## Descriptions

10A non-isolated ultra-wide input and buck single output DC-DC converter



RoHS

CE Report EN62368-1

UKCA Report BS EN62368-1

## Features

- Input voltage range: 18 - 85VDC
- Maximum 252W output power
- High efficiency up to 98%
- Input under-voltage protection, output short-circuit, over-current protection, over-temperature protection
- Operating ambient temperature range: -40℃ to +85℃
- Industry standard 1/16-Brick package and pin-out

## Applications

- Robotics
- Communications
- battery management
- DC-DC distributed power supply

## Selection Guide

| Certification | Part No. | Input Voltage(VDC) | | Output | | Full Load Efficiency③(%) Min./Typ. | Capacitive Load (μF) Max. |
|---|---|---|---|---|---|---|---|
| | | Nominal① (Range) | Max.② | Voltage (VDC) | Current(A) Max. | | |
| EN/BS EN | DNJOSB10-B4805 | 48 (18-85) | 90 | 5 | 10 | 91 | 8500 |
| | DNJOSB10-B4812 | | | 12 | 10 | 95 | 5500 |
| | DNJOSB10-B4815 | 48 (21-85) | | 15 | 10 | 95 | 3300 |
| | DNJOSB10-B4824 | 48 (30-85) | | 24 | 10 | 97 | 3300 |
| | DNJOSB7-B4836 | 48 (43-85) | | 36 | 7 | 98 | 1000 |

Notes:
①For input voltage exceeding 48VDC, an input capacitor of 330μF/100V is required;
②Exceeding the maximum input voltage may cause permanent damage;
③Current efficiency is measured at a nominal 48V input;
④Product images are for reference only; the actual product shall prevail.

## Specifications

| Product Specifications | Item | Operating Conditions | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|
| Input Specifications | Input Current (full load/no-load) | Nominal input voltage | DNJOSB10-B4805 | -- | 1145/2 | 1184/-- | mA |
| | | | DNJOSB10-B4812 | -- | 2632/2 | 2718/-- | |
| | | | DNJOSB10-B4815 | -- | 3290/2 | 3397/-- | |
| | | | DNJOSB10-B4824 | -- | 5155/2 | 5320/-- | |
| | | | DNJOSB7-B4836 | -- | 5358/2 | 5527/-- | |
| | Reflected Ripple Current | Nominal input voltage | | -- | 200 | -- | |
| | Surge Voltage (1sec. max.) | | | -0.7 | -- | 90 | VDC |
| | Start-up Voltage | DNJOSB10-B4805, DNJOSB10-B4812 | | -- | 17 | 18 | |
| | | DNJOSB10-B4815 | | -- | 20 | 21 | |
| | | DNJOSB10-B4824 | | -- | 29 | 30 | |
| | | DNJOSB7-B4836 | | -- | 42 | 43 | |
| | Under-voltage Protection | DNJOSB10-B4805, DNJOSB10-B4812 | | 13 | -- | -- | |
| | | DNJOSB10-B4815 | | 16 | -- | -- | |
| | | DNJOSB10-B4824 | | 25 | -- | -- | |
| | | DNJOSB7-B4836 | | 36 | -- | -- | |
| | Input Filter | | | Capacitance filter | | | |
| | Hot Plug | | | Unavailable | | | |
| | Input Reverse Polarity Protection | | | Unavailable | | | |
| | Ctrl① | Module on | | Ctrl pin open or pulled high (TTL 3 - 20VDC) | | | |
| | | Module off | | Ctrl pin pulled low to GND (0 - 1VDC) | | | |
| | | Input current when off | | -- | 1 | 5 | mA |
| Output Specifications | Voltage Accuracy | Input voltage range, 10% - 100%Io | | -- | ±2 | ±3 | % |
| | Linear Regulation | Input voltage range, full load | | -- | ±0.3 | ±1 | |
| | Load Regulation | Nominal input voltage, 10% - 100%Io | | -- | ±0.5 | ±2 | |
| | Transient Recovery Time | Nominal input voltage, 25% load step change | | -- | 300 | 500 | μs |
| | Transient Response Deviation | Nominal input voltage, 25% load step change | 5VDC output | -- | -- | ±8 | % |
| | | | Other output | -- | -- | ±5 | |
| | Temperature Coefficient | Operating temperature -40℃ to +85℃, full load | | -- | ±0.02 | -- | %/℃ |
| | Ripple & Noise② | 20MHz bandwidth, nominal input voltage, full load | | -- | 200 | 300 | mVp-p |
| | Over-temperature Protection③ | Maximum surface temperature of the product | | -- | 125 | -- | ℃ |
| | Current Limit | Normal temperature, input voltage range | | 110 | 130 | 230 | %Io |
| | Short-circuit Protection | Input voltage range | | Hiccup, continuous, self-recovery | | | |
| General Specifications | Trim④ | | | 90 | -- | 110 | %Vo |
| | Sense | See Use of Sense and precautions | | -- | -- | 105 | |
| | Operating Temperature | | | -40 | -- | +85 | ℃ |
| | Storage Temperature | | | -55 | -- | +125 | |
| | Pin Soldering Resistance Temperature⑤ | Soldering spot is 1.5mm away from the case, 10 seconds max. | | -- | -- | +300 | |
| | | Wave soldering, maximum 10 seconds | | 255 | 260 | 265 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Storage Humidity | Non-condensing | | 5 | -- | 95 | %RH |
| | Vibration | | | 10-150Hz, 5g, 0.75mm, 90 Min. along X, Y and Z | | | |
| | Switching Frequency⑥ | Nominal input voltage, full load | DNJOSB10-B4805, DNJOSB10-B4812 | -- | 300 | -- | kHz |
| | | | DNJOSB10-B4815 | -- | 360 | -- | |
| | | | DNJOSB10-B4824 | -- | 420 | -- | |
| | | | DNJOSB7-B4836 | -- | 400 | -- | |
| | MTBF | MIL-HDBK-217F@25℃ | | 1000 | -- | -- | k hours |
| Mechanical Specifications | Dimension | 33.02× 22.86× 11.80mm | | | | | |
| | Weight | 14.5g(Typ.) | | | | | |
| | Cooling Method | Natural air cooling or forced air cooling | | | | | |

