PCB Embedded Devices 기술

이 성 규 PCB연구소장
(LG전자)

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Embedded device Technology

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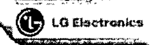

➢ Mobile function 변화

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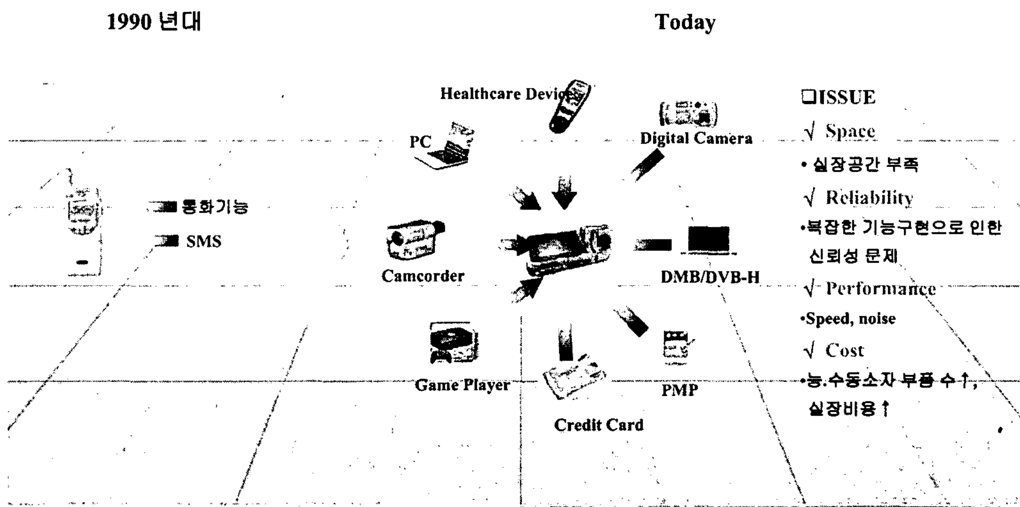
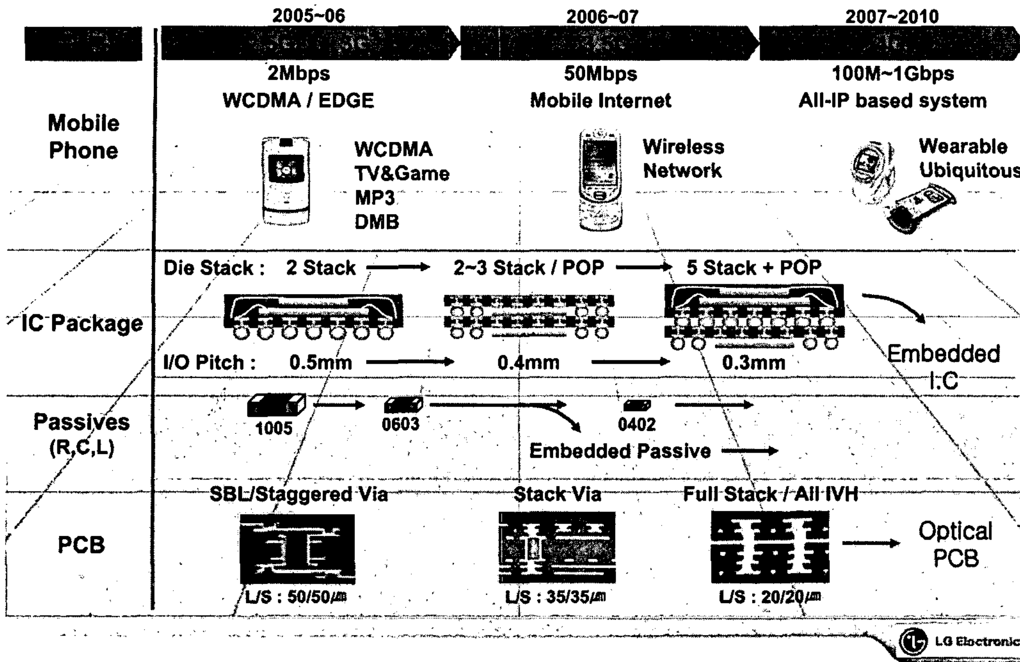
■ Mobile의 Multi & High function 및 Digital Convergence化로 새로운 산업화 Issue로 대두됨.

