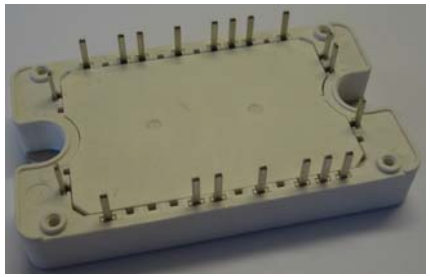

Mounting Instructions for SP3F Power Modules

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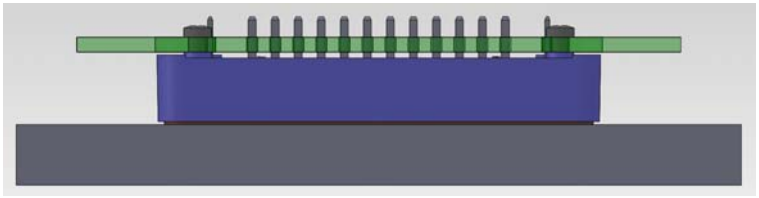
Introduction:

This application note gives the main recommendations to appropriately connect the PCB (Printed Circuit Board) to the power module, and mount the power module onto the heat sink. It is very important to follow the mounting instructions to limit both the thermal and mechanical stresses.

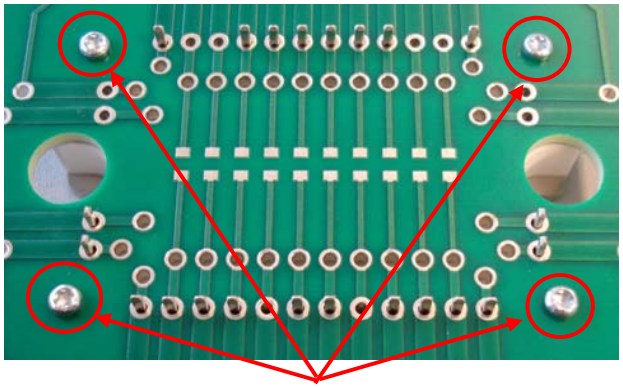
1. PCB mounting instruction on the power module.

The PCB mounted on the SP3F power module can be screwed onto the standoffs in order to reduce all mechanical stress and minimize relative movements on the pins which are soldered onto the power module.

➔ **The first step** consists of screwing the PCB on the standoffs of the power module. (See pictures 1 & 2).



Picture1: PCB mounted on SP3F power module.



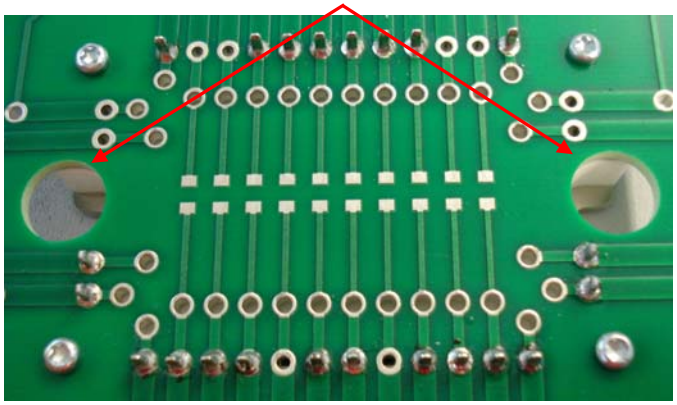
Picture 2: plastite screws on standoff.

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 3). The screw length depends on the PCB thickness. With a 1.6 mm (0.063”) thick PCB, use a plastite screw 6 mm (0.24”) long. The maximum mounting torque is 0.6Nm (5 lbf·in). In any case, the customer must check the integrity of the plastic post after screwing.

Picture 3: example of plastite screw.

➔ **The second step** consists of soldering all electrical pins of the power module to the PCB. (See picture 4).
No-clean solder flux is required to attach the PCB onto the module since aqueous module cleaning is not allowed.

Holes in the PCB for inserting or removing the mounting screws



Picture 4: PCB after soldering

Do not reverse these two steps, because if all pins are soldered first to the PCB, screwing the PCB onto the standoffs will create a deformation of the PCB, leading to some mechanical stress that can damage the tracks or break the components on the PCB.

Holes in the PCB (see picture 4) are necessary to insert or remove 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.

The PCB hole diameter for the power pins is recommended at $1.8^{\pm 0.1}$mm.

The PCB hole diameter for inserting or removing the mounting screws is recommended at $10^{\pm 0.1}$mm.

For efficient production, a wave soldering process can be used to solder the terminals to the PCB. Each application, heat sink and PCB can be different; wave soldering must be evaluated on a case-by-case basis. In any case, a well-balanced layer of solder should surround each pin.

The gap between the bottom of the PCB and the power module (see picture 1) is 0.5 to 1mm only. Microsemi does not recommend using through hole components above the module.

SP3F pinout can change according to the configuration. See the product datasheet to see the pin out location.

2. Power module mounting instruction onto 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 <50µm for 100mm continuous, 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.

➔ 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 60µm (2.4 mils) on the heat sink (see picture 5). The thermal interface 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).

Picture 5: Grease on the heat sink before assembly

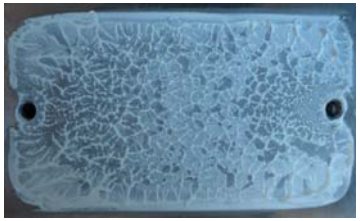
➔ **Mounting the power module onto the heat sink.**

Place the power module above heat sink holes, and apply a small pressure to it. Insert the M4 screw with lock and flat washers in each mounting hole (a #8 screw can be used instead of M4). The screw length must be at least 12 mm (0.5”).

