

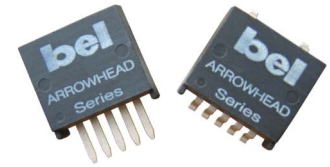
## NON-ISOLATED DC/DC CONVERTERS

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

**bel**  
POWER PRODUCTS

### 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	-	

## NON-ISOLATED DC/DC CONVERTERS

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



### Input Specifications (continued)

Parameter	Min	Typ	Max	Notes
I <sup>2</sup> t Inrush Current Transient	-	0.004 A <sup>2</sup> s	0.008 A <sup>2</sup> s	
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				Test conditions: Vin=5 V, Io=50% full load
Vo=3.3 V	3.217 V	3.3 V	3.383 V	
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	-	8 mV	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 <sup>2</sup> s	0.044 A <sup>2</sup> s	
Ripple and Noise (rms)				Test condition: 0-20 MHz BW
Vo=1.2 V-3.3 V	-	15 mV	25 mV	
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	
<b>Transient Response</b>				
50% ~ 100% Max Load	Overshoot	-	150 mV	Test conditions: di/dt = 0.5 A/uS; Vin = 5 V
	Settling Time	-	20 uS	
100% ~ 50% Max Load	Overshoot	-	150 mV	
	Settling Time	-	20 uS	

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

# NON-ISOLATED DC/DC CONVERTERS

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



## General Specifications

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

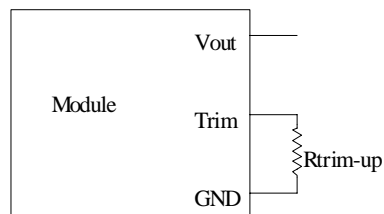
## Control Specifications

Parameter	Min	Typ	Max	Notes
<b>Remote On/Off</b>				
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 (V<sub>adj</sub>) and the nominal output voltage of the converter (V<sub>o</sub>) 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.

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



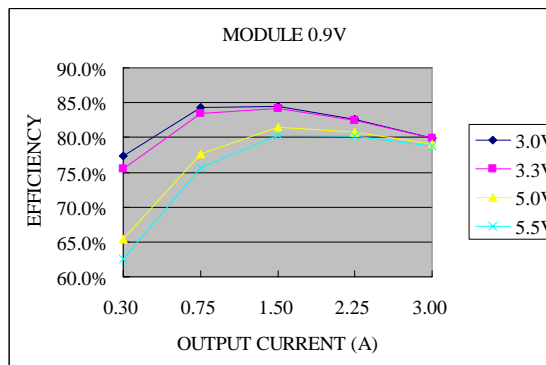
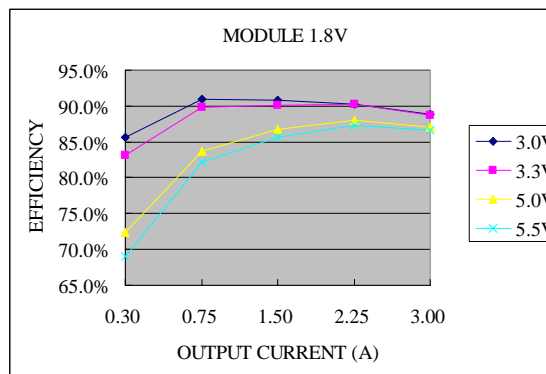
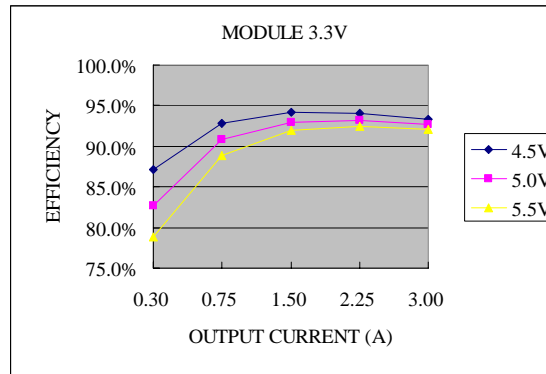
**Note:** Output voltage V<sub>o</sub>=0.902V when Ttrim-up is not connected.

