

Pressure Sensor Process Assessment

Instructor Guide

Note to Instructor

The objective of this assessment on the MTTC Pressure Sensor is to evaluate the participant's knowledge and understanding of the information covered in the related primary knowledge unit. There is a final assessment for both the primary knowledge unit and the various activities.

This assessment can be compared with the results from the knowledge probe to help determine the amount and level of learning that took place as a result of this learning module and its related activities.

The *MTTC Pressure Sensor Process Learning Module* includes the following:

- Knowledge Probe (KP) or pre-quiz
- MTTC Pressure Sensor Process Primary Knowledge
- MTTC Pressure Sensor Process Activity (Requires cleanroom or fabrication facility)
- A MEMS Process Model Activity
- Micro Pressure Sensor Process Activity*
- Surface Micromachining: Lift-Off Process Activity*
- Bulk Micromachining: An Etch Process Activity*
- **Final Assessment**

*Kit available through scme-nm.org while supply lasts

Introduction

The purpose of this assessment is to determine your knowledge and understanding of the basic processes used to construct a MEMS pressure sensor. This assessment is based upon the process presented in the MTTC Pressure Sensor Process Learning Module. This process is very similar to a commercial process for this type of pressure sensor.

There are ten (10) assessment questions. All of the questions and answer are relative to the MTTC Pressure Sensor fabrication process.

1. What types of micromachining processes are used in the MTTC pressure sensor fabrication process?
 - a. Surface and LIGA
 - b. Surface and Bulk**
 - c. Bulk and LIGA
 - d. Surface only
2. What is the first thin film layer deposited on the silicon wafer?
 - a. Silicon Nitride**
 - b. Photoresist
 - c. Lift-off resist
 - d. HMDS
3. The first photolithography develop process patterns the _____ layer on the _____ of the wafer.
 - a. HMDS, backside
 - b. Photoresist, frontside
 - c. Photoresist, backside**
 - d. Silicon nitride, backside
4. A RIE or reactive ion etch is used to etch the _____ layer on the _____ of the wafer.
 - a. metal, frontside
 - b. Photoresist, backside
 - c. Silicon nitride, frontside
 - d. Silicon nitride, backside**
5. Which of the following BEST describes the purpose of HMDS?
 - a. Provides better adhesion of the photoresist to the wafer's surface**
 - b. Acts as the anchor for photoresist in the lift-off process
 - c. Is the hard mask for the KOH etch on the wafer backside
 - d. Is the hard mask for the RIE etch on the wafer backside
6. Which of the following process steps is followed immediately with a piranha ($\text{H}_2\text{SO}_4/\text{H}_2\text{O}_2$) strip?
 - a. Frontside photoresist strip after the gold / chrome layer is etched
 - b. Frontside photoresist strip after the silicon nitride layer is patterned
 - c. Backside photoresist strip after the silicon nitride is etched**
 - d. Backside photoresist strip after the photoresist is patterned
7. Which of the following is necessary to ensure a selective lift-off?
 - a. LOR**
 - b. Chrome
 - c. KOH
 - d. HMDS

8. KOH is used to remove or etch which of the following material?
- a. Silicon nitride
 - b. Photoresist
 - c. Gold/Chrome
 - d. Silicon**
9. Which of the following BEST describes the purpose of the LOR layer?
- a. Ensures proper adhesion of the photoresist on the frontside of the wafer prior to depositing the gold layer
 - b. Provides a photosensitive layer that develops *faster than* photoresist, creating the desired undercutting below the photoresist**
 - c. Because the LOR chemically reacts with acetone, it dissolves during lift-off taking the unwanted gold with it
 - d. Provides a hard mask that is not chemically reactive with KOH and allows for the selective etching of silicon
10. Which of the following BEST describes the outcome of the KOH etch process?
- a. Selectively etches cavities on the backside of the wafer, the full depth of the wafer under the circuits on the silicon nitride membrane**
 - b. Patterns the silicon nitride on the wafer backside to open up select areas that will be used as the reference pressure chambers
 - c. The KOH dissolves the LOR during the lift-off process allowing the unwanted gold to lift-off
 - d. Removes all of the photoresist remaining on the wafer after all of the other processes have been completed

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