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>
<thead>
<tr>
<th>Methods</th>
<th>Soldering Temp. &amp; Time</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>a Solder dipping / Soldering iron</td>
<td>260±5℃, 10±1sec</td>
<td></td>
</tr>
<tr>
<td>b Solder dipping / Soldering iron</td>
<td>350±10℃, 3.5±0.5sec</td>
<td></td>
</tr>
</tbody>
</table>

(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 screw fastening procedure](image)

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

![The measurement point of heat sink flatness](image)

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 application position and application quantity](image)
3. Cooler (Heat Sink) Selection Method

- Please make sure that the junction temperature $T_j$ should not exceed $T_{j\text{max}}$ for safe operation. Cooling device (heat sink) should be designed to ensure that $T_j$ is always below $T_{j\text{max}}$ even in abnormal conditions such as overload operation as well as under the rated load.
- If the IGBT junction temperature is higher than $T_{j\text{max}}$, it might cause a damage to the chips. The $T_{j\text{OH}}$ protection function works if the junction temperature exceeds $T_{j\text{max}}$. However, if the temperature rises too quickly, the $T_{j\text{OH}}$ protection may not work.
- Please note that the junction temperature of FWD should not exceed $T_{j\text{max}}$ 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