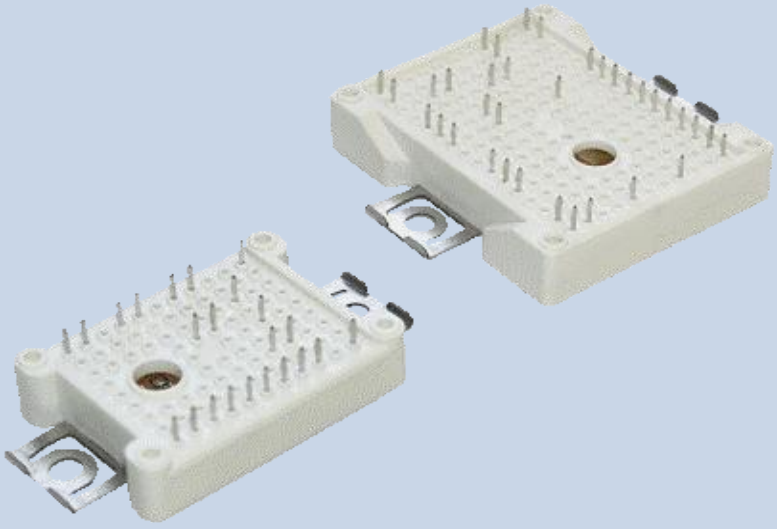
Application Note AN 2006-08 V2.1
April 2013

Easy B-Series Modules

Mounting Instructions for EasyPIM™ and EasyPACK Modules

IFAG IPC



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1 General information

The mounting instructions outlined below are recommended for the safe and reliable operation of the above mentioned modules in typical applications. The recommendations given are based on the experiences gained during laboratory and field tests.

