

# 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 <sup>2</sup> t Inrush Current Transient	-	0.02A <sup>2</sup> s	0.1A <sup>2</sup> s	
Turn on Voltage Threshold <sup>1</sup>	-	4.1V	4.5V	
Turn off Voltage Threshold <sup>2</sup>	-	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				Test conditions: Vin=12V, Io=50% full load	
Vo=5.0V	4.900V	5.0V	5.100V		
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 <sup>2</sup> s	0.1A <sup>2</sup> 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		
<b>Transient Response</b>					
50% ~ 100% Max Load	Overshoot	Vo=5.0V	-	150mV	Test conditions: di/dt = 0.5A/uS; Vin = 12V; with a 220uF Tantalum capacitor at the output.
	Settling Time		-	100uS	
100% ~ 50% Max Load	Overshoot	Vo=5.0V	-	150mV	
	Settling Time		-	100uS	
50% ~ 100% Max Load	Overshoot	Vo=3.3V	-	130mV	
	Settling Time		-	100uS	
100% ~ 50% Max Load	Overshoot	Vo=3.3V	-	130mV	
	Settling Time		-	100uS	
50% ~ 100% Max Load	Overshoot	Vo=1.8V - 2.5V	-	100mV	
	Settling Time		-	50uS	
100% ~ 50% Max Load	Overshoot	Vo=1.8V - 2.5V	-	100mV	
	Settling Time		-	50uS	
50% ~ 100% Max Load	Overshoot	Vo=1.2V - 1.5V	-	90mV	
	Settling Time		-	40uS	
100% ~ 50% Max Load	Overshoot	Vo=1.2V - 1.5V	-	90mV	
	Settling Time		-	40uS	

**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				Measured at Vin=12V, full load and Ta=25°C
Vo=5.0V	89%	92%	-	
Vo=3.3V	87%	90%	-	
Vo=2.5V	85%	88%	-	
Vo=1.5V	82%	85%	-	
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

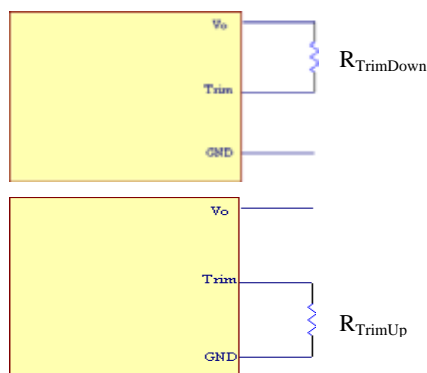
Parameter	Min	Typ	Max	Notes
<b>Remote On/Off</b>				
Signal Low (Unit On)	-0.3V	-	1V	Remote on/off pin open, unit on.
Signal High (Unit Off)	2.8V	-	12V	

