## Descriptions

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

RoHS

3 Years Warranty

## Features

- Input voltage range: 9 - 60V
- Output voltage range: 0 - 60V
- Output current range: 0 - 10A
- Both output voltage and current are adjustable
- High efficiency up to 95%
- Input under-voltage protection, output short-circuit protection, over-temperature protection
- Operating ambient temperature range: -40℃ to +105℃
- Industry standard 1/8-Brick package and pin-out

## Applications

- Robotic field
- Battery powered systems

## Selection Guide

| Certification | Part No.① | Input | | | Output | | | Full Load Efficiency③ (%) Min./Typ. |
|---|---|---|---|---|---|---|---|---|
| | | Nominal (Range) (VDC) | Max.② (VDC) | Current Limit (A)Typ. | Nominal (Range) (VDC) | Current Limit (A)Typ. | Current Setting Range(A) | |
| -- | DNUEB10-B4836(F) | 48 (9-60) | 65 | 12.5 | 36 (0-60) | 12.5 | 0-10 | 93/95 |
| | DNUEB10-B4836(F)-RS | | | | | | | |

Note:
①Use ”F” suffix for heat sink mounting;
②Exceeding the maximum input voltage may cause permanent damage;
③Efficiency is measured at nominal input voltage, nominal output voltage and max. output load.

## Specifications

| Product Specifications | Item | Operating Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Input Specifications | Input Current (full load/no-load) | | -- | 7895/25 | 8065/50 | mA |
| | Surge Voltage (1sec. max.) | | -0.7 | -- | 65 | VDC |
| | Start-up Voltage | | -- | -- | 9 | |
| | Input Under-voltage Protection | | 6 | 7 | -- | |
| | Start-up Time | Nominal input voltage, constant resistance load | -- | -- | 100 | ms |
| | Input Filter | | C filter | | | |
| | Hot Plug | | Unavailable | | | |
| | Input Reverse Polarity Protection | | Unavailable | | | |
| | Ctrl① | Module on | Ctrl pin connected to -Vin or low level (0-0.8VDC) | | | |
| | | Module off | Ctrl open circuit or connected to TTL high level (1.8-5.0VDC) | | | |
| | | Input current when off | -- | 5 | 15 | mA |
| | Input Current Limit | Input voltage range | 11 | 12.5 | 14 | A |
| Output Specifications | Voltage Accuracy | Constant voltage model, Input voltage range, nominal output voltage, 0-100% load | -- | ±1 | ±3 | % |
| | Current Accuracy | Constant current model, nominal Input voltage, nominal output voltage, 100% load | -- | ±5 | ±8 | |
| | Output Voltage Adjustment | Vset setup | See Vset function for output voltage adjustment | | | |
| | | Adjustable range of output voltage | 3.3② | -- | 60 | VDC |
| | Output Current Adjustment | Iset setup | See Iset function for output current adjustment | | | |
| | | Adjustable range of output current | 0 | -- | 10 | A |
| | Temperature Coefficient | Constant voltage model, nominal input voltage, nominal output voltage,100% load | -- | -- | ±0.03 | %/℃ |
| | Ripple & Noise③ | 20MHz bandwidth, constant voltage model, nominal input voltage, nominal output voltage | -- | 100 | 300 | mVp-p |
| | Over-temperature Protection④ | Max. Case Temperature | -- | 120 | -- | ℃ |
| | Output Current Limit | Input voltage range | 10.5 | 12.5 | 14.5 | A |
| General Specifications | Isolation | Input/output-case. Electric Strength Test for 1 minute with a leakage current of 1mA max | 1500 | -- | -- | VDC |
| | Operating Temperature | See temperature derating curves | -40 | -- | +105 | ℃ |
| | Storage Temperature | | -55 | -- | +125 | |
| | Storage Humidity | Non-condensing | 5 | -- | 95 | %RH |
| | Pin Soldering Resistance Temperature | Wave-soldering, 10 seconds | -- | -- | +260 | ℃ |
| | | Soldering spot is 1.5mm away from case for 10 seconds | -- | -- | +300 | |
| | Pollution Level | | PD 3 | | | |
| | Shock And Vibration | | IEC/EN61373 - Category 1, Grade B | | | |
| | Switching Frequency | | -- | 160 | -- | KHz |