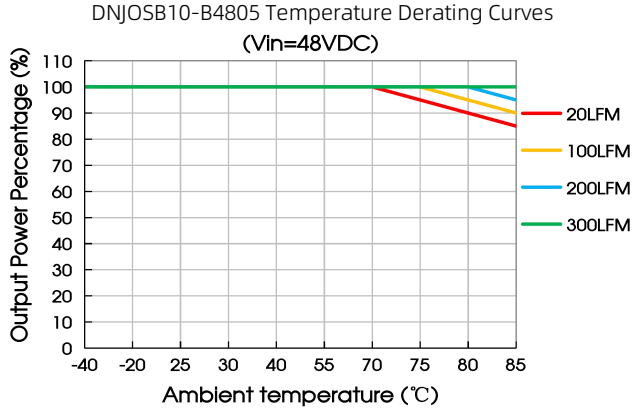
Notes:
①The voltage of the Ctrl control pin is relative to the input pin GND;
②The method is used for ripple and noise test, please refer to Fig.2 and DC-DC Converter Application Notes for specific information;
③Over-temperature protection for product is output off;
④When using Trim and Sense, the 24VDC output needs to meet Vin≥34VDC, the 36VDC output needs to meet Vin≥48VDC;
⑤The pin soldering temperature tolerance is not the actual temperature set by the soldering iron but the temperature required for proper solder joints. The actual temperature set by the customer should be determined comprehensively based on factors such as PCB thickness, copper coverage, soldering iron power, and soldering iron tip selection;
⑥Switching frequency varies with input voltage and load, ranging from 110-750 kHz.

