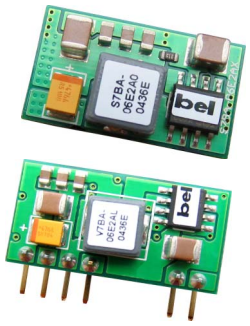
NON-ISOLATED DC/DC CONVERTERS

4.5V-14V Input 0.75V-5.0V/6A Output

x7BA-06E2Ax Series

- Non-Isolated
- High Efficiency
- High Power Density
- Fixed Frequency
- Flexible Output Voltage Sequencing
- Active Low/High (option)
- Under-voltage Lockout (UVLO)
- Remote On/Off
- OCP/SCP
- Wide Input
- Wide Trim Range



Description

The Bel x7BA-06E2Ax modules are a series of non-isolated DC/DC converters that can deliver up to 6A of output current with full load efficiency of 92% at 5.0V output. These modules provide precisely regulated voltage programmable via external resistor from 0.75V to 5.0V over a wide range of input voltage. These modules have a sequencing feature that enables designers to implement various types of output voltage sequencing when powering multiple voltages on a board. Their open-frame construction and small footprint enable designers to develop cost and space-efficient solutions. Standard features include remote On/Off, programmable output voltage and over current protection.

Part Selection

Output Voltage	Input Voltage	Max. Output Current	Max. Output Power	Typical Efficiency	Model Number Surface Mount	Model Number Vertical Mount
5.0V	7.0V - 14V	6A	30.0W	92%	S7BA-06E2Ax	V7BA-06E2Ax
0.75V – 3.3V	4.5V - 14V	6A	19.8W	88%	S7BA-06E2Ax	V7BA-06E2Ax

Note: Use “0” to replace “x” for remote on/off active high logic and use “L” for active low logic. Add “G” suffix at the end of the model numbers to indicate Tray Packaging.

Absolute Maximum Ratings

Parameter	Min	Typ	Max	Notes
Input Voltage (continuous)	-0.3V	-	15V	All specifications are typical at 25°C unless otherwise stated.
Output Enable Terminal Voltage	-0.3V	-	15V	
Sequencing Voltage [1]	-0.3V	-	Vin	
Ambient Temperature	-40°C	-	85°C	
Storage Temperature	-55°C	-	125°C	

Note: 1. x7BA-06E2Ax series of modules include a sequencing feature that enables users to implement various types of output voltage sequencing in their applications. This is accomplished via an additional sequencing pin. When the sequencing feature is not used, tie the SEQ pin to Vin.

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4.5V-14V Input 0.75V-5.0V/6A Output

Input Specifications

Parameter	Min	Typ	Max	Notes
Input Voltage				
Vo, set ≤ 3.3V	4.5V	12V	14V	
Vo, set = 5.0V	7.0V	12V	14V	
Input Current (full load)				
Vo=5.0V	-	2.75A	4.8A	
Vo=3.3V	-	1.85A	4.8A	
Vo=1.8V	-	1.05A	3.2A	
Vo=0.75V	-	0.55A	1.8A	
Input Current (no load)				
Vo=5.0V	-	-	100mA	
Vo=0.75V	-	-	20mA	
Remote Off Input Current	-	3mA	5mA	
Input Reflected Ripple Current (pk-pk)	-	120mA	200mA	Tested with two 100uF/25V input Tantalum capacitors & simulated source impedance of 1uH, 5Hz to 20MHz.
Input Reflected Ripple Current (RMS)	-	60mA	100mA	
I^2t Inrush Current Transient	-	$0.002A^2s$	$0.02A^2s$	
Turn-on Voltage Threshold				
Vo, set ≤ 3.3V	-	4.3V	4.5V	
Vo, set = 5.0V	-	6.0V	6.5V	
Turn-off Voltage Threshold				
Vo, set ≤ 3.3V	-	4.0V	4.3V	Shut down or below 90% set point.
Vo, set = 5.0V	-	5.5V	6.0V	

