

## PressFIT mounting instructions for Microsemi power modules

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### Introduction:

This application note gives the main recommendations to appropriately connect the PressFIT Microsemi power module into the PCB (Printed Circuit Board) and the heatsink. It is very important to follow the mounting instructions to limit both the thermal and mechanical stresses.

The PressFIT pin technology is a solderless connection method, which ensures reliable mechanical and electrical contact that allows mounting the module on both sides of the PCB.

This application note cannot cover each type of application and condition. The user is responsible to perform any necessary detailed qualification.

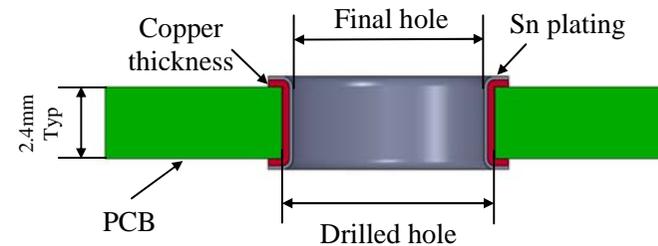
### 1. PCB requirements.

The pressFIT technology is tested and qualified according to IEC60352-5 by Microsemi per the PCB requirements shown in table 1. Should other processing or thickness technologies be used for PCB manufacturing, they must be tested, examined, and qualified.

The PressFIT technology is qualified for FR4 PCB material.

	min	typ	max
Drill hole diameter (mm)	1.575	1.6	1.625
Final hole diameter (mm)	1.39		1.54
Copper thickness in the hole ( $\mu\text{m}$ )	25		
Sn plating in the hole ( $\mu\text{m}$ )	4		10
Copper thickness of the circuit board copper track ( $\mu\text{m}$ )	35	70	
PCB thickness (mm)	2	2.4	

Table 1: PCB requirements



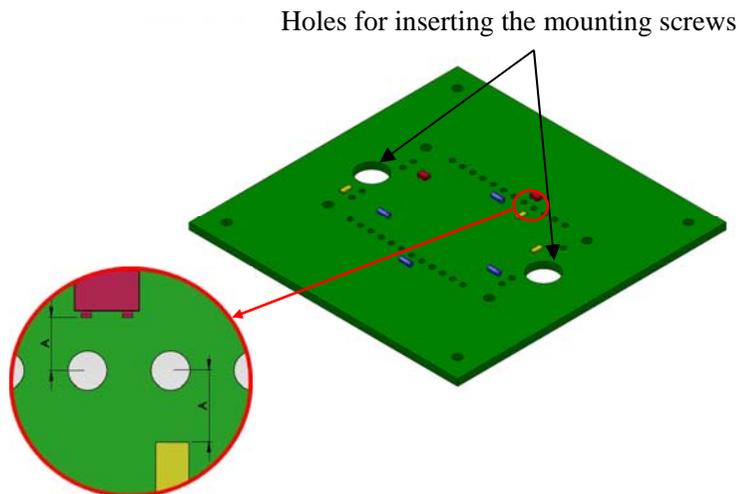
Picture 1: PCB construction

Holes in the PCB are necessary to insert and tighten the mounting screws that bolt down the power module to the heat sink. These access holes must be large enough for the screw head and washers to pass through freely, allowing for normal tolerance in PCB hole location.

## 2. Components next to module pins.

Design rule must be used to place the components like resistors, diodes or capacitors near the pressFIT pins. The SMD capacitor is the most highly sensitive part to mechanical stresses.

It is recommended to leave at least  $A=4$  mm between the center of the pressFIT pin and the edge of the component on both sides of the PCB. This allows enough space (with Microsemi tools) for the pressing tool to avoid damaging the components while inserting or removing the PressFIT pins. (See picture 2).



