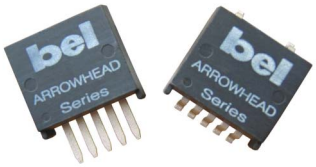
NON-ISOLATED DC/DC CONVERTERS

3.0 V-5.5 V Input 0.9 V-3.3 V/3 A Output

x7AH-03F1A0

- Non-Isolated
- High Efficiency
- Fixed Frequency (300 kHz)
- Low Cost
- Remote On/Off
- Input Under Voltage Lockout
- OCP/SCP
- Wide Range Trim



Description

The Bel x7AH-03F1A0 module is a non-isolated, step down dc/dc converter that operates from 3.0 V to 5.5 V source. This converter is available in a range of output voltages from 0.9 V to 3.3 V. It is packaged in a compact, overmolded package rated at 3 A. Optional lead forming provides a vertical mount product for minimal footprint or a surface mount option for a very low profile. The efficiency of 3.3 V module is typically 92% at 5 V input at full load. Typical features include remote on/off, input under voltage lockout, over current protection and short circuit protection.

Part Selection

Output Voltage	Input Voltage	Max. Output Current	Max. Output Power	Typical Efficiency	Part Number Surface Mount	Part Number Vertical Mount
0.9 V - 3.3 V	3.0 V - 5.5 V	3 A	10 W	92%	S7AH-03F1A0	V7AH-03F1A0

Note: Add “0” suffix at the end of the model number to indicate “Tube Packaging”, and “R” for “Reel Packaging”, and “G” for “Tray Packaging”.

Absolute Maximum Ratings

Parameter	Min	Typ	Max	Notes
Input Voltage (continuous)	-0.3 V	-	6 V	
Output Enable Terminal Voltage	-0.3 V	-	6 V	
Ambient Temperature	-40 °C	-	85 °C	
Storage Temperature	-40 °C	-	125 °C	

Input Specifications

Parameter	Min	Typ	Max	Notes
Input Voltage				
Vo=3.3 V	4.5 V	-	5.5 V	
Vo=2.5 V	3.6 V	-	5.5 V	
Vo=0.9 V-1.8 V	3.0 V	-	5.5 V	
Input Current (no load)	-	-	70 mA	
Input Current (full load)				
Vo=3.3 V	-	-	2.5 A	
Vo=2.5 V	-	-	2.4 A	
Vo=1.8 V	-	-	2.2 A	
Vo=1.5 V	-	-	1.9 A	
Vo=1.2 V	-	-	1.6 A	
Vo=0.9 V	-	-	1.3 A	
Remote Off Input Current	-	5 mA	10 mA	
Input Reflected Ripple Current (pk-pk)	-	75 mA	-	Tested with simulated source impedance of 500 nH, 5 Hz to 20 MHz and two 270 uF/16 V Oscon caps with ESR=0.018 ohm max at 100 kHz
Input Reflected Ripple Current (rms)	-	25 mA	-	

Input Specifications (continued)

Parameter	Min	Typ	Max	Notes
I^2t Inrush Current Transient	-	0.004 A^2s	0.008 A^2s	
Turn on Voltage Threshold	-	-	2.9 V	Only for 0.9 V-1.8 V output modules.
Turn off Voltage Threshold	2.2 V	2.4 V	-	

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

Output Specifications

Parameter	Min	Typ	Max	Notes
Output Voltage Set Point				
Vo=3.3 V	3.217 V	3.3 V	3.383 V	Test conditions: Vin=5 V, Io=50% full load
Vo=2.5 V	2.437 V	2.5 V	2.563 V	
Vo=1.8 V	1.755 V	1.8 V	1.845 V	
Vo=1.5 V	1.462 V	1.5 V	1.538 V	
Vo=1.2 V	1.170 V	1.2 V	1.230 V	
Vo=0.9 V	0.877 V	0.9 V	0.923 V	
Line Regulation				
Vo=3.3 V	-	10 mV	20 mV	
Vo=2.5 V	-	8 mV	16 mV	
Vo=1.8 V	-	6 mV	12 mV	
Vo=1.5 V	-	5 mV	10 mV	
Vo=1.2 V	-	4 mV	8 mV	
Vo=0.9 V	-	3 mV	6 mV	
Load Regulation				
Vo=3.3 V	-	17 mV	33 mV	
Vo=2.5 V	-	13 mV	25 mV	
Vo=1.8 V	-	9 mV	18 mV	
Vo=1.5 V	-	8mV	15 mV	
Vo=1.2 V	-	6 mV	12 mV	
Vo=0.9 V	-	5 mV	9 mV	
Regulation Over Temperature(-40 °C to +85 °C)				
Vo=3.3 V	-	72 mV	97 mV	
Vo=2.5 V	-	54 mV	72 mV	
Vo=1.8 V	-	39 mV	52 mV	
Vo=1.5 V	-	32 mV	43 mV	
Vo=1.2 V	-	26 mV	40 mV	
Vo=0.9 V	-	19 mV	40 mV	
Output Current	0 A	-	3 A	
Current Limit Threshold	5 A	-	12 A	
Short Circuit Surge Transient	-	0.022 A^2s	0.044 A^2s	
Ripple and Noise (rms)				
Vo=1.2 V-3.3 V	-	15 mV	25 mV	Test condition: 0-20 MHz BW
Vo=0.9 V	-	10 mV	20 mV	
Ripple and Noise (pk-pk)				
Vo=1.2 V-3.3 V	-	50 mV	70 mV	
Vo=0.9 V	-	40 mV	60 mV	
Turn on Time	-	7 mS	12 mS	
Overshoot at Turn on	-	0%	3%	
Output Capacitance	0 uF	-	1200 uF	
Transient Response				
50% ~ 100% Max Load — Overshoot	-	150 mV	200 mV	Test conditions: di/dt = 0.5 A/uS; Vin = 5 V
50% ~ 100% Max Load — Settling Time	-	20 uS	40 uS	
100% ~ 50% Max Load — Overshoot	-	150 mV	200 mV	
100% ~ 50% Max Load — Settling Time	-	20 uS	40 uS	