# NON-ISOLATED DC/DC CONVERTERS

3.0 V-5.5 V Input    0.9 V-3.3 V Output



## Efficiency Data

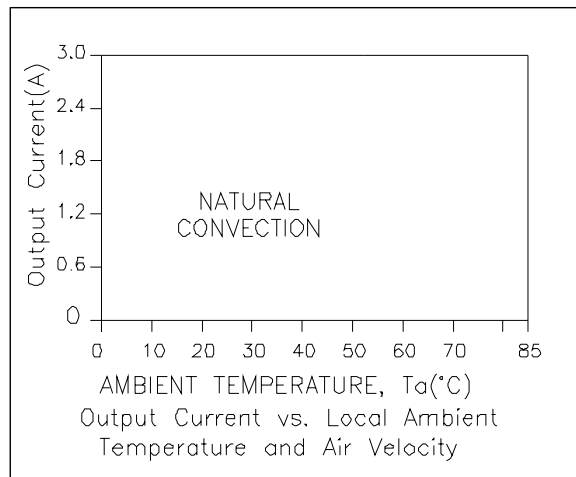


## NON-ISOLATED DC/DC CONVERTERS

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

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### Thermal Derating Curve



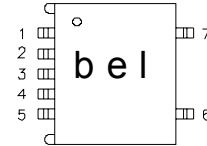
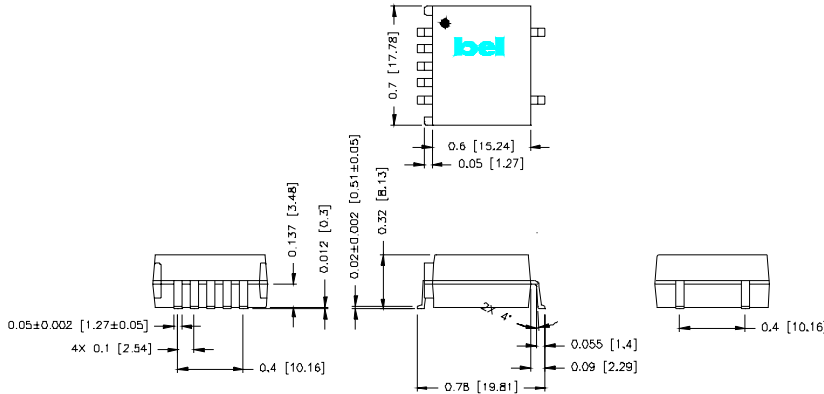
x7AH-03F1A0

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



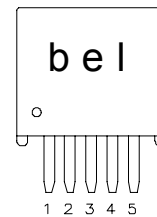
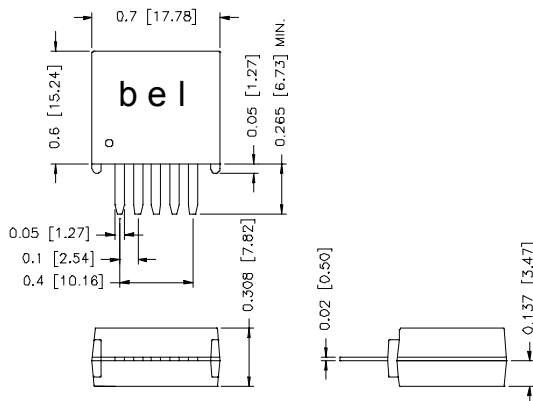
## S7AH-03F1A0



### Pin Connections

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

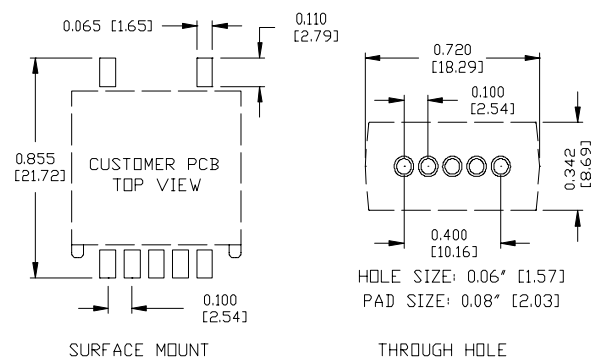
## V7AH-03F1A0



### Pin Connections

Pin	Function
1	Remote On/Off
2	Vin
3	Ground
4	Vout
5	Trim

### RECOMMENDED PCB PAD LAYOUT



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