# NON-ISOLATED DC/DC CONVERTERS

**5.0V Input 0.9V to 3.3V/12A Output**

## S7DB-12B1Ax

- Non-Isolated
- Fixed frequency (300kHz)
- Low profile package (8.5mm)
- Remote Sense
- Remote On/Off
- Input Under-voltage Lockout (UVLO)
- OCP/SCP
- Wide Trim Range/output


## Description

The S7DB-12B1Ax is part of the low cost non-isolated DC/DC power converter series. The module uses a DIP package for ease of layout and space savings, with a low profile of 8.5mm. The output is widely trimmed from 0.9V to 3.3V, and the efficiency of 3.3V output module is typically 92% at full load. Features include remote sense, remote on/off, short circuit protection, over current protection and input under-voltage lockout.

## Part Selection

| Output Voltage | Input Voltage | Max. Output Current | Max. Output Power | Typical Efficiency | Model Number Active High | Model Number Active Low |
|---|---|---|---|---|---|---|
| 0.9 – 3.3V | 5V | 12A | 39.6W | 92% | S7DB-12B1AH | S7DB-12B1A0 |

**Note:** Add "R" suffix at the end of the model number to indicate "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 | - | 6V | |
| Ambient Temperature | -40°C | - | 85°C | |
| Storage Temperature | -55°C | - | 100°C | |

## Input Specifications

| Parameter | Min | Typ | Max | Notes |
|---|---|---|---|---|
| Input Voltage | 4.5V | 5.0V | 5.5V | |
| Input Current (full load) | | | | |
| Vo=3.3V | - | - | 11.2A | |
| Vo=2.5V | - | - | 8.7A | |
| Vo=1.8V | - | - | 6.6A | |
| Vo=1.5V | - | - | 5.5A | |
| Vo=1.2V | - | - | 4.5A | |
| Vo=1.0V | - | - | 3.5A | |
| Vo=0.9V | - | - | 3.2A | |
| Input Current (no load) | - | 70mA | 100mA | |
| Remote Off Input Current | | 10mA | 20mA | |
| Input Reflected Ripple Current (pk-pk) | - | 140mA | 280mA | Tested with simulated source impedance of 500Hz to 20MHz & two 270uF/10V Oscon capacitors with ESR=0.018 ohm max. at 100KHz |
| Input Reflected Ripple Current (RMS) | - | 40mA | 80mA | |
| $I^2t$ Inrush Current Transient | - | $0.1A^2s$ | $0.2A^2s$ | |
| Turn-on Voltage Threshold | - | 4.3V | 4.5V | |
| Turn-off Voltage Threshold | - | 3.85V | 4.49V | |

