

NON-ISOLATED DC/DC CONVERTERS

2.4V-5.5V Input

0.75V-3.63V/6A Output

bel
POWER PRODUCTS

S7BA-06F2Ax Series

- Non-Isolated
- High Efficiency
- High Power Density
- Excellent Thermal Performance
- Low Cost
- Remote On/Off
- Flexible Output Voltage Sequencing
- Under-voltage Lockout (UVLO)
- Over Temperature Protection
- OCP/SCP
- Wide Input
- Wide Trim Range
- Active Low/High (option)
- Able to Sink & Source Current
- Fixed Frequency (300KHz)



Description

The Bel S7BA-06F2Ax modules are a series of non-isolated dc-dc converters that deliver up to 6A of output current with full load efficiency of 93% at 3.3V output. These modules provide precisely regulated voltage programmable via external resistor from 0.75V to 3.63V over a wide range of input voltage (2.4V-5.5V). These modules have a sequencing feature that enables designers to implement various types of output voltage sequencing when powering multiple voltages on a board. The open-frame construction and small footprint enable designers to develop cost and space-efficient solutions. Standard features include remote On/Off, over current protection, short current protection, wide input, and programmable output voltage.

Part Selection

Output Voltage	Input Voltage	Max. Output Current	Max. Output Power	Typical Efficiency	Model Number Active Low	Model Number Active High
0.75V -3.63V	2.4V – 5.5V	6A	21.8W	93%	S7BA-06F2AL	S7BA-06F2A0

Note: Add “G” to the end of the Model Number to indicate Tray Packaging.

Absolute Maximum Ratings

Parameter	Min	Typ	Max	Notes
Input Voltage (continuous)	-0.3V	-	5.8V	
Output Enable Terminal Voltage	-0.3V	-	5.5V	
Sequencing Voltage ¹	-0.3V	-	V _{in}	
Ambient Temperature	-40°C	-	85°C	
Storage Temperature	-55°C	-	125°C	

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

1. S7BA-06F2Ax 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 V_{in}.

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Input Specifications

Parameter	Min	Typ	Max	Notes
Input Voltage	2.4V	-	5.5V	$V_o, set \leq V_{in} - 0.5V$
Input Current (full load)				
$V_o=3.3V$	-	-	4.73A	
$V_o=2.5V$	-	-	5.49A	
$V_o=1.8V$	-	-	5.11A	
$V_o=1.5V$	-	-	4.31A	
$V_o=1.2V$	-	-	3.57A	
$V_o=0.75V$	-	-	2.40A	
Input Current (no load)				
$V_o=3.3V$	-	50mA	-	
$V_o=0.75V$	-	25mA	-	
Remote Off Input Current	-	0.6mA	-	
Input Reflected Ripple Current (pk-pk)	-	120mA	-	Tested with simulated source impedance of 1uH, 5Hz to 20MHz.
Input Reflected Ripple Current (RMS)	-	35mA	-	
I^2t Inrush Current Transient	-	-	0.04A ² s	
Turn-on Voltage Threshold	-	2.05V	2.4V	
Turn-off Voltage Threshold	1.8V	2.0V	-	

Output Specifications

Parameter	Min	Typ	Max	Notes
Output Voltage Set Point	-2% V_o, set	-	2% V_o, set	$V_{in}=5V$, 50% full load
Output Voltage Set Point	-3% V_o, set	-	3% V_o, set	Over all operating input voltages, resistive loads and temperature conditions
Adjustment Range Selected by External Resistor or Voltage	0.7525V	-	3.63V	
Load Regulation	-	0.4% V_o, set	-	$I_o=0\% \sim 50\%$ full load; $I_o=50\% \sim 100\%$ full load
Line Regulation	-	0.3% V_o, set	-	$V_{in}=V_{in, min}$ to $V_{in, max}$
Regulation Over Temperature (-40°C to +85°C)	-	0.4% V_o, set	-	$T_{ref}=T_a$, min to T_a , max
Output Current	0A	-	6A	
Current Limit Threshold	9A	-	18A	Hiccup mode
Short Circuit Surge Transient	-	0.32A ² s	-	
Ripple and Noise (pk-pk)	-	40mV	70mV	Tested with 0-20MHz, with 10uF tantalum capacitor & 1uF/10V ceramic capacitor at output
Ripple and Noise (RMS)	-	10mV	30mV	
Turn on Time	-	6mS	10mS	
Overshoot at Turn on	-	0%	3%	
Output Capacitance				
ESR \geq 1mohm	0uF	-	1000uF	
ESR \geq 10mohm	0uF	-	3000uF	
Transient Response				
50% ~ 100% Max Load	$V_o = 0.75V - 3.63V$	-	130mV	di/dt=2.5A/uS; $V_{in}=5V$; and with 10uF tantalum capacitor & 1uF/10V TDK ceramic capacitor at output
Settling Time		-	25uS	
100% ~ 50% Max Load		-	130mV	
Settling Time		-	25uS	

