

## NON-ISOLATED DC/DC CONVERTERS

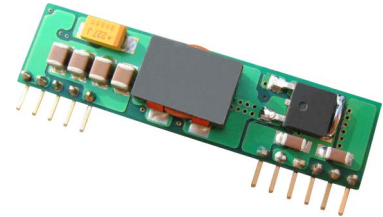
4.5 V-14 V Input

0.75 V-3.63 V/10 A Output

**bel**  
POWER PRODUCTS

### V7BC-10E2Ax Series

- Non-Isolated
- High Efficiency
- High Power Density
- Excellent Thermal Performance
- Low Cost
- Flexible Output Voltage Sequencing (option)
- Remote Sense
- Wide Input
- Wide Trim
- OCP/SCP
- Remote On/Off
- Active Low/High (option)
- Over Temperature Protection
- Under-voltage Lockout (UVLO)
- Industrial Temperature Range



### Description

The Bel V7BC-10E2Ax is part of the non-isolate dc/dc power converter series. The modules use a SIP package. These converters are available in a range of output voltages from 0.75 V to 3.63 V over a wide range of input voltage ( $V_{in} = 4.5 \text{ V} - 14 \text{ V}$ ). The Bel V7BC-10E2Ax has a sequencing feature that enables designers to implement various types of output voltage sequencing when powering. The efficiency is typically 94.3% at 3.3V output at 5.0V input at full load.

### Part Selection

Output Voltage	Input Voltage	Max. Output Current	Max. Output Power	Typical Efficiency	Model Number Active Low	Model Number Active High
0.75 V- 3.63 V	4.5 V – 14 V	10 A	36.3 W	94.3%	V7BC-10E2AL	V7BC-10E2A0

**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)	-0.3 V	-	15 V	
Output Enable Terminal Voltage	-0.3 V	-	15 V	
Sequencing Voltage <sup>1</sup>	-0.3 V	-	$V_{in}$	
Ambient Temperature	-40 °C	-	85 °C	
Storage Temperature	-55 °C	-	125 °C	

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

1. V7BC-10E2Ax 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 not using the sequencing feature, either tie the SEQ pin to  $V_{in}$  or leave it unconnected.

# NON-ISOLATED DC/DC CONVERTERS

4.5 V-14 V Input

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## Input Specifications

Parameter	Min	Typ	Max	Notes
Input Voltage				
Vo,set < 3.0 V	4.5 V	-	14 V	
Vo,set ≥ 3.0 V	Vo,set+1.5 V	-	14 V	
Input Current (full load)	-	-	8.6 A	An input line fuse must always be used.
Input Current (no load)	-	40 mA	-	
Remote Off Input Current	-	2 mA	-	
Input Reflected Ripple Current (pk-pk)	-	-	400 mA	Tested with one 1000uF/25V AL input capacitor with ESR=0.03 ohm max and 4 × 47 uF/16 V Tantalum capacitors with ESR=0.013 ohm max at 100 kHz, & simulated source impedance of 1000 nH, 5 Hz to 20 MHz.
Input Reflected Ripple Current (rms)	-	-	150 mA	
I <sup>2</sup> t Inrush Current Transient	-	0.2 A <sup>2</sup> s	0.4 A <sup>2</sup> s	
Turn-on Voltage Threshold	-	4.3 V	-	
Turn-off Voltage Threshold	-	4.0 V	-	

**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=5V & 12V, full load
Load Regulation	-	0.1% Vo,set	-	
Line Regulation	-	0.1% Vo,set	-	
Regulation Over Temperature (-40°C to +85°C)	-	0.3Vo,set	-	Tref=Ta, min to Ta, max
Output Current	0 A	-	10 A	
Current Limit Threshold	-	200% Io,out	-	
Short Circuit Surge Transient	-	1 A <sup>2</sup> s	3 A <sup>2</sup> s	
Ripple and Noise (pk-pk)	-	30 mV	80 mV	Tested with 0-20MHz, with 10uF tantalum capacitor & 1uF ceramic capacitor at the output
Ripple and Noise (rms)	-	12 mV	35 mV	
Turn on Time	-	8 mS	20 mS	
Overshoot at Turn on	-	0%	1%	
Output Capacitance	0 uF	-	5600 uF	
<b>Transient Response</b>				
50% ~ 100% Max Load	Vo = 0.75 V - 3.63 V	-	160 mV	di/dt=2.5 A/uS; Vin=5 V & 12 V; and with 470 uF Tantalum capacitor at the output
Settling Time		-	50 uS	
100% ~ 50% Max Load		-	160 mV	
Settling Time		-	50 uS	