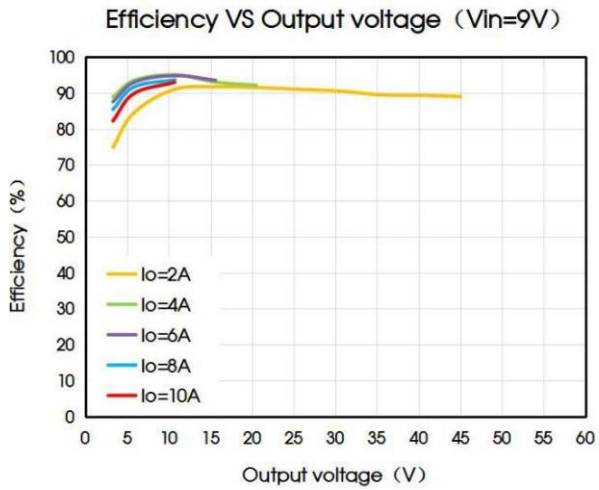
| | | | |
|---|---|---|---|
| | Altitude | | Altitude: ≤2000m, atmospheric pressure: 80 ~ 110KPa |
| **Mechanical Specifications** | Dimension | DNUEB10-B4836(-RS) | 60.80 × 25.00 × 12.70 mm |
| | | DNUEB10-B4836F(-RS) | 60.80 × 36.83 × 12.70 mm |
| | Weight | DNUEB10-B4836(-RS) | 53.0g(Typ.) |
| | | DNUEB10-B4836F(-RS) | 58.2g(Typ.) |
| | Cooling Method | Free air convection (20LFM) | |

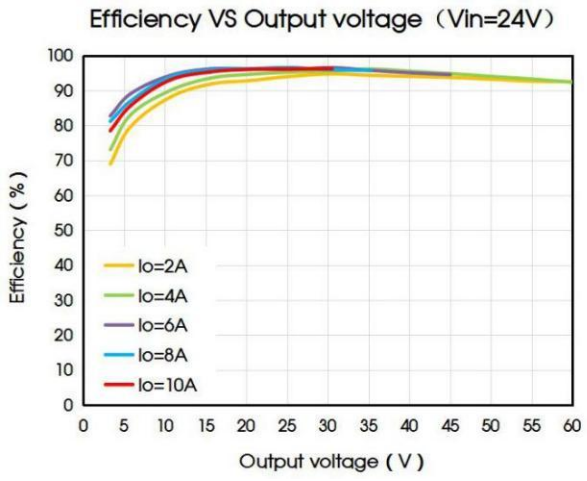
Note:
①The Ctrl pin voltage is referenced to input -Vin. When Pin of Vset and Iset are floating, there will be voltage and current output after power on. Please put the Ctrl pin in a high impedance state or connect to a high level before the product is powered on.
②The "Tip and barrel" method is used for ripple and noise test, please refer to Fig. 6. and DC-DC Converter Application Notes for specific information;
③The product can work in constant current mode when the output voltage at 0-3.3V;
④Over-temperature protection is in the form of product output shutdown.

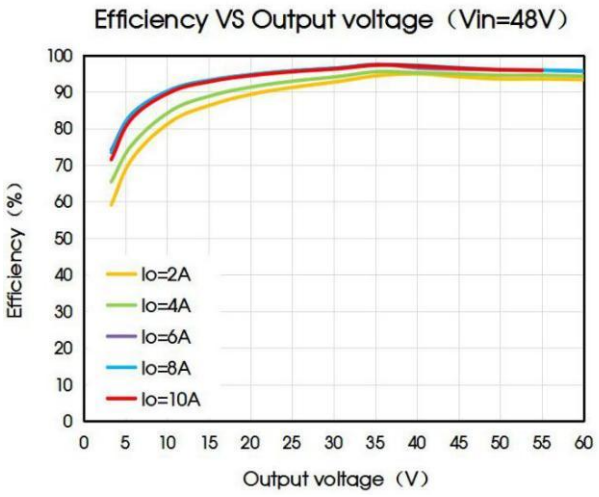
## Electromagnetic Compatibility (EMC)

