

## NON-ISOLATED DC/DC CONVERTERS

4.5V-14V Input

0.75V-5.0V/3A Output



### V7BA-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/High (Option)



### Description

The Bel V7BA-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%	V7BA-03E1A0	V7BA-03E1AL

**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	14V	
Vo,set=5V	7.0V	12V	14V	
Input Current (full load)				
Vo=5.0V	-	1.35A	3.70A	
Vo=3.3V	-	1.00A	2.50A	
Vo=0.75V	-	0.25A	0.65A	
Input Current (no load)				
Vo=5.0V	-	65mA	80mA	
Vo=3.3V	-	50mA	60mA	
Vo=0.75V	-	15mA	20mA	
Remote Off Input Current	-	3mA	6mA	
Input Reflected Ripple Current (pk-pk)				
Vo=5.0V	-	150mA	200mA	Tested with simulated source impedance of 1uH, 5Hz to 20MHz and two 100uF/25V external input Tantalum capacitors.
Vo=3.3V	-	100mA	150mA	
Vo=0.75V	-	35mA	60mA	

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## Input Specifications (continued)

Parameter	Min	Typ	Max	Notes
Input Reflected Ripple Current (RMS)				Tested with simulated source impedance of 1uH, 5Hz to 20MHz and two 100uF/25V external input Tantalum capacitors.
Vo=5.0V	-	50mA	70mA	
Vo=3.3V	-	30mA	50mA	
Vo=0.75V	-	12mA	20mA	
I <sup>2</sup> t Inrush Current Transient	-	0.01A <sup>2</sup> s	0.02A <sup>2</sup> s	
Turn-on Voltage Threshold				
Vo set=5V	-	5.5V	6.5V	
Vo set≤3.3V	-	4.3V	4.5V	
Turn-off Voltage Threshold				
Vo set=5V	3.8V	5.5V	6.0V	
Vo set≤3.3V	3.8V	4.0V	4.3V	

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

## 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	0.3%Vo,set	0.4%Vo,set	Io=Iomin to Iomax	
Line Regulation	0.5%Vo,set	0.3%Vo,set	0.5%Vo,set	Vin=Vinmin to Vinmax	
Regulation Over Temperature	-	0.5%Vo,set	-	-40°C to +85°C	
Output Current	0A	-	3A		
Current Limit Threshold	5A	-	9.5A		
Short Circuit Surge Transient	-	0.1A <sup>2</sup> s	0.2A <sup>2</sup> s		
Ripple and Noise (pk-pk) Vo=5.0V Vo=3.3V Vo=0.75V	- - -	130mV 100mV 35mV	150mV 120mV 45mV	Test conditions: 0-20MHz BW, with external 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	- - -	40mV 30mV 10mV	50mV 40mV 20mV		
Ripple and Noise (pk-pk) Vo=5.0V Vo=3.3V Vo=0.75V	- - -	70mV 55mV 20mV	85mV 70mV 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 (RMS) Vo=5.0V Vo=3.3V Vo=0.75V	- - -	20mV 15mV 5mV	30mV 25mV 10mV		
Turn on Time	-	8mS	12mS		
Overshoot at Turn on	-	0%	3%		
Output Capacitance	0uF	-	1200uF		
Transient Response					
50% ~ 100% Max Load	All	-	200mV	300mV	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		-	20uS	50uS	
100% ~ 50% Max Load		-	200mV	300mV	
Settling Time		-	20uS	50uS	

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

# NON-ISOLATED DC/DC CONVERTERS

4.5V-14V Input

0.75V-5.0V/3A Output



## General Specifications

Parameter	Min	Typ	Max	Notes
Efficiency				
Vo=5.0V	90%	93%	-	Measured at Vin=12V, full load
Vo=3.3V	88%	91%	-	
Vo=0.75V	77%	80%	-	
Switching Frequency	200KHz	230KHz	250KHz	
Output Voltage Trim Range (Wide Trim)	0.7525V	-	5V	
MTBF	7,900,000 hours			Calculated Per Bell Core TR-332 (Io = Nominal; Ta = 25°C)
Dimensions (Vertical Mount)				
Inches (L x W x H)	1.0 x 0.5 x 0.27			
Millimeters (L x W x H)	25.41 x 12.7 x 6.85			
Weight	-	2.5g	-	

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

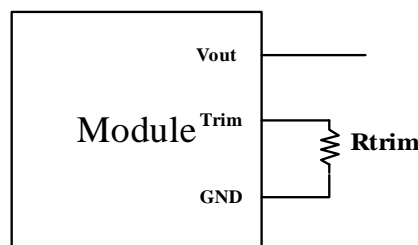
## Control Specifications

Parameter	Min	Typ	Max	Notes
<b>Remote On/Off</b>				
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

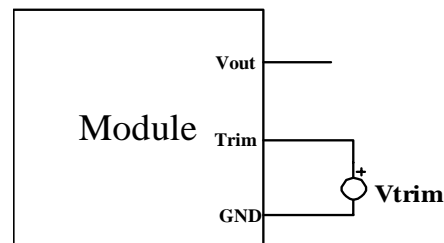
Equation for calculating the trim resistor (in kΩ) given the desired adjusted voltage (Vadj) is shown below. The Trim Up resistor should be connected between the Trim pin and Ground.

