

# Bare Die Assembly on 3D MID (Chip on MID)

## Flip Chip and Wire Bonding Technology

The continuing trend towards miniaturized systems demands for new concepts for packaging and assembly of electronic components. MEMS and MOEMS need suitable substrates and packages, which have to provide appropriate interfaces to the peripheral environment. Here, the technology of molded interconnect devices (MID) offers new and unique solutions. MID enable the integration of functional interfaces such as membranes, fluidic channels, optical windows, lightguides, plug connectors and so on. Using micromolding and laser technology, nowadays 3D MID with metal line pitches down to 100 µm can be fabricated and therefore bare die assembly with wire bonding and flip chip technology is feasible. In addition to the advantages regarding miniaturization, the number of process steps can be reduced resulting in a large potential for low cost packaging.

Assembly technologies for bare dies like ultrasonic wedge / wedge bonding with aluminum wires and thermosonic ball / wedge bonding with gold wires, which are widely used on common substrates can also be used on MID. Chip and wire technology on MID has been investigated and applied at HSG-IMAT since 2000.

Requirements like low surface roughness of the metal layer and high rigidity of the substrate structure have to be kept in mind. Assuming proper design and processing, wire bonding is not only well suited for assembly of bare dies on MID similar to other substrates, but can also be used for advanced packaging concepts e.g. with chips in a cavity to provide extra flat packages.

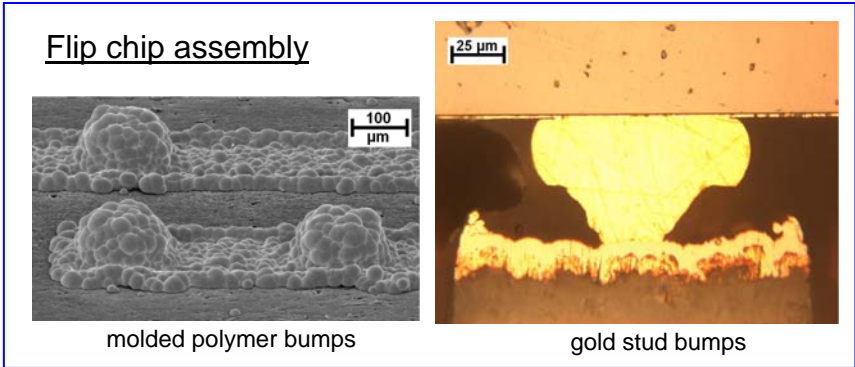
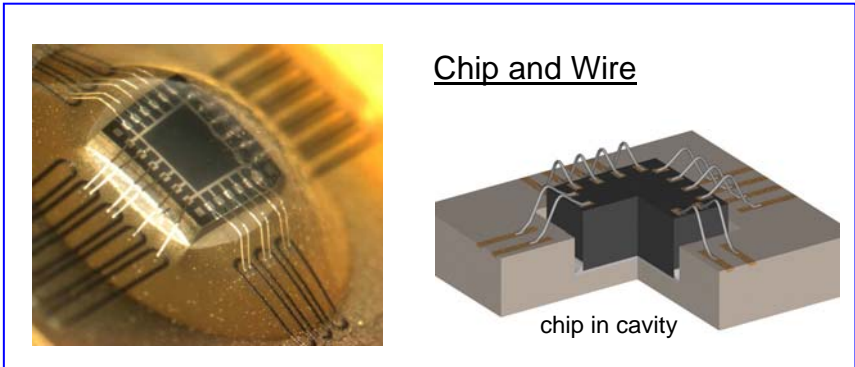
Flip chip assembly on MID is usually accomplished with adhesive technologies. Both isotropic conductive adhesives (ICA) and non conductive adhesives (NCA) can be used. Flip chip assembly with NCA is a simple process which provides low

### Molded Interconnect Devices (MID)

- Higher functionality
- Higher level of integration
- Reduction of cost
- Reduction of weight
- Smaller package sizes

### Chip on MID

- Chip and wire
  - Ultrasonic wedge / wedge bonding with Al wires
  - Thermosonic ball / wedge bonding with Au wires
- Flip chip technology
  - with isotropic conductive adhesive
  - with non conductive adhesive



thermal stress and few process steps. After applying the NCA on the substrate the flip chip is attached. The flip chip is provided with gold stud bumps manufactured by the known stud bump bonding (SBB) process. Afterwards the adhesive is instantly cured by thermal snap curing within a few seconds. Especially when chips with low I/O counts are used, this is a very cost-effective process. Flip chip on MID also offers an ad-

vanced approach for bare die packaging. Thereby metallized polymer bumps, which are fabricated by injection molding of the MID substrates are used to substitute the stud bumping process. On chip side only thin Ni/Au bumps are needed which can be fabricated in an electroless batch process on wafer level.