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

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General Specifications

Parameter	Min	Typ	Max	Notes
Efficiency				Measured at Vin=5V, full load
Vo=3.3V	-	93%	-	
Vo=2.5V	-	91%	-	
Vo=1.8V	-	88%	-	
Vo=1.5V	-	87%	-	
Vo=1.2V	-	84%	-	
Vo=0.75V	-	78%	-	
Switching Frequency	250KHz	300KHz	350KHz	
Over Temperature Shutdown	-	135°C	-	
Output Voltage Trim Range	0.7525V	-	3.63V	
MTBF	6,954,974 hours			Calculated Per Bell Core TR-332 (Io = Nominal; Ta = 25°C)
Dimensions				
Inches (L x W x H)	0.8 x 0.45 x 0.25			
Millimeters (L x W x H)	20.32 x 11.42 x 6.36			
Weight	-	5g	-	

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

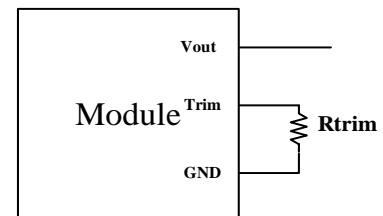
Control Specifications

Parameter	Min	Typ	Max	Notes
Remote On/Off				
Signal Low (Unit Off)	-0.2V	-	0.3V	Active High: S7BA-06F2A0; Remote On/Off pin open, Unit on.
Signal High (Unit On)	-	-	Vin, max	
Signal Low (Unit On)	-0.2V	-	0.3V	Active Low: S7BA-06F2AL; Remote On/Off pin open, Unit on.
Signal High (Unit Off)	1.5V	-	Vin, max	
Sequencing Voltage	0V	-	Vin	Sequencing Voltage applied on SEQ pin 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	-	100mV	200mV	
Power-Down	-	200mV	400mV	

Output Trim Equations

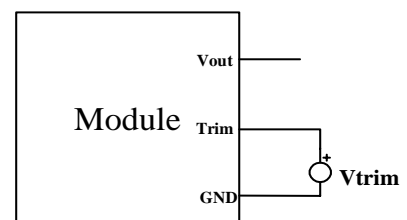
Equation for calculating the trim resistor (in kΩ) given the desired adjusted voltage (Vadj) is shown below. The Trim Up resistor should be connected between the Trim pin and Ground.

$$R_{TrimUp} = \frac{21.07}{V_{adj} - 0.7525} - 5.11$$



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.

$$V_{TrimUp} = 0.7 - 0.1698 \times (V_{adj} - 0.7525)$$



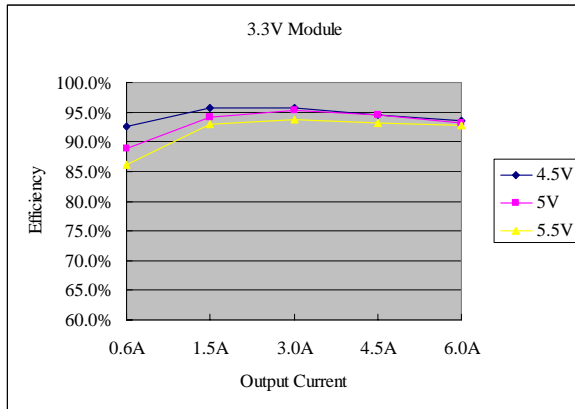
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2.4V-5.5V Input

