

NON-ISOLATED DC/DC CONVERTERS

4.5V-32V Input

1.2V-5.0V/1A Output



X7AH-01HXX0

PRELIMINARY

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

Description

The Bel X7AH-01HXX0 is part of the low cost non-isolated DC/DC converter Power Module series. It is packaged in a compact, overmolded package rated at 1A. 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 5V 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	4.5 – 32V	1A	5.0W	90%	S7AH-01H500	V7AH-01H500
3.3V	4.5 – 32V	1A	3.3W	86%	S7AH-01H330	V7AH-01H330
2.5V	4.5 – 32V	1A	2.5W	83%	S7AH-01H250	V7AH-01H250
1.8V	4.5 – 32V	1A	1.8W	79%	S7AH-01H180	V7AH-01H180
1.5V	4.5 – 32V	1A	1.5W	76%	S7AH-01H150	V7AH-01H150
1.2V	4.5 – 32V	1A	1.2W	73%	S7AH-01H120	V7AH-01H120

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				
Vo=5.0V	8.0V	20V	32V	
Vo=1.2V-3.3V	4.5V	20V	32V	
Input Current (no load)	-	5mA	8mA	
Input Current (full load)				
Vo=5.0V	-	-	0.30A	
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	

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Input Specifications (continued)

Parameter	Min	Typ	Max	Notes
Input Reflected Ripple Current (pk-pk)	-	150mA	300mA	Tested with simulated source impedance of 500nH, 5Hz to 20MHz and one 100uF/50V electrolytic caps and a 3.3uF/50V ceramic capacitor at the input
Input Reflected Ripple Current (RMS)	-	60mA	120mA	
i ² t Inrush Current Transient	-	0.02A ² s	0.1A ² s	
Turn on Voltage Threshold				
Vo=5.0V	-	5.0V	7.0V	
Vo=1.2V-3.3V	-	4.1V	4.5V	
Turn off Voltage Threshold				
Vo=5.0V	-	3.6V	5.0V	
Vo=1.2V-3.3V	-	3.3V	4.0V	

Output Specifications

Parameter	Min	Typ	Max	Notes
Output Voltage Set Point				Test conditions: Vin=20V, Io=50% full load
Vo=5.0V	4.90V	5.0V	5.10V	
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	-	±5mV	±10mV	
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=5.0V	-	±5mV	±10mV	
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	1.3A	-	2.5A	
Short Circuit Surge Transient	-	0.02A ² s	0.1A ² 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	

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Output Specifications (continued)

Parameter		Min	Typ	Max	Notes	
Transient Response						
50% ~ 100%	Overshoot	Vo=5.0V	-	140mV	170mV	Test conditions: di/dt = 0.5A/uS; Vin = 20V
	Settling Time		-	100uS	130uS	
100% ~ 50%	Overshoot	Vo=3.3V	-	140mV	170mV	
	Settling Time		-	100uS	130uS	
50% ~ 100% Max Load	Overshoot	Vo=3.3V	-	80mV	120mV	
	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=1.2V - 1.5V	-	60mV	100mV	
	Settling Time		-	100uS	130uS	
100% ~ 50% Max Load	Overshoot	Vo=1.2V - 1.5V	-	60mV	100mV	
	Settling Time		-	100uS	130uS	

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

General Specifications

Parameter	Min	Typ	Max	Notes
Efficiency				Measured at Vin=20V, full load and Ta=25°C
Vo=5.0V	87%	90%	-	
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=5.0V	130KHz	150KHz	170KHz	
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	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	-	

