

## Mounting Instruction

### Solder-pin type Small-PIM

#### Revised Records

Date	Version	Contents
Apr.-25th-2013	1.0	-
Oct.-25th-2013	1.1	Attention about removing the module from a heat sink
Jan.-27th-2016	1.2	Attention about thermal paste
Oct.-17th-2016	1.3	Attention about thermal paste
Oct.-10th-2018	1.4	Added section 9

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**1** General Information

This application note describes the recommended mounting process of Fuji Electric (here in after Fuji) Solder-pin type Small-PIM.

This application note cannot cover every type of application and/or conditions. Therefore, Fuji Small-PIM, which is used out of these suggestions on mounting process, will not have any warranty and/or guarantee under any circumstances. We recommend you or your technical partners to confirm throughout electro-mechanical evaluation in practical applications.

**2** Requirements for PCBs

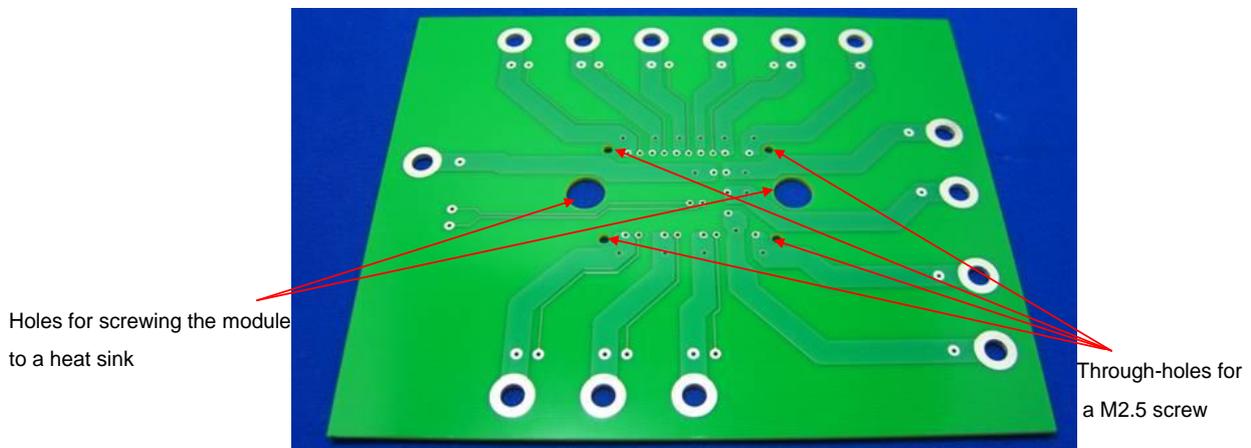


Fig. 1 An example of a PCB

This chapter describes the PCB recommendation for the Small-PIM.

Fig. 1 shows an example of a PCB. \*It is a temporary PCB for measurement, is not an actual PCB for inverter application. The thickness of the PCB must be less than 2mm. The PCB needs 2 holes for screwing the module to a heat sink. The distance between two holes is  $53.0 \pm 0.1$ mm. \*If the module is mounted to a heat sink before soldering process, these two holes are not essential. The PCB needs 4 through-holes for M2.5 screw fixing the PCB to the module.

**3 Fixing a PCB to the Module**

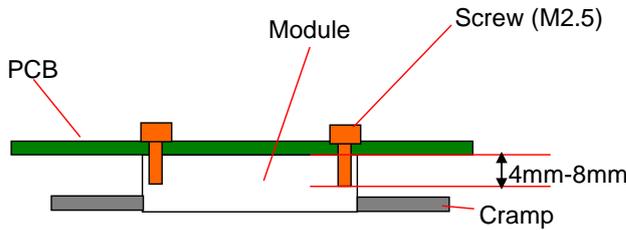


Fig. 2(a) Fix a PCB to the module by screws

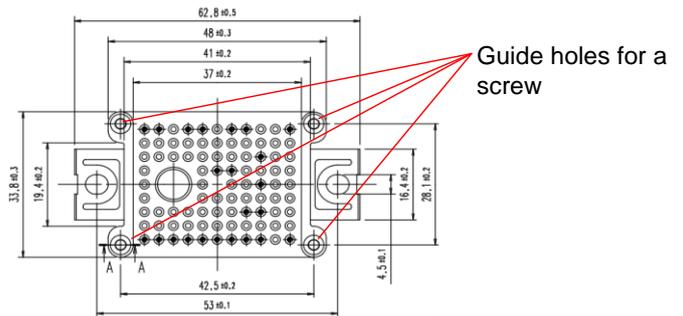


Fig. 2(b) Guide holes for a screw (1B)

