Pressure sensors

Handling guideline, pressure sensors bare dies

Series/Type:
Ordering code:

Date: 2018-02-25
Version: 1.0

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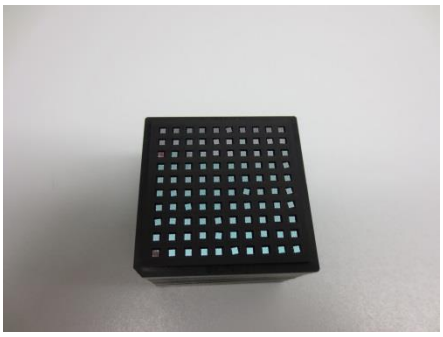
Introduction

This application note is intended as a customer's guideline for handling pressure sensors bare die. Improper handling can impair the performance of the elements. This document provides information about the appropriate handling of the pressure sensors bare die.

Delivery form

For delivery, dies are packaged either on a tape or in waffle packs, referred to as trays in the following document.

- For each die type there is a particular tray type with corresponding pocket dimensions. The tray stack (Fig.1) is packed in a labelled spring box (Fig.2). These spring boxes are in turn packed in a plastic tray (Fig.3) and sealed in an antistatic bag (Fig.4).



- Figure 1

Figure 2

- Figure 3

Figure 4

- The tape with dies is stabilized with a labelled frame shipper (Fig.5), which is sealed in an antistatic bag (Fig.6).

Figure 5

Figure 6

Sensitivity

The delivered dies have undergone electrical and optical inspection upon shipment. This ensures that their performance conforms with the specification and that they are free of any damage or contamination.

- **Contamination** during handling, for example, particles on bond pads and semiconductor surfaces can affect the performance of a die. For this reason dies must be processed in a class 1000 clean room (ISO 6) and handled with clean tools.
- Any **mechanical damage** can also be crucial for the performance of the die. Bending forces can cause cracks Therefore, only a limited mechanical pressure should be applied on the die and its active side (top side with wire bond pads) should never be touched. Appropriate tools are indispensable during handling.
- The die is susceptible to **electric fields**. The environment must be electrostatically protected according to relevant electrostatic discharge (ESD) guidelines when processing the die. Thus, each device or tool that comes into contact with the die should be adjusted on the same electric potential as the die.

Handling requirements

- In order to avoid contamination, the active side of the bare die should never be touched, nor should the die be contacted by bare fingers. Packaged dies should be opened only in a clean room in order to prevent any dust from coming into contact with the surface of the dies. Handling tools must be cleaned regularly and properly to prevent residues from transferring to the surface of dies. Please contact your equipment supplier for cleaning instructions.
- Mechanical pressure applied at any stage to the die should be minimized. Suitable tools for picking dies from the front side should be equipped with a soft rubber tip with a vacuum hole in the middle that is larger than the diaphragm of the sensor die. Pushing up the dies from the tape can be done with ejector pins with multiple needles. Some tools such as tweezers can damage the dies. The dies should be transported only in appropriate boxes and bags. The forces applied during die bonding processes should be kept below 100 cN in order to keep mechanical stress at a minimum. It is recommended to reduce overall handling to a minimum.
- Process temperatures should be kept as low as possible in order to prolong the stability and lifetime of the die. A temperature of +225 °C should not be exceeded.

Bare die assembling

Die assembling can affect the performance of the die considerably with regards to hysteresis behavior of different parameters as well as long-term drift.

- Mechanical stress due to die assembling is the main factor that negatively affects the performance. A soft silicone adhesive with low hardness (shore A approx. 30) and adhesive thickness >50 µm is recommended. (Hard adhesives such as epoxy could result in an offset drift and higher temperature coefficient of offset voltage).
- Adhesives or its residues on the diaphragm can result in a high temperature dependency and high long-term drifts of the output signal.
- Bond pads consist of aluminum or gold, depending on the application or requirements.
- Aluminum or gold wires for aluminum bond pads and only gold wires for gold bond pands can be used for wire bonding.
- Gel can be applied to the sensor surface in order to protect the bond pads from corrosion. Please note that gel can influence the diaphragm mechanically and therefore also the output characteristic.

Storage conditions

- Any parts not being used in processing must be protected according to JEDEC JESD 625 B. Any packaging materials used for this purpose must be non-outgassing and chemically stable. Furthermore, the following storage conditions should be preserved (except as noted otherwise):
    - Storage in cabinets (if shipment package is opened):
        - Atmosphere: inert gas, dry air or dry nitrogen
        - Temperature range (in cabinet): 20±3 °C
        - Relative humidity range (in cabinet): < 40 %
        - Particle count (in cabinet): Class 6 per ISO 14644:1999 (equivalent FED STD 209E Class 1000)
        - Shelf life under these conditions: 24 months for deliveries in trays
        - Shelf life under these conditions: 12 months for deliveries on tape
    - Storage in containers (if shipment package is sealed):
        - Sealed as delivered or backfilled with inert gas, dry air or dry nitrogen and re-sealed
        - Temperature range: 20±3 °C
        - Relative humidity range: < 50 %
        - Particle count (during backfill): Class 6 per ISO 14644:1999 (equivalent FED STD 209E Class 1000)
        - Shelf life for deliveries in trays under these conditions: 12 months
        - Shelf life for deliveries on tape under these conditions: 6 months

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