

# Leaner, Meaner Chip Card Package

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Infineon Technologies AG and Giesecke & Devrient GmbH (G&D) have jointly developed an innovative production method for chip packages specifically for use in chip card applications. The FCOS (Flip Chip On Substrate) method unveiled today is the first in which a chip card IC is rotated or flipped inside the module housing it. The functional side of the chip is attached directly to the module by means of conductive contacts; conventional gold wires and synthetic resin encapsulation are no longer required. The new attachment technique saves space in the module; additionally, it is even more robust than the conventional wiring solution. This means that the whole module handles high mechanical stresses better like those encountered, for example, when a chip card is sent by post and passes through the postal system's sorting machines.

Removing the need for the wiring used in existing methods frees up space in the module, which is therefore able to accommodate a larger chip. Typically, the standard maximum chip size has been around 25 square millimetres. Using the new technique, it should be now possible to add extra functionality to the card relatively quickly, without the time- and cost-intensive space optimization work typically required in chip development.

Alternatively, the space savings provided by the FCOS method can be used to shrink the modules in which existing chips are housed. Smaller modules are already in demand for certain applications. The European Telecommunications Standards Institute (ETSI), for example, approved a smaller form factor for SIM (Subscriber Identification Module) cards

in mobile phones at the beginning of 2004. ETSI wants to see dimensions of just 12 mm x 15 mm in future, a specification for which the smallest possible modules will be required.

Infineon's responsibilities in the FCOS project included the fundamental development work, the design of the module and the development of the production method for FCOS modules. Both companies then brought their expertise to bear to ready the FCOS technology for practical chip card applications. G&D contributed its knowledge of chip card production, built the new module into the card body and conducted all of the card qualification tests necessary to confirm its suitability for high-volume production. Infineon and G&D will each market FCOS independently.

## **New FCOS technology already in widespread use**

FCOS module technology is ready to go and is suitable for use with the standard production process for smart cards with contacts. The new packaging technology has passed its practical test. Infineon provided the more than 70 million FCOS modules which G&D integrated into prepaid phone cards already in circulation in Mexico.

The FCOS method is in principle suitable for use in all types of chip card including not only prepaid telephone cards and SIM cards for mobile phone network access, but also healthcare cards, personal entitlement cards for access to official services online, bank cards for electronic payment and company ID cards.

## **FCOS modules: only 6 times thicker than a human hair**

The module, the gold contacts which can be seen on the left side of the

chip card, is the structure that houses the chip. It connects the chip to the reader and is thus the card's gateway to the outside world. FCOS module technology accommodates memory chips and microcontrollers equally effectively. Conventional chip packages are currently around 580 micrometer ( $\mu\text{m}$ ) thick on average; FCOS modules not more than 500  $\mu\text{m}$ . A human hair, by way of comparison, is typically around 80  $\mu\text{m}$  thick.

## **Market position of G&D and Infineon in the smart card sector**

Infineon estimates that it had a market share in excess of 25 percent in 2004 and was thus the world's leading producer of chip packages for chip card applications. Data from US-based market researchers Gartner shows that Infineon was the world market leader in chips for chip card applications in 2003, supplying approximately 1.1 billion chip card ICs to a market with a total volume of just over two billion units (a market share of 53 percent). Gartner puts the total value of the chip card ICs market in 2003 at around USD 1.26 billion, giving Infineon a market share by sales revenue of 41 percent. According to international growth consultants Frost & Sullivan, G&D is the world's number three manufacturer of chip cards in the year 2003, with a market share of approximately 17 percent of the about two billion chip cards issued in 2003.

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