

NON-ISOLATED DC/DC CONVERTERS

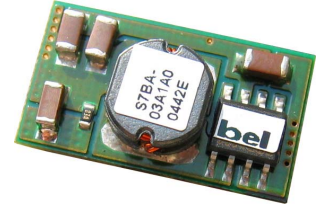
8.3V-14V Input

0.75V-5.0V/3A Output

bel
POWER PRODUCTS

S7BA-03A1Ax Series

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



Description

The Bel S7BA-03A1Ax 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 5.5V 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, over-temperature protection, over current protection, short circuit protection, and undervoltage lockout.

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	8.3V - 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	8.3V	12V	14V	
Input Current (full load)				
Vo=5.0V	-	1.35A	2.00A	
Vo=3.3V	-	0.90A	1.30A	
Vo=0.75V	-	0.24A	0.35A	
Input Current (no load)				
Vo=5.0V	-	55mA	65mA	
Vo=3.3V	-	40mA	50mA	
Vo=0.75V	-	15mA	20mA	

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Input Specifications (continued)

Parameter	Min	Typ	Max	Notes
Remote Off Input Current	-	3mA	6mA	
Input Reflected Ripple Current (pk-pk)				Tested with two 100uF/25V tantalum input capacitors & simulated source impedance of 1uH, 5Hz to 20MHz.
Vo=5.0V	-	75mA	120mA	
Vo=3.3V	-	50mA	90mA	
Vo=0.75V	-	20mA	35mA	
Input Reflected Ripple Current (RMS)				
Vo=5.0V	-	20mA	60mA	
Vo=3.3V	-	15mA	30mA	
Vo=0.75V	-	5mA	15mA	
I ² t Inrush Current Transient	-	0.01A ² s	0.02A ² s	
Turn-on Voltage Threshold	7.6V	7.9V	8.2V	
Turn-off Voltage Threshold	7.0V	7.8V	8.1V	

Output Specifications

Parameter	Min	Typ	Max	Notes	
Output Voltage Set Point	-2%Vo,set	-	2%Vo,set	Vin=12V, Io=Iomax, full load	
Output Voltage Set Point	-2.5%Vo,set	-	3.5%Vo,set	Over all operating input voltages, resistive loads and temperature conditions	
Load Regulation	0.5%Vo,set	0.4%Vo,set	0.5%Vo,set	Io=Io, min to Io, max	
Line Regulation	0.4%Vo,set	0.3%Vo,set	0.4%Vo,set	Vin=Vin, min to Vin, max	
Regulation Over Temperature (-40°C to +85°C)	-	0.5%Vo,set	0.8%Vo,set		
Output Current	0A	-	3A		
Current Limit Threshold	5A	-	12A		
Short Circuit Surge Transient	-	0.15A ² s	-		
Ripple and Noise (pk-pk) Vo=5.0V Vo=3.3V Vo=0.75V	- - -	65mV 45mV 20mV	100mV 80mV 35mV	Tested with 0-20MHz, with 10uF/10V tantalum capacitor and 1uF/10V ceramic capacitor at the output	
Ripple and Noise (RMS) Vo=5.0V Vo=3.3V Vo=0.75V	- - -	20mV 10mV 5mV	40mV 25mV 15mV		
Turn on Time	-	5mS	8mS		
Overshoot at Turn on	-	0%	3%		
Output Capacitance	0uF	-	1200uF		
Transient Response					
50% ~ 100% Max Load	All	-	200mV	300mV	di/dt=2.5A/uS; Vin=12V; and with 10uF/10V tantalum capacitor and 1uF/10V ceramic capacitor at the output
Settling Time		-	50uS	80uS	
100% ~ 50% Max Load		-	200mV	300mV	
Settling Time		-	50uS	80uS	

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

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General Specifications

Parameter	Min	Typ	Max	Notes
Efficiency				
Vo=5.0V	90%	93%	-	Measured at Vin=12V, full load (Current Source)
Vo=3.3V	88%	91%	-	
Vo=0.75V	76%	80%	-	
Switching Frequency	-	300KHz	-	
Over Temperature Shutdown	-	135°C	-	
MTBF	6,740,000 hours			Calculated Per Bell Core TR-332 (Io = Nominal; Ta = 25°C)
Dimensions (Surface Mount)				
Inches (L x W x H)	0.8 x 0.45 x 0.251			
Millimeters (L x W x H)	20.32 x 11.42 x 6.38			
Weight	-	3g	-	

