

The BCT40T series of PCB mount DC-DC converters deliver an output power of 40W in a compact 25.4 x 25.4mm (1" x 1") metal package and offer regulated single outputs from 3.3V to 24VDC and dual outputs at  $\pm 12V$  &  $\pm 15VDC$ . The single output models support  $\pm 10\%$  adjustment via trim resistor, offering flexibility to meet specific voltage needs.

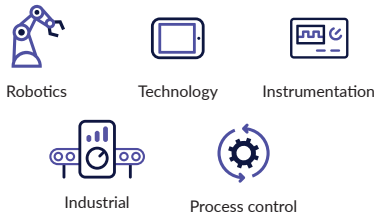
Featuring a wide 4:1 input, high efficiency, world-wide ITE safety approvals, UVLO, remote on/off and a wide operating temperature range, the BCT40T series is ideal for a wide range of ITE, industrial and communications applications.



### Features

- ▶ Single regulated outputs from 3.3V to 24VDC
- ▶ Dual regulated outputs  $\pm 12V$  &  $\pm 15VDC$
- ▶ 4:1 wide input voltage range
- ▶ 25.4 x 25.4mm (1" x 1") compact package
- ▶ 2kVDC isolation
- ▶ UL62368-1 & EN62368-1 safety approvals
- ▶ Continuous short circuit protection
- ▶ Remote on/off
- ▶ -40°C to +105°C operation temperature
- ▶ 3 year warranty

### Applications



### Dimensions

25.4 x 25.4 x 10.5mm (1.0" x 1.0" x 0.41")

### Models & ratings

| Model number | Input voltage        | Output voltage | Output current | Efficiency <sup>(1)</sup> | Maximum capacitive load |
|--------------|----------------------|----------------|----------------|---------------------------|-------------------------|
| BCT40T24S3V3 | 24V<br>(9.0V-36.0V)  | 3.3V           | 10.00A         | 87%                       | 10000 $\mu$ F           |
| BCT40T24S05  |                      | 5V             | 8.00A          | 88%                       | 6000 $\mu$ F            |
| BCT40T24S12  |                      | 12V            | 3.33A          | 88%                       | 3000 $\mu$ F            |
| BCT40T24S15  |                      | 15V            | 2.67A          | 88%                       | 1000 $\mu$ F            |
| BCT40T24S24  |                      | 24V            | 1.67A          | 89%                       | 680 $\mu$ F             |
| BCT40T24D12  |                      | $\pm 12V$      | $\pm 1.67A$    | 88%                       | $\pm 1500\mu$ F         |
| BCT40T24D15  |                      | $\pm 15V$      | $\pm 1.33A$    | 88%                       | $\pm 1000\mu$ F         |
| BCT40T48S3V3 | 48V<br>(18.0V-75.0V) | 3.3V           | 10.00A         | 86%                       | 10000 $\mu$ F           |
| BCT40T48S05  |                      | 5V             | 8.00A          | 88%                       | 6000 $\mu$ F            |
| BCT40T48S12  |                      | 12V            | 3.33A          | 89%                       | 3000 $\mu$ F            |
| BCT40T48S15  |                      | 15V            | 2.67A          | 88%                       | 1000 $\mu$ F            |
| BCT40T48S24  |                      | 24V            | 1.67A          | 88%                       | 680 $\mu$ F             |
| BCT40T48D12  |                      | $\pm 12V$      | $\pm 1.67A$    | 88%                       | $\pm 1500\mu$ F         |
| BCT40T48D15  |                      | $\pm 15V$      | $\pm 1.33A$    | 88%                       | $\pm 1000\mu$ F         |

