



**THE DATASHEET OF
S7AH-03H1200**



NON-ISOLATED DC/DC CONVERTERS

4.5V-32V Input

1.2V-5.0V/3A Output



X7AH-03H Series PRELIMINARY

- Non-Isolated
- High Efficiency
- High Power Density
- Excellent Thermal Performance
- Remote On/Off
- Input Under Voltage Lockout
- OCP/SCP
- Low Cost

Description

The Bel X7AH-03HXX0 is part of the low cost non-isolated DC/DC converter Power Module series. It is packaged in a compact, overmolded package rated at 3A. Optional lead forming provides a vertical mount product for minimal footprint or a surface mount option for a very low profile. The output is closely regulated and the efficiency of 3.3V output is typically 90% 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 |
|----------------|---------------|---------------------|-------------------|--------------------|---------------------------|----------------------------|
| 5.0V | 8.0V – 32V | 3A | 15W | 92% | S7AH-03H500 | V7AH-03H500 |
| 3.3V | 4.9V – 32V | 3A | 10W | 90% | S7AH-03H330 | V7AH-03H330 |
| 2.5V | 4.5V – 32V | 3A | 7.5W | 88% | S7AH-03H250 | V7AH-03H250 |
| 1.8V | 4.5V – 32V | 3A | 5.4W | 85% | S7AH-03H180 | V7AH-03H180 |
| 1.5V | 4.5V – 32V | 3A | 4.5W | 83% | S7AH-03H150 | V7AH-03H150 |
| 1.2V | 4.5V – 32V | 3A | 3.6W | 81% | S7AH-03H120 | V7AH-03H120 |

Absolute Maximum Ratings

| Parameter | Min | Typ | Max | Notes |
|--------------------------------|-------|-----|-------|-------|
| Input Voltage (continuous) | -0.3V | - | 34V | |
| Output Enable Terminal Voltage | -0.3V | - | 12V | |
| Ambient Temperature | -40°C | - | 85°C | |
| Storage Temperature | -40°C | - | 125°C | |

Input Specifications

| Parameter | Min | Typ | Max | Notes |
|---|------|----------------------|---------------------|---|
| Input Voltage | 4.5V | - | 32V | See "Part Selection" for more details. |
| Input Current (no load) | - | 30mA | - | |
| Input Current (full load) | - | - | 3A | |
| Remote Off Input Current | - | 4mA | - | |
| Input Reflected Ripple Current (pk-pk) | - | 200mA | 400mA | Tested with simulated source impedance of 500nH, 5Hz to 20MHz and two 100uF/50V electrolytic capacitors and a 3.3uF/50V ceramic capacitor at the input. |
| Input Reflected Ripple Current (RMS) | - | 100mA | 150mA | |
| I ² t Inrush Current Transient | - | 0.02A ² s | 0.1A ² s | |
| Turn on Voltage Threshold ¹ | - | 4.1V | 4.5V | |
| Turn off Voltage Threshold ² | - | 3.3V | 4.0V | |

- Notes:**
1. The max Turn on Voltage threshold of the 3.3V & 5.0V output module will be relaxed to 4.9V & 8.0V respectively.
 2. The max Turn off Voltage threshold of the 3.3V output module will be relaxed to 4.5V. The 5.0V output module does not have such function.

