Chapter 6

Mounting Guideline and Thermal Design

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1. Soldering to PCB

Soldering

(1) The device temperature during soldering might exceed the maximum storage temperature. To prevent damage to the device and to ensure reliability, please use the following soldering temperature.

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	

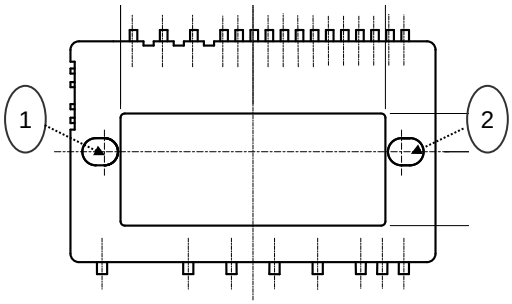
(2) The immersion depth of the lead terminal should be more than 1.5mm apart from the device. When using flow-soldering, be careful to avoid immersing the package in the solder bath.

(3) It is not recommended to reuse the device after it is removed from the circuit board. There is a possibility that the removed device 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 fastening order. Uneven fastening due to excessive torque might lead to destruction or 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 0μm/100mm to +100μm/100mm, and the surface roughness (Rz) should be less than 10 μm.
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.

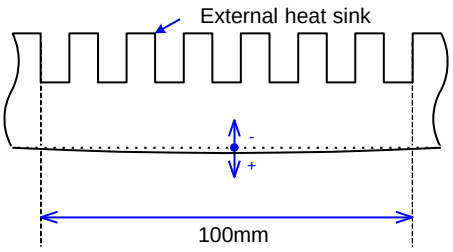
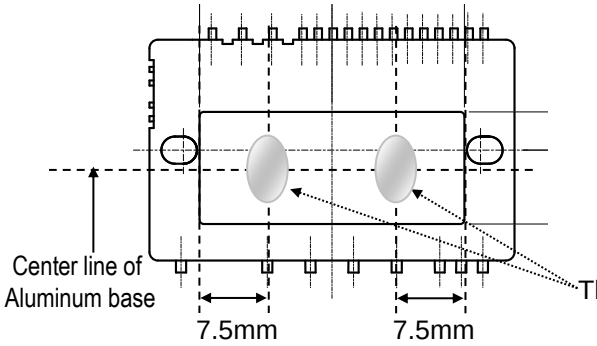


Fig.6-2 The measurement point of heat sink flatness

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 T_j should not exceed the maximum junction temperature $T_{j(max)}$ for safe operation. Cooling device (heat sink) should be designed to ensures that T_j is always below $T_{j(max)}$ even during abnormal conditions such as overload operation as well as during rated load.

• If the IGBT junction temperature is higher than $T_{j(max)}$, it might cause damage to the chips.
The over-heating (OH) protection function works when the IGBT junction temperature exceeds $T_{j(max)}$.
However, if the temperature rises too quickly, the OH protection might not work.

• Please note that the junction temperature of FWD should not exceed $T_{j(max)}$ also.

• When selecting a cooling device (heat sink), please verify the chip temperature by measuring at the position shown in Figure 2-2.

For more detail about thermal design, please refer Chapter 6 Section 2 of this note and “IGBT MODULE APPLICATION MANUAL (REH984c)”

Contents:

• Power dissipation loss calculation

• Selecting heat sinks

• Heat sink mounting precautions

• Troubleshooting