#### Notes:

1. Typical value at nominal input voltage and full load.

## Input

| Characteristic        | Minimum | Typical | Maximum | Units | Notes & conditions |
|-----------------------|---------|---------|---------|-------|--------------------|
| Input voltage range   | 9.0     |         | 36.0    | VDC   | 24V nominal        |
|                       | 18.0    |         | 75.0    |       | 48V nominal        |
| No load input current |         |         | 12      | mA    | 24V model          |
|                       |         |         | 10      |       | 48V model          |
| Input filter          | Pi type |         |         |       |                    |
| Input surge voltage   |         |         | 50      | VDC   | 24V model for 1s   |
|                       |         |         | 100     |       | 48V model for 1s   |
| Under voltage lockout |         | 7.5     |         | VDC   | 24V model          |
|                       |         | 16.0    |         |       | 48V model          |

## Output

| Characteristic                             | Minimum   | Typical   | Maximum | Units    | Notes & conditions  |
|--|---|-----------|---------|----------|---|
| Output voltage                             | 3.3   |           | 30      | VDC      | See Models & ratings table  |
| Output voltage trim                        |   |           | ±10     | %        | Via external resistors, see Application Notes. Single output model only   |
| Initial set accuracy                       |   | ±1        |         | %        | Full load   |
| Minimum load                               |   |           |         |          | No minimum load required  |
| Start up time                              |   |           | 50/30   | ms       | 3V3/others, Nominal input, full load  |
| Line regulation                            |   | ±0.2/±0.5 |         | %        | Single/dual outputs, min. input to max. input, full load  |
| Load regulation                            |   | ±0.5/±1.0 |         | %        | Single/dual outputs from 0% to full load  |
| Cross regulation                           |   |           | ±5      | %        | On dual output models, with one output set to 50% load and the other varied from 10% to 100% load   |
| Ripple & noise                             |   |           | 75      | mV/pk-pk | Measured with 20MHz bandwidth and 22µF ceramic capacitor (single output) and 10µF ceramic capacitor (dual output) at nominal input +25°C<br>3V3 & 5V models measured with 20MHz bandwidth and using 100mm twisted pair wire terminated with 22µF ceramic capacitor at nominal input +25°C |
| Transient response                         |   |           | 10/5    | %        | 3V3/other models. Deviation, recovery to within 1% in <300µs for a 25% load change (75% - 100% - 75%) at nominal input  |
| Overload protection                        | 130   |           | 180     | %        | Nominal input +25°C   |
| Short circuit protection                   | Continuous, with autorecovery   |           |         |          |   |
| Overtemperature protection                 |   | +115      |         | °C       | Case temperature  |
| Maximum capacitive load                    | See Models & ratings table  |           |         |          |   |
| Temperature coefficient                    |   | ±0.05     |         | %/°C     | Full load   |
| Remote ON/OFF                              | Output is ON if pin 3 is open or >3.0VDC and output is OFF if pin 3 is short to -Vin or <1.2VDC |           |         |          |   |
| Overvoltage protection (Zener diode clamp) | 3.7   |           | 5.3     | VDC      | 3.3VDC models   |
|  | 5.6   |           | 8       |          | 5VDC models   |
|  | 13.4  |           | 19.2    |          | 12VDC models  |
|  | 16.8  |           | 24      |          | 15VDC models  |
|  | 26.8  |           | 38.4    |          | 24VDC models  |
|  | ±13.4   |           | ±19.2   |          | ±12VDC models   |
|  | ±16.8   |           | ±24.0   |          | ±15VDC models   |

## General

| Characteristic             | Minimum                      | Typical   | Maximum      | Units                                  | Notes & conditions       |
|----------------------------|------------------------------|-----------|--------------|--|--------------------------|
| Efficiency                 | See models and ratings table |           |              |  |                          |
| Isolation: input to output | 2000                         |           |              | VDC                                    |                          |
| Isolation resistance       | 1 <sup>9</sup>               |           |              | Ω                                      | Input to output          |
| Isolation capacitance      |                              | 2200      |              | pF                                     | Input to output          |
| Switching frequency        |                              | 300       |              | kHz                                    | 3V3 models, full load    |
|                            |                              | 400       |              |  | Other models, full load  |
| Power density              |                              |           | 5.95 (97.56) | W/cm <sup>3</sup> (W/in <sup>3</sup> ) |                          |
| Mean time between failure  | 500                          |           |              | khrs                                   | MIL-HDBK-217F, +25°C, GB |
| Weight                     |                              | 21 (0.05) |              | g (lb)                                 |                          |

