

## NON-ISOLATED DC/DC CONVERTERS

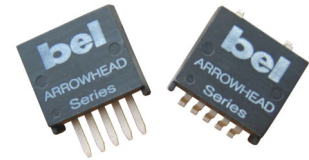
3.0V-5.5V Input

1.0V-3.3V/12A Output

**bel**  
POWER PRODUCTS

### x7AH-12Fxx0 Series

- Non-Isolated
- Fixed frequency (300kHz)
- Low profile package (7.82mm)
- Under-voltage lockout (UVLO)
- OCP/SCP
- Trim function (Option)
- Remote On/Off
- Remote Sense (SMD module)



### Description

The Bel x7AH-12Fxx0 series are part of the low cost non-isolated DC/DC converter series. These converters are available in a range of output voltages from 1.0V to 3.3V. It is packaged in a compact, overmolded package rated at 12A. The output is closely regulated and the efficiency of 3.3V output module is typically 93% at full load. Typical features include remote on/off, input under voltage lockout, over current protection and short circuit protection.

### Part Selection

Output Voltage	Input Voltage	Max. Output Current	Max. Output Power	Typical Efficiency	Part Number Surface Mount	Part Number Vertical Mount
3.3V	4.5V – 5.5V	12A	39.6W	93%	S7AH-12F330	V7AH-12F330
2.5V	3.6V – 5.5V	12A	30.0W	89%	S7AH-12F250	V7AH-12F250
1.8V	3.0V – 5.5V	12A	21.6W	87%	S7AH-12F180	V7AH-12F180
1.5V	3.0V – 5.5V	12A	18.0W	84%	S7AH-12F150	V7AH-12F150
1.2V	3.0V – 5.5V	12A	14.4W	82%	S7AH-12F120	V7AH-12F120
1.0V	3.0V – 5.5V	12A	12.0W	80%	S7AH-12F100	V7AH-12F100

**Note:** Add “0” suffix at the end of the model number to indicate “Tube Packaging”, and “R” for “Reel Packaging”, and “G” for “Tray Packaging”.

### Absolute Maximum Ratings

Parameter	Min	Typ	Max	Notes
Input Voltage (continuous)	-0.3V	-	6V	
Output Enable Terminal Voltage	-0.3V	-	7V	
Ambient Temperature	-40°C	-	85°C	
Storage Temperature	-55°C	-	125°C	

### Input Specifications

Parameter	Min	Typ	Max	Notes
Input Voltage				
Vo=3.3V	4.5V	-	5.5V	
Vo=2.5V	3.6V	-	5.5V	
Vo=1.8-1.0V	3.0V	-	5.5V	
Input Current (no load)	-	120mA	200mA	
Input Current (full load)				
Vo=3.3V	-	-	11A	
Vo=2.5V	-	-	10.5A	
Vo=1.8V	-	-	9.0A	
Vo=1.5V	-	-	8.1A	
Vo=1.2V	-	-	6.5A	
Vo=1.0V	-	-	5.2A	
Remote Off Input Current	-	2mA	5mA	

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3.0V-5.5V Input      1.0V-3.3V/12A Output



### Input Specifications (continued)

Parameter	Min	Typ	Max	Notes
Input Reflected Ripple Current (pk-pk)	-	260mA	320mA	With simulated source impedance of 500nH, 5Hz to 20MHz; use a 270uF/6.3V cap with ESR=0.03 ohm max at 100KHz
Input Reflected Ripple Current (RMS)	-	75mA	120mA	
I <sup>2</sup> t Inrush Current Transient	-	0.09A <sup>2</sup> s	0.2A <sup>2</sup> s	
Turn on Voltage Threshold		2.1V	-	
Turn off Voltage Threshold	-	2V	2.4V	

