# ISOLATED DC/DC CONVERTERS

**48V Input 3.3V/7A or 5V/5A or 12V/2.5A Output**

## 07LC-25T Series

- Compact Through-hole Package
- Excellent Thermal Performance
- 1500V Isolation
- High Efficiency
- High Power Density
- Wide Input Voltage
- Remote On/Off
- Output Voltage Trim
- Input Under Voltage Lockout
- Over Voltage Protection
- SCP/OCP
- Over Temperature Protection

## Description

The 07LC-25Txx0 series converters are isolated DC/DC converters that operate from a nominal 48V source. These converters provide up to 25W of output power. These units are designed to be high efficient and very low cost. Features include remote on/off, output adjust, short circuit protection, over current protection, over-temperature protection, and input under voltage lockout. These converters are provided in a compact, through-hole package that is easy to use and provides good thermal performance, and are pin-to-pin compatible with the Emerson AG25 Series.

## Part Selection

| Output Voltage | Input Voltage | Max. Output Current | Max. Output Power | Typical Efficiency | Model Number |
|---|---|---|---|---|---|
| 12.0V | 36 – 75V | 2.5A | 30.0W | 90% | 07LC-25T120 |
| 5.0V | 36 – 75V | 5A | 25.0W | 90% | 07LC-25T050 |
| 3.3V | 36 – 75V | 7A | 23.0W | 88% | 07LC-25T033 |

**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) | -0.3V | - | 80V | |
| Remote On/Off | -0.3V | - | 12V | |
| Ambient Temperature | -40°C | - | 85°C | |
| Storage Temperature | -55°C | - | 125°C | |

## Input Specifications

| Parameter | Min | Typ | Max | Notes |
|---|---|---|---|---|
| Input Voltage | 36V | - | 75V | |
| Input Current (no load) | - | 25mA | 40mA | |
| Input Current (full load) | - | - | 1.1A | |
| Remote Off Input Current | - | 3mA | 10mA | |
| Input Reflected Ripple Current (RMS) | - | 10mA | 20mA | Tested with simulated source impedance of 10uH, 5Hz to 20MHz and a 100uF/100V electrolytic capacitor with ESR=1 ohm max, at 200KHz |
| Input Reflected Ripple Current (pk-pk) | - | 40mA | 60mA | |
| $I^2t$ Inrush Current Transient | - | $0.0012A^2s$ | $0.0024A^2s$ | |
| Turn-on Input Voltage | 31V | 34V | 36V | |
| Turn-off Input Voltage | 30V | 33V | 35V | |

**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 | | 3.234 V | 3.3 V | 3.366 V | Test condition: $V_{in}$=48V, $I_O$=50% full load |
| | Vo=5.0V | | 4.900V | 5.0 V | 5.100V | |
| | Vo=12.0V | | 11.760V | 12.0V | 12.240V | |
| Line Regulation | | | | | | |
| | Vo=3.3V | | - | 1mV | 3mV | |
| | Vo=5.0V | | - | 2mV | 5mV | |
| | Vo=12.0V | | - | 5mV | 10mV | |
| Load Regulation | | | | | | |
| | Vo=3.3V | | - | 2mV | 5mV | |
| | Vo=5.0V | | - | 4mV | 8mV | |
| | Vo=12.0V | | - | 9mV | 18mV | |
| Temperature Regulation (-40°C to +85°C) | | | | | | |
| | Vo=3.3V | | - | 30mV | 50mV | |
| | Vo=5.0V | | - | 40mV | 70mV | |
| | Vo=12.0V | | - | 100mV | 170mV | |
| Ripple and Noise (RMS) | | | - | 10mV | 20mV | Tested with 0-20MHz BW, with a 0.47uF ceramic capacitor at the output |
| Ripple and Noise (pk-pk) | | | - | 40mV | 75mV | |
| Output Current | | | | | | |
| | Vo=3.3V | | 0A | - | 7A | |
| | Vo=5.0V | | 0A | - | 5A | |
| | Vo=12.0V | | 0A | - | 2.5A | |
| Current Limit Threshold | | | | | | |
| | Vo=3.3V | | 7.7A | - | 12A | |
| | Vo=5.0V | | 5.5A | - | 8A | |
| | Vo=12.0V | | 3A | | 4.2A | |
| Short Circuit Surge Transient | | | - | $0.5A^2s$ | $1A^2s$ | |
| Turn on Time | | | - | 10mS | 25mS | |
| Overshoot at Turn On | | | - | 0% | 5% | |
| Output Capacitance | | | | | | |
| | Vo=3.3V | | 0uF | - | 3300uF | |
| | Vo=5.0V | | 0uF | - | 2200uF | |
| | Vo=12.0V | | 0uF | - | 330uF | |
| **Transient Response** | | | | | | |
| 50% ~ 75% Max Load | Overshoot | Vo=3.3V | - | 75mV | 100mV | Tested conditions: di/dt=0.1A/uS, Vin=48V, Ta=25°C, with a 220uF/10V electrolytic capacitor at the output. |
| | Settling Time | | - | 150uS | 200uS | |
| 50% ~ 25% Max Load | Overshoot | | - | 75mV | 100mV | |
| | Settling Time | | - | 150uS | 200uS | |
| 50% ~ 75% Max Load | Overshoot | Vo=5.0V | - | 100mV | 150mV | |
| | Settling Time | | - | 150uS | 200uS | |
| 50% ~ 25% Max Load | Overshoot | | - | 100mV | 150mV | |
| | Settling Time | | - | 150uS | 200uS | |
| 50% ~ 75% Max Load | Overshoot | Vo=12.0V | - | 150mV | 200mV | |
| | Settling Time | | - | 150mV | 200mV | |
| 50% ~ 25% Max Load | Overshoot | | - | 150mV | 200mV | |
| | Settling Time | | - | 150mV | 200mV | |