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



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.

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



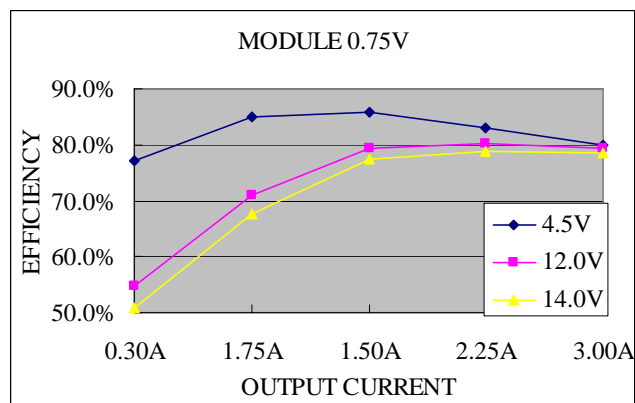
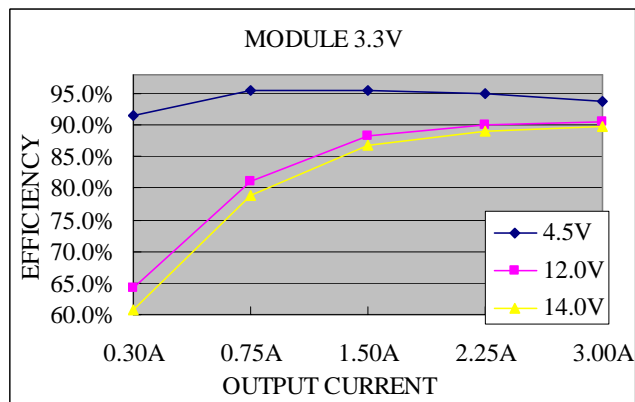
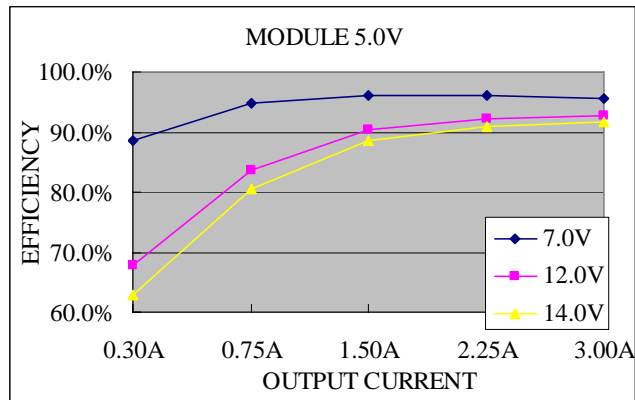
## NON-ISOLATED DC/DC CONVERTERS