## Environmental

| Characteristic           | Minimum            | Typical | Maximum | Units | Notes & conditions |
|--------------------------|--------------------|---------|---------|-------|--------------------|
| Operating temperature    | -40                |         | +105    | °C    | See derating curve |
| Storage temperature      | -55                |         | +125    | °C    |                    |
| Maximum case temperature |                    |         | +110    | °C    |                    |
| Humidity                 | 5                  |         | 95      | %RH   | Non-condensing     |
| Cooling                  | Natural convection |         |         |       |                    |
| Operating altitude       |                    |         | 3000    | m     |                    |

## Safety approvals

| Safety agency | Standard                         | Notes & conditions |
|---------------|----------------------------------|--------------------|
| CB            | IEC62368-1                       |                    |
| TUV           | EN62368-1                        |                    |
| UL            | UL/cUL62368-1                    |                    |
| CE            | Meets all applicable legislation |                    |
| UKCA          | Meets all applicable legislation |                    |

## EMC: Emissions

| Phenomenon | Standard | Test level | Notes & conditions    |
|------------|----------|------------|-----------------------|
| Conducted  | EN55032  | Class A/B  | See application notes |
| Radiated   | EN55032  | Class A/B  | See application notes |

## EMC: Immunity<sup>(1)</sup>

| Phenomenon     | Standard    | Test level | Criteria | Notes & conditions               |
|----------------|-------------|------------|----------|----------------------------------|
| ESD immunity   | EN61000-4-2 | 3          | A        | ±6kV contact, ±8kV air discharge |
| Radiated       | EN61000-4-3 | 10V/m      | A        |                                  |
| EFT/burst      | EN61000-4-4 | ±2kV       | A        | Line to line                     |
| Surges         | EN61000-4-5 | ±2kV       | A        | Line to line                     |
| Conducted      | EN61000-4-6 | 10V        | A        |                                  |
| Magnetic field | EN61000-4-8 | 10A/m      | A        |                                  |

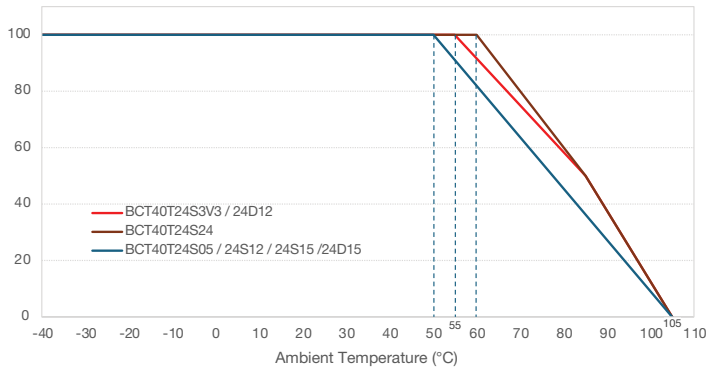
### Notes:

- External 680µF/100V input capacitor required.

## Application notes

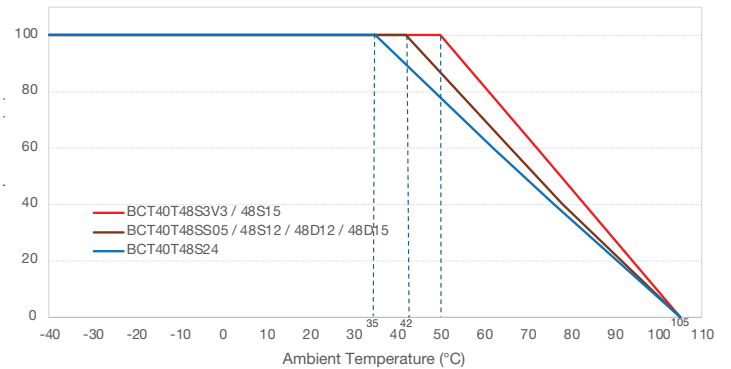
### Derating curve (nominal input voltage)

