Infineon Technologies Bipolar

Modules with applied Thermal Interface Material (TIM)

Use and installation manual

Content

1 Basics

To ensure optimum heat transfer between power semiconductors and heat sinks the application of a filling material with good heat conduction that suitably smooths any unevenness is necessary.

Material selection as well as the type of application considerably influences the heat conduction. Moreover, it must be ensured that the selected material conforms to the long-term requirements of the application.

To realize the best possible results, the module and the geometrical arrangement of the applied material as well as the applied material itself have to be seen as one entity. This application note describes the use and the handling of modules with factory applied Thermal Interface Material (TIM).

2 Image and Properties

The Thermal Interface Material (TIM) applied by Infineon consists of a material that changes its state when heated. At a temperature of >45°C it transitions from a solid to a liquid state. Below the melting temperature it is roughly comparable in consistency to candle wax. Other thermal and mechanical properties that this TIM possesses are very good heat conduction. It is silicone free, has high long-term stability and is resistant to pump out.

2.1 Storage and Transport

For storage and transport the document TR14 Storage of IFX Products applies. In addition, the thermally active material in the original packing can be stored for 24 months at a temperature up to 40°C. Touching the thermally active layer is to be avoided.

2.2 Packaging

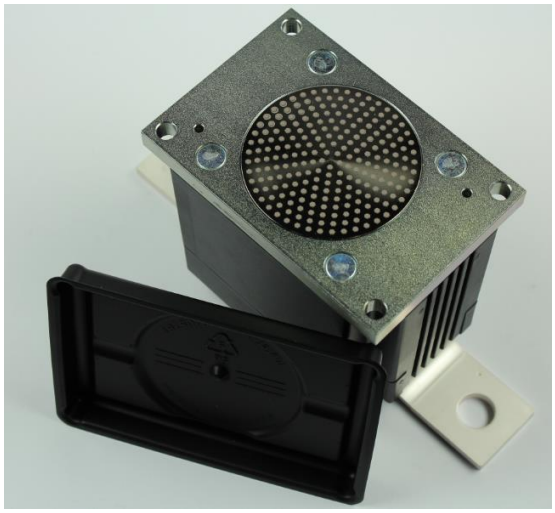


Fig. 1: Printed power semiconductor module

Fig. 2: Protective cover for base plate with TIM

The power semiconductor modules are placed in cardboard packaging with a cardboard inlay and a protective cover for the base plate.

A second top cardboard inlay secures the power semiconductor module.

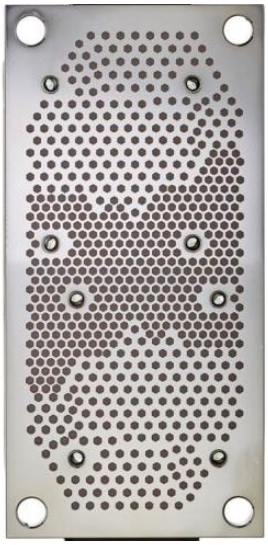
Fig. 3 and 4: Packaging of the 70 mm Power Block module

2.3 Visual Inspection

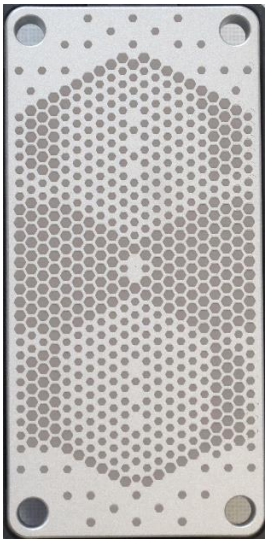
The Thermal Interface Material is printed on the module base plate with a stencil with varying quantities in a controlled process.

Prior to the mounting on the heat sink, a visual inspection is recommended to check whether the printed image is undamaged and complete as presented by the examples in figure 5.

