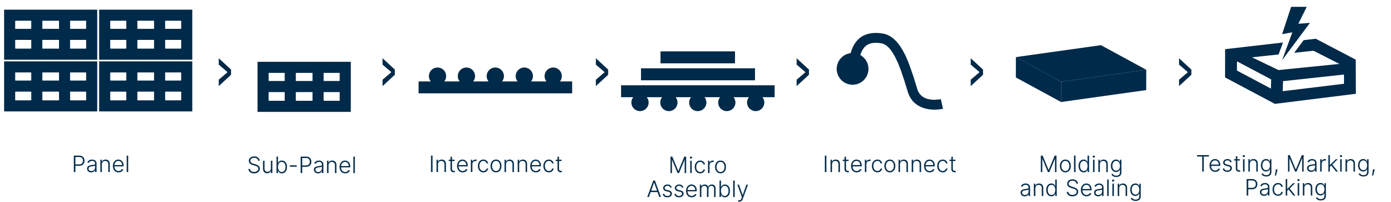
iNPACK™
A PCB TECHNOLOGIES COMPANY

Advanced Packaging Solutions

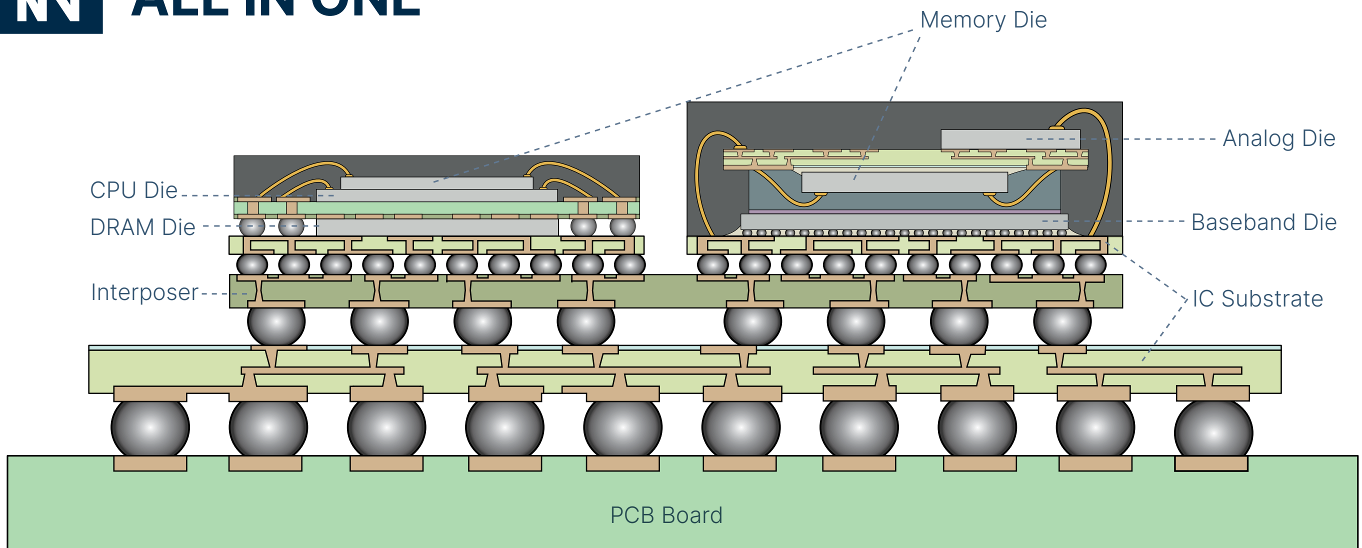


Introduction

iNPACK is an advanced heterogeneous integration provider of System-in-Package (SiP) solutions. We help our clients achieve maximum functionality and efficiency within a smaller semiconductor and electronic packaging form factor. We focus on embedded technology that contributes to improved signal integrity and reduces unwanted inductance effects while embedding power dissipation solutions.

Our All-in-One approach benefits our customers with SMT, substrate design and manufacturing, process design, testing, and excellent supply chain services. All under the same roof.

