IMAPS-Korea

Application of Circuit Tape in Low Cost IC Package

May 28, 1999

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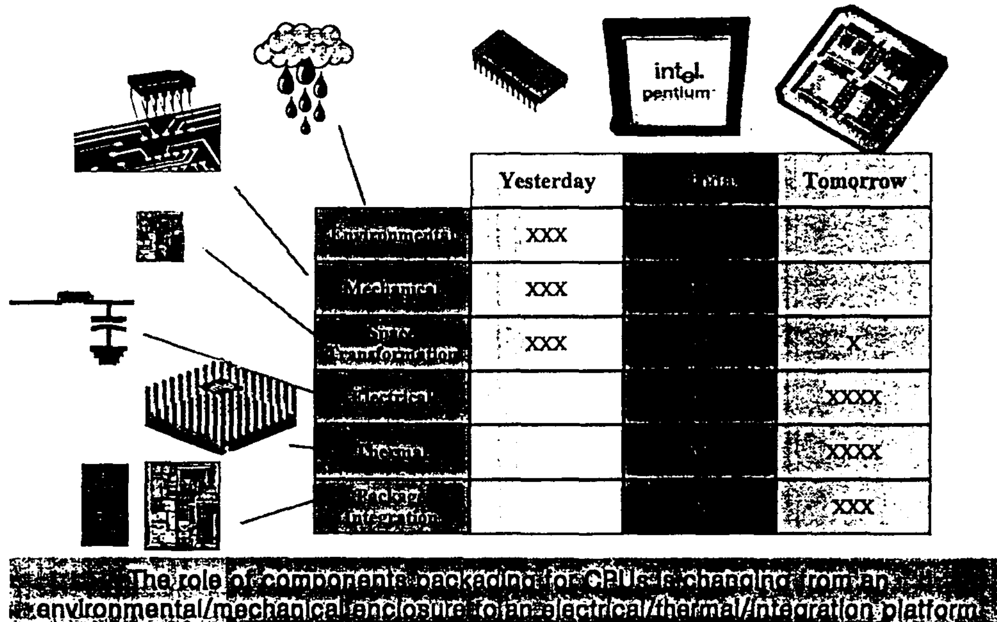
Anam Semiconductor Inc.

Enabling Effective Performance
The Changing Role of Packaging

GLORY2000



Product Trends

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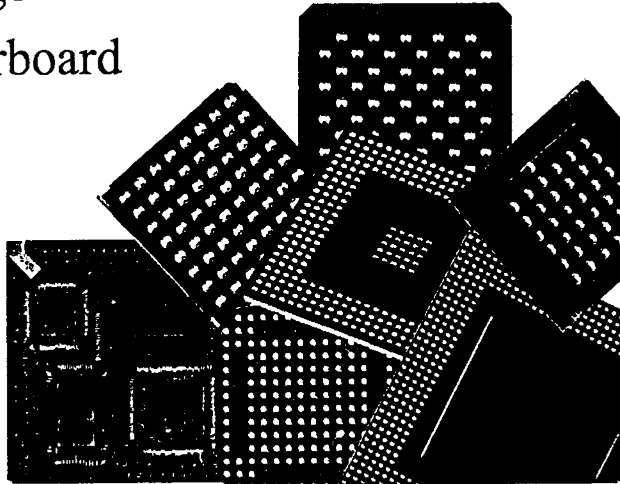
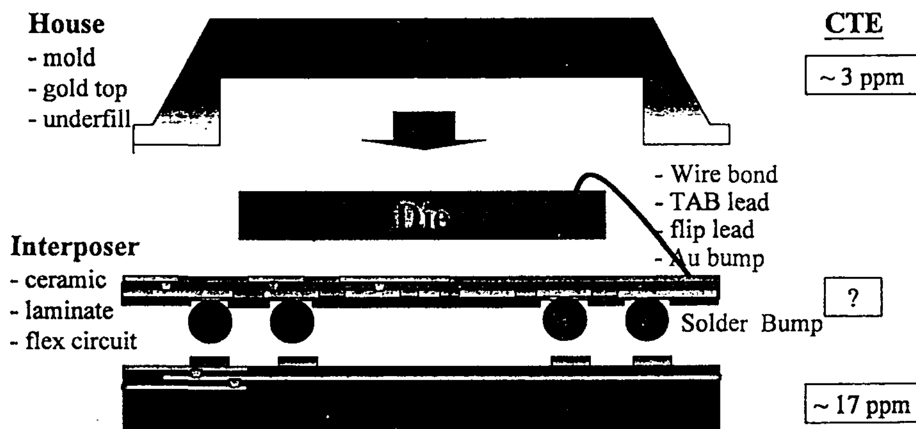
- Lower voltage circuits for increased battery life
- Smaller devices that are portable and light
- Shrinking motherboards but with tighter metal trace density as well as increased layer density
- Increased use of modules for speed improvement by placing ICs physically close
- Increased integration of memory functions on semiconductor devices - Rambus, Neomagic
- Increased use of DSP and mixed digital/analog systems - modems, cameras, phones

