

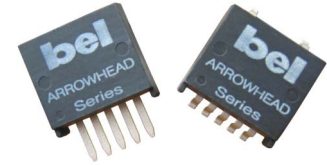
NON-ISOLATED DC/DC CONVERTERS

4.5V-13.2V Input 1.0V-5.0V/6A Output

bel
POWER PRODUCTS

x7AH-06E Series

- Non-Isolated
- Fixed Frequency (400kHz)
- Remote On/Off
- Under-voltage Lockout (UVLO)
- OCP/SCP (Latch off)
- Trim Function
- Low Profile Package (7.82mm)



Description

The Bel x7AH-06Exx0 is part of the low cost non-isolated dc/dc converter series. The modules use a surface mount package or vertical package for ease of layout and space savings, with a low profile of only 7.82mm. The output is closely regulated and the efficiency of 3.3V output module is typically 91% at full load. Typical features include Remote On/Off, 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	8.0 – 13.2V	6A	30W	94%	S7AH-06E500	V7AH-06E500
3.3V	4.5 – 13.2V	6A	19.8W	91%	S7AH-06E330	V7AH-06E330
2.5V	4.5 – 13.2V	6A	15W	89%	S7AH-06E250	V7AH-06E250
1.8V	4.5 – 13.2V	6A	10.8W	86%	S7AH-06E180	V7AH-06E180
1.5V	4.5 – 13.2V	6A	9.0W	84%	S7AH-06E150	V7AH-06E150
1.2V	4.5 – 13.2V	6A	7.2W	81%	S7AH-06E120	V7AH-06E120
1.0V	4.5 – 13.2V	6A	6W	79%	S7AH-06E100	V7AH-06E100

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	-	14V	
Output Enable Terminal Voltage	-0.3V	-	6.5V	
Ambient Temperature	-40°C	-	85°C	
Storage Temperature	-40°C	-	125°C	

Input Specifications

Parameter	Min	Typ	Max	Notes
Input Voltage	4.5V	-	13.2V	
Input Current (full load)				
Vo=5.0V	-	-	4.8A	
Vo=3.3V	-	-	5.5A	
Vo=2.5V	-	-	4.5A	
Vo=1.8V	-	-	3.4A	
Vo=1.5V	-	-	2.9A	
Vo=1.2V	-	-	2.4A	
Vo=1.0V	-	-	2.0A	

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4.5V-13.2V Input 1.0V-5.0V/6A Output



Input Specifications (continued)

Parameter	Min	Typ	Max	Notes
Input Current (no load)				When Vout=5V, Vin=8V-13.2V, Otherwise Vin=4.5V-13.2V
Vo=5.0V	-	55mA	95mA	
Vo=3.3V	-	50mA	85mA	
Vo=2.5V	-	45mA	75mA	
Vo=1.8V	-	40mA	65mA	
Vo=1.5V	-	35mA	60mA	
Vo=1.2V	-	32mA	55mA	
Vo=1.0V	-	30mA	50mA	
Remote Off Input Current	-	2mA	-	
Input Reflected Ripple Current (pk-pk)	-	150mA	250mA	With simulated source impedance of 500nH, 5Hz to 20MHz; use two 270uF/16V Oscon capacitors with ESR = 0.018 ohm max. at 100KHz
Input Reflected Ripple Current (RMS)	-	60mA	120mA	
I ² t Inrush Current Transient	-	0.04A ² s	0.1A ² s	
Turn-on Voltage Threshold	-	4.2V	4.5V	Only applicable to 1.0V to 3.3V output modules.
Turn-off Voltage Threshold	3.2V	3.6V	4.0V	

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

Output Specifications

Parameter	Min	Typ	Max	Notes
Output Voltage Set Point				Test condition: Vin=8V, Iout=half 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	
Vo=1.0V	0.980V	1.0V	1.020V	
Line Regulation				
Vo=5.0V	-	±8mV	±10mV	
Vo=3.3V	-	±5mV	±8mV	
Vo=2.5V	-	±4mV	±8mV	
Vo=1.8V	-	±3mV	±6mV	
Vo=1.5V	-	±2mV	±4mV	
Vo=1.2V	-	±2mV	±4mV	
Vo=1.0V	-	±2mV	±4mV	
Load Regulation				
Vo=5.0V	-	±8mV	±15mV	
Vo=3.3V	-	±6mV	±10mV	
Vo=2.5V	-	±5mV	±8mV	
Vo=1.8V	-	±4mV	±6mV	
Vo=1.5V	-	±3mV	±5mV	
Vo=1.2V	-	±3mV	±5mV	
Vo=1.0V	-	±3mV	±5mV	