Output Specifications

Parameter	Min	Typ	Max	Notes
Output Voltage Set Point	-2%Vo,set	-	2%Vo,set	Vin=12V, full load
Output Voltage Set Point [1]	-2.5%Vo,set	-	3.5%Vo,set	
Load Regulation	-0.7%Vo,set	0.4%Vo,set	0.7%Vo,set	Io=Io, min to Io, max
Line Regulation	-0.7%Vo,set	0.3%Vo,set	0.7%Vo,set	Vin=Vin, min to Vin, max
Regulation Over Temperature (-40°C to +85°C)	-	0.5%Vo,set	-	Tref=Ta, min to Ta, max
Output Current	0A	-	6A	
Current Limit Threshold	6.8A	-	15A	
Short Circuit Surge Transient	-	$0.25A^2s$	-	
Ripple and Noise (pk-pk)				
Vo=5.0V	-	100mV	140mV	
Vo=3.3V	-	80mV	120mV	Tested with 0-20MHz, with 10uF/10V tantalum capacitor & 1uF/10V ceramic capacitor at the output
Vo=0.75V	-	35mV	70mV	
Ripple and Noise (RMS)				
Vo=5.0V	-	35mV	50mV	
Vo=3.3V	-	25mV	40mV	
Vo=0.75V	-	10mV	15mV	
Turn on Time	-	6mS	12mS	
Overshoot at Turn on	-	0%	3%	
Output Capacitance				
ESR ≥ 1mohm	0uF	-	1000uF	
ESR ≥ 10mohm	0uF	-	2200uF	

Transient Response					
50% ~ 100% Max Load	Vo = 0.75V -5.0V	-	200mV	350mV	di/dt=2.5A/uS; Vin=12V; and with 10uF/10V tantalum capacitor & 1uF/10V ceramic capacitor at the output.
Settling Time		-	25uS	50uS	
100% ~ 50% Max Load		-	200mV	350mV	
Settling Time		-	25uS	50uS	

Notes: All specifications are typical at nominal input (Vin=12V), full load at 25°C unless otherwise stated.

1. Over all operating input voltages, resistive loads and temperature conditions.

General Specifications

Parameter	Min	Typ	Max	Notes
Efficiency Vo=5.0V Vo=3.3V Vo=1.8V Vo=0.75V	 88% 85% 80% 68%	 92% 88% 84% 73%	 - - - -	Measured at Vin=12V, full load
Switching Frequency	220KHz	250KHz	280KHz	
Output Voltage Trim Range (wide trim)	0.7525V	-	5V	
MTBF	3,079,469 hours			Calculated Per Bell Core TR-332 (Io = Nominal; Ta = 25°C)
Dimensions Inches (L × W × H) Millimeters (L × W × H)	 0.8 x 0.45 x 0.251 20.32 x 11.42 x 6.38			Surface Mount
Dimensions Inches (L × W × H) Millimeters (L × W × H)	 1.0 x 0.5 x 0.243 25.4 x 12.7 x 6.16			Vertical Mount
Weight	-	5g	-	

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

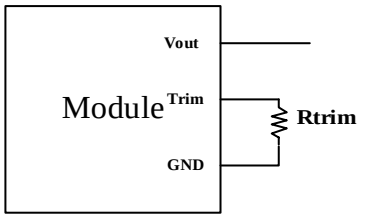
Control Specifications

Parameter	Min	Typ	Max	Notes
Remote On/Off				
Signal Low (Unit Off)	-0.3V	-	0.4V	x7BA-06E2A0; Remote On/Off pin open, Unit on.
Signal High (Unit On)	2.5V	-	14V	
Signal Low (Unit On)	-0.3V	-	0.4V	x7BA-06E2AL; Remote On/Off pin open, Unit on.
Signal High (Unit Off)	2.5V	-	14V	
Voltage Sequencing				
Sequencing Voltage	0.05V	-	Vin	Sequencing Voltage should be higher than output voltage.
Sequencing Slew Rate Capability	-	-	2V/mS	
Sequencing Delay Time	10mS	-	-	Delay from Vin, min to application of voltage on SEQ pin
Tracking Accuracy Power-Up Power-Down	 - -	 100mV 200mV	 200mV 400mV	

