

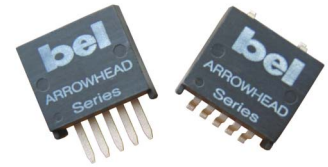
## NON-ISOLATED DC/DC CONVERTERS

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:<br>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:<br>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                | -                   |  |   |

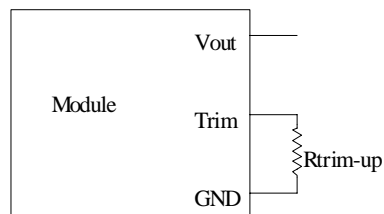
## Control Specifications

| 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.

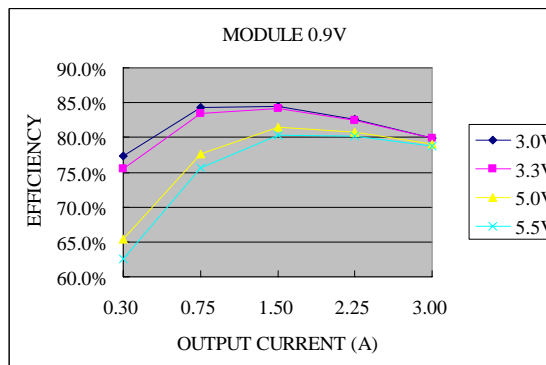
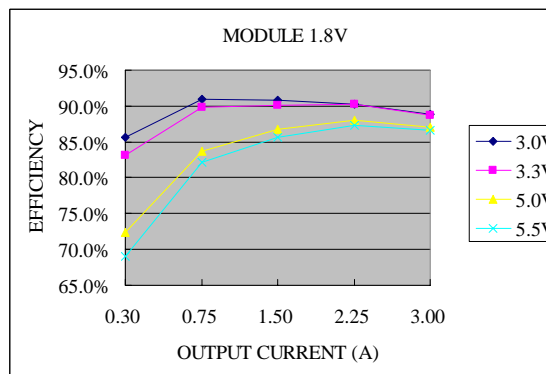
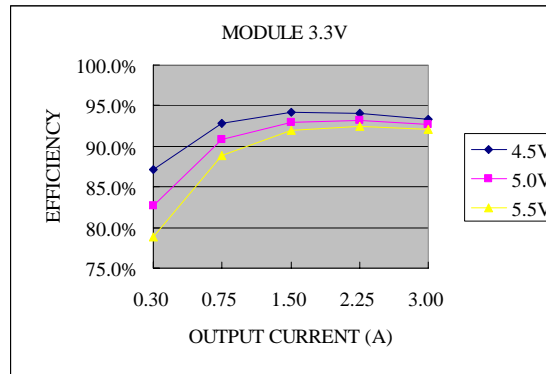
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3.0 V-5.5 V Input