(All transient response rows: All)

Note: All specifications are typical at nominal input, full load at 25 °C unless otherwise stated.

General Specifications

Parameter	Min	Typ	Max	Notes
Efficiency				
Vo=3.3 V	88%	92%	-	Measured at Vin=5 V, full load and Ta=25 °C
Vo=2.5 V	86%	90%	-	
Vo=1.8 V	83%	87%	-	
Vo=1.5 V	80%	84%	-	
Vo=1.2 V	77%	81%	-	
Vo=0.9 V	75%	79%	-	
Switching Frequency	250 kHz	300 kHz	360 kHz	
Output Trim Range (wide trim)	-	-	403% Vo	Vo=0.9 V
Output Trim Range (narrow trim)				
Vo=1.2 V-3.3 V	90% Vo	-	110% Vo	
Vo=0.9 V	-	-	110% Vo	
MTBF	7,800,000 hours			Calculated Per Bell Core TR-332 (Vin= 5 V; Vo=3.3 V; Io = 2.4 A; Ta = 25 °C)
Dimensions (surface mount)				
Inches (L × W × H)	0.78 x 0.70 x 0.32			
Millimeters (L × W × H)	19.81 x 17.78 x 8.13			
Dimensions (vertical)				
Inches (L × W × H)	0.70 x 0.308 x 0.65			
Millimeters (L × W × H)	17.78 x 7.82 x 16.51			
Weight	-	5 g	-	

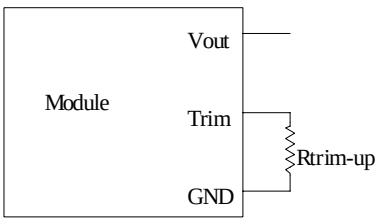
Control Specifications

Parameter	Min	Typ	Max	Notes
Remote On/Off				
Signal Low (Unit Off)	-0.3 V	-	0.8 V	Remote on/off pin open, unit on.
Signal High (Unit On)	2.8 V	-	6 V	

Output Trim Equations

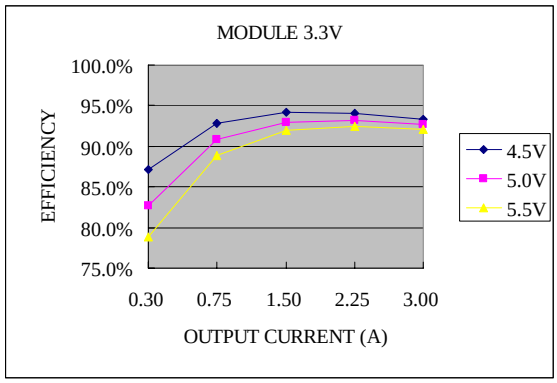
Equations for calculating the trim resistor (in kΩ) given the desired adjusted voltage (Vadj) and the nominal output voltage of the converter (Vo) are shown below. The Trim Up resistor should be connected between the Trim pin and Ground. Only one of the resistors should be used for any given application.