ALL IN ONE

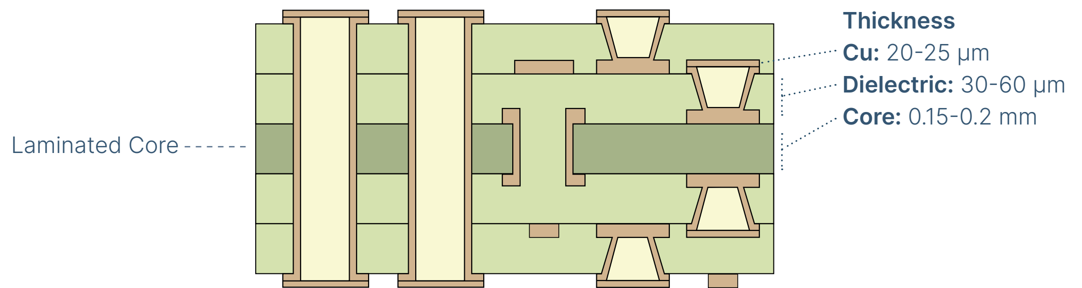


Substrate Design for Manufacturing (DFM)

Parameters	Specifications	Advanced Design
Resolution (L/S at outer and inner layer) [µm]	50/75	25/25 20/20 for special applications
Base Cu thickness [µm] / **Process**	5, 9, 12, 17 / Subtractive	1.5, 3 / mSAP
Cu finish (after process) [µm]	20-30	20-30
Laser drill diameter [µm]	90-100	60-80
Dielectric thickness (MV) [µm]	60-80	30-60
Min. mechanical drill [mm]	0.15	0.075-0.1
Micro via type	Staggered MV	Stacked MV, Cu filled
Micro via fill	Epoxy-ceramic / Cu filled (Electroplated)	Cu filled (Electroplated)
Final finish	ENEPIG	ASIG/EPAG, ENEPIG
Cu Pillar: **Diameter** [µm] / **Height** [µm]	D: 100-130 / H: 40-50	D: 100-130 / H: 40-50
Final finish	ENEPIG	ASIG/EPAG, ENEPIG
Laminate and prepreg materials	MITSUBISHI HL832/972 MCL-E-795/705	Outer layers AD1000 / HS200D
Dk	3.5 - 4.5	3.0 - 9.0
Df (10,100 GHz)	Df: 0.011, 0.02	Df: 0.0023, 0.004
CTE [ppm/ºC]	2 – 12	2 - 12
Core thickness	(0.6-0.8mm or 0.15-0.2 mm)	
Solder resist	PSR-4000	Taiyo America, INC.

