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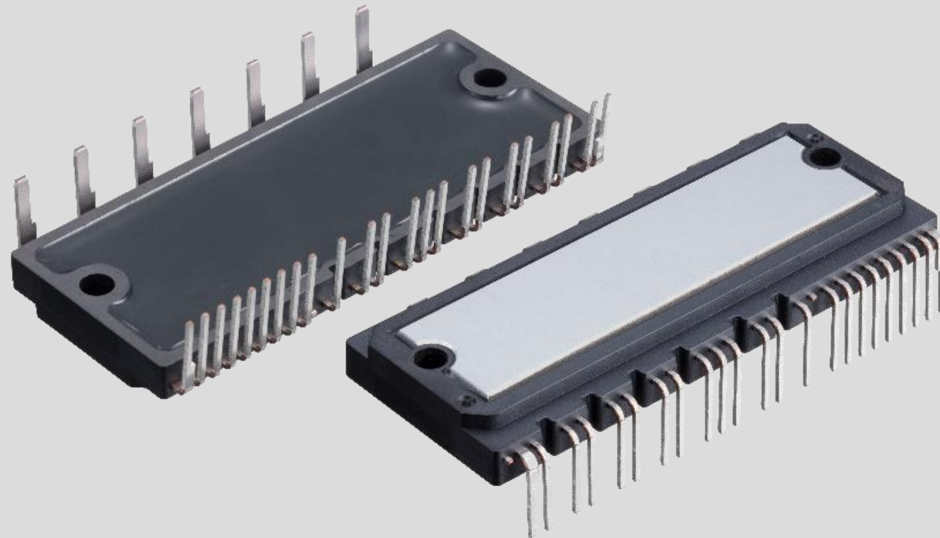

Fuji Small IPM (Intelligent Power Module)
P642 Series
6MBP**XT*065-50
Chapter 6 Mounting Guidelines and Thermal Design

Application Manual

July 2022

Fuji Electric Co., Ltd.

MT6M15234 b

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Chapter 6 Mounting Guidelines and Thermal Design

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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
Dip soldering	260±5°C, 10±1sec

(2) A stopper is provided on the terminal to prevent the immersion depth of the terminal from coming too close to the product body. Use this stopper to secure the required distance from the printed circuit board and prevent the product body from being immersed in the solder bath during flow soldering.

(3) It is not recommended to reuse the product after it is removed from the printed circuit board because there is a possibility that the removed product was subjected to thermal or mechanical damage during the removal process.

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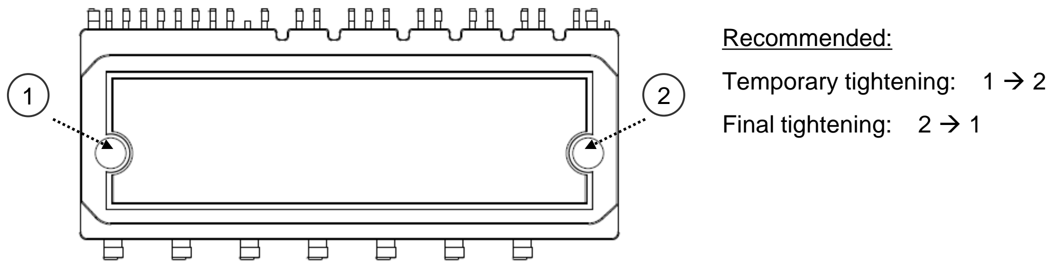
2. Mounting to Heat Sink

<u>Mounting procedure and precautions</u>

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.



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.

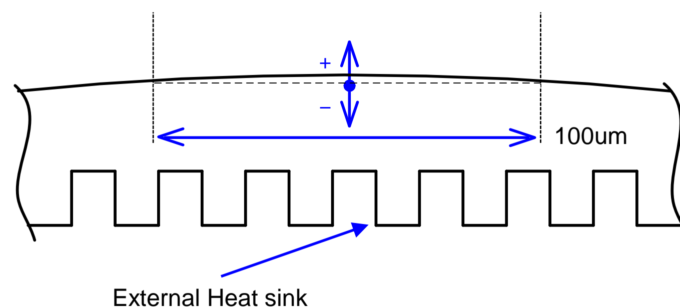


Fig. 6-2 The measurement position of heat sink flatness

It is recommended to apply thermal grease using a stencil mask to obtain the heat dissipation effect. The stencil mask is described in the mounting instructions (MT6M16534).

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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.

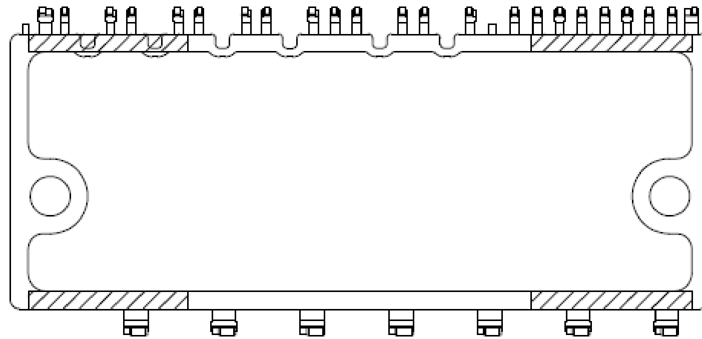

Fig. 6-3 Recommended spacer position

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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 (REH984e)"

Contents:

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

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