NON-ISOLATED DC/DC CONVERTERS

4.5V-32V Input

1.2V-5.0V/3A Output



Output Specifications

| Parameter | | Min | Typ | Max | Notes | |
|--|---------------|-------------------|----------------------|---------------------|---|---|
| Output Voltage Set Point | Vo=5.0V | 4.900V | 5.0V | 5.100V | Test conditions: Vin=12V, Io=50% full load | |
| | Vo=3.3V | 3.234V | 3.3V | 3.366V | | |
| | Vo=2.5V | 2.450V | 2.5V | 2.550V | | |
| | Vo=1.8V | 1.764V | 1.8V | 1.836V | | |
| | Vo=1.5V | 1.470V | 1.5V | 1.530V | | |
| | Vo=1.2V | 1.176V | 1.2V | 1.224V | | |
| Line Regulation | Vo=5.0V | - | ±10mV | ±15mV | | |
| | Vo=1.2-3.3V | - | ±5mV | ±10mV | | |
| Load Regulation | Vo=5.0V | - | ±10mV | ±15mV | | |
| | Vo=1.2-3.3V | - | ±5mV | ±10mV | | |
| Regulation Over Temperature (-40°C to +85°C) | | - | 30mV | 50mV | | |
| Output Current | | 0A | - | 3A | | |
| Current Limit Threshold | | 3.3A | - | 9A | | |
| Short Circuit Surge Transient | | | | | | |
| | Vo=1.2V-5.0V | - | 0.02A ² s | 0.1A ² s | | |
| Ripple and Noise (RMS) | | | | | Tested with 0-20MHz BW, with a 220uF tantalum capacitor at the output. | |
| | Vo=1.2V-5.0V | - | 25mV | 50mV | | |
| Ripple and Noise (pk-pk) | | | | | | |
| | Vo=1.2V-5.0V | - | 60mV | 100mV | | |
| Turn on Time | | - | 15mS | 50mS | | |
| Overshoot at Turn on | | - | 2% | 5% | | |
| Output Capacitance | | 220uF | - | 1200uF | | |
| Transient Response | | | | | | |
| 50% ~ 100% Max Load | Overshoot | Vo=5.0V | - | 150mV | 200mV | Test conditions: di/dt = 0.5A/uS; Vin = 12V; with a 220uF Tantalum capacitor at the output. |
| | Settling Time | | - | 100uS | 150uS | |
| 100% ~ 50% Max Load | Overshoot | Vo=5.0V | - | 150mV | 200mV | |
| | Settling Time | | - | 100uS | 150uS | |
| 50% ~ 100% Max Load | Overshoot | Vo=3.3V | - | 130mV | 180mV | |
| | Settling Time | | - | 100uS | 150uS | |
| 100% ~ 50% Max Load | Overshoot | Vo=3.3V | - | 130mV | 180mV | |
| | Settling Time | | - | 100uS | 150uS | |
| 50% ~ 100% Max Load | Overshoot | Vo=1.8V - 2.5V | - | 100mV | 150mV | |
| | Settling Time | | - | 50uS | 100uS | |
| 100% ~ 50% Max Load | Overshoot | Vo=1.8V - 2.5V | - | 100mV | 150mV | |
| | Settling Time | | - | 50uS | 100uS | |
| 50% ~ 100% Max Load | Overshoot | Vo=1.2V - 1.5V | - | 90mV | 140mV | |
| | Settling Time | | - | 40uS | 80uS | |
| 100% ~ 50% Max Load | Overshoot | Vo=1.2V - 1.5V | - | 90mV | 140mV | |
| | Settling Time | | - | 40uS | 80uS | |

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

NON-ISOLATED DC/DC CONVERTERS

4.5V-32V Input 1.2V-5.0V/3A Output



General Specifications

| Parameter | Min | Typ | Max | Notes |
|---------------------------------|-------------------------|----------------------|--------|---|
| Efficiency | Vo=5.0V | 89% | 92% | Measured at Vin=12V, full load and Ta=25°C |
| | Vo=3.3V | 87% | 90% | |
| | Vo=2.5V | 85% | 88% | |
| | Vo=1.5V | 82% | 85% | |
| | Vo=1.5V | 80% | 83% | |
| | Vo=1.2V | 78% | 81% | |
| Switching Frequency | 200KHz | 300KHz | 400KHz | |
| Output Trim Range (narrow trim) | 90%Vo | - | 110%Vo | |
| MTBF | TBD | | | Calculated Per Bell Core TR-332 (Io = Nominal; Ta = 25°C) |
| Dimensions (surface mount) | Inches (L x W x H) | 0.78 x 0.70 x 0.32 | | |
| | Millimeters (L x W x H) | 19.81 x 17.78 x 8.13 | | |
| Dimensions (vertical) | Inches (L x W x H) | 0.70 x 0.308 x 0.65 | | |
| | Millimeters (L x W x H) | 17.78 x 7.82 x 16.51 | | |
| Weight | - | 5.1g | - | |