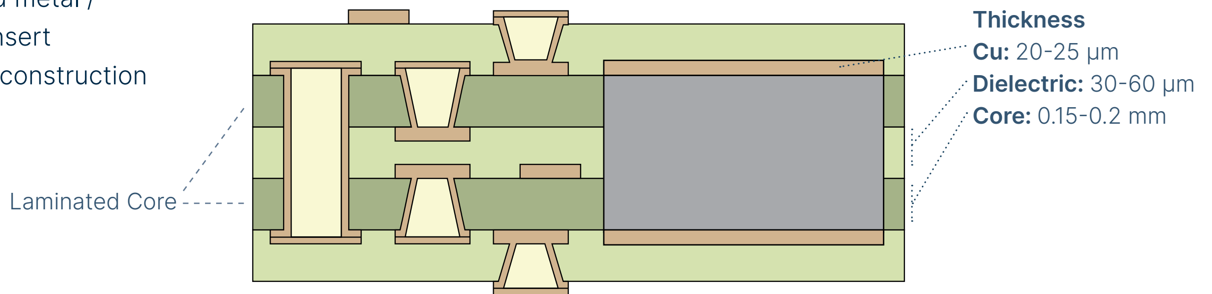
Organic Substrates

- Low CTE



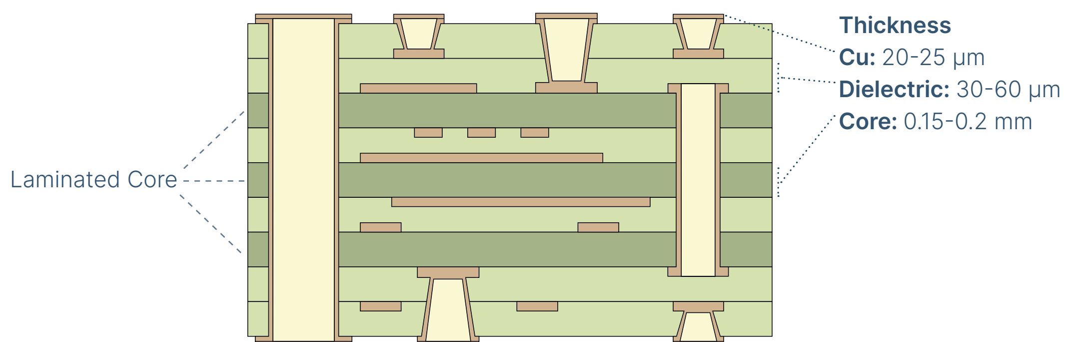
High Power Substrates

- Low CTE
- Embedded metal /
- Ceramic insert
- Two Core construction



Radio Frequency Substrates

- External core construction



Legend

- Cu
- PP
- Core
- Non conductive resin fill
- Embedded metal / Ceramic insert

The Technological Edge

All in One - Advanced SiP design and Multi-Chip Module Assembly for high-end applications

1 **Sub panel level processes**

- Customized substrate solutions on a 12”x18” panels
- 25/25 µm L/S
- Cu pillars
- High thermal conductivity
- Low and adjustable CTE

2 **Sub paneling to 4”x8” panels going into a micro-assembly line**

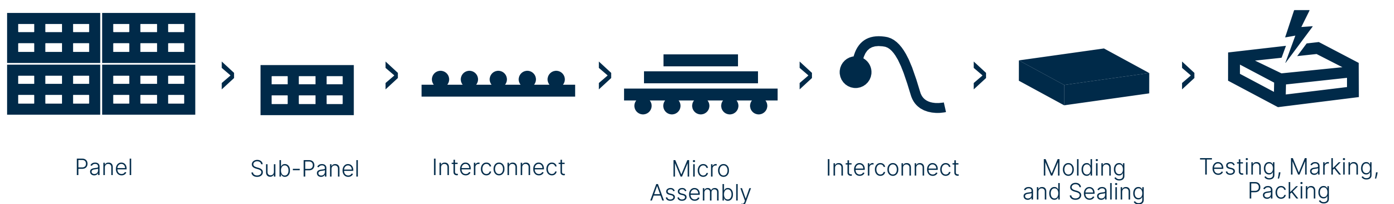
- Die bonding
- Flip chip
- Wire bonding
- Molding
- Through mold interconnections
- Lid sealing and lid substrates
- 3D integration

3 **Testing**

4 **High-reliability design and manufacturing**

5 **Qualification**

Process Flow



Assembly Capabilities

Process and machinery

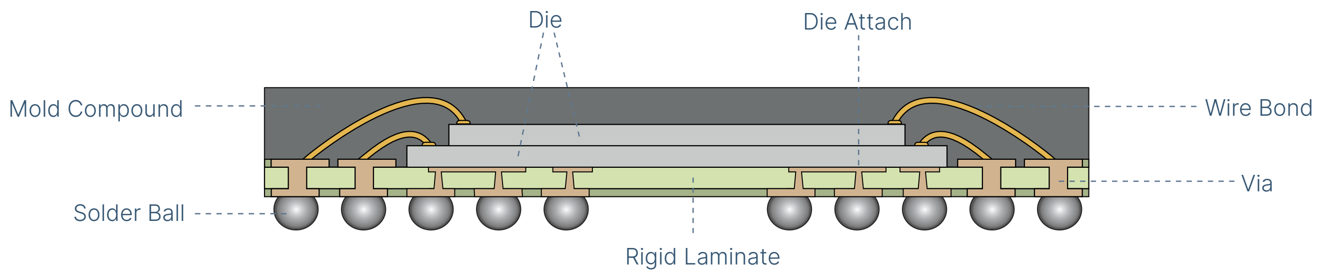
Handling	▪ Flip-chip – Die Attached
Connecting	▪ Solder jet ▪ Wire bonding - Ball ▪ Wire bonding - Wedge ▪ Soldering ▪ Press sintering ▪ Die Bond
Complimentary Equipment	▪ Molding ▪ Dispenser ▪ Vacuum / pressure Oven / inner environment ▪ Dicing ▪ Laser marking ▪ Plasma cleaning ▪ Planarizer ▪ Degreaser ▪ Nitrogen cabinet ▪ Fume hood + laminar air flow tables
Non Destructive Test	▪ X-ray ▪ Sono scan*
Visual Inspection	▪ SEM ▪ EDX ▪ AOI* ▪ Stereo microscope-Lieca ▪ Metallurgical microscopes ▪ Digital inspection
Destructive Tests	▪ BGA Die & Pry ▪ Encapsulation and lapping ▪ Fine leak tester ▪ Testers – pull, shear ▪ Components de-encapsulation

