

Handling, packing and storage conditions for sawn wafer dies and bare dies

ABB Semiconductors delivers high voltage IGBTs and diodes ranging from 1,200 to 6,500 volts (V) as unsawn and sawn wafer dies and bare dies in waffle packs.

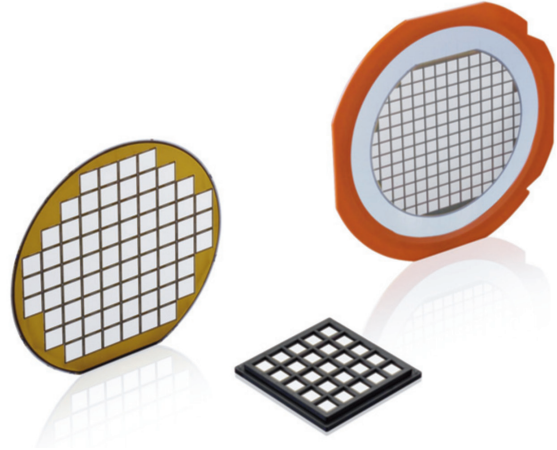


Fig 1: Dies in unsawn wafer die, waffle pack and sawn wafer die

Scope

Safe handling, packing and storage of the dies is important to maintain overall quality and ensure the best yields when they are assembled into modules. Due to both the physical and electrical sensitivity of the material, life of a die is severely affected by the conditions in which the dies are stored.

The IGBT is an electrostatic sensitive device and must be handled properly to avoid damage from electrostatic discharge (ESD).

Therefore please observe the international standard IEC 60747-1 chapter IX.

There are two major problems a die user is faced with, the first is electrical protection, the dies must be protected from ESD (Electro Static Discharge), and chips can deteriorate due to the excessive ESD charge forced through them therefore dropping the overall performance of the module. In the worst cases the chips can be destroyed entirely!

This document summarizes the boundary conditions for handling, packing and storage of dies, necessary to meet high quality requirements on the final product.

General

Bare hand contact with the exposed chips should be avoided. Only properly designed tools and materials should be used when contacting bare dies. Both sides of the chips have active areas, hence they should never be touched. The mechanical pressure has to be limited and all handling (including unpacking and inspection, die bonding, wire bonding, moulding, sealing) should be done in an at least class 10000 (ISO 7) environment. It is recommended to use special tweezers or dedicated vacuum pick up tools for grabbing the die and wafers on its edge. The working environment, including tools, materials and containers for handling and transport of dies should provide for ESD protection (refer to IEC 61340-5-1 and IEC 61340-5-2)

Working environmental controls

Bare die must always be handled in a clean room environment of at least class 10000 (ISO 7) or better.

General handling precautions

Dies are delivered as fully tested. Damages due to further testing are in the responsibility of the customer.

Cleanroom good practice

Containers of dies should only be opened in a work area with a controlled environment, known as a cleanroom. This applies to any process that exposes the dies to the environment, for example quality checks or assembly of modules. Personnel working in these areas need to be adequately trained to ensure that dies are not physically damaged nor contaminated when handled in the cleanroom.

Dies in process should remain in a clean environment at all times. If dies are to be transported between cleanrooms, a suitable carrier should be used and the container should remain closed during transportation. The container should be externally cleaned on re-entering the cleanroom.

All surfaces coming in contact with the dies throughout the process should be clean and when practicable non-metallic. Any hard material in contact with the dies may cause scratches or cracks in the silicon. These principles should be observed at all times, since if one part of the die becomes contaminated; the contaminants may be transferred to other surfaces and process equipment.

Packing and transport

Packing

Unsaun wafers are delivered in boxes (Fig.2) and bare dies in so called waffle packs (Fig.3), both sealed in nitrogen filled plastic bags.

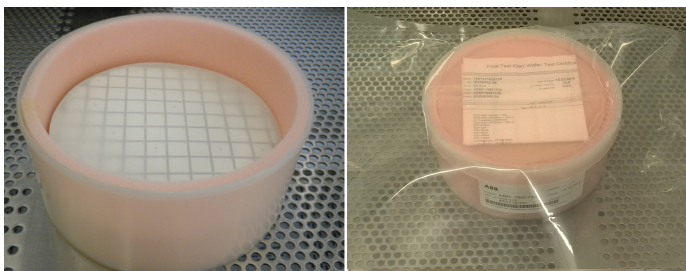


Fig 2: Packing for unsawn wafer dies in boxes



Fig 3: Packing of bare dies in waffle packs

The shelf life of the wafer or bare dies is not affected, if the transport and store conditions, described hereafter, are kept. Sawn wafer dies are also delivered on an adhesive tape packed in nitrogen filled plastic bags (Fig.4).

The estimated shelf life of the nitrogen filled bag is 9 months after the packed date indicated in the label.



Fig 4: Packing of sawn wafer dies on adhesive tape

Following information is included in the labels of sawn wafer dies :

1. Article number (e.g. 5SMY 86M1280)
2. Date packed :
3. Date of package valid until :
4. Numbers of the wafers inside the package
5. Barcode with lot ID.

Transport

During transport, the packing and the products have to be protected, among others, against extreme temperatures, humidity, direct sunlight and mechanical forces. The temperature has to be between 8 °C to 60 °C. The total transport time should be as short as possible. When the transport time exceeds five days the transport conditions shall be the same as storage conditions described below.

Storage

Secure and clean storage areas shall be provided to isolate and protect the products. Conditions in the storage areas shall be such that the quality of the products does not deteriorate due to, among others, harmful gasses or electrical fields.

At all times, bare dies should be stored in clean containers in a controlled environment. This method of storage is commonly referred to as short-term storage. When a container is opened, contaminants from the outside are able to enter and contami-

nate the products, the container and the interior of the container. Therefore doors on cabinets should be kept closed at all times when not in use.

Storage environment and conditions and storage time

When not in process, devices, which are taken out of the sealed bag, should be stored in an inert (dry air or nitrogen) environment, suitable for the storage of dies. The following conditions are to be maintained for dies:

- a) Atmosphere: inert gas, dry air, dry nitrogen or in nitrogen flow boxes
- b) Temperature: 18 °C – 24 °C
- c) Humidity: RH minimum of 7 percent, maximum of 30 percent
- d) Particle count: ISO 14644-1, Class 7.

Bare dies and unsawn wafers have an estimated shelf life of 3 years (starting with the packed date indicated in the labels) before usage if kept under above storage conditions.

Sawn wafer dies, which are on glued on a tape, have to be processed faster. Their estimated shelf life is 9 months after the packed date indicated in the label. Estimated shelf lives are based on ABB's experience and are non-binding. They do not change the agreed warranty period.

If bare dies, sawn wafers or unsawn wafers are kept in the sealed bags or boxes, then the environment conditions for storage are as follows:

- a) Atmosphere: inside a building, protected from dust, dirt and water, no exposure to direct sunlight.
- b) Temperature: 8 °C – 45 °C
- c) Humidity: RH maximum of 75 percent

References

Following documents are indispensable for the application of this document:

IEC 62258-3: Semiconductor die products – Part 3: Recommendations for good practice in handling, packing and storage

IEC 61340-5-1: 1998, Electrostatics – Part 5-1: Protection of electronic devices from electrostatic phenomena – General requirements

IEC 61340-5-2:1999, Electrostatics – Part 5-2: Protection of electronic devices from electrostatic phenomena – User guide

ISO 14644-1, Cleanrooms and associated controlled environments – Part 1: Classification of air cleanness.

Revision history

Prepared	Checked 1	Checked 2	Approved	Date
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