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

## Output Specifications

| Parameter | Min | Typ | Max | Notes |
|---|---|---|---|---|
| Output Voltage Set Point | | | | |
| Vo=3.3V | 3.234V | 3.3V | 3.366V | Vin=5V, full load |
| 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 | |
| Vo=0.9V | 0.882V | 0.9V | 0.918V | |
| Line Regulation | - | 2mV | 5mV | |
| Load Regulation | | | | |
| Vo=2.5V-3.3V | - | 6mV | 12mV | |
| Vo=0.9V-1.8V | - | 6mV | 10mV | |
| Regulation Over Temperature (-40°C to +85°C) | | | | |
| Vo=3.3V | - | 22mV | 45mV | |
| Vo=2.5V | - | 17mV | 34mV | |
| Vo=1.8V | - | 12mV | 25mV | |
| Vo=1.5V | - | 10mV | 20mV | |
| Vo=1.2V | - | 8mV | 17mV | |
| Vo=1.0V | - | 7mV | 15mV | |
| Vo=0.9V | - | 6mV | 13mV | |
| Output Current | 0A | - | 12A | |
| Current Limit Threshold | 15.6A | - | 30A | |
| Ripple and Noise (RMS) | - | 10mV | 25mV | Test conditions: two 270uF/10V with ESR=0.018 ohm max at the input; 0-20MHz BW; 1uFceramic capacitor & 10uF aluminum capacitor at the output. |
| Ripple and Noise (pk-pk) | - | 30mV | 60mV | |
| Short Circuit Surge Transient | | | | |
| Vo=3.3V | - | $0.25A^2s$ | $0.5A^2s$ | |
| Vo=2.5V | - | $0.3A^2s$ | $0.6A^2s$ | |
| Vo=1.8V | - | $0.35A^2s$ | $0.7A^2s$ | |
| Vo=1.5V | - | $0.4A^2s$ | $0.8A^2s$ | |
| Vo=1.2V | - | $0.4A^2s$ | $0.8A^2s$ | |
| Vo=1.0V | - | $0.45A^2s$ | $0.9A^2s$ | |
| Vo=0.9V | - | $0.45A^2s$ | $0.9A^2s$ | |
| Turn on Time | - | 12mS | 20mS | |
| Overshoot at Turn on | - | 0% | 3% | |
| Output Capacitance | 0uF | | 4800uF | |
| **Transient Response** | | | | |
| 50% ~ 100% Max Load | Overshoot | Vo=3.3V | - | 115mV | 150mV | Test conditions: di/dt=0.5A/uS, Vin=5V, without external capacitance |
| | Settling Time | | - | 100uS | 130uS | |
| 100% ~ 50% Max Load | Overshoot | | - | 115mV | 150mV | |
| | Settling Time | | - | 100uS | 130uS | |
| 50% ~ 100% Max Load | Overshoot | Vo=2.5V | - | 120mV | 150mV | |
| | Settling Time | | - | 70uS | 100uS | |
| 100% ~ 50% Max Load | Overshoot | | - | 120mV | 150mV | |
| | Settling Time | | - | 70uS | 100uS | |
| 50% ~ 100% Max Load | Overshoot | Vo=1.8V | - | 120mV | 150mV | |
| | Settling Time | | - | 50uS | 80uS | |
| 100% ~ 50% Max Load | Overshoot | | - | 120mV | 150mV | |
| | Settling Time | | - | 50uS | 80uS | |

## Output Specifications (continued)

| Parameter | | Min | Typ | Max | Notes | |
|---|---|---|---|---|---|---|
| **Transient Response** | | | | | | |
| 50% ~ 100% Max Load | Overshoot | Vo=1.5V | - | 115mV | 150mV | |
| | Settling Time | | - | 40uS | 70uS | |
| 100% ~ 50% Max Load | Overshoot | | - | 115mV | 150mV | |
| | Settling Time | | - | 40uS | 70uS | |
| 50% ~ 100% Max Load | Overshoot | Vo=1.2V | - | 110mV | 140mV | Test conditions: di/dt=0.5A/uS, Vin=5V, without external capacitance |
| | Settling Time | | - | 35uS | 70uS | |
| 100% ~ 50% Max Load | Overshoot | | - | 110mV | 140mV | |
| | Settling Time | | - | 35uS | 70uS | |
| 50% ~ 100% Max Load | Overshoot | Vo=1.0V | - | 110mV | 140mV | |
| | Settling Time | | - | 35uS | 70uS | |
| 100% ~ 50% Max Load | Overshoot | | - | 110mV | 140mV | |
| | Settling Time | | - | 35uS | 70uS | |
| 50% ~ 100% Max Load | Overshoot | Vo=0.9V | - | 100mV | 130mV | |
| | Settling Time | | - | 30uS | 50uS | |
| 100% ~ 50% Max Load | Overshoot | | - | 100mV | 130mV | |
| | Settling Time | | - | 30uS | 50uS | |