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4.5V-32V Input

1.2V-5.0V/1A Output



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

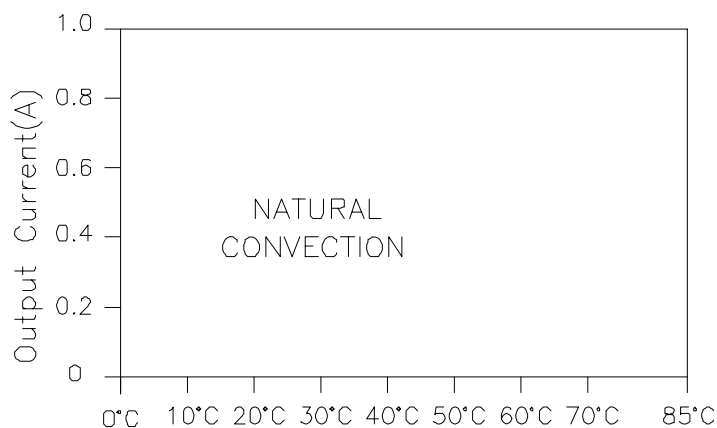
Equations for calculating the trim resistor (in kΩ) given the desired adjusted voltage (V_{adj}) and the nominal output voltage of the converter (V_o) are shown below. The Trim Down resistor should be connected between the Trim pin and V_{out} . The Trim Up resistor should be connected between the Trim pin and Ground. Only one of the resistors should be used for any given application.

$$R_{TrimDown} = \frac{A}{V_o - V_{adj}} - B \qquad R_{TrimUp} = \frac{C}{V_{adj} - V_o} - D$$

V_o	A	B	C	D
5.0	153.56	85.20	29.20	48.70
3.3	53.80	21.50	17.20	X
2.5	36.70	21.50	17.20	X
1.8	21.70	21.50	17.20	X
1.5	15.20	21.50	17.20	X
1.2	8.70	21.50	17.20	X

Thermal Derating Curve

DERATING CURVE

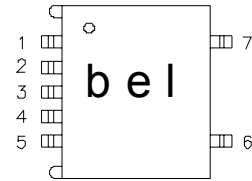
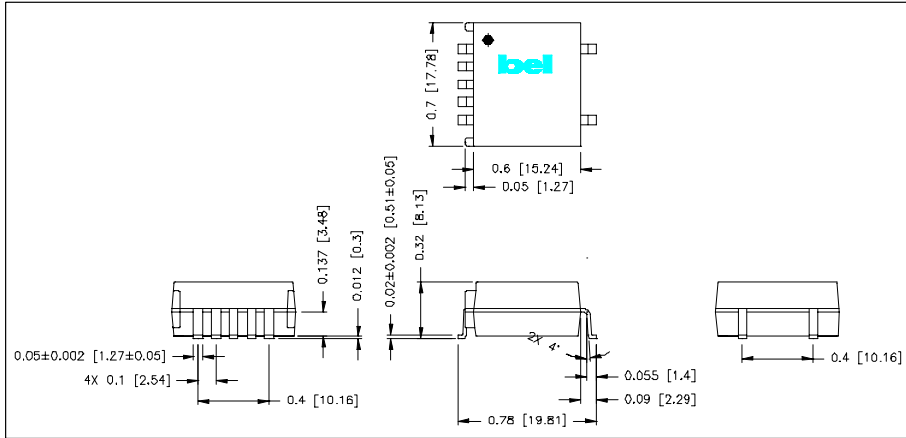


AMBIENT TEMPERATURE, T_a (°C)
Output Current vs. Local Ambient Temperature and Air Velocity

NON-ISOLATED DC/DC CONVERTERS

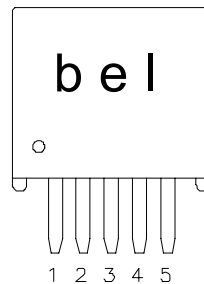
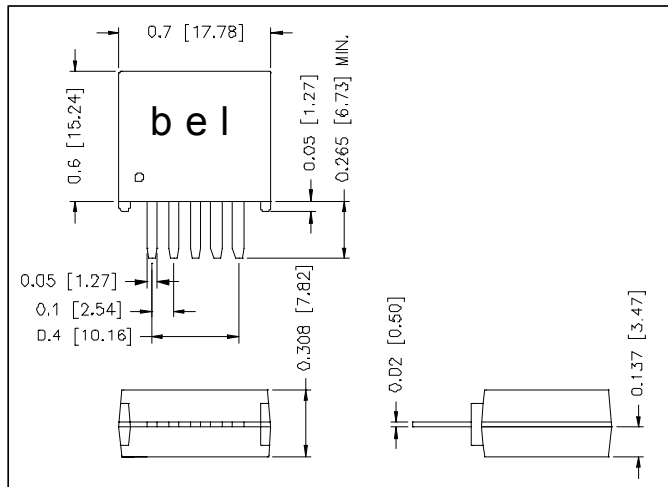
4.5V-32V Input

1.2V-5.0V/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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