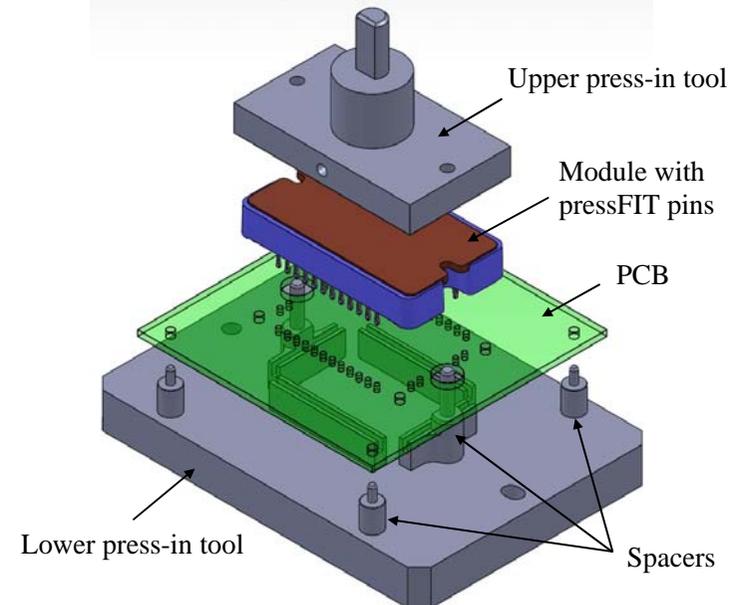
Picture 2: distance between components & the middle of the pins

## 3. Tools for inserting the pressFIT pin into the PCB.

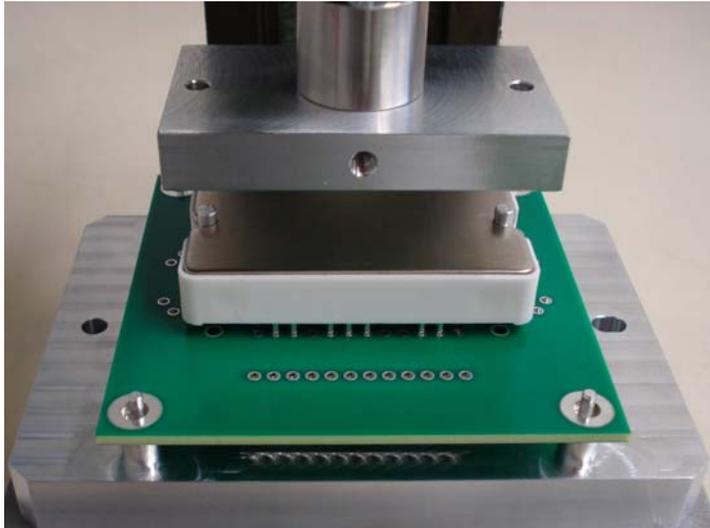
Picture 3 shows the general mounting process for inserting the module in the PCB.

- The PCB is placed on the lower press-in tool. This PCB is well positioned thanks to the spacers located on the lower press-in tool.
- The module is mounted on the PCB. (See picture 4).
- The machine exerts the force to push the pressFIT pins into the PCB. The module is well inserted when the module domes reach the PCB. (See picture 5).

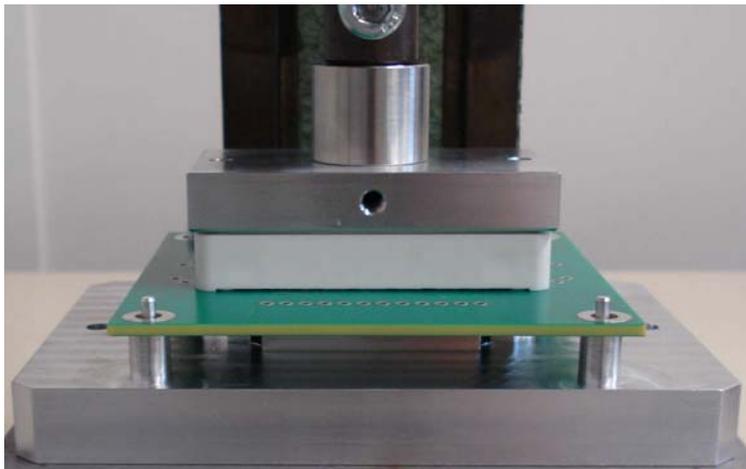
The press process can be realized by a manual or an automatic machine. The insertion force per pin is 80N maximum and the recommended insertion speed is between 25 and 50 mm/min.



