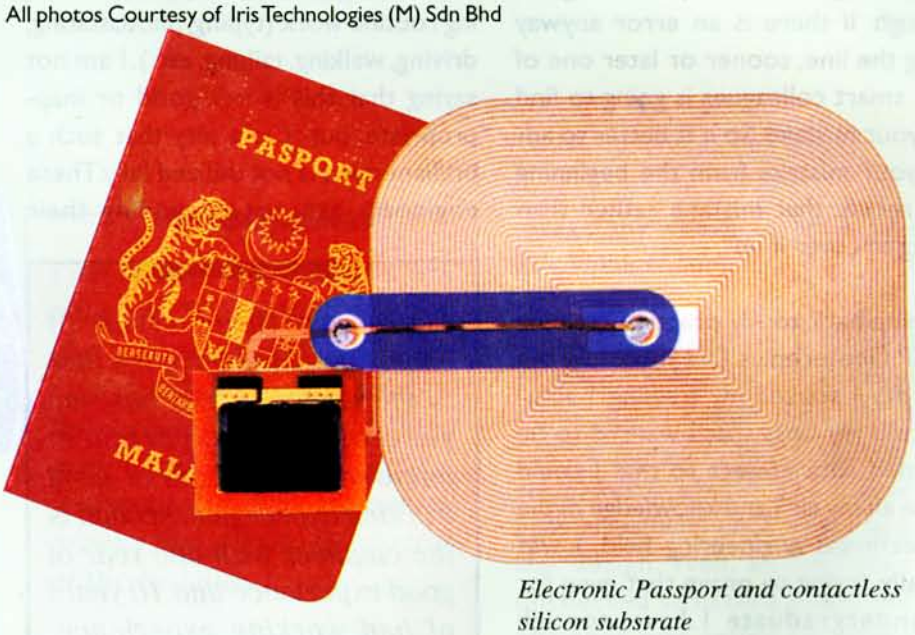
SMART CARD TECHNOLOGY

IRIS INNOVATION

All photos Courtesy of Iris Technologies (M) Sdn Bhd

M-Satu multi-application card



Electronic Passport and contactless silicon substrate

Smart cards are gaining in popularity and use throughout the world. They come in various forms and sizes - telephone cards, SIM mobile phone cards, Touch-n-Go cards, credit and debit cards. Malaysia has established a record in launching an Electronic Passport this year - a first of its kind in smart card application. Another innovation is the Multipurpose Smart card - a single smart card for multiple applications such as identity card, ATM card, credit card and phone card.

While smart card technologies have been developed in various parts of the world, notably Europe, a Malaysian company, Iris Technologies (M) Sdn Bhd, has developed proprietary technologies in the Image, Retrieval and Identifications System (IRIS) and Iris Smart card Operating Systems (ICOS). The two technologies have been registered with the Copyrights Office in Washington, USA. Using these technologies, Iris Technologies developed and manufactured the Malaysian Electronic Passport.

A Malaysian company, Iris Technologies (M) Sdn Bhd, has developed a proprietary image compression and retrieval system, and smart card Operating Systems for smart card applications such as the Malaysian Electronic Passport and a multipurpose smart card.

The IRIS is an integration of several key processes such as compression and decompression algorithms; passive contactless card reading technologies and silicon substrate design. IRIS captures, compresses and retrieves images (such as human faces, finger prints, palm prints) in full colour. The compression technique can compress a 640 Kbytes photo image to only 4 Kbytes, and a 130 Kbytes thumbprint into just 3 Kbytes. The image can be stored in a chip which has only 8 Kbytes of storage space. When decompressed, there is minimal loss of quality.

The IRIS interfaces with ICOS. This operating system provides a wide range of security functions such as encryption algorithms, personal identification number, verification tests, authentication procedures, biometrics and facial verification.

Eddy S. H. Cheah, general manager of sales and marketing, at Iris Technologies, explains that the ICOS is loaded at the time of chip fabrication. This operating system has gained commercial recognition as chip maker Motorola will be masking the ICOS onto its Enterprise 32 bit silicon chips this year. This will be carried out under a collaboration agreement signed between Motorola and Iris Technologies in January 1998.

The Malaysian Electronic Passport made by Iris Technologies contains a contactless silicon substrate (microprocessor chip together with electronic circuitry and antennae). This passport is

IRIS compression technique can compress and decompress images such as faces and finger prints

said to be tamper-proof as information is encoded in the silicon substrate embedded inside the passport book. The passport holder's information, images and biometrics are first captured, compressed, encoded and embedded inside the microprocessor chip. With eight Kbytes of memory, the chip can store a digitised photo, a thumbprint, digital signature and several pages of text data. The images and information cannot be read without properly configured equipment and the data inside is digitally encrypted. Even if the passport bearer manages to change the photograph in the passport, the encrypted photo on the smart chip cannot be altered.