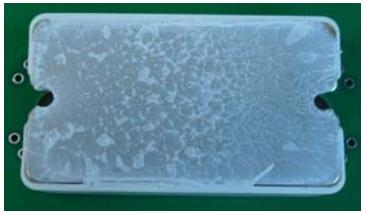
First lightly tighten the two mounting screws. Tighten alternatively the screws until their final torque value is reached (See the product datasheet for the maximum torque allowed).

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 onto the heat sink with the appropriate mounting torque.
In any case, the module bottom surface must be completely wetted with thermal grease. (See picture 7).



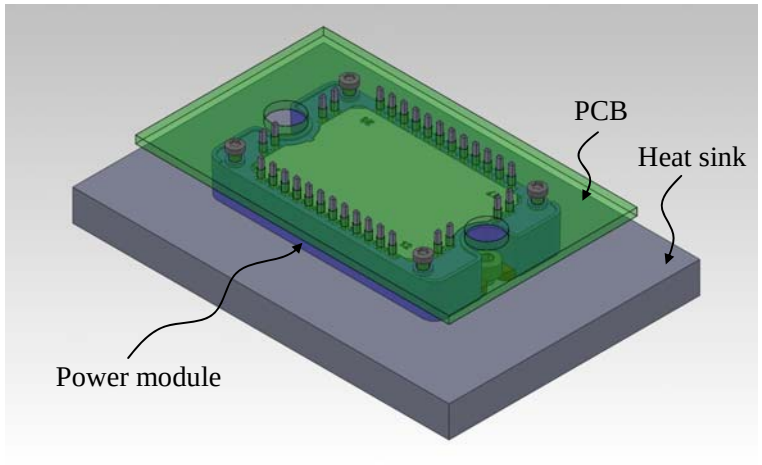
Picture 6: Grease on the heat sink after removing the module



Picture 7: Grease on the module after disassembling

The gap between the screws top height and the nearest terminal must be checked in order to maintain safe insulation spacing.

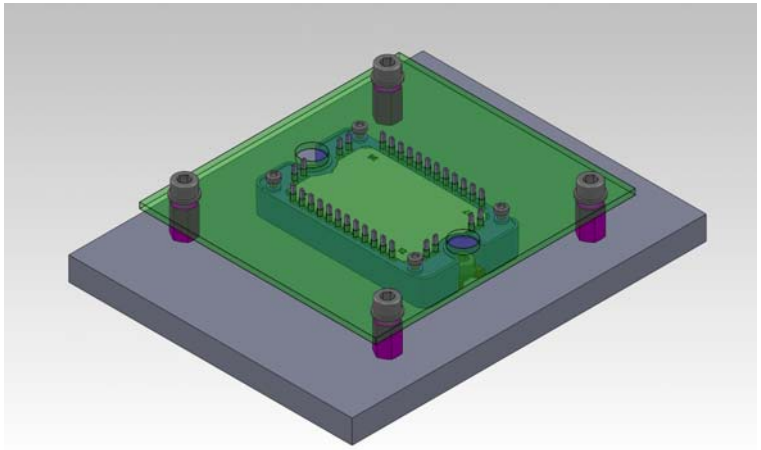
3. General assembly view.



Picture 8: General assembly view.

If a large PCB is used, additional spacers between the PCB and the heat sink are necessary. It is recommended to keep a distance of at least 5 cm between the power module and the spacers (see picture 9). The spacers must have the same height as the standoffs ($12^{\pm 0.1}$ mm).

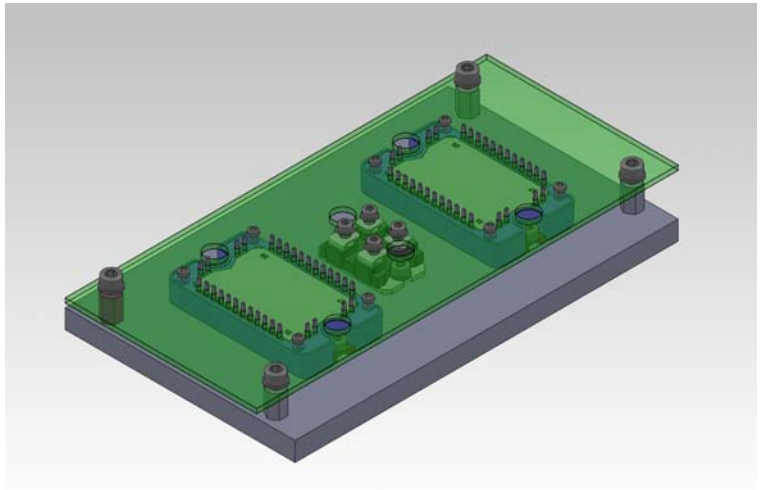
For specific applications some SP3F power modules are manufactured with an AlSiC (Aluminium Silicon Carbide) baseplate (M suffix in the part number). AlSiC baseplate is 0.5 mm higher than the copper baseplate, so the spacers must be $12.5^{\pm 0.1}$mm height.



Picture 9: General assembly view with large PCB

The SP3F plastic frame height is the same height as an Isotop® (SOT-227). On the same PCB, if an Isotop® and one or several SP3F power modules with copper baseplate are used and if the distance between the two power modules does not exceed 5 cm, it is not necessary to install the spacer. (See picture 10).

Be careful with the heavy components like electrolytic or polypropylene capacitors, transformers or inductors. If these components are located in the same area, it is recommended to add spacers even if the distance between two modules does not exceed 5cm such that the weight of these components on the board is not handled by the power module but by the spacers.



Picture 10: General assembly view with several modules

Conclusion:

This application note gives the main recommendations regarding the mounting of SP3F modules. Applying these instructions will help decreasing the mechanical stress both on PCB and power module and therefore will 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 cooler. All these operations are essential to guarantee the best system reliability.