

## NON-ISOLATED DC/DC CONVERTERS

8.3 V-14 V Input

0.75 V-5.0 V/16 A Output

**bel**  
POWER PRODUCTS

### SRBC-16A2Ax Series

### RoHS Compliant

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



### Description

The Bel SRBC-16A2Ax modules are a series of non-isolated dc/dc converters that deliver up to 16 A of output current with full load efficiency of 92% at 3.3 V output. These modules provide precisely regulated voltage programmable via external resistor from 0.75 V to 5.0 V over a wide range of input voltage (8.3-14 V). 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, remote sense, 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
0.75 V - 5.0 V	8.3 V - 14 V	16 A	80 W	94%	SRBC-16A2AL	SRBC-16A2A0

**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 <sub>in</sub>	
Ambient Temperature	-40 °C	-	85 °C	
Storage Temperature	-55 °C	-	125 °C	

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

1. SRBC-16A2Ax 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<sub>in</sub> or leave it unconnected.

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### Input Specifications

Parameter	Min	Typ	Max	Notes
Input Voltage				
$V_o, \text{set} \leq 3.63 \text{ V}$	8.3 V	12 V	14 V	
$V_o, \text{set} > 3.63 \text{ V}$	8.3 V	12 V	13.2 V	
Input Current (full load)	-	-	11 A	
Input Current (no load)	-	100 mA	-	
Remote Off Input Current	-	2 mA	-	
Input Reflected Ripple Current (pk-pk)	-	70 mA	200 mA	Tested with one 1000 $\mu\text{F}/25 \text{ V}$ AL input capacitor with $\text{ESR}=0.03 \text{ ohm}$ max and $6 \times 47 \text{ uF}/16 \text{ V}$ tantalum capacitors with $\text{ESR}=0.013 \text{ ohm}$ max at 100 kHz, & simulated source impedance of 1000 nH, 5 Hz to 20 MHz.
Input Reflected Ripple Current (rms)	-	-	150 mA	
$I^2t$ Inrush Current Transient	-	0.2 $\text{A}^2\text{s}$	0.4 $\text{A}^2\text{s}$	
Turn-on Voltage Threshold	-	8.0 V	-	
Turn-off Voltage Threshold	-	7.5 V	-	

### Output Specifications

Parameter	Min	Typ	Max	Notes
Output Voltage Set Point	-2% $V_{o,\text{set}}$	-	2% $V_{o,\text{set}}$	$V_{in}=12 \text{ V}$ , full load
Load Regulation	-	0.1% $V_{o,\text{set}}$	-	$I_o=I_o$ , min to $I_o$ , max
Line Regulation	-	0.1% $V_{o,\text{set}}$	-	$V_{in}=V_{in}$ , min to $V_{in}$ , max
Regulation Over Temperature (-40 °C to +85 °C)	-	0.3% $V_{o,\text{set}}$	-	$T_{ref}=T_a$ , min to $T_a$ , max
Output Current	0 A	-	16 A	
Current Limit Threshold	-	180% $I_o$	-	
Short Circuit Surge Transient	-	1 $\text{A}^2\text{s}$	3 $\text{A}^2\text{s}$	
Ripple and Noise (pk-pk)	-	75 mV	100 mV	Tested with 0-20 MHz, 10 $\mu\text{F}$ tantalum capacitor & 1 $\mu\text{F}$ TDK ceramic capacitor at the output
Ripple and Noise (rms)	-	30 mV	45 mV	
Turn on Time	-	6 mS	10 mS	
Overshoot at Turn on	-	-	1% $V_{o,\text{set}}$	
Output Capacitance	-	-	5000 $\mu\text{F}$	
<b>Transient Response</b>				
50% ~ 100% Max Load	$V_o=0.75 \text{ V} - 5.0 \text{ V}$	-	100 mV	$di/dt=2.5 \text{ A}/\mu\text{S}$ ; $V_{in}=12 \text{ V}$ ; and with $2 \times 150 \text{ uF}$ polymer capacitors at the output
Settling Time		-	50 $\mu\text{S}$	
100% ~ 50% Max Load		-	100 mV	
Settling Time		-	50 $\mu\text{S}$	

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

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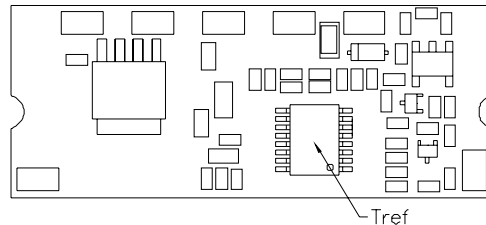


