NON-ISOLATED DC/DC CONVERTERS

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

x7AH-03H Series

- 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 power converter 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

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	-	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^2t Inrush Current Transient	-	$0.02A^2s$	$0.1A^2s$	
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.

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	-	$0.02A^2s$	$0.1A^2s$	
Ripple and Noise (RMS)						
		Vo=1.2V-5.0V	-	25mV	50mV	Tested with 0-20MHz BW, with a 220uF tantalum capacitor at the output.
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		-	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		-	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		-	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		-	90mV	140mV	
	Settling Time		-	40uS	80uS	

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

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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=1.8V	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	8,120,000 hours			Calculated Per Bell Core TR-332 (Io = Nominal; Ta = 25°C)
Dimensions (surface mount)				
Inches (L × W × H)	0.78 x 0.70 x 0.32			
Millimeters (L × W × H)	19.81 x 17.78 x 8.13			
Dimensions (vertical)				
Inches (L × W × H)	0.70 x 0.308 x 0.65			
Millimeters (L × W × H)	17.78 x 7.82 x 16.51			
Weight	-	5.1g	-	

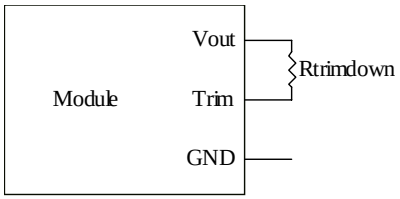
Control Specifications

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	

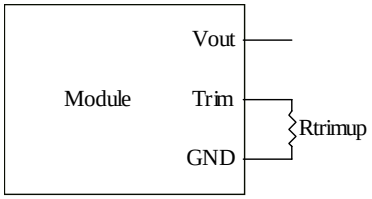
Output Trim Equations

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.

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

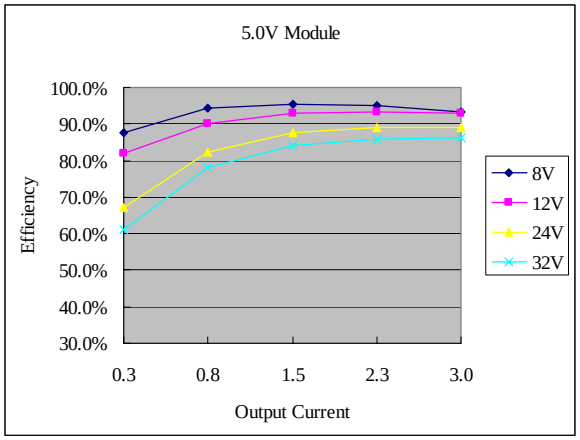


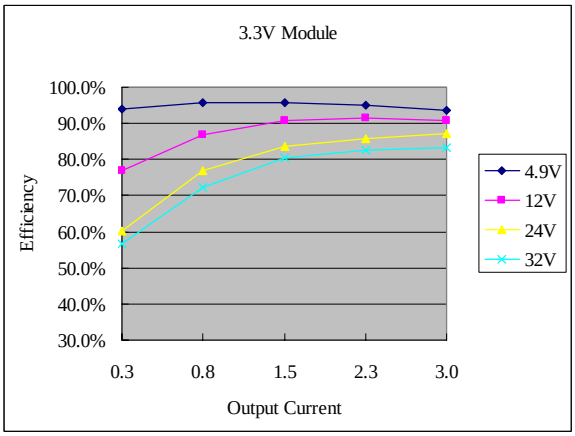
$$R_{trimup} = \frac{C}{V_{adj} - V_{nom}} - D$$

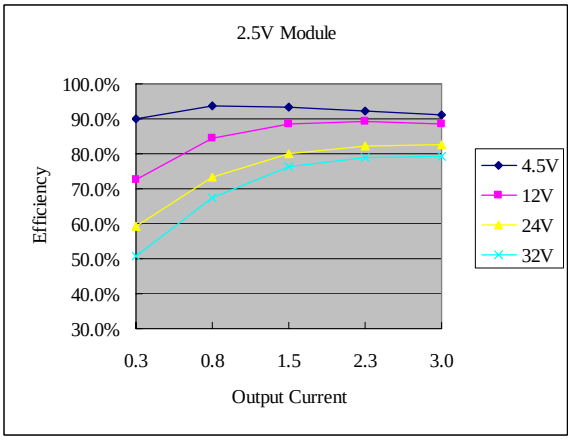


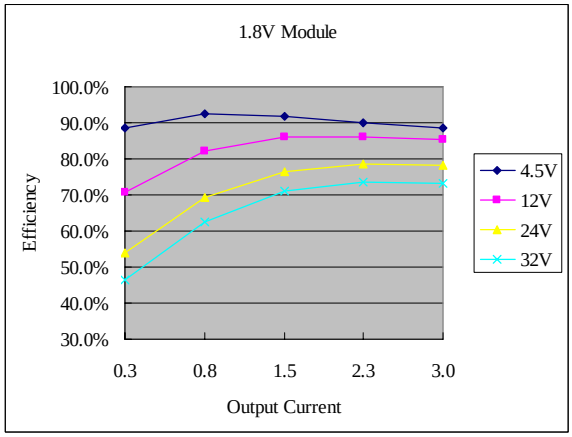
Vnom	A	B	C	D
5.0	61.850	29.400	11.760	14.700
3.3	53.840	61.700	17.200	40.200
2.5	9.556	15.620	4.496	10.000
1.8	3.849	13.830	3.064	10.000
1.5	3.102	14.420	3.536	10.000
1.2	1.794	10.910	3.536	6.490