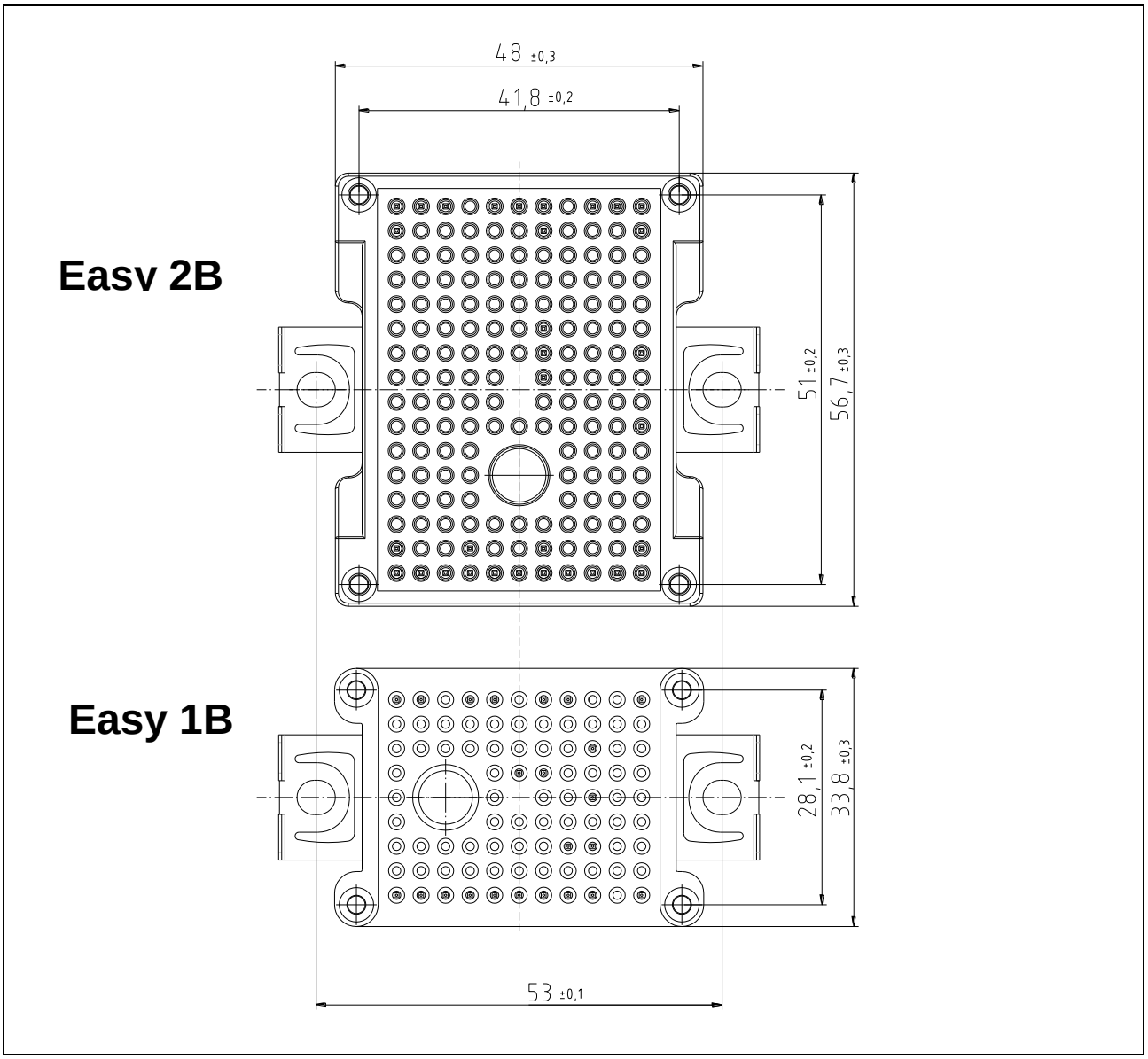

Figure 1 EasyPIM™, EasyPACK 1B and 2B respectively. Module with injected screw clamps.

The EasyPIM™ and EasyPACK modules of the Easy B-series are designed to be soldered to a printed circuit board (PCB) with a thickness of up to 2 mm.

Each module is mounted to the heat sink using two injected screw clamps. The required distance between the holes for both modules is 53 mm ±0.1mm as shown in Picture 1.

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2 Soldering the module to a Printed Circuit Board (PCB)

The soldering of the pins can be done either before or after mounting the module on the heat sink. If the module is mounted to the heat sink after soldering to the PCB then through holes in the PCB will be required. The screws for tightening the module onto the heat sink will pass through these additional PCB holes (Picture 2).

The through holes in the PCB are not required if the soldering is done after mounting to the heat sink (Picture 3). In this case the heat sink's mass has to be considered during the soldering process.