24V models



Measured at 24VDC input

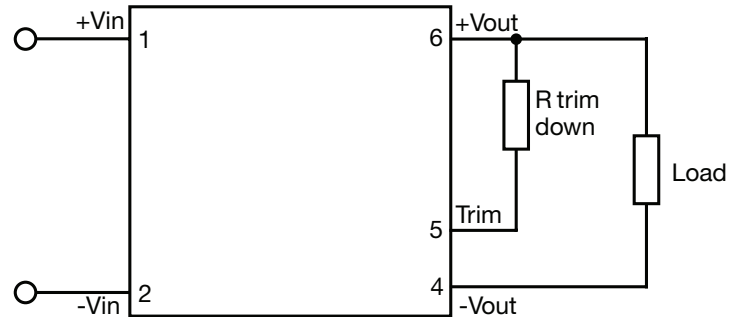
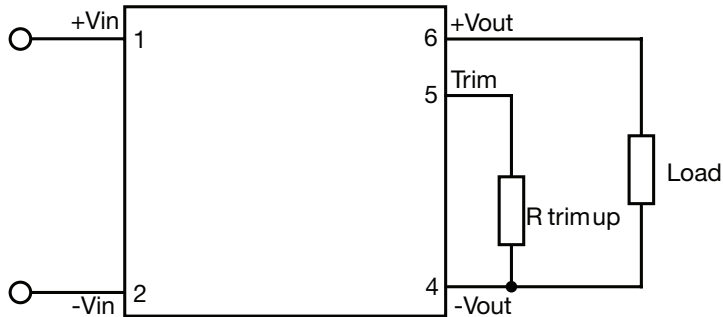
48V models



Measured at 48VDC input

## Application notes

### Single output voltage adjustment



In order to trim the voltage up or down, connect the trim resistor either between the trim pin and -Vout for trim-up and between trim pin and +Vout for trim-down. The output voltage trim range is  $\pm 10\%$ .

#### The value of R trim-up defined as:

$$R_{\text{trim-up}} = \left( \frac{V_r \times R_1 \times R_2}{(V_o - V_{o \text{ nom}}) \times R_2} \right) - R_3$$

#### The value of R trim-down defined as:

$$R_{\text{trim-down}} = R_1 \times \left( \frac{V_r \times R_1}{(V_{o \text{ nom}} - V_o) \times R_2} - 1 \right) - R_3$$

#### Where

R trim-up is the external resistor in Kohm.

$V_{o \text{ nom}}$  is the nominal output voltage.

$V_o$  is the desired output voltage.

$R_1$ ,  $R_2$ ,  $R_3$  and  $V_r$  are internal to the unit and are defined in the table to the below.

#### Where

R trim-up is the external resistor in Kohm.

$V_{o \text{ nom}}$  is the nominal output voltage.