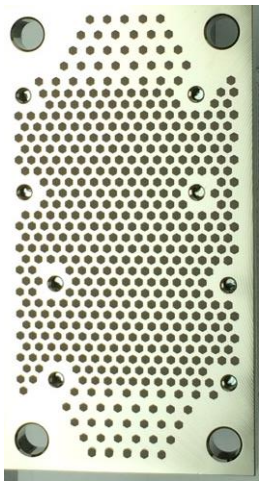
Power Block 70
(PB70)



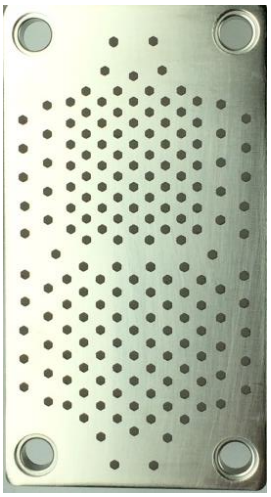
Power Block 60
(PB60)



Eco Block60
(eco PB60)

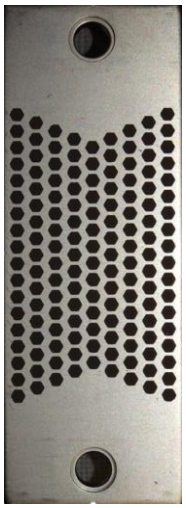


Power Block 50
(PB50)



Eco Block 50
(SB50)

Power Block 34
(PB34)



Eco Block 34
(SB34)

Fig. 5: Examples of power semiconductor modules printed with TIM

3 Mounting on a Heat Sink

For power semiconductor modules equipped with TIM, use the mounting instructions of the respective product family which are given in application notes (AN2012-01 Technical Information Bipolar Semiconductors). The contact surface of the heat sink may not exceed a flatness and a roughness (R_z) of 10µm.

3.1 Cleaning During Replacement

When replacing the power semiconductor module, the heat sink must be cleaned to remove any remaining TIM. Removing TIM creates no special industrial safety demands and can be carried out without gloves.

Cleaning for example can be accomplished with a lint free cloth. The surface of the heat sink must not be damaged during this process.

Step 1: Lift module from the heat sink

Step 2: Remove coarse particles

Step 3: Final cleaning

In the microstructure of the heat sink surface, minute particles will remain. These do not represent a problem for the mounting of a module with applied TIM provided that the remaining TIM on the heatsink is identical to the new material.

If a module coated with TIM is mounted to a position that has previously been coated with other heat conducting media, a thorough cleaning, where applicable with solvents or alcohol, has to be carried out.

