

NON-ISOLATED DC/DC CONVERTERS

8.3 V-14 V Input 0.75 V-5.0 V/6 A Output



SRBA-06A1Ax Series RoHS Compliant

- Non-Isolated
- High Efficiency
- High Power Density
- Fixed Frequency
- Remote On/Off
- Under-Voltage Lockout (UVLO)
- OCP/SCP
- Wide Input Range
- Wide Output Trim Range
- Active Low/High



Description

The Bel SRBA-06A1Ax modules are a series of non-isolated dc/dc converters that deliver up to 6 A of output current with full load efficiency of 92% at 5.0 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 V-14 V). 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 |
|----------------|---------------|---------------------|-------------------|--------------------|-------------------------|--------------------------|
| 0.75 V - 5.0 V | 8.3 V - 14 V | 6 A | 30.0 W | 92% | SRBA-06A1AL | SRBA-06A1AO |

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 | |
| Ambient Temperature | -40 °C | - | 85 °C | |
| Storage Temperature | -55 °C | - | 125 °C | |

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

Input Specifications

| Parameter | Min | Typ | Max | Notes |
|---|-------|------------------------|-----------------------|---|
| Input Voltage | 8.3 V | 12 V | 14 V | |
| Input Current (full load) | | | | |
| Vo=5.0 V | - | 2.75 A | 4.0 A | |
| Vo=3.3 V | - | 1.85 A | 2.8 A | |
| Vo=2.5 V | - | 1.45 A | 2.2 A | |
| Vo=1.8 V | - | 1.05 A | 1.6 A | |
| Vo=1.2 V | - | 0.75 A | 1.1 A | |
| Vo=0.75 V | - | 0.55 A | 0.8 A | |
| Input Current (no load) | | | | |
| Vo=5.0 V | - | - | 100 mA | |
| Vo=0.75 V | - | - | 20 mA | |
| Remote Off Input Current | - | 1 mA | 2 mA | |
| Input Reflected Ripple Current (pk-pk) | - | 120 mA | - | Tested with two 100 uF/25 V tantalum input capacitors & simulated source impedance of 1 uH, 5 Hz to 20 MHz. |
| Input Reflected Ripple Current (rms) | - | 40 mA | - | |
| I ² t Inrush Current Transient | - | 0.002 A ² s | 0.02 A ² s | |
| Turn-on Voltage Threshold | - | 8.1 V | 8.2 V | |
| Turn-off Voltage Threshold | - | 7.5 V | 8.0 V | |

NON-ISOLATED DC/DC CONVERTERS

8.3 V-14 V Input

0.75 V-5.0 V/6 A Output



Output Specifications

| Parameter | Min | Typ | Max | Notes | |
|---|-------------------------------|----------------------|------------------|--|--|
| Output Voltage Set Point | -2% $V_{o,set}$ | - | 2% $V_{o,set}$ | $V_{in}=12\text{ V}$, full load | |
| Output Voltage Set Point | -2.5% $V_{o,set}$ | - | 3.5% $V_{o,set}$ | Over all operating input voltages, resistive loads and temperature conditions | |
| Adjustment Range Selected by External Resistor or Voltage | 0.7525 V | - | 5.0 V | | |
| Load Regulation | - | 0.4% $V_{o,set}$ | - | $I_o=I_o$, min to I_o , max | |
| Line Regulation | - | 0.3% $V_{o,set}$ | - | $V_{in}=V_{in}$, min to V_{in} , max | |
| Regulation Over Temperature (-40 °C to +8 °C) | - | 0.5% $V_{o,set}$ | - | $T_{ref}=T_a$, min to T_a , max | |
| Output Current | 0A | - | 6A | | |
| Current Limit Threshold | 7.2A | - | 18A | | |
| Short Circuit Surge Transient | - | 0.25A ² s | - | | |
| Ripple and Noise (pk-pk) $V_o=0.75\text{ V}-3.63\text{ V}$ | - | 50 mV | 75 mV | Tested with 0-20MHz, with 10 uF/10 V tantalum capacitor & 1 uF/10 V TDK ceramic capacitor at the output. | |
| Ripple and Noise (rms) $V_o=0.75\text{ V}-3.63\text{ V}$ | - | 15 mV | 30 mV | | |
| Ripple and Noise (pk-pk) $V_o=5.0\text{ V}$ | - | 75 mV | 100 mV | | |
| Ripple and Noise (rms) $V_o=5.0\text{ V}$ | - | 30 mV | 40 mV | | |
| Turn on Time | - | 8 mS | 10 mS | | |
| Overshoot at Turn on | - | 0% | 3% | | |
| Output Capacitance | | | | | |
| ESR $\geq 1\text{ mohm}$ | 0 uF | - | 1000 uF | | |
| ESR $\geq 10\text{ mohm}$ | 0 uF | - | 3300 uF | | |
| Transient Response | | | | | |
| 50% ~ 100% Max Load | $V_o = 0.75\text{ V}$ -5 V | - | 200 m V | - | $di/dt=2.5\text{ A/uS}$; $V_{in}=12\text{ V}$; and With 10 uF/10 V tantalum capacitor & 1 uF/10 V ceramic capacitor at the output. |
| Settling Time | | - | 50 uS | - | |
| 100% ~ 50% Max Load | | - | 200 m V | - | |
| Settling Time | | - | 50 uS | - | |