4.5V-14V Input

0.75V-5.0V/3A Output



### Efficiency Data



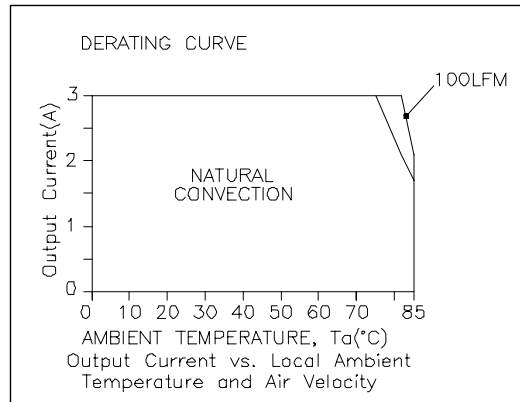
## NON-ISOLATED DC/DC CONVERTERS

4.5V-14V Input

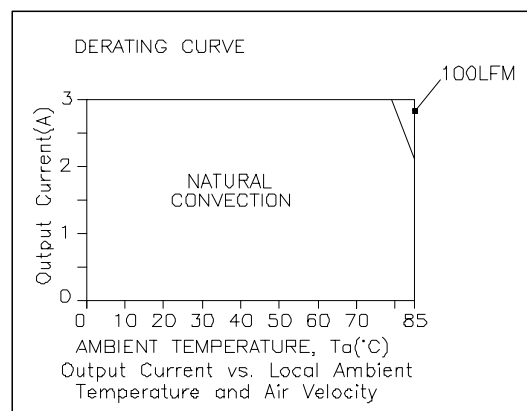
0.75V-5.0V/3A Output



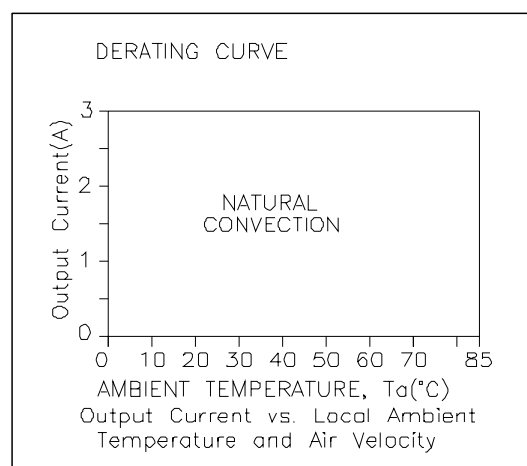
### Thermal Derating Curves



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



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

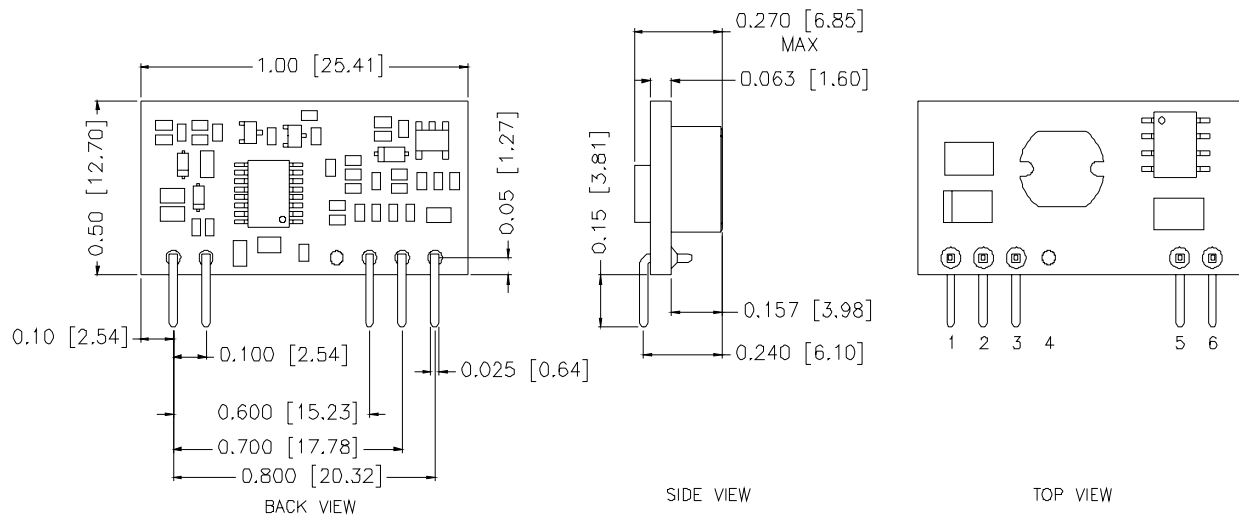


$V_{in}=12\text{V}$ ,  $V_o=0.75\text{V}$

# NON-ISOLATED DC/DC CONVERTERS

4.5V-14V Input

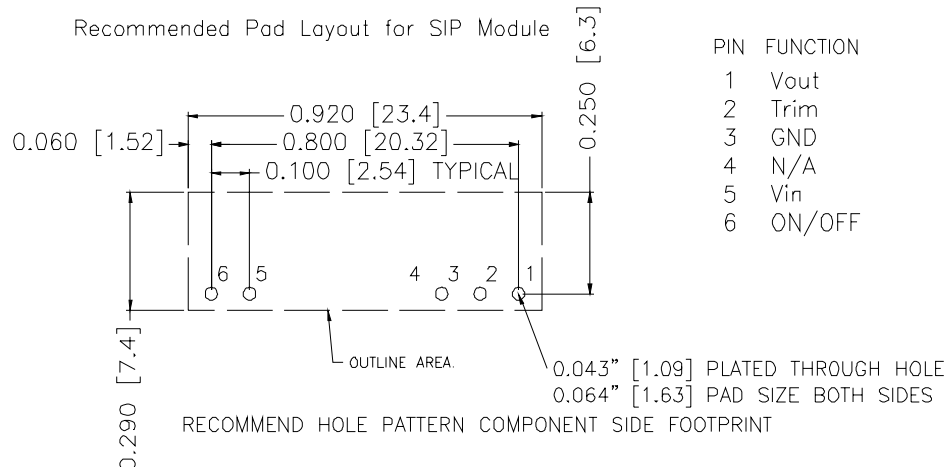
0.75V-5.0V/3A Output



## Pin Connections

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

Recommended Pad Layout for SIP Module



PIN FUNCTION

- 1 Vout
- 2 Trim
- 3 GND
- 4 N/A
- 5 Vin
- 6 ON/OFF

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