*Planning ahead

Assembly Capabilities

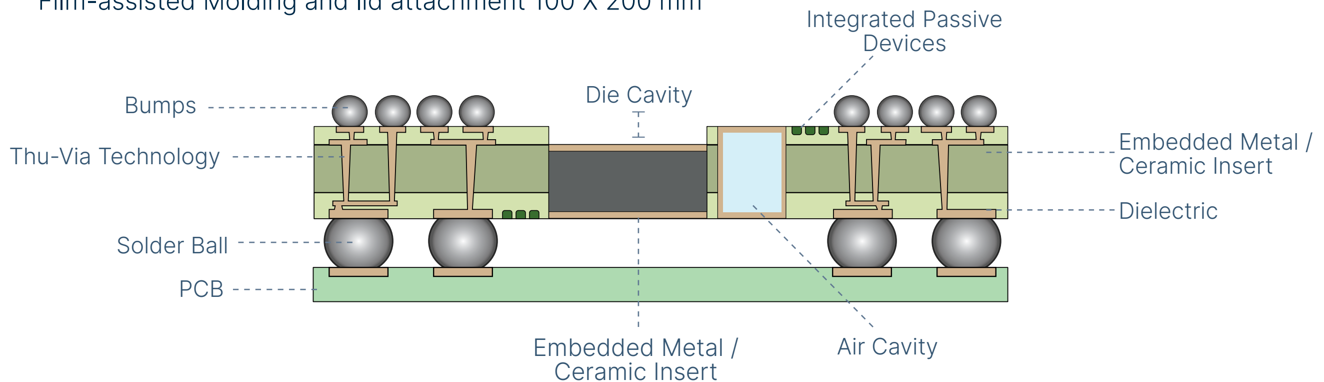
Wire Bonding

- 305 X 410 mm substrate size (standard 100 X 200)
- Z height 30 mm
- Fine pitch wedge-40 µm in line, 25 staggered
- Rotation 4400
- 450 head & 900 deep access
- Ball wire: Au, Al, Cu, Ni, Pt 12.5-75 µm
- Wedge: Al , Au 35 X 6 to 250 X 25 µm ribbons



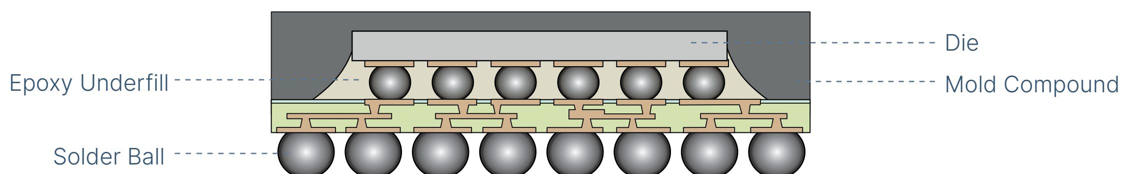
Advanced Packaging

- Advanced substrates low CTE 100 X 200 mm
- Thermal inserts
- Air cavity (SS or organic)
- 2.5/3D, fan-out
- Dicing & planer -/+ 1 µm accuracy over 100 X 200 mm substrate
- Film-assisted Molding and lid attachment 100 X 200 mm



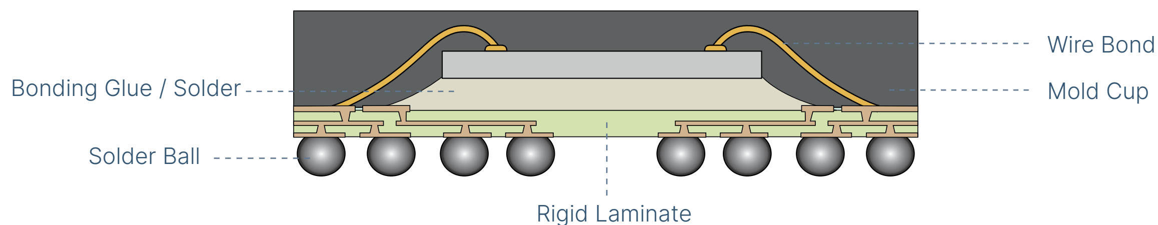
Flip chip & Under-fill

- Package size - 5x5 (mm) – 100x200 (mm)
- Flux / Flux Less
- Non-clean / Cleaning