Package Trend Drivers *GLORY2000*

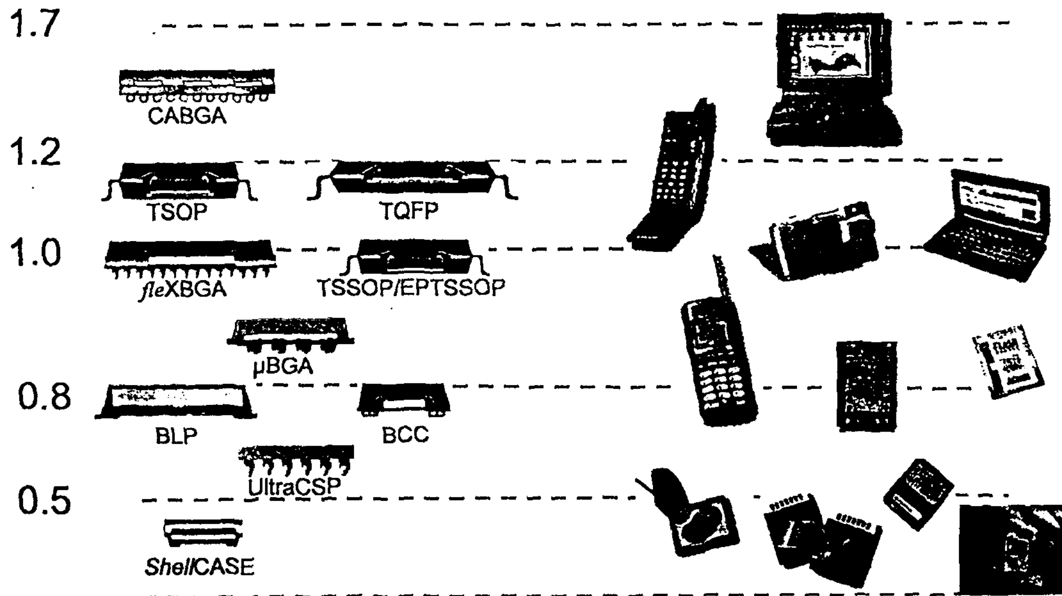
- Cost of the die
- Cost of the package
- Cost of the motherboard
- Size
- Thickness
- I/O Count
- Thermal
- Electrical



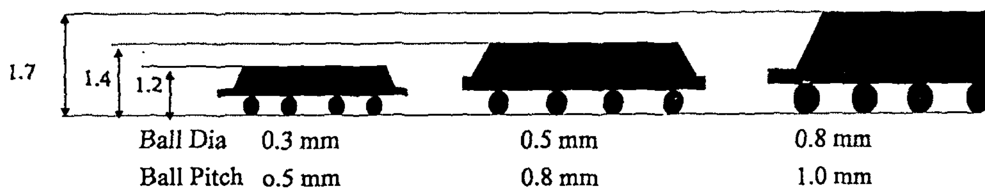
Package Design Options *glory2000*



Thickness Trends *GLORY2000*



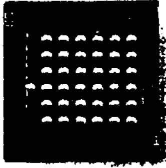
Package Size Shrinkage *glory2000*



Ball Dia	0.3 mm	0.5 mm	0.8 mm
Ball Pitch	o.5 mm	0.8 mm	1.0 mm

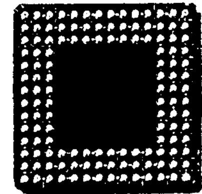
◆ Contact solder ball diameter of BGA varying with their pitch