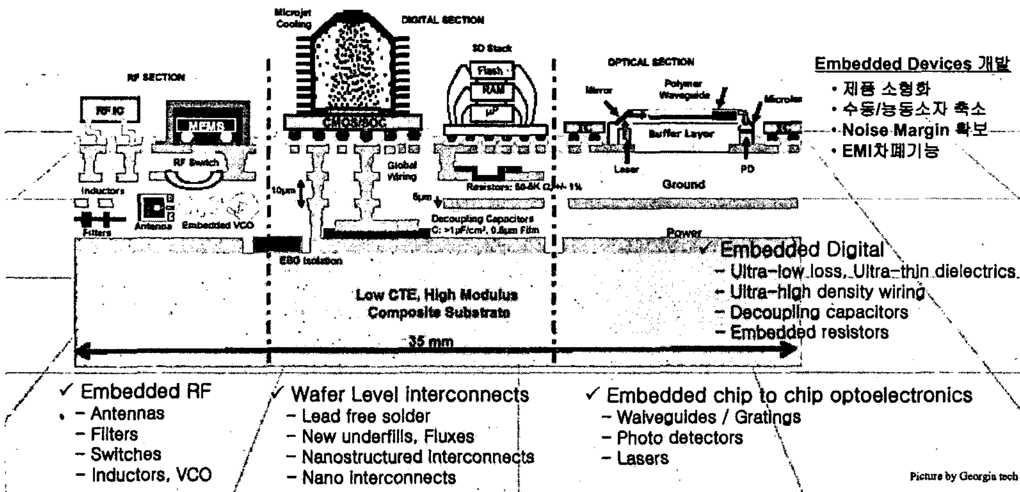


➤ 제품 기술 Trend



➤ 미래형 Multi-function PCB의 방향

- **Multi-function integrated PCB key drive.**
  - Single package에서 완벽한 system solution을 제공.
  - Thin film or thick film의 build up을 통한 component integration / I.C embedded PCB가 요구됨.

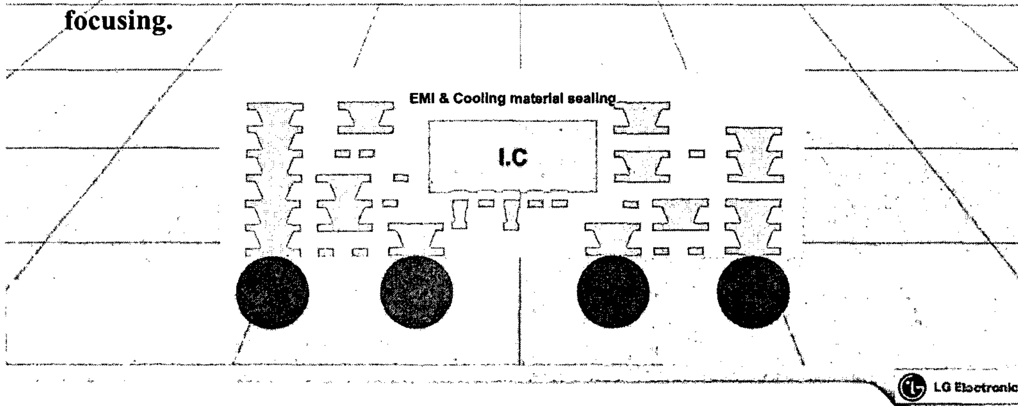


➢ What is embedded ICs?

■ Wafer back grinding을 최대화 하여 active chip을 PCB 안으로 integrate 함.

■ Interconnection은 Build up layer로 구성.

■ Embedded Active의 Issue는 Process, design, cooling, yield등에 대한 극복에 focusing.



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➢ Performance of Embedded ICs.

■ Small, Slim, light

■ Better electrical performance

Electrical Parameter	Wire bond	Flip-chip Bump	Embedded ICs
Inductance(nH)	1.0~3.0	0.05~0.1	0.005~0.01
Capacitance(pF)	0.01~0.05	0.002~0.01	0.0002~0.001
Resistance(mΩ)	30~100	2.0~6.0	0.2~1.0

(R.Fillion, et al, proceeding 1992 ISHM, International Symposium on Microelectronics)

➢ Embedded ICs Trends

■ **Chip-first approach**

- PCB build up前 Embedded IC 공정을 진행하는 concept.
- GE, Intel등이 연구 개발 진행중.

■ **Chip-last approach**

- PCB build up後 Embedded IC 공정을 진행하는 concept.
- Shinko 및 NEC가 연구 개발 진행중.

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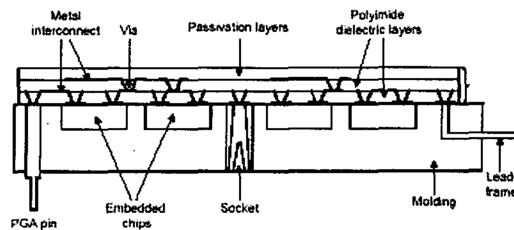
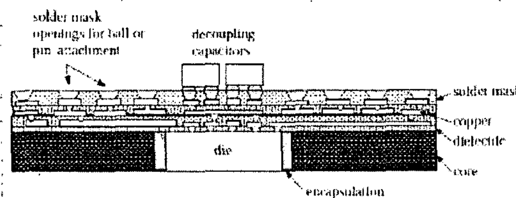
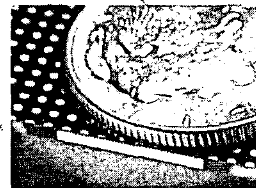
➢ Chip-First Embedded ICs

