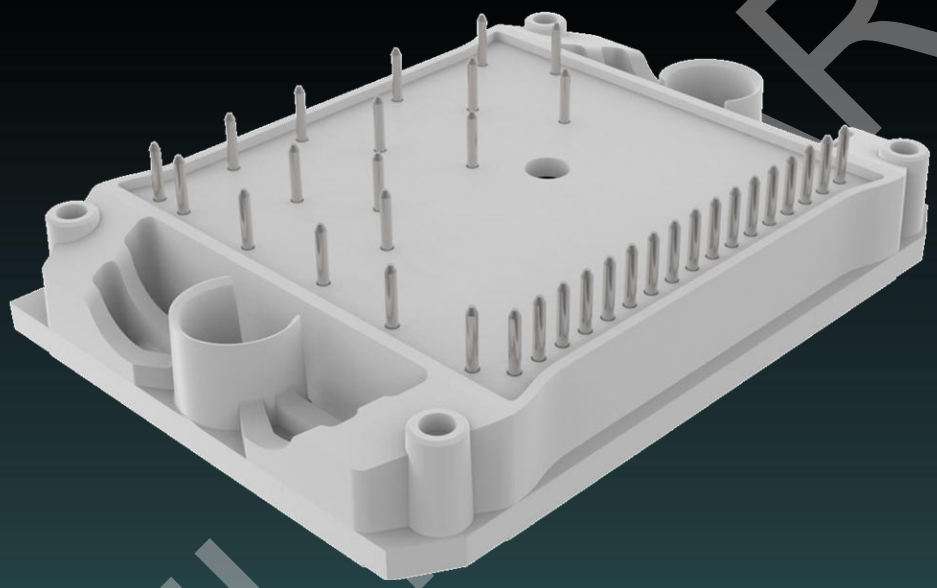
Vincotech

Handling Instructions

for *flow* 1C packages



This document is valid for all type of flow 1C modules with solder pins

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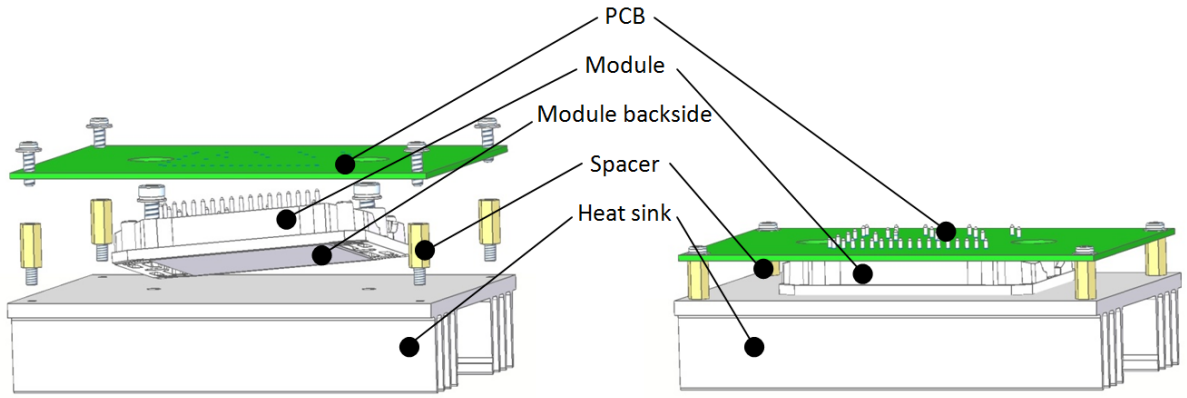
Revision History

Date	Revision Level	Description	Page Number(s)
18.08.2016	01	Preliminary release	

1 General assembly instructions

The *flow* 1C type modules have to be mounted to a PCB. The electrical connections between module and the PCB can be made by soldering. In applications where the module is attached to a heat sink, the PCB must also be attached to this heat sink. 1. Figure shows how this attachment can be achieved with threaded spacers.



1. Figure: Module with PCB and heat sink

The distance between the top surface of the heat sink and the bottom plane of the PCB is 12 mm, defined by the module type. PCB spacers can be used to obtain the correct spacing. The number and the position of the fixing points depend on the design of the circuit, the location of different masses like capacitors or inductors and the environment of the system. General recommendation cannot be given. For recommended heights of these spacers see the sections of mounting options (6).

