Mounting Instructions for SEMiX® IGBT Modules

1 Preparation, Surface Specification

To obtain the maximum thermal conductivity the bottom side of the module must be free from grease and particles. Further the contact springs have to be clean and should never be touched by hand to ensure a long term reliable electrical contact.

The heat sink must fulfil the following specifications:

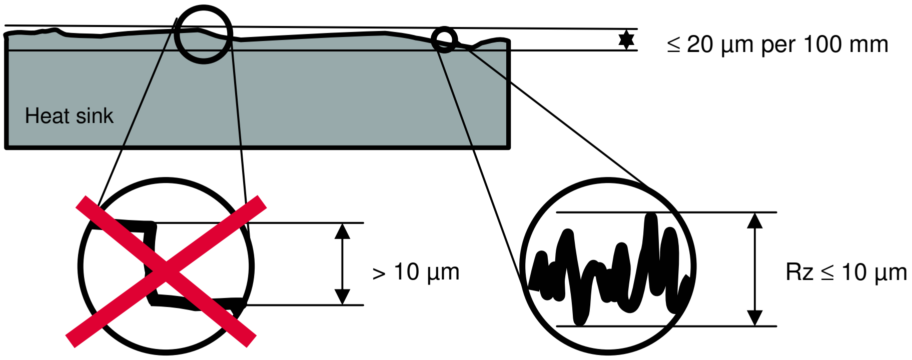


Fig. 1-1 Heat sink surface specification

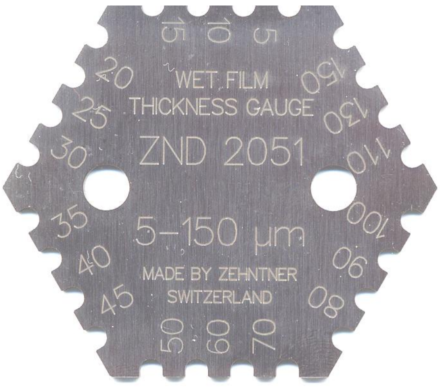
- Heat sink must be free from grease and particles
- Unevenness of heat sink mounting area must be ≤ 20 µm per 100 mm (DIN EN ISO 1101)
- Roughness “Rz” ≤ 10 µm (DIN EN ISO 4287)
- No steps > 10 µm (DIN EN ISO 4287)

2 Assembly

2.1 Application of Thermal Paste

A thin layer of thermal paste has to be applied onto the heat sink surface or module bottom surface. A layer thickness of 50 µm – 100 µm is recommended for „Silicone Paste P 12” from WACKER CHEMIE.
The thickness of the layer can be determined with a measurement gauge as shown in Fig. 2-1.

SEMIKRON recommends screen printing for applying the thermal paste. In certain cases an applying by a hard rubber roller might be applicable.



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ELCOMETER GmbH
Himmlingstr. 18
D-73434 Aalen
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Fig. 2-1 “Wet Film Thickness Gauge 5 – 150 µm “

2.2 Mounting the SEMiX to the Heat Sink

The SEMiX has to be placed on the appropriate heat sink area. Then the screws have to be pre tightened with max. 1.0 Nm. Finally the mounting torque M_s (as given in the data sheets) has to be applied. During the assembly process the thermal paste shall spread evenly, so that a good and homogeneous thermal contact is achieved.

SEMIKRON recommends as screw

- M5 - 4.8
- Strength of screw: “4.8”
  = Tensile strength - Rm = 400 N / mm²
  = Yield point - Re = 320 N / mm²
- The mounting torque M_s has to be between min. 3.0 Nm and max. 5.0 Nm (unless otherwise specified in the data sheet)
- To keep the creepage- and clearance distances, the height of the screw and washer must not exceed 6 mm + 1 mm. Refer also to Fig. 2-2.