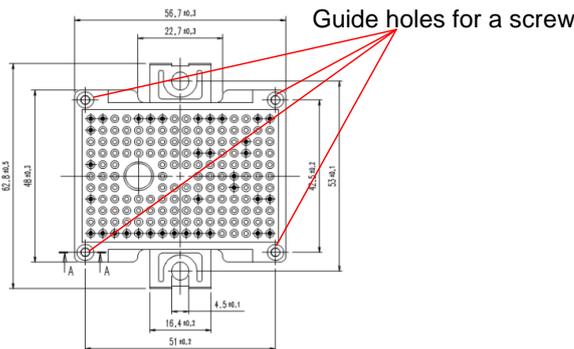


Fig. 2(c) Guide holes for a screw (2B)

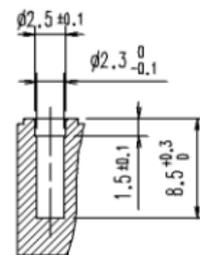


Fig. 2(d) Cross section of a guide hole

After soldering process, it is recommended to fix a PCB to the module by screws because of the solder joint reliability. Fig. 2(a) shows an example of fixing process. M2.5 screws are suitable. The effective length of a screw except the PCB thickness, have to be 4.0-8.0mm. Screwdriver speed n must be smaller than 300rpm, screw driver torque; 0.4Nm±10% s recommended.

**4 Requirements for a Heat Sink**

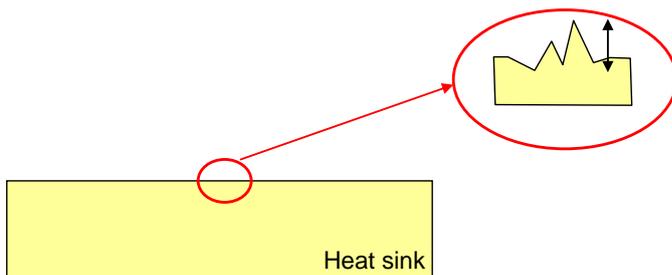


Fig. 3(a) Roughness of a heat sink

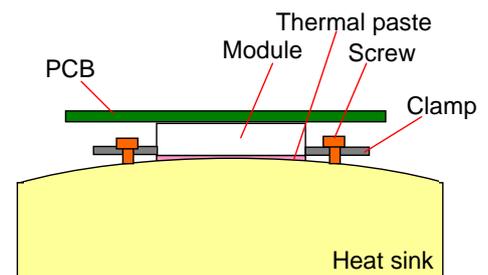


Fig. 3(b) Flatness of a heat sink

A heat sink for module assembly must fulfill below surface condition.

- (1)The roughness of a heat sink must be smaller than 10μm.
- (2)The heat sink flatness based on a length of 100mm must be smaller than 50μm.

\*The flatness must be less than above value in the module mounting area including two screw clamps.

