Advanced Flip Chip Technology and Its Application in Europe

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Abstract

The electronics industry in Europe is characterized by special high end manufacturing on the IC and system level. Since the products for volume mass production on IC level and on the package and assembly level have migrated to Asia, the European industry is looking for specialized high end applications.

This paper presents some selected products for European Packaging.

The areas which have been selected for the presentation include:

1. Smart Cards and Smart Labels
2. Special Advanced Packaging for Medical Applications in the field of pace makers, hearing aids and implants
3. Industrial Sensor Applications
4. Power Packaging

1. Applications in the Area of Smart Cards and Smart Labels

European industry is leading in the field of smart cards and smart labels. Regarding the IC for these applications, the infrastructure is covered with manufacturers like Philips, STM, Infineon, Atmel, EM Microelectronics Marin and some other manufacturers of IC’s for special applications, like AMS, etc.

In the field of assembly, we have two packaging roadmaps:

1. Roadmap for the contactless cards
2. Roadmap for the contact cards

The so-called combicards which are a combination of contact cards with integrated antenna for contactless RFID and communication is being elaborated. For the combicards, besides the contact chip and the contactless applications, additional implementation of features, like LCD display with a battery, are under development.
For the contact cards, the modules with the IC on it are mainly manufactured by wire bonding technology. Some companies are, however, looking and evaluating the use of Flip Chip Technology in these applications because Flip Chip offers the advantage of a reduced card height and reduced cost in high volume.

Flip Chip is especially desirable for the roadmap in direction of the combicards.

In contrast to this, the contactless cards are all moving towards Flip Chip. A comprehensive overview of roadmaps for contactless smart cards and RFID tags was given during the 4th International Workshop on Smart Card Technologies and Applications in Berlin 2003.

Figure 1a shows an application of contactless smart cards, respectively RFID tag in which Flip Chip is used in volume.

These applications are all very strongly driven by the cost. Therefore, the materials which are used here are low T<sub>g</sub> substrate materials in combination with low cost bumping technologies.

Electroless bumping of NiAu is the main bumping technology used in these applications.

Figure 1b: Low Cost Flip Chip Bumping for Smart Cards and LCD Drivers

Interconnection technologies are ranging from ACF to soldering and a few NCP applications.

For the RFID tag applications, a combination of the antenna with the RFID IC (Reading and information sending IC) together with other components, like SMD, decoupling capacitors are integrated. An example of such a demonstrator is shown in Figure 2.

Smart card and smart label applications are driven by the need to reduce the thickness and the mechanical flexibility of the interconnection. Therefore, European consortia have been working intensively in developing technology for ultra thinned
wafers down to thicknesses of 30µm. Below 50µm, the Silicon wafer becomes flexible and can be integrated in applications, including textiles with integrated ultra thin RFID cards.

In summary, the packaging for this industrial segment requires:

1. Flip Chip
2. Low Cost Bumping
3. Interconnection Technologies for Low Cost Substrates
4. Ultra Thinned Wafers

2. Medical Applications – Pace Maker, Hearing Aids, Implants

These applications are driven by the need of miniaturization and 3D – packaging. Therefore, Flip Chip is applied in nearly all products. The substrate materials are ranging from ceramic substrates to flexible and combinations between flexible and organic PCB – materials.

Figure 3 shows an example of a biomedical implant sensor in Flip Chip Technology.

3. Power Packaging

Power Packaging includes the application area of automotive, mass transportation, train and aerospace.

This industry has a very strong localized focus in the Toulouse area in France. For this, a center for development of power IC and for packaging of power IC’s has been inaugurated recently.

The applications are also driven by the requirement of miniaturization. Therefore, Flip Chip is being evaluated in many of the projects.

The main features and requirements for the packaging is:

1. Miniaturization
2. Power Management
3. Reliability in Power Cycling for High Temperature Interconnections and
functionality in different environments and the requirements of the full microsystem.

**Figure 5** shows an application of an inductive sensor.

![Flap Chip Applications in Industrial Sensor and Consumer Application](Image)

**References**


7/ Pac Tech Webpage: [www.pactech.de](http://www.pactech.de)


