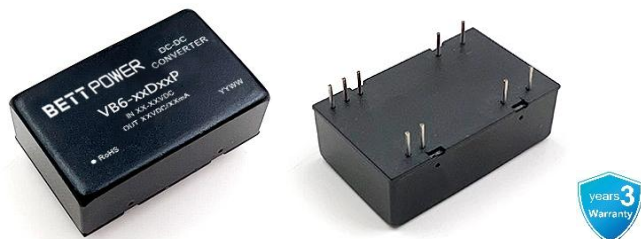


## VB6-xxDxxP Series

DC-DC Converter | 6W | DIP24 | 4: 1 Wide Input Voltage, Regulated Output | 1600VDC



### Features

- DIP24 package
- Operating temperature range: -40°C to +85°C
- 4: 1 wide input voltage range
- Isolation voltage: 1600VDC
- Full load efficiency: 86% (typ.)
- Input Under-voltage, Output Over-current, Output Short Circuit Protection
- Designed to meet IEC/EN/BS EN/UL 62368

### Product description



The VB6-xxDxxP series features a compact DIP24 package, high efficiency, an operating temperature range of -40°C to +85°C, and remote on/off and continuous short circuit protection functions. The small size and excellent cost design make this converter an ideal solution for communication equipment, instrumentation, and industrial electronics applications.

### Selection Guide

| Certification    | Part No.   | Input Voltage (VDC) |      | Output               |                   | Full Load Efficiency (%)<br>Typ. | Capacitive Load (μF)<br>Max.* |
|------------------|------------|---------------------|------|----------------------|-------------------|----------------------------------|-------------------------------|
|                  |            | Nominal (Range)     | Max. | Output Voltage (VDC) | Max. Current (mA) |                                  |                               |
| EN/UL<br>pending | VB6-12D03P | 12 (4.5-18)         | 20   | ±3.3                 | ±750              | 80                               | 680                           |
|                  | VB6-12D05P | 12 (4.5-18)         | 20   | ±5                   | ±600              | 82                               | 680                           |
|                  | VB6-12D06P | 12 (4.5-18)         | 20   | ±6                   | ±500              | 82                               | 680                           |
|                  | VB6-12D09P | 12 (4.5-18)         | 20   | ±9                   | ±334              | 84                               | 330                           |
|                  | VB6-12D12P | 12 (4.5-18)         | 20   | ±12                  | ±250              | 85                               | 330                           |
|                  | VB6-12D15P | 12 (4.5-18)         | 20   | ±15                  | ±200              | 85                               | 220                           |
|                  | VB6-12D18P | 12 (4.5-18)         | 20   | ±18                  | ±167              | 85                               | 220                           |
|                  | VB6-12D24P | 12 (4.5-18)         | 20   | ±24                  | ±125              | 85                               | 150                           |
|                  | VB6-24D03P | 24 (9~36)           | 40   | ±3.3                 | ±750              | 81                               | 680                           |
|                  | VB6-24D05P | 24 (9~36)           | 40   | ±5                   | ±600              | 83                               | 680                           |
|                  | VB6-24D06P | 24 (9~36)           | 40   | ±6                   | ±500              | 83                               | 680                           |
|                  | VB6-24D09P | 24 (9~36)           | 40   | ±9                   | ±334              | 85                               | 330                           |

Selection Guide

| Certification    | Part No.   | Input Voltage (VDC) |      | Output               |                   | Full Load Efficiency (%)<br>Typ. | Capacitive Load (μF)<br>Max.* |
|------------------|------------|---------------------|------|----------------------|-------------------|----------------------------------|-------------------------------|
|                  |            | Nominal (Range)     | Max. | Output Voltage (VDC) | Max. Current (mA) |                                  |                               |
| EN/UL<br>pending | VB6-24D12P | 24 (9~36)           | 40   | ±12                  | ±250              | 86                               | 330                           |
|                  | VB6-24D15P | 24 (9~36)           | 40   | ±15                  | ±200              | 86                               | 220                           |
|                  | VB6-24D18P | 24 (9~36)           | 40   | ±18                  | ±167              | 86                               | 150                           |
|                  | VB6-24D24P | 24 (9~36)           | 40   | ±24                  | ±125              | 87                               | 100                           |
|                  | VB6-48D03P | 48 (18~75)          | 80   | ±3.3                 | ±750              | 80                               | 680                           |
|                  | VB6-48D05P | 48 (18~75)          | 80   | ±5                   | ±600              | 82                               | 680                           |
|                  | VB6-48D06P | 48 (18~75)          | 80   | ±6                   | ±500              | 82                               | 680                           |
|                  | VB6-48D09P | 48 (18~75)          | 80   | ±9                   | ±334              | 84                               | 330                           |
|                  | VB6-48D12P | 48 (18~75)          | 80   | ±12                  | ±250              | 86                               | 330                           |
|                  | VB6-48D15P | 48 (18~75)          | 80   | ±15                  | ±200              | 86                               | 220                           |
|                  | VB6-48D18P | 48 (18~75)          | 80   | ±18                  | ±167              | 86                               | 150                           |
|                  | VB6-48D24P | 48 (18~75)          | 80   | ±24                  | ±125              | 87                               | 100                           |