Picture 3: Tools for inserting the pressFIT pin into the PCB.



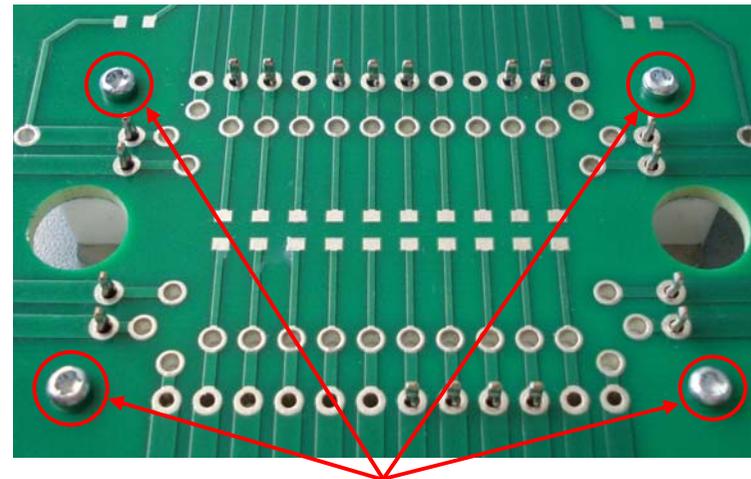
Picture 4: PCB + module before the insertion



Picture 5: PressFIT pins into the PCB

#### 4. Plastite screw used.

After the assembly process, the pressFIT contact between PCB and module should be mechanically relieved. Therefore, all the power modules must be screwed onto the standoffs with plastite screws in order to reduce all mechanical stresses and minimize relative movements on the pressFIT contact. (See picture 6).



Picture 6: plastite screws on standoff.

Microsemi recommends a self-tapering plastite screw with a nominal diameter of 2.5 mm.

A plastite screw is a type of screw specifically designed for use with plastic and other low density materials. (See picture 7). The screw length depends on the PCB thickness. With a 2.4 mm (0.094") thick PCB, use a plastite screw 8 mm (0.32") long. A maximum mounting torque of 0.6Nm (5 lbf-in) is recommended.



Picture 7: example of plastite screw.

### 5. Power module mounting onto the heat sink.

Proper mounting of the module base plate onto the heat sink is essential to guarantee good heat transfer. The heat sink and the power module contact surface must be flat (recommended flatness  $<50\mu\text{m}$  for 100mm continuous while recommended roughness Rz 10) and clean (no dirt, no corrosion, no damage) in order to avoid mechanical stress when power module is mounted, and to avoid an increase in thermal resistance.

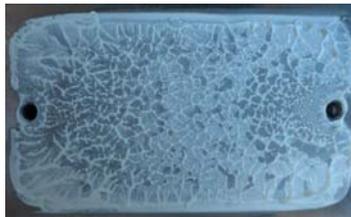
### 6. Thermal grease application.

To achieve the lowest case to heat sink thermal resistance, a thin layer of thermal grease must be applied between the power module and the heat sink.

It is recommended to use screen printing technique to ensure a uniform deposition of a minimum thickness of  $60\mu\text{m}$  (2.4 mils) on the heat sink (see picture 8). In any case, the module bottom surface must be wetted completely with thermal grease. (See picture 10).



Picture 8: Grease on the heat sink before assembling



Picture 9: Grease on the heat sink after removing the module



Picture 10: Grease on the module after disassembling

### 7. Mounting the power module onto the heat sink.

Place the power module above heat sink holes and apply a small pressure to it. Insert the screws with lock and flat washers in each mounting hole.