Typical (recommended) assembly sequence:

1. Attach module to the PCB
2. Position and fix the assembled PCB with spacers to the heat sink
3. Fix the module to the heat sink

During assembly process, a single pin is not allowed to be drawn or pushed more than ±0.2 mm or load with a force greater than 35 N.

The tension of the pin must not exceed ±5 N at a maximum substrate temperature of 100 °C.

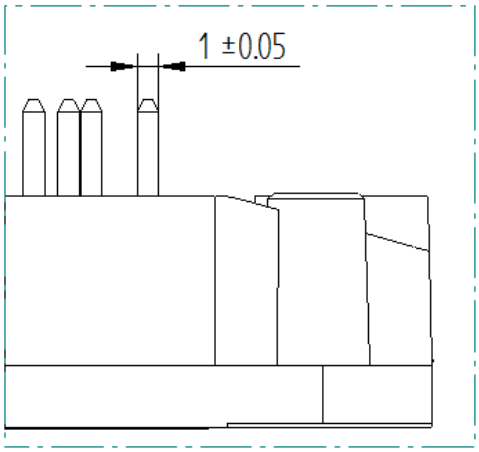
2 Specification for PCBs

- Printed board material meets the requirements of IEC 61249-2-7;
- The number of conductive layers is not limited.

2.1 Specification for modules with solder pins

- The module must be attached to the PCB with 4 screws
- After screwing the module to the PCB, all pins must be soldered. The hole diameters on the PCB have to be designed according to the soldering pin diameter which is Ø 1 mm ±0.05 mm.

For further dimensions or a 3D model please contact your local sales manager.



2. Figure: Solder pin diameter

3 Specification for heat sink

The whole heat sink surface under the module must be plane, clean and free of particles.

- The flatness tolerance should be: < 25 µm in general.
- In case the thermal paste thicker than 50 µm the flatness tolerance can be < 50 µm. (A flatness tolerance specifies a tolerance zone defined by two parallel planes within which the surface must lie.)
- The surface roughness should be less than: R_z < 10 µm.

Heat sink surface imperfections should be within the values 1000 µm and 200 µm specified for the diameter and the depth of surface imperfections respectively.

4 Specification for thermal interface materials

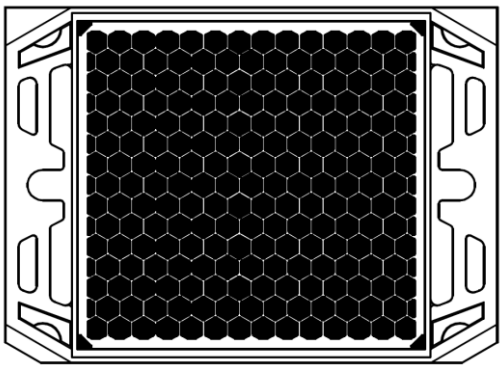
4.1 OPTION 1: Thermal paste:

A. The proposed thermal paste applying technology is screen printing. The preferred solution is to apply an inhomogeneous, honeycomb pattern on the backside surface of the module (seen on 3. Figure: Thermal paste honey comb pattern).

Module type	Thermal paste thickness (Wacker P12)
flow 1C	TBD

1. Table: Thermal paste thickness

B. As an alternative, a roller or spatula can be used to apply a homogeneous layer of thermal conductive paste over the whole backside of the module.



3. Figure: Thermal paste honey comb pattern

For any other thermal paste application technology or thermal paste type, additional tests should be performed. The mounting procedure for modules is the same as the standard mounting process; screws to the heat sink can be fastened and tightened in one single step.

4.2 OPTION 2: Pre-applied thermal interface material

The *flow* 1C modules may have already been pre-printed with thermal interface material. Once the compound is applied, it is dried to a solid phase change material. The material will only flow above the phase change temperature of 45 °C when pressure is applied.

