SEMICONDUCTOR MANUFACTURING PROCESS

RAGHAVENDRA ANJANAPPA

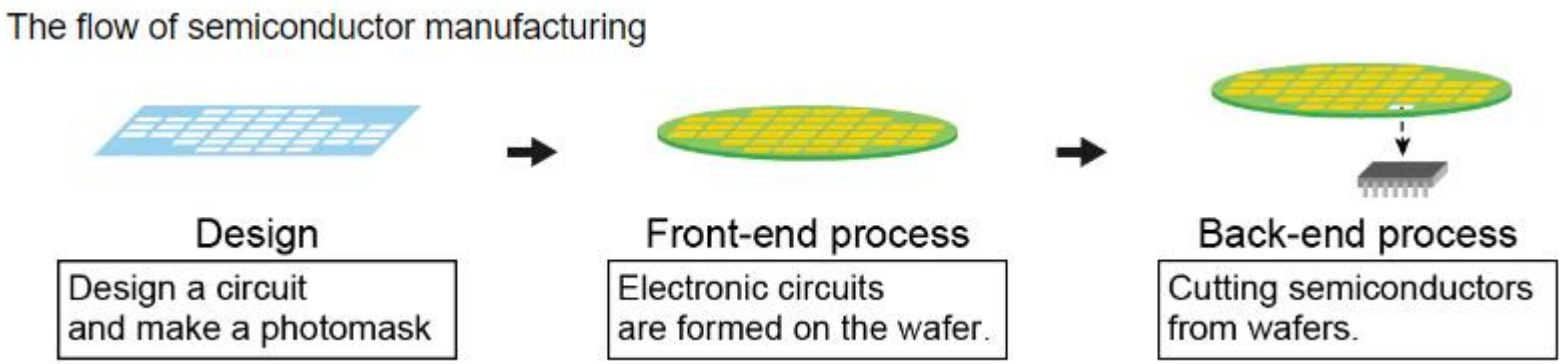
OVERVIEW - SEMICONDUCTOR MANUFACTURING PROCESS

The semiconductor manufacturing process can be divided into three main areas: the design process, the front-end process, and the back-end process. The tasks to be performed in each step are as follows.

1.Design process: Design the circuit. We also manufacture photomasks, which are necessary for making circuits. A photomask is required for each layer to be stacked.

2.Front-end process: On a wafer made from silicon, hundreds of semiconductors are lined up to make an LSI (Large Scale Integrated Circuit).

3.Back-end process: This is the process of cutting the wafer to separate the semiconductor and complete the semiconductor. The cut semiconductors are fixed, and terminals are attached or covered with resin.