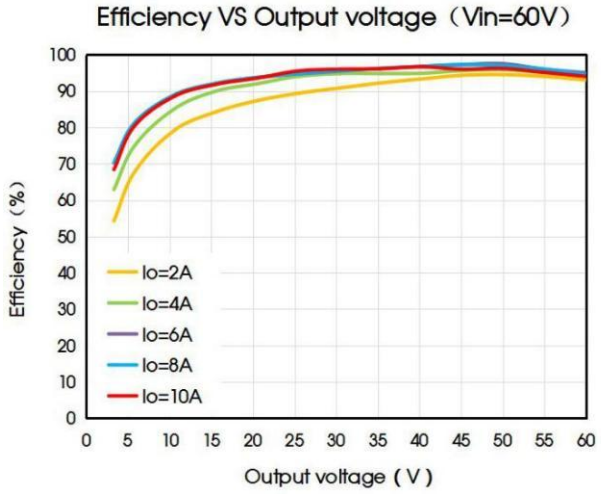
| | | |
|---|---|---|
| **Emissions** | CE | CISPR32/EN55032 CLASS A (see Fig. 7 for recommended circuit) |
| | RE | CISPR32/EN55032 CLASS A (see Fig. 7 for recommended circuit) |
| **Immunity** | ESD | IEC/EN61000-4-2 Contact ±6KV/Air ±8KV |
| | RS | IEC/EN61000-4-3 10V/m |
| | EFT | IEC/EN61000-4-4 ±2KV (see Fig. 7 for recommended circuit) |
| | Surge | IEC/EN61000-4-5 line to line ±2KV (see Fig. 7 for recommended circuit) |
| | CS | IEC/EN61000-4-6 10 Vr.m.s |

## Characteristic Curve

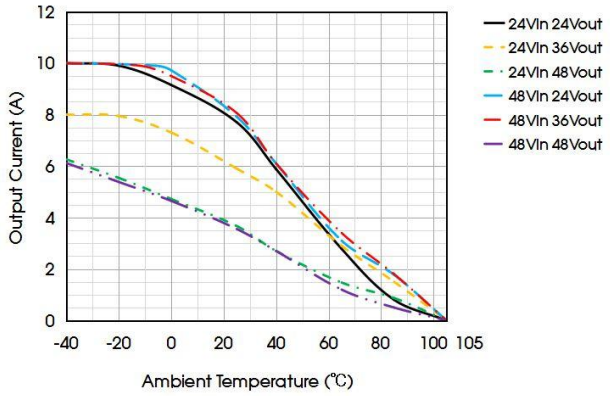


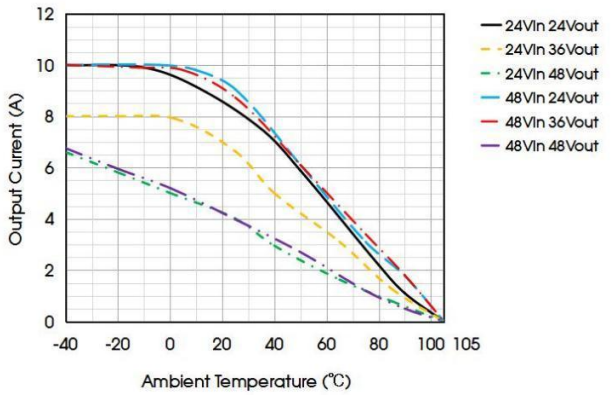



DNUEB10-B4836(-RS) Temperature Derating Curves
(20LFM)