## General Specifications

Parameter	Min	Typ	Max	Notes
Efficiency				Measured at Vin=12 V, full load
Vo=5.0 V	-	94%	-	
Vo=3.3 V	-	92%	-	
Vo=2.5 V	-	90%	-	
Vo=1.8 V	-	88%	-	
Vo=1.5 V	-	87%	-	
Vo=1.2 V	-	85%	-	
Vo=0.75 V	-	79%	-	
Switching Frequency	265 kHz	300 kHz	335 kHz	
Over Temperature Shutdown <sup>1</sup>	-	130 °C	-	
Output Trim Range (Wide Trim)	0.7525 V	-	5 V	
Remote Sense Compensation	-	-	0.5 V	
MTBF	2,666,488 hours			Calculated Per Bell Core SR-332 (Io =80% Io,max; Vo=5 V; Vin=12 V; Ta = 25°C)
Dimensions				
Inches (L × W × H)	1.30 x 0.53 x 0.315			
Millimeters (L × W × H)	33.02 x 13.46 x 8.00			
Weight	-	8 g	-	

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

1. The Tref temperature measurement location:



## Control Specifications

Parameter	Min	Typ	Max	Notes
<b>Remote On/Off</b>				
Signal Low (Unit Off)	-0.2 V	-	0.3 V	SRBC-16A2A0; Remote On/Off pin open, Unit on.
Signal High (Unit On)	-	-	Vin, max	
Signal Low (Unit On)	-0.2 V	-	0.3 V	SRBC-16A2AL; Remote On/Off pin open, Unit on.
Signal High (Unit Off)	2.5 V	-	Vin, max	
<b>Voltage Sequencing</b>				
Sequencing Delay Time	10 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	-	100 mV	200 mV	
Power-Down	-	300 mV	500 mV	

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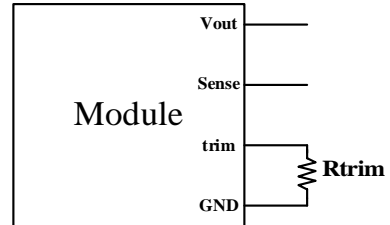
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## Output Trim Equations

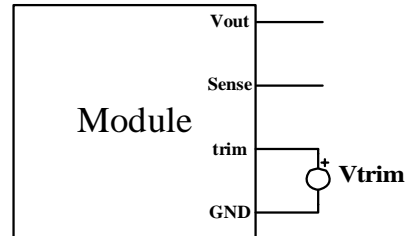
Equation for calculating the trim resistor (in  $\Omega$ ) given the desired adjusted voltage ( $V_{adj}$ ) is shown below. The Trim Up resistor should be connected between the Trim pin and Ground.

$$R_{trimup} = \frac{10500}{V_{adj} - 0.7525} - 1000$$

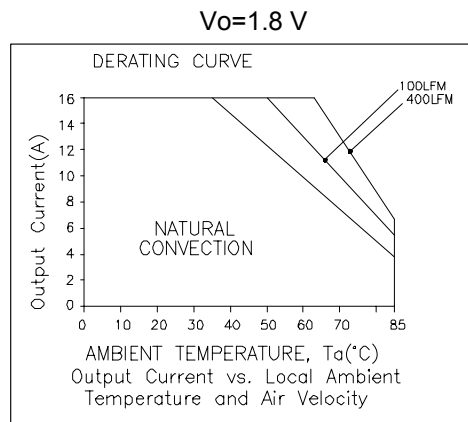
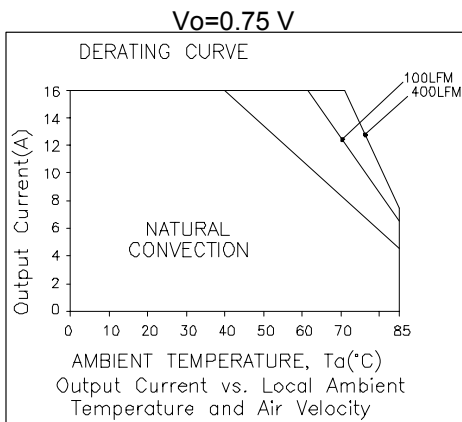
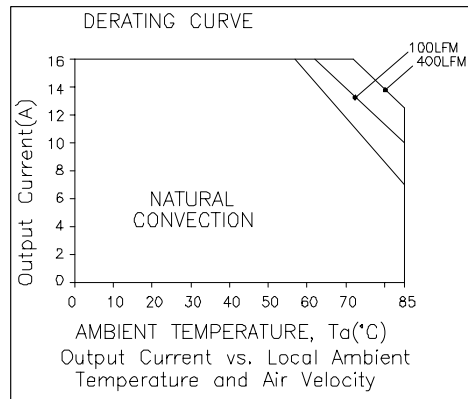
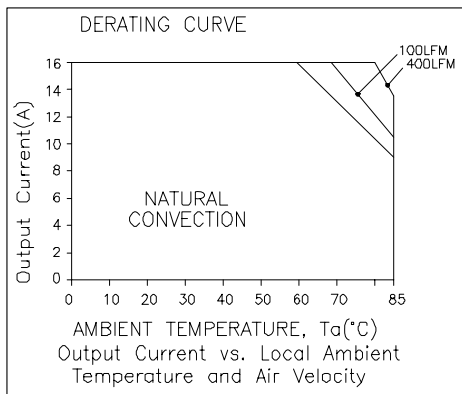