Bending or folding of the passport is not a concern as the flexible semi-conductor allows bending like rubber without losing any of its properties.

How is the embedded information read? Radio waves are used to communicate with the microprocessor chip. A stand alone IRIS reader connected to a personal computer, is equipped with an antenna to transmit power and information to the chip. The antenna in the contactless silicon substrate receives the power and allows the chip to communicate with the reader.

To retrieve the information embedded in the chip, IRIS proprietary system hardware and software decompress the photo and thumbprint images and display them on the computer screen. The reading time and decompression of data are very fast, taking between six and eight seconds.

A model of the Electronic Passport and Passport Reader

The multipurpose smart card can replace individual single function cards such as credit cards (above) and phone cards (right)

At the immigration checkpoints, the authentication process is twofold.

1. The information displayed on the computer monitor must match the information printed on the passport.
2. The displayed image (photo of passport holder) must match the holder and true owner of the document.

In case of mismatch, a counterfeit or forged passport can be detected.

Another innovation in smart card application - the multipurpose smart card - has the capacity to replace all single function cards with one card using a multi-application operating system. Iris Technologies developed a multi-platform, multi-application operating system called the Multi-Chip Operating System (M-COS), a secure derivative of the IRIS core technology. Using M-COS, the company has produced a multipurpose smart card as one of the flagship applications under the Multimedia Super Corridor. Called the M-SATU card, its applications incorporate:

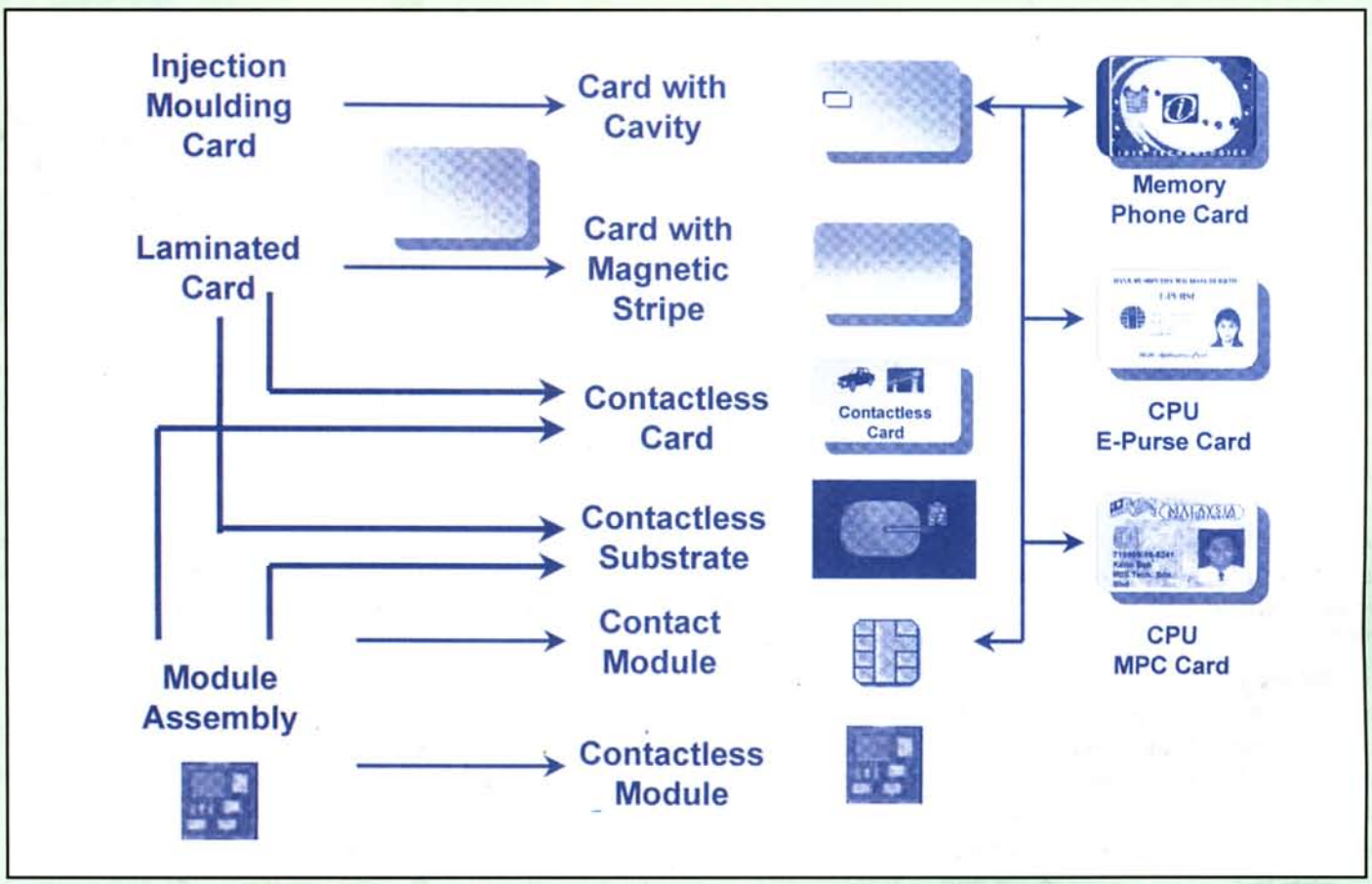
- Identity Card
- ATM Card
- Driving License
- Medical Card
- Phone Card
- Electronic Purse
- Frequent Travellers Card
- Security Features