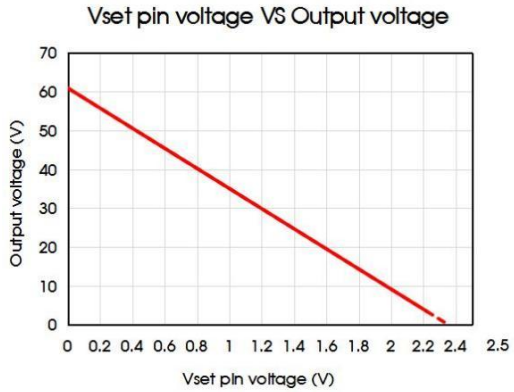



DNUEB10-B4836F(-RS) Temperature Derating Curves
(20LFM)




## Vset Function for Output Voltage Adjustment

**1. DNUEB10-B4836(F): The Vset pin is connected to the external voltage Vf for adjustment:**



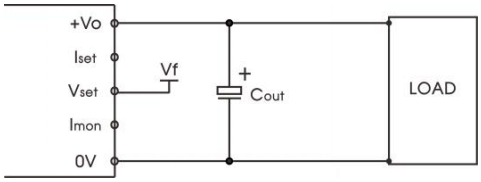



Fig. 1

Calculation formula of output voltage adjustment:

$$Vo = 60.9 - 25.9V_f$$

Notes:

1. Adjustable range of output voltage: 3.3-60V;
2. Vf is the externally supplied voltage which range from 0V to 2.5V. The Vf voltage is referenced to output 0V;
3. Vset pin must not be opened.

### 2. DNUEB10-B4836(F)-RS: The Vset pin is connected to the external resistance for adjustment:

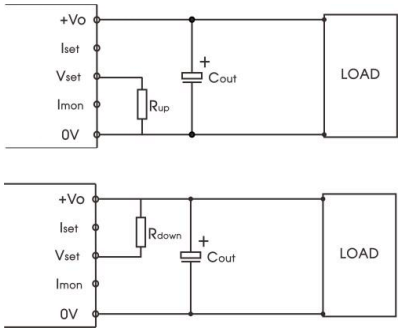



Fig. 2

Calculation formula of output voltage adjustment:

up: $$Vo = 60 - \frac{29.934R_{up}}{2.87 + R_{up}}$$

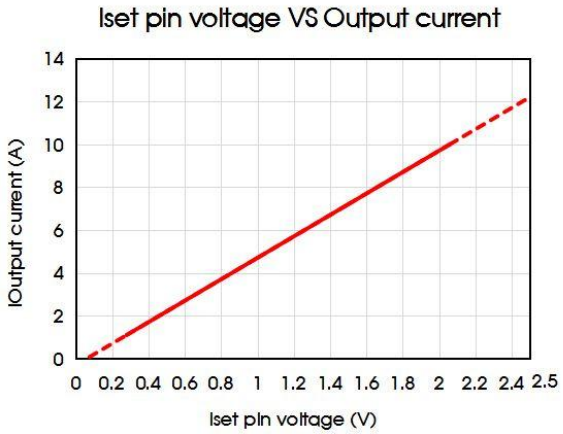
down: $$Vo = \frac{30.066R_{down} + 172.19}{74.046 + R_{down}}$$

Notes:

1. Adjustable range of output voltage: 3.3-60V;
2. When the Vset pin is open, the output voltage of the product is 30V;
3. Rup and Rdown are external resistance, in kΩ.

## Iset Function for Output Current Adjustment

### 1. DNUEB10-B4836(F): The Iset pin is connected to the external voltage Vf for adjustment:



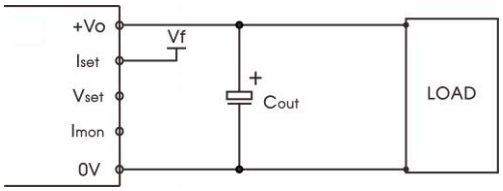




Fig. 3

Calculation formula of output current adjustment:

$$I_o = 5V_f - 0.3$$

Notes:

1. Adjustable range of output current: 0-10A;
2. Vf is the externally supplied voltage which range from 0V to 2.5V. The Vf voltage is referenced to output 0V;
3. Iset pin must not be opened.

