

# NON-ISOLATED DC/DC CONVERTERS

12V Input 0.9V-3.63V/7A Output



## X7AH-07A Series PRELIMINARY

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

### Description

The Bel X7AH-07AXX0 modules are a series of non-isolated, step down DC/DC power converters that operate from a nominal 12V source. These converters are available in a range of output voltages from 0.9V to 3.3V. It is packaged in a compact, overmolded package rated at 7A. 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 88% 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
3.3V	12V	7A	23.1W	88%	S7AH-07A330	V7AH-07A330
2.5V	12V	7A	17.5W	86%	S7AH-07A250	V7AH-07A250
1.8V	12V	7A	12.6W	83%	S7AH-07A180	V7AH-07A180
1.5V	12V	7A	10.5W	81%	S7AH-07A150	V7AH-07A150
1.2V	12V	7A	8.4W	78%	S7AH-07A120	V7AH-07A120
0.9V	12V	7A	6.3W	74%	S7AH-07A090	V7AH-07A090
0.9V - 3.63V	12V	7A	23.1W	88%	S7AH-07A1A0	V7AH-07A1A0

### Absolute Maximum Ratings

Parameter	Min	Typ	Max	Notes
Input Voltage (continuous)	-0.3V	-	15V	
Output Enable Terminal Voltage	-0.3V	-	14V	
Ambient Temperature	-40°C	-	85°C	
Storage Temperature	-55°C	-	125°C	

### Input Specifications

Parameter	Min	Typ	Max	Notes
Input Voltage	10V	-	14V	
Input Current (no load)	-	-	100mA	
Input Current (full load)				
Vo=3.3V	-	-	3.0A	
Vo=2.5V	-	-	2.6A	
Vo=1.8V	-	-	1.9A	
Vo=1.5V	-	-	1.6A	
Vo=1.2V	-	-	1.3A	
Vo=0.9V	-	-	1.0A	
Remote Off Input Current	-	3mA	10mA	

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## Input Specifications (continued)

Parameter	Min	Typ	Max	Notes
Input Reflected Ripple Current (pk-pk)	-	180mA	-	Tested with simulated source impedance of 500nH, 5Hz to 20MHz and two 270uF/16V OSC capacitors with ESR=0.018 ohm max. at 100KHz
Input Reflected Ripple Current (RMS)	-	50mA	-	
I <sup>2</sup> t Inrush Current Transient	-	TBD	-	
Turn on Voltage Threshold	-	9.5V	-	
Turn off Voltage Threshold	8.5V	9.0V	9.5V	

## Output Specifications

Parameter	Min	Typ	Max	Notes		
Output Voltage Set Point				Test conditions: Vin=12V, Io=50% full load		
Vo=3.3V	3.247V	3.3V	3.353V			
Vo=2.5V	2.460V	2.5V	2.540V			
Vo=1.8V	1.771V	1.8V	1.829V			
Vo=1.5V	1.476V	1.5V	1.524V			
Vo=1.2V	1.181V	1.2V	1.219V			
Vo=0.9V	0.886V	0.9V	0.914V			
Line Regulation	-	±3mV	±6mV			
Load Regulation				Test condition: 0-20MHz BW, with a 330uF/10V tan capacitor at the output.		
Vo=3.3V	-	±5mV	±10mV			
Vo=2.5V	-	±5mV	±10mV			
Vo=1.8V	-	±5mV	±10mV			
Vo=1.5V	-	±3mV	±6mV			
Vo=1.2V	-	±3mV	±6mV			
Vo=0.9V	-	±3mV	±6mV			
Regulation Over Temperature (-40°C to +85°C)	-	30mV	50mV			
Output Current	0A	-	7A			
Current Limit Threshold	10A	-	20A			
Short Circuit Surge Transient	-	TBD	-			
Ripple and Noise (RMS)				Test condition: 0-20MHz BW, with a 330uF/10V tan capacitor at the output.		
Vo=3.3V	-	20mV	50mV			
Vo=2.5V	-	20mV	50mV			
Vo=1.8V	-	15mV	40mV			
Vo=1.5V	-	15mV	40mV			
Vo=1.2V	-	15mV	30mV			
Vo=0.9V	-	10mV	30mV			
Ripple and Noise (pk-pk)				Test condition: 0-20MHz BW, with a 330uF/10V tan capacitor at the output.		
Vo=3.3V	-	70mV	100mV			
Vo=2.5V	-	70mV	100mV			
Vo=1.8V	-	60mV	100mV			
Vo=1.5V	-	60mV	80mV			
Vo=1.2V	-	60mV	80mV			
Vo=0.9V	-	50mV	70mV			
Turn on Time	-	8mS	20mS			
Overshoot at Turn on	-	0%	3%			
Output Capacitance	330uF	-	2800uF			
<b>Transient Response</b>						
50% ~ 100% Max Load	Overshoot	All	-	120mV	180mV	Test conditions: di/dt = 0.5A/uS; Vin = 12V; with a 330uF/10V Tan. Capacitor at the output.
	Settling Time		-	50uS	80uS	
100% ~ 50% Max Load	Overshoot		-	120mV	180mV	
	Settling Time		-	50uS	80uS	

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

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## General Specifications

Parameter	Min	Typ	Max	Notes
Efficiency				Measured at Vin=12V, full load and Ta=25°C
Vo=3.3V	85%	88%	-	
Vo=2.5V	83%	86%	-	
Vo=1.8V	80%	83%	-	
Vo=1.5V	78%	81%	-	
Vo=1.2V	75%	78%	-	
Vo=0.9V	71%	74%	-	
Switching Frequency	250KHz	300KHz	350KHz	
Output Trim Range (wide trim)	-	-	403%Vo	Vo=0.9V
Output Trim Range (narrow trim)				
Vo=1.2V-3.3V	90%Vo	-	110%Vo	
Vo=0.9V	-	-	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	-	5g	-	