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

## General Specifications

| Parameter | Min | Typ | Max | Notes |
|---|---|---|---|---|
| Efficiency | | | | |
| Vo=3.3V | 89% | 92% | - | Vin=5V, full load |
| Vo=2.5V | 87% | 90% | - | |
| Vo=1.8V | 83% | 86% | - | |
| Vo=1.5V | 81% | 84% | - | |
| Vo=1.2V | 79% | 82% | - | |
| Vo=1.0V | 77% | 80% | - | |
| Vo=0.9V | 76% | 79% | - | |
| Switching Frequency | 260KHz | 300KHz | 340KHz | |
| Output Voltage Trim Range | 0.855V | - | 3.63V | Vo=0.9V when trim pin is open. |
| Remote Sense Compensation [1] | - | - | 10% | |
| MTBF | 5,782,475 hours | | | Calculated Per Bell Core TR-332 (Io =9.6A, Vin=5V; Ta = 25°C) |
| Dimensions | | | | |
| Inches | 1.22 x 0.67 x 0.345 | | | |
| millimeters | 31.0 x 17.0 x 8.75 | | | |
| Weight | - | 10.5g | - | |

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

1. Total adjustment of trim, setpoint and remote sense combined should not exceed 3.63V.

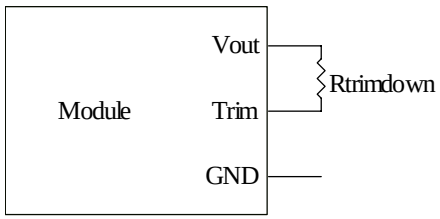
## Control Specifications

| Parameter | | Min | Typ | Max | Notes |
|---|---|---|---|---|---|
| **Remote On/Off** | | | | | |
| Signal Low (Unit Off) | S7DB-12B1AH | 0V | - | 1V | Remote on/off pin open, unit on. |
| Signal High (Unit On) | | 2.5V | - | 5.5V | |
| Signal Low (Unit On) | S7DB-12B1A0 | 0V | - | 1V | |
| Signal High (Unit Off) | | 2.5V | - | 5.5V | |

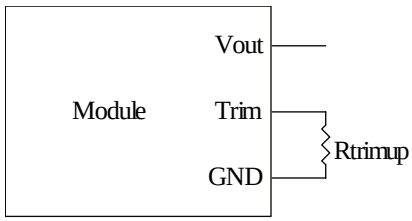
## Output Trim Equations

Equations for calculating the trim resistor (in kΩ) given the desired adjusted voltage (Vadj) 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.

$$R_{TrimDown} = \frac{1330 \cdot V_{adj} - 1064}{90.64 - 100 \cdot V_{adj}} - 3.65$$

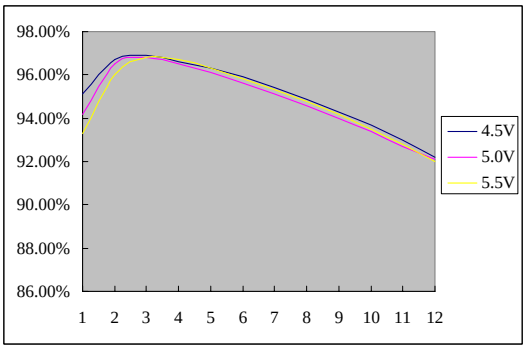



$$R_{TrimUp} = \frac{1064}{100 \cdot V_{adj} - 90.64} - 3.65$$

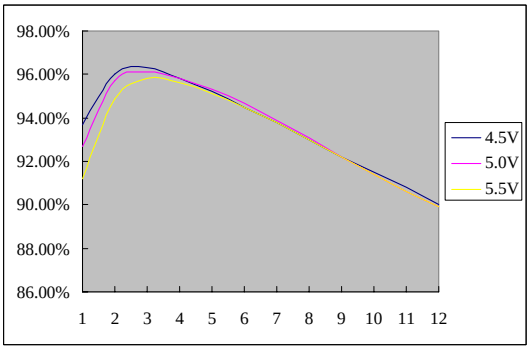



**Note:** It is strongly recommended that the Trim Resistor be placed as near to the module as possible, otherwise it may cause regulation problem.