## Electromagnetic Compatibility (EMC)

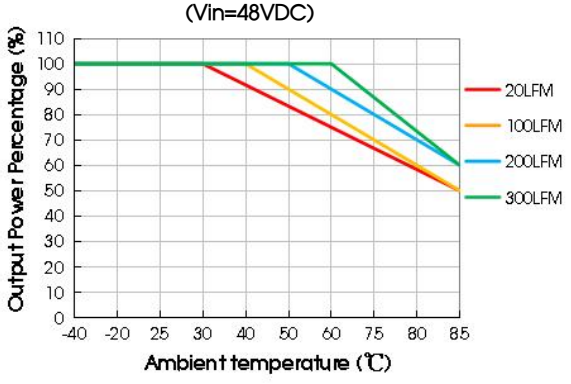
| | | | | |
|---|---|---|---|---|
| Emissions | CE | CISPR32/EN55032 | CLASS A (see Fig. 3 for recommended circuit) | |
| | RE | CISPR32/EN55032 | CLASS A (see Fig. 3 for recommended circuit) | |
| Immunity | ESD | IEC/EN61000-4-2 | Contact ±6kV, Air ±8kV | perf.Criteria B |
| | RS | IEC/EN61000-4-3 | 10V/m | perf.Criteria A |
| | EFT | IEC/EN61000-4-4 | ±2kV (see Fig. 3 for recommended circuit) | perf.Criteria A |
| | Surge | IEC/EN61000-4-5 | line to line ±2kV (see Fig. 3 for recommended circuit) | perf.Criteria B |
| | CS | IEC/EN61000-4-6 | 10Vr.m.s | perf.Criteria A |

## Characteristic Curve

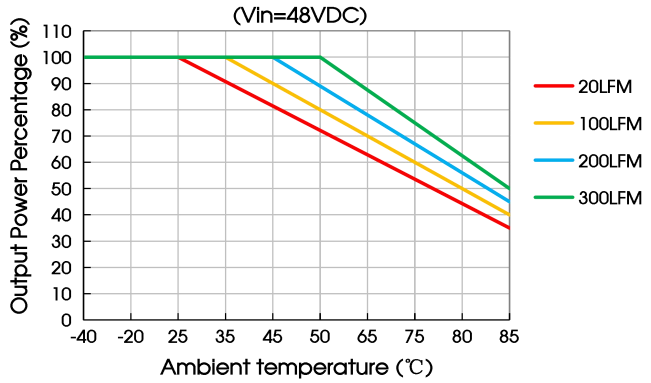
DNJOSB10-B4805 Temperature Derating Curves
(Vin=48VDC)




DNJOSB10-B4812、DNJOSB10-B4815 Temperature Derating Curves
(Vin=48VDC)



DNJOSB10-B4824 Temperature Derating Curves




DNJOSB7-B4836 Temperature Derating Curves

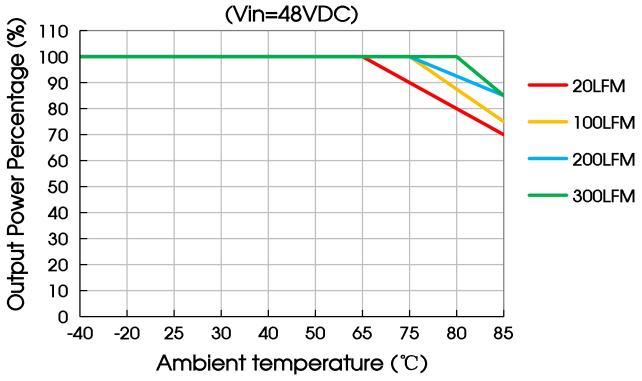
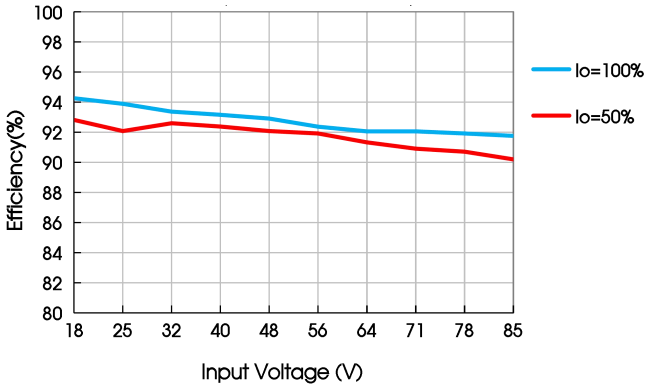
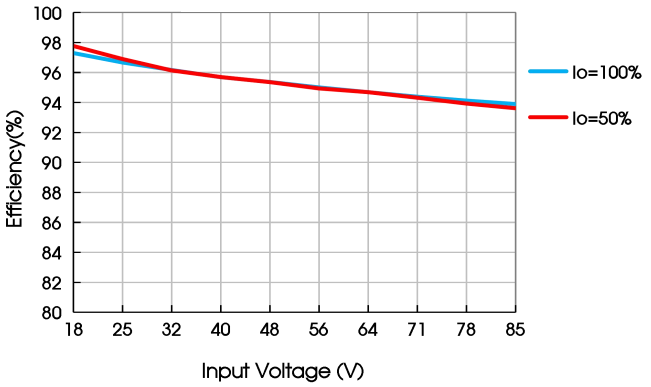