- No burn-in is necessary to melt the phase change material. As the thermal interface material (TIM) changes into liquid phase, the air is expelled from the interface and the material conforms to the surface features located on the heat sink and the bottom of the power module. By reducing the thermal impedance, the TIM performs as a highly efficient thermal transfer material.
- Further information about using modules with pre-applied TIM see the application note for "*Power modules with Phase-Change Material*" on Vincotech's website

Module type	Phase change (Loctite PSX-Pm)
flow 1C	TBD

2. Table: Phase change material thickness

5 Specification for fastening screws to the heat sink

- Screws M4 (recommended screw type DIN 7984)
- Min. length of the screw in the heat sink: 6 mm
- Flat washer ISO 7092 (DIN 433)
- Spring washer DIN127 or DIN 128
- Mounting torque: 1.6 Nm < M_s < 2 Nm
- For modules with AlN DCB: tighten both screws with half torque first, and then tighten both screws with max. torque afterwards

A torque wrench shall be used to tighten the mounting screws at the specified torque as excessive torque may result in damage or degradation of the device. The inaccuracy of torque wrench tightening method can range up to ±12 %. This has to be taken into account to prevent over-tightening the fastener.

Due to excessive temperature fluctuations washers should be used to prevent the loosening of the screws. After accurate tightening of the screws the spring washer exerts a constant force on the joint. The flat washer distributes this force on the plastic surface.

5.1 Screw with pre-assembled washers

Screws with pre-assembled washers (SEMS or kombi screws) combine the screw and the washers into a single component. These screws eliminate the need to slip the washers into place by hand, boosting the speed and efficiency of the assembly process. The specifications of these screws are provided below:

- Screw size M4 according to DIN 6900 (ISO 10644; JIS B1188)
- Flat washer according to DIN 6902 Type C (ISO 10673 Type S; JIS B1256)
- Split lock spring washer according to DIN 6905 (JIS B1251)
- Mounting torque range: 1.6 Nm < M_s < 2 Nm

5.2 Mounting with automatic screwdriver

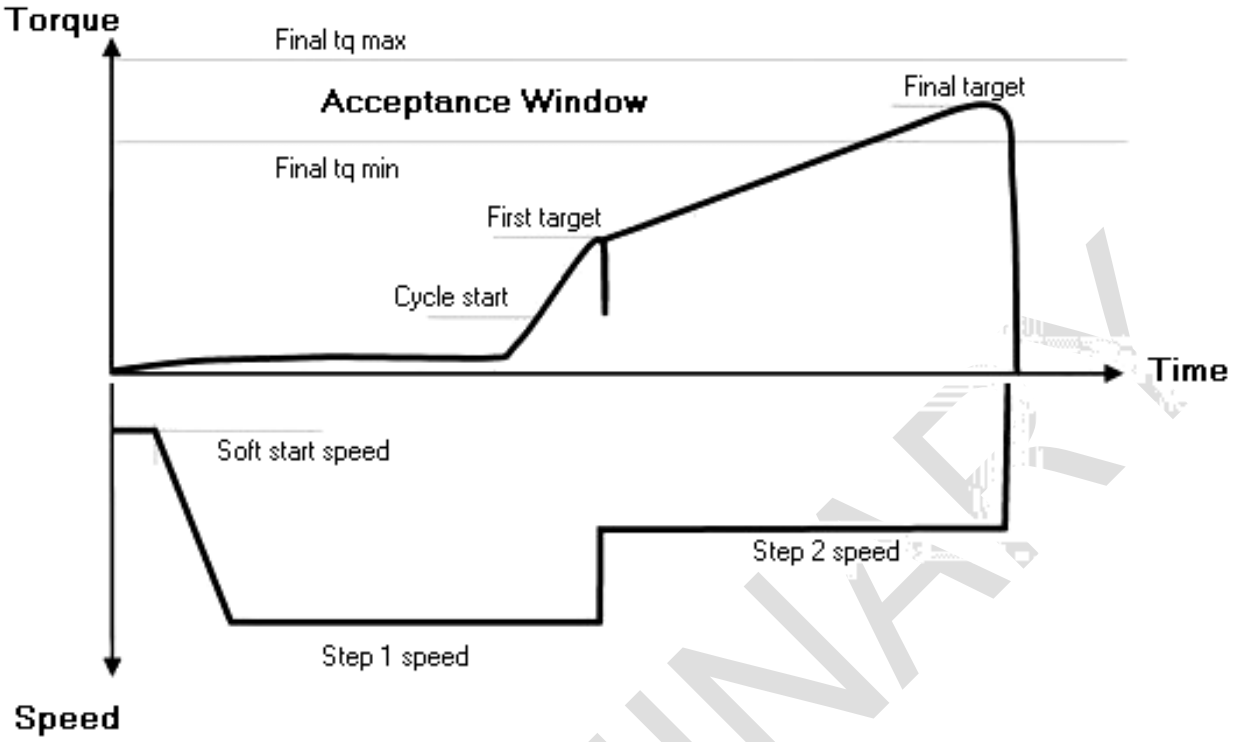
For a fast, reliable and repeatable screwing process an automatic screwdriver with two stage tightening method is recommended. The screwdriver starts fast in the first stage and slows down after the first target torque is reached to accurately tighten the screw to the final target. For torque and speed recommendations see below the curves (4. Figure: Recommended torque and speed curve) and values:

Torque

- Cycle start: 0.3 Nm
- First target: 0.5 Nm
- Final tq min.: 1.6 Nm
- Final target: 1.8 Nm
- Final tq max.: 2 Nm

Speed

- Soft start speed: 96 rpm
- Step 1 speed: max. 650 rpm
- Step 2 speed: max. 12 rpm



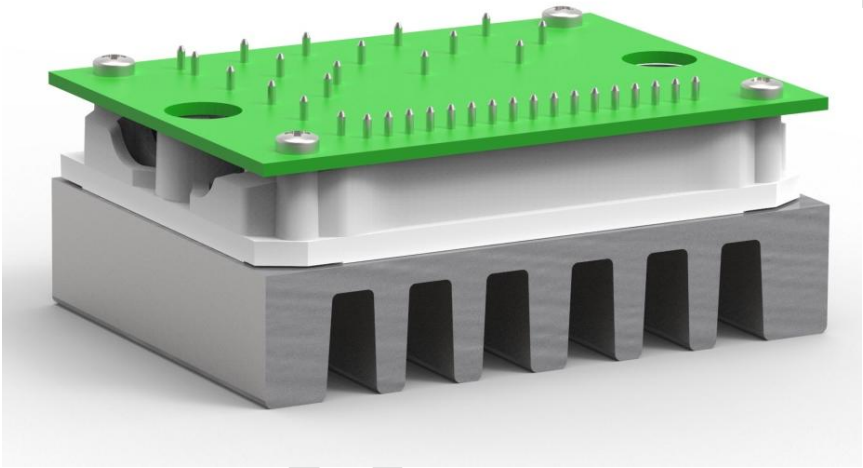
4. Figure: Recommended torque and speed curve

6 Mounting options of modules with solder pins

For minimum overhang of the pins IPC-A-610E standard and the module datasheet drawing should be considered.

6.1 Using screws to fix the module to the PCB

- Insert the module pins into the PCB
- Fix the module to the PCB with 4 screws by the towers before soldering (for screws min. ø2.8 mm hole is needed on PCB). Screw type: BN82428, D = 2.5 mm and L = 6 mm with a mounting torque: 0.4 Nm.
- Recommendation for spacer height is $11.2^{-0.1}$ mm.

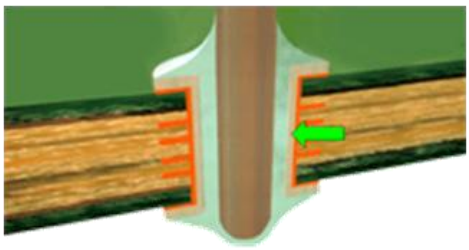


5. Figure: Assembly illustration

6.2 Using soldering jig (without using screws)

- Insert the module pins into the PCB
- Fix the module to the PCB with soldering jig before soldering
- The height of the spacers depends on the distance between the soldering jig and PCB thickness.