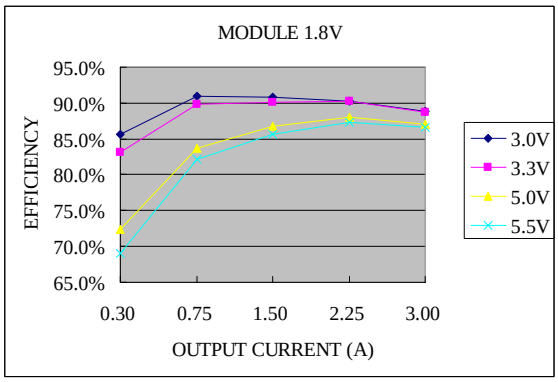
$$R_{trim-up} = \frac{3.712}{V_{adj} - V_o} - 1$$

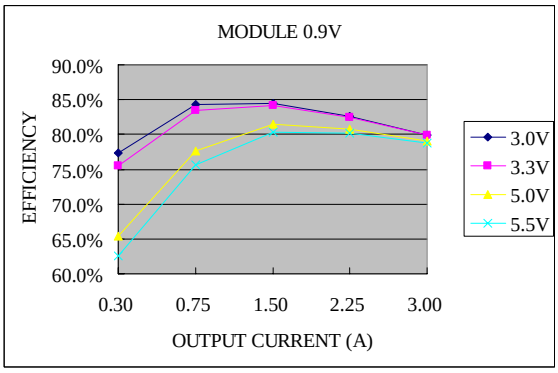


Note: Output voltage Vo=0.902V when Ttrim-up is not connected.

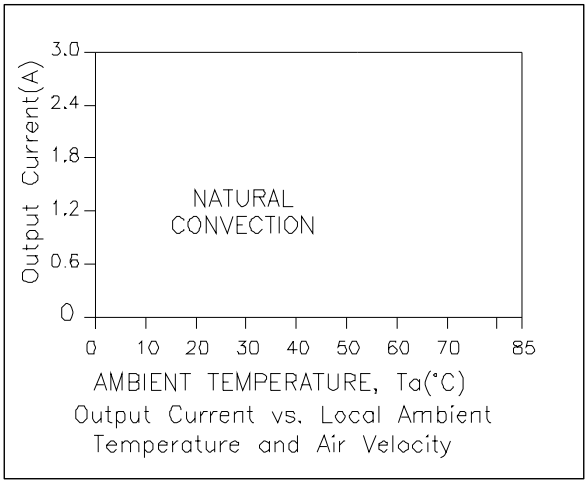
Efficiency Data







Thermal Derating Curve



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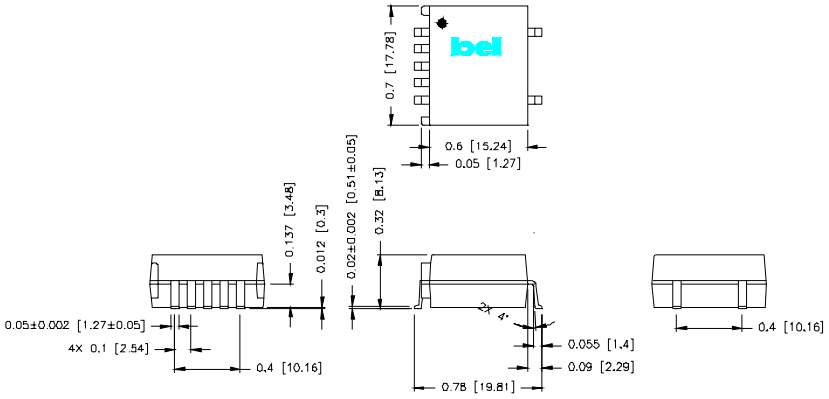
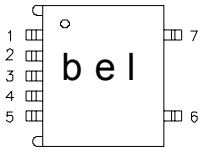
S7AH-03F1A0

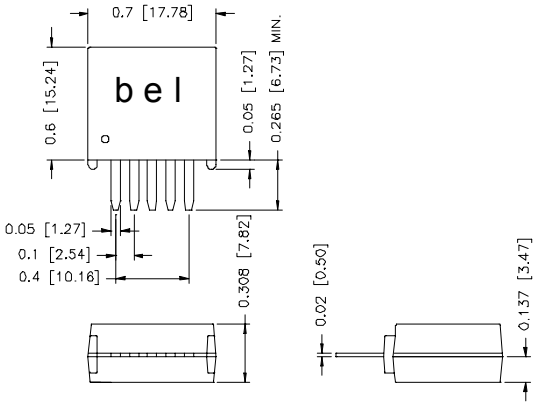


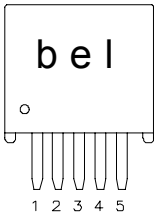


Pin Connections

Pin	Function
1	Remote On/Off
2	Vin
3	Ground
4	Vout
5	Trim
6	N/A
7	N/A

V7AH-03F1A0





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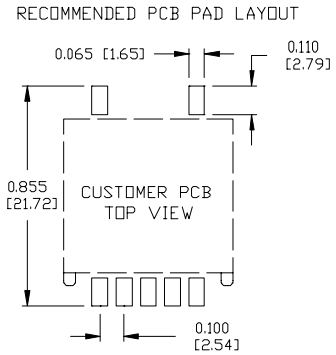

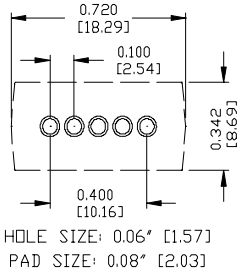

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