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

General Specifications

| Parameter | Min | Typ | Max | Notes |
|-------------------------------|----------------------|---------|---------|---|
| Efficiency | | | | Measured at $V_{in}=12\text{ V}$, full load |
| $V_o=5.0\text{ V}$ | 90% | 92% | - | |
| $V_o=3.3\text{ V}$ | 87% | 89% | - | |
| $V_o=2.5\text{ V}$ | 85% | 88% | - | |
| $V_o=1.8\text{ V}$ | 83% | 86% | - | |
| $V_o=1.2\text{ V}$ | 79% | 82% | - | |
| $V_o=0.75\text{ V}$ | 71% | 74% | - | |
| Switching Frequency | 250 kHz | 300 kHz | 350 kHz | |
| Over Temperature Shutdown | - | 135 °C | - | |
| Output Trim Range (Wide trim) | 0.7525 V | - | 5 V | |
| MTBF | 3,079,469 hours | | | Calculated Per Bell Core SR-332 ($I_o = \text{Nominal}$; $T_a = 25\text{ °C}$) |
| Dimensions | | | | |
| Inches (L x W x H) | 0.8 x 0.45 x 0.251 | | | |
| Millimeters (L x W x H) | 20.32 x 11.42 x 6.38 | | | |
| Weight | - | 3 g | - | |

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

NON-ISOLATED DC/DC CONVERTERS

8.3 V-14 V Input

0.75 V-5.0 V/6 A Output

bel
POWER PRODUCTS

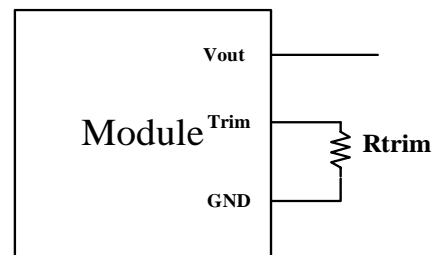
Control Specifications

| Parameter | Min | Typ | Max | Notes |
|------------------------|--------|-----|-------|---|
| Remote On/Off | | | | |
| Signal Low (Unit Off) | -0.3 V | - | 0.4 V | SRBA-06A1A0; Remote On/Off pin open, Unit on. |
| Signal High (Unit On) | 2.5 V | - | 14 V | |
| Signal Low (Unit On) | -0.3 V | - | 0.4 V | SRBA-06A1AL; Remote On/Off pin open, Unit on. |
| Signal High (Unit Off) | 2.5 V | - | 14 V | |

Output Trim Equations

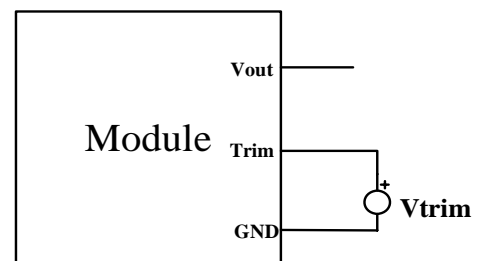
Equation for calculating the trim resistor (in kΩ) given the desired adjusted voltage (V_{adj}) is shown below. The Trim Up resistor should be connected between the Trim pin and Ground.