Note:

- 1. The input voltage must not exceed this value, otherwise it may cause permanent and irreparable damage;
- 2. The above efficiency is measured under nominal input voltage and rated output load;
- 3. \*The capacitive load of both positive and negative output channels is the same.

## Input Specifications

| Item                                 | Operating Conditions |              | Min.                  | Typ.   | Max.   | Unit |
|--------------------------------------|----------------------|--------------|-----------------------|--------|--------|------|
| Input Current<br>(Full Load/No-load) | 12VDC Input          | 3.3V Output  | --                    | 516/5  | 529/10 | mA   |
|                                      |                      | 5V/6V Output | --                    | 610/8  | 625/15 | mA   |
|                                      |                      | Others       | --                    | 595/20 | 610/35 | mA   |
|                                      | 24VDC Input          | 3.3V output  | --                    | 255/4  | 261/8  | mA   |
|                                      |                      | 5V/6V output | --                    | 301/5  | 309/10 | mA   |
|                                      |                      | Others       | --                    | 294/10 | 301/20 | mA   |
|                                      | 48VDC Input          | 3.3V output  | --                    | 129/4  | 132/8  | mA   |
|                                      |                      | 5V/6V output | --                    | 152/4  | 156/8  | mA   |
|                                      |                      | 9V output    | --                    | 149/4  | 152/8  | mA   |
|                                      |                      | Others       |                       | 145/8  | 149/15 | mA   |
| Reflected Ripple Current             |                      |              | --                    | 30     | --     | mA   |
| Surge Voltage<br>(1sec.max.)         | 12VDC Input          |              | -0.7                  | --     | 30     | VDC  |
|                                      | 24VDC Input          |              | -0.7                  | --     | 50     | VDC  |
|                                      | 48VDC Input          |              | -0.7                  | --     | 100    | VDC  |
| Start-up Voltage                     | 12VDC Input          |              | --                    | --     | 4.5    | VDC  |
|                                      | 24VDC Input          |              | --                    | --     | 9      | VDC  |
|                                      | 48VDC Input          |              | --                    | --     | 18     | VDC  |
| Input Under-voltage<br>Protection    | 12VDC Input          |              | 3.5                   | 4      | --     | VDC  |
|                                      | 24VDC Input          |              | 5.5                   | 6.5    | --     | VDC  |
|                                      | 48VDC Input          |              | 12                    | 15.5   | --     | VDC  |
| Input Filter Type                    |                      |              | Capacitance Filtering |        |        |      |
| Hot Plug                             |                      |              | Unavailable           |        |        |      |

## Output Specifications

| Item                            | Operating Conditions                                  |     | Min. | Typ. | Max. | Unit  |
|---------------------------------|-------------------------------------------------------|-----|------|------|------|-------|
| Output Voltage Accuracy         | 5%~100% Load                                          | Vo1 | --   | ±1.0 | ±3.0 | %     |
|                                 |                                                       | Vo2 | --   | ±2.0 | ±5.0 | %     |
| Line Regulation                 | Full load, input voltage from low limit to high limit | Vo1 | --   | ±0.2 | ±0.5 | %     |
|                                 |                                                       | Vo2 | --   | ±0.5 | ±1.0 | %     |
| Load Regulation                 | 5% to 100% Load                                       | Vo1 | --   | ±0.5 | ±1.0 | %     |
|                                 |                                                       | Vo2 | --   | ±0.5 | ±1.5 | %     |
|                                 | 0%-100% Load                                          |     | --   | ±3.0 | ±5.0 | %     |
| Ripple & Noise                  | 20MHz bandwidth (peak-to-peak)                        |     | --   | 40   | 80   | mVp-p |
| Transient Recovery<br>Time      | 25% load step change, nominal input voltage           |     | --   | 300  | 500  | ms    |
| Transient Response<br>Deviation | 25% load step change, nominal input voltage           |     | --   | ±5.0 | ±8.0 | %     |

