

NON-ISOLATED DC/DC CONVERTERS

4.5V-14V Input

0.75V-5.0V/3A Output



S7BA-03E1Ax Series

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



Description

The Bel S7BA-03E1Ax modules are a series of non-isolated DC/DC converters that deliver up to 3A of output current with full load efficiency of 93% 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. 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 at 5.0V	Model Number Active High	Model Number Active Low
0.75V – 5.0V	4.5V - 14V	3A	15W	93%	S7BA-03A1A0	S7BA-03A1AL

Note: Add “G” suffix at the end of the model number to indicate “Tray Packaging”.

Absolute Maximum Ratings

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

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

Input Specifications

Parameter	Min	Typ	Max	Notes
Input Voltage	Vo,set≤3.3V	4.5V	12V	
	Vo,set=5V	7.0V	12V	
Input Current (full load)	Vo=5.0V	-	1.35A	
	Vo=3.3V	-	1.00A	
	Vo=0.75V	-	0.25A	
Input Current (no load)	Vo=5.0V	-	65mA	
	Vo=3.3V	-	50mA	
	Vo=0.75V	-	15mA	
Remote Off Input Current	-	3mA	6mA	

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Input Specifications (continued)

Parameter	Min	Typ	Max	Notes
Input Reflected Ripple Current (pk-pk) Vo=5.0V Vo=3.3V Vo=0.75V	- - -	150mA 100mA 35mA	200mA 150mA 45mA	Tested with simulated source impedance of 1uH, 5Hz to 20MHz and two 100uF/25V external input Tantalum capacitors.
Input Reflected Ripple Current (RMS) Vo=5.0V Vo=3.3V Vo=0.75V	- - -	30mA 20mA 8mA	40mA 35mA 15mA	
I ² t Inrush Current Transient	-	0.01A ² s	0.02A ² s	
Turn-on Voltage Threshold Vo set=5V Vo set≤3.3V	- -	5.5V 4.3V	6.5V 4.5V	
Turn-off Voltage Threshold Vo set=5V Vo set≤3.3V	- -	5.5V 4.0V	6.0V 4.3V	

Output Specifications

Parameter	Min	Typ	Max	Notes	
Output Voltage Set Point	-2%Vo,set	-	2%Vo,set	Vin=12V, Io=Iomax	
Output Voltage Set Point	-3.5%Vo,set	-	2.5%Vo,set	Over all operating input voltage, resistive load, and temperature conditions	
Load Regulation	0.4%Vo,set	0.2%Vo,set	0.4%Vo,set	Io=Iomin to Iomax	
Line Regulation	0.4%Vo,set	0.3%Vo,set	0.4%Vo,set	Vin=Vinmin to Vinmax	
Regulation Over Temperature (-40°C to +85°C)	-	0.5%Vo,set	-		
Output Current	0A	-	3A		
Current Limit Threshold	5A	-	9.5A		
Short Circuit Surge Transient	-	0.1A ² s	0.2A ² s		
Ripple and Noise ¹ (pk-pk) Vo=5.0V Vo=3.3V Vo=0.75V	- - -	100mV 80mV 55mV	120mV 100mV 80mV	Test conditions: 0-20MHz BW, with external 10uF/10V Tantalum capacitor and 1uF/10V ceramic capacitor at the output.	
Ripple and Noise ¹ (RMS) Vo=5.0V Vo=3.3V Vo=0.75V	- - -	30mV 20mV 15mV	40mV 30mV 20mV		
Ripple and Noise ² (pk-pk) Vo=5.0V Vo=3.3V Vo=0.75V	- - -	60mV 40mV 20mV	80mV 50mV 30mV		Test conditions: 0-20MHz BW, with external 10uF/10V Tantalum capacitor 1uF/10V ceramic capacitor and two 22uF/10V ceramic capacitors at the output.
Ripple and Noise ² (RMS) Vo=5.0V Vo=3.3V Vo=0.75V	- - -	15mV 12mV 5mV	25mV 20mV 10mV		
Turn on Time	-	8mS	12mS		
Overshoot at Turn on	-	0%	3%		
Output Capacitance	0uF	-	1200uF		
Transient Response					
50% ~ 100% Max Load	All	-	150mV	200mV	Test conditions: di/dt = 2.5A/uS, Vin=12V, and with external 10uF/10V Tantalum capacitor and 1uF/10V ceramic capacitor at the output.
Settling Time		-	25uS	40uS	
100% ~ 50% Max Load		-	150mV	200mV	
Settling Time		-	25uS	40uS	

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

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4.5V-14V Input

0.75V-5.0V/3A Output



General Specifications

Parameter	Min	Typ	Max	Notes
Efficiency Vo=5.0V Vo=3.3V Vo=0.75V	90% 88% 77%	93% 91% 80%	- - -	Measured at Vin=12V, full load
Switching Frequency	200KHz	230KHz	250KHz	
Output Voltage Trim Range (Wide Trim)	0.7525V	-	5V	
MTBF	6,350,000 hours			Calculated Per Bell Core TR-332 (Io = Nominal; Ta = 25°C)
Dimensions (Surface Mount) Inches (L x W x H) Millimeters (L x W x H)	0.8 x 0.45 x 0.251 20.32 x 11.42 x 6.38			
Weight	-	2.5g	-	