Fig. 1

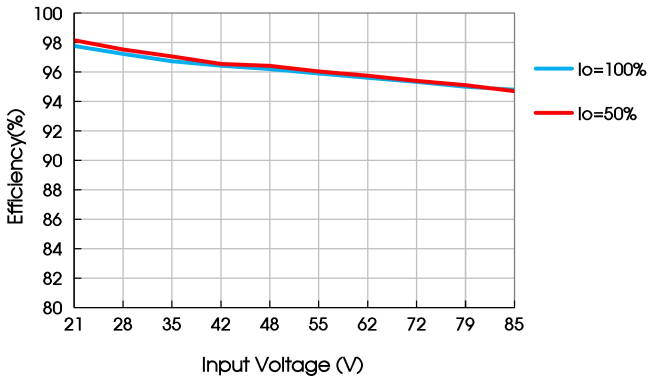
Efficiency Vs Input Voltage (DNJOSB10-B4805)



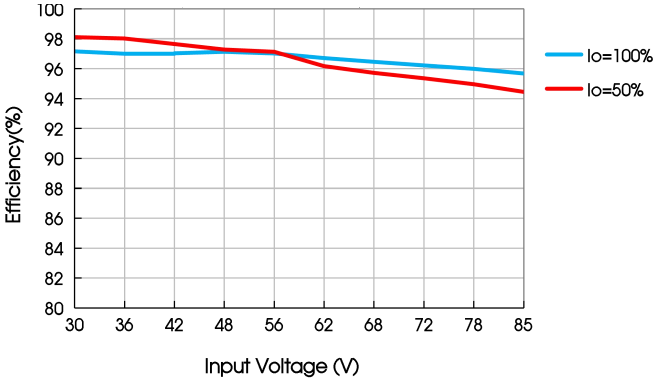

Efficiency Vs Input Voltage (DNJOSB10-B4812)



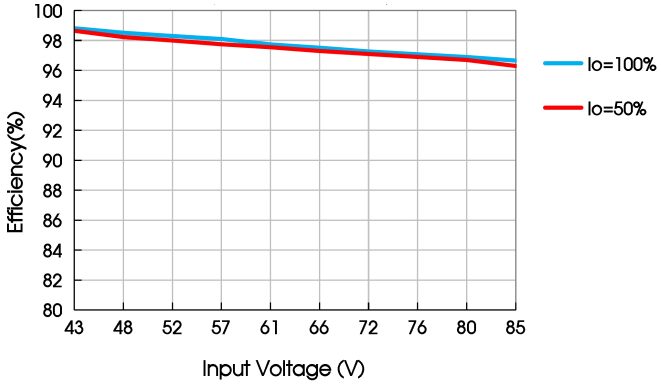

Efficiency Vs Input Voltage (DNJOSB10-B4815)



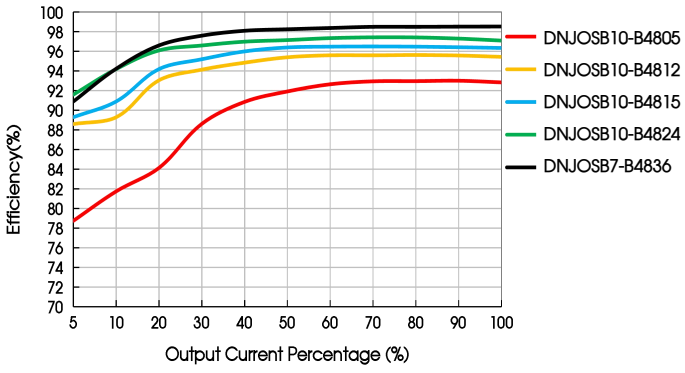

Efficiency Vs Input Voltage (DNJOSB10-B4824)