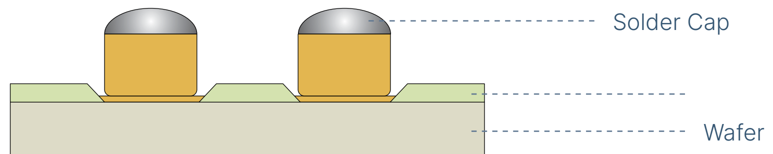
Die Bonder

- Accuracy: 5 µm
- SMT component: Reel tape feeder / JEDEC trays / waffle pack / gel Pack / wafer / flip chip mounter
- Dispensing system: Musashi T/P and scroll type for underfill and glob top 100 µm drop size
- Stamping: double-strip stamp well (100 µm drop size)
- Camera: High resolution
- Die size for die attach: 0.2 - 50mm
- Die size for flip chip: 0.5 - 50mm
- Die thickness: 0.05 - 7mm
- Wafer size: 8”
- Substrate working area: 350 X 250 mm
- Curing: UV
- Eutectic soldering station with forming gas: up to 50 X 50 mm



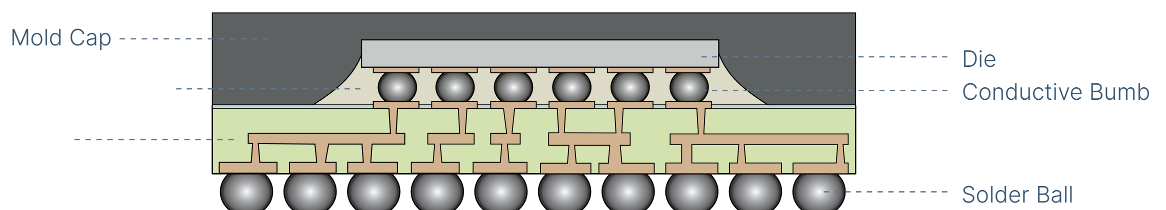
Cu Pillars

- P-Pitch 180 µm no line, 230 µm with line
- PH-Height 45 µm, TH-150-175 µm
- D-Diameter 150 µm



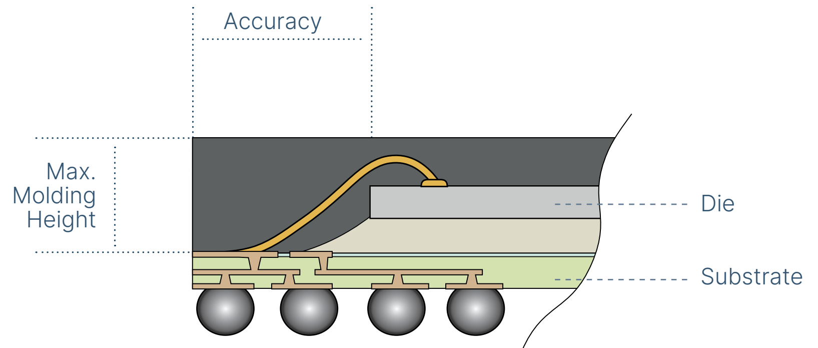
Substrate BGA Solder Ball

- 100 – 750 µm
- 50-75 µm special
- Ball on ball
- Solder ball pad 150 µm
- Pitch 250 µm
- Solder resist thickness, defined - 30/12 µm, non - 20 µm
- Alloys: AuSn, Sn63, Sac



Encapsulation, Molding, and Sealing

- 1500 µm max molding height
- Automated dispensing and molding
- Working area for 6“x9“
- Accuracy 25 µm
- Air cavity optional
- Shielding
- Molded interconnection
- Over-bond loop thickness Min 0.2mm



Raw Materials

Laminate & prepreg materials	Hitachi | Mitsubishi | CuMoCu | Rogers AD1000
Underfill & adhesives	Hitachi | Locttite | Kyocera | Epoxy tech
Solder Alloys	Koki | Alpha
Molding	Hitachi | Caplinq