Chapter 6 Mounting Guidelines and Thermal Design

1. Soldering to PCB

Soldering

(1) The IPM temperature during soldering might exceed the absolute maximum rating of the IPM. To prevent damage to the IPM and to ensure reliability, please do not use exceed the following soldering temperature.

Table 6-1 Soldering temperature and immersion time

	Method	Soldering temperature and time
a	Dip soldering / Soldering iron	260±5℃, 10±1sec
b	Dip soldering / Soldering iron	350±10℃, 3.5±0.5sec

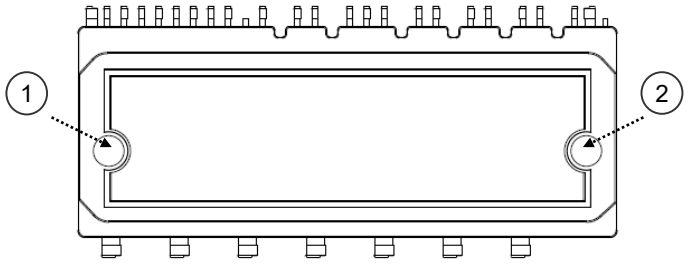
(2) Keep the terminal immersion depth at least 1.5mm away from the lead stopper position. When using flow soldering, be careful not to immerse the package in the solder bath.

(3) We recommend that you do not reuse IPM that have been removed from the PCB. There is possibility that the removed IPM was subjected to thermal or mechanical damage during the removal process.

2. Mounting to Heat Sink

Mounting procedure and precautions

When mounting the IPM to a heat sink, please refer to the following recommended tightening sequence. Uneven tightening due to excessive torque might lead to destruction or degradation of the chip.



Recommended:
Temporary tightening: 1 → 2
Final tightening: 2 → 1

Note) Set the temporary tightening torque to about 30% of the maximum torque rating

Fig. 6-1 Recommended screw tightening sequence

Fig. 6-2 shows the measurement position of the heat sink flatness.
The flatness of the heat sink should be 0μm/100mm to +100μm/100mm, and the surface roughness (Rz) should be less than 10μm.
If the heat sink has a concave surface, a gap occurs between the heat sink and the IPM, leading to reduced cooling efficiency.
If the flatness is +100μm or more, the aluminum base of the IPM may be deformed and cracks could occur in the internal insulating substrate.

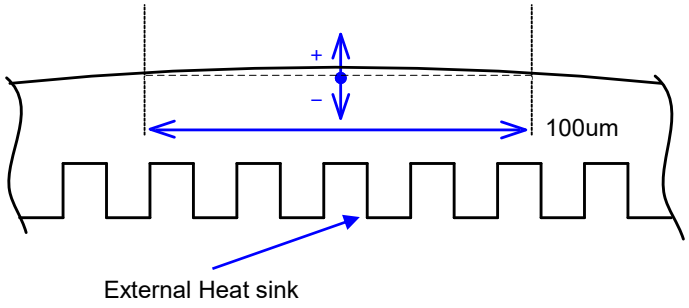


Fig. 6-2 The measurement position of heat sink flatness

In order to obtain effective heat dissipation, apply thermal compound with good thermal conductivity uniformly with thickness of approximately +100um～+200um to the contact surface between the IPM and heat sink.

The recommended thermal compound is G-747 by Shin-Etsu Silicone, and the application quantity is about 0.35g.

3. Spacer Position

When fixing the IPM using a resin spacer or metal spacer between the PCB and the IPM, such as during soldering, it is recommended to support the IPM at the shaded area as shown in Fig. 6-3.

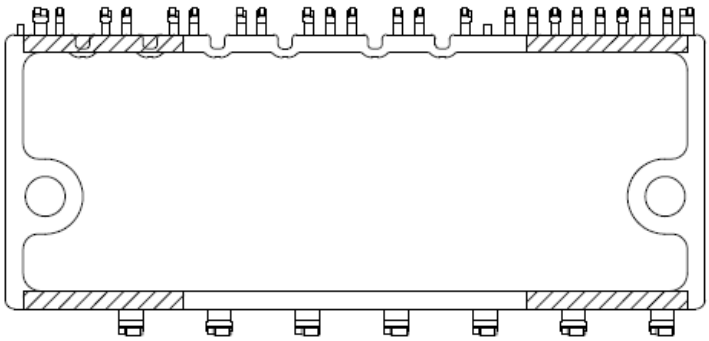


Fig. 6-3 Recommended spacer position

4. Cooler (Heat Sink) Selection

- Please design the cooling body (heat sink) so that the IGBT virtual junction temperature does not exceed the maximum virtual junction temperature T_{vj} for safe operation even during abnormal conditions such as overload.
- Operation of the IGBT at a temperature higher than the maximum virtual junction temperature T_{vj} might cause damage to the chip. In IPM, when the IGBT chip temperature exceeds T_{vj}, the overheating protection function operates. However if the temperature rises rapidly, the chip might not be protected.
- Similarly, please make sure that the FWD chip temperature does not exceed the T_{vj} too.
- When selecting a cooling body (heat sink), please verify the chip temperature by measuring at the position shown in Figure 2-3.

Please refer to Chapter 6, Section 2 and the following document for more details about thermal design:
“FUJI IGBT MODULES APPLICATION MANUAL (RH984e)”

Contents:

- Power dissipation loss calculation
- Selecting heat sinks
- Heat sink mounting precautions
- Troubleshooting