## Control Specifications

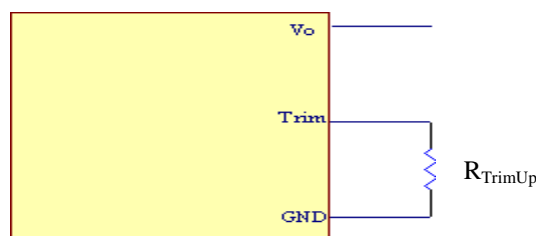
Parameter	Min	Typ	Max	Notes
<b>Remote On/Off</b>				
Signal Low (Unit Off)	-0.3V	-	1V	Remote on/off pin open, unit on.
Signal High (Unit On)	3.5V	-	14V	

## Output Trim Equations

### 1) X7AH-07A1A0

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 Up resistor should be connected between the Trim pin and Ground.

$$R_{TrimUp} = \frac{6.062}{V_{adj} - V_{nom}} - 1.05$$



Note: Output voltage Vo=0.9V when RtrimUp is not connected.

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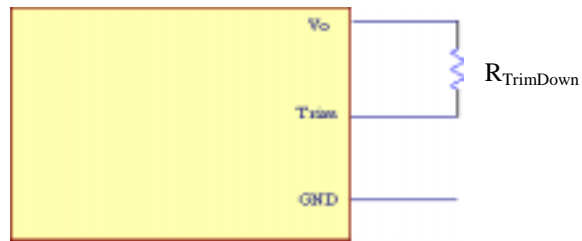


## Output Trim Equations (Continued)

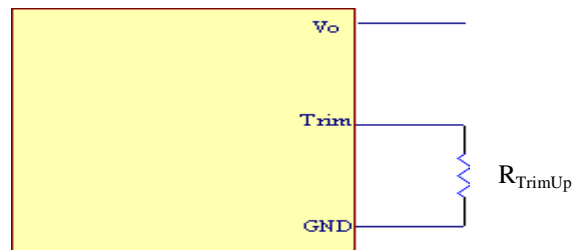
### 2) X7AH-07AXX0

Equations for calculating the trim resistor (in kΩ) given the desired adjusted voltage ( $V_{adj}$ ) and the nominal output voltage of the converter ( $V_{nom}$ ) are shown below. The Trim Down resistor should be connected between the Trim pin and  $V_{out}$ . 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.

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



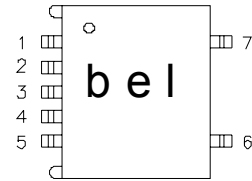
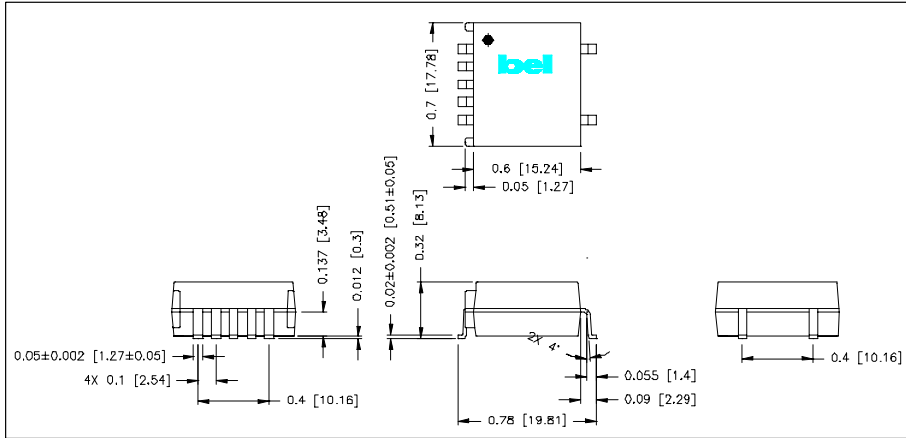
$$R_{TrimUp} = \frac{C}{V_{adj} - V_{nom}} - D$$



Vnom	A	B	C	D
3.3	22.56	18.66	6.06	10.00
2.5	15.62	18.66	6.06	10.00
1.8	9.55	18.66	6.06	10.00
1.5	6.95	18.66	6.06	10.00
1.2	4.35	18.66	6.06	10.00
0.9	N/A	N/A	6.06	1.05

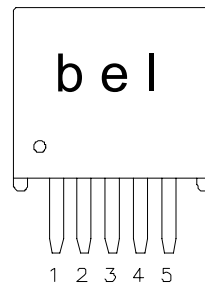
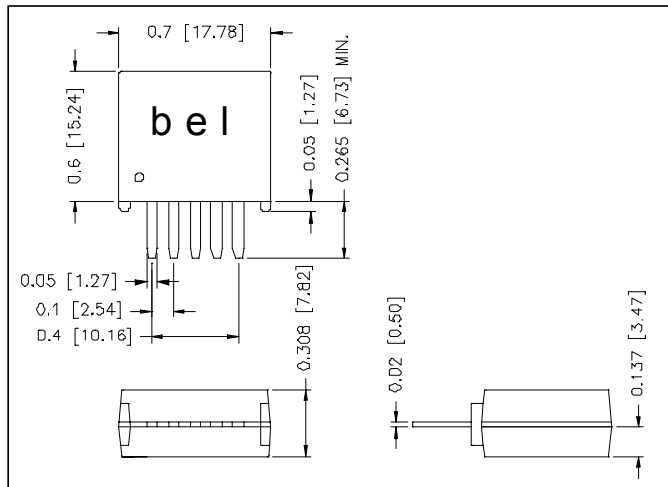
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## Pin Connections

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



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

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