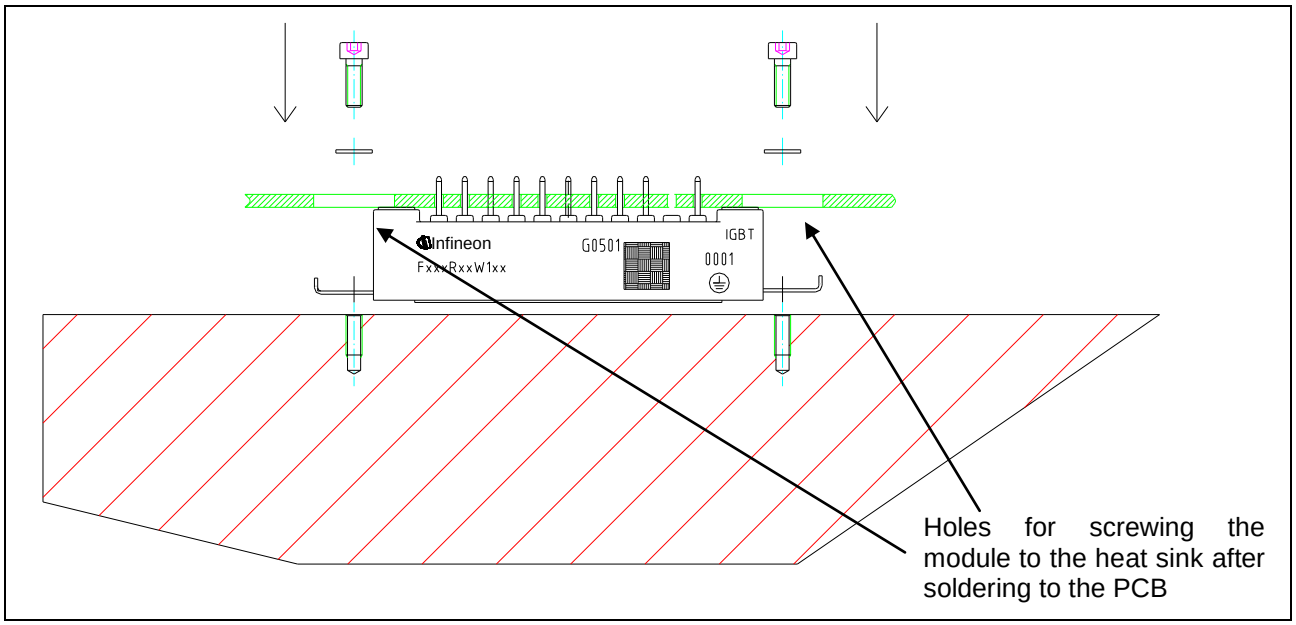

Figure 2 Mounting of the module onto the heat sink after soldering into the PCB

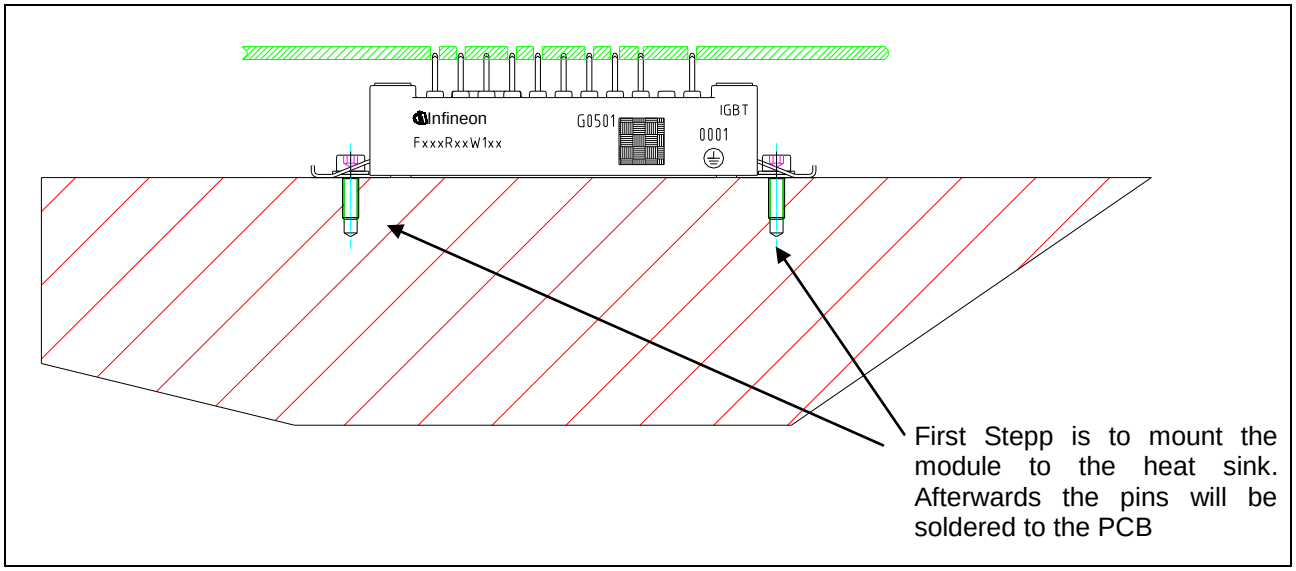

Figure 3 Mounting of the module onto the heat sink before soldering.

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3 Mounting a PCB to the module

To fix a PCB onto the module additional screws can be used if desired. These screws will be tightened into the stand offs of the module.

An electronically controlled or at least slowly turning electric screwdriver n ≤ 300 rpm is the preferred mounting tool.

Due to the lack of accuracy we do not recommend the use of pneumatic screwdrivers or manual screwdrivers.