**2. DNUEB10-B4836(F)-RS: The Iset pin is connected to the external resistance for adjustment:**

（1）When the maximum output current is set between 0-10A:

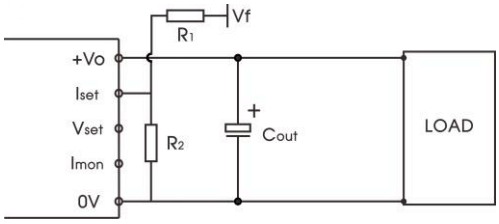



Fig. 4

Recommended Parameter Setting:

1. Vf is 5V;
2. R1 is 10kΩ.

Calculation formula of output current adjustment:

$$I_o = 11.925 - \frac{270.73R_2}{10.59R_2+88.79}$$

Notes:

1. Adjustable range of output current: 0-10A;
2. When using external resistance to adjust Iset current, external auxiliary power supply and regulating resistance are needed. Please ensure that the external resistance meets the power and withstand voltage requirements;
3. R2 is external resistance, in kΩ. When R2 value range is 0-10kΩ, it can meet the requirements of output current regulation range;
4. When the Iset pin is opened, the output current ≤7A.

（2）When the maximum output current is set between 5-10A:

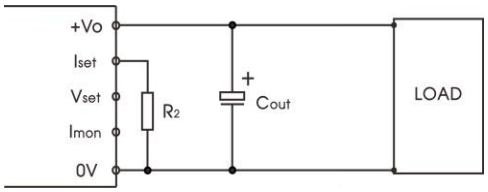



Fig. 5

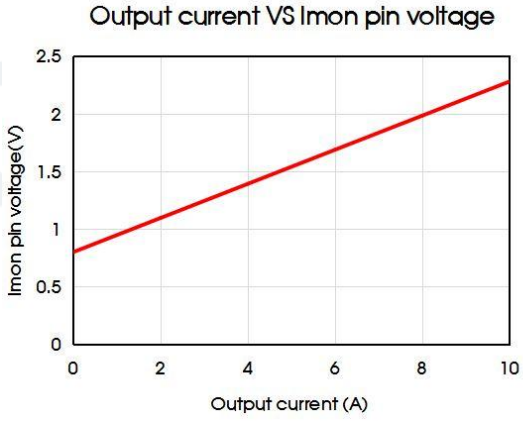
Calculation formula of output current adjustment:

$$I_o = \frac{1209}{3R_2+155.82} + 4.87$$

Notes:

1. Adjustable range of output current: 5-10A;
2. R2 is external resistance, in kΩ;
3.When the Iset pin is opened, the output current ≤7A.

## The Output Current Detection Imon




Calculation formula of the Imon pin voltage and output current:

$$V_{Imon} = \frac{3.64+0.676Io}{4.568}$$

Notes:

1. VImon is the Imon pin voltage, in V. The VImon voltage is referenced to output 0V.
2. Io is the output current, in A.

## Design Reference

### 1. Typical application

1.During testing and application, please follow the recommended test circuit (Figure 6); Be sure to connect an electrolytic capacitor Cin (≥ 220μF) at the input to suppress the surge voltage that may be generated at the input terminal, and connect an electrolytic capacitor Cout(≥ 220μF) at the output, used 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), it may cause the input voltage of the product to be pulled down. Please pay attention to the fluctuation of the input voltage of the product, and it is recommended to increase the electrolytic capacitor at the input terminal appropriately. The capacitance value of Cin is to ensure the stability of the input terminal voltage and avoid the situation that the input voltage is lower than the undervoltage protection point and the product restarts repeatedly.

3. If the output terminal of the product is an inductive load (such as a relay, a motor), it is recommended to increase the value of the output capacitor Cout and add a TVS to filter out the voltage spikes.

