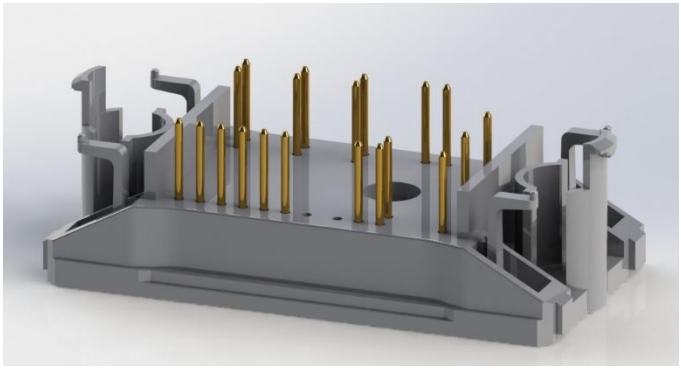
Assembly Instruction for F-Series Module with PressFIT PIN



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1 General Information

1.1 Introduction

F-module has the following advantages:

1. Low thermal resistance, higher power density.
2. Optimized chip layout for easy drive control.
3. Suitable for inverter, servo control and other fields.

1.2 Module Dimensions

[Figure 1] shows the technical drawing of F-module. The main dimensions and screw specifications are listed in [Table 1].

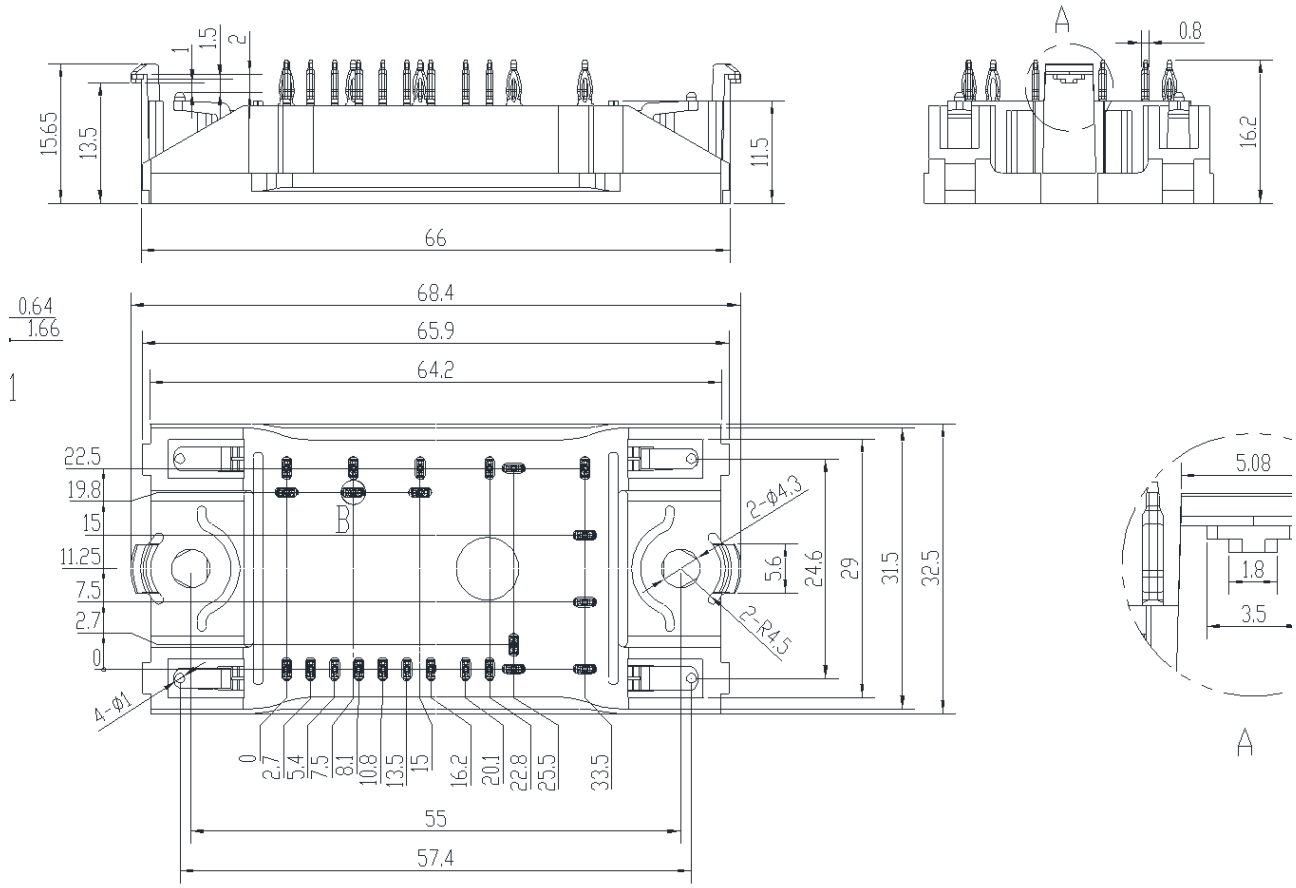


Figure 1: Technical drawing of F-module.