Step 1: Lift module from the heat sink

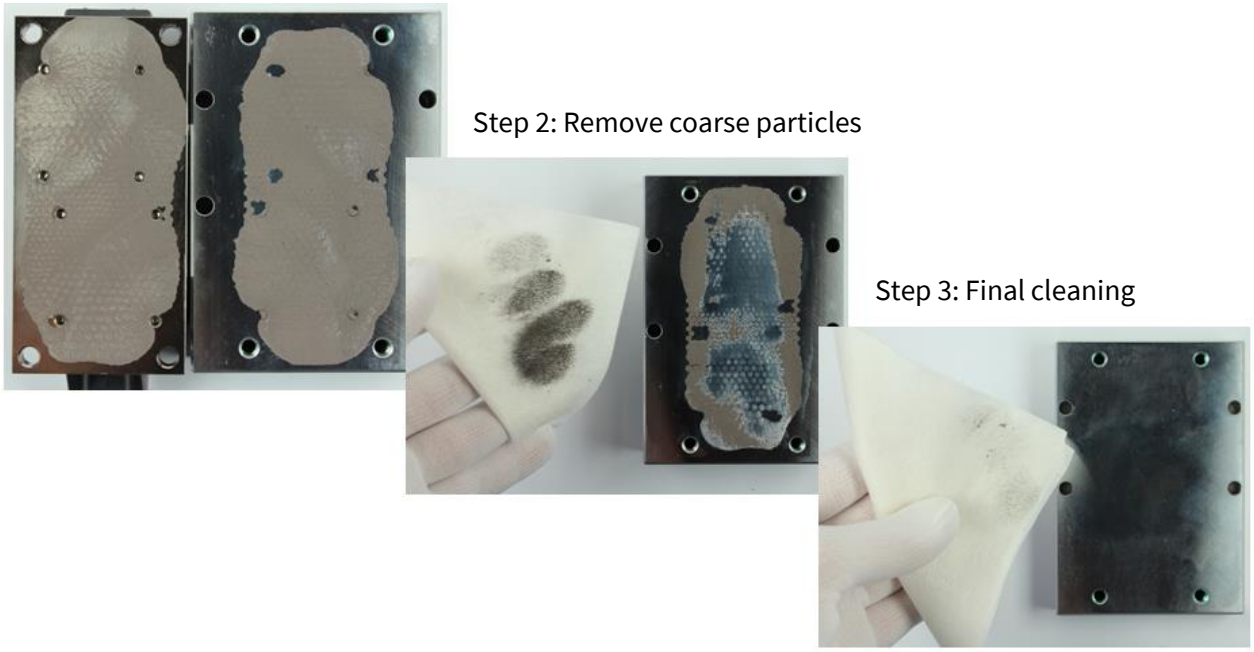


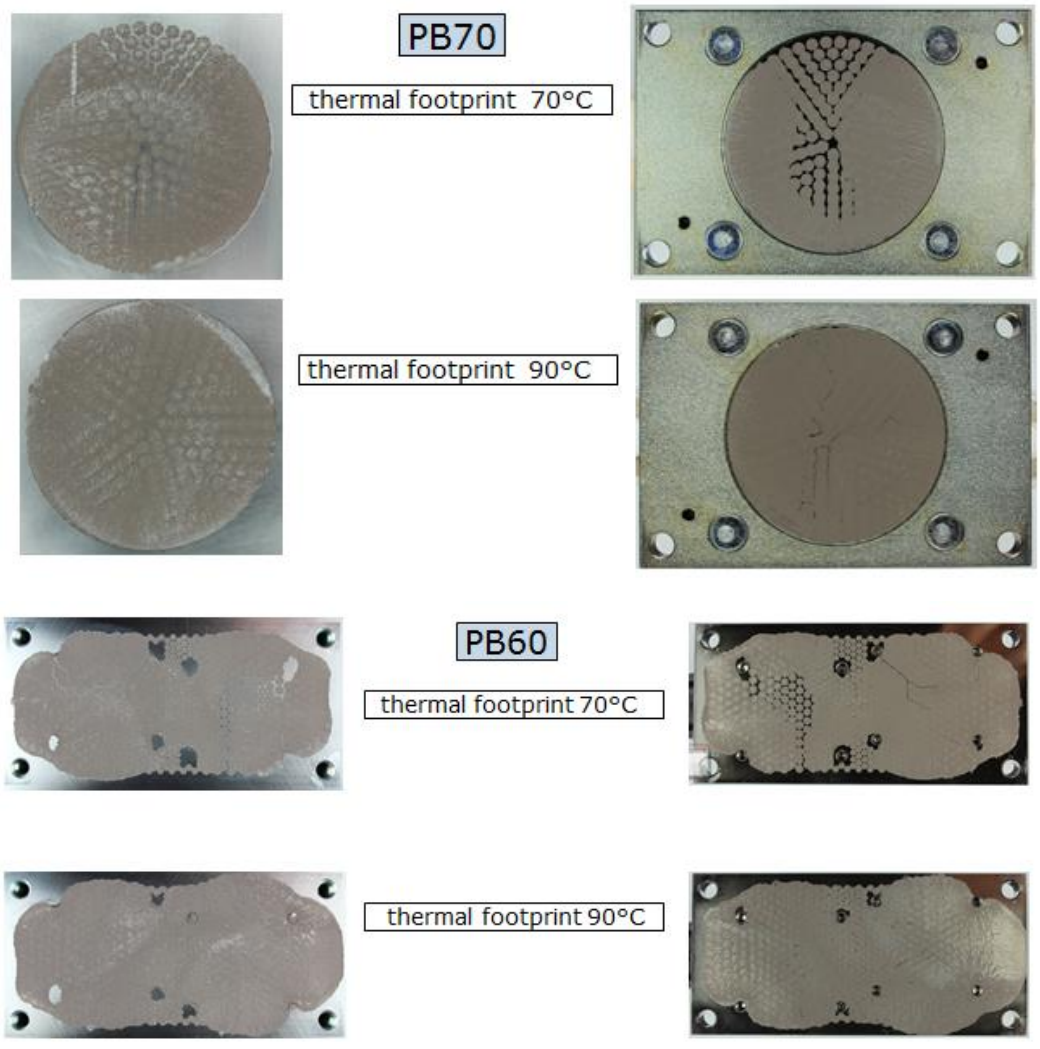
Fig. 6: Cleaning of the mounting surface for the exchange of a module

4 Handling in Production

The packaging protective cover should only be removed immediately before mounting on the heat sink. It is necessary to ensure that the base plate functional surface is protected against contact or contamination by dust, grease, oils and humidity.