# VB6-xxDxxP Series

DC-DC Converter | 6W | DIP24 | 4: 1 Wide Input Voltage, Regulated Output | 1600VDC



|                          |                     |                                         |     |       |      |
|--------------------------|---------------------|-----------------------------------------|-----|-------|------|
| Temperature Coefficient  | Full Load           | --                                      | --  | ±0.03 | %/°C |
| Over-voltage Protection  | Input Voltage Range | 110                                     | --  | 160   | %Io  |
| Over current Protection  | Input Voltage Range | 110                                     | 160 | --    | %Vo  |
| Short Circuit Protection | Input Voltage Range | Continuous Short Circuit, Self-recovery |     |       |      |

Note: Ripple & noise are measured at 20MHz of bandwidth with a 10uF electrolytic capacitor and a 1uF ceramic capacitor connected in parallel at the output.

## General Specifications

| Item                  | Operating Conditions                                            | Min.                  | Typ. | Max. | Unit |
|-----------------------|-----------------------------------------------------------------|-----------------------|------|------|------|
| Isolation Voltage     | Input-Output, Test Time 1 minute, leakage current less than 1mA | 1600                  | --   | --   | VDC  |
| Insulation Resistance | Input-Output, Insulation Voltage 500VDC                         | 1000                  | --   | --   | MΩ   |
| Isolation Capacitance | Input-Output, 100KHz/0.1V                                       | --                    | 2200 | --   | pF   |
| Operating Temperature | See: Temperature Derating Curve                                 | -40                   | --   | 85   | °C   |
| Storage Temperature   |                                                                 | -55                   | --   | 125  | °C   |
| Storage Humidity      | No condensation                                                 | 5                     | --   | 95   | %RH  |
| Soldering method      | Wave soldering                                                  | 260±5°C; Time 5 - 10s |      |      |      |
|                       | Manual soldering                                                | 360±10°C; Time 3 - 5s |      |      |      |
| Switching frequency   | PWM mode                                                        | --                    | 300  | --   | kHz  |
| Vibration             | IEC/EN 61373 Body 1 Class B                                     |                       |      |      |      |
| MTBF                  | MIL-HDBK-217F@25°C                                              | >1000Kh               |      |      |      |

## Mechanical Specifications

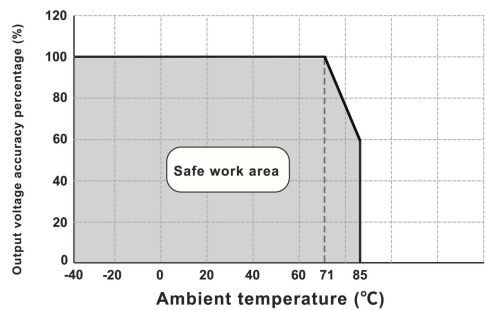
|                       |                         |
|-----------------------|-------------------------|
| Case Material         | Aluminum alloy          |
| Mechanical Dimensions | 32.00 * 20.00 * 11.10mm |
| Weight                | 12.00g (typ.)           |
| Cooling Method        | Free air convection     |

## Electromagnetic Compatibility (EMC)

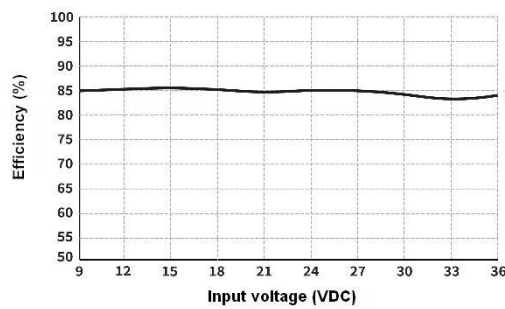
|     |       |                 |                                                       |                  |
|-----|-------|-----------------|-------------------------------------------------------|------------------|
| EMI | CE    | CISPR32/EN55032 | CLASS B (Recommended circuit see Figure 2-②)          |                  |
|     | RE    | CISPR32/EN55032 | CLASS B (Recommended circuit see Figure 2-②)          |                  |
| EMS | ESD   | IEC/EN61000-4-2 | Contact±4KV                                           | perf. Criteria B |
|     | RS    | IEC/EN61000-4-3 | 10V/m                                                 | perf. Criteria A |
|     | EFT   | IEC/EN61000-4-4 | ±2KV (Recommended circuit see Figure 2-①)             | perf. Criteria B |
|     | Surge | IEC/EN61000-4-5 | line to line±2KV (Recommended circuit see Figure 2-①) | perf. Criteria B |
|     | CS    | IEC/EN61000-4-6 | 3Vr.m.s                                               | perf. Criteria A |

