Chapter 6

Mounting Guideline and Thermal System Design

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1. Soldering to PCB

Soldering

(1) Soldering involves temperatures which exceed the device storage temperature rating. To avoid device damage and to ensure reliability, observe the following guidelines from the quality assurance standard.

Table 6.1 Solder temp. and duration

	Methods	Soldering Temp. & Time	Note
a	Solder dipping / Soldering iron	260±5℃, 10±1sec	
b	Solder dipping / Soldering iron	350±10℃, 3.5±0.5sec	

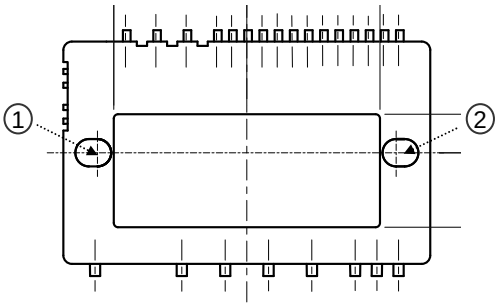
(2) The immersion depth of the lead should keep the distance 1.5mm from the device. When flow-soldering, be careful to avoid immersing the package in the solder bath.

(3) We do not recommend to re-use the device once after solder is removed and detached from the board. The detached device may not withstand the thermal when solder is removed, or damage by mechanical force.

2. Mounting to Heat sink

Mounting method and basic precautions

When installing the IPM to a heat sink, please refer to the following recommended order of fastening conditions, excessive uneven fastening force might be caused destruction and degradation of a chip.



Recommended:

Pre-screwing:

1 → 2

Final screwing:

2 → 1

Note: the pre-screwing torque is set to 30% of the maximum torque rating.

Fig.6-1 Recommended screw fastening order

Fig.6-2 shows the measurement position of heat sink flatness. Finish the heat sink surface within roughness of 10µm and flatness (camber) between screw positions of 0 to +100µm.
If the heat sink surface is concave, a gap occurs between the heat sink and the IPM, leading to deterioration of cooling efficiency.
If the flatness is +100 µm or more, the aluminum base of the IPM is deformed and cracks could occur in the internal isolating substrates.

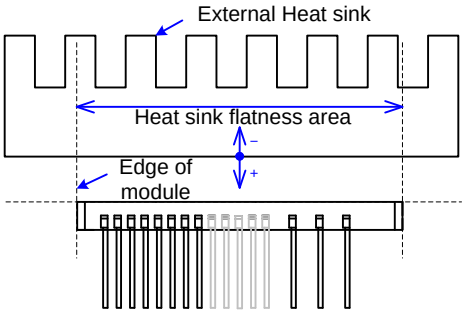
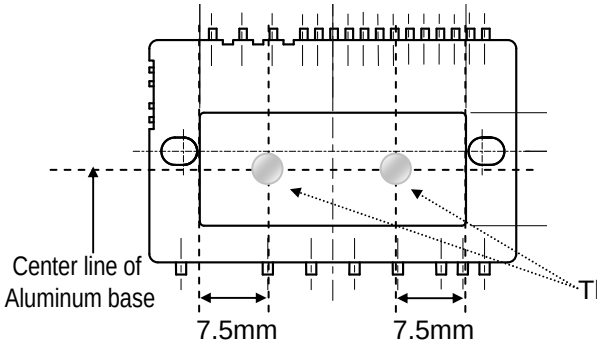


Fig.6-2 The measurement position of heat sink flatness.

In order to obtain effective heat dissipation, Thermal compound with good thermal conductivity should be applied evenly with about +50µm on the contacting surface of this device and heat sink. Refer to the following for an application position and application quantity.



Recommended:

Product name: G-747 (Shin-Etsu Silicones)

Application position: The end of an aluminum base to 7.5mm.

Application quantity: 0.03g at each point

Fig.6-3 Recommended an application position and application quantity.

3. Cooler (Heat Sink) Selection Method

- To safeguard operation of the IGBT, make sure the junction temperature Tj does not exceed Tjmax. Cooling should be designed in such a way that ensures that Tj is always below Tjmax even in abnormal states such as overload operation as well as under the rated load.
- Operation of IGBT at temperatures higher than Tjmax could result in damage to the chips. In the IPM, the TjOH protection function operates when the chip temperature of IGBT exceeds Tjmax. However, if the temperature rises too quickly, the chip may not be protected.
- Likewise, note that the chip temperature of FWD should not exceed Tjmax.
- When selecting the cooler (heat sink), always measure the temperature directly in Fig.2-2.

For the concrete design, refer to chapter 6 section 2 and the following document.

“IGBT MODULE APPLICATION MANUAL REH984b”

Contents:

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