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



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

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



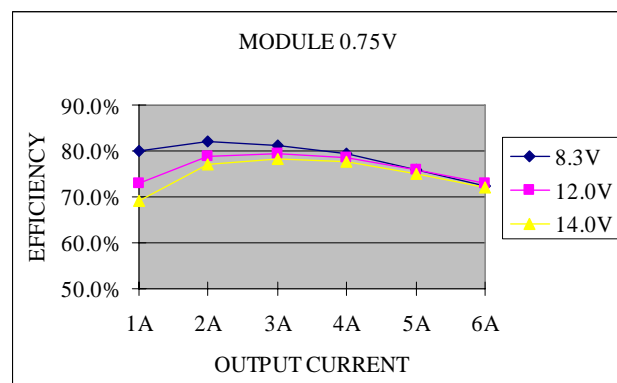
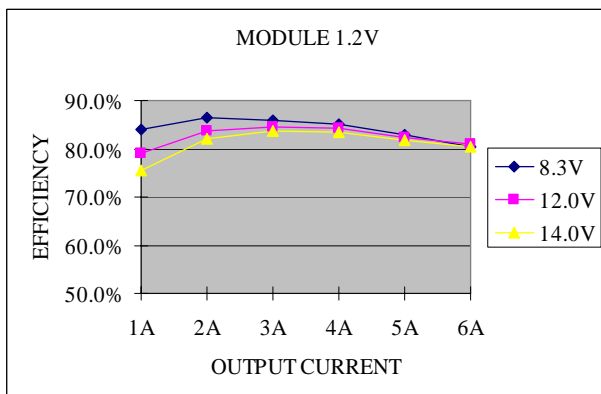
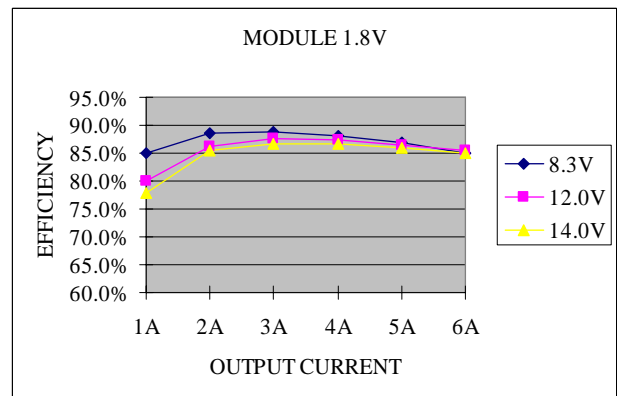
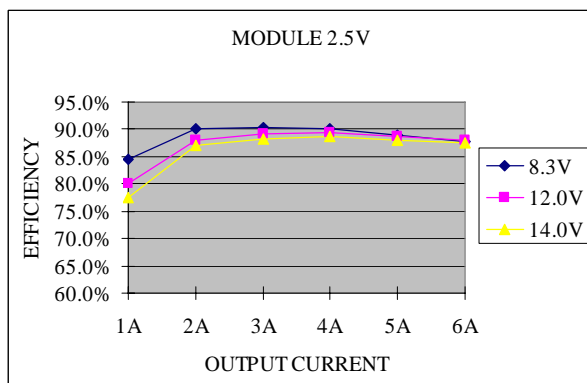
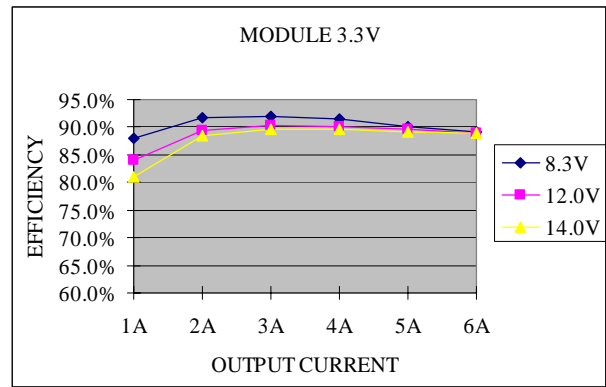
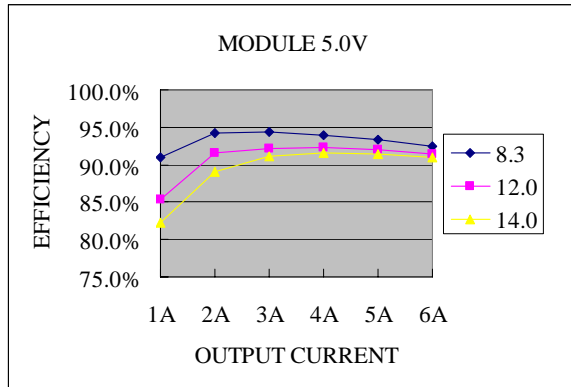
NON-ISOLATED DC/DC CONVERTERS