4. Input and/or output ripple can be further reduced by appropriately increasing the input & output capacitor values Cin and Cout and/or by selecting capacitors with a low ESR (equivalent series resistance).

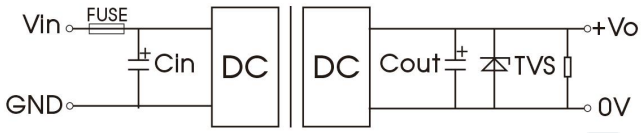



Fig. 6

| FUSE | Cin | Cout | TVS |
|---|---|---|---|
| 20A, slow | 220μF/100V | 220μF/100V | 85V |

Note:

①Please pay attention to the ambient temperature of the product when using an external capacitor, increase the electrolytic capacitor values to at least 1.5 times the original parameter if the ambient temperature is low.

### 2. EMC solution-recommended circuit

We recommended using the circuit shown in Fig.7 during product EMC testing and application.

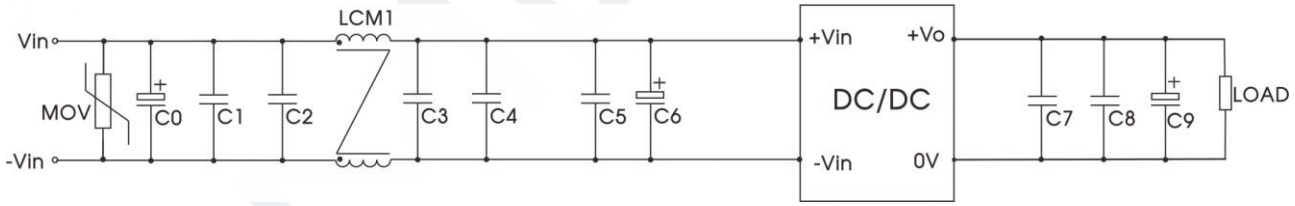


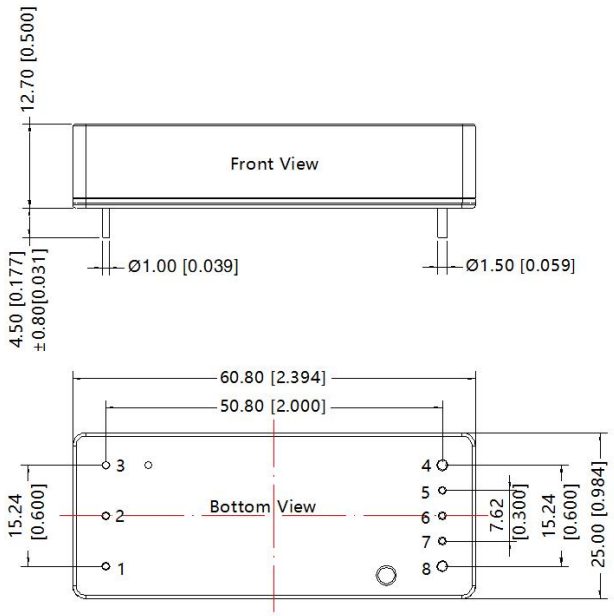

Fig. 7

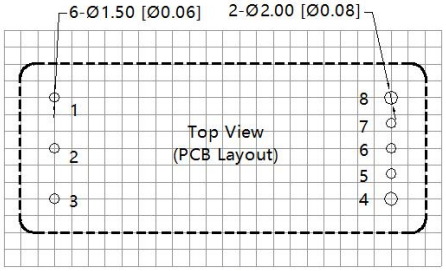
| Components | Recommended Component Value |
|---|---|
| MOV | S14K60 (Varistor) |
| C0 | 680μF/100V electrolytic capacitor |
| C6 | 470μF/100V electrolytic capacitor |
| C9 | 470uF/100V electrolytic capacitor |
| C1, C2, C3, C4, C5, C7, C8 | 4.7μF/100V ceramic capacitor |
| LCM1 | T24 x 23.5 x 19/4mH/35mΩmax |