## Efficiency Data

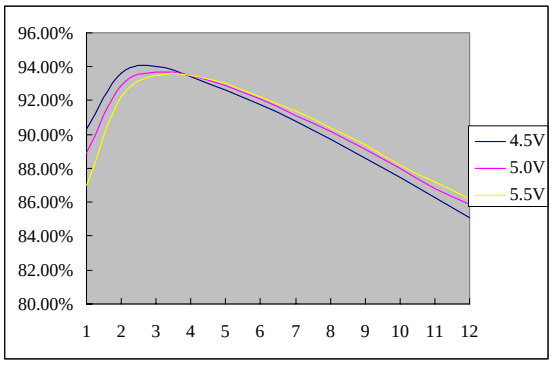



Vo = 3.3V

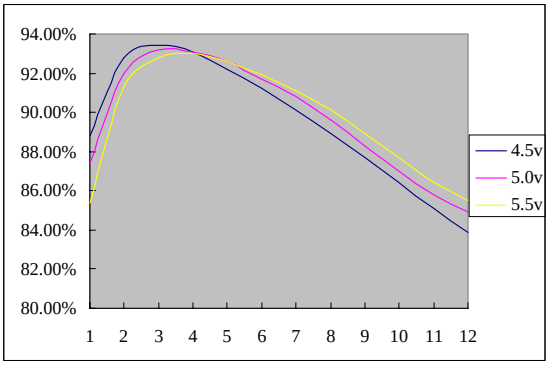



Vo = 2.5V

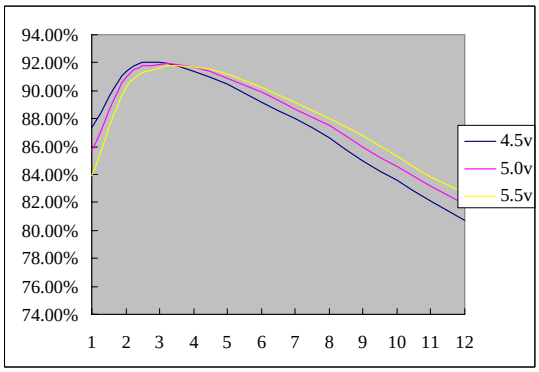
## Efficiency Data (continued)