Efficiency Vs Input Voltage (DNJOSB7-B4836)

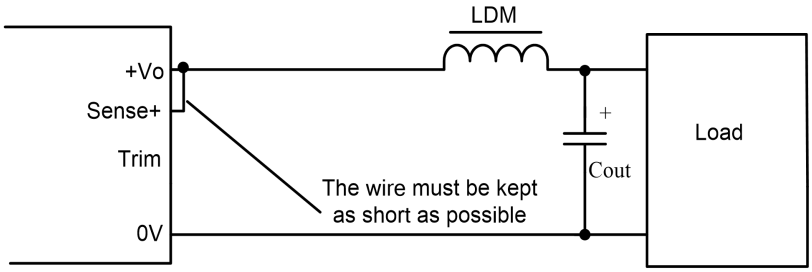



Efficiency Vs Output Load



## Remote Sense Application

### 1. Remote Sense Connection if not used

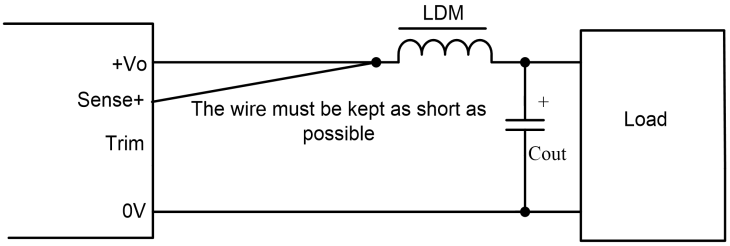



Notes:

①If the sense function is not used for remote regulation the user must connect the Sense+ to + Vo at the DC-DC converter pins and will compensate for voltage drop across pins only;

②The connections between Sense lines and their respective power lines must be kept as short as possible, otherwise they may be picking up noise, interference and/or causing unstable operation of the power module.

### 2. Remote Sense Connection used for Compensation




Notes:

①Using remote sense with long wires may cause unstable output, please contact technical support if long wires must be used;

②We recommend using adequate cross section for PCB-track layout and/or cables to connect the power supply module to the load in order to keep the voltage drop below 0.3V and to make sure the power supply's output voltage remains within the specified range;

③Note that large wire impedance may cause oscillation of the output voltage and/or increased ripple. Consult technical support or factory for further advice of sense operation.

## Design Reference

### 1. Applied circuit

(1) During product testing and application, please follow the recommended test circuit (Fig. 2); At least one electrolytic capacitor Cin is guaranteed to be connected externally to suppress the possible input surge voltage; An external inductor and electrolytic capacitor are connected to output for output filtering;

(2) If the input terminal of the product is connected in parallel with a circuit with large transient energy (such as a parallel motor drive circuit), the input voltage of the product may be pulled down. At this time, pay attention to the fluctuation of the input voltage of the product, and it is recommended to appropriately increase the capacitance of the electrolytic capacitor Cin at the input terminal to ensure the stability of the input terminal voltage and avoid the situation where the input voltage is lower than the under-voltage protection point and cause the product to restart repeatedly;

(3) If the input and output ripple needs to be further reduced, Cin and Cout capacity of external capacitors can be appropriately increased or external capacitors with small series equivalent impedance can be selected.

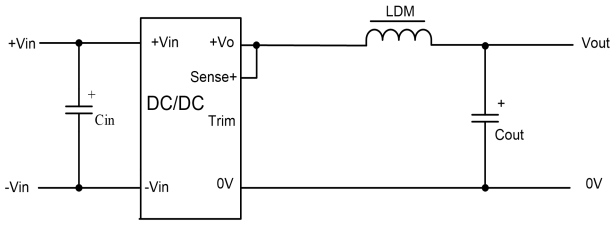



Fig. 2

| Cin | LDM | Cout |
|---|---|---|
| 330μF/100V(ESR<45mΩ) | 0.47μH/27A | 330μF/50V |

## 2. EMC compliance circuit

When measuring EMC characteristics of the product, you are advised to follow the recommended test circuit (as shown in Fig. 3). The following table lists the recommended circuit parameters.