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

## DNUEB10-B4836(-RS) Dimensions and Recommended Layout

THIRD ANGLE PROJECTION



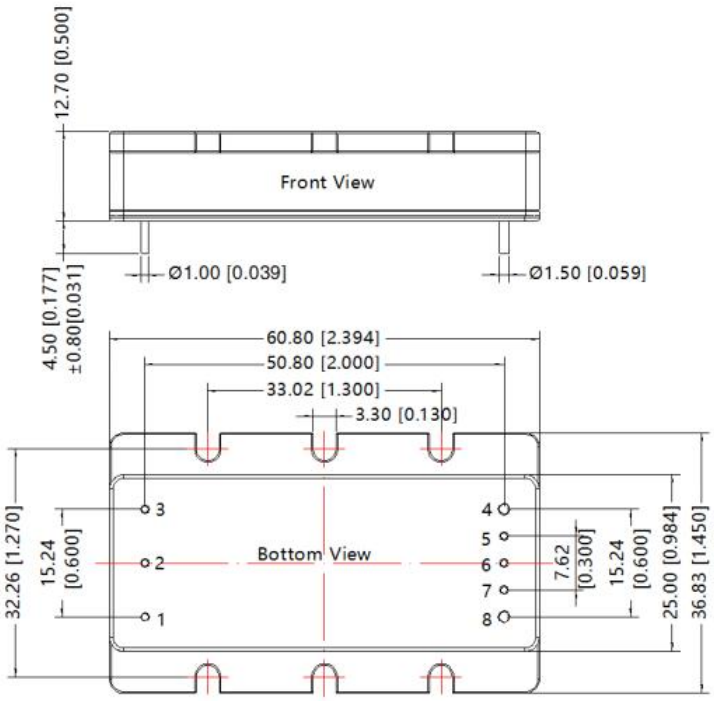




Note: Grid 2.54*2.54mm

Note:
Unit: mm[inch]
Pin1,2,3,5,6,7 diameter: 1.00[0.039]
Pin4,8 diameter: 1.50[0.059]
Pin diameter tolerances: ±0.10[±0.004]
General tolerances: ±0.50[±0.020]

| Pin-Out | | | |
|---|---|---|---|
| Pin | Mark | Pin | Mark |
| 1 | +Vin | 5 | Iset |
| 2 | Ctrl | 6 | Vset |
| 3 | -Vin | 7 | Imon |
| 4 | 0V | 8 | +Vo |

## DNUEB10-B4836F(-RS) Dimensions and Recommended Layout




Note:
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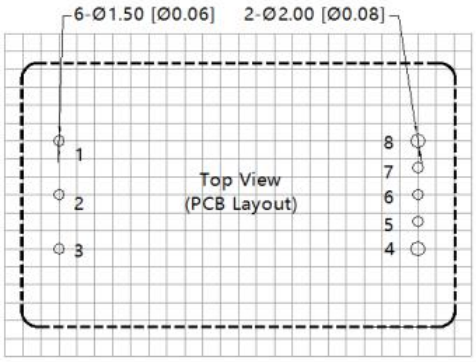


Note: Grid 2.54*2.54mm

| Pin-Out | | | |
|---|---|---|---|
| Pin | Mark | Pin | Mark |
| 1 | +Vin | 5 | Iset |
| 2 | Ctrl | 6 | Vset |
| 3 | -Vin | 7 | Imon |
| 4 | 0V | 8 | +Vo |

Note:
1. If the product is not operated within the required load range, the product performance cannot be guaranteed to comply with all parameters in the datasheet;
2. Unless otherwise specified, parameters in this datasheet were measured under the conditions of Ta=25℃, humidity<75% with nominal input voltage and rated output load;
3. All index testing methods in this datasheet are based on our company corporate standards;
4. Products are related to laws and regulations: see "Features" and "EMC";
5. Our products shall be classified according to ISO14001 and related environmental laws and regulations, and shall be handled by qualified units.