IC Assembly & Packaging
PROCESS AND TECHNOLOGY

Presented by:
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A semiconductor is a material that behaves in between a conductor and an insulator. Examples of semiconductors include chemical elements and compounds such as silicon, germanium, and gallium arsenide.
SEMICONDUCTOR MANUFACTURING

Back End

Production of pure silicon

Wafer fabrication

Semiconductor assembly packaging

Testing and packing

Front End
Packaging Evolution

- QFP: 100%
- TAB: 44%
- COB: 28%
- CSP: 13%
- FC: 11%

Dimensions:
- QFP: 30mm
- TAB: 20mm
- COB: 15mm
- CSP: 10mm
Package Variation

- Pre mold (cavity) package
- Leadless package
- Power package
- BGA
- Standard Leaded
- Other

- QFN package
- DFN package
- SIP sensor

- Thru hole pack
- Surface mount device

- Molded with exposed die
Progression in Packaging

Leaded Package

Ball Grid Array

Chip Size Package

Chip On Board

Flip Chip Ball Grid Array

Flip Chip On Board (FCOB)

Source: TechSearch International, Inc.
**IC Applications**

- **Communications / Wireless**
  - [Images of communication devices]

- **Consumer**
  - [Images of consumer electronics]

- **Automotive**
  - [Images of automotive components]

- **Computing**
  - [Images of computing devices]

- **Power**
  - [Images of power equipment]

- **Industrial**
  - [Images of industrial components]
Front of Line Assembly Process Flow

- Wafer back grind
- Wafer mount
- Wafer Saw
- Die overcoat
- Wire bond
- Die Attach
Back End Assembly Process Flow

Molding

Marking

DFTS
Deflash/form/trim/singulation

Lead finish

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Wafers

- Majority material from Silicon
- Some made by GaAs, Glass
- Diameter: 4, 5, 6, 8, 12 inches
- Original thickness: 25 and 29 mils
Back Grinding

- Process to thin down the wafer from original thickness to the required final thickness by abrasive grinding wheel in combination to mechanical/chemical polish
- Common industries used wafer thickness 8-15 mils (200-300 microns)
- Current Machine capability 1.0 mil (25 microns)
- Challenge: ??
Back Grinding
Wafer Mount

- Mount the wafer to mounting tape to prepare for wafer sawing process
- Current technology can mount wafer as thin as 2.0 mils (50 microns)
- Challenge: ???
Wafer Mount
Wafer Mount

Video
Wafer Saw

- Process of Singulation the IC to be individually separated by abrasive diamond blade or by laser cutting
- Challenge:???
Wafer Saw

Video
Die Bonding

- Bonding the individually singulated IC to substrate. Bonding material can be epoxy/glue to DAF tape
- Challenge: ????
Die Bonding
Die Bonding
Die Bonding

Video
Flip Chip

Video
Wire Bonding

- Process of interconnecting the IC to its substrate through bonding wire
- Each IC has bond pad that can transfer the circuit information to the designated lead that to be connected to board application
- Challenge: ???
Wire Bonding

1. Capillary tool
2. Gold wire
3. Spark
4. EFO wand
5. Chip bond pad
6. US energy, pressure, and heat to form ball bond
7. Loop formation
8. Package bond pad
9. US energy, pressure, and heat to form tail bond
10. Crescent or stitch bond
Wire bonding
Wire Bonding

Video
Stacked Die
Wire bonding

Video
MOLDING MACHINE
PROSESS PENUTUPAN CHIP DENGAN THERMOSETTING PLASTIK

• AUTO MOLD
• MANUAL MOLD
TIDAK ADA BANTUAN OPERATOR UNTUK MOLD PROSESS DARI ON LOAD SAMPAI OFF LOAD

PACKAGE:
- LEADED
- QFN
- BGA
PACKAGE:
- LEADED

OPERATOR MELETAKAN LEAD FRAME DAN MOLD COMPOUND SECARA MANUAL DENGAN BANTUAN JIG
PLATING MACHINE
PROSESS PELAPISAN TIMAH PADA PERMUKAAN COPPER

• FULLY AUTO WITH CONVEYOR BELT
PACKAGE:
- LEADED
- QFN
MARKING MACHINE

PROCESS PENAMAAN DARI UNIT DENGAN MEMBAKAR PERMUKAAN MOLD COMPOUND MENGGUNAKAN LASER

- FULLY AUTO
TRIM AND FORM MACHINE
PROSESS PEMBENTUKAN LEAD DAN PEMISAHAN UNIT DARI STRIP

• FULLY AUTO
PACKAGE:
- LEADED
Testing and Packing Process Flow

- Testing
- Burn in
- Tape and reel
- Dry packing
- Boxing and labeling
- DHL
- Dry packing

22 June 2007
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Thank You