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

### Output Specifications

Parameter	Min	Typ	Max	Notes	
Output Voltage Set Point				Test conditions: Vin=5V, Io= 50% load	
Vo=3.3V	3.234V	3.3V	3.366V		
Vo=2.5V	2.450V	2.5V	2.550V		
Vo=1.8V	1.764V	1.8V	1.836V		
Vo=1.5V	1.470V	1.5V	1.530V		
Vo=1.2V	1.176V	1.2V	1.224V		
Vo=1.0V	0.980V	1.0V	1.020V		
Line Regulation	-	±1mV	±4mV		
Load Regulation	-	±2mV	±5mV		
Regulation Over Temperature (-40°C to +85°C)					
Vo=3.3V	-	±10mV	±15mV		
Vo=2.5V	-	±9mV	±13mV		
Vo=1.8V	-	±7mV	±12mV		
Vo=1.5V	-	±6mV	±11mV		
Vo=1.2V	-	±5mV	±10mV		
Vo=1.0V	-	±4mV	±9mV		
Output Current	0A	-	12A		
Current Limit Threshold	20A	-	30A		
Short Circuit Surge Transient	-	0.3A <sup>2</sup> s	0.6A <sup>2</sup> s		
Ripple and Noise (RMS)	-	12mV	21mV	Test conditions: 0-20MHz BW; 1uF ceramic capacitor and 330uF external capacitor at the output.	
Ripple and Noise (pk-pk)	-	50mV	90mV		
Turn on Time	-	5mS	10mS		
Overshoot at Turn on	-	0%	3%		
Output Capacitance	330uF	-	4800uF		
<b>Transient Response</b>					
50% ~ 100% Max Load	Overshoot	Vo=3.3V	-	110mV	Test conditions: di/dt=0.5A/us, Vin=5V, with 330uF external load capacitance.
	Settling Time		-	40uS	
100% ~ 50% Max Load	Overshoot	Vo=2.5V	-	110mV	
	Settling Time		-	40uS	
50% ~ 100% Max Load	Overshoot	Vo=2.5V	-	100mV	
	Settling Time		-	30uS	
100% ~ 50% Max Load	Overshoot	Vo=2.5V	-	100mV	
	Settling Time		-	30uS	
50% ~ 100% Max Load	Overshoot	Vo=1.0V - 1.8V	-	90mV	
	Settling Time		-	20uS	
100% ~ 50% Max Load	Overshoot	Vo=1.0V - 1.8V	-	90mV	
	Settling Time		-	20uS	

Note: 1. All specifications are typical at 5V input, full load at 25°C unless otherwise stated.

## NON-ISOLATED DC/DC CONVERTERS

3.0V-5.5V Input

1.0V-3.3V/12A Output



### General Specifications

Parameter	Min	Typ	Max	Notes
Efficiency Vo=3.3V Vo=2.5V Vo=1.8V Vo=1.5V Vo=1.2V Vo=1.0V	90%	93%	-	Vin=5V, full load
	86%	89%	-	
	84%	87%	-	
	81%	84%	-	
	79%	82%	-	
	77%	80%	-	
Efficiency Vo=1.8V Vo=1.5V Vo=1.2V Vo=1.0V	85%	88%	-	Vin=3.3V, full load
	81%	84%	-	
	79%	82%	-	
	76%	79%	-	
Switching Frequency	250KHz	300KHz	350KHz	
Output Trim Range	90%Vo	-	110%Vo	
Remote Sense Compensation	-	-	10%	SMD module
MTBF	4,038,174 hours			Calculated Per Bell Core TR-332 (Io = 9.6A, Vin=5V; Ta = 25°C)
Dimensions (surface mount) Inches (L x W x H) Millimeters (L x W x H)	0.78 x 0.70 x 0.32 19.81 x 17.78 x 8.128			
	0.70 x 0.308 x 0.65 17.78 x 7.82 x 16.51			
Dimensions (vertical) Inches (L x W x H) Millimeters (L x W x H)	0.70 x 0.308 x 0.65 17.78 x 7.82 x 16.51			
Weight	-	5.1g	-	

### Control Specifications

Parameter	Min	Typ	Max	Notes
<b>Remote On/Off</b>				
Signal Low (Unit Off)	-	-	0.9V (Vin=3.0V)	Remote on/off pin open, unit on.
	-	-	1.35V (Vin=4.5V)	
	-	-	1.65V (Vin=5.5V)	
Signal High (Unit On)	2.1V (Vin=3.0V)	-	-	
	3.15V (Vin=4.5V)	-	-	
	3.85V (Vin=5.5V)	-	-	

## NON-ISOLATED DC/DC CONVERTERS

3.0V-5.5V Input

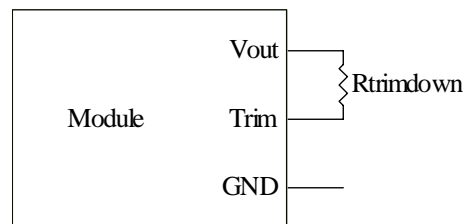
1.0V-3.3V/12A Output

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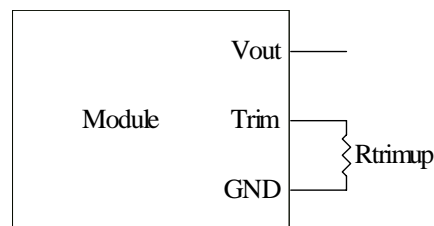
### Output Trim Equations

