„FCOS – The Evolution of Chip Card Modules“

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Packaging Center at a glance

Regensburg-Burgweinting / Germany
Volume Production
- Preassembly
- Module Assembly
- Contract Assembly
- Pre-personalisation
Quality
Development
Marketing
Area: 2,500m²
Employees: 260

Wuxi / China
Volume Production
- Preassembly
- Module Assembly
- Contract Assembly
- Pre-personalisation
Area: 2,000m²
Employees: 170
15 years of history in Chip Card Packaging

- **1990** Start module production
- **1995** Chip-on-chip module for Pay-TV application
- **1997** First dual interface module
- **1998** Worldwide thinnest contactless module (MCC2)
- **1999** Establishing Marketing at Packaging Center – onsite support for customers
- **2000** Start mass production in China for local market
- **2001** Successful finalization of Display-on-Card – government research project
- **2002** Thinnest contactless package for chip card controller
- **2003** Installation of card implantation equipment at Packaging Center for customer support
- **2004** Establishing thinnest contactless module MFCC1 for 450 µm thin IC Card; production of 3rd billionth module
Leader in cost/piece and innovation

Benchmark cost position

- High volume production at benchmark cost
- Fast transition from Wirebond to Flip Chip on Substrate (FCOS) technology

Innovation leadership

- Leadsite Regensburg-Burgweinting with integrated marketing/development/quality/production function
- In time ramp of new technologies: ultrathin wafer, NiAu, bumping, Face-to-Face, powder antenna, etc.
- Use synergies with central IC & Packaging Development

New opportunities in SEC value chain

- Integrated development with SEC business unit of new opportunities, such as personalization, contactless sub-systems (Epassport pre-lam, RFID inlay), etc.
...already thinking of future requirements

MFC3.1

MFC5.6/8

DBG
ultra thin

Face-to-Face
early prod. line

S-Pack

MFCC8
eD1
ePassport Inlays
Why FCOS™?

Market Situation before FCOS

- 2 tape suppliers dominated the chip card market
- Cost of tapes more than 50% of total package costs
- High price pressure due to overcapacity of module manufacturers which tape supplier did not follow
- Increased mechanical and reliability requirements from the market

Solution

- Enable new source of tape supplier (high volume)
- Change to cheaper material cost of tape
- Adapt process of module assembly to new tape
- Work closely with card manufacturers for integration of new module technology into card
FCOS vs Wirebonding

Wafer → Active Area → FLIP → Active Area → IC

Au Wire → Die Glue → Epoxy (130µm) → Cu 35µm (Ni Au)

Underfiller NCP → PET

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FCOS - Benefits

- Increased temperature cycling by 10
- Improvement for high dynamic bending stress (mailing)
- Increased mechanical reliability for static tests
- High corrosion resistance
- Housing for large IC area
- Increased implanting area
- Green Package
- FIPS (Federal Information Processing Standard) compatibility
Max. IC-area: Wirebond vs. FCOS 6-contacts

Max. IC-area:
1.9 x 1.9 mm

Max. IC-area:
5.0 x 6.0 mm

Wirebond 6-contact module

FCOS 6-contact module
3rd Form Factor

First Form Factor
(size of a credit card)

Second Form Factor
(size of a SIM card, current norm for GSM devices)

Third Form Factor (3FF)
Mini-UICC, half the size of the existing SIM card for use in high-end ultra-slim mobile phones and small devices such as GSM modems, WLAN cards
- allows the design of small terminals (e.g. data transmission only)
- full backwards compatibility
- implementation within a short time frame, main production equipment usable
- can be punched out of the existing plug-in, all three form factors on one card possible

- Punching tool of 6-contact at card manufacturer available
- Max. IC-area: ~30mm²
- For GSM application E² until …mm² (IFX) will fit in MFC5.6
Successful co-operation: Infineon and G&D

- **JOINT DEVELOPMENT** with technology leading card manufacturer results in innovative product

- Special **CUSTOMER REQUIREMENTS** have been incorporated into product definition to optimize the usage of the technology’s advantages

- **TIME TO MARKET**
  The project development could be finalized efficiently because of the close cooperation and communication between Infineon and G&D as well as tape suppliers (simultaneous engineering)

- **FIRST TIME RIGHT**
  Successful field trial of the new technology right after qualification