520.495/530.495/580.495 Microfabrication Laboratory

Optical Waveguides

Lab 8: Wafer Dicing and Packaging

This week we will finish the fabrication of the project by harvesting individual smaller dice that incorporate the optical waveguides. In doing so, we facilitate the possibility that we may want to package our devices and or we avoid the risk damaging the whole wafer while testing the individual parts. The wafers will be scribed manually by dragging a diamond tipped tool across the wafer to score the surface. Subsequently, the individual microchips will be separated from the wafer. These will be mounted on the printed circuit board or a commercial package using epoxy (optional). The wire bonder will be used to make connections from the bonding pads on the die to the leads of the package (optional).

Preliminaries:

1. When scribing the wafers be extra careful and gentle.

2. Use tweezers to handle the dice; dispose properly the extra silicon pieces in the "sharps" container.

I. PRELAB ASSIGNMENT:

1. What are the commercial tools for wafer dicing? Who are their manufacturers?

II. LAB WORK:

A. Scribing the wafer

   1. Place your wafer on a hard but flat surface on a clean filter paper.
   2. Using the tool with a diamond tip, scribe lines in the pattern of a cross to separate the four quarters of the wafer. Scribe each line twice or three times, being very careful not to break the wafer.

B. Dicing the wafer and harvesting the dice.

   1. Place your wafer face down on a clean filter paper, on a piece of rubber mat, noting the orientation and location of the scribe lines.
   2. Position a pencil over the scribe line and press down gently. Rock the pencil back and forth while increasing the downward pressure until the wafer breaks.
   3. Repeat this until the individual dice are harvested.

4. Inspect the individual chips and try to pick the best one or two for packaging

C. Packaging (Optional)

1. Mix up the epoxy following the instructions provided by the Teaching Assistant
2. Place some epoxy at the edge of the printed circuit board and carefully place the die on the epoxy making sure that the square bonding pads on die and the copper bonding surfaces on the printed circuit board are on the same side! The mask that we used to make the printed circuit boards is shown
3. Cure the packaged dies in the Blue-M oven for 15 minutes at 40°C.

D. Wire bonding (Optional)

1. Use the wire bonder to place bonding wires from the die to the printed circuit board. Do two bonding wires per pad for each of the two pads. The T.A. will help you with this.
2. Put a drop of epoxy on each of the bonding pads on the die and on the printed circuit board for extra protection (please see diagram)
3. Cure in the Blue-M oven for 15 minutes at 40°C.

III. POSTLAB ASSIGNMENT:

1. Particles are generated during dicing, making it not a cleanroom process. These particles can damage the MEMS or IC components on your chips. How to prevent this from happening?

Lab procedure prepared by H. Vo and A.G. Andreou, Fall 2003. Revised 2007..