嘉兴斯达半导体有限公司
STARPOWER SEMICONDUCTOR LTD.

POWER MODULES

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www.powersemi.cc

# Installation guide for P1/P2 Modules


# 1.P1/P2 Application Introduction





The package of P1/P2 module has the following advantages：

1) Low thermal resistance, higher power density;
2) Optimize chip layout for high power applications;
3) Low inductance, optimized dynamic performance, suitable for multi-module parallel;
4) Ultrasonic welding of terminals for more harsh environments;
5) High reliability process. long module life;
6) Low contact thermal resistance;

Suitable for wind power, rail transit, high voltage inverter, SVG, photovoltaic power generation, electric vehicle field.

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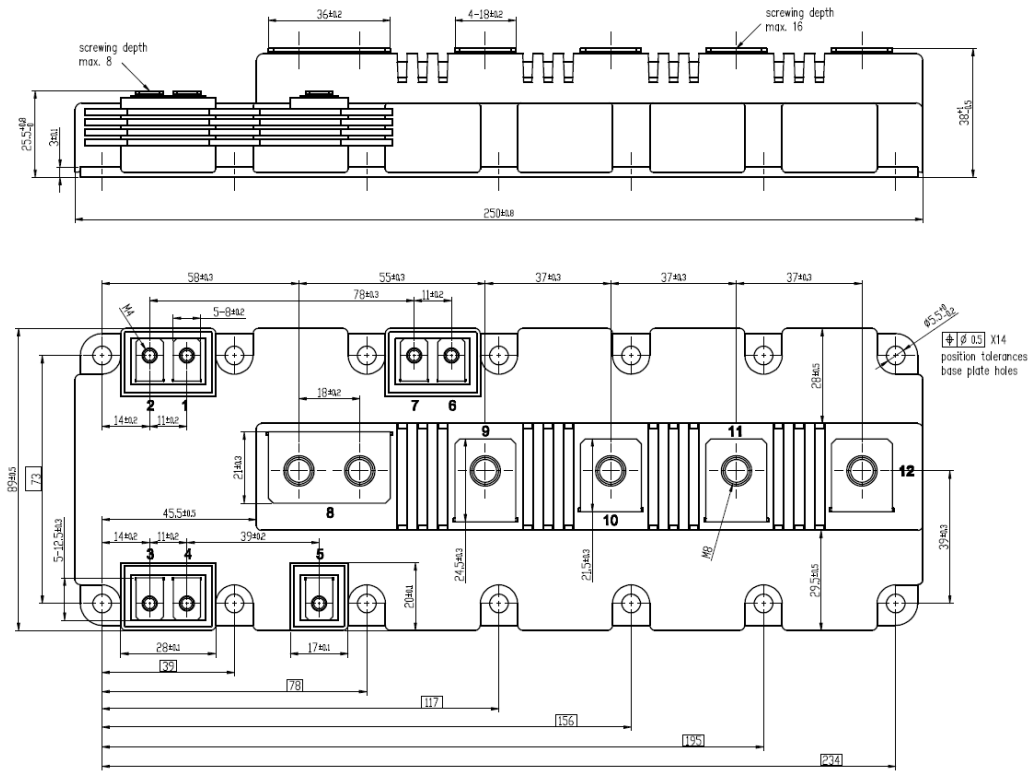
# 2. Module Peripheral Size