**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 Vo=3.3 V Vo=2.5 V Vo=1.8 V Vo=1.5 V Vo=1.2 V Vo=0.75 V	- - - - - -	94.3% 93% 91.5% 90.8% 89.3% 83%	- - - - - -	Measured at Vin=5V, full load
Efficiency Vo=3.3 V Vo=2.5 V Vo=1.8 V Vo=1.5 V Vo=1.2 V Vo=0.75 V	- - - - - -	93% 92% 90% 89% 87.5% 81%	- - - - - -	Measured at Vin=12V, full load
Switching Frequency	265 kHz	300 kHz	335 kHz	
Over Temperature Shutdown	-	130°C	-	
Output Voltage Trim Range	0.7525 V	-	3.63 V	
Remote Sense Compensation	-	-	0.5 V	
MTBF	5,114,191 hours			Calculated Per Bell Core TR-332 (Io = 80%Io,max; Vo=3.3 V; Vin=12 V; Ta = 25 °C)
Dimensions Inches (L × W × H) Millimeters (L × W × H)	2.0 x 0.5 x 0.32 50.8 x 12.7 x 8.13			
Weight	-	7.1 g	-	

**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)	-0.2 V	-	0.3 V	V7BC-10E2A0; Remote On/Off pin open, Unit on.
Signal High (Unit On)	-	-	Vin, max	
Signal Low (Unit On)	-0.2 V	-	0.3 V	V7BC-10E2AL; Remote On/Off pin open, Unit on.
Signal High (Unit Off)	2.5 V	-	Vin, max	
<b>Voltage Sequencing</b>				
Sequencing Delay Time	25 mS	-	-	Delay from Vin, min to application of voltage on SEQ pin
Sequencing Slew Rate Capability	-	-	2 V/mS	Vin, min to Vin, max; Io, min to Io, max; Vseq<Vo
Tracking Accuracy Power-Up Power-Down	- -	100 mV 300 mV	200 mV 500 mV	

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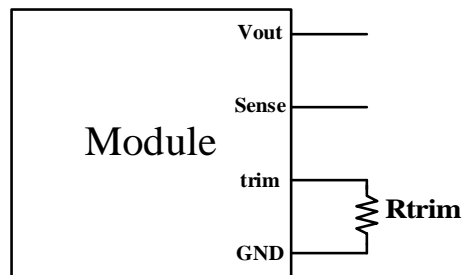
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### Output Trim Equations

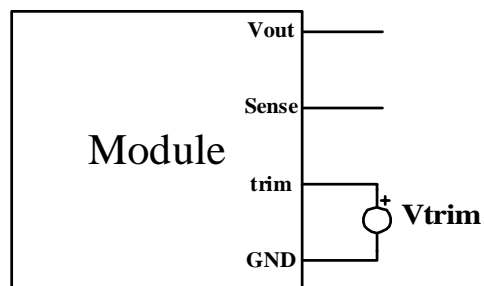
Equation for calculating the trim resistor (in  $\Omega$ ) given the desired output voltage ( $V_o$ ) is shown below. The Trim Up resistor should be connected between the Trim pin and Ground.