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

## General Specifications

| Parameter | Min | Typ | Max | Notes |
|---|---|---|---|---|
| Efficiency<br>$V_O$=3.3V<br>$V_O$=5.0V<br>$V_O$=12.0V | <br>85%<br>87%<br>87% | <br>88%<br>90%<br>90% | <br>-<br>-<br>- | Measured at $V_{in}$=48V, $I_O$=Io, max |
| Switching Frequency | 200kHz | 230kHz | 260kHz | |
| Output Trim Range | 90% $V_O$ | - | 110% $V_O$ | |
| I/O Isolation Voltage | 1500V | - | - | |
| Isolation Capacitance | - | 1500pF | - | |
| Output Voltage Trim Range | 90% | - | 110% | |
| Over Temperature Protection | - | 110°C | - | |
| Over Voltage Protection<br>$V_O$=3.3V<br>$V_O$=5.0V<br>$V_O$=12.0V | <br>3.9V<br>5.7V<br>13.6V | <br>-<br>-<br>- | <br>5V<br>7V<br>14.2V | |
| MTBF | 2,602,427 hours | | | Calculated Per Bell Core TR-332 ($I_O$ = $I_{Omax}$; $T_a$ = 25°C) |
| Dimensions<br>Inches (L × W × H)<br>Millimeters (L × W × H) | <br>2.0 x 1.0 x 0.438<br>50.8 x 25.4 x 11.14 | | | |
| Weight | - | 20g | - | |

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

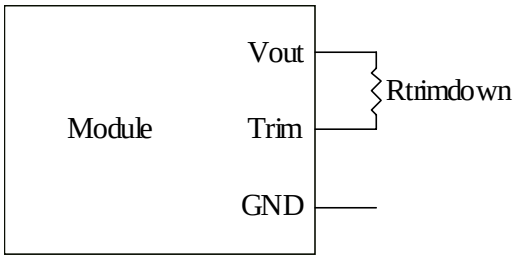
## Control Specifications

| Parameter | | Min | Typ | Max | Notes |
|---|---|---|---|---|---|
| **Remote On/Off** | | | | | |
| Signal Low (Unit On) | Active Low | -0.3V | - | 0.8V | The remote On/Off pin open, Unit On. |
| Signal High (Unit Off) | | 3.5V | - | 12V | |
| Signal Low (Unit Off) | Active High | -0.3V | - | 0.8V | |
| Signal High (Unit On) | | 3.5V | - | 12V | |
| Current Sink | | 0.3mA | - | 0.75mA | |

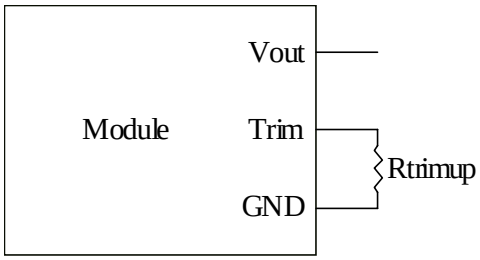
## Output Trim Equations

Equations for calculating the trim resistor (in kΩ) given the desired adjusted voltage (Vadj) and the nominal output voltage of the converter (Vnom) 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.