NON-ISOLATED DC/DC CONVERTERS

4.5V-13.2V Input 1.0V-5.0V/6A Output



Output Specifications (continued)

Parameter		Min	Typ	Max	Notes	
Regulation Over Temperature (-40°C to 85°C)	Vo=5.0V		±15mV	±30mV		
	Vo=3.3V		±10mV	±20mV		
	Vo=2.5V	-	±10mV	±20mV		
	Vo=1.8V		±8mV	±15mV		
	Vo=1.5V		±6mV	±12mV		
	Vo=1.2V		±5mV	±10mV		
	Vo=1.0V		±5mV	±8mV		
Output Current		0A	-	6A		
Current Limit Threshold		7A	-	15A	Latch Off	
Short Circuit Surge Transient		-	0.003A ² s	0.006A ² s	Latch Off	
Ripple and Noise (RMS)		-	30mV	50mV	BW = 0-20MHz; with 1uF ceramic capacitor & 10uF Aluminum capacitor at the output.	
Ripple and Noise (pk-pk)			50mV	100mV		
Turn on Time		-	-	30mS		
Overshoot at Turn on		-	3%	7%		
Output Capacitance		0uF	-	2400uF		
Transient Response						
50% ~ 100% Max Load	Overshoot	Vo=1.0V - 5.0V	-	150mV	200mV	di/dt = 0.5A/uS; Vin = 8V; with a 220uF Tantalum capacitor at the output.
	Settling Time		-	100uS	150uS	
100% ~ 50% Max Load	Overshoot		-	150mV	200mV	
	Settling Time		-	100uS	150uS	

Note: All specifications are typical at 8V input, full load at 25°C unless otherwise stated.

General Specifications

Parameter		Min	Typ	Max	Notes
Efficiency	Vo=5.0V	91%	94%	-	Measured at Vin=8V, full load
	Vo=3.3V	88%	91%	-	
	Vo=2.5V	86%	89%	-	
	Vo=1.8V	83%	86%	-	
	Vo=1.5V	81%	84%	-	
	Vo=1.2V	78%	81%	-	
	Vo=1.0V	76%	79%	-	
Switching Frequency		340KHz	400KHz	460KHz	
Output Trim Range		90%Vo	-	110%Vo	
MTBF		6,922,389 hours			Calculated Per Bell Core TR-332 (Io = Nominal; Ta = 25°C)
Dimensions (surface mount)					
Inches (L x W x H)		0.78 x 0.7 x 0.32			
Millimeters (L x W x H)		19.812 x 17.78 x 8.128			
Dimensions (vertical)					
Inches (L x W x H)		0.7 x 0.308 x 0.65			
Millimeters (L x W x H)		17.78 x 7.82 x 16.51			
Weight		-	5.5g	-	

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

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4.5V-13.2V Input 1.0V-5.0V/6A Output



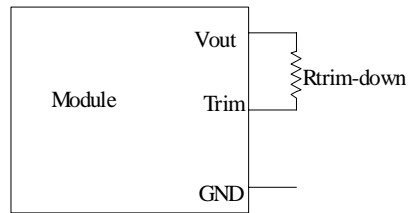
Control Specifications

Parameter	Min	Typ	Max	Notes
Remote On/Off				
Signal Low (Unit Off)	-0.3V	-	1.25V	Remote on/off pin open, unit on.
Signal High (Unit On)	3.5V	-	6.5V	

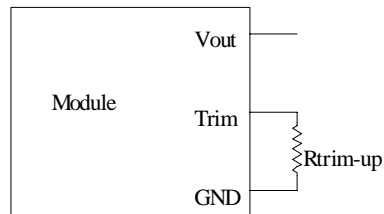
Output Trim Equations

Equations for calculating the trim resistor (in kΩ) given the desired adjusted voltage (V_{adj}) and the nominal output voltage of the converter (V_{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.