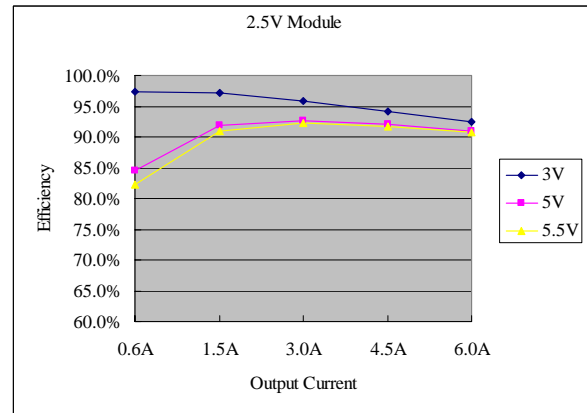
0.75V-3.63V/6A Output



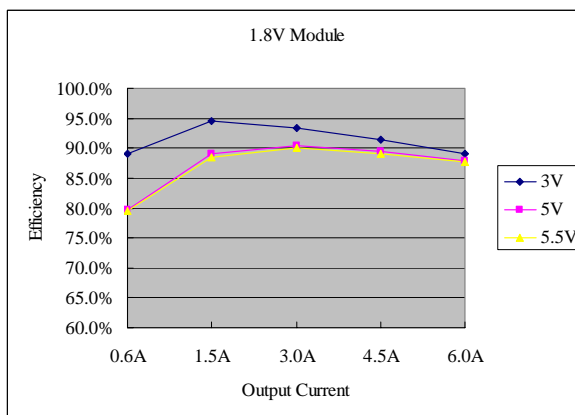
Efficiency Data



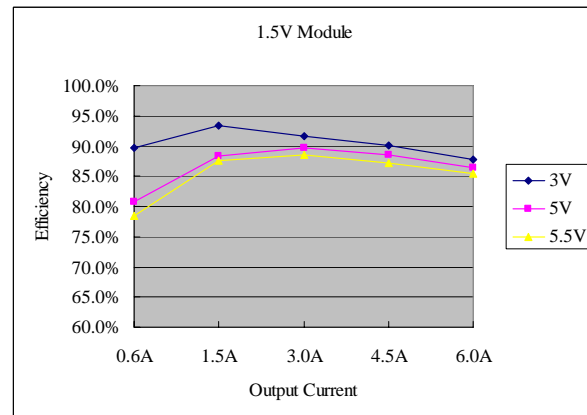
Vo=3.3V



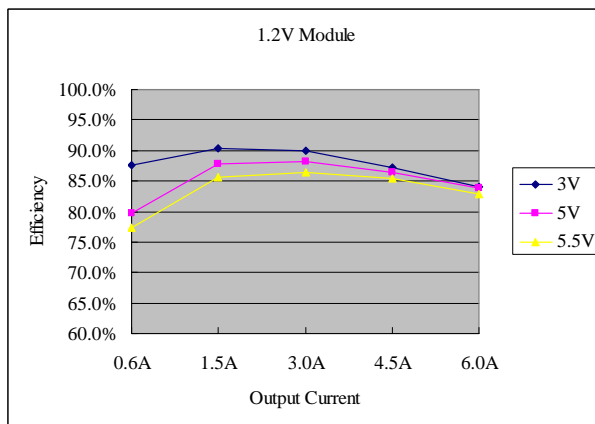
Vo=2.5V



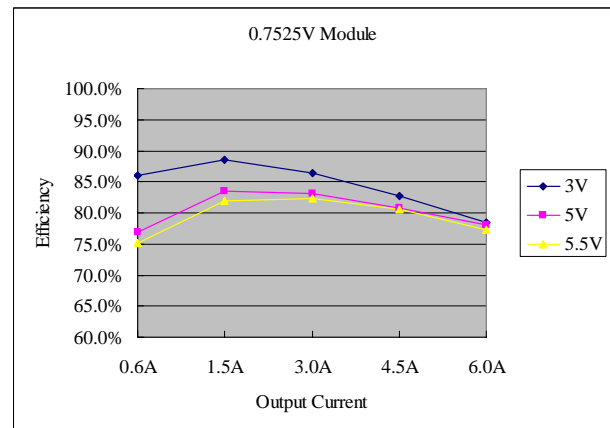
Vo=1.8V



Vo=1.5V



Vo=1.2V



