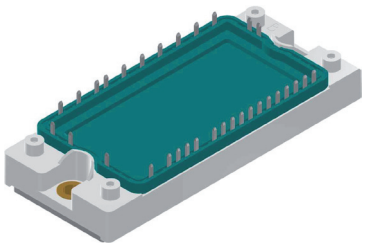
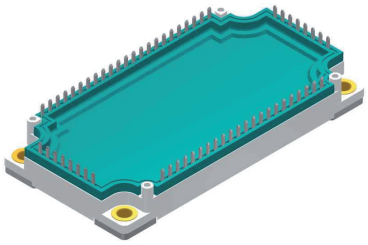
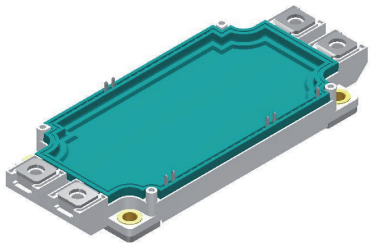
Mounting Instruction for E2-/E3- and SimBus F packages



E2 package



E3 package



SimBus F package

Basic instructions

This range of power modules are highly integrated. In order to have the best performance and long term reliability it is necessary to follow some basic assembly rules. It is important to consider physical layout in order to minimize heat transfer from adjacent parts. In addition the cross-sectional area of the power traces on the PCB must be adequate to prevent the power terminals from being heated by resistive losses. Special consideration to prevent tension, pressure or mechanical vibrations cannot cause mechanical stress to the connection between leads, package and base plate is required.

Base plate

Due to the high power integration and the resulting cooling requirements, the base plate of these modules is designed with a convex shape to ensure optimized thermal contact for a module when properly mounted.
The bow of the base plate is measured across an active region of the module. The typical bow across a 75 mm section along the longitudinal axis is 100 µm convex. These values are checked on a sample basis at final test and are also used to supervise the quality of the soldering process. Other measuring techniques may lead to different values and it should be noted that there are certain areas of the base plate with an even more convex profile.

Heat sink requirements

The heat sink design greatly influences the thermal dissipation of the system. IXYS recommends that the flatness of the heat sink across the module mounting area should be less than 25 µm with a roughness RZ less than 10 µm. This is a standard requirement for heat sinks.
For the case of natural convection cooling, the heat sink fins must be arranged so that the air can flow freely from the bottom to the top. For the case of forced convection by air or liquid, the module can be mounted in any position as long as the cooling medium amount is sufficient for the load.

Mounting to heat sink

The use of thermal grease is recommended to ensure low case-to-sink thermal resistance. We recommend using either DC340 (Dow Corning) or silicone free HTCP (Electrolube) or equivalent thermal grease. It should be applied with a thickness of 60 to 80 µm by using a roller. Thermal grease contact and distribution will improve during the first hours and after heating up the system for the first time. Removing some modules from their heat sink after mounting to inspect the entire area of the metal base plate is an ideal measure to control the minimum thickness of grease. The modules bottom surface must be wetted completely with thermal grease.

For proper mounting it is recommended to use M5 screws. These screws must be secured by a lock washer and flat washer (Fig 1 next page) torqued to a recommended 4 Nm (E2, E3 and SimBus F package). The minimum required thread depth in Al heat sink is 12 mm (0.48 in) and 10 mm (0.40 in) in Cu heat sinks. All mounting holes must be free of burrs.
First lightly tighten all mounting screws with a torque of 0.5 Nm before tightening the screws to their final torque value in a step pattern (see Fig 2) using a torque wrench or torque screwdriver.

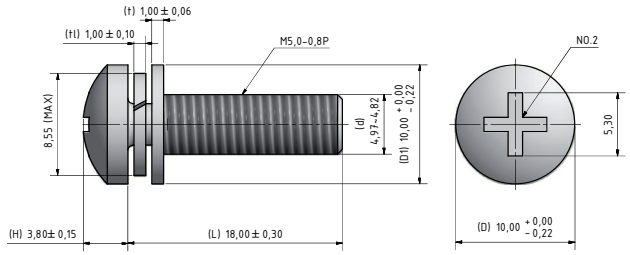


Fig 1 Example for a M5 screw with lock and flat washer

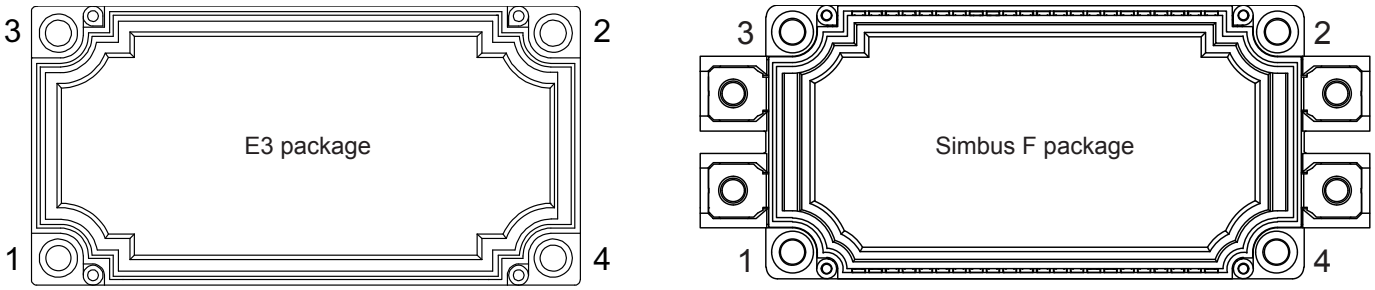


Fig 2 Step pattern for M5 screw tightening (E3 and SimBus F package)

PCB mounting

The PCB holes for the module pins have to be designed for a maximum tolerance of 0.4 mm in diameter and located according to the nominal position (see datasheet drawing).

It is essential to design the copper traces on the PCB in a way to prevent damages to the PCB and/or to the module by excesive self heating. A copper thickness of 105 µm is typical. The maximum RMS current determines the width of the copper pattern. Forced air-cooling for the PCB can improve the temperature situation.

Mounting height from the heat sink to the lower side of the PCB is $17^{\pm 0.5}$ mm.

In order to prevent tension, vibration and mechanical stress from PCB to the module pins it is necessary fasten the PCB to the modules stand-offs. Self-tapping screws (for example EJOT PT type DS self-tapping screws of the dimension K25 with 2.5 mm diameter) are recommended for the mechanical connection between module and PCB. The maximum thread depth into the module mounting studs is 6 mm. This dimension plus the PCB board thickness determines the length of the self-tapping screw. The recommended screw torque is 1.5 Nm (13 lb-inch). Depending on the design of the power stage, additional support from the heat sink to the PCB might be necessary.

A good solder contact is required for proper conduction between terminal pins and PCB and ensures good heat dissipation. All pins have a solderable SN finish. Care has to be taken not to overheat the package during soldering. Soldering time must not exceed 3 s at a temperature of 260 °C. Washing is not allowed due to holes in the module cover.

IXYS also offers these module types with PressFit-Pins (PFP) for solder free electrical connection. For more information please see application note IXAN0077 on IXYS web site.

Disassembly

For disassembly the solder connection must be undone by an appropriate technique. After the solder is removed the screw connections to the PCB and to the heat sink need to be removed. The proper method to remove the modules from the heat sink is to either slide off the heat sink or rotate the module on the heat sink surface to overcome adhesion of the thermal grease. Pulling directly on the module housing may cause separation of module base plate and package.

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