**5 Application of Thermal Paste**

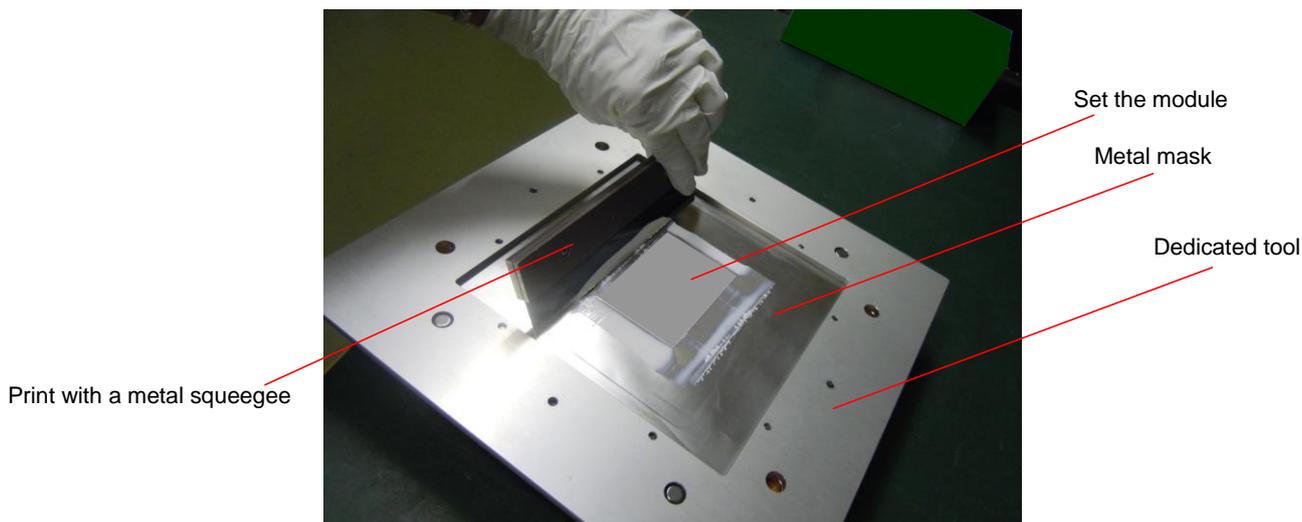


Fig. 4 Stencil printing process

Thermal paste thickness strongly affects the thermal resistivity between the module and a heat sink. Stencil printing process is recommended to control thermal paste thickness. Fig. 4 shows an example of stencil printing process. Thermal paste thickness 80μm is recommended.

An example of recommendation thermal paste is indicated in table 1.

Table1 Example of thermal paste

Model	Manufacturer
G-776	Shin-Etsu Chemical Co., Ltd.
TG320	NIHON HANDA Co.,Ltd.

**6 Mounting the Module to a Heat Sink**

In case of mounting on a heat sink, use thermal paste to secure thermal conductivity. If the thermal paste amount was not enough or applying method was not suitable, its spreading will not be enough, then thermal conductivity will be worse and thermal run away destruction may occur. Confirm spreading condition of the thermal paste. Power cycle capability is possibly decreased due to deterioration or depletion of the thermal paste in high temperature operation if an improper thermal paste is used. Please pay careful attention to selection of a proper thermal grease.(Spreading condition of the thermal paste can be confirmed by removing the module after mounting.)

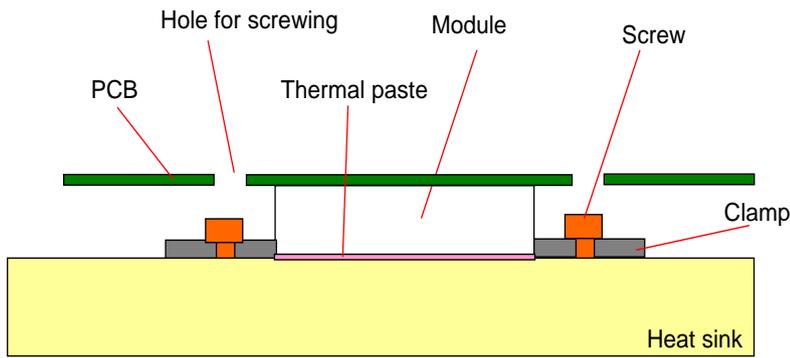
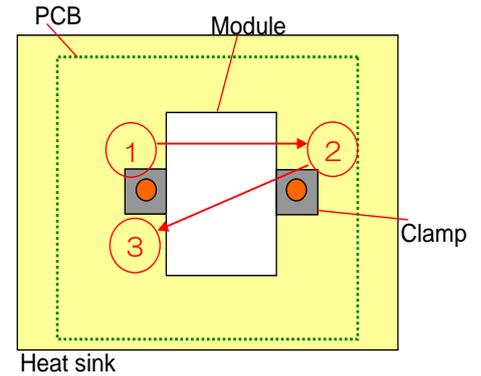


Fig. 5(a) Mount the module to a heat sink



- 1; Pre-screwing by torque 0.5Nm
- 2; Screwing by torque 1.3-1.7Nm
- 3; Screwing by torque 1.3-1.7Nm

Fig. 5(b) Recommended sequence of screwing (1B, 2B)

Fig. 5 shows an example of mounting process by screwing. If mounting process is applied after soldering, a PCB must have two holes for screwing. M4 screws and 9mm washers are recommended. Recommend screw torque and screw sequence is shown in fig. 5(b). In the screwing process, the module should be held in place in order not to lean.

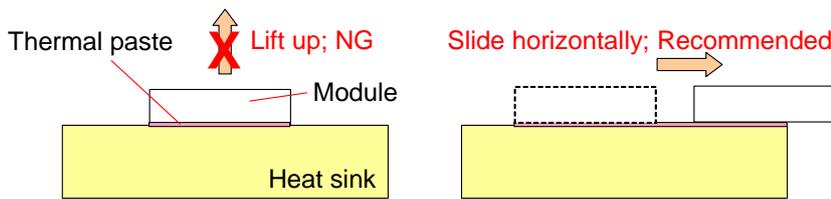


Fig. 6(a)

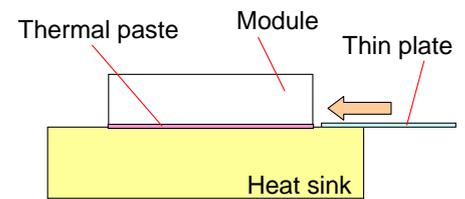


Fig. 6(b)

Fig. 6 An example of removal process after the screwing

Fig. 6(a); Slide the module horizontally to the outside of the heat sink carefully, don't lift up.