## 2.1 P2 peripheral dimension drawing

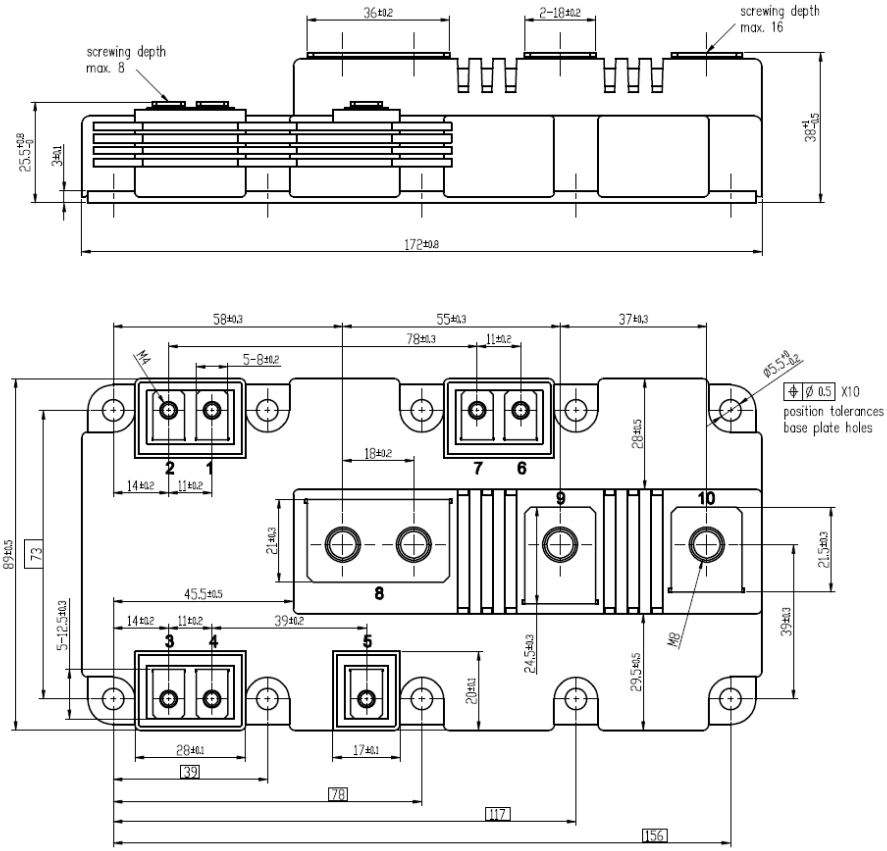



P2 peripheral dimension drawing

## 2.2 Main dimensions and screw specifications of P2

| | Specification |
|---|---|
| Length | 250mm |
| Width | 89mm |
| Height | 38mm |
| Busbar screw | M8 |
| Signal screw | M4 |
| Substrate mounting screw | M5 |

## 2.3 P1 peripheral dimension drawing




P1 peripheral dimension drawing

## 2.4 P1 Main dimensions and screw specifications of the module

| | Specification |
|---|---|
| Length | 172mm |
| Width | 89mm |
| Height | 38mm |
| Busbar screw | M8 |
| Signal screw | M4 |
| Substrate mounting screw | M5 |

# 3. Radiator surface and thermal grease requirements

## 3.1 Radiator surface requirements

| | Surface roughness | Surface flatness |
|---|---|---|
| P1 | 1e-5m | 3e-5m |
| P2 | 1e-5m | 5e-5m |

The heat dissipation of the power module mainly dissipates heat through the heat sink that is in contact with the module. Contact thermal resistance of the module and the heat sink is very critical. If there are pores in the contact area, since the thermal conductivity of the gas is very low, generally only 0.02 K/W*M, the heat transfer efficiency is greatly reduced, and the contact thermal resistance is increased. Ultimately affecting the reliability of the module, Therefore, it is necessary to use a thermal grease having a relatively good thermal conductivity to fill the uneven, uneven surface of the contact area. The surface roughness and flatness requirements of the heat sink are as above. It need to check and clean the radiator before the module is installed, ensure that the surface is not stained, exceed the standard bulge, check the roughness and flatness to meet the above requirements.

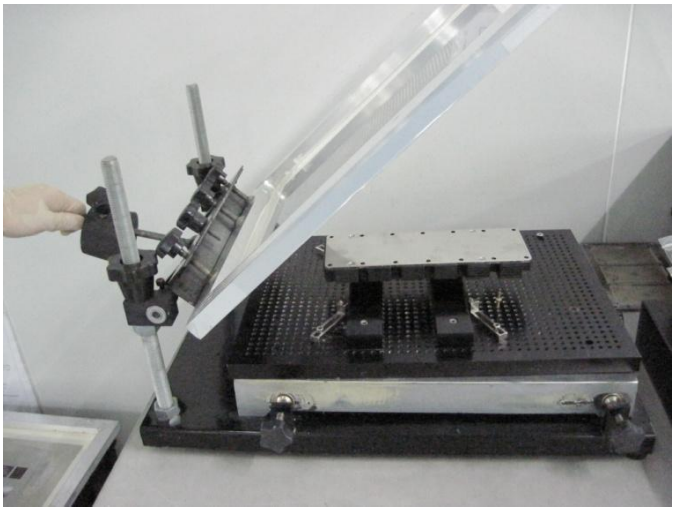
## 3.2 Thermal grease parameters and dosage requirements

| | Thermal Conductivity | Total demand (5e-5m thinkness) |
|---|---|---|
| P1 | >=1K/W*M | 0.740$cm^3$ |
| P2 | >=1K/W*M | 1.062$cm^3$ |