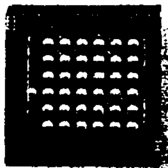
Lead Pitch					0.8	0.5	0.65
(mm)		0.62	0.5	0.4	(3 rows)	(2 rows)	(full)
Package		MQFP	TQFP	TQFP	FPBGA	FPBGA	Bare Die
Pin Count		160	128	128	132	136	144
Pin Array					(14 x 14)	(19 x 19)	(12 x 12)
Package Thickness (mm)		3.37	1.4	1.4	1.25	1.2	0.5
Package Size	Body	28 x 28	20 x 20	14 x 14	12 x 12	10 x 10	8.5 x 8.5
	Mount area	31.2 x 31.2	22.8 x 22.8	16.8 x 16.8	12 x 12	10 x 10	8.5 x 8.5
Relative mounting area		3.45	1.84	1	0.51	0.35	0.26
		6.76	3.61	1.96	1	0.68	0.51



The Emergence of Film-based Interconnect

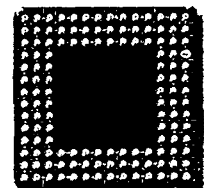
- Finer lines and spaces than PCBs
- Finer pitch accommodates high density silicon
- Several vendors building the tape infrastructure
- Enables thinner packages
- Improved via density
- Several film packages qualified by OEMs
  - **Anam/Amkor *fle*XBGA**
  - **μBGA**
  - **T.I. μStar**
  - **Sharp CSP, etc**