## 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

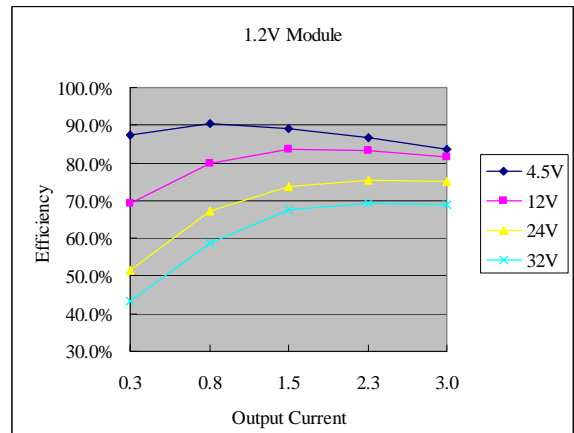
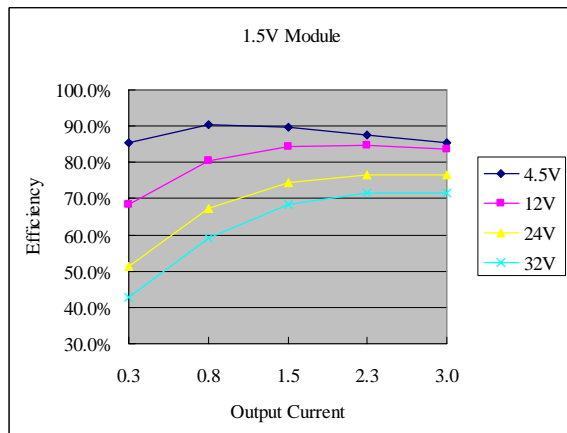
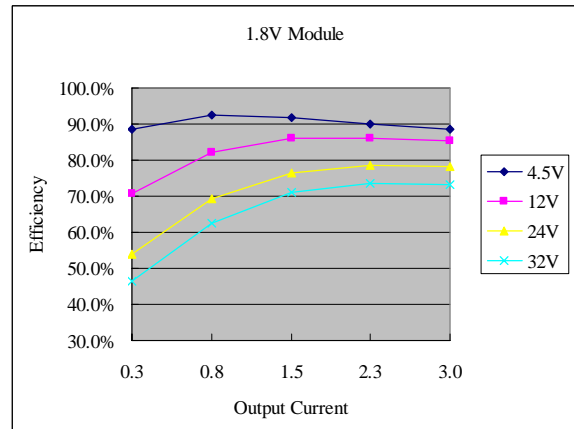
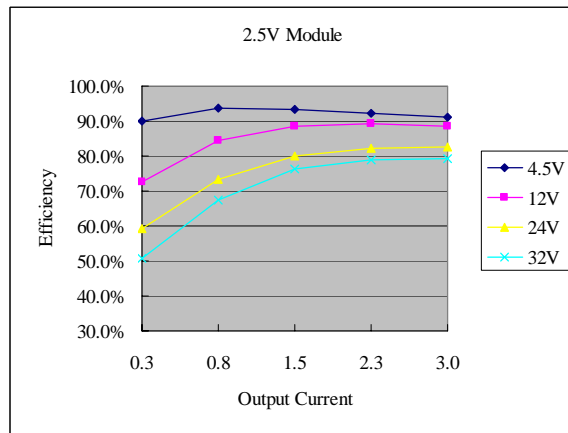
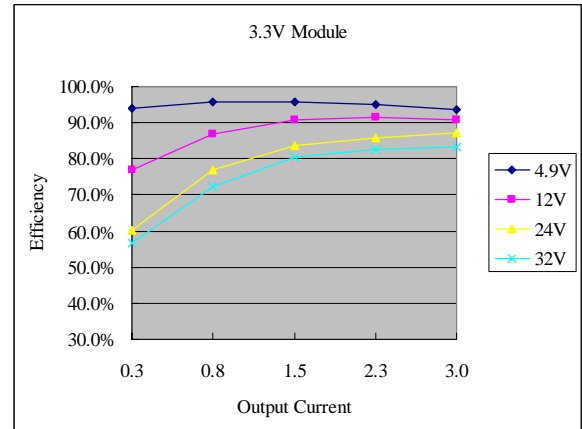
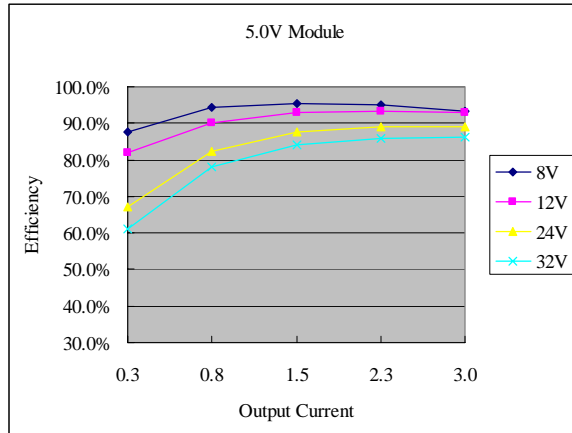
# NON-ISOLATED DC/DC CONVERTERS