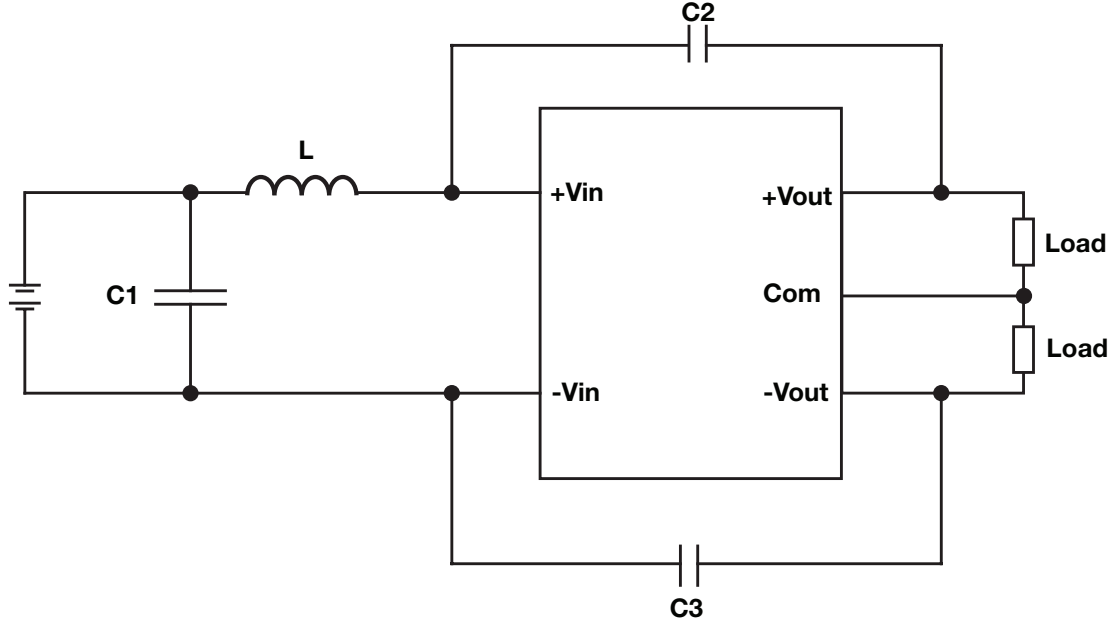
$V_o$  is the desired output voltage.

$R_1$ ,  $R_2$ ,  $R_3$  and  $V_r$  are internal to the unit and are defined in the table to the below.

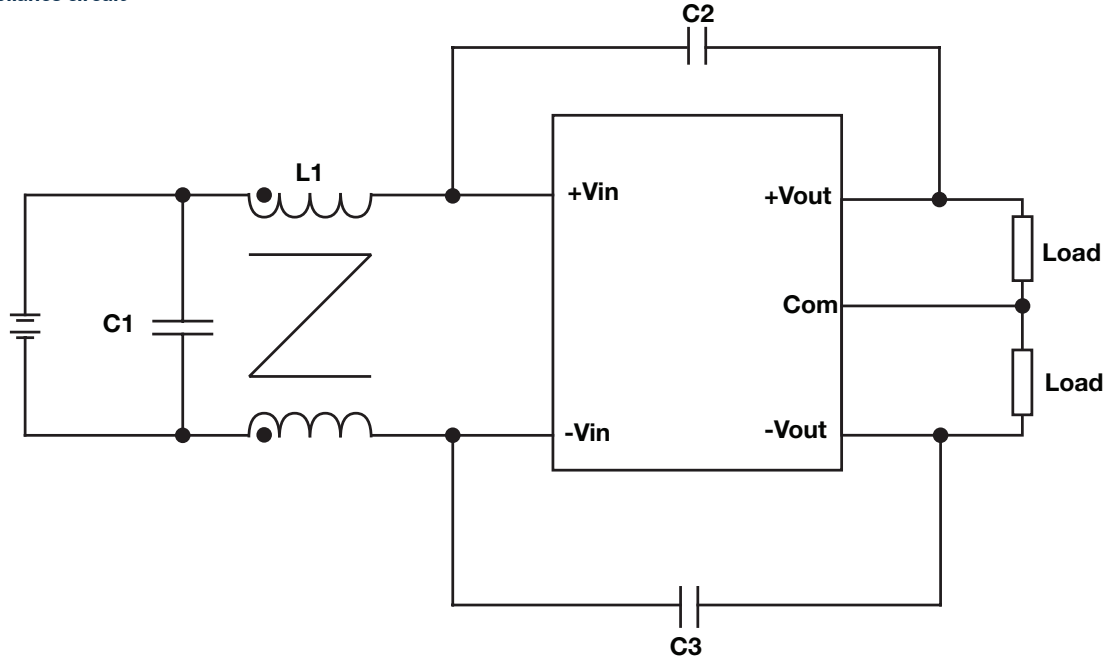
| Vout | Vr (V) | R1 (k $\Omega$ ) | R2 (k $\Omega$ ) | R3 (k $\Omega$ ) |
|------|--------|------------------|------------------|------------------|
| 3V3  | 1.24   | 16.7             | 10.0             | 52.3             |
| 5V   | 1.24   | 33.5             | 11.0             | 73.2             |
| 12V  | 2.50   | 38.0             | 10.0             | 48.7             |
| 15V  | 2.50   | 50.1             | 10.0             | 64.9             |
| 24V  | 2.50   | 86.0             | 10.0             | 73.2             |

