

## NON-ISOLATED DC/DC CONVERTER

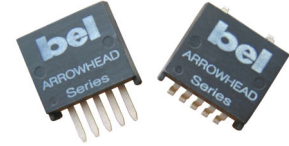
4.5V-32V Input

1.2V-3.3V/1A Output

**bel**  
POWER PRODUCTS

### x7AH-01H1A0

- Non-Isolated output
- Trim function
- Low profile package (7.82mm)
- Remote On/Off
- OCP/SCP
- Under-voltage lockout (UVLO)



### Description

The Bel x7AH-01H1A0 is part of the low cost non-isolated DC/DC converter series. The modules use a SMD or vertical mount package for ease of layout and space savings. The output is widely trimmed from 1.2V to 3.3V. 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
1.2V - 3.3V	4.5 - 32V	1A	3.3W	86%	S7AH-01H1A0	V7AH-01H1A0

**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)	-0.3V	-	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	20V	32V	
Input Current (no load)	-	5mA	8mA	
Input Current (full load)				
Vo=3.3V	-	-	0.20A	
Vo=2.5V	-	-	0.16A	
Vo=1.8V	-	-	0.12A	
Vo=1.5V	-	-	0.11A	
Vo=1.2V	-	-	0.09A	
Remote Off Input Current	-	2mA	5mA	
Input Reflected Ripple Current (pk-pk)	-	300mA	420mA	Tested with simulated source impedance of 500nH, 5Hz to 20MHz and one 100uF/50V electrolytic capacitor and a 3.3uF/50V ceramic capacitor at the input
Input Reflected Ripple Current (RMS)	-	100mA	160mA	
I <sup>2</sup> t Inrush Current Transient	-	0.02A <sup>2</sup> s	0.1A <sup>2</sup> s	
Turn on Voltage Threshold	-	4.1V	4.5V	
Turn off Voltage Threshold	-	3.3V	4.0V	

**Note:** All specifications are typical at 25°C unless otherwise stated.

# NON-ISOLATED DC/DC CONVERTER

4.5V-32V Input

1.2V-3.3V/1A Output



## Output Specifications

Parameter		Min	Typ	Max	Notes	
Output Voltage Set Point	Vo=3.3V	3.234V	3.3V	3.366V	Test conditions: Vin=20V, Io=50% full load	
	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=3.3V	-	±3mV	±6mV		
	Vo=2.5V	-	±2mV	±5mV		
	Vo=1.8V	-	±2mV	±4mV		
	Vo=1.5V	-	±1mV	±3mV		
	Vo=1.2V	-	±1mV	±2mV		
Load Regulation	Vo=3.3V	-	±3mV	±6mV		
	Vo=2.5V	-	±2mV	±5mV		
	Vo=1.8V	-	±2mV	±4mV		
	Vo=1.5V	-	±1mV	±3mV		
	Vo=1.2V	-	±1mV	±2mV		
Regulation Over Temperature (-40°C to +85°C)		-	±10mV	±20mV		
Output Current		0A	-	1A		
Current Limit Threshold		2A	-	3A		
Short Circuit Surge Transient		-	0.02A <sup>2</sup> s	0.1A <sup>2</sup> s		
Ripple and Noise (RMS)		-	6mV	10mV	Test condition: 0-20MHz BW	
Ripple and Noise (pk-pk)		-	60mV	100mV		
Turn on Time		-	6mS	30mS		
Overshoot at Turn on		-	2%	5%		
Output Capacitance		0uF	-	400uF		
<b>Transient Response</b>						
50% ~ 100% Max Load	Overshoot	Vo=3.3V	-	80mV	120mV	Test conditions: di/dt = 0.5A/uS; Vin = 20V
	Settling Time		-	150uS	200uS	
100% ~ 50% Max Load	Overshoot	Vo=3.3V	-	80mV	120mV	
	Settling Time		-	150uS	200uS	
50% ~ 100% Max Load	Overshoot	Vo=2.5V	-	70mV	110mV	
	Settling Time		-	120uS	160uS	
100% ~ 50% Max Load	Overshoot	Vo=2.5V	-	70mV	110mV	
	Settling Time		-	120uS	160uS	
50% ~ 100% Max Load	Overshoot	Vo=1.8V	-	60mV	100mV	
	Settling Time		-	100uS	130uS	
100% ~ 50% Max Load	Overshoot	Vo=1.8V	-	60mV	100mV	
	Settling Time		-	100uS	130uS	
50% ~ 100% Max Load	Overshoot	Vo=1.5V	-	60mV	100mV	
	Settling Time		-	100uS	130uS	
100% ~ 50% Max Load	Overshoot	Vo=1.5V	-	60mV	100mV	
	Settling Time		-	100uS	130uS	
50% ~ 100% Max Load	Overshoot	Vo=1.2V	-	60mV	100mV	
	Settling Time		-	100uS	130uS	
100% ~ 50% Max Load	Overshoot	Vo=1.2V	-	60mV	100mV	
	Settling Time		-	100uS	130uS	