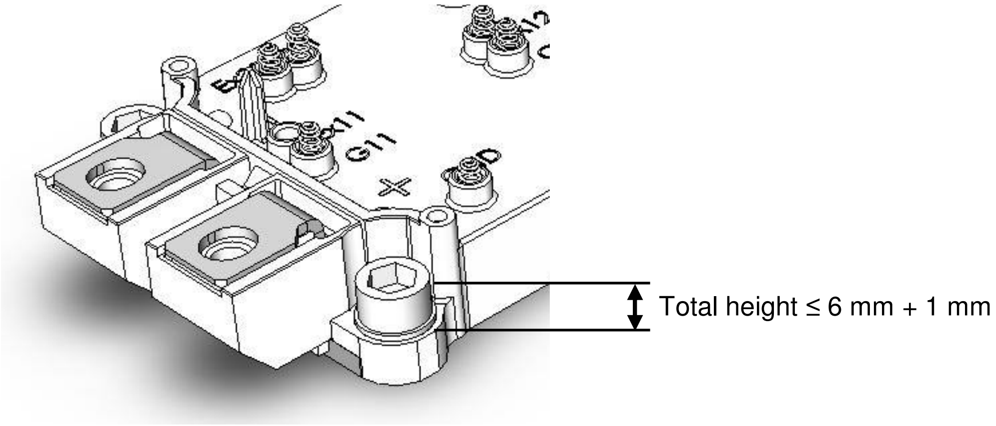

Fig. 2-2 Maximum height of screw plus washer

For modules with four screws the order of assembly has to be in a diagonal (crosswise) sequence. For six pack modules in the “SEMiX 33c” case the screws have to be assembled in the order as described in Fig. 2-3.

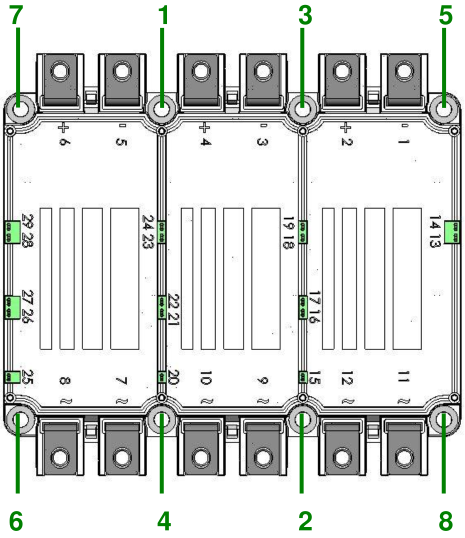

Fig. 2-3 Assembly order of screws for “SEMiX 33c” case (assembly to the heat sink)

2.3 Mounting to the Main Terminals of SEMiX

Since SEMiX is a power module and not part of the mechanical construction the maximum mechanical forces on the main terminals as given in Fig. 2-4 must not be exceeded during the whole assembly procedure.

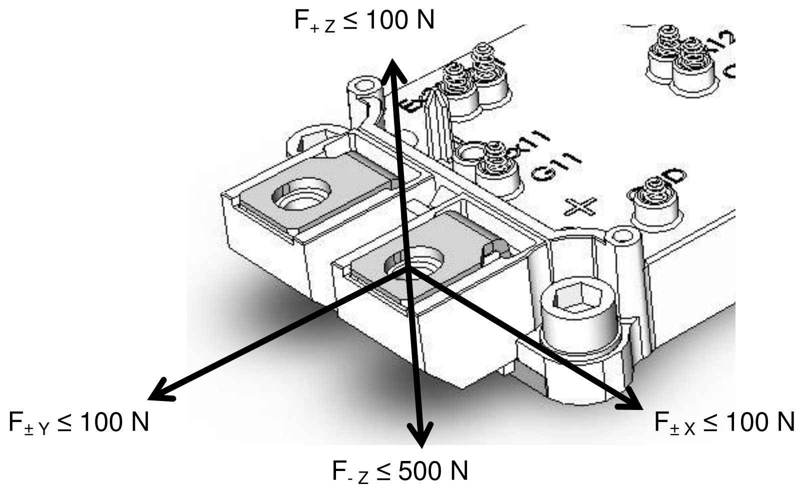

Fig. 2-4 Maximum forces at the main terminals

SEMIKRON recommends as screw

- M6 - 4.8
- Strength of screw: “4.8”
  = Tensile strength - Rm = 400 N / mm^2
  = Yield point - Re = 320 N / mm^2
- The depth of the screw in the module has to be between min. 6.5 mm and max. 10.0 mm.
- The mounting torque M_t has to be between min. 2.5 Nm and max. 5.0 Nm
  (unless otherwise specified in the data sheet)