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

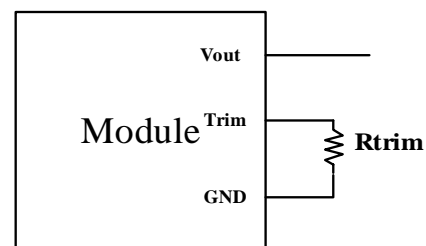
Control Specifications

Parameter	Min	Typ	Max	Notes
Remote On/Off				
Signal Low (Unit Off)	-0.3V	-	0.4V	Remote On/Off pin open, Unit on.
Signal High (Unit On)	2.5V	-	14V	
Signal Low (Unit On)	-0.3V	-	0.4V	
Signal High (Unit Off)	2.5V	-	14V	

Output Trim Equations

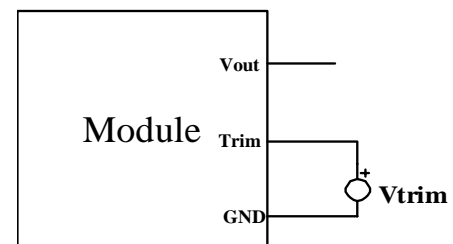
Equation for calculating the trim resistor (in kΩ) given the desired adjusted voltage (Vadj) is shown below. The Trim Up resistor should be connected between the Trim pin and Ground.

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



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.

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



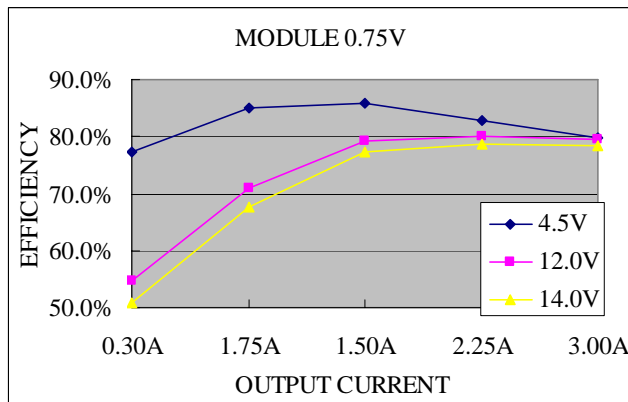
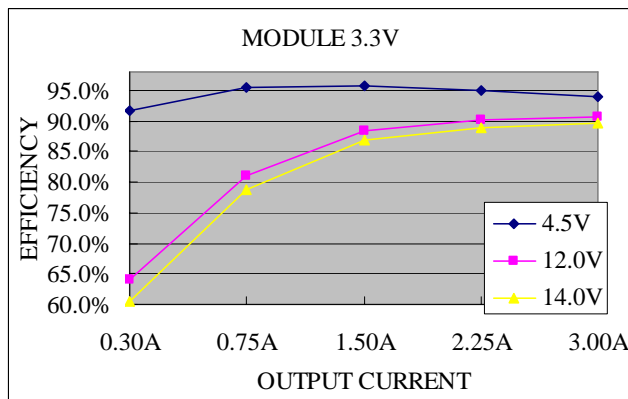
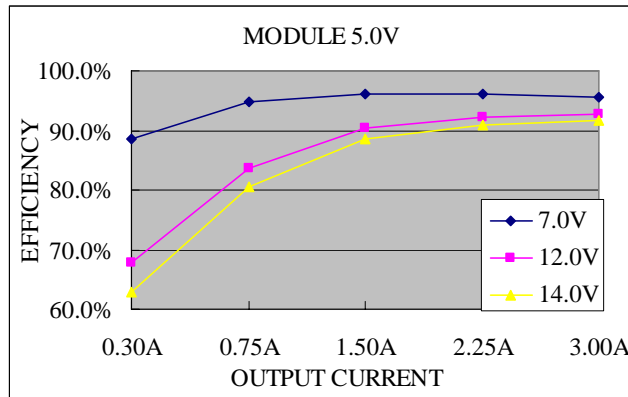
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4.5V-14V Input