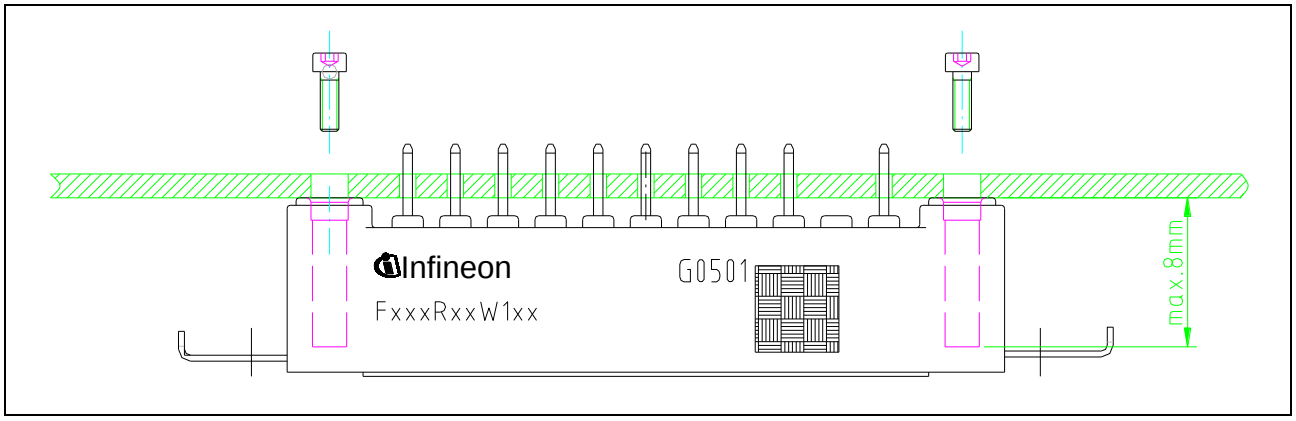

Figure 4 Cross-sectional view of the mounting stand offs

The effective length of the thread in the stand-off should have a minimum of 4mm and a maximum length of 8 mm.

The initial 1.5 mm of the mounting stand-off serves as guidance only and cannot take any force. The thread in the plastics will form itself by screwing.

For the choice of the screw length the given PCB thickness has to be taken into account.

The following screws are tested to fix the PCB to the module:

- Ejot PT WN 1451 K25*10 A2K M_{max}=0,45Nm ±10%
- Ejot DELTA PT WN 5451 K25*8 M_{max}=0,4Nm ±10%
- Metrical screws M2.5*X, z.B. M2.5*8 or M2.5*10 depending on PCB thickness:

To avoid damage or splitting of the stand-off, straight insertion of the screw into the stand-off has to be observed during assembly.

4 Condition of the heat sink for module assembly

The power loss occurring in the module has to be dissipated via heatsink in order not to exceed the maximum permissible temperature T_{vjop} specified in the datasheets during operation.

The condition of the heatsink surface in the area where the module is mounted is of great importance, as this interface between heatsink and module is of decisive influence on the heat transfer of the entire system.

The contact surfaces, the surface below the module and the surface of the heatsink, have to be free of degradation and contamination to prevent excess mechanical stress to the module as well as an increase in thermal resistance.

Heat sink requirements:

- Roughness: ≤ 10 µm
- Flatness based on a length of 100 mm: ≤ 50 µm

Hinweis: 1. The flatness of the heat sink should not exceed the values listed above. This area includes the entire module mounting area as well as that of the clamps.

Hinweis: 2. If the layer of thermal paste is applied too thick, e.g. as a consequence of cavities, the thermal resistance R_{th} between module and heat sink will increase.

5 Applying the thermal paste

Due to the individual surface shape (e.g. roughness and flatness) of the heatsink and the module these do not touch across the entire area so that a certain localized separation between the two components cannot be avoided.

To dissipate the losses occurring in the module and to achieve a good flow of heat into the heatsink, all localised cavities have to be filled with a thermal compound. When using a heat conductive paste, a homogenous application needs to be assured.

A well applied layer will fill all cavities and at the same time does not prevent the metallic contact between module base and heatsink surface. A compound should be selected which shows permanently elastic features in order to assure a continuously favourable heat transfer resistance.

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Before the module is mounted onto the heat sink an even layer of thermal paste, 80 µm thick, should be applied to the module base or to the heat sink according to the module size and used thermal paste. This paste can be applied using either a spatula, a roller or by a silk screen printing. The quantity of thermal paste is sufficient if a small amount of paste is visible around the module after assembling it to the heat sink.

Recommended is the application of thermal paste by means of a screen print process. Apart from an optimized and module specific distribution of the heat conductive paste, a homogenous and reproducible layer thickness is achievable with this procedure. If a screen print process is used the layer thickness could be reduced to values under the above mentioned numbers. The size of the module and the viscosity of the thermal paste are important factors in this case.

Further notes regarding the application of screen print templates for the application of thermal grease can be found in the application note AN2006-02 Application of silk screen.