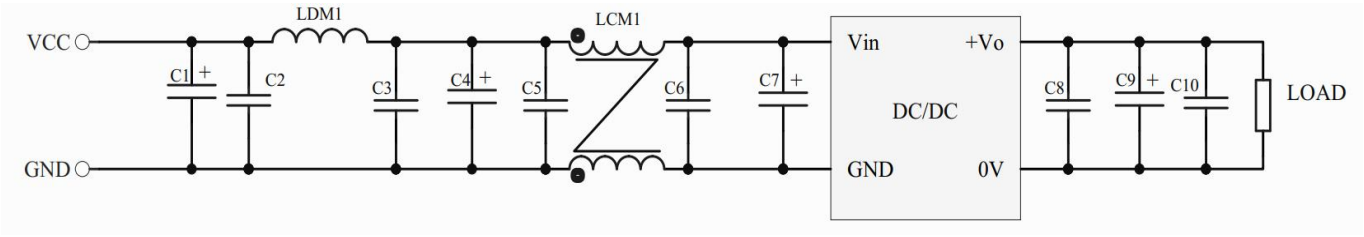
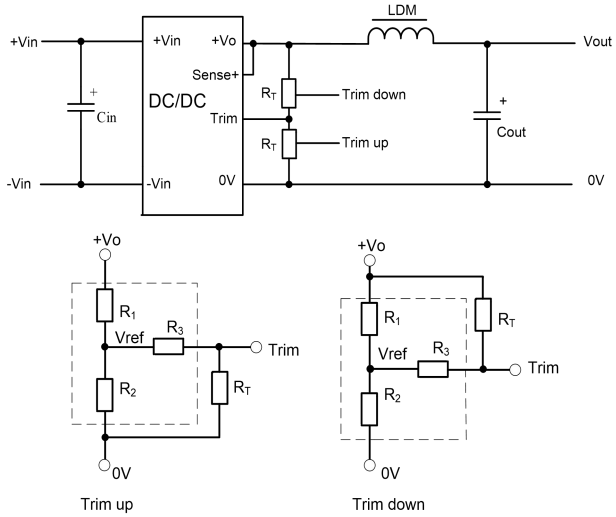



Fig. 3

| Device No | Device Parameters | Device Function |
|---|---|---|
| C1 | 2000μF/100V Electrolytic capacitor | Meet pulse group and surge |
| C7 | 330μF/100V Electrolytic capacitor | |
| C1, C4, C7 | 330μF/100V Electrolytic capacitor | Meet the requirements of conduction disturbance and radiation disturbance |
| C2, C3, C5, C6 | 4.7 μF/100V Ceramic capacitor | |
| C8, C10 | 4.7 μF/50V Ceramic capacitor | |
| C9 | 330μF/50V Electrolytic capacitor | |
| LDM1 | 8.2uH/10A chip inductor | |
| LCM1 | EFL2D-40-040 | |

## 3.Trim Function for Output Voltage Adjustment







Trim resistor connection (dashed line shows internal resistor network)

Trim resistance calculation formula:

$$\text{up: } R_T=\frac{\alpha R_2}{R_2-\alpha}-R_3 \qquad \alpha=\frac{Vref}{+Vo-Vref}-R_1$$

$$\text{down: } R_T=\frac{\alpha R_1}{R_1-\alpha}-R_3 \qquad \alpha=\frac{+Vo-Vref}{Vref}-R_2$$