Output Trim Equations

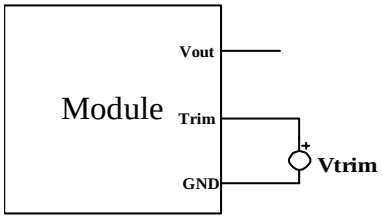
Equation for calculating the trim resistor (in kΩ) given the desired adjusted voltage (Vadj) is shown below. The Trim Up resistor should be connected between the Trim pin and Ground.

$$R_{trim} = \frac{10.507}{V_{adj} - 0.7525} - 1$$

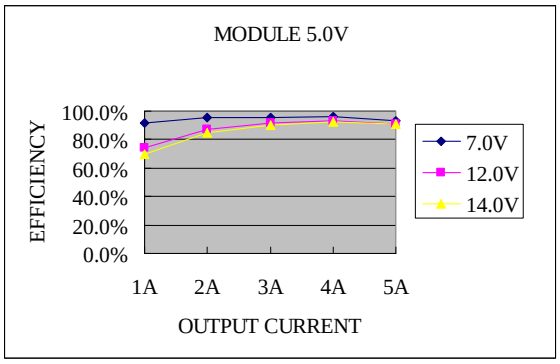


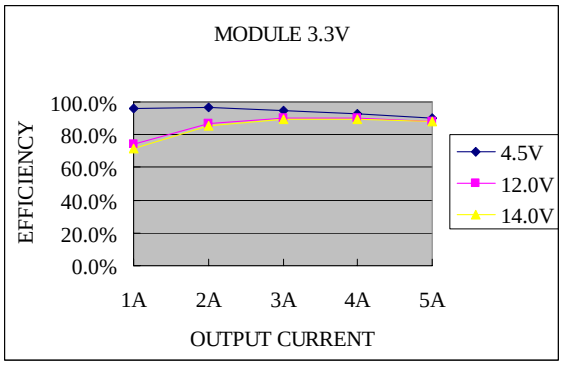
Equation for calculating the trim voltage (in V) given the desired adjusted voltage (Vadj) is shown below. The Trim Up voltage should be connected between the Trim pin and Ground.

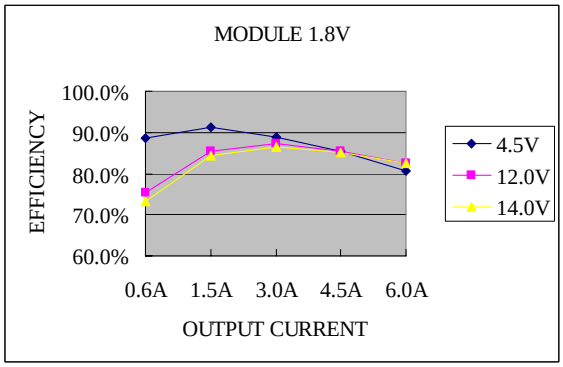
$$V_{trim} = 0.7 - 0.0667 \times (V_{adj} - 0.7525)$$