6 Assembling the module on the heat sink

The module is mounted onto the heat sink using M4 screws. It is also possible to use an additional flat washer. The heat sink has to be provided with threaded holes as shown in picture 5.

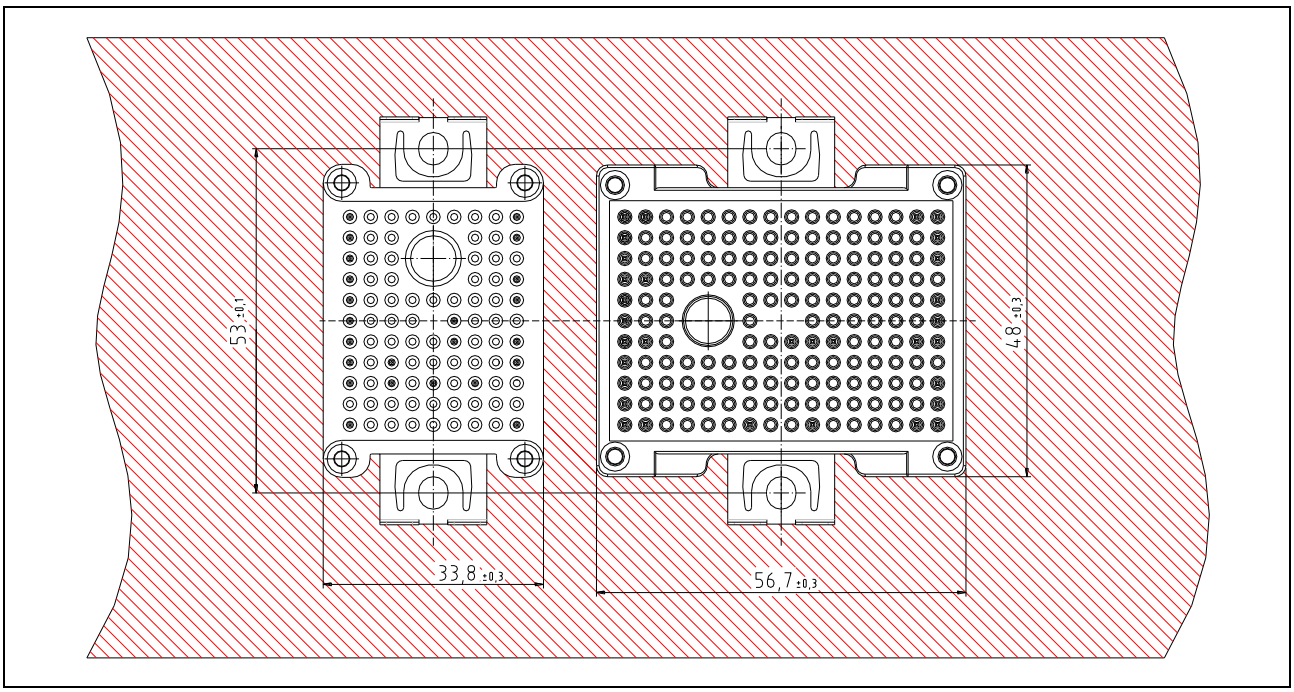

Figure 5 Distance of the threaded holes

Hinweis: ***If the module is first soldered into the PCB or if a later disassembling of the module is desired, the PCB must contain suitable through holes. The hole size depends on the screwdriver size or the screw's head diameter or washer.***