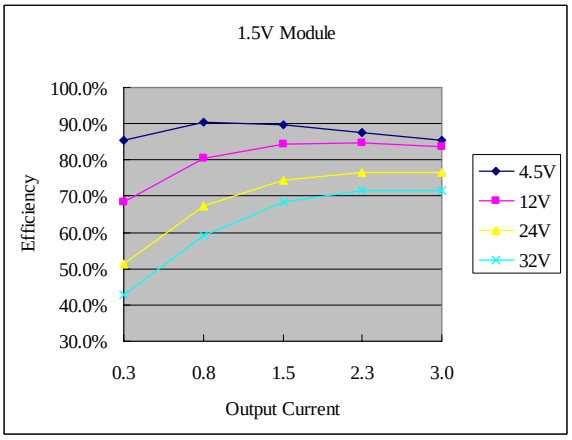
Efficiency Data

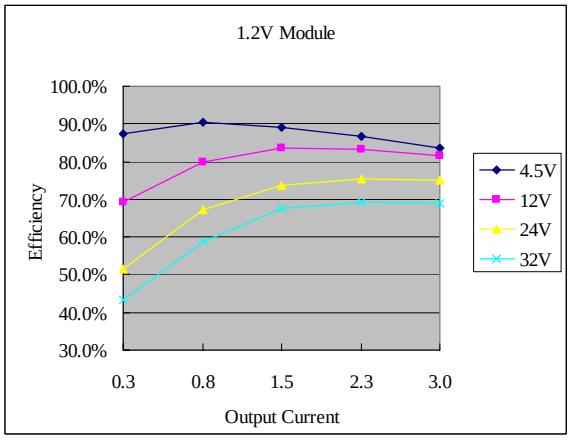




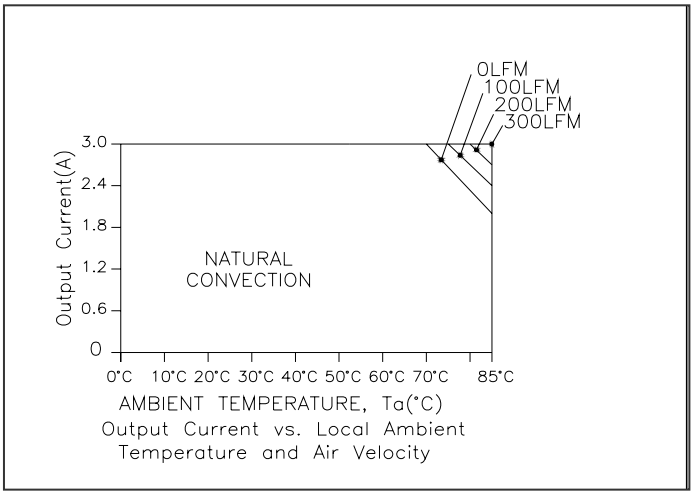








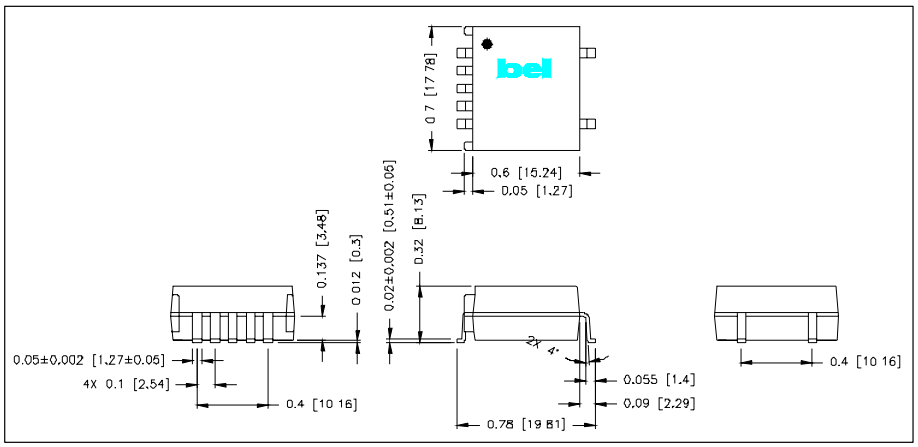
Thermal Derating Curve

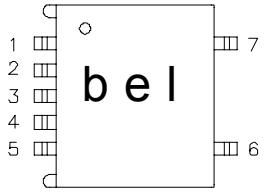


Vin=24V

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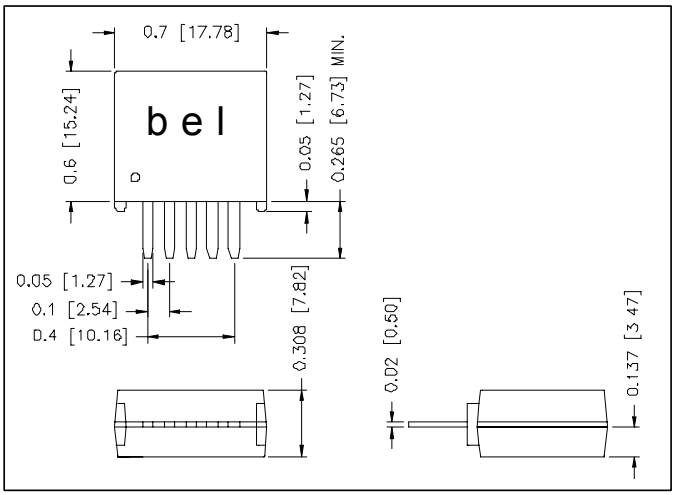
4.5V-32V Input 1.2V-5.0V/3A Output

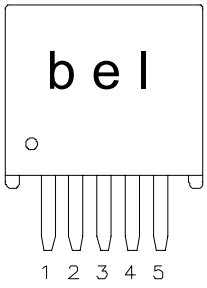




Pin Connections

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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