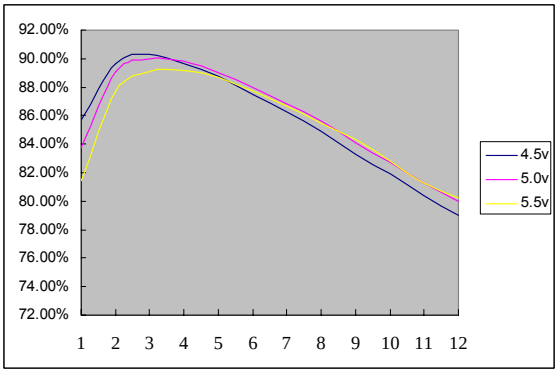

Vo = 1.8V



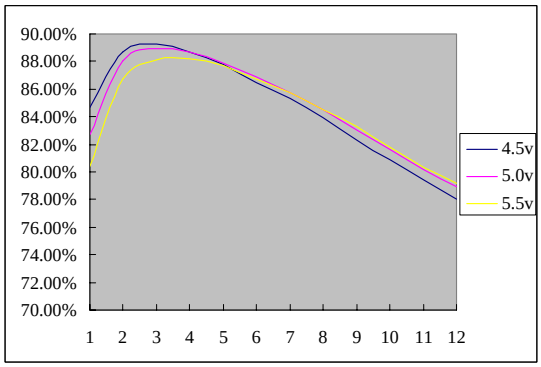

Vo = 1.5V




Vo = 1.2V

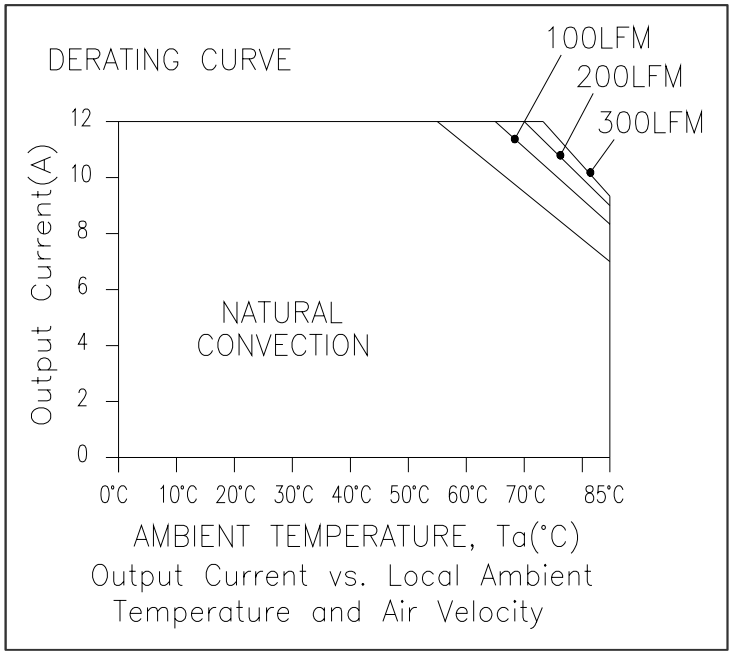



Vo = 1.0V




Vo = 0.9V

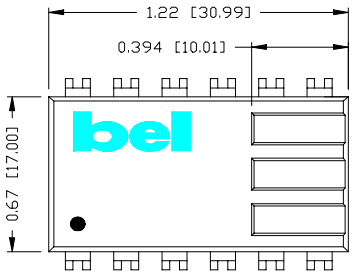
## Thermal Derating Curve

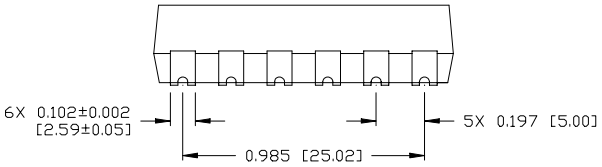


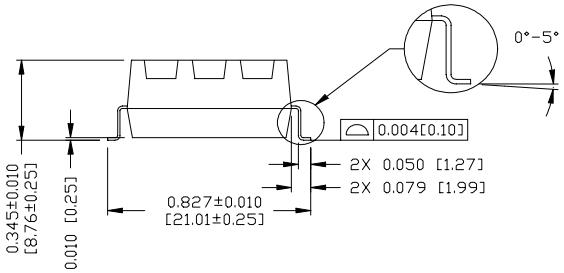

**Test Condition**: Derating curve is tested at nominal input voltage.

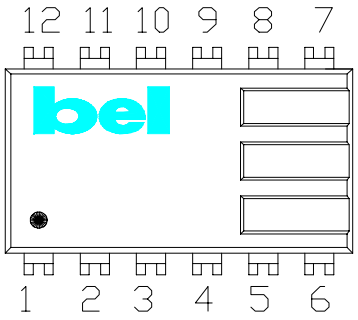
# NON-ISOLATED DC/DC CONVERTERS

**5.0V Input 0.9V to 3.3V/12A Output**




## Pin Connections

| Pin | Function |
|---|---|
| 1 | GND |
| 2 | GND |
| 3 | GND |
| 4 | GND |
| 5 | Vin |
| 6 | Vin |
| 7 | Trim |
| 8 | Remote On/Off |
| 9 | Remote Sense(+) |
| 10 | Vo |
| 11 | Vo |
| 12 | Vo |



**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