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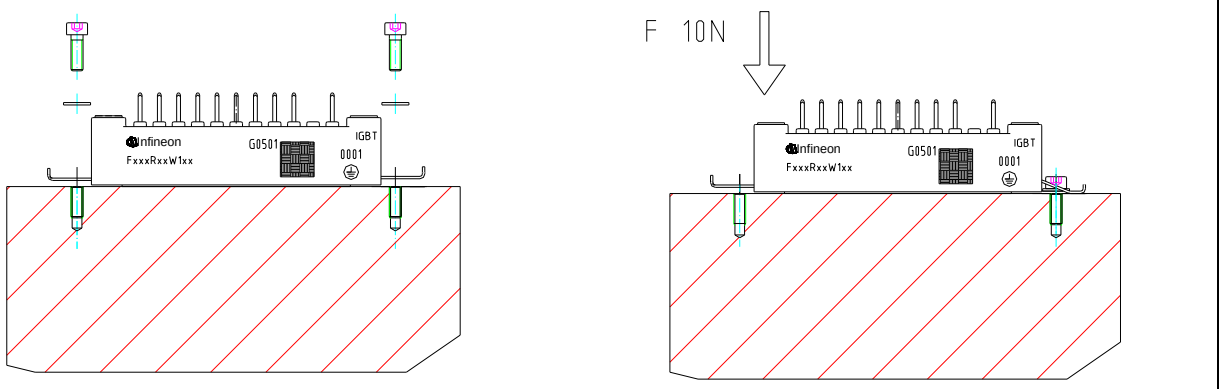
The module should be positioned onto the heat sink in such a way that the holes of the screw clamps are exactly above the threaded holes of the heat sink. The mounting surface must be clean and free of contamination.

After positioning of the module it can be fixed by screwing both screws simultaneously (Pic.6a) or the module can be held in place with a force of approximately 10 N during the mounting process (Pic. 6b). This 10 N force it used to prevent cantilevering of the module when the first screw is torqued.

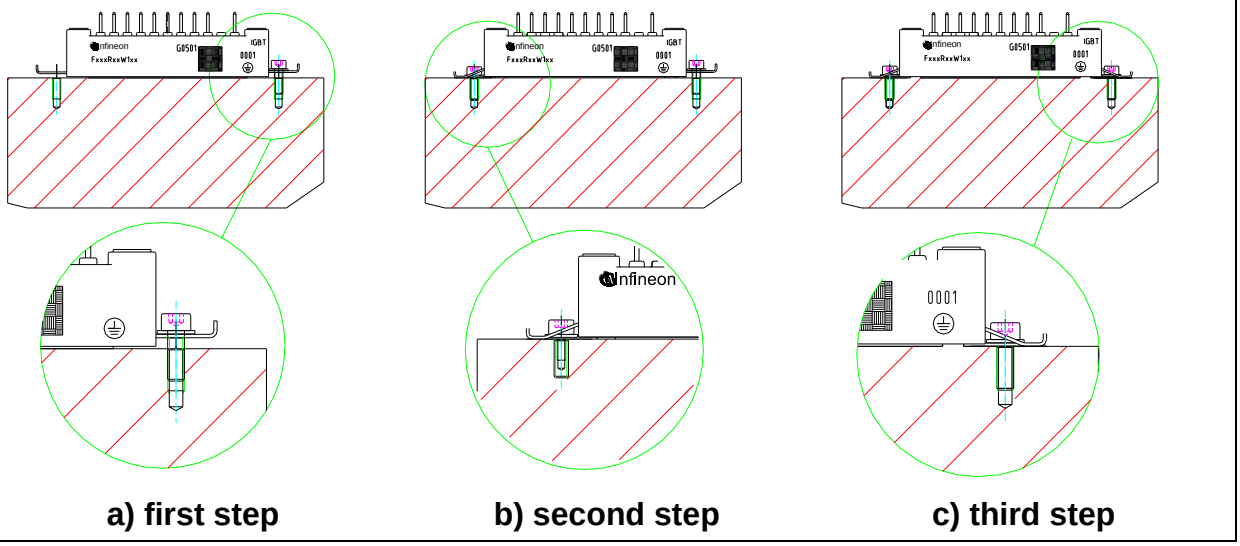


a) fixing the module via screwing simultanious.

b) fixing the module in two steps with pressing down the module during the mounting process

Figure 6 Possibilities of module fixing

Alternatively one screw can be applied initially. It is important that the module does not cantilever. To prevent this, the first screw has to be loosely tightened to avoid a press force to the clamp (Pic. 7a). Afterwards the second screw has to be fully tightened (Pic. 7b). Finally the first and still loose screw has to be fully tightened (Bild 7c).



a) first step **b) second step** **c) third step**

Figure 7 Mounting steps to fix the module

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Table 1 Technical data of the mounting screw

Description	Values
Mounting screw	M4
Recommended mounting torque	M_a = 2,0 – 2.3 Nm
Recommended thread engagement for screws with property class 4.8 to 6.8 for different materials	
Aluminium cast alloy Aluminium alloy hardened Aluminium alloy not hardened	2,2 x d = 8,8 mm [1)] 1,2 x d = 4,8 mm [1)] 1,6 x d = 6,4 mm [1)]
Washer acc. to DIN 125	D = 9 mm

1) As per technical literature

7 System consideration

If the module is correctly mounted to the heat sink and to the printed circuit board, the screw clamps will apply the necessary pressure. This pressure together with the correct amount of thermal paste will ensure a low thermal resistance and an optimal thermal flow between the module and the heat sink.