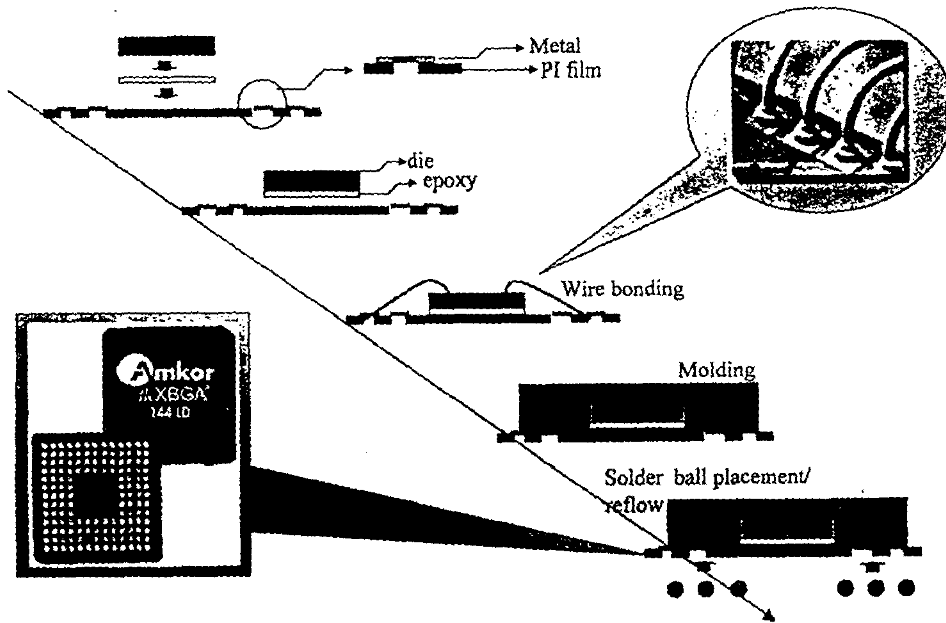


The Emergence of Film-based Interconnect

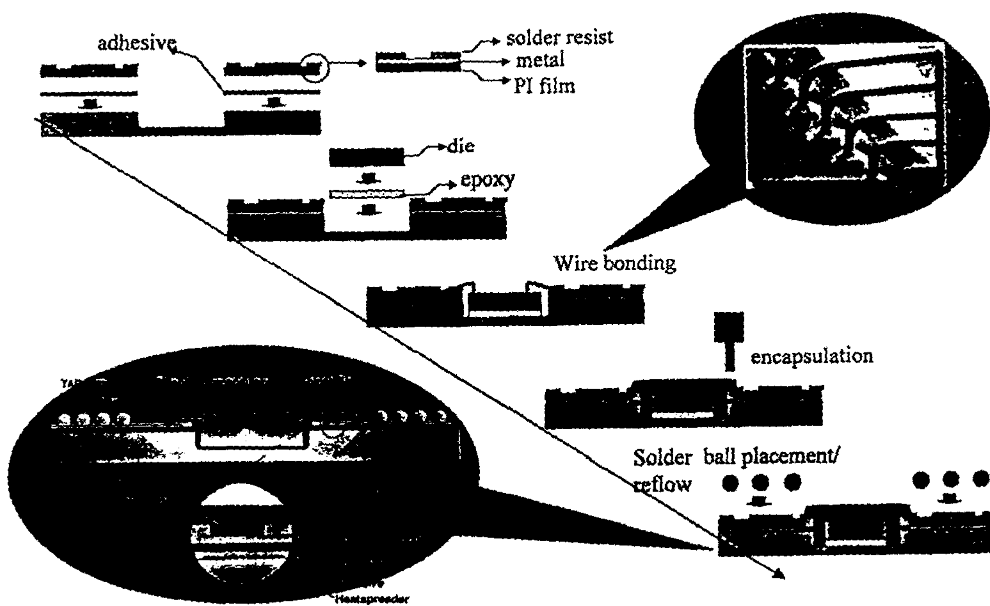
- Industry moving to wider web reel-to-reel processing:
  - Casio - 156 mm wide
  - 3M - 350 mm wide
  - Sheldahl - 350 mm wide
- Two metal layer film will extend the technology