Due to the mismatch of the thermal expansion coefficients of the copper substrate and the insulating substrate, the module substrate may be slightly concave under the insulating substrate. During the module installation process, the thermal grease is required to fill the underside of the insulating substrate. Starpower will measure the substrate curvature of each module before leaving the factory to ensure good heat dissipation after the module is installed. The thermal grease requires a thermal conductivity of not less than 1 K/W*M. In the case of using a steel mesh, the amount of silicone grease used is as shown in the table above.

# 4. Thermal grease application method

## 4.1 Use steel mesh



By specially designing the steel mesh, the distribution of the silicone grease and the uneven distribution of the substrate are consistent. Make sure that the most concave place has sufficient thickness of silicone grease, and Where the substrate is convex, there is a thin thermal grease to obtain the best heat dissipation performance.

Advantages：

①Save thermal grease;

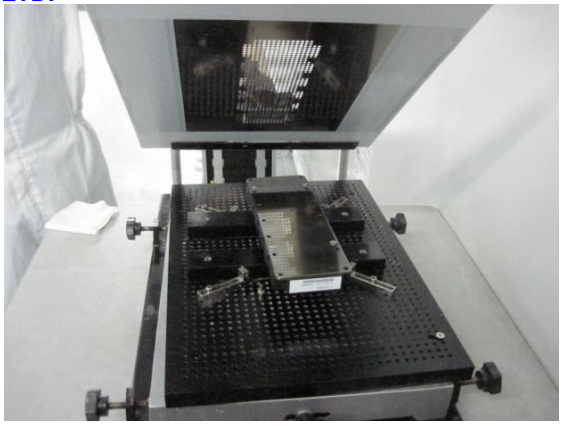
②Designing the distribution of silicone grease according to the uneven shape of the surface of the substrate;

③High production efficiency;

## 4.2 Steel mesh used method

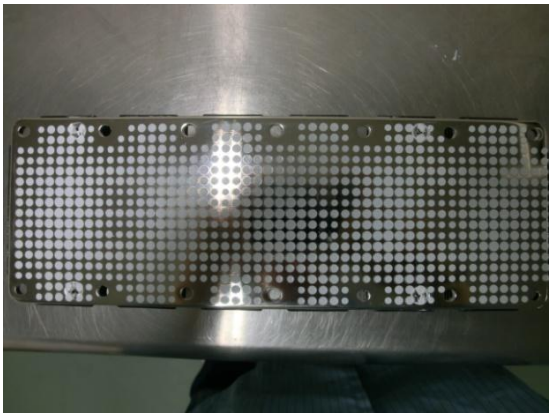
Step one:

Prepare the steel mesh, bracket, and adjust the position of the module and steel mesh. both can be aligned (P1 and P2 steel meshes need to use Starpower's special steel mesh, it can be on the official website. www.powersemi.cc or contact customer service to get the relevant drawings);



Step two:

Printing thermal silica gel, so that the silicone grease is covered on the surface of the substrate, and the force is uniform when printing;



Step three：

Install the stencil with thermal grease on the radiator and use the appropriate mounting torque

## 4.3 Post-installation effect

### 4.3.1 Partial area of silicone grease does't touch

If encounter the above problem, need to confirm the following:

① Whether the flatness of the radiator meets the requirements;
② Whether the thermal grease is evenly applied and the thickness is acceptable;
③ Whether the installation torque and installation sequence is correct;
④ Whether the module substrate is concave;