Since the PCB is connected to the module by soldered pins only, suitable measures have to be taken to ensure that vibrations are kept at a minimum. Any possible movement between the soldered terminals and the module case has to be avoided.

Each single pin may only be subjected to a maximum press and pull force of 6 N vertical to the heat sink. The overall pulling force to the module of 20N must not be exceeded. The compressive force could be 10 times higher than the possible pulling force. A low compressive load to the module is preferred.

Therefore, the circuit board should additionally be fixed to the heat sink at a position close to the module. Two options are possible:

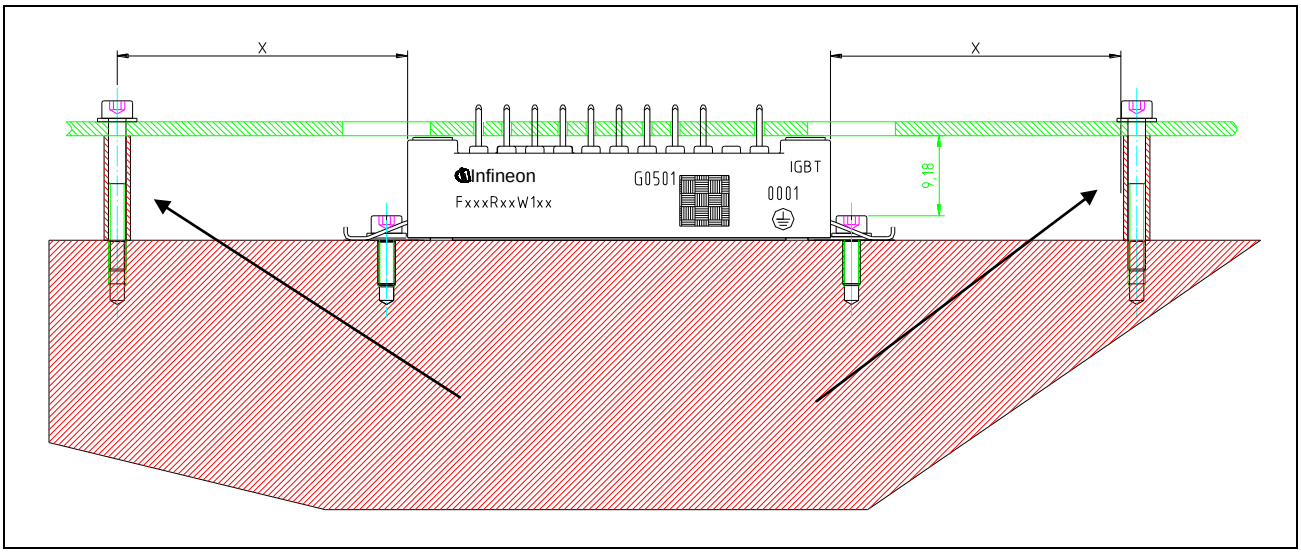

Figure 8 Fixing of the PCB.

7.1 The module will be soldered to the PCB before mounting it onto the heat sink

To minimise the forces that are applied to the pins of a module, it is recommended to keep a distance of at least x = 5 cm from the module's outer edges (Picture 8). In this case, the height tolerance of the spacer should not be larger than the height tolerance of the module (± 0.3 mm).

7.2 The module will be soldered to the PCB after mounting it onto the heat sink

In this case no mechanical stress will occur. Therefore it is allowed to place the distance keeper as close as possible x ≤ 5 cm to the module.

8 Clearance and Creepage distances

When defining the layout of the PCB, application specific standards, mainly regarding clearance and creepage distances, have to be considered. This is particularly important for the area of the screw clamp which is located under the printed circuit board. In order to meet the respective requirements regarding clearance and creepage distances, current carrying devices or through-holes in this area should be avoided or additional isolation measures like lacquering must be taken.