Control Specifications

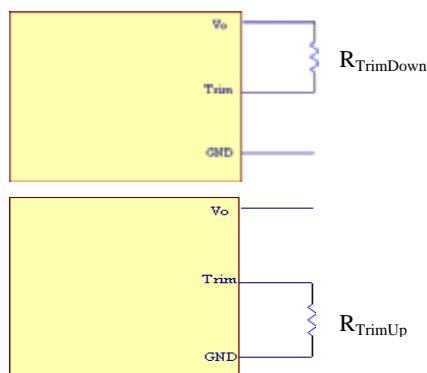
| Parameter | Min | Typ | Max | Notes |
|------------------------|-------|-----|-----|----------------------------------|
| Remote On/Off | | | | |
| Signal Low (Unit On) | -0.3V | - | 1V | Remote on/off pin open, unit on. |
| Signal High (Unit Off) | 2.8V | - | 12V | |

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 (Vnom) are shown below. The Trim Down resistor should be connected between the Trim pin and Vout. 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.

$$R_{TrimDown} = \frac{A}{V_{nom} - V_{adj}} - B$$

$$R_{TrimUp} = \frac{C}{V_{adj} - V_{nom}} - D$$



| Vnom | A | B | C | D |
|------|--------|--------|--------|--------|
| 5.0 | 61.850 | 29.400 | 11.760 | 14.700 |
| 3.3 | 53.840 | 61.700 | 17.200 | 40.200 |
| 2.5 | 9.556 | 15.620 | 4.496 | 10.000 |
| 1.8 | 3.849 | 13.830 | 3.064 | 10.000 |
| 1.5 | 3.102 | 14.420 | 3.536 | 10.000 |
| 1.2 | 1.794 | 10.910 | 3.536 | 6.490 |