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



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



Vnom	A	B	C	D
5.0	272.745	133.400	37.140	71.500
3.3	167.607	152.800	37.140	90.900
2.5	117.622	152.800	37.140	90.900
1.8	74.394	152.800	37.140	90.900
1.5	329.981	1365.000	219.000	1000.000
1.2	219.000	666.000	219.000	301.000
1.0	100.252	898.000	149.400	649.000

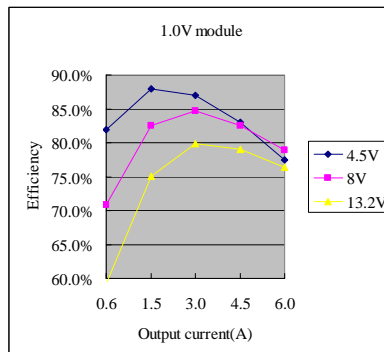
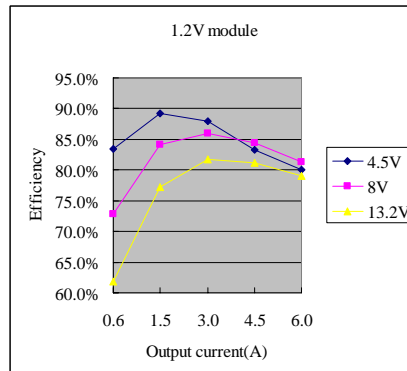
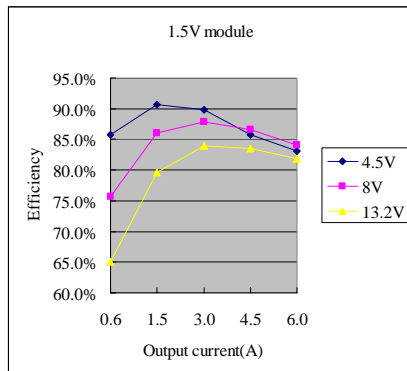
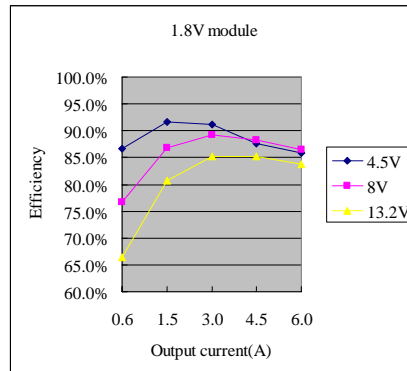
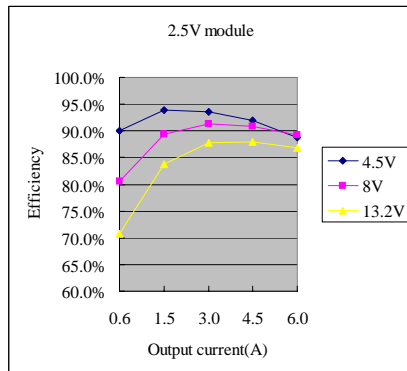
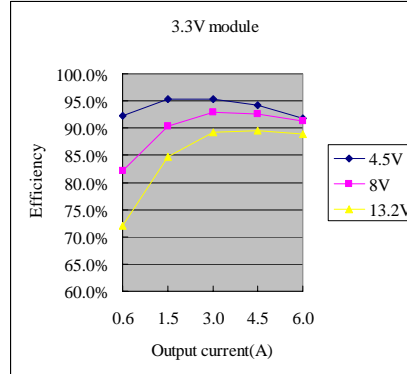
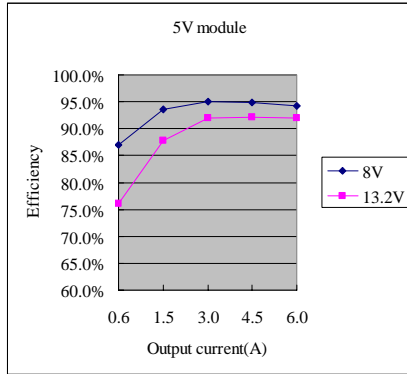
NON-ISOLATED DC/DC CONVERTERS