## Application notes

### EMI (Class A) compliance circuit



### EMI (Class B) compliance circuit

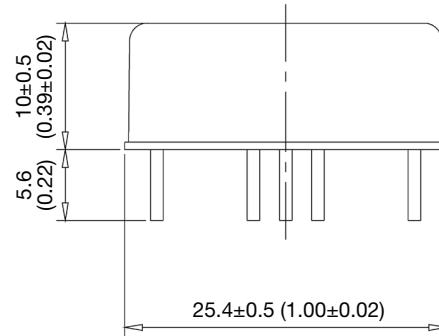
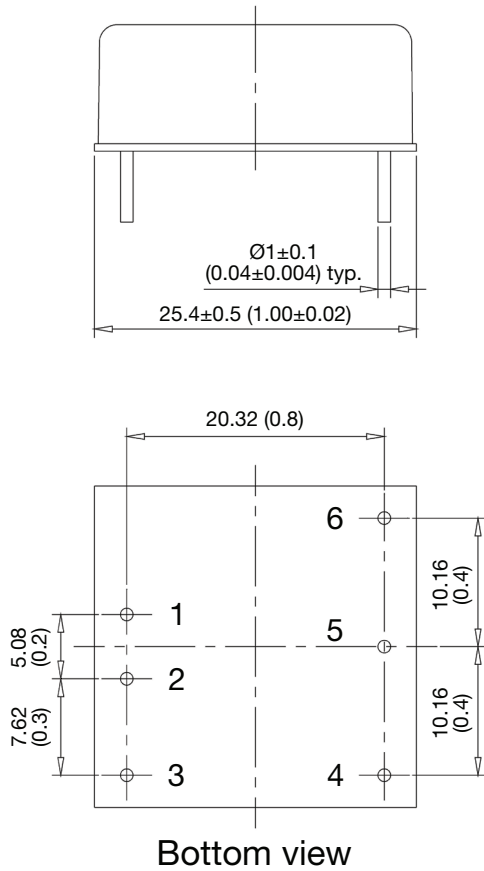


| EMI     | L1                                 | C1   | C2 <sup>(1)</sup> | C3     |
|---------|------------------------------------|------|-------------------|--------|
| Class A | 2.2μH                              | 10μF | 2200pF            | 2200pF |
| Class B | CMC: 70μH<br>(K5B T20X5X10C, 10Ts) | 10μF | 2200pF            | 2200pF |

#### Notes:

1. Not applicable for BCT40T24S3V3 / 24D12 / 48D12 / 24D15 / 48D15

## Mechanical details



| Pin connections |        |        |
|-----------------|--------|--------|
| Pin             | Single | Dual   |
| 1               | +Vin   | +Vin   |
| 2               | -Vin   | -Vin   |
| 3               | Remote | Remote |
| 4               | -Vout  | -Vout  |
| 5               | Trim   | Common |
| 6               | +Vout  | +Vout  |

### Notes:

1. All dimensions shown in mm (inches).
2. Weight: 21g (0.05lb) typical.
3. Pin diameter tolerance:  $\pm 0.1$  ( $\pm 0.004$ )

4. Pin pitch tolerance:  $\pm 0.25$  ( $\pm 0.01$ )
5. Case tolerance:  $\pm 0.5$  ( $\pm 0.02$ )

Specifications subject to change without notice.