Handling and Mounting of Pressure Die

1. Introduction

The following application note is intended to describe the best methods for handing and mounting bare die pressure sensors. Merit produces all pressure chips on 4 inch wafers, which are sawn and delivered on Mylar film (foil tape). The foil tape is attached to a metal wafer frame that is suitable for most automated die bonders (see figure 1). Any unit that is marked with a black ink dot is considered to be a bad unit.

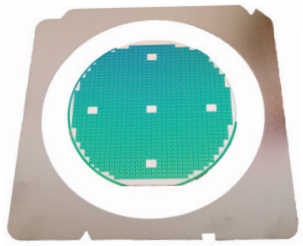

Figure 1

2. Packaging & Storage

All wafers assembled on foil tape will be delivered in plastic clam shells (see figure 2), which are then inserted into an antistatic zip-lock bag. The bags should be opened in clean rooms only and stored in a dark, nitrogen-filled cabinet after opening. Wafers can be shipped either individually or multiple clamshells in one plastic antistatic zip-lock bag. The label on each clamshell will contain the part number, purchase order number (if applicable), lot and wafer number and the quantity of good die (see figure 3). The lot and wafer number will also be written on the foil tape.

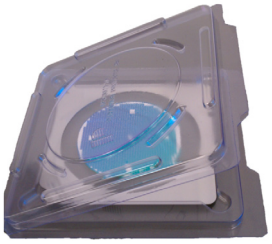

Figure 2

Storage Temperature is 19-26 °C: In a proper storage environment, the storage time of sawn wafers is approximately five years. Storage beyond this limit, or storage in an uncontrolled or different environment, may result in picking problems at die bonding (sticking die) or unreliable wire bonds due to corrosion of the aluminum bonding pads.

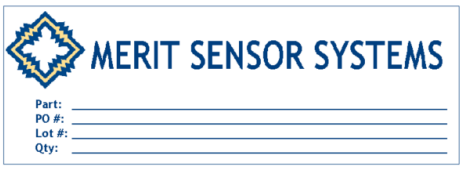

Figure 3

3. Handling of Wafers

All sensors chips are 100% electrically tested to ensure that they comply with the datasheet limits. The wafers are visually inspected to guarantee that all sensors are free from any defects. The pressure chips are RoHS compliant and in most cases consist of a silicon/glass stack that is electro statically bonded together.

- All wafers are mounted, tested, diced and delivered on a metal wafer frame. Each wafer yields approximately 600 to 1600 pieces depending on the product.
- The surface of the wafer is very sensitive so special care should be taken when handling the wafer.
- No cleaning is necessary but the wafer should be opened in a clean room.
- We do not recommend picking die off the wafer frame with tweezers. The pressure chips should be picked up with a tool made of soft rubber with a vacuum hole in the middle that is larger than the membrane of the sensor.
- The bonding force should be less than 100 grams in order to prevent mechanical stress, which can result in an unstable, drifting offset.
- All tools should be cleaned thoroughly to prevent any residue on the bonding pads, which could lead to reliability problems.
- For gage pressure sensors (hole on backside), ejector pins with 3 or 4 needles may be used to remove the die from the wafer tape.
- For absolute pressure sensors (no hole on backside) a single ejector needle will be sufficient.
- Process temperatures above 225°C should be avoided. The lower the maximum temperature, the more stable the sensor will be in a long-term.

Continued

4. Mounting of Pressure Chips

- All pressure chips have been optimized for the highest output signal and long-term stability. In order to achieve the best performance (long-term drift, hysteresis, temperature behavior), it is critical that special care be taken when mounting the die.
- The pressure chips are sensitive to mechanical stress, especially sensors with full scale pressures below 1 bar. These pressure chips should be mounted using a soft silicone adhesive with a low hardness (A25 or lower) and a bond-line thickness of 50-100um. Special care should be taken to not allow the adhesive to climb up the outside or inside walls of the sensor die as this could lead to unstable output.
- Die bonding with hard silicone or epoxy will typically result in an unstable offset value and high TCO (temperature coefficient offset).

5. Attaching the Pressure Chips

- The bond pads on each pressure chip are at least 100x100um. The pad material is aluminum with a thickness of 1-2um.
- Wire bonding can be done with aluminum or gold wire. A good thermo-sonic gold-ball bond, with 30um gold wire, will result in a ball shear force of >30 grams and a Pull Force of >6 grams.
- The wire bonds should be protected with a soft ion free silicone gel that has a viscosity of <1000 cps and no hardness. The gel can have a significant impact on the sensor performance; therefore, special care should be taken when making a selection. Merit has tested and currently uses Dow Corning Sylgard 527.
- The gel can be applied as drop on the surface of the sensor to simply protect the bond pads from corrosion. If further humidity protection is required, then the entire area around the sensor including bonding wires can be covered.
- For gage pressure sensor where the pressure is applied from the backside, Merit still recommends to protect the topside of the sensor with gel to avoid corrosion of the aluminum bonding pad.

6. Disclaimer Notice

Merit Sensor Systems produces high quality products that perform within the parameters of the data sheet. Typical pressure and temperature performance values are not tested 100% but they have been validated during qualification. Merit cannot guarantee that the die will function properly after mounting and post processing by the customer. It is the responsibility of the customer to test and to qualify the function of the pressure chip in the final package. Customer is responsible for the required knowledge to handle bare die and Merit assumes no liability for consequential damages that may result in yield loss or field failures in the final application.

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MERIT SENSOR™

Sales +1 801.208.4722 · Customer Service +1 801.208.4700 · Fax +1 801.208.4798 · sensors@merit.com · www.MeritSensor.com
1600 W. Merit Parkway · South Jordan, Utah · 84095 · USA