■ **G.E의 HDI embedded ICs.**



■ **Intel의 BBUL (Bumpless build-up layer)**





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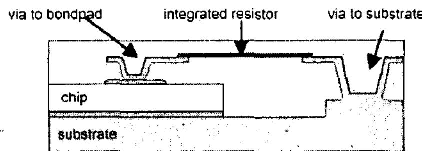
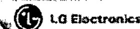
➢ Chip-First Embedded ICs

■ **Fraunhofer의 chip in polymer.**



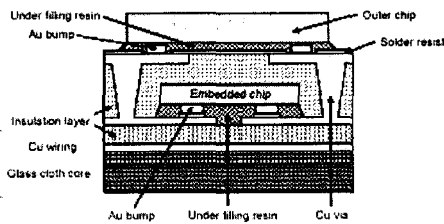
■ **Chip First에 대한 Issues**

- ✓ PCB build-up process가 길어 제품 개발 기간 문제.
- ✓ Cumulative yield 문제.
- ✓ 양산에 적합하지 않음.
- ✓ Heat-management 문제.
- ✓ Micro via와 chip pad간 연결시 thermal fatigue 누적

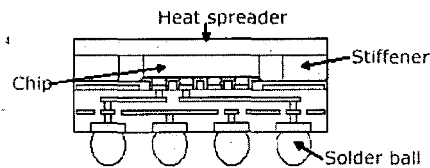


➢ Chip-Last Embedded ICs

■ **Shinko.**

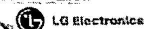


■ **NEC .**



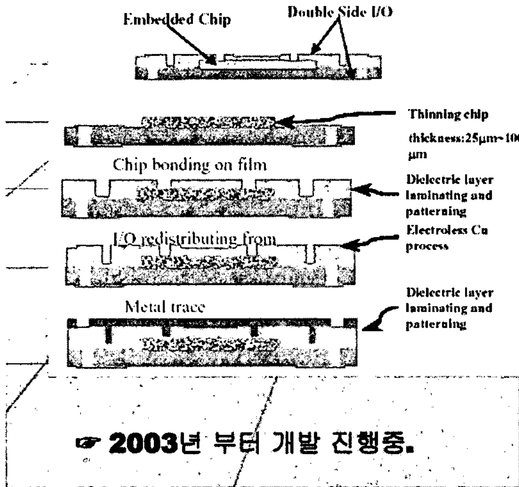
■ **Chip Last에 대한 Issues**

- ✓ Chip embedding 다음 공정 진행시 chip damage.
- ✓ Heat- management 문제점.
- ✓ Electrical performance의 감소.



➢ Embedded ICs in others

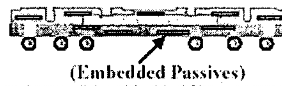
■ Taiwan ITRI. (Embedded chip in substrate)



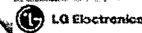
Applications:

- Low I/O PKG & Stacking:(Memory chip)
  >> Stacking with known good PKG

-High performance IC PKG: (CPU, Advanced Graphics, etc.)
  >> Fine line and Embedded Passives

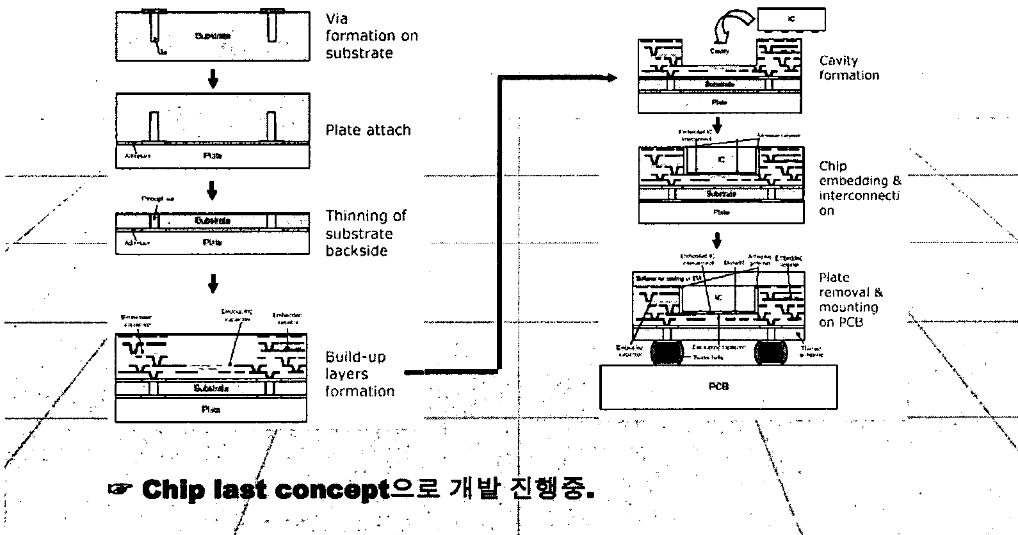


☞ **2003년 부터 개발 진행중.**



➢ Embedded ICs in others

■ Georgia tech PRC.



☞ **Chip last concept으로 개발 진행중.**

➤ Embedded I.C R&D Direction