8.3 V-14 V Input

0.75 V-5.0 V/6 A Output



Efficiency Data



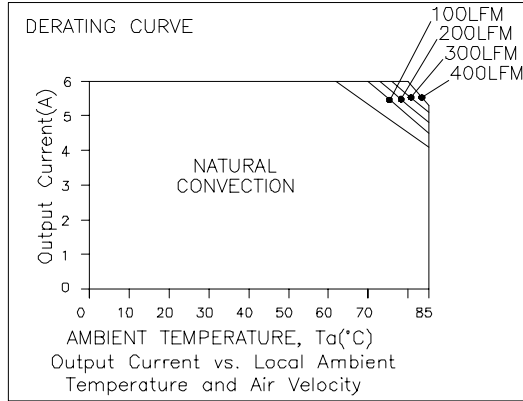
NON-ISOLATED DC/DC CONVERTERS

8.3 V-14 V Input

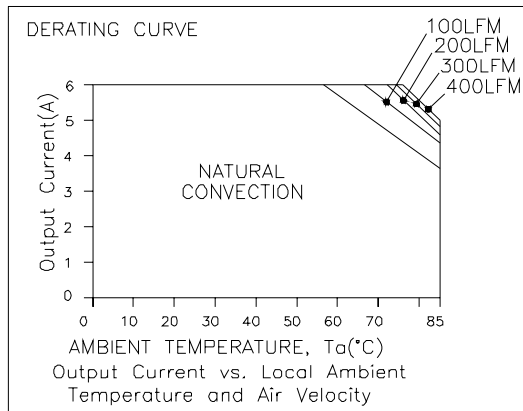
0.75 V-5.0 V/6 A Output



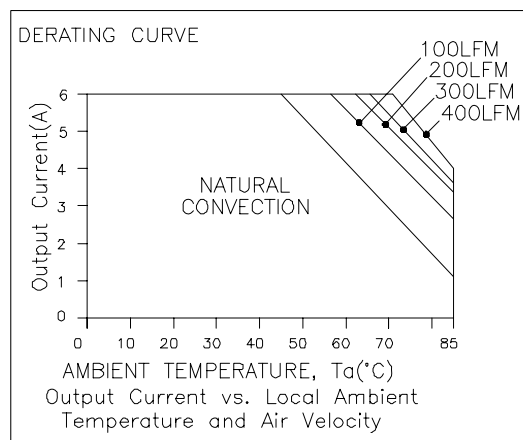
Thermal Derating Curves



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



$V_{in}=12\text{ V}$, $V_o=2.5\text{ V}$

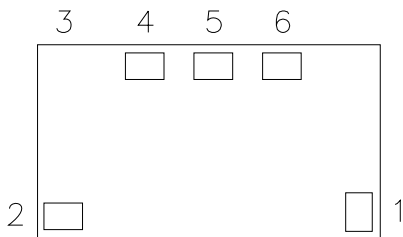
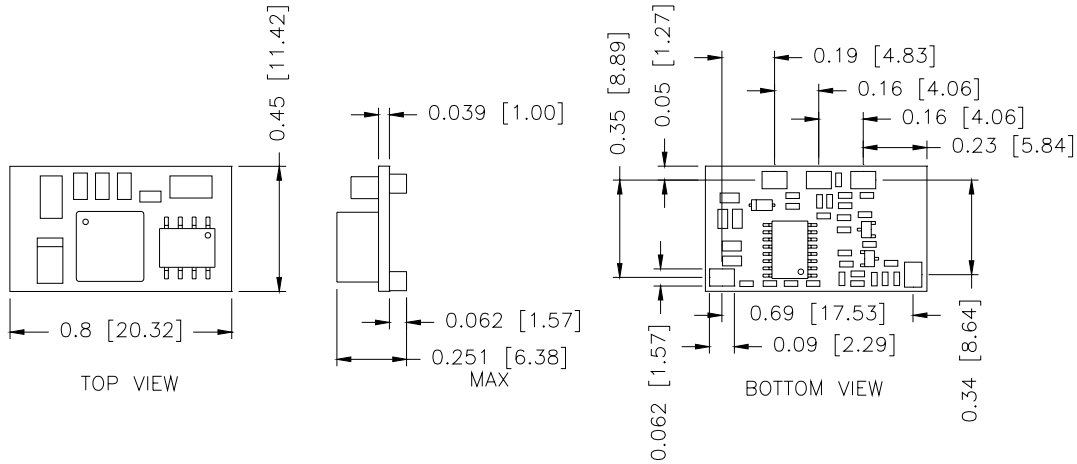


$V_{in}=12\text{ V}$, $V_o=5.0\text{ V}$

NON-ISOLATED DC/DC CONVERTERS

8.3 V-14 V Input

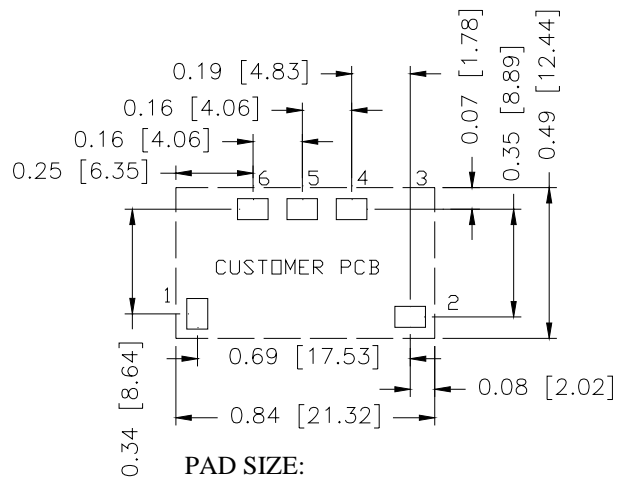
0.75 V-5.0 V/6 A Output



Pin Connections

| Pin | Function |
|-----|---------------|
| 1 | Remote On/Off |
| 2 | Vin+ |
| 3 | No Pin |
| 4 | Ground |
| 5 | Trim |
| 6 | Vout+ |

RECOMMENDED PAD LAYOUT



PAD SIZE:

MIN: 0.12" * 0.095" (3.05mm * 2.41mm)

MAX: 0.135" * 0.11" (3.43mm * 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. These parts are not however compatible with the higher temperatures associated with lead free solder processes and must be soldered using a reflow profile with a peak temperature of no more than 240°C



©2005 Bel Fuse Inc. Specifications subject to change without notice. 090105

CORPORATE

Bel Fuse Inc.
206 Van Vorst Street
Jersey City, NJ 07302
Tel 201-432-0463
Fax 201-432-9542
WWW.belfuse.com

FAR EAST

Bel Fuse Ltd.
8F/ 8 Luk Hop Street
San Po Kong
Kowloon, Hong Kong
Tel 852-2328-5515
Fax 852-2352-3706
WWW.belfuse.com

EUROPE

Bel Fuse Europe Ltd.
Preston Technology Management Centre
Marsh Lane, Suite G7, Preston
Lancashire, PR1 8UD, U.K.
Tel 44-1772-556601
Fax 44-1772-888366
WWW.belfuse.com