Vo=0.7525V

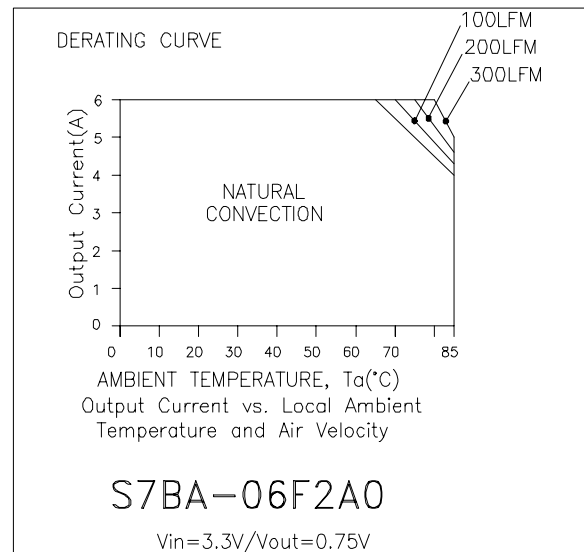
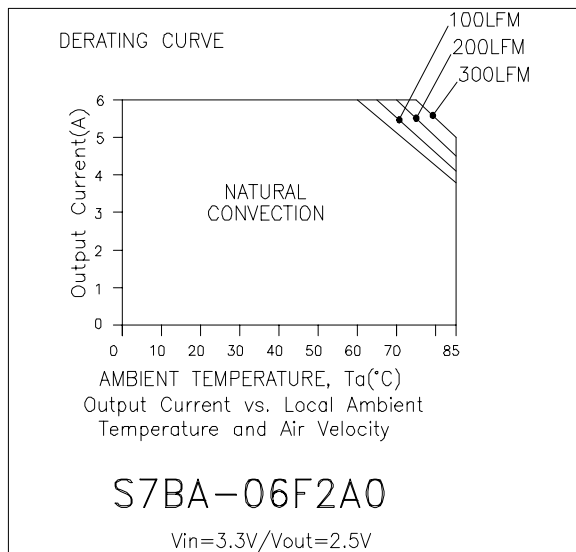
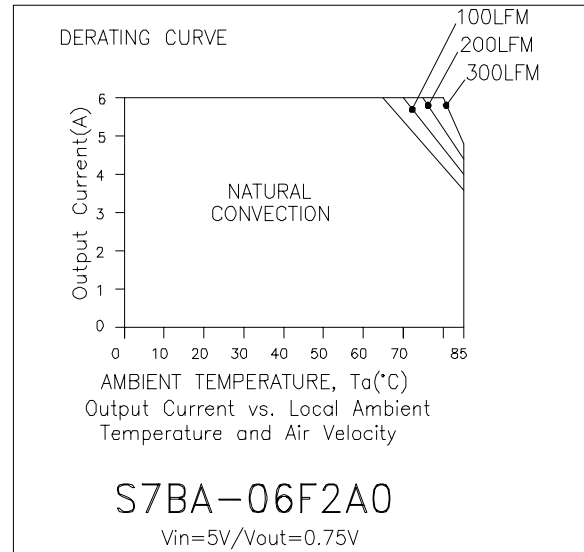
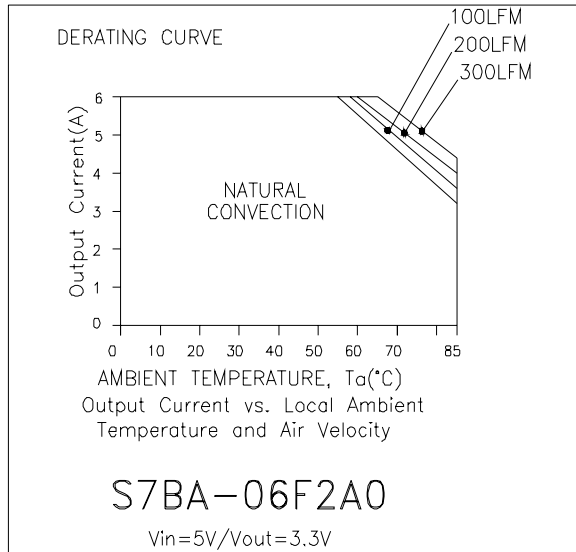
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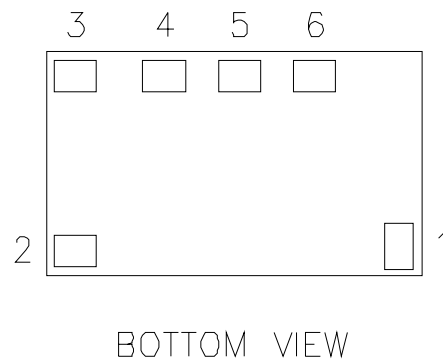
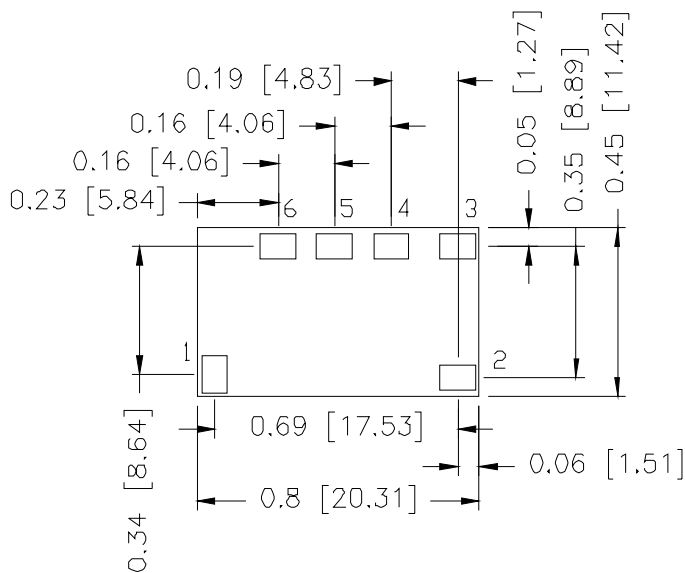