Equations for calculating the trim resistor (in kΩ) given the desired adjusted voltage ( $V_{adj}$ ) and the nominal output voltage of the converter ( $V_{nom}$ ) are shown below. The Trim Down resistor should be connected between the Trim pin and Vout. The Trim Up resistor should be connected between the Trim pin and Ground. Only one of the resistors should be used for any given application.

$$R_{TrimDown} = \frac{A}{V_{nom} - V_{adj}} - B$$



$$R_{TrimUp} = \frac{C}{V_{adj} - V_{nom}} - D$$



Vnom	A	B	C	D
3.3	161.391	161.900	43.330	100.000
2.5	111.674	208.900	43.330	147.000
1.8	68.576	287.900	43.330	226.000
1.5	50.000	287.900	43.330	226.000
1.2	31.240	208.900	43.330	147.000
1.0	18.850	161.900	43.330	100.000

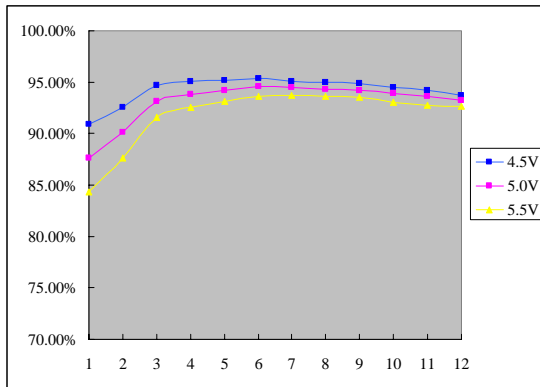
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3.0V-5.5V Input

