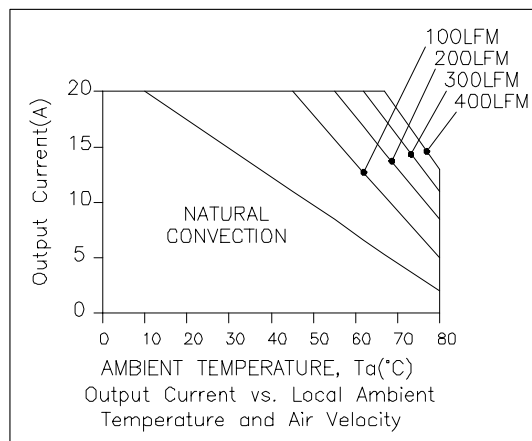
12V Input 0.9V-5.0V/20A Output



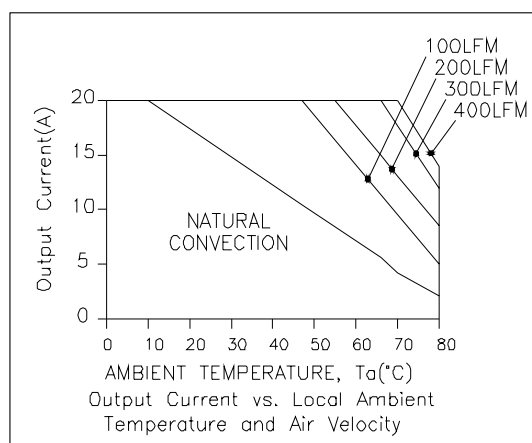
Thermal Derating Curves



$V_o=5\text{V}$; $V_{in}=12\text{V}$



$V_o=2.5\text{V}$; $V_{in}=12\text{V}$

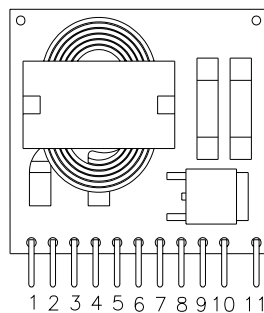
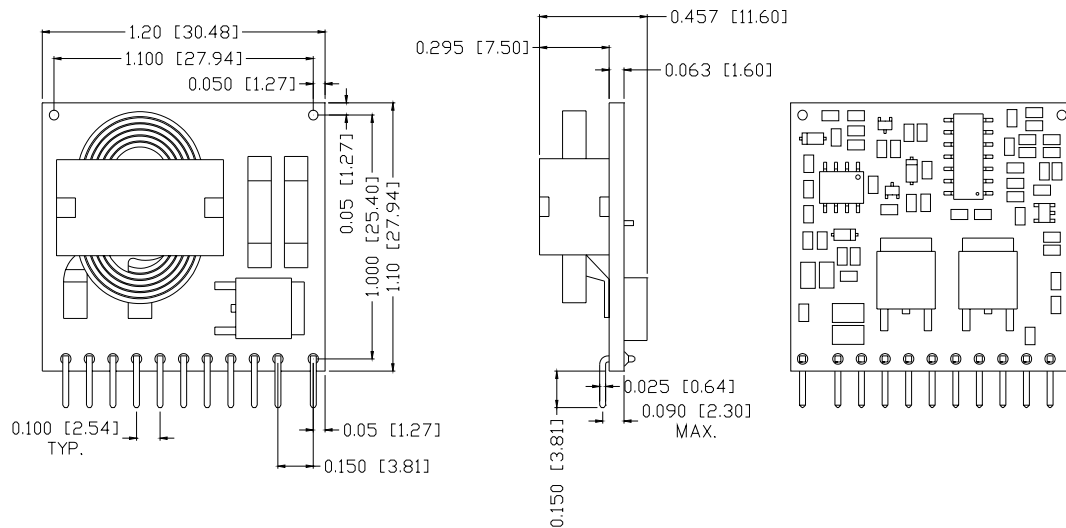


$V_o=0.9\text{V}$; $V_{in}=12\text{V}$

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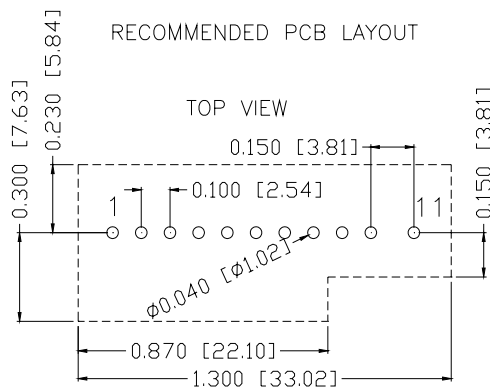
V7PF-20A1A0



Pin Connections

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

RECOMMENDED PCB LAYOUT

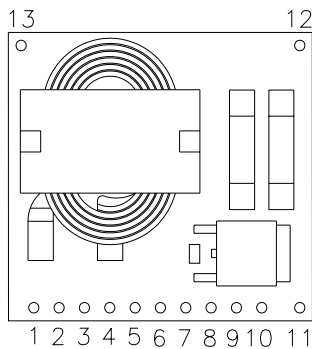
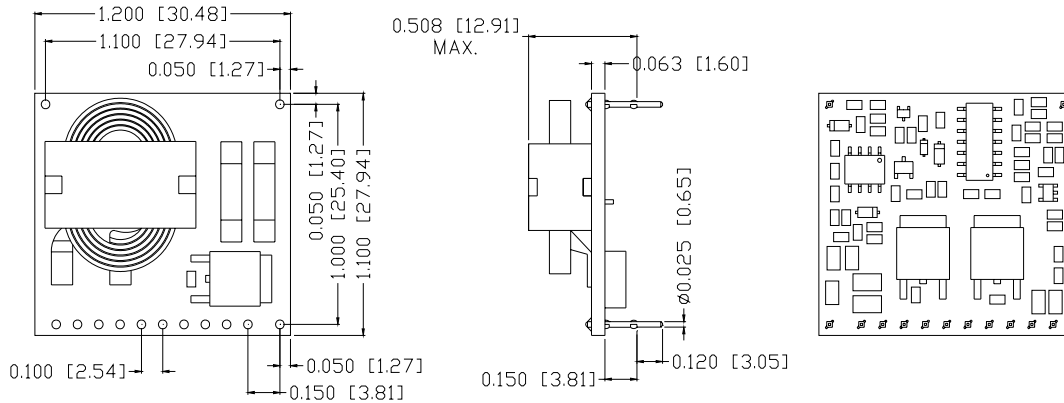


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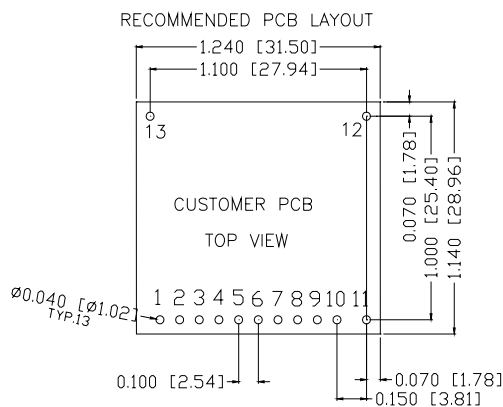


07PF-20A1A0



Pin Connections

Pin	Function
1	Vout
2	Vout
3	Vout
4	Trim
5	Remote On/Off
6	Power Good
7	Ground
8	Ground
9	Pwrgd_set
10	Vin
11	Vin
12	Support Pin
13	Support Pin



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