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

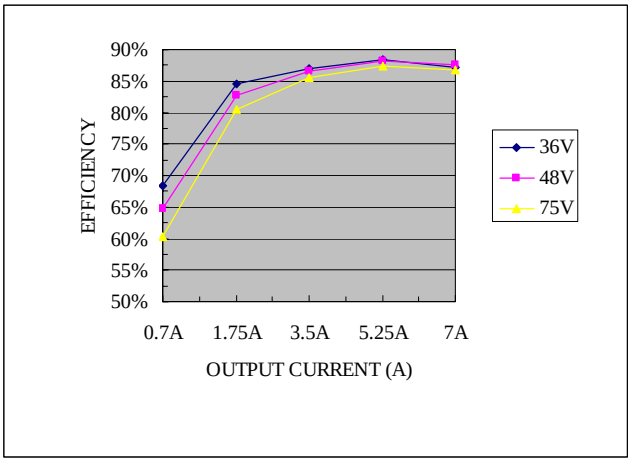



$$R_{trimup} = \frac{C}{V_{adj} - V_{nom}} - D$$

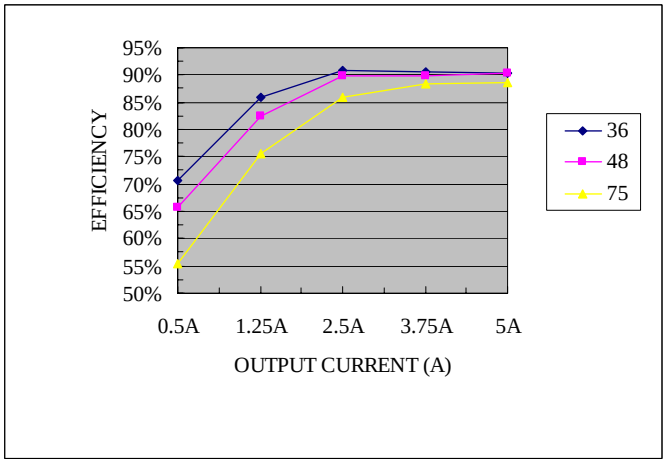



| Vnom | A | B | C | D |
|---|---|---|---|---|
| 12 | 53.320 | 9.260 | 14.025 | 3.650 |
| 5 | 19.300 | 15.120 | 6.350 | 10.000 |
| 3.3 | 21.711 | 40.610 | 13.032 | 30.100 |

