

Fingerprint Sensor Solution

In the near future, a new generation of fingerprint sensors with higher cost performance and recognition ability than other biometric authentication equipment is expected to come into wide use.

This article introduces our fingerprint sensor devices and fingerprint-recognition software.

Introduction

In order to protect privacy during online transactions such as e-commerce or database access management, user identification is an essential requirement. Today's fingerprint sensor devices are used in such fields that require high recognition ability. In the coming broadband Internet era, these devices are expected to be adopted in multi-function Smart cards and mobile devices. By 2004, the market for fingerprint sensor devices is expected to expand to 100 billion yen from its current level of 2 billion yen.

FUJITSU has obtained hardware and software IPs from the US company Veridicom, a technology and market leader in silicon fingerprint sensing, to set up a manufacturing and distribution system for fingerprint sensing devices in-house. The wafer process is already launched, and production lines have been supplying ES products since August 2001.

FUJITSU's fingerprint sensors MBF110/200 are already being marketed with bundled recognition software. In October 2001 we launched sales of our MBF200 equipped with a USB IP core on-chip, and MBF300 with unique functions will be available soon.

The Rise of Fingerprint Sensing

With the growing sophistication of the Internet and its functions, demand for online user verification has grown. PKI (Public Key Infrastructure) is a solution for establishing a highly secure network environment using encryption keys. PKI will play an essential role in securing network

environments for things like Japan's electronic signoff law enforcement, the 100 trillion B2B market in 2005, 'the First

Photo 1 External View

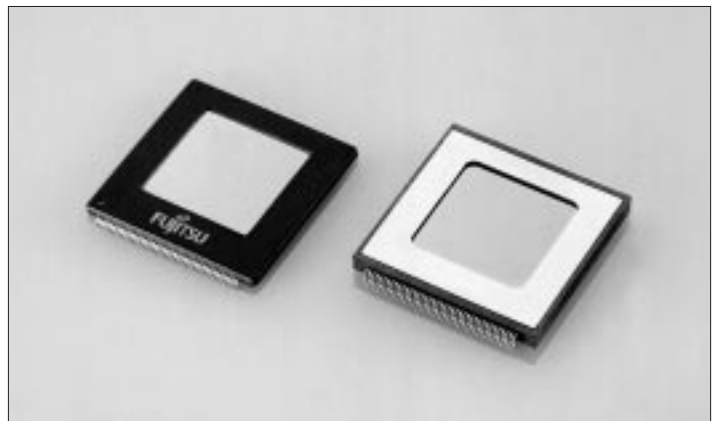
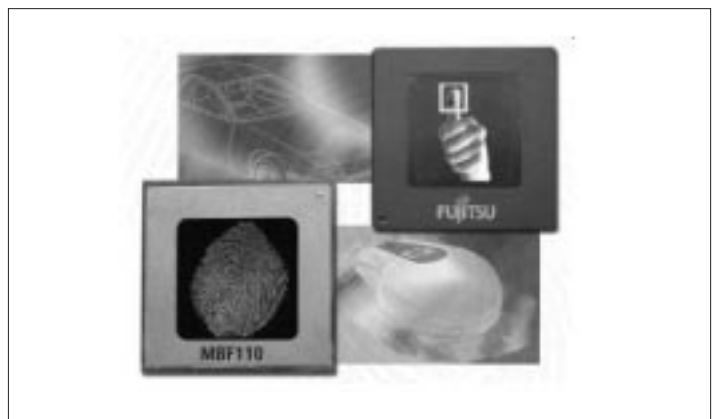


Photo 2 Image



Year' of e-business and e-commerce, electronic government, and so on. PKI solution consists of private key (issued to the subscriber by Certification Authorities=CA), public key (also issued by Certification Authorities and stored on Repository) and cryptographic technology. This scheme ensures extremely high level security and accuracy of verification.

The simplest "key" is a password, but passwords are no longer very secure. In fact, as people use more passwords in their day-to-day transactions, the number of net crimes rises. In the US, where the internet is most developed, statistics indicate that an average citizen holds eleven passwords. An easy-to-remember password may expose personal property to risk, and recognition of this security flaw has prompted security specialists to develop biometrics.

Biometrics is a technology that analyzes human characteristics for security purposes. The voice, iris, hand, and face can be used in addition to fingerprints, but among these, fingerprints are regarded as the most cost-effective. Until recently, the most common type of fingerprint sensors worked with optical and pressure mechanisms, but now these devices have been overtaken by static-capacity, silicon fingerprint sensors.

Features of the Static-Capacity, Silicon Fingerprint Sensor

- **A silicon semiconductor device that performs stably with no optical mechanisms**
- **As a normal silicon semiconductor, it can be very easily integrated into various control circuits, memories, interfaces, and so on. The devices combine a new technology with proven technology for low power consumption.**
- **Installable in various sensor areas for different purposes**
- **Highly durable with a rigid protective membrane**

MBF I I 0/200/300

Fingerprint Detection Technology

The static-capacity semiconductor sensor technology is shown in Fig.1. As shown in the cross-sectional diagram, large numbers of capacitors are arranged in the top layer of the chip. When a finger is placed on the surface, the capacitor values across the array change in accordance to the uneven surface of the print. The principle may be more easy to understand if you substitute the light in a CMOS image sensor for the ridges and bifurcations along the surface of the finger. Each capacity value from the sensor is converted by an 8-bit AD algorithm, the data is coded into a 300×300 pixel array (300×256 for the MBF200), and the finger image is then output at 500 dpi resolution. Since the pitch in the ridges of the finger is generally more than 200 μm , a dimension of 50 μm ×50 μm size is adequate for one condenser. The condenser array of 300×300=90,000 pixels covers a surface area about the same size as the tip of a finger.

Fingerprint Recognition Software

The software handles the process after the chip has captured the fingerprint image.

Fig.2 shows how it works. Each human fingerprint has unique characteristics. As shown in the figure, every person has his/her own pattern of bifurcations and endings over the surface of the finger, and this pattern is permanent unless some operative treatment is given. This software extracts these characteristics from the image and converts them into positional information in a kind of contour drawing. The original 90K-byte image data is discarded, and much smaller point-position data is registered.

To protect privacy, this point registration data cannot be used to reconstruct the original fingerprint image. This software can be bundled with the chips for customers, and the collation engine can be run on Windows or other platforms.

This software has the following characteristics:

- To protect privacy, the fingerprint image cannot be restored from the fingerprint data.
- Rotations or shifts of the fingerprint image are adjusted, securing the recognition accuracy.
- Only 300 to 600 bytes of data is generated for each fingerprint sensed, guaranteeing simple data handling.
- A built-in software development environment is provided.

Future Development

FUJITSU will combine this fingerprint sensor with an LSI with FRAM for multi-function IC cards. The new device will become a high security solution, and it will be built into new FUJITSU products for the broadband Internet era. Ultimately FUJITSU hopes to win a 40 percent market share in the fingerprint-sensing business worldwide. ★

NOTES

- * Windows is a registered trademark of US Microsoft Corporation in the USA and other countries.
- * FRAM is a registered trademark of US Ramtron International Corporation.

Figure 1 Static-Capacity, Semiconductor Sensor Technology