Fig. 6(b); Insert a thin plate between the module and the heat sink carefully.

After the module has been set on the thermal paste, it is possible to remove the module from the heat sink before the module is screwed to the heat sink.

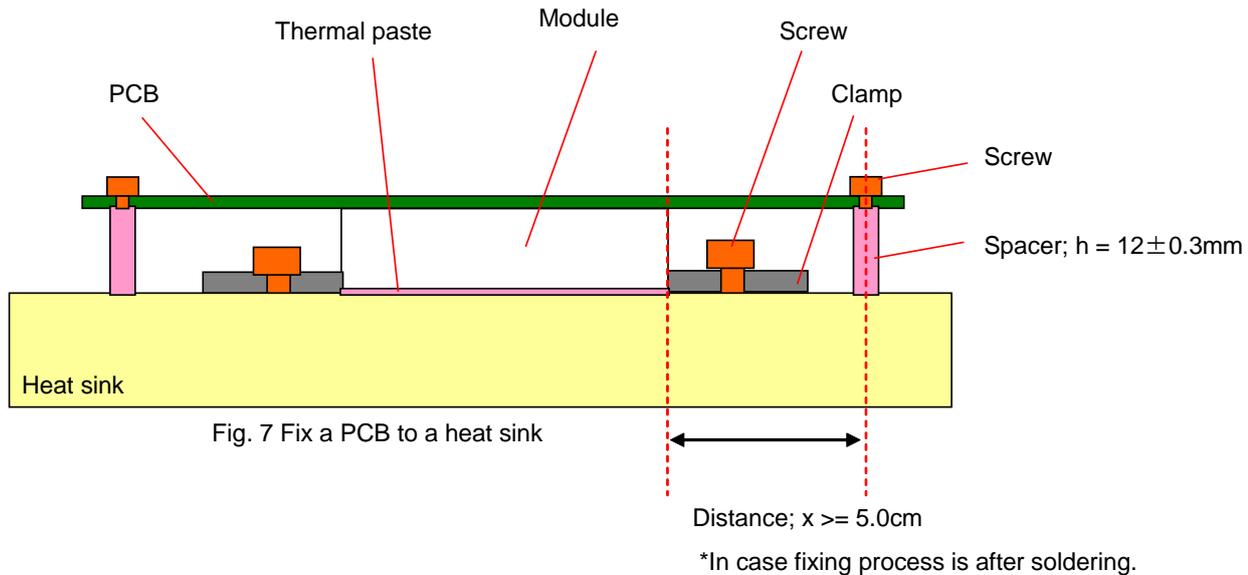
After the screwing, it is not recommended to remove the module from the heat sink because it causes a module failure arising from a module structure deformation.

In case of removing the module from the heat sink, please try below methods. It needs special attention for the removal process to avoid module destruction or failure. It is recommended to check the isolation of the module after the removal process.

## 7 Fixing a PCB to a Heat Sink

To ensure solder joint reliability against vibration, it is good to fix a PCB to a heat sink by spacers and screws. Fig. 7 shows an example of fixing process.

The arrangement of a spacer is restricted to avoid excess stress of solder joint. The distance between the module outer edge and the spacer center line must be more than 5.0cm in case that fixing process is after soldering. In case that fixing process is before soldering, the distance less than 5.0cm is allowable.



## 8 Storage and Transport condition

(1) The module should be stored at a standard temperature of 5 to 35°C and humidity of 45 to 75%.

Be careful to solderability of the terminals if the module has passed over one year from manufacturing date, under the above storage condition.

- (2) Store modules in a place with few temperature changes in order to avoid condensation on the module surface.
- (3) Avoid exposure to corrosive gases and dust.
- (4) Avoid excessive external force on the module.
- (5) Store modules with unprocessed terminals.
- (6) Do not drop or otherwise shock the modules when transporting.

**9** Mounting surface

Fingerprints and/or discoloration on the mounting surface do not affect the thermal behavior. The following figure (Figure 8) defines surface characteristics, which do not affect the thermal behavior.



Figure 8 examples of discoloration on mounting surfaces which do not affect the thermal behavior

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