$$R_{trim} = \frac{10500}{V_o - 0.7525} - 1000$$



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

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



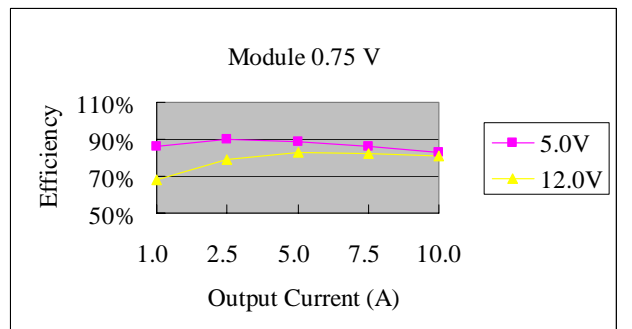
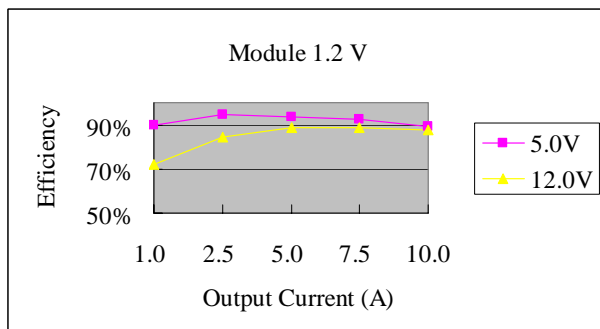
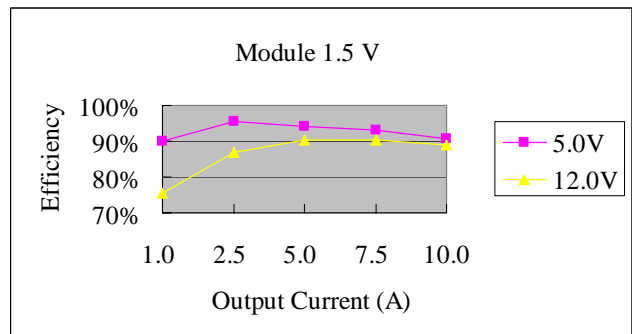
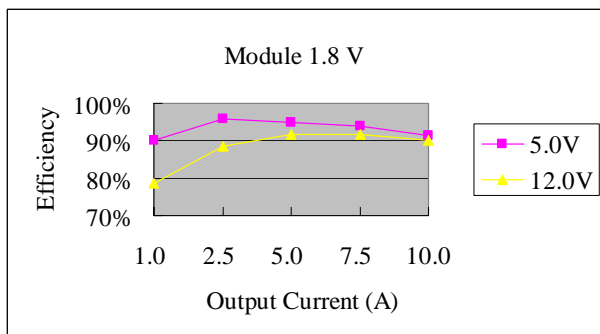
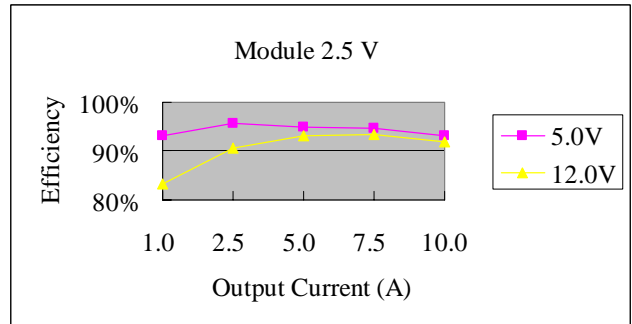
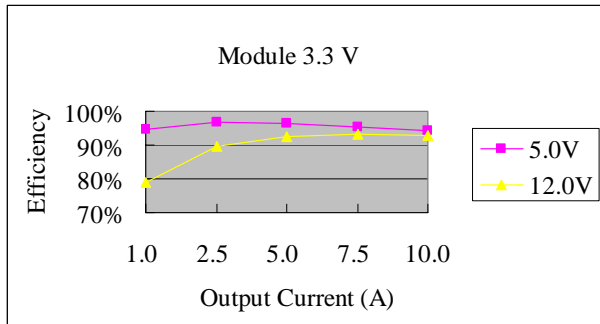
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## Efficiency Data



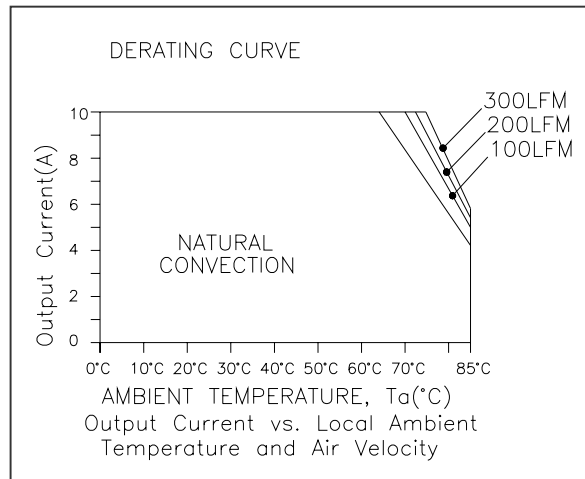
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4.5 V-14 V Input