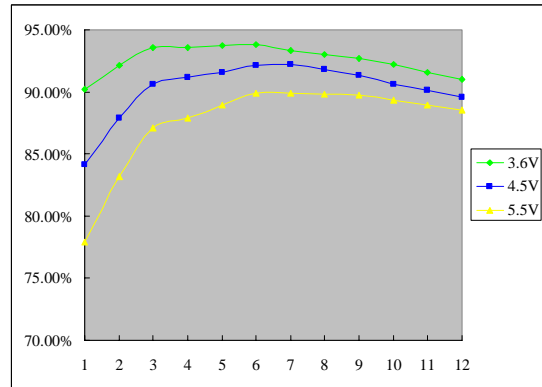
1.0V-3.3V/12A Output



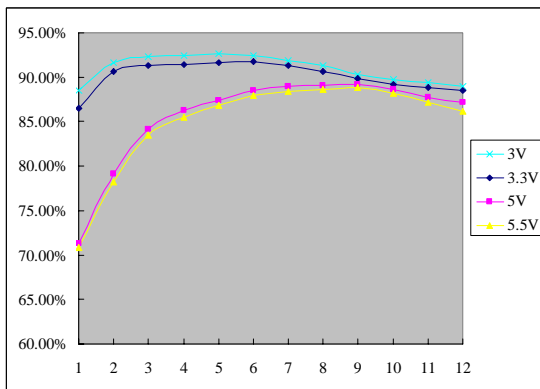
## Efficiency Data



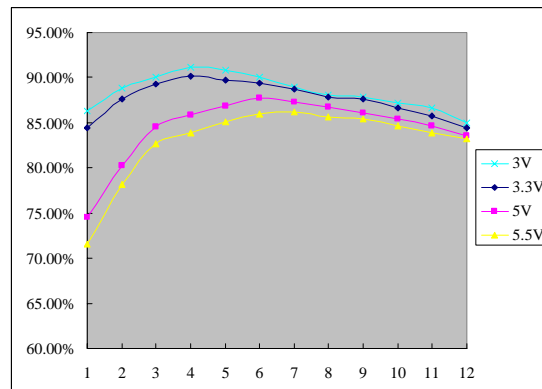
x7AH-12F330



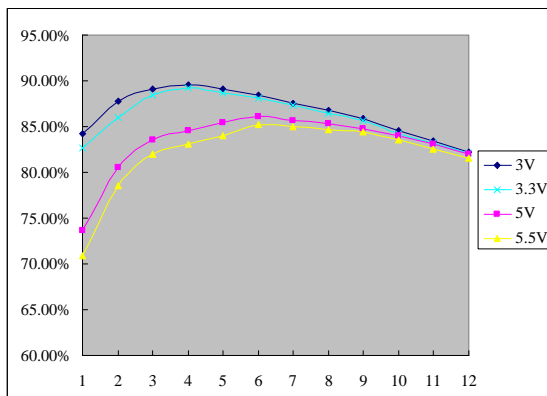
x7AH-12F250



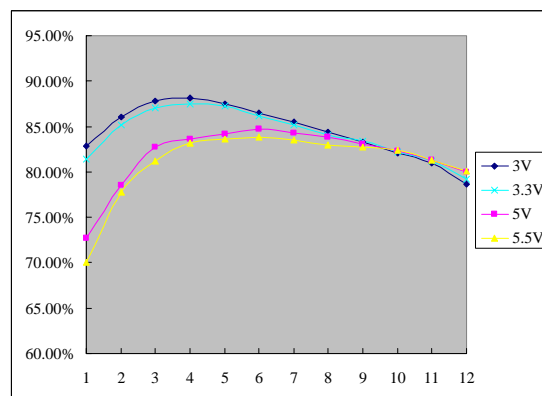
x7AH-12F180



x7AH-12F150



x7AH-12F120



x7AH-12F100

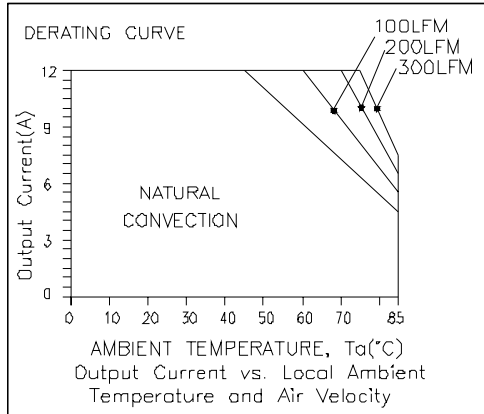
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3.0V-5.5V Input