0.9 V-3.3 V Output



## Efficiency Data

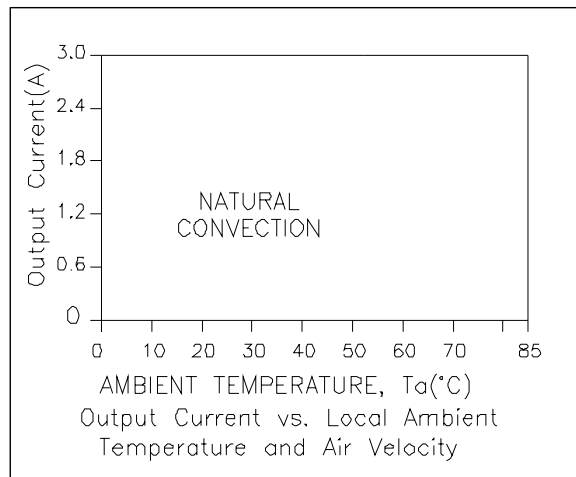


## NON-ISOLATED DC/DC CONVERTERS

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### Thermal Derating Curve



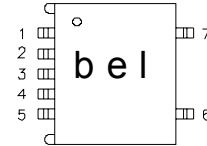
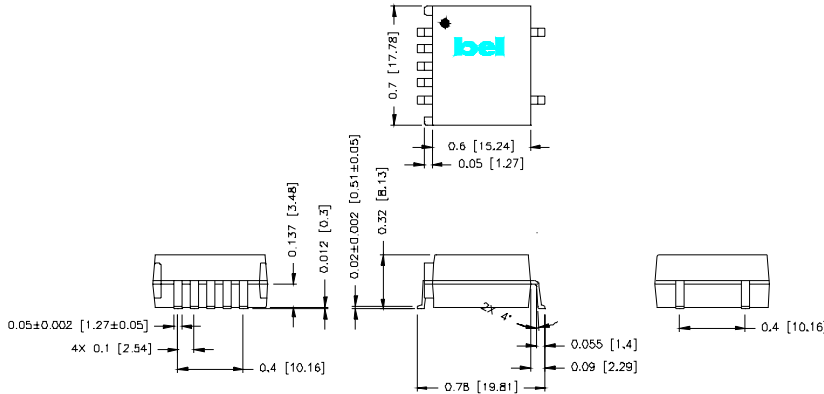
x7AH-03F1A0

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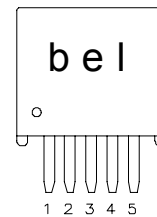
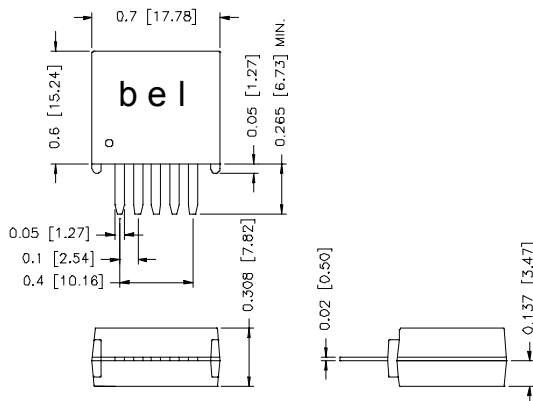
## S7AH-03F1A0



### Pin Connections

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

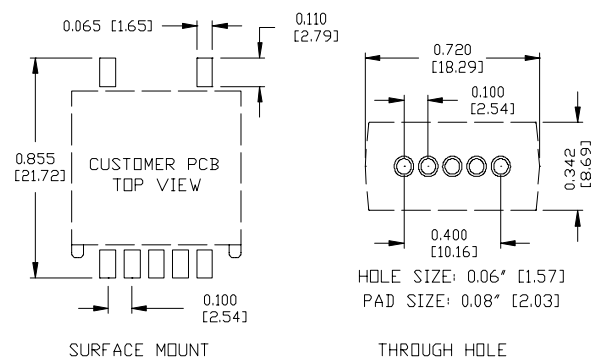
## V7AH-03F1A0



### Pin Connections

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

### RECOMMENDED PCB PAD LAYOUT



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### CORPORATE

Bel Fuse Inc.  
206 Van Vorst Street  
Jersey City, NJ 07302  
Tel 201-432-0463  
Fax 201-432-9542  
[www.belfuse.com](http://www.belfuse.com)

### FAR EAST

Bel Fuse Ltd.  
8F/ 8 Luk Hop Street  
San Po Kong  
Kowloon, Hong Kong  
Tel 852-2328-5515  
Fax 852-2352-3706  
[www.belfuse.com](http://www.belfuse.com)

### EUROPE

Bel Fuse Europe Ltd.  
Preston Technology Management Centre  
Marsh Lane, Suite G7, Preston  
Lancashire, PR1 8UD, U.K.  
Tel 44-1772-556601  
Fax 44-1772-888366  
[www.belfuse.com](http://www.belfuse.com)

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Тел: +7 (812) 336 43 04 (многоканальный)

Email: [org@lifeelectronics.ru](mailto:org@lifeelectronics.ru)