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

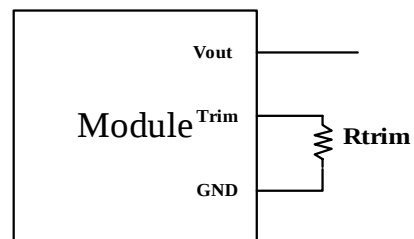
Control Specifications

Parameter	Min	Typ	Max	Notes
Remote On/Off				
Signal Low (Unit Off)	-0.3V	-	0.4V	S7BA-03A1A0; Remote On/Off pin open, Unit on.
Signal High (Unit On)	2.5V	-	14V	
Signal Low (Unit On)	-0.3V	-	0.4V	S7BA-03A1AL; Remote On/Off pin open, Unit on.
Signal High (Unit Off)	2.5V	-	14V	
Output Voltage Trim Range (Wide Trim)	0.7525V	-	5.0V	

Output Trim Equations

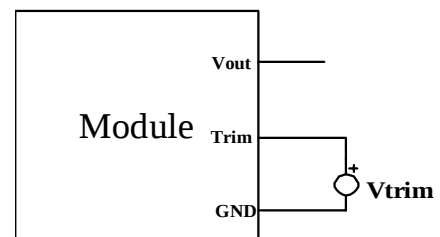
Equation for calculating the trim resistor (in kΩ) given the desired adjusted voltage (Vadj) is shown below. The Trim Up resistor should be connected between the Trim pin and Ground.

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



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.

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



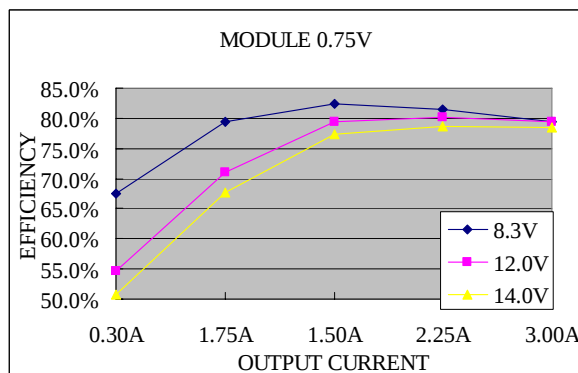
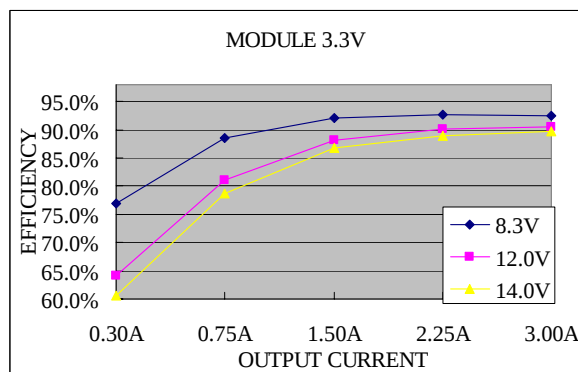
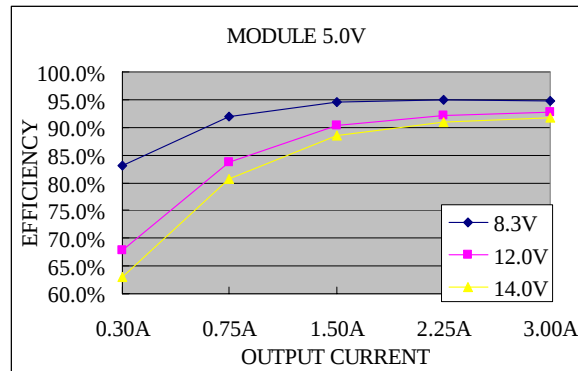
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Efficiency Data