**Note:** All specifications are typical at 20V input, full load at 25°C unless otherwise stated.

# NON-ISOLATED DC/DC CONVERTER

4.5V-32V Input

1.2V-3.3V/1A Output



## General Specifications

Parameter	Min	Typ	Max	Notes
Efficiency				Measured at Vin=20V, full load.
Vo=3.3V	83%	86%	-	
Vo=2.5V	80%	83%	-	
Vo=1.8V	76%	79%	-	
Vo=1.5V	73%	76%	-	
Vo=1.2V	70%	73%	-	
Switching Frequency				
Vo=3.3V	270KHz	290KHz	310KHz	
Vo=2.5V	190KHz	220KHz	250KHz	
Vo=1.8V	150KHz	170KHz	190KHz	
Vo=1.5V	130KHz	150KHz	170KHz	
Vo=1.2V	100KHz	120KHz	140KHz	
Output Trim Range	1.2V	-	3.3V	Vo=1.2V when trim pin open.
MTBF	8,040,000 hours			Calculated Per Bell Core TR-332 (Io =0.8A, Vin=20V; 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	-	

**Note:** All specifications are typical at 20V input, full load at 25°C unless otherwise stated.

## 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	

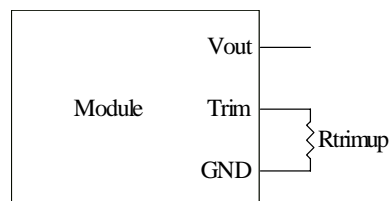
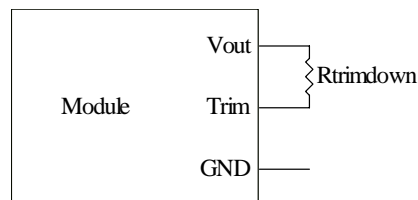
## Output Trim Equations

Equations for calculating the trim resistor (in kΩ) given the desired adjusted voltage (Vadj) and the nominal output voltage of the converter (Vo) 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.