Product Characteristic Curve

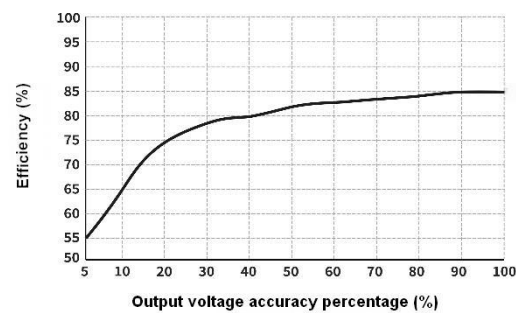
Temperature Derating Curve



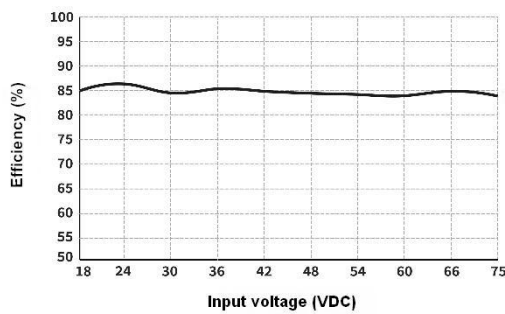
Efficiency VS Input Voltage (Full load, Vin=24V)



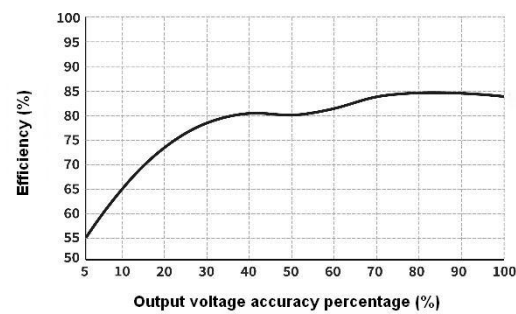
Efficiency VS Output Load (Vin=24V)



Efficiency VS Input Voltage (Full load, Vin=48V)

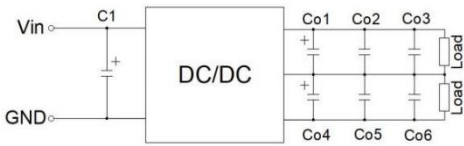


Efficiency VS Output Load (Vin=48V)



Design Reference - Application circuit

Application circuit



(Figure 1)

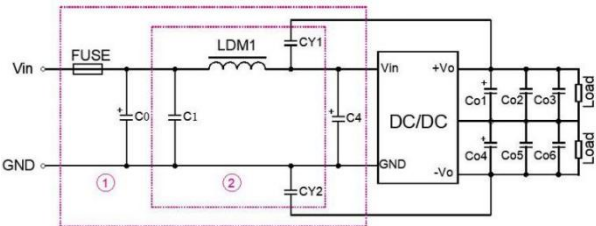
Recommended Capacitive Load Value Table

| Vout       | C1         | Co1/Co4   | Co2/Co5  | Co3/Co6   |
|------------|------------|-----------|----------|-----------|
| 3.3/5/6VDC | 100μF/100V | 100μF/16V | 10μF/50V | 0.1μF/16V |
| 9/12/15VDC | 100μF/100V | 47μF/25V  | 10μF/50V | 0.1μF/25V |
| 18/24VDC   | 100μF/100V | 47μF/50V  | 10μF/50V | 0.1μF/50V |

All DC/DC converters in this series are tested before shipment according to the recommended application circuit (Figure 1). If further reduction of input and output ripple is required, the external input and output capacitors C1, Co1, Co2, Co3, Co4, Co5, Co6 can be increased or capacitors with low equivalent series impedance can be selected. For each output, under safe and reliable operating conditions, the maximum capacitance of the filter capacitor must not exceed the maximum capacitive load of the product.