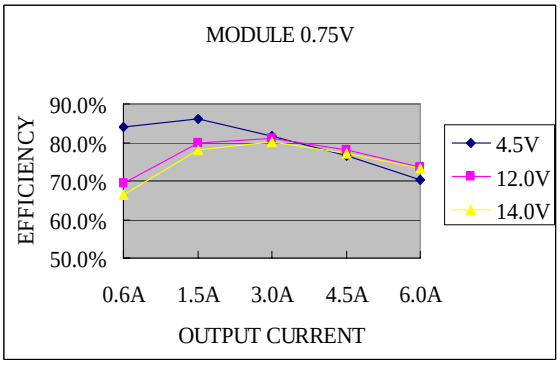


Efficiency Data

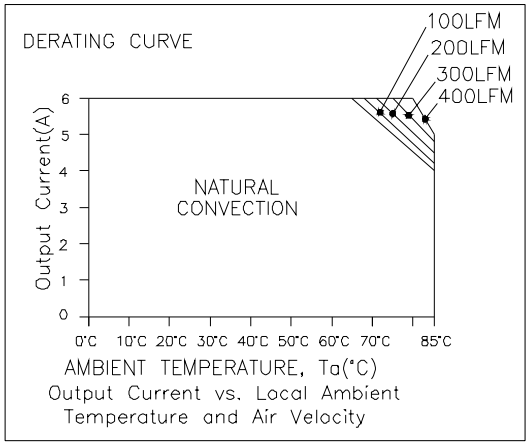




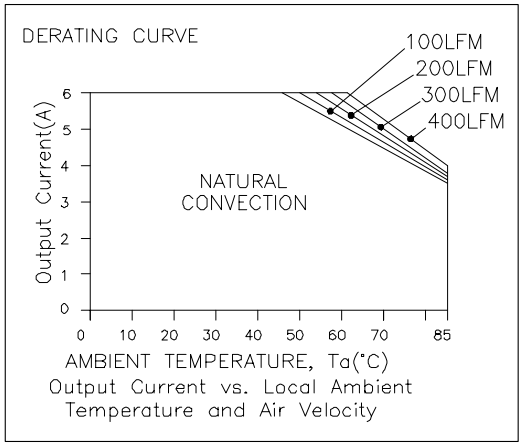




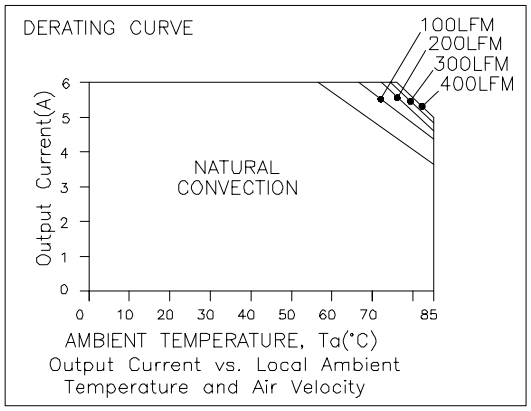
Thermal Derating Curves



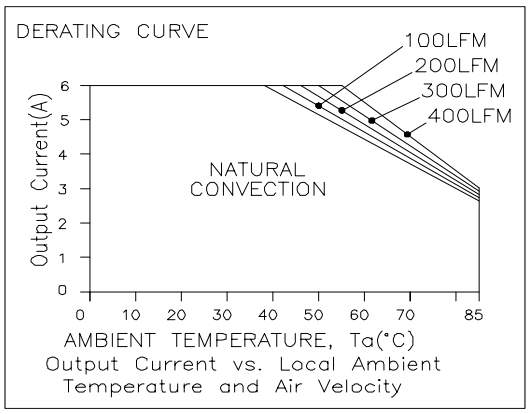
S7BA-06E2Ax, Vo=0.75V



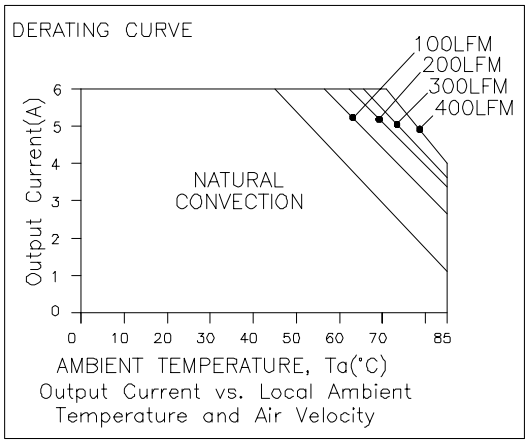
V7BA-06E2Ax, Vo=0.75V



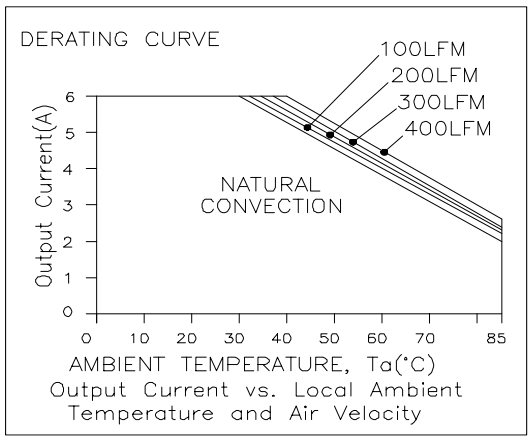
S7BA-06E2Ax, Vo=2.5V