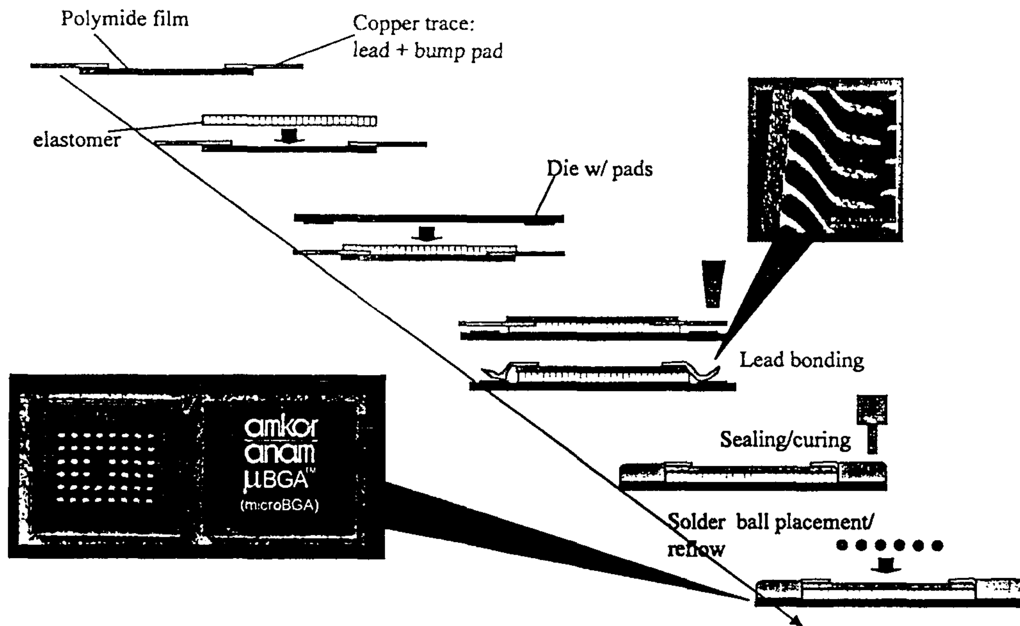
Low Pin Count ASIC CSP *glory2000*



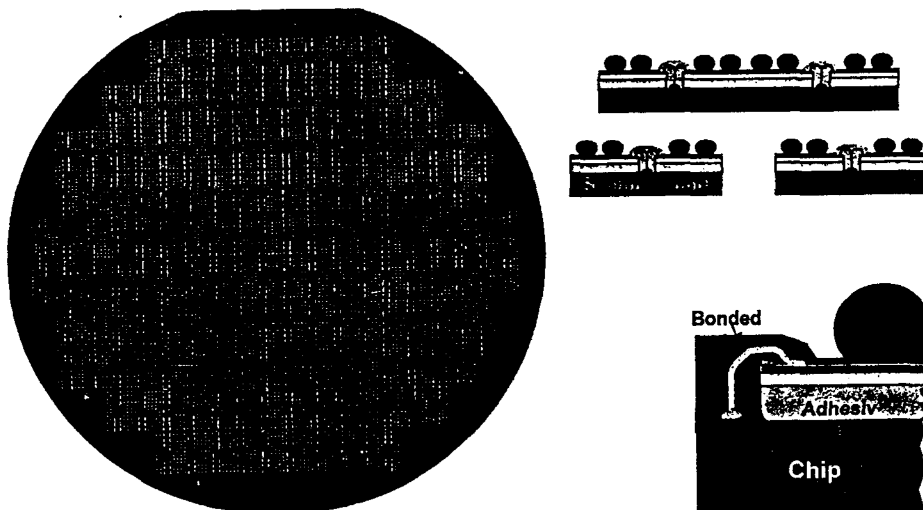
High Pin Count Thermal Enhanced BGA *glory2000*



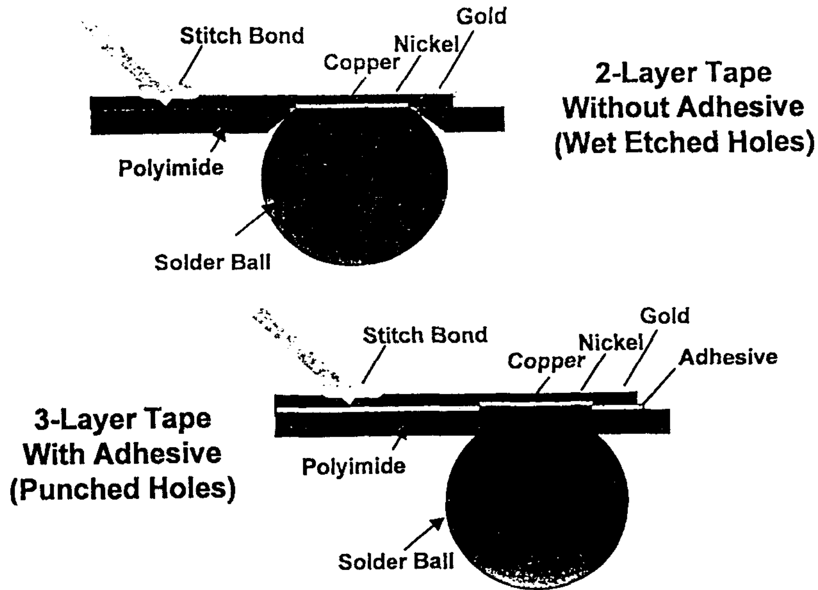
Memory IC CSP *glory2000*



Wafer Scale CSP Structure *GLORY2000*



Single Metal Tape Construction *glory2000*



Tape Production Process Flow *glory2000*

2 Layer Tape

1. Metallize polymide substrate
2. Laminate photoresist to both sides
3. Expose both simutaneously and develop
4. Electrodeposit copper
5. Chemically etch polimide substrate
6. Strip photoresist, etach seed layer
7. Ni, Au plating