4.5V-13.2V Input

1.0V-5.0V/6A Output



Efficiency Data

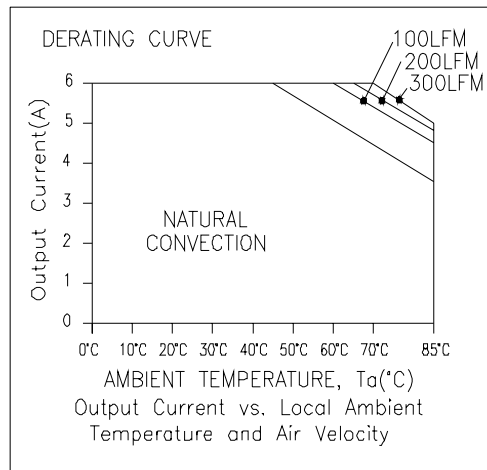


NON-ISOLATED DC/DC CONVERTERS

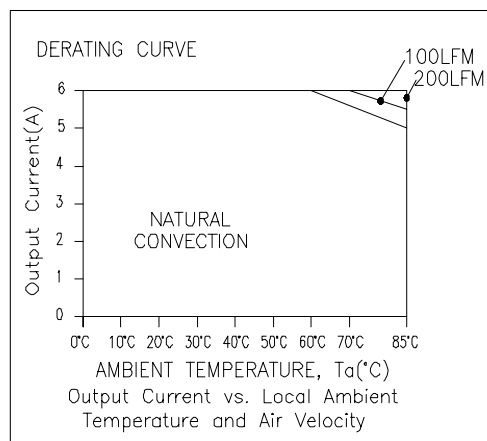
4.5V-13.2V Input 1.0V-5.0V/6A Output



Thermal Derating Curves



The derating curve of 3.3-5.0V Output Voltage



The derating curve of 1.0-2.5V Output Voltage

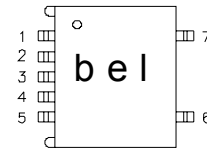
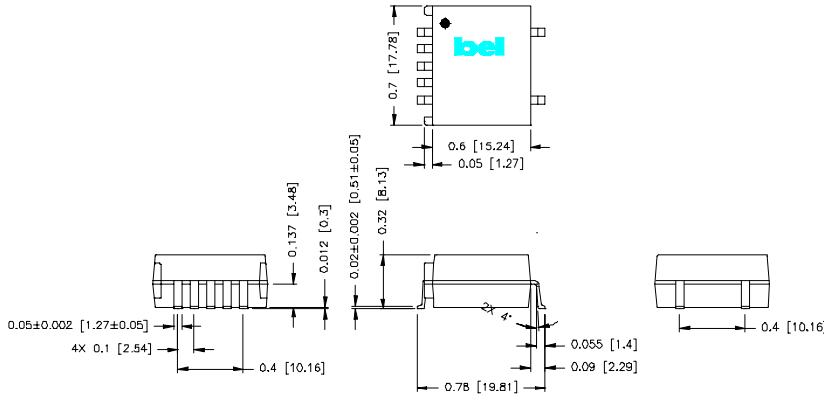
NON-ISOLATED DC/DC CONVERTERS

4.5-13.2V Input

1.0V-5.0V/6A Output



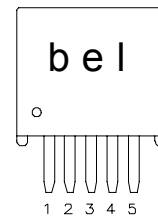
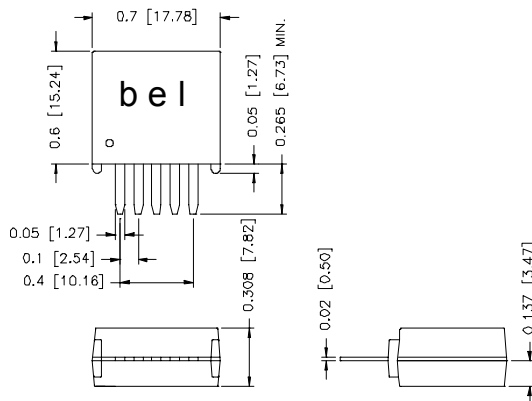
S7AH-06E



Pin Connections

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

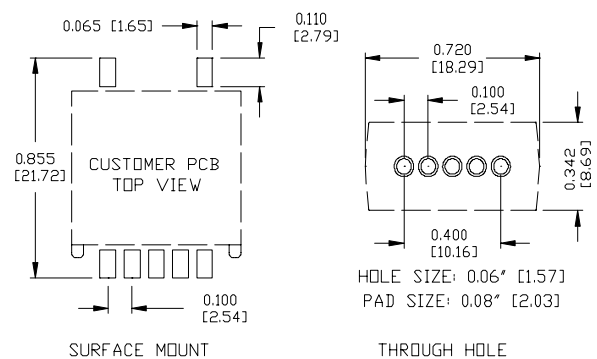
V7AH-06E



Pin Connections

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

RECOMMENDED PCB PAD LAYOUT



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