Table 1: Main dimensions and screw specifications.

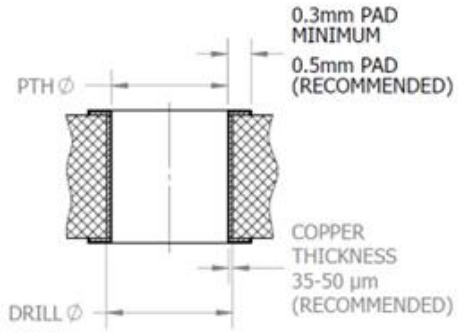
Item	Specification
Length	68.4 mm
Width	32.5 mm
Height	16.2 mm
Base plate mounting screw	M4

2 Requirements for PCB

The PressFIT technology used in the F-series modules has been inspected and qualified by Starpower AG in China for Standard FR4 PCB's with tin applied chemically (IEC 60352-5).

Correct design of the plated through holes (PTH) in the PCB is essential to obtain a reliable connection between PTH and PressFIT PIN. [Table 2] lists the requirements of the PCB.

Table 2: Requirements for PCB.

	Metric (mm)	
Drill diameter	φ1.6±0.025	
Copper thickness	0.05±0.025	
Diameter of Plated-through hole(PTH)	φ1.5+0.04 -0.05	

3 Fixing PCB on Heat Sink

The PCB has to be fixed on the heat sink by a support pillar to minimize the mechanical stress on the Pressfit PIN, as shown in [Figure 2]. The number and position of the support pillar are designed according to the system. The height between heat sink and PCB are determined by the press-in process and the tool. In order to reduce the PCB deformation, the recommended height of the support pillar is between 11.7 mm and 11.9 mm.

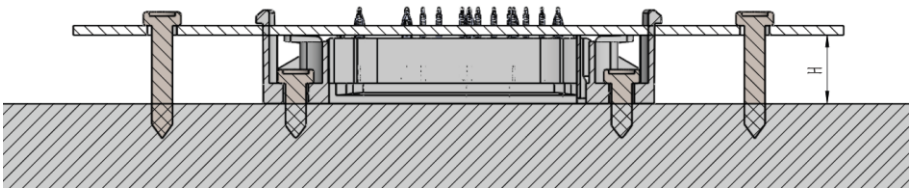


Figure 2: Mounting a PCB to the heat sink.

4 Press-in Process

This section introduces the necessary press-in force and tools for the press-in process. The PressFIT module is pressed into a PCB by using a toggle lever press. A suitable PressFIT speed is chosen to avoid deformation of the pins or a non-gas-tight connection. [Figure 3] shows the assembly drawing of press-in tool. The parameters for press-in process are listed in [Table 3].

The general press-in process can be divided into four steps.

1. The press-in tool and supporting tool should be aligned in the vertical direction to protect the bottom of the module from damage.
2. PCB is placed on the supporting tool and fixed by positioning pins.
3. The module is placed on top of the PCB and fixed by the positioning pins.
4. The upper press-in tool moves downwards to press the module into PCB.

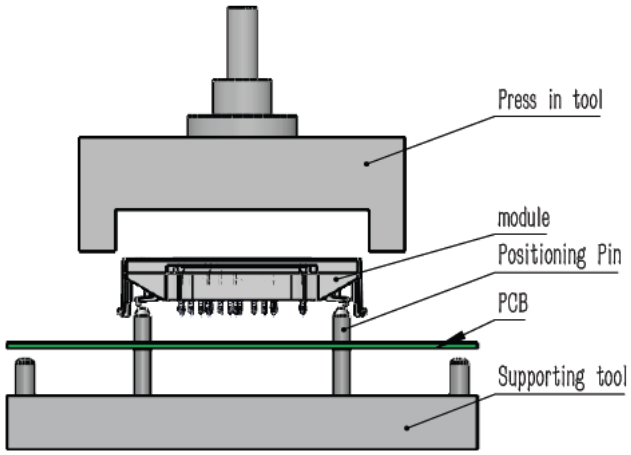


Figure 3: Schematic of press-in process.

Table 3: Parameter for press-in process.

