Chapter 6

# Mounting Guideline and Thermal Design

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# 1. Soldering to PCB

**Soldering**

(1) The device temperature during soldering is possible to exceed the maximum storage temperature. To avoid device damage and to ensure reliability, the following guidelines are recommended from the quality assurance standard.

Table 6.1 Soldering temperature 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 | |

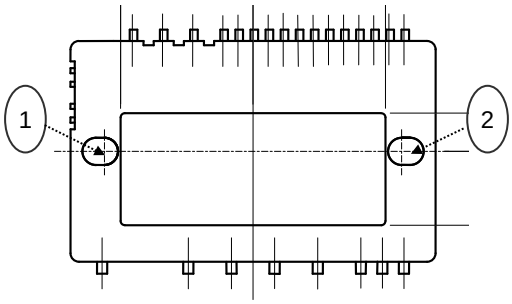
(2) The immersion depth of the lead terminal should keep the distance 1.5mm apart from the device. When using flow-soldering, be careful to avoid immersing the package in the solder bath.

(3) We do not recommend to re-use the device once after solder is removed and detached from the board. The detached device from PCB might be damaged by thermal or mechanical stress when the solder is removed.

# 2. Mounting to heat sink

Mounting procedure and precautions

When mounting the IPM to a heat sink, please refer to the following recommended procedure of fastening conditions. One side screwing with excessive torque might cause a destruction and degradation of the 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 procedure

Fig.6-2 shows the measurement position of heat sink flatness.

The heat sink flatness should be from 0um/100mm to +100um/100mm, and the surface roughness (Rz) should be less than 10μm.
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.

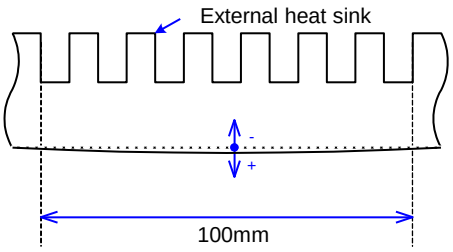
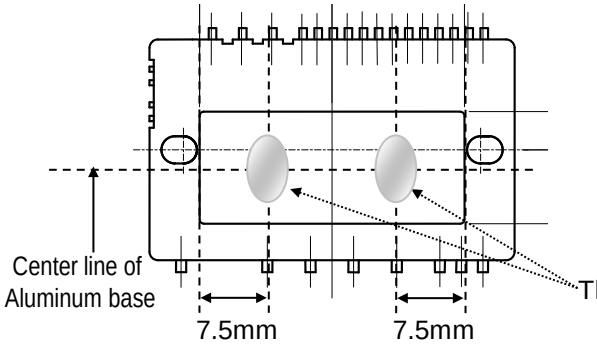



Fig.6-2 The measurement point of heat sink flatness

In order to obtain effective heat dissipation, thermal compound with good thermal conductivity should be applied uniformly with +50μm thickness on the contacting surface between the IPM and heat sink.
Refer to the following information for an application position and application quantity.




Recommended:

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

Application position : 7.5mm apart from the eadge of aluminum base

Application quantity : 0.03g

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

# 3. Cooler (Heat Sink) Selection Method

• Please make sure that the junction temperature Tj should not exceed Tjmax for safe operation. Cooling device (heat sink) should be designed to ensures that Tj is always below Tjmax even in abnormal conditions such as overload operation as well as under the rated load.

• If the IGBT junction temperature is higher than Tjmax, it might cause a damage to the chips. The TjOH protection function works if the junction temperature exceeds Tjmax.
However, if the temperature rises too quickly, the TjOH protection may not work.

• Please note that the junction temperature of FWD should not exceed Tjmax also.

• When selecting a cooling device (heat sink), please measure the temperature directly as shown in Fig.2-2.

For more detail about thermal design, please refer Chapter 6 Section 2 of this note and “IGBT MODULE APPLICATION MANUAL REH984b”

Contents:

• Power dissipation loss calculation

• Selecting heat sinks

• Heat sink mounting precautions

• Troubleshooting