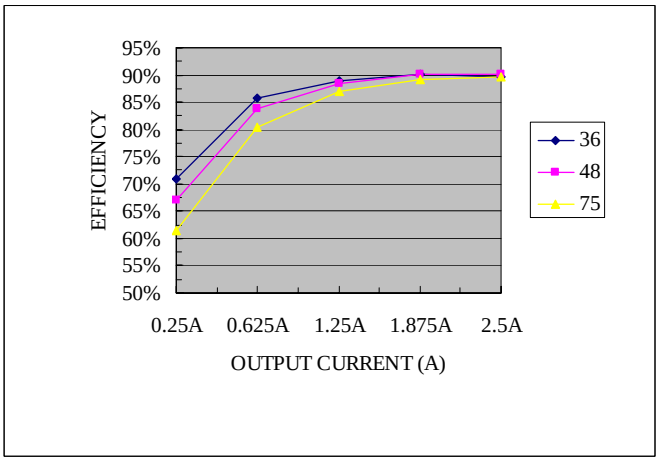
## Efficiency Data




07LC-25T033

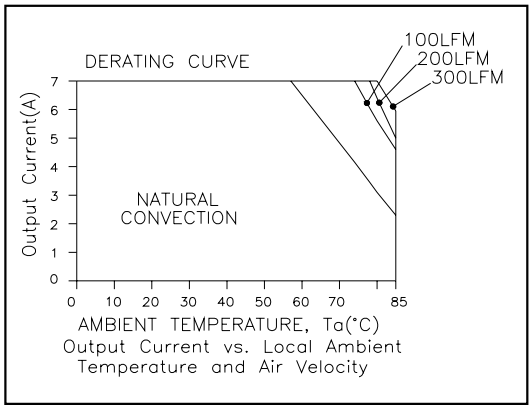



07LC-25T050

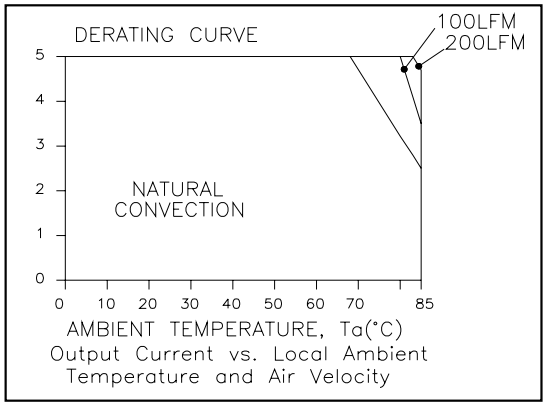



07LC-25T120

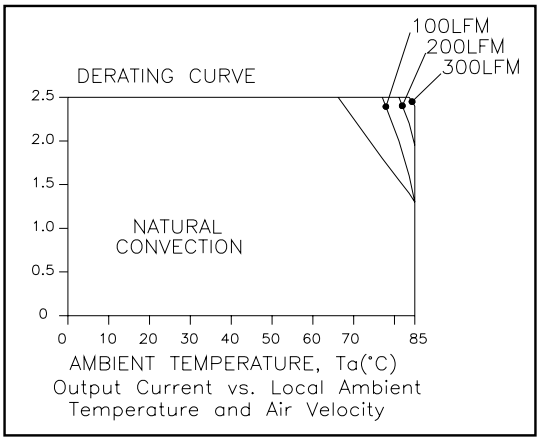
## Thermal Derating Curves




07LC-25T033



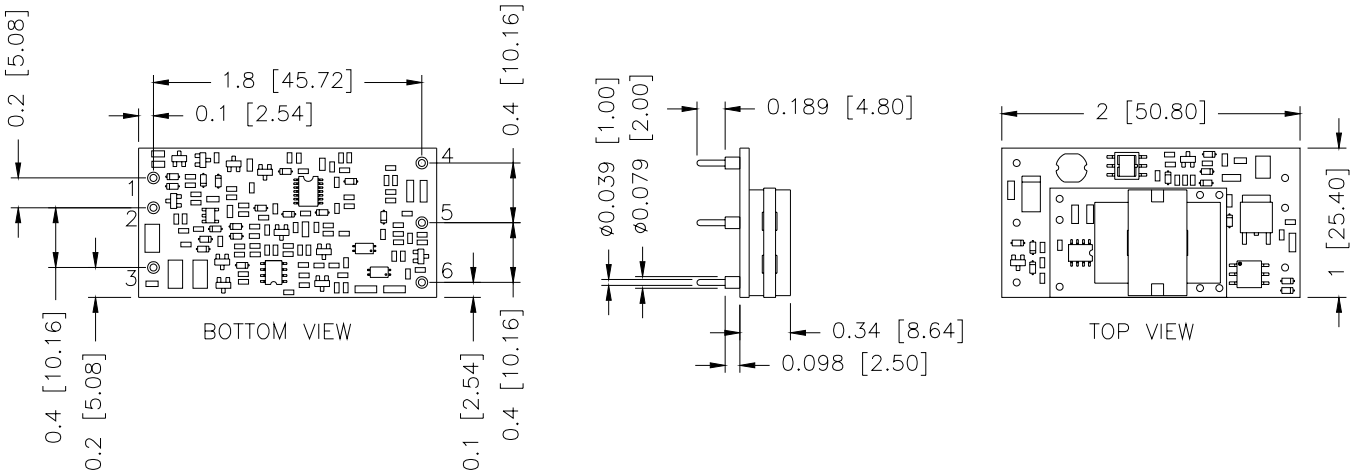

07LC-25T050

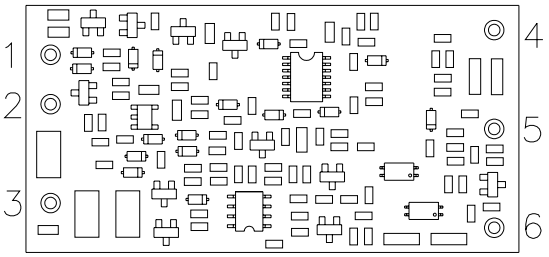



07LC-25T120

# ISOLATED DC/DC CONVERTERS

**48V Input 3.3V/7A or 5V/5A or 12V/2.5A Output**




## Pin Connections

| Pin | Function |
|---|---|
| 1 | Vin+ |
| 2 | Vin- |
| 3 | Remote On/Off |
| 4 | Vo+ |
| 5 | Vo- |
| 6 | Trim |



**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