V7BA-06E2Ax, Vo=2.5V

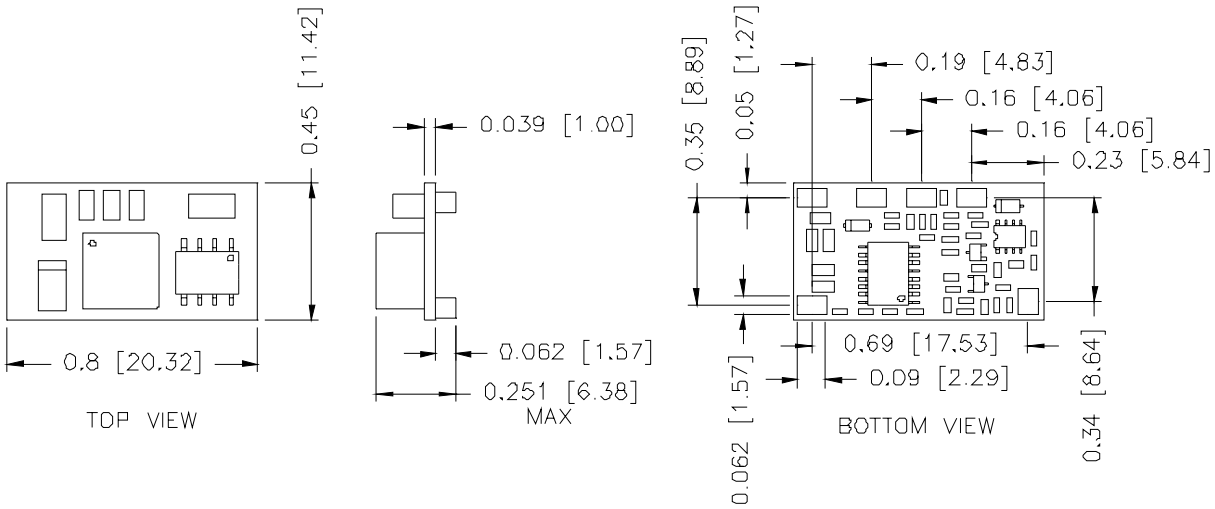


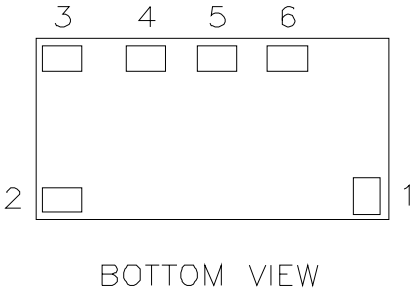
S7BA-06E2Ax, Vo=5.0V



V7BA-06E2Ax, Vo=5.0V

S7BA-06E2Ax

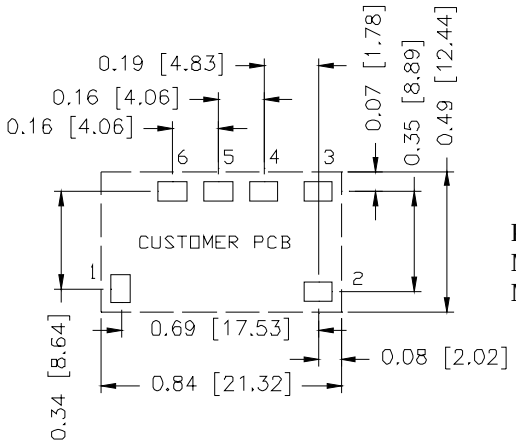




Pin Connections

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

RECOMMENDED PAD LAYOUT



PAD SIZE:
MIN: 0.12"* 0.095" (3.05mm * 2.41mm)
MAX: 0.135"* 0.11" (3.43mm * 2.79mm)