3 Layer Tape

1. Polymide substrate with adhesive layer
2. Punching
3. Cu foil laminatioin
4. Photpresist
5. Expose and develop
6. Chemically etch Cu foil
7. Strip photoresist & Ni,Au plating

2 Layer Tape VS 3 Layer Tape (Conductor Layer)

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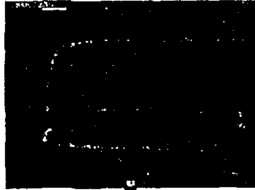
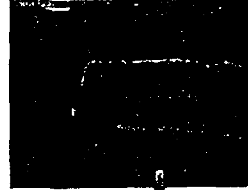
2 Layer Tape



3 Layer Tape



2 Layer Tape VS 3 Layer Tape (Interfacial Surface)

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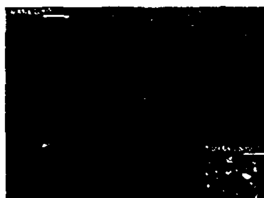
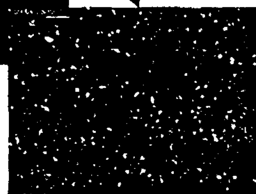
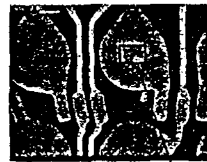
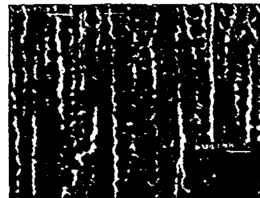
2 Layer



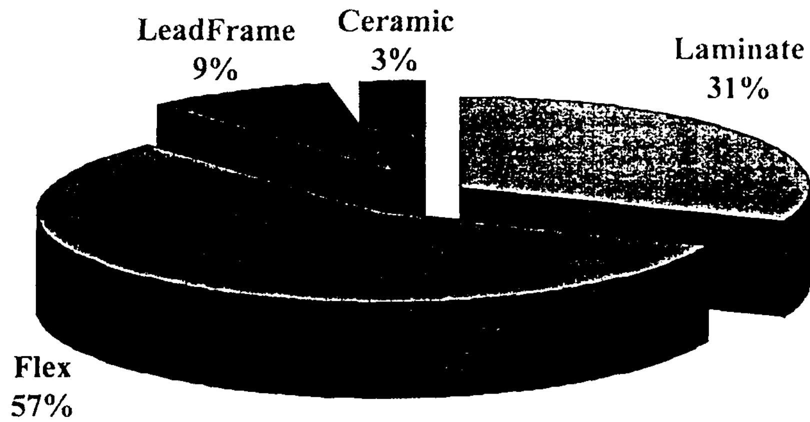


3 Layer





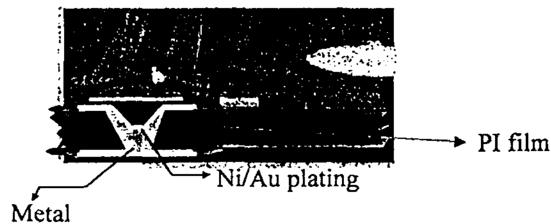
2002 CSP Demand by Substrate *GLORY2000*



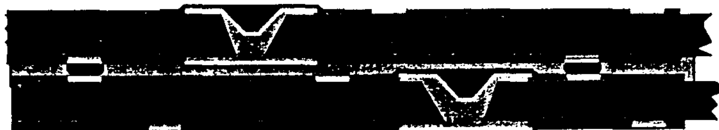
Total 5339 million units

Advanced Tape Substrate *glory2000*

- Two metal layer tape substrate



- Multiple layer Tape Substrate



Closing Statements

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- Package technology driven by personal application; migrated from military, and from commercial application.

- Endless demands of increasing level of integration on devices; smaller, thinner and lighter

- FlexCircuit has been a natural solution to meet both performance and cost driven requirements of many applications; existing industry infrastructure and material characteristics.