$R_T$: the Trim resistor

α : a user-defined parameter and has no actual meaning

+Vo : the actual up or down voltage required

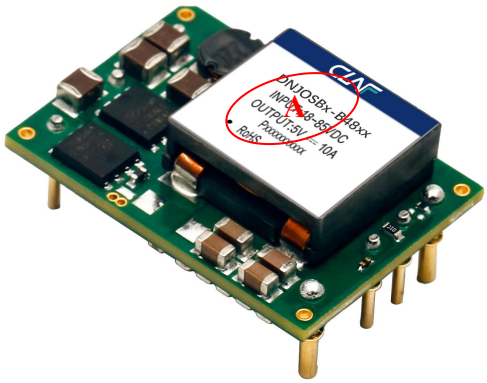
| Part No. | R1(kΩ) | R2(kΩ) | R3(kΩ) | Vref(V) |
|---|---|---|---|---|
| DNJOSB10-B4805 | 6.8 | 2.87 | 12.8 | 1.5 |
| DNJOSB10-B4812 | 20 | 2.87 | 14.7 | |
| DNJOSB10-B4815 | 25.80 | 2.87 | 17.5 | |
| DNJOSB10-B4824 | 43.13 | 2.87 | 17 | |
| DNJOSB7-B4836 | 83.08 | 3.6 | 20.4 | |

When using the Trim function, it is not recommended to directly short-circuit the Trim and +Vo pins or the Trim and 0V pins, which may cause irreversible damage to the product.

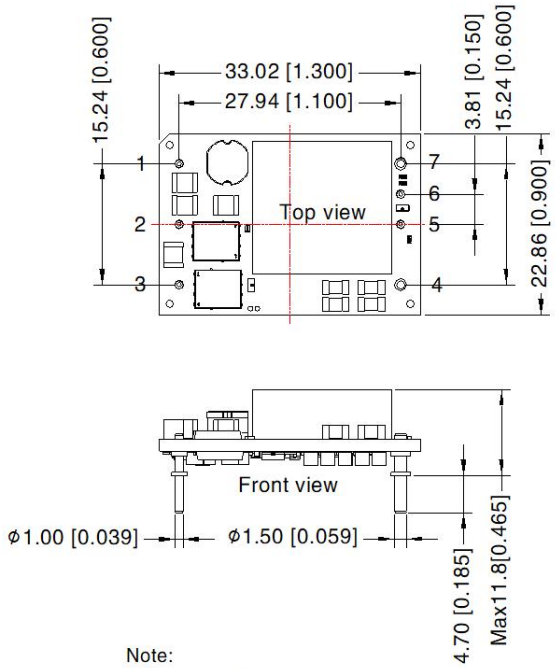
## 4. The products do not support parallel connection of their output

## 5. Recommended solution for thermal test

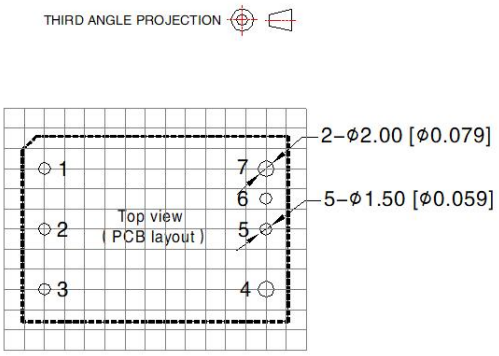
In the application process, the product temperature derating curve can be combined to evaluate the product thermal design; The temperature of point A is used to determine the stable operating range of the product, when it is lower than 125℃, it is the stable operating range.



## Dimensions and Recommended Layout




Note:
Unit: mm[inch]
Pin diameter tolerances: ± 0.10[ ± 0.004]
General tolerances: ± 0.50[ ± 0.020]
PIN 1/2/3/5/6: ϕ1.0mm; PIN 4/7: ϕ1.5mm
The layout of the device is for reference only, please refer to the actual product




Note: Grid 2.54*2.54mm

| Pin-Out | |
|---|---|
| Pin | Mark |
| 1 | Vin |
| 2 | Ctrl |
| 3 | GND |
| 4 | 0V |
| 5 | Trim |
| 6 | Sense+ |
| 7 | +V0 |

Notes:

1. Unless otherwise specified, parameters in this datasheet were measured under the conditions of Ta=25℃, humidity<75%RH with nominal input voltage and rated output load;
2. All index testing methods in this datasheet are based on company corporate standards;
3. Products are related to laws and regulations: see "Features" and "EMC";
4. Our products shall be classified according to ISO14001 and related environmental laws and regulations, and shall be handled by qualified units;
5. The image certification marks are for reference only; please refer to the selection table for actual specifications. Certification is based on t he physical mark or packaging label.