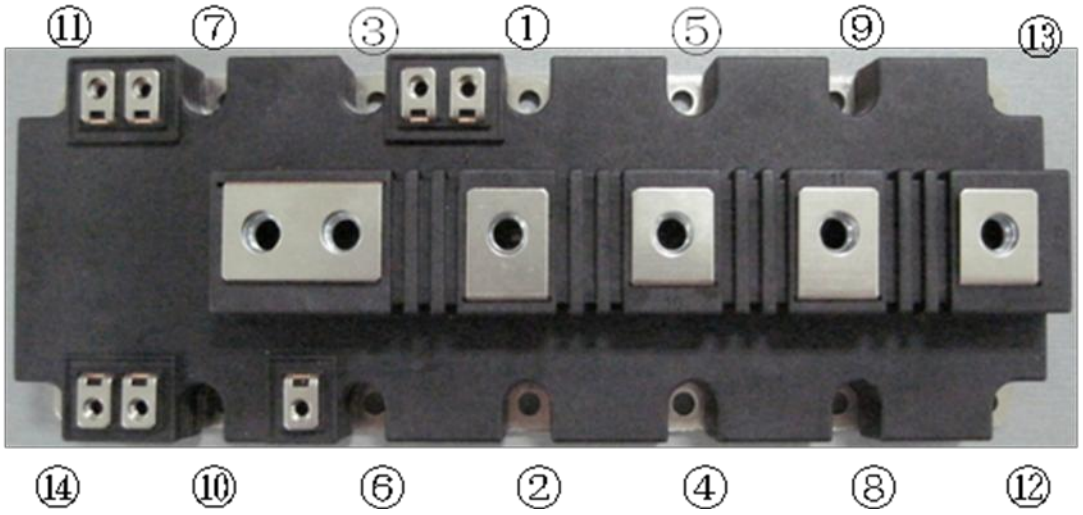
### 4.3.2 Good contact in all areas of silicone grease

Good contact

After good contact, the substrate has a very good heat dissipation effect, improving the service life and efficiency of the module.

# 5. Moudle installation process and requirements

## 5.1 P2 Module installation




Description:

① In order to achieve a good installation effect, the module is required to be in the numerical order of the above figure. 1→2→3→4→5→6→7→8→9→10→11→12→13→14, The screws are pre-tightened with 0.5N*M, then tightened according to the standard torque;

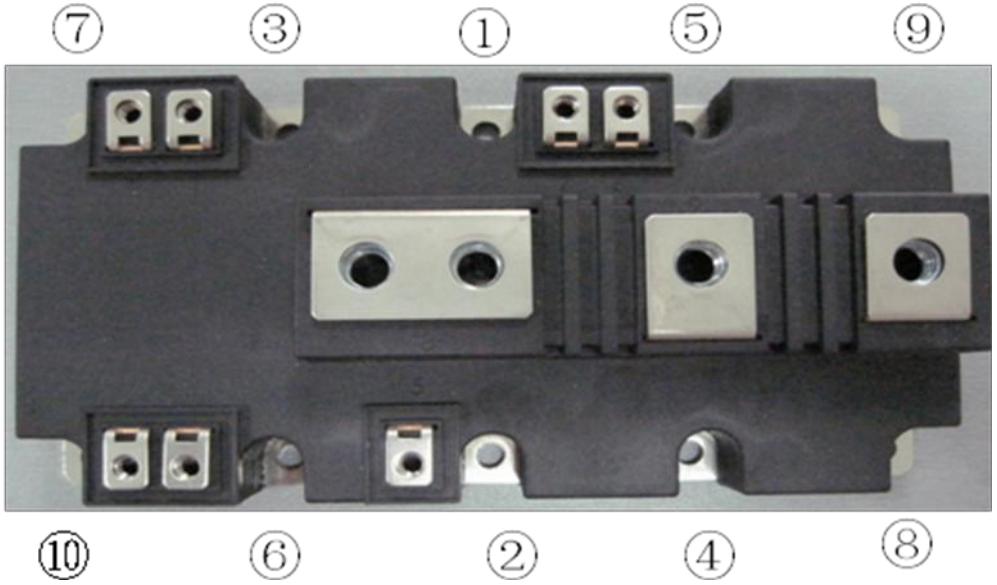
② Mounting screw is M5, torque range is 3-6N*M;

③ The length of the screw needs to be according to the depth of the mounting hole of the radiator. It is recommended that the depth of the radiator hole be greater than 10mm;

④ Screws with anti-slip gaskets are required for applications with vibration;

⑤ Screw mounting is recommended for tools with torque display.