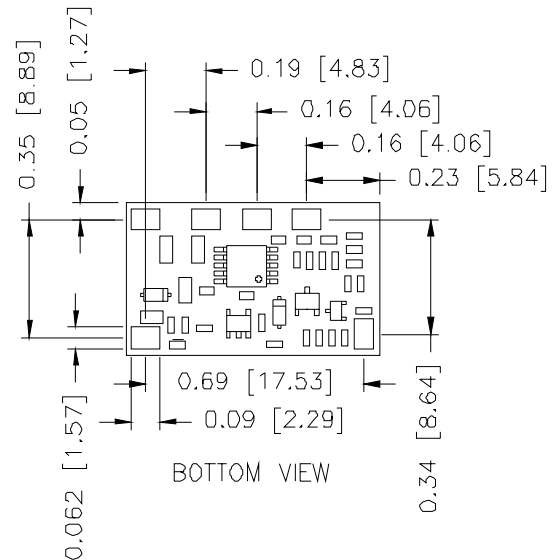
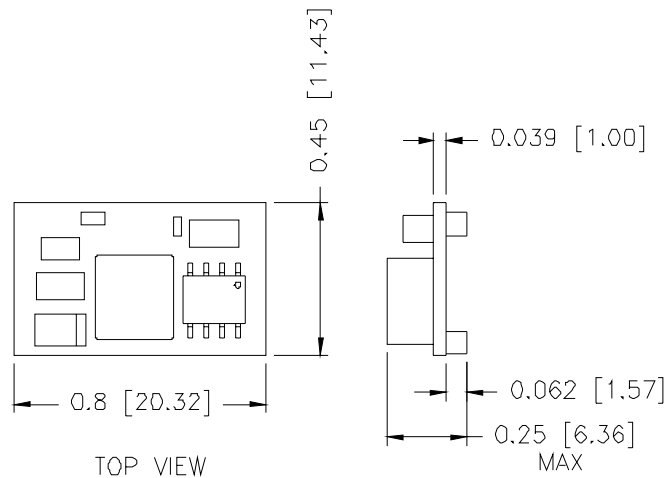
Thermal Derating Curves



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Pin Connections

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

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