Description	Unit	Min.	Typ.	Max.
Press-in speed	mm/s	0.4	2 -- 4	5
Max allowed press force per pin	N	115		145

The press-in process and press-in tool for TIM module are similar to the module without TIM. However, it should be noted that the TIM honeycombs must be protected during the press-in process. Therefore, the upper press-in tool has to be designed with respect to the position of the TIM material on the base plate of the module. A honeycombs structure with a minimum height of 0.4 mm must be considered on the upper press-in tool to ensure that the press in tool doesn't damage the TIM material. [Figure 4] shows an example of the upper press-in tool for the TIM-module.

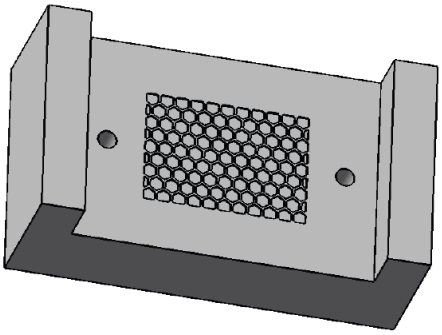


Figure 4: An example of the upper press-in tool for TIM-module.

5 Requirements for Heat Sink

The contact surface between the base plate and the heat sink must be kept clean, free of any contamination to avoid excessive mechanical stress and increased thermal resistance to the module.

The surface of the heat sink should meet the following requirements:

- surface flatness < 50 µm (related to a length of 100 mm)
- surface roughness Rz < 10 µm.

The heat sink must have sufficient rigidity to meet assembly and shipping requirements without introducing additional stress or strain on the base plate.

6 Applying the Thermal Grease on DCB

The heat conductive paste with permanently elastic properties and a favorable heat transfer resistance is selected to fill the gap between two contact surfaces. Screen print process is recommended to apply the thermal grease for a homogenous and reproducible layer thickness. Before the module is mounted on the heat sink, it is recommended to apply the thermal grease with a thickness of 80 - 100 µm to the underside of the module or to the heatsink.

7 Assembling F-Module on Heat Sink

F-module is mounted on the heat sink using M4 screws and flat washers, as shown in [Figure 5]. [Table 4] describes the recommended parameters to mount F-module on heat sink.

In addition, some requirements must be considered when installing the module on the heat sink.

① It is recommended to mount the module on the heat sink in the following sequence: 1→2, as shown in the [Figure 6].
② First tighten the screws slightly with a torque between 0.3 Nm and 0.5 Nm. Then tighten the screw firmly to the heat sink with a torque in the range of 2 Nm to 2.2 Nm.
③ The length of the screw is chosen according to the thread length into the heat sink. The recommended thread length into the heat sink should be min. 5 mm.
④ Screw with non-slip washer is required if the module is used under vibration situation.

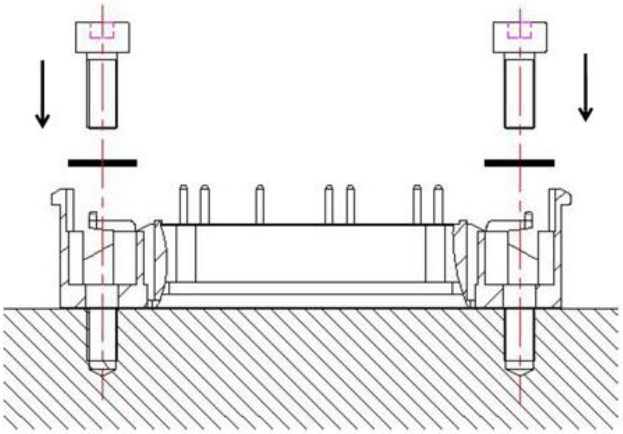


Figure 5: Module fastening on the heat sink.

Table 4: Recommended parameters for heat sink mounting.

Description	Specification
Mounting screw	M4 x 10 mm (The effective thread length into the heat sink is not less than 4 mm)
Recommended washer	M4
Pre-tightening torque	0.3 - 0.5 Nm
Tightening torque	2 - 2.2 Nm
Screw velocity (pre-tightening)	Max. 650 rpm
Screw velocity (tightening)	Max. 15 rpm
Thread length into the heat sink	Min. 5 mm

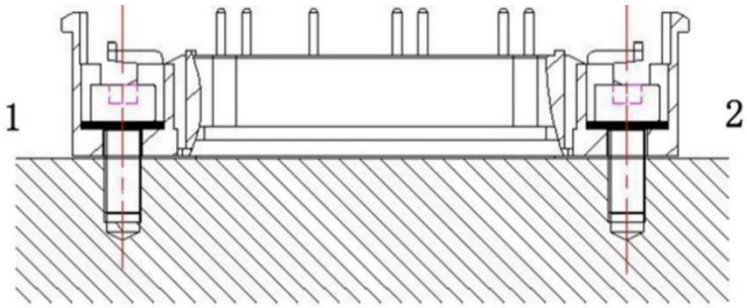


Figure 6: Fastening sequence.