## 5.2 P1 Module installation




## Description

① In order to achieve a good installation effect, the module is required to be in the numerical order of the above figure. 1→2→3→4→5→6→7→8→9→10.
The screws are pre-tightened with 0.5N*M, then tightened according to the standard torque;

② Mounting screw is M5, torque range is 3-6N*M;

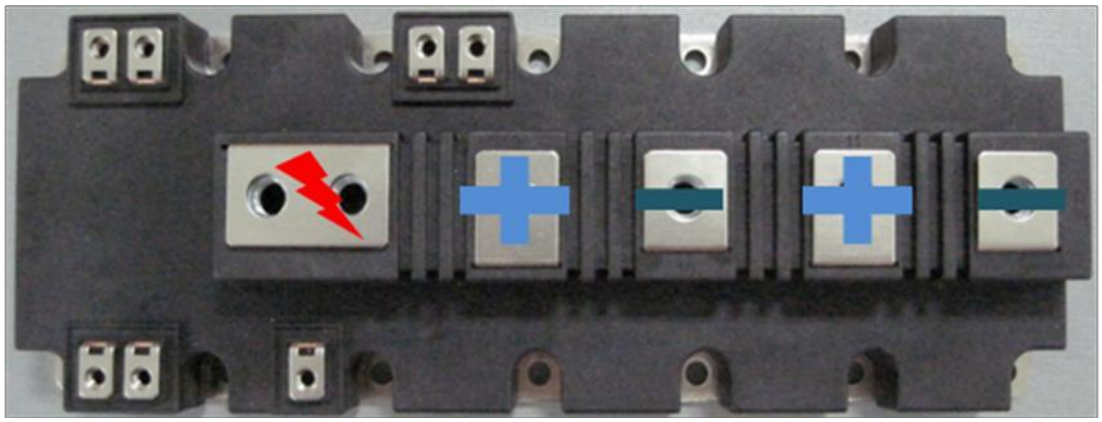
③ The length of the screw needs to be according to the depth of the mounting hole of the radiator. It is recommended that the depth of the radiator hole be greater than 10mm;

④ Screws with anti-slip gaskets are required for applications with vibration;

⑤ Screw mounting is recommended for tools with torque display.

# 6. Busbar and PCB installtion

## 6.1 Busbar installation



Description：

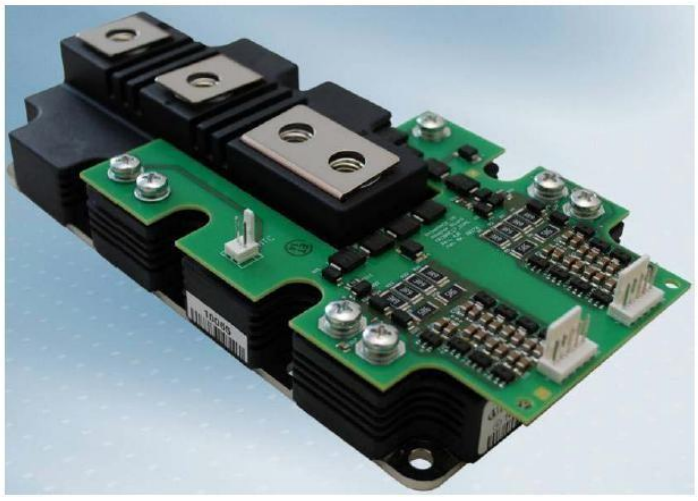
① The figure above is a schematic diagram of the P2 module bus input (including positive and negative) and output (lightning identification);

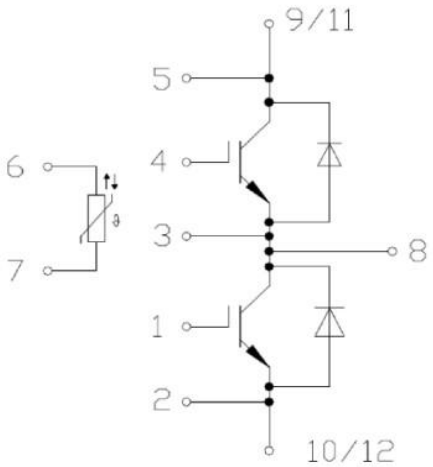
② Busbar installation requires reducing the inductance between the positive and negative.It is recommended to use laminated busbars, and the busbars use copper material;

③ The output terminal requires sufficient current carrying capacity;

④ The busbar is installed with M8 bolts, and the maximum bolt length is referenced to the module dimension drawing;

## 6.2 Driving PCB installation






Half bridge circuit diagram

Description (the half bridge circuit shown is an example):

① The thermistor signal is led through terminals 6 and 7;

② The gate drive is 1, 2, 3, 4, which are the lower and upper tube controls respectively.

③ 5 is the bus input positive signal leading

④ All signal terminals are connected to the PCB via M4 bolts (maximum bolt length reference module size drawing);

⑤ M4 bolt torque range 1.8N*M - 2.1 N*M.