Iris Technologies' office and manufacturing facility at the Technology Park Malaysia

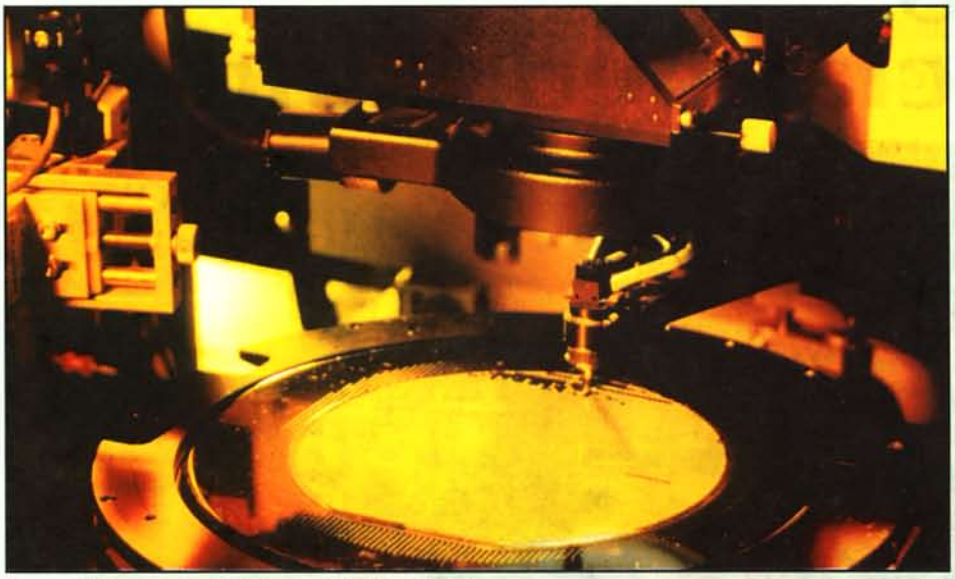
All applications are provided independent of each other. with their own security control systems (firewalls). The card can be used almost anywhere in the world that accepts a smart card.

Iris Technologies was founded in 1994, and is a joint venture between TL Technology and the Berjaya Group. Its smart card manufacturing facility, located at Technology Park Malaysia, is a fully integrated plant able to undertake silicon wafer processing, module embedding and printing of finished cards. It manufactures contact, contactless cards and contactless substrates. (A contact card has a chip implanted on the card, e.g., a phone card. A contactless card has a chip and antennae embedded inside a card, e.g., Touch-n-Go card). The smartcard manufacturing process is divided into various sub-processes.