$$R_{TrimDown} = \frac{8.7}{V_o - V_{adj}} - 21.5$$

$$R_{TrimUp} = \frac{17.2}{V_{adj} - V_o}$$

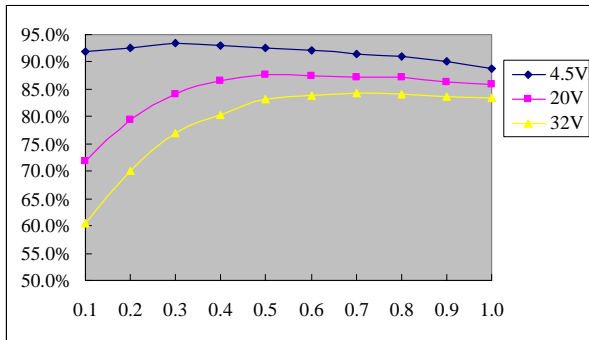
**Note:** Output voltage Vo=1.205V



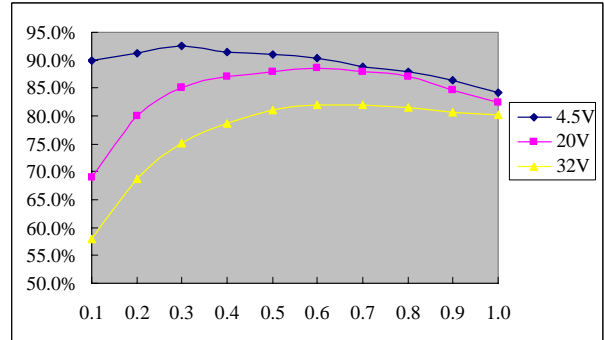
**NON-ISOLATED DC/DC CONVERTER**  
 4.5V-32V Input      1.2V-3.3V/1A Output