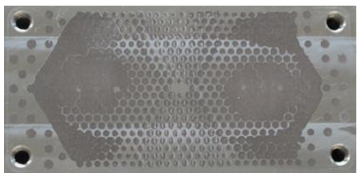
4.1 Evaluation of the Printed Image of the Thermal Interface Material

The printed image of the TIM on a mounted module depends on temperature. The higher the temperature, the more the honeycomb pattern of the applied TIM (see figures 7 and 8) dissolves.



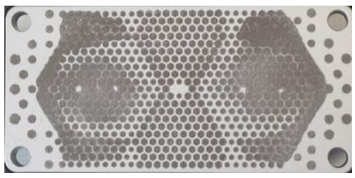
Left: View of the clamping area of the heat sink Right: View of the base plate of the module

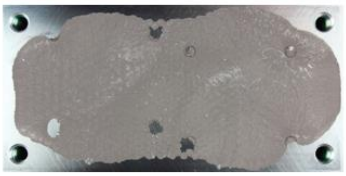
Fig. 7 and 8: Optical image of the TIM layer after thermal stress and disassembly



eco PB60

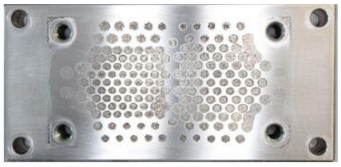
thermal footprint 90°C





PB50

thermal footprint 90°C



SB50

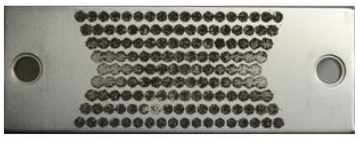
thermal footprint 90°C

PB34

thermal footprint 90°C

SB34

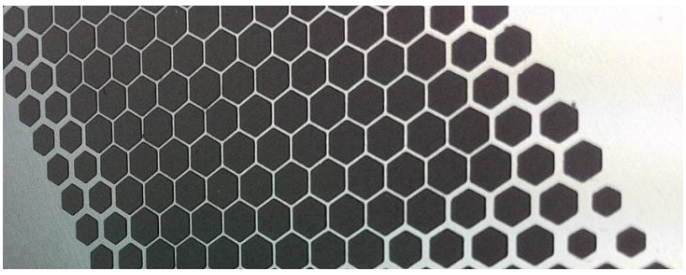
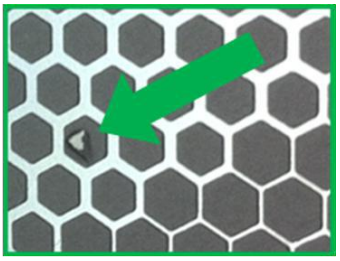
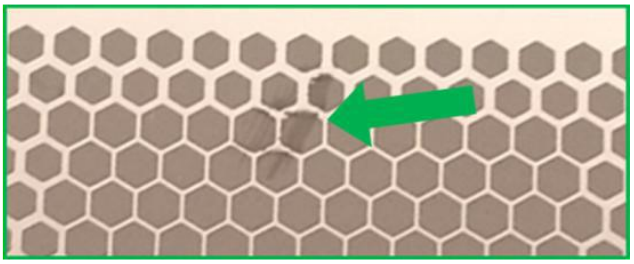
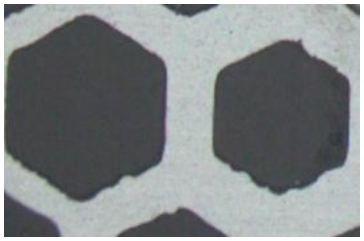
thermal footprint 90°C



Left: View of the clamping area of the heat sink Right: View of the base plate of the module

5 Visual Imperfections

Despite intensive manufacturing control of the printing process and proper care in handling and processing, variations of the applied layer may occur that have no influence on the thermal quality or the longevity of the material. This section shows and explains the deviations that are classified as allowed.

Allowed image: A little bit of TIM material is leaking around the honeycomb shapes.	
Allowed image: Small deformation within the honeycomb shape.	
Allowed image: Local discoloration or small scratches on the honeycomb shapes.	
Allowed image: The edge of the honeycomb shape is not “sharp”.	
Allowed image: A little bit of TIM material is between the honeycombs shapes.	

6 Further Literature

A series of articles about Thermal Interface Material and thermal management can be found on Infineon´s website www.infineon.com/tim.

Revision History

Major changes since the last revision

Page or Reference	Description of change
4	Change of temperature for storage and transport
6; 9	Addition of 34 mm modules in solder bond and pressure contact technology
6; 9	Addition of 60 mm eco modules

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