First lightly tighten the mounting screws. Tighten alternatively the screws until their final torque value is reached. (See the product datasheet for the maximum torque allowed).

It is recommended to use a screwdriver with controlled torque for this operation.

If possible, screws can be tightened again after three hours.

The quantity of thermal grease is correct when a small amount of grease appears around the power module once it is bolted down into the heat sink with the appropriate mounting torque.

The thermal interfacing between the module and the heat sink can also be made with other type of conductive thermal interface material such as phase change compound (screen-printed or adhesive layer).

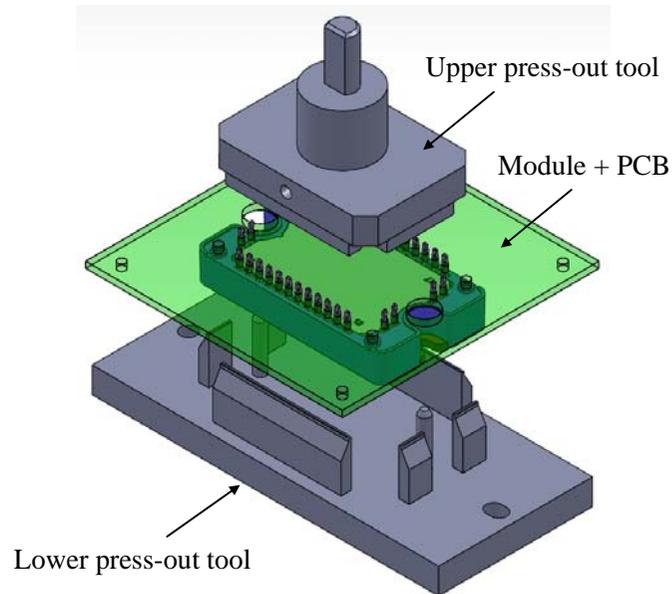
Note: For insulation purposes, the maximum height of screw head plus washer must not exceed 7mm to maintain a safe spacing between the screw head and the nearest terminal of power module.

### 8. Tools for extracting the pressFIT pin from the PCB.

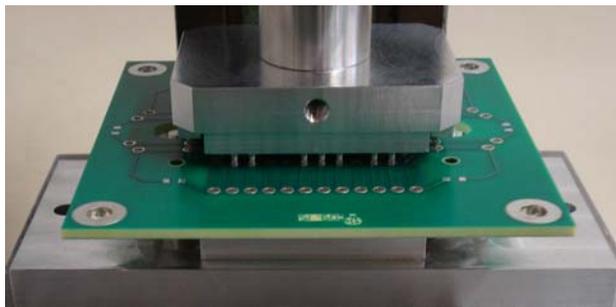
Picture 11 shows the general process for removing the module from the PCB.

- Remove the plastite screws.
- The module and the PCB are placed on the lower press-out tool. (See picture 12).
- The machine exerts the force on the pressFIT pins in order to push out the module from the PCB. (See picture 13).

The press process can be realized by a manual or an automatic machine. The extraction force per pin is 60N maximum and the recommended extraction speed is lower than 15 mm/min.



Picture 11: Tools for extracting the pressFIT pin from the PCB.



Picture 12: PCB + module before the extraction



Picture 13: Module removed

### Conclusion:

This application note gives the main recommendations regarding the pressFIT mounting and dismounting instructions. Applying these instructions will help decrease the mechanical stress both on the PCB as well as the power module and will therefore ensure long term operation of the system. Mounting instructions to the heat sink must also be followed to achieve the lowest thermal resistance from the power chips down to the cooling section. All these operations are essential to guarantee the best system reliability and achieve the highest possible MTBF (Mean Time Between Failure).

Once the pressFIT power module is pressed out and assuming it is still electrically and mechanically good, this module can only be refitted by soldering to the PCB.