4.5V-32V Input

1.2V-5.0V/3A Output



## Efficiency Data



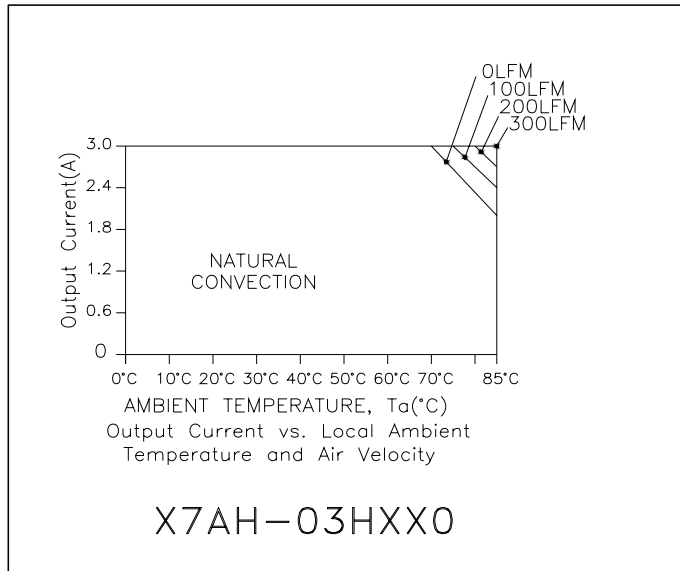
# NON-ISOLATED DC/DC CONVERTERS

4.5V-32V Input

1.2V-5.0V/3A Output



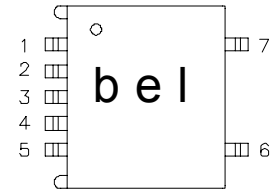
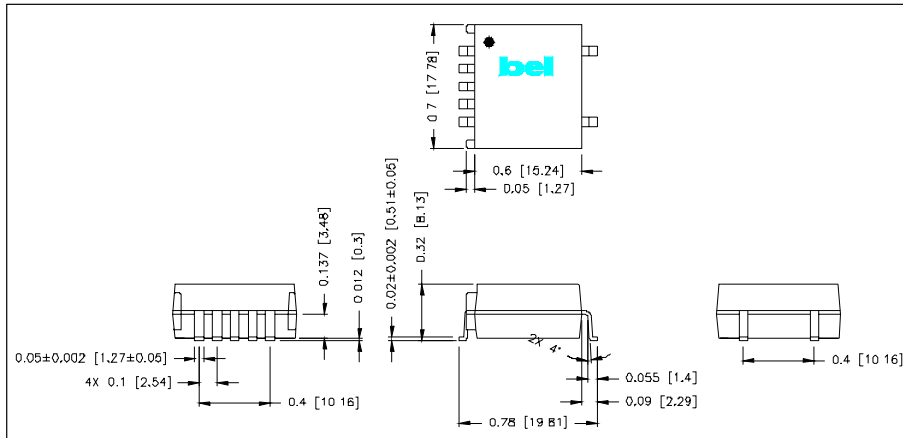
## Thermal Derating



# NON-ISOLATED DC/DC CONVERTERS

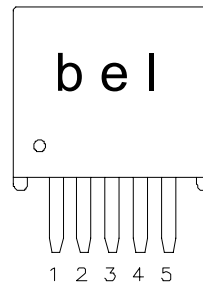
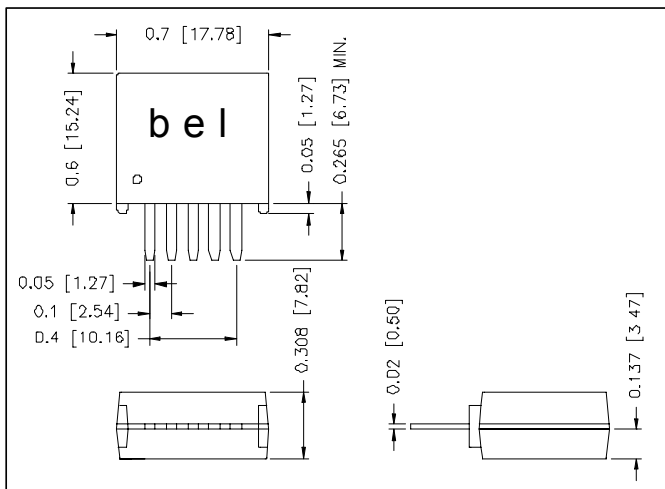
4.5V-32V Input

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)

©2003 Bel Fuse Inc. Specifications subject to change without notice. 101804

### 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)