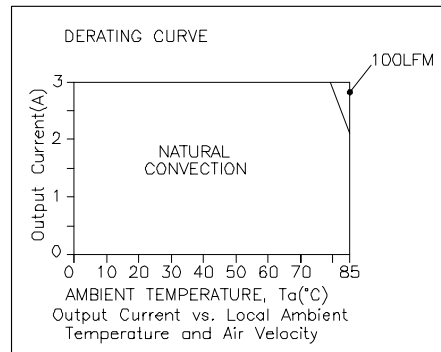
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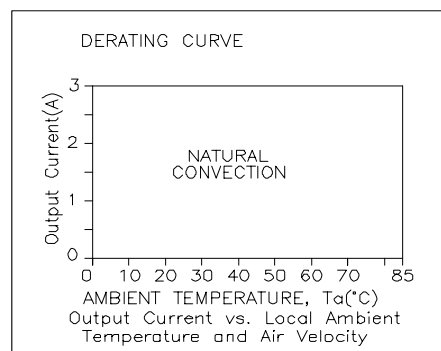
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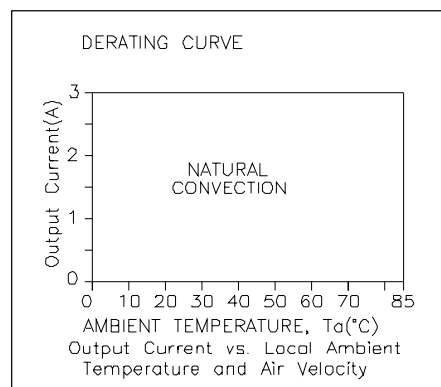
Thermal Derating Curves



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



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



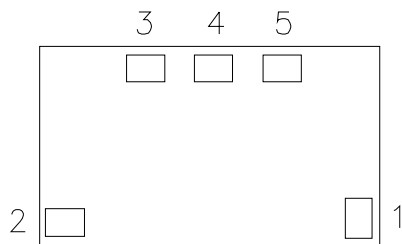
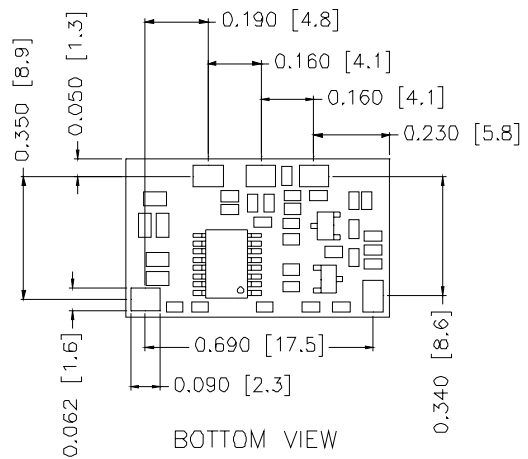
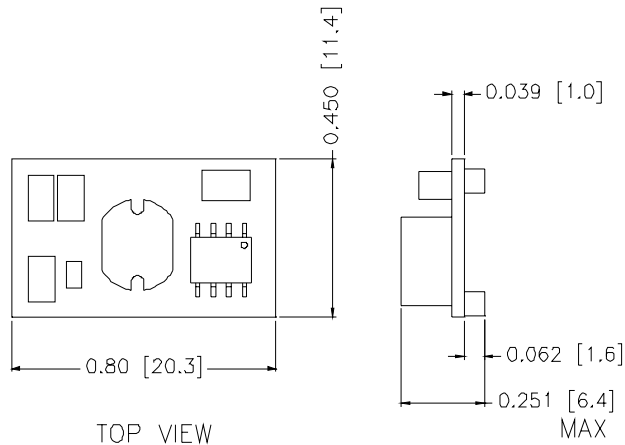
$V_{in}=12\text{V}$, $V_o=0.75\text{V}$

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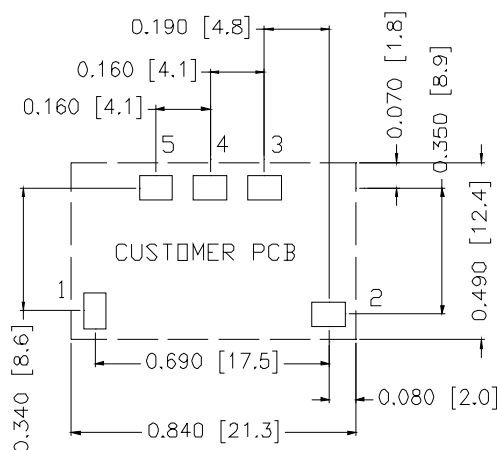
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Pin Connections

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