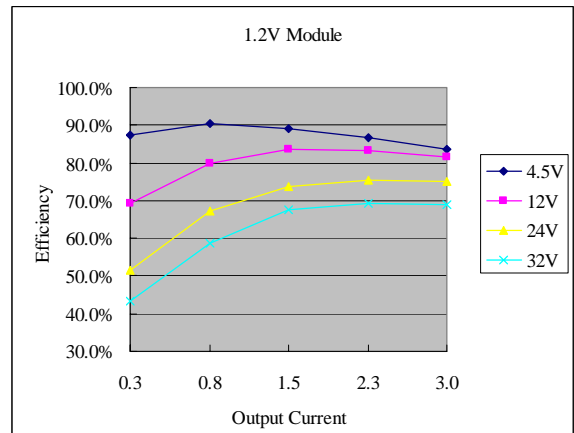
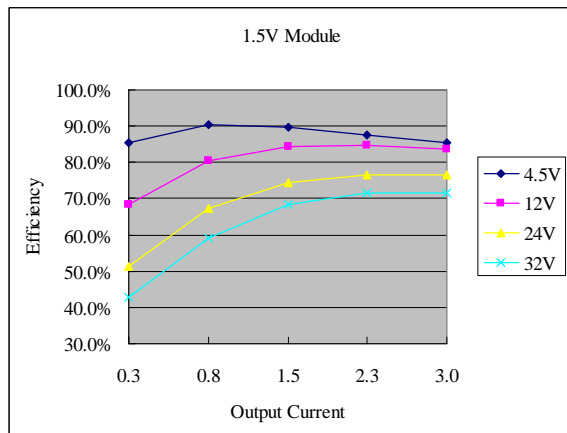
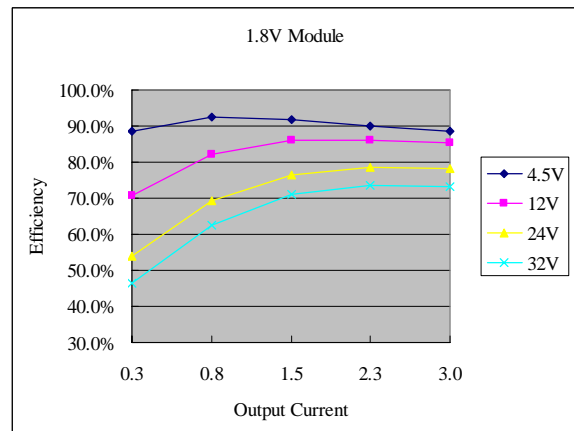
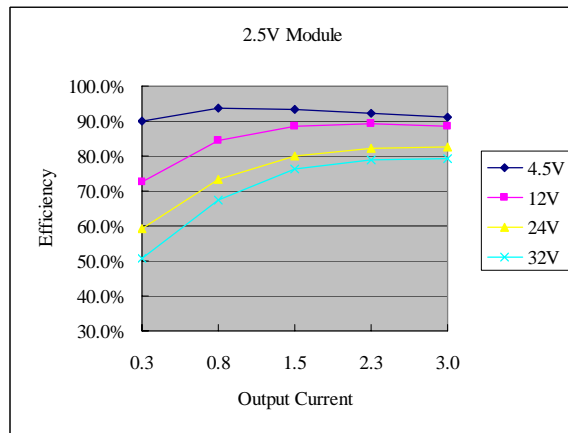
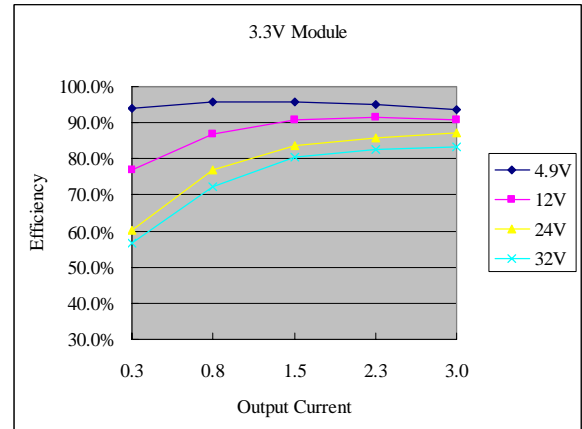
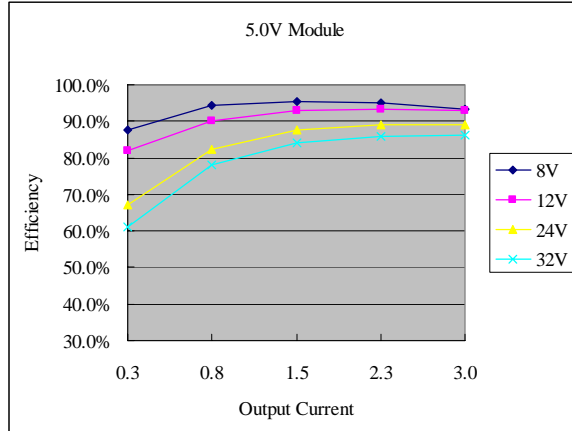
NON-ISOLATED DC/DC CONVERTERS