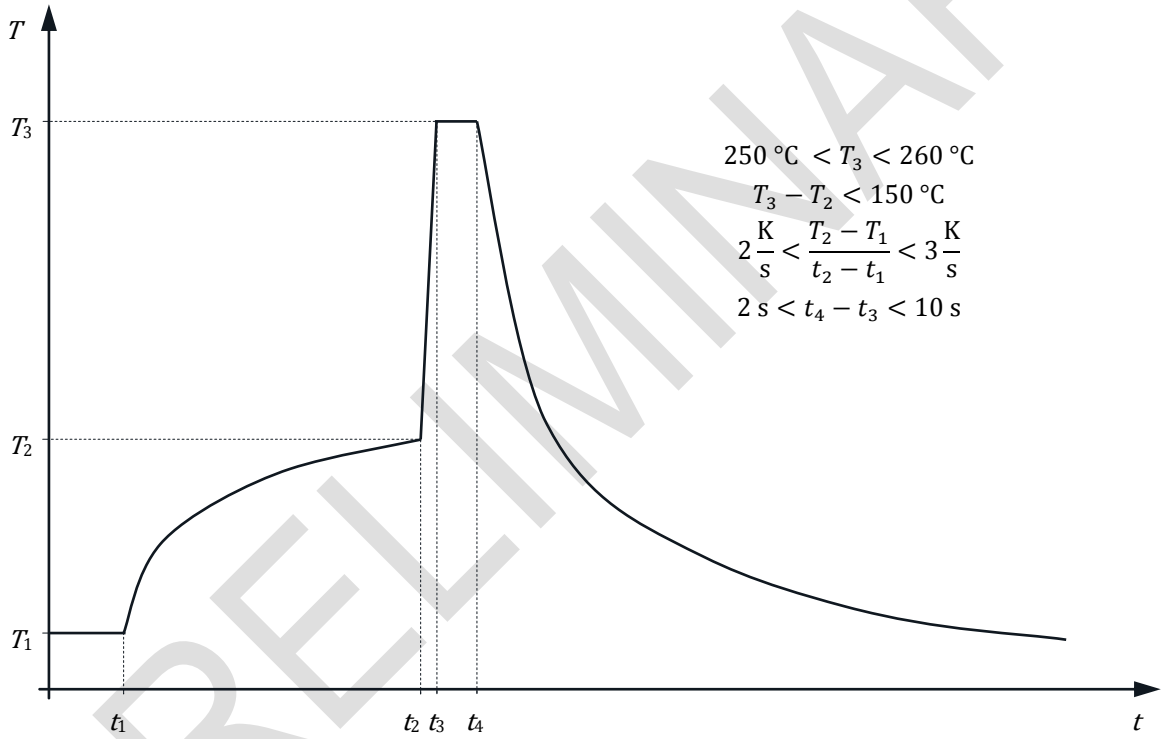
7 Recommendation for soldering



6. Figure: Plated through hole, good soldering

Plated through holes should exhibit a vertical solder fill of 75 %, with a fully formed fillet on the solder side and evidence of 75 % wetting on the component side lead, barrel and pad.

Wave soldering of modules with solder pins



7. Figure: Typical profile for wave soldering

7.1 Hand soldering parameters

- Max. solder iron temperature: 350 °C
- Max. contact time with component lead: 10 s
- Number of heat cycles: 3

8 ESD protection

Modules are sensitive to electrostatic discharge which can damage or destroy sensitive semiconductors. All modules are ESD protected in the shipment box by semi conductive plastic trays. During the handling and assembly of the modules it is recommended to wear a conductive grounded wrist band and ensure a conductive grounded working place.

Please take into consideration the following standards for handling electrostatic-sensitive devices: EN61340-5-1, ANSI S20.20

9 Storage and transportation conditions

The modules can be subjected to environmental conditions characterized by the following classes:

Storage:	1K2 / 1B1 / 1C1 / 1S2 / 1M2
Transportation:	2K2 / 2B1 / 2C1 / 2S1 / 2M2*

These classes are defined in the IEC 60721-3-1 and IEC 60721-3-2 standards. The modules have 1 year shelf life with the given storage conditions.

Flammability classification of the plastic material for *flow* 1C are V-0 and 5-VA (self-extinguishing, no dripping of flaming particles) according to UL 94, IEC 60695-11-10 and IEC 60695-11-20 test methods.

10 Disclaimer

The information and recommendations in this document are based on standards and common engineering practices. Customer specific applications and specifications may require additional processes and tests that may supersede those recommended in this document.