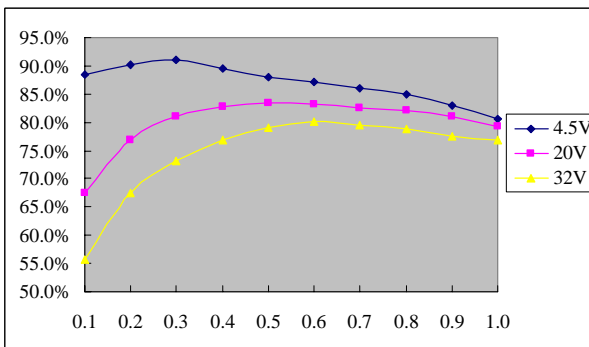
**Efficiency Data**



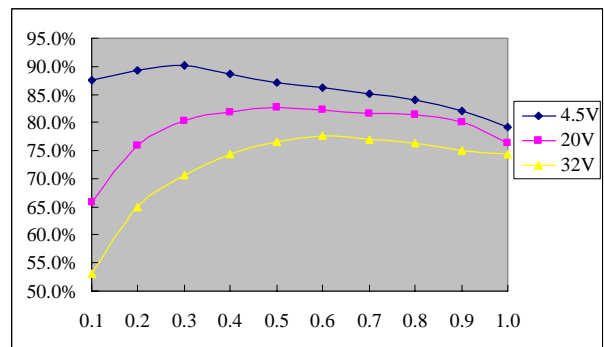
Vo = 3.3V



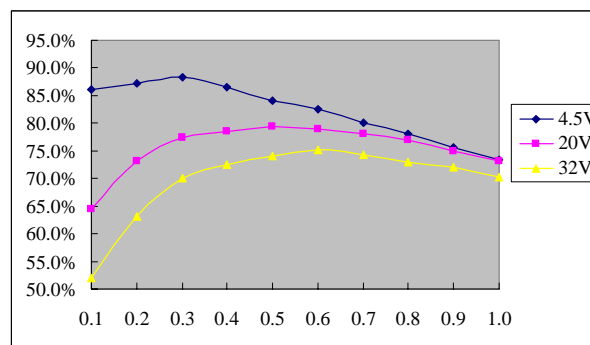
Vo = 2.5V



Vo = 1.8V



Vo = 1.5V



Vo = 1.2V

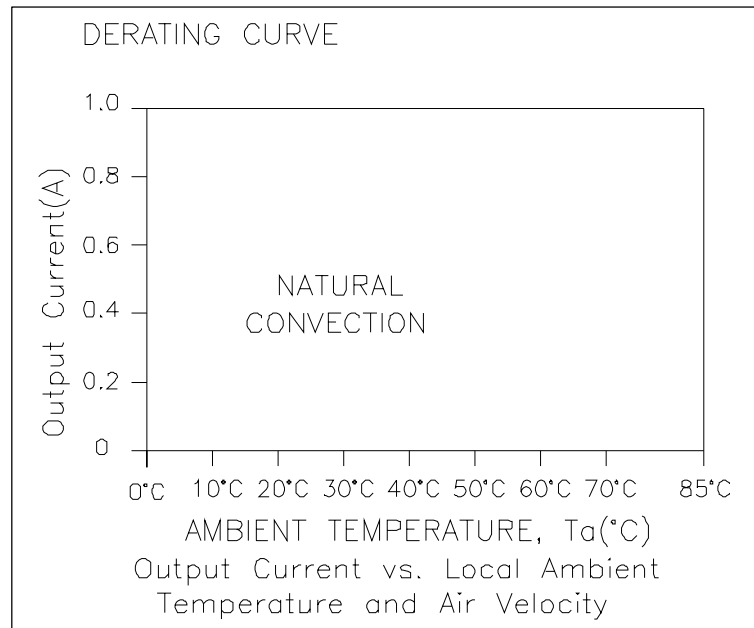
## NON-ISOLATED DC/DC CONVERTER

4.5V-32V Input

1.2V-3.3V/1A Output

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POWER PRODUCTS

### Thermal Derating Curve

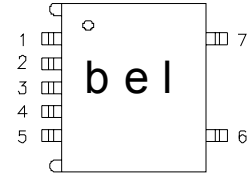
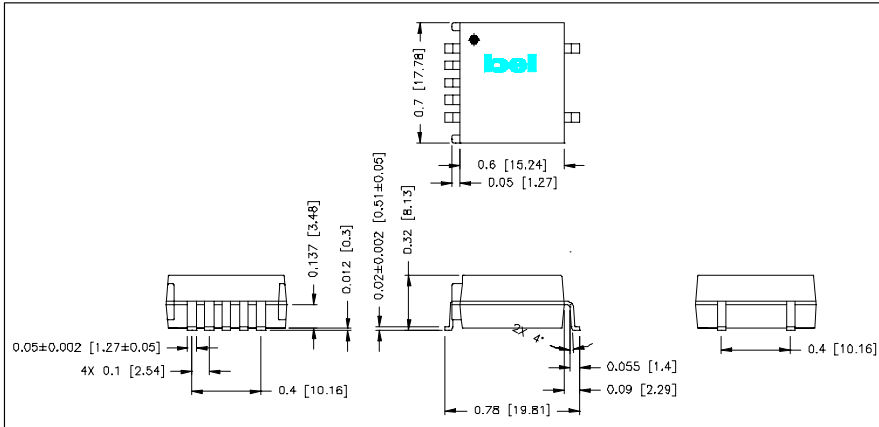


**Test Condition:** Derating curve is tested at nominal input voltage.

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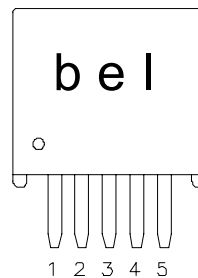
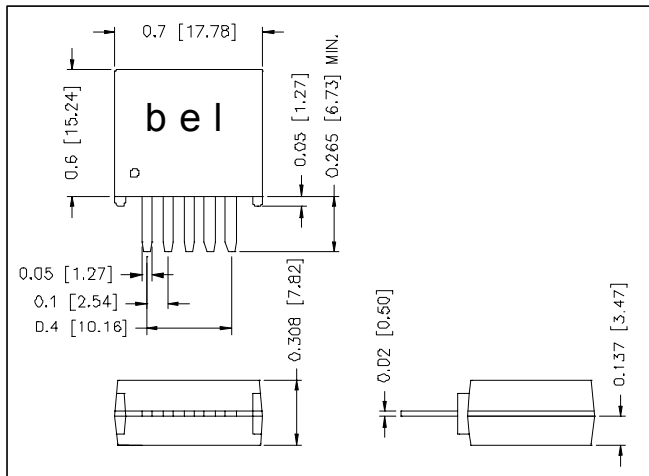
4.5V-32V Input

1.2V-3.3V/1A 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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