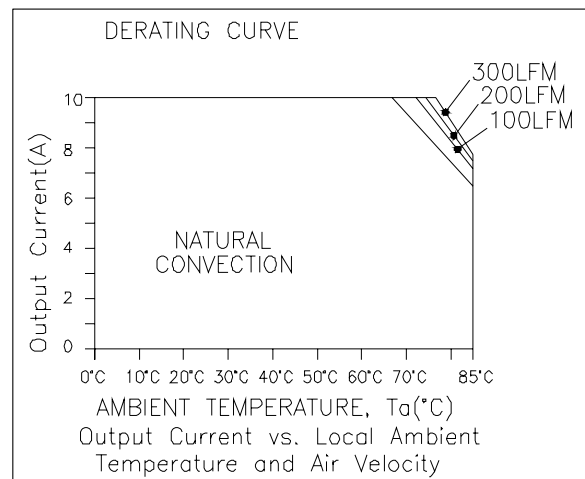
0.75 V-3.63 V/10 A Output



## Thermal Derating Curves



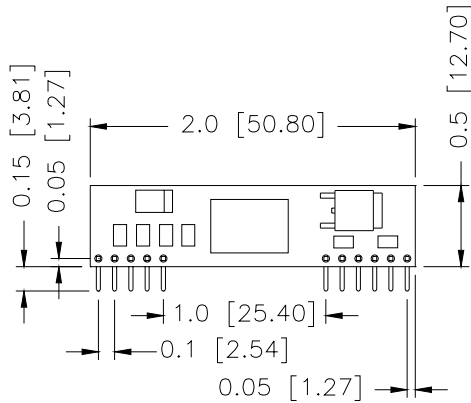
$V_{in}=12\text{ V}$ ,  $V_o = 3.3\text{ V}$



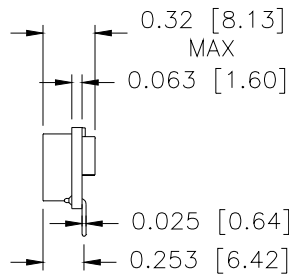
$V_{in}=5\text{ V}$ ,  $V_o = 3.3\text{ V}$

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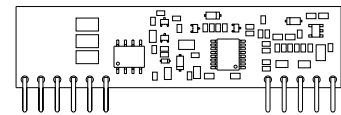
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TOP VIEW

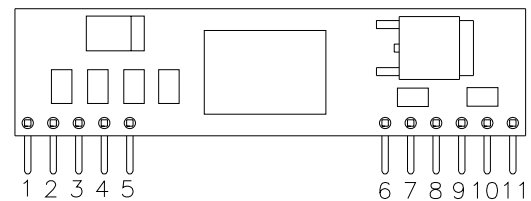


SIDE VIEW

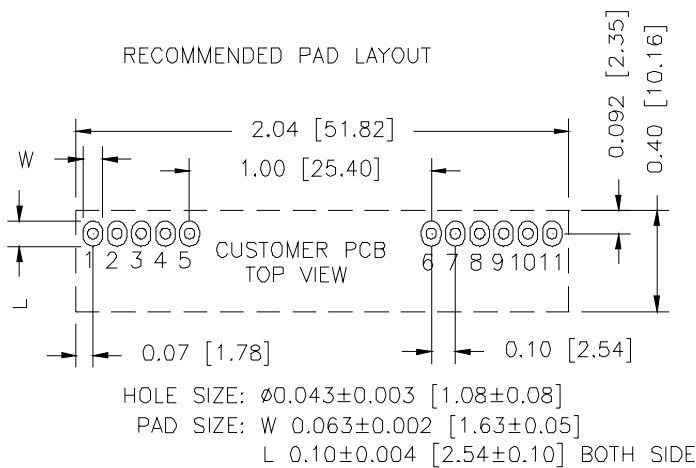


UNIT: INCH [MM]

BACK VIEW



## RECOMMENDED PAD LAYOUT



## Pin Connections

Pin	Function
1	Vout
2	Vout
3	Remote Sense
4	Vout
5	Ground
6	Ground
7	Vin
8	Vin
9	SEQ
10	Trim
11	Remote On/Off

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