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FRONT END SEMICONDUCTOR MANUFACTURING FLOW

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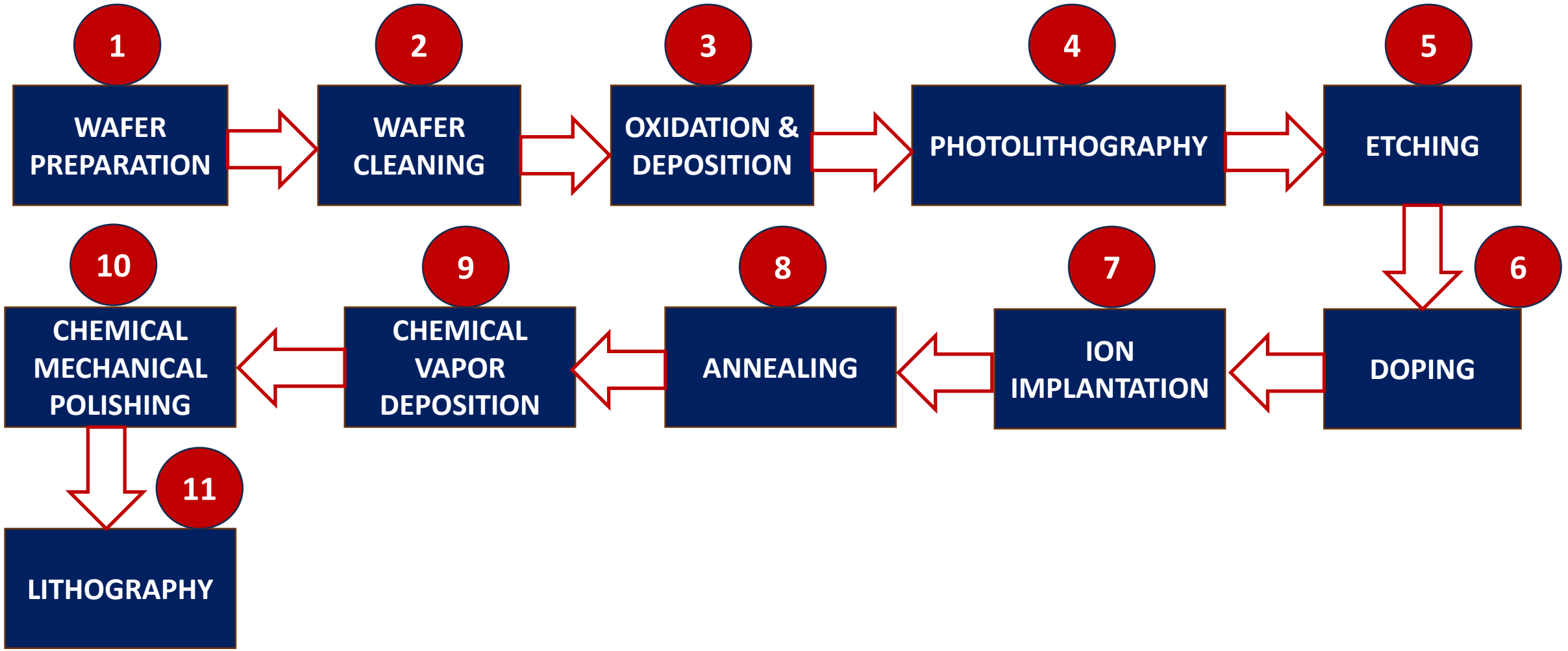
FRONT END SEMICONDUCTOR MANUFACTURING FLOW



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FRONT END SEMICONDUCTOR MANUFACTURING FLOW

1.Wafer Preparation: High-purity silicon ingots are sliced into thin, circular wafers using a process called wafering or slicing. The wafers are typically 200mm or 300mm in diameter.

2.Wafer Cleaning: The wafers are thoroughly cleaned to remove contaminants, particles, and organic residues, ensuring a clean surface for subsequent processing.

3.Oxidation and Deposition: Oxide layers are either grown thermally or deposited using chemical vapor deposition (CVD) to create insulating layers or gate dielectrics on the wafer's surface.

4.Photolithography: A photoresist material is applied to the wafer's surface, exposed to UV light through a photomask, and developed to define patterns for various circuit elements (transistors, interconnects, etc.).

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5.Etching: Etching processes selectively remove material from the wafer's surface based on the pattern defined in the photoresist. Wet or dry etching methods are used.

6.Doping: To modify the electrical properties of specific regions, dopants (such as boron or phosphorus) are introduced into the wafer using ion implantation or diffusion processes.

7.Ion Implantation: High-energy ions are precisely implanted into the wafer to create specific doping profiles in semiconductor materials.

8.Annealing: Heat treatments are performed to activate dopants, remove defects, and restore crystal lattice integrity.

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9.Chemical Vapor Deposition (CVD): CVD processes deposit thin films of materials like polysilicon, silicon nitride, or silicon dioxide onto the wafer's surface to create various components and interconnects.

10.Chemical Mechanical Polishing (CMP): CMP is used to flatten the wafer's surface, ensuring planarity for subsequent layers.