4.5V-32V Input

1.2V-5.0V/3A Output



Efficiency Data



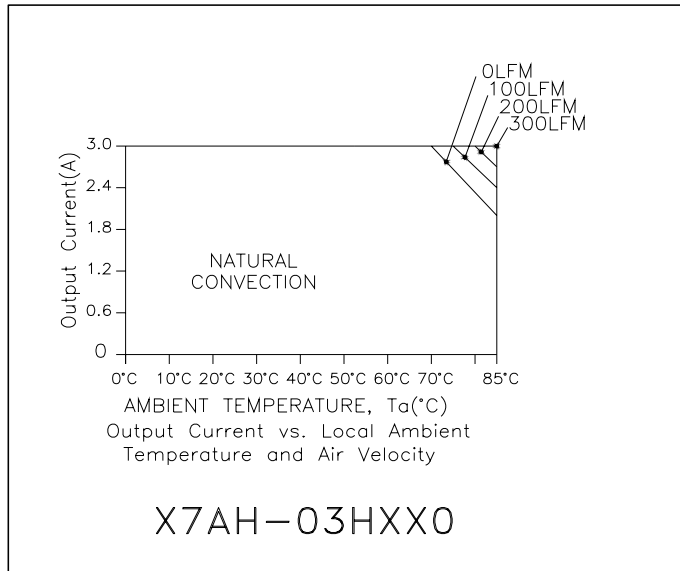
NON-ISOLATED DC/DC CONVERTERS

4.5V-32V Input

1.2V-5.0V/3A Output



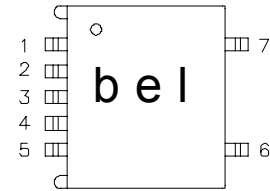
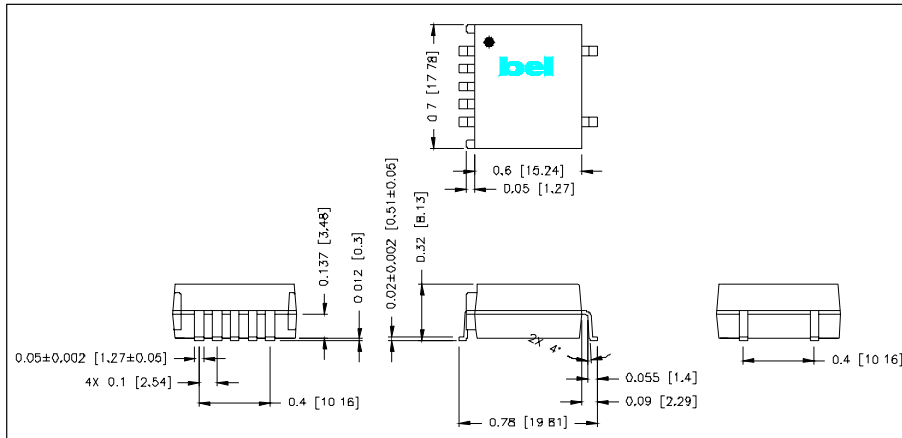
Thermal Derating



NON-ISOLATED DC/DC CONVERTERS

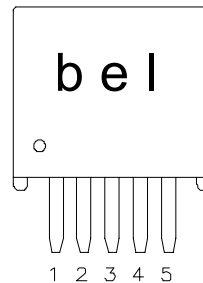
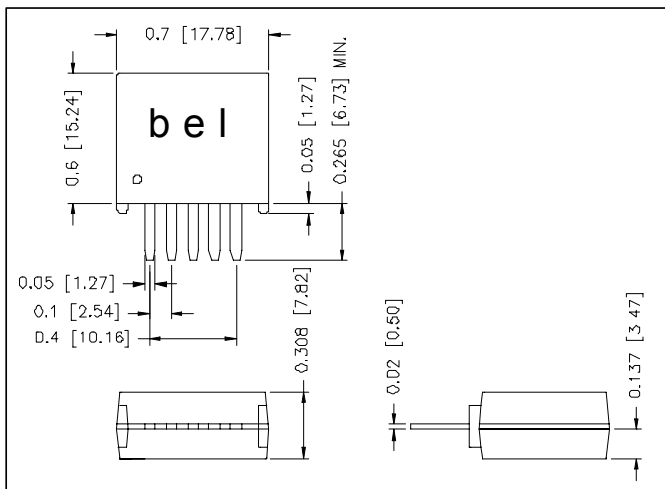
4.5V-32V Input

1.2V-5.0V/3A Output



Pin Connections

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



Pin Connections

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

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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

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

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

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