2.4 Mounting the Printed Circuit Board to the SEMiX

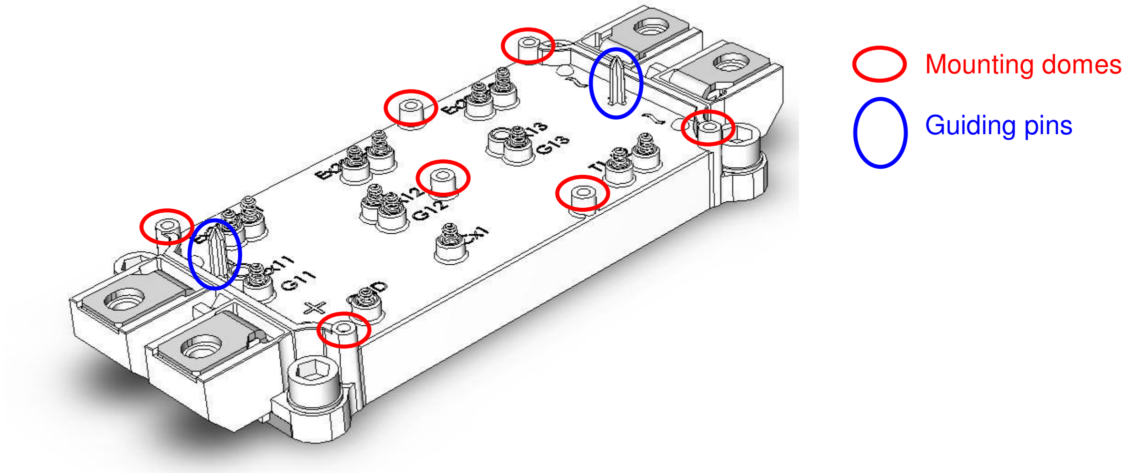

Fig. 2-5 SEMiX mounting domes and guiding pins

SEMIKRON recommends as screw

- Self-tapping screws as e.g.
    - EJOT DELTA PT WN 5451 25x8
    - EJOT DELTA PT WN 5452 25x8 (alternative)
    - Screw head "TORX T8"
    - Surface specification "A2F"
    - http://www.ejot.de/
- The depth of the screw in the module has to be between min. 6.0 mm and max. 9.0 mm.
- The mounting torque M has to be between min. 0.65 Nm and max. 0.85 Nm

For the "SEMiX 33c" case (Fig. 2-3), the auxiliary contacts have to be soldered. During the solder process a maximum soldering temperature T_{solder} = 265 °C and a maximum soldering time t_{solder} = 10 sec must not be exceeded. Due to ESD protection all soldering tools (e.g. soldering iron) have to be conductively grounded (refer also to chapter 3). Wave soldering is an applicable soldering process.

2.5 Automated Screw Driver

The usage of torque wrenches with automatic release is strongly recommended. These should be calibrated regularly.

For power screw driver it is recommend to use an electric power screw driver. With pneumatic systems, the behaviour of the clutch can lead to a shock and a torque over shoot which damage the SEMiX module.

The screwing speed has to be limited to a maximum speed of 300 r.p.m. (revolutions per minute).

3 ESD Protection

SEMiX IGBT modules are sensitive to electrostatic discharge, because such a discharge can damage or destroy the sensitive MOS structure of the gate. All SEMiX modules are ESD protected in the shipment box by conductive plastic trays.
During the handling and assembly of the modules it is recommended to wear a conductive grounded wristlet and to use a conductive grounded working place. The personal should to be trained for correct ESD handling.