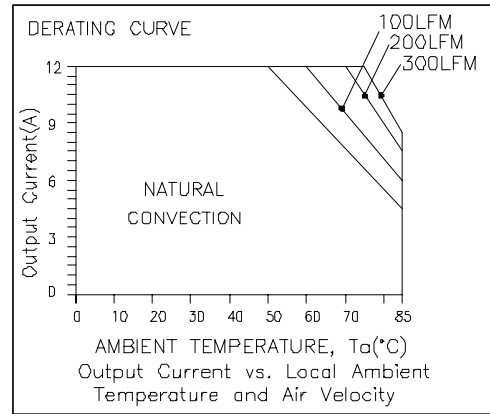
1.0V-3.3V/12A Output



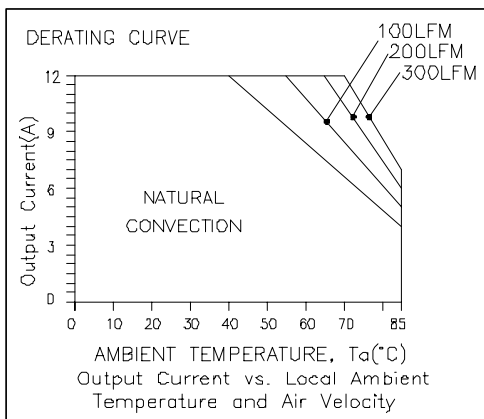
## Thermal Derating Curves



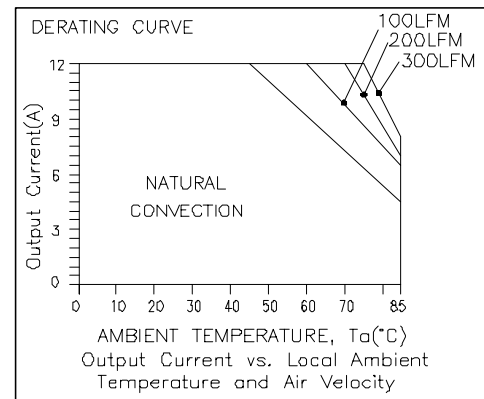
S7AH-12F330



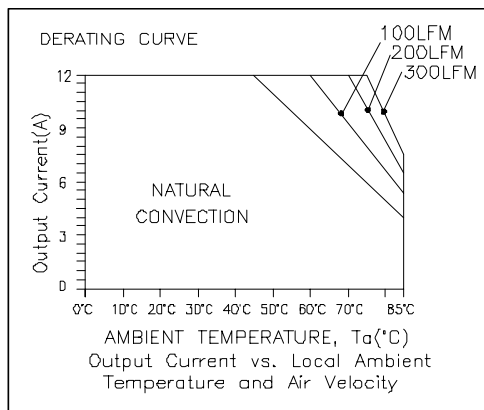
V7AH-12F330



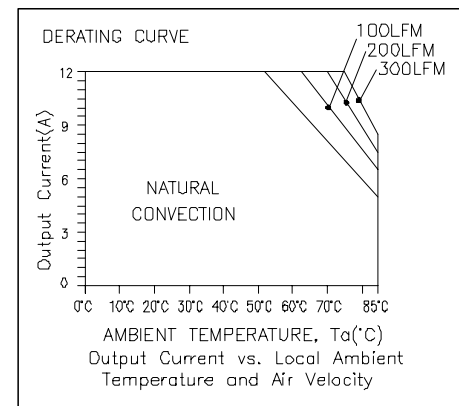
S7AH-12F250



V7AH-12F250



S7AH-12F180



V7AH-12F180

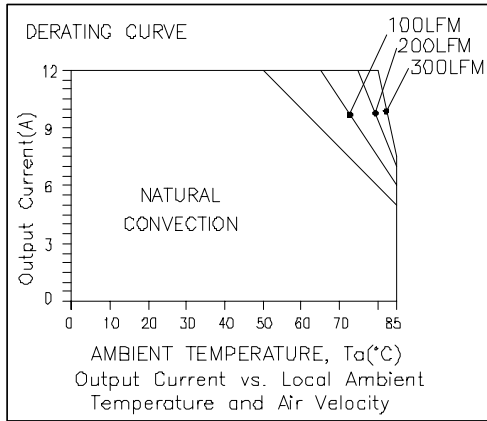
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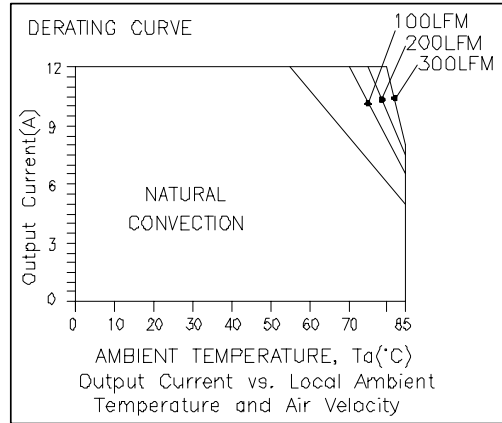
1.0V-3.3V/12A Output



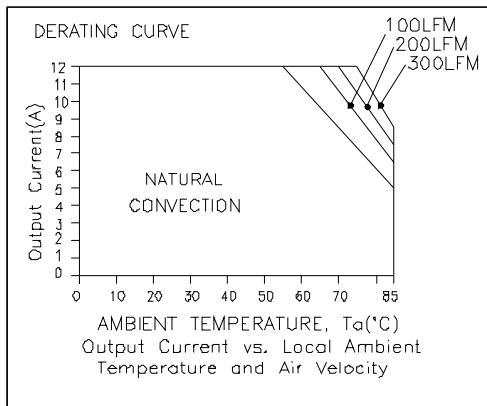
## Thermal Derating Curves (continued)



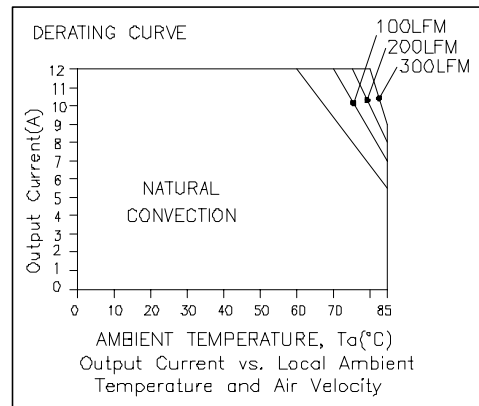
S7AH-12F150



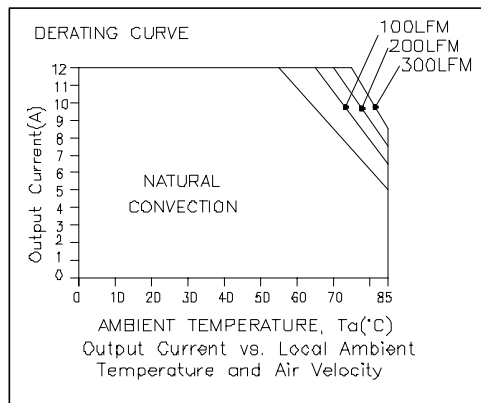
V7AH-12F150



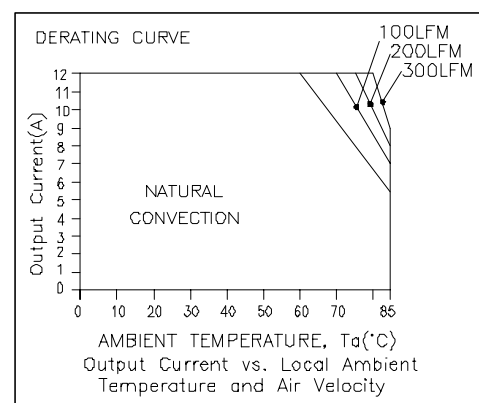
S7AH-12F120



V7AH-12F120



S7AH-12F100



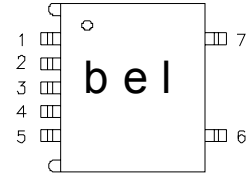
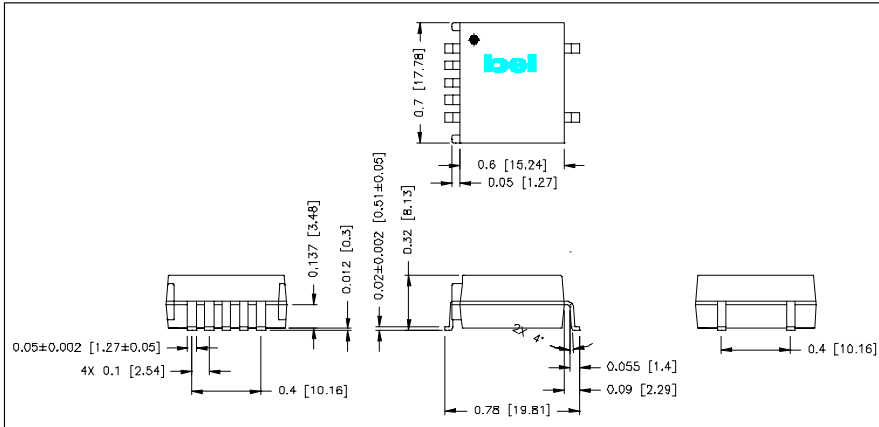
V7AH-12F100

**Test Condition:** Derating curves are tested at 5V input.

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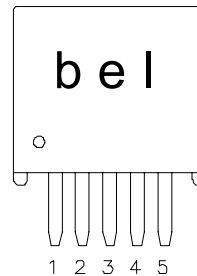
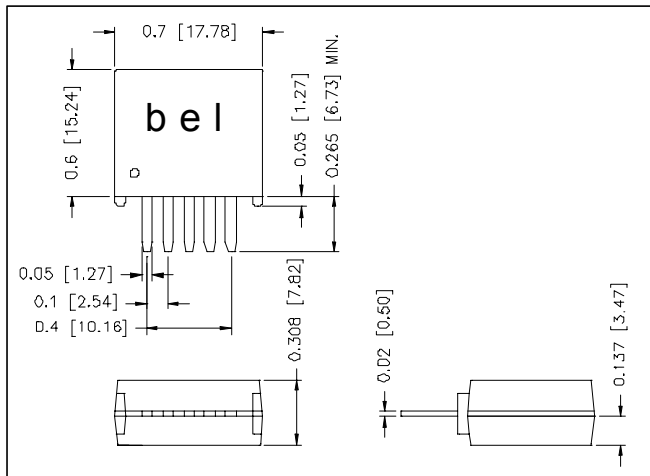
3.0V-5.5V Input

1.0V-3.3V/12A Output



## Pin Connections

Pin	Function
1	Remote On/Off (option)
2	Vin
3	Ground
4	Vout
5	Trim (option)
6	Remote Sense (option)
7	N/A



## Pin Connections

Pin	Function
1	Remote On/Off (option)
2	Vin
3	Ground
4	Vout
5	Trim (option)

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