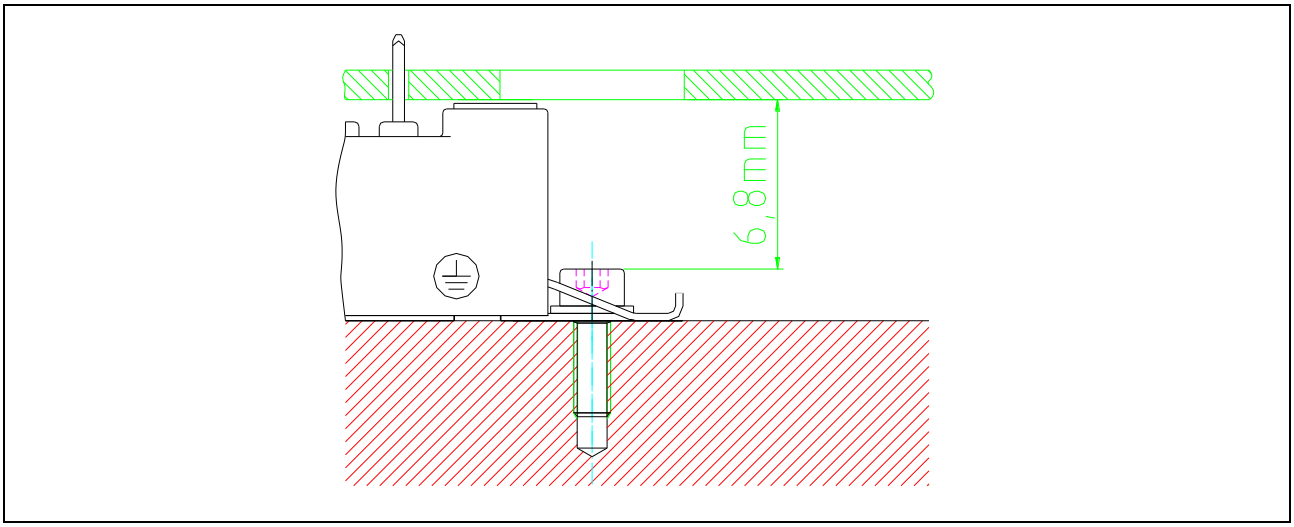

Figure 9 Clearance distance between screw clamp and PCB

The minimum clearance distance between the screw and the PCB depends on the screw itself. The distance will be 6.8 mm with a hexagon socket head screw according to DIN 912, a washer according to DIN 125 and the clamp which can be seen in Pic. 9.

The clearance and creepage distances specified in the datasheet are minimum values irrespective of other devices that would be mounted close to the module.

In any case, the application specific clearance and creepage distances have to be checked and compared to relevant standards and guaranteed by suitable constructive means, if required.

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9 Storage and transport

During transport and storage of the modules extreme forces through shock or vibration have to be avoided as well as extreme environmental influences.

Storage of the modules at the limits of the temperature specified in the datasheet is possible, however, not recommended.

The recommended storage conditions according to Infineon TR14 (Application Note “Storage of Products Supplied by Infineon Technologies) and IEC60721-3-1, class 1K2 should be assured for the recommended storage time of max. 2 years.

Max. air temperature: T_{maxair}=+40°C
Min. air temperature: T_{minair}=+5°C
Max. relative humidity: 75%
Min. relative humidity: 10%
Condensation: not permissible
Precipitation: not permissible
Iceing: not permissible

Pre-drying of the case prior to the solder process as it is recommended for moulded discrete components (e.g. microcontrollers, TO-cases etc.) is not required for Easy B-series modules.

10 Climatic conditions during active, current carrying operation of EasyPIM™ and EasyPACK Modules

EasyPIM™ and EasyPACK modules are not hermetically sealed. The housings and the molding compound, used for the electrical isolation within the housing, are permeable for humidity and gases in both directions. Therefore humidity differences will be equalized in both directions.
Corrosive gases must be avoided during operation and storage of the devices.
The climatic conditions for Infineon EasyPIM™ and EasyPACK modules in active, current carrying operation are specified as per EN60721-3-3 class 3K3 for fixed installations.
The operation of the modules in humid atmosphere caused by condensation and/or the operation in climatic conditions beyond class 3K3 of EN60721-3-3 must be avoided and additional countermeasures need to be taken in such cases.

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