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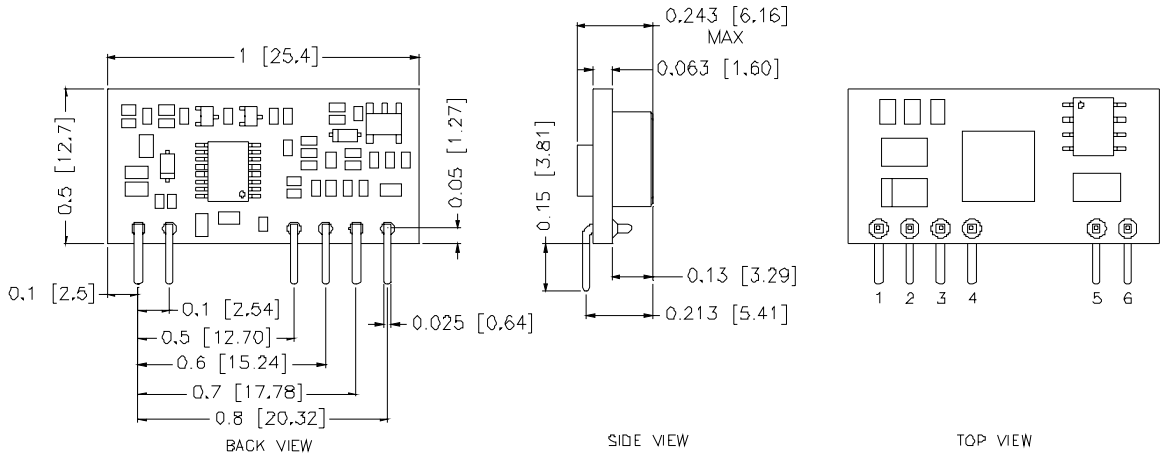

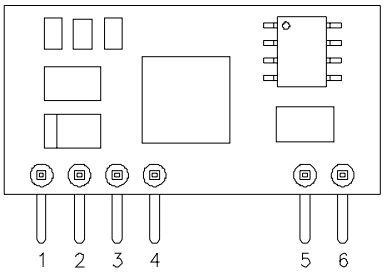

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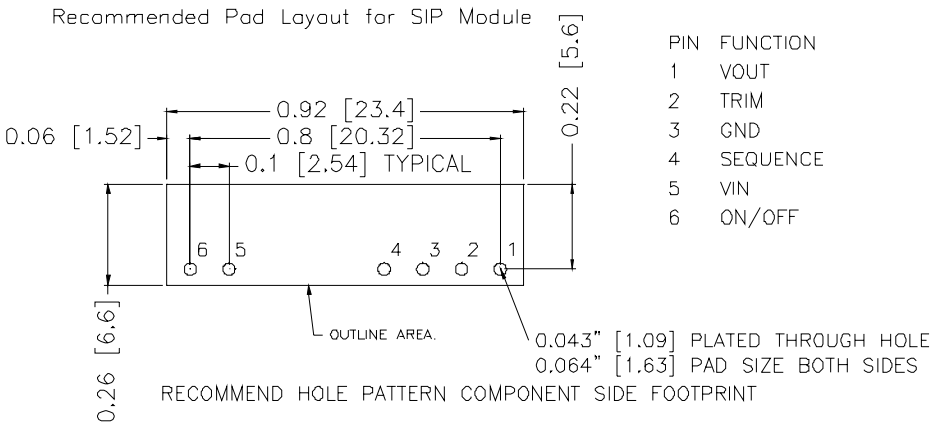

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