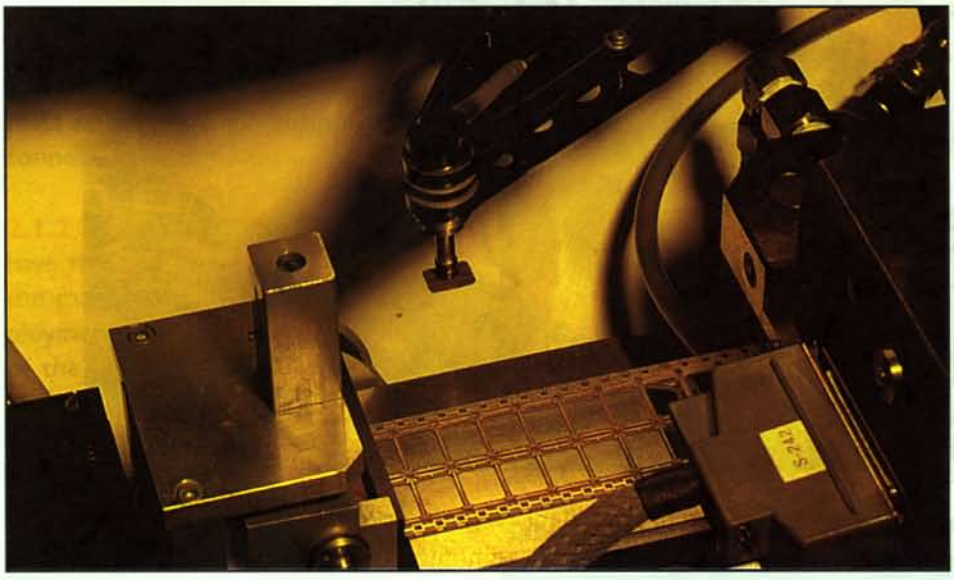
First is module manufacturing where raw silicon wafer is loaded into a wafer saw machine and the wafer is sawn into an individual die. The sawn wafer is loaded into a bonding machine where the individual 'good' die is selected and bonded onto a module tape. The tape with the bonded die is loaded into a machine which electrically connects the die to the module using gold wire. An encapsulation machine then encases the bonded die in protective epoxy and



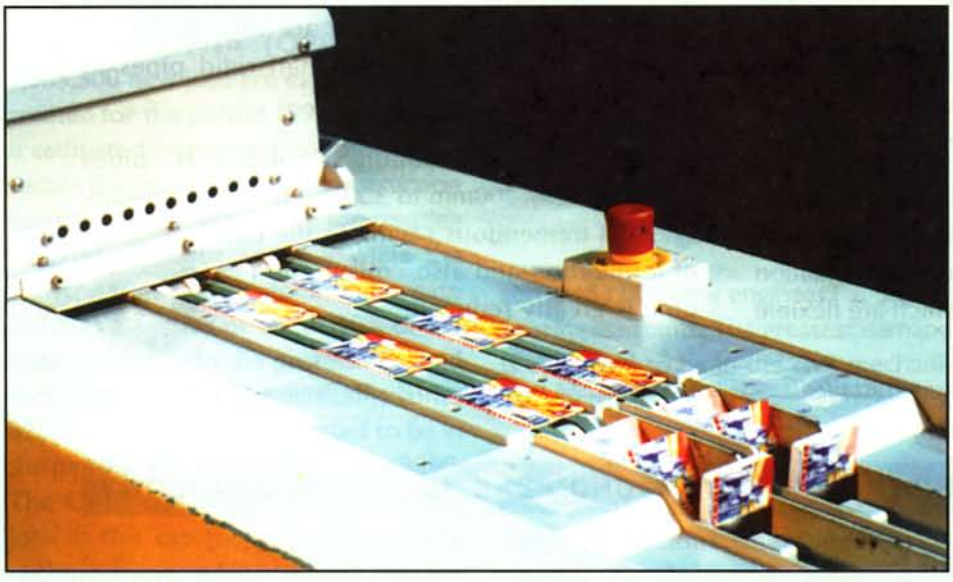
Smart card manufacturing system flow chart



Raw silicon wafer diced into individual chips



Chip impanting machine implants the module onto cards



Printing of smart cards

cures the epoxy. The individual modules are electrically tested to ensure that they are in working order.

Then, the card body is produced and printed. This involves the manufacture of ISO type credit card sized bodies. These card bodies are made by either:

- Plastic injection - for contact cards with a pre-defined cavity, or
- Lamination - for contactless cards, contactless substrates and magnetic stripe cards

Printing is either by a card by card process or a sheet printing process.

Finally, the module is inserted into the card. For contact cards, the module in a tape and reel, is loaded into an insertion machine together with the card bodies. The insertion machine applies glue to the cavity; punches the individual module out of the module tape; inserts the module into the cavity; activates the glue in a heat process; cools down the heated card and electrically tests the module in the card to ensure that it is working.

If a laminated card body is required, the card is first loaded into a 'card milling' machine and the appropriate cavity is milled out of the card. This milled card is then loaded into the insertion machine for module insertion.

Coding and personalisation of cards can then be carried out. The cards can be serialised by laser or inkjet printing. For magnetic stripe cards that require a signature panel or a security hologram, the cards will undergo tape laying and hot stamping respectively.

According to Cheah, close to 100,000 smart cards have been made for use in the Malaysian Electronic Passports. Iris Technologies is awaiting news from the Government on whether its multi-purpose M-SATU card has been officially approved. – *Inforeach*