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Efficiency Data



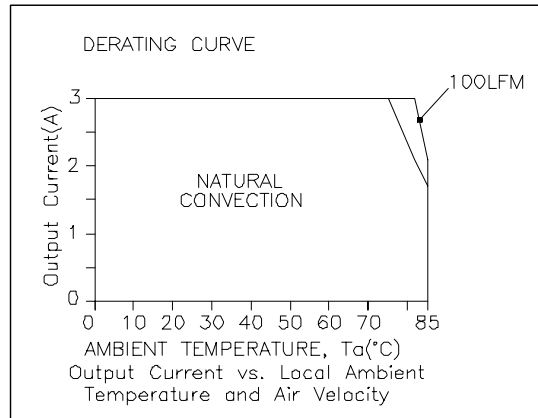
NON-ISOLATED DC/DC CONVERTERS

4.5V-14V Input

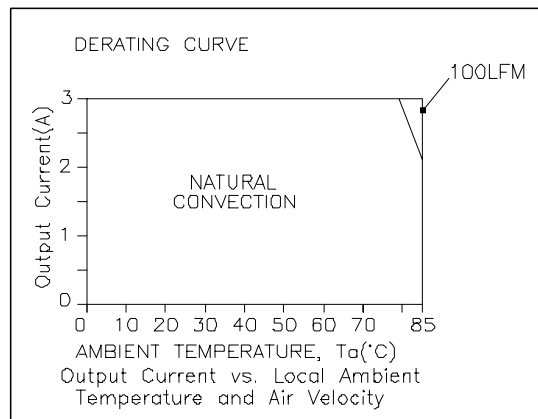
0.75V-5.0V/3A Output



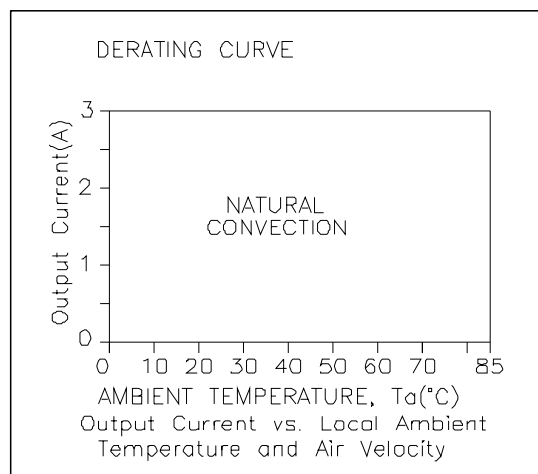
Thermal Derating Curves



$V_{in}=12\text{V}$, $V_o=5.0\text{V}$



$V_{in}=12\text{V}$, $V_o=3.3\text{V}$

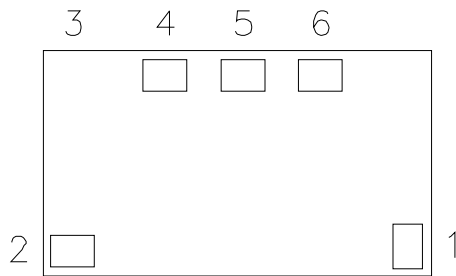
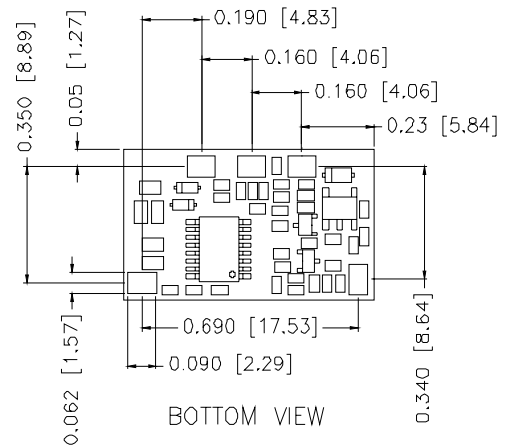
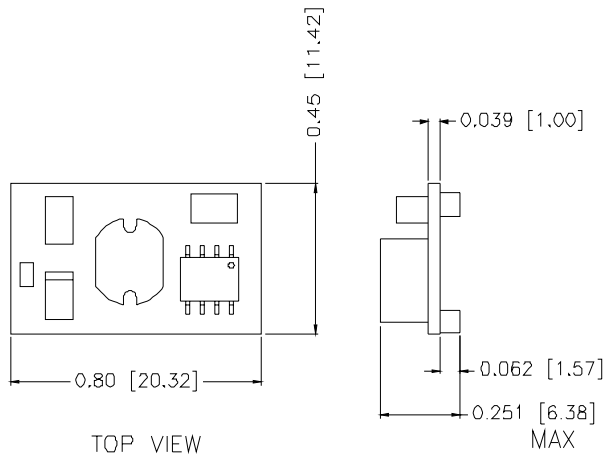


$V_{in}=12\text{V}$, $V_o=0.75\text{V}$

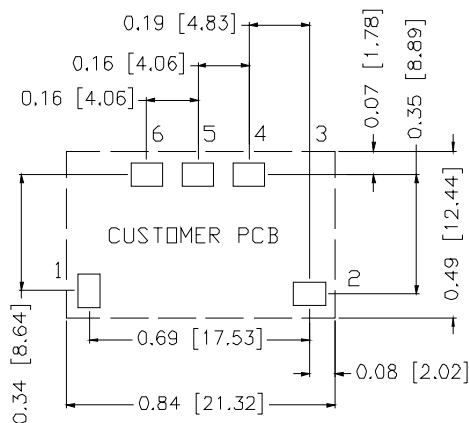
NON-ISOLATED DC/DC CONVERTERS

4.5V-14V Input

0.75V-5.0V/3A Output



RECOMMENDED PAD LAYOUT



Pin Connections

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

PAD SIZE:

MIN: 0.12" * 0.095" (3.05mm*2.41mm)

MAX: 0.135" * 0.11" (3.43mm*2.79mm)

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