Design Reference - EMC Solutions - Recommended Circuits

EMC Recommended Circuit Design and Application



(Figure 2)

Recommended Parameter Table

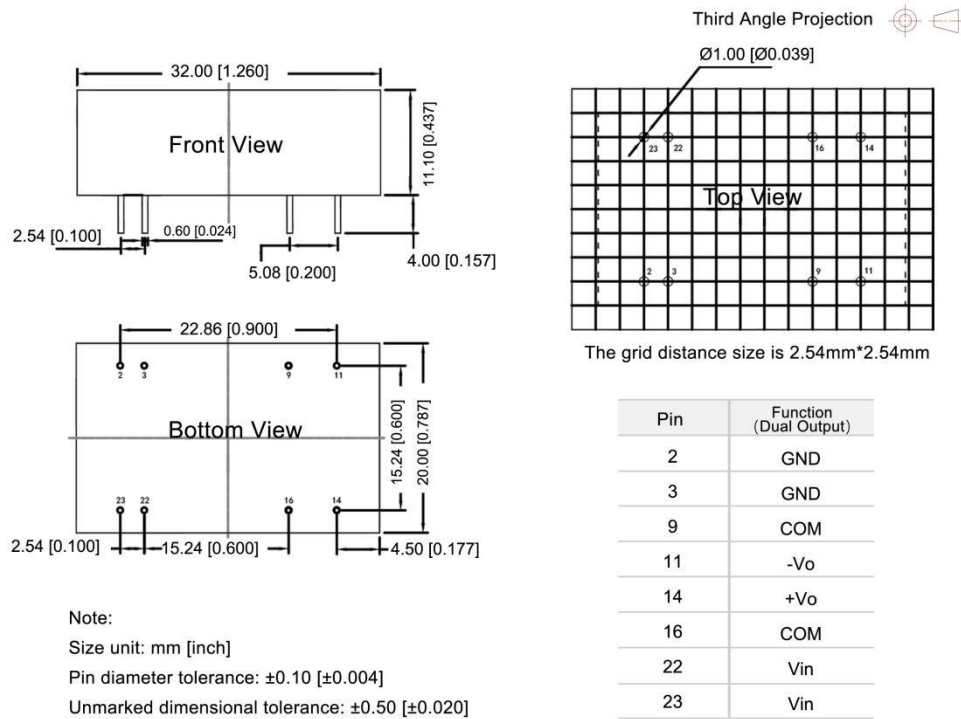
| Model                       | Vin: 12V                                      | Vin: 24V | Vin: 48V   |
|-----------------------------|-----------------------------------------------|----------|------------|
| FUSE                        | Select according to the actual input current  |          |            |
| C0,C4                       | 330μF/50V                                     |          | 330μF/100V |
| C1                          | 4.7μF/50V                                     |          | 4.7μF/100V |
| LDM1                        | 4.7μH                                         |          | 4.7μH      |
| Co1,Co2,Co3,<br>Co4,Co5,Co6 | Refer to the capacitor parameters in Figure 1 |          |            |
| CY1,CY2                     | 1nF/2KVDC                                     |          |            |

Part ① is used for EMC testing;

Part ② is used for EMI filtering, can be selected as needed.

Dimensions and Recommended Layout

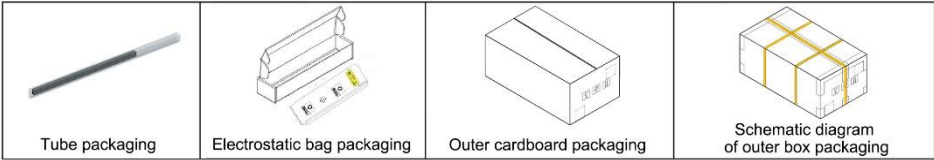
VB6-xxDxxP Dimensions and Recommended Layout



Packaging Information

| Model series<br>(Tube packaging) | Quantity per tube<br>(pcs/ tube) | Quantity of electrostatic bag<br>(pcs/ bag) | Quantity of inner box<br>(pcs/ box) | Full box Quantity (pcs) |
|----------------------------------|----------------------------------|---------------------------------------------|-------------------------------------|-------------------------|
| VB6-xxDxxP                       | 16                               | 80                                          | 320                                 | 1280                    |

The schematic diagram of tube packaging is shown below:



## Product Precautions

1. The input voltage should not exceed the specified range value, otherwise it may cause permanent and irreparable damage;
2. It is recommended to use at a load of over 5%. If the load is below 5%, the ripple index of the product may exceed the specifications, but it does not affect the reliability of the product;
3. The maximum capacitive load is tested within the input voltage range and under full load conditions;
4. Unless otherwise specified, all indicators in this manual are measured at  $T_a=25\text{ }^{\circ}\text{C}$ , humidity<75% RH, nominal input voltage, and output rated load;
5. All indicator testing methods in this manual are based on our company's corporate standards;
6. Our company can provide product customization, and specific requirements can be directly contacted by our technical personnel;
7. Product specifications are subject to change without prior notice.

## Manufacturer contact information

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