11.Lithography (Again): Advanced nodes may require multiple photolithography steps to define increasingly smaller features.

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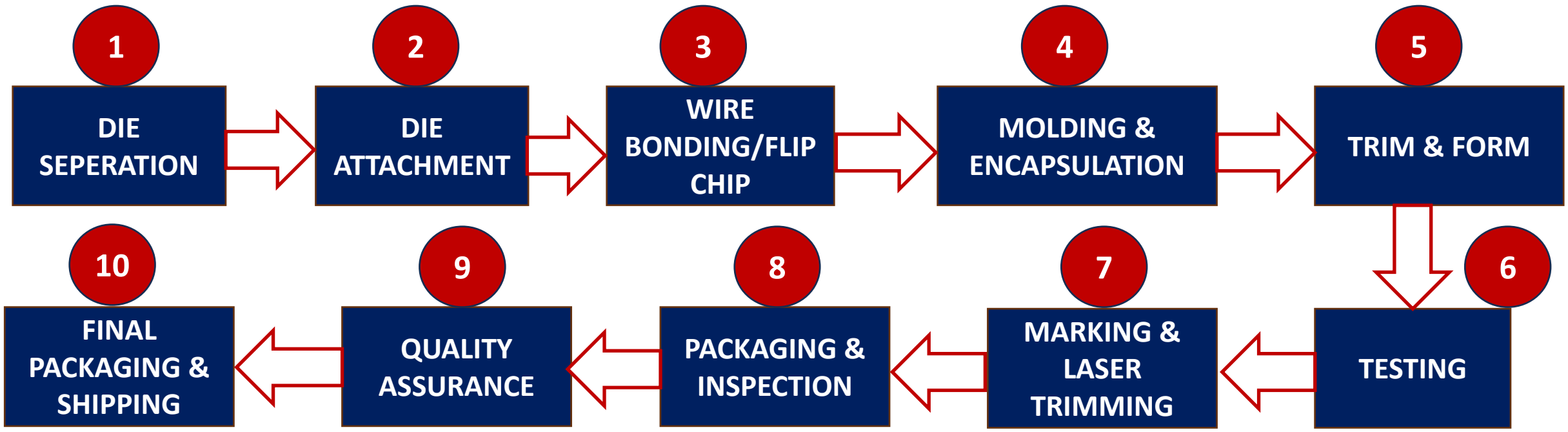

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BACK END SEMICONDUCTOR MANUFACTURING FLOW

1.Die Separation (Dicing): After frontend processing, the wafer is diced into individual dies (chips) using a diamond saw or laser cutting.

2.Die Attachment: Each chip is attached to a package substrate or lead frame using adhesive materials, solder, or conductive adhesives.

3.Wire Bonding or Flip-Chip: Wire bonding involves attaching thin wires between the chip's bonding pads and the package, while flip-chip bonding connects the chip directly to the package with solder bumps.

4.Molding and Encapsulation: The chip and wire bonds are encapsulated in a protective material, usually epoxy resin or plastic, to safeguard the device from environmental conditions.

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5.Trim and Form: The lead frame or package is trimmed and formed to the desired shape and size.

6.Testing (Final Test): Comprehensive electrical tests are conducted on each packaged semiconductor device to verify its functionality, speed, and power characteristics. This is known as the final test.

7.Marking and Laser Trimming: The chip package is marked with identification and branding information, and laser trimming may be performed to fine-tune specific circuit parameters.

8.Packaging and Inspection: The packaged devices undergo inspection for defects, and only the good units are prepared for distribution.

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BACK END SEMICONDUCTOR MANUFACTURING FLOW

9.Quality Assurance: Rigorous quality control measures are implemented to ensure that only reliable semiconductor devices are shipped to customers.

10.Final Packaging and Shipping: The packaged devices are placed into trays, tubes, or reels for shipping to customers who will integrate them into their end products.

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