Equation for calculating the trim voltage (in V) given the desired adjusted voltage ( $V_{adj}$ ) is shown below. The Trim Up voltage should be connected between the Trim pin and Ground.

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



## Thermal Derating Curves



$V_o=0.75\text{ V}$

$V_o=1.8\text{ V}$

$V_o=3.3\text{ V}$

$V_o=5.0\text{ V}$

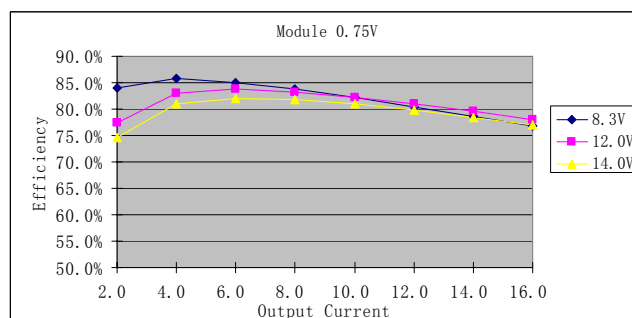
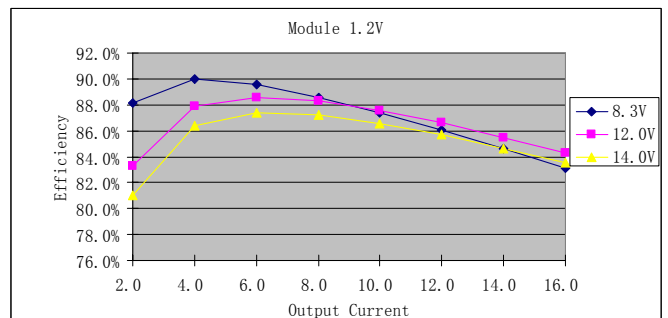
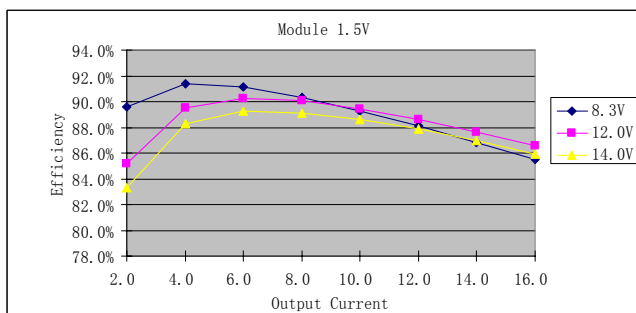
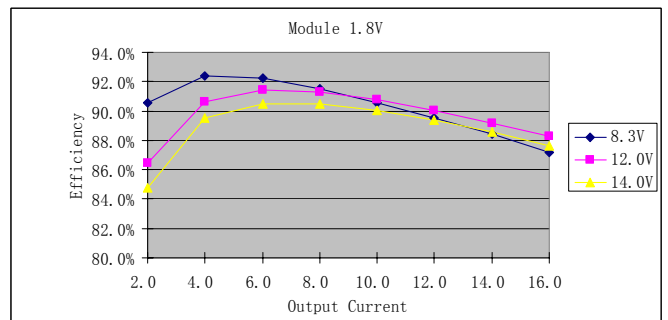
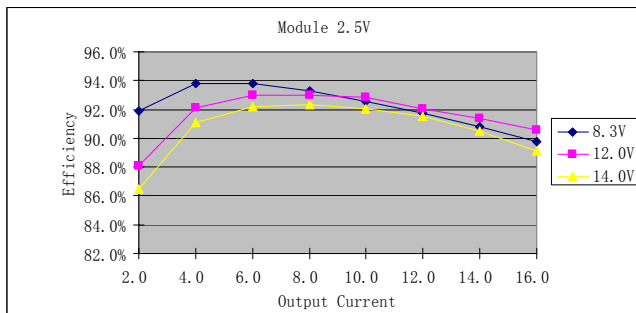
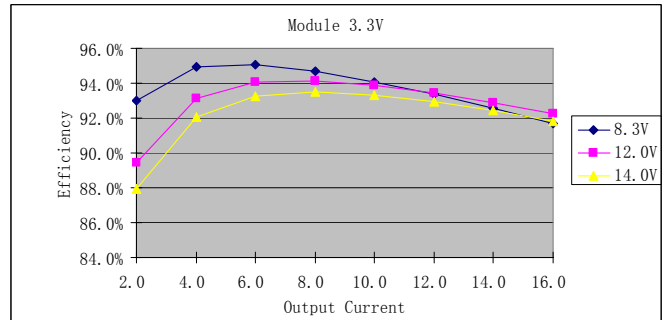
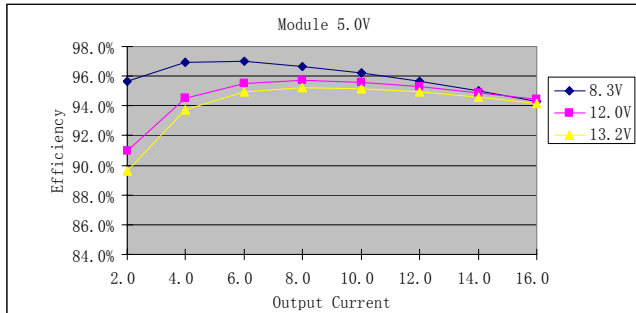
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## Efficiency Data



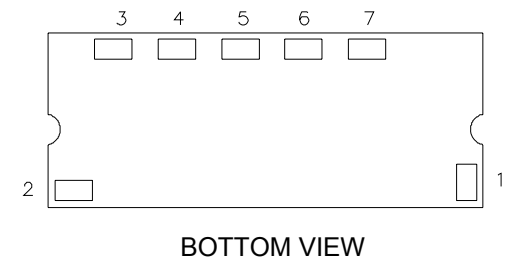
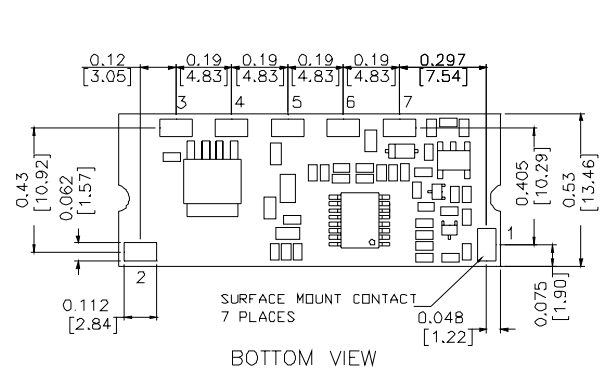
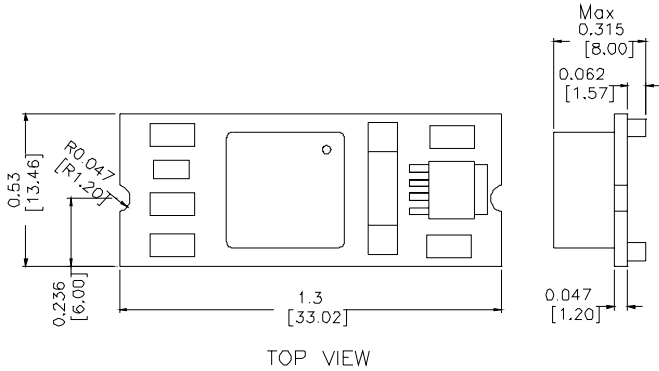
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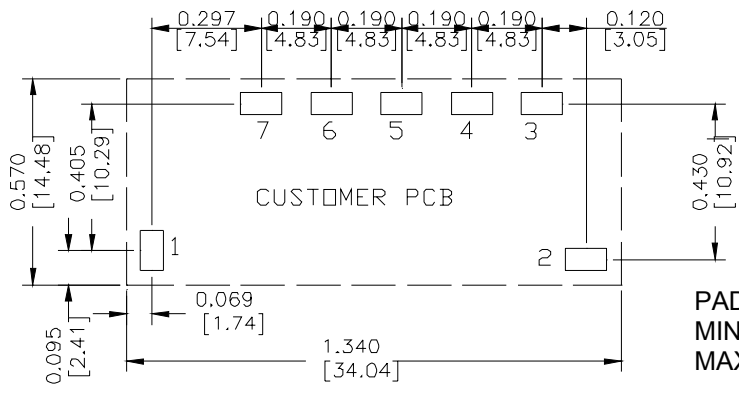


## Mechanical Outline



## Pin Connections

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



**PAD SIZE:**  
 MIN: 0.14" \* 0.095" (3.56mm \* 2.41mm)  
 MAX: 0.165" \* 0.11" (4.19mm \* 2.79mm)

**RoHS Compliance**  
 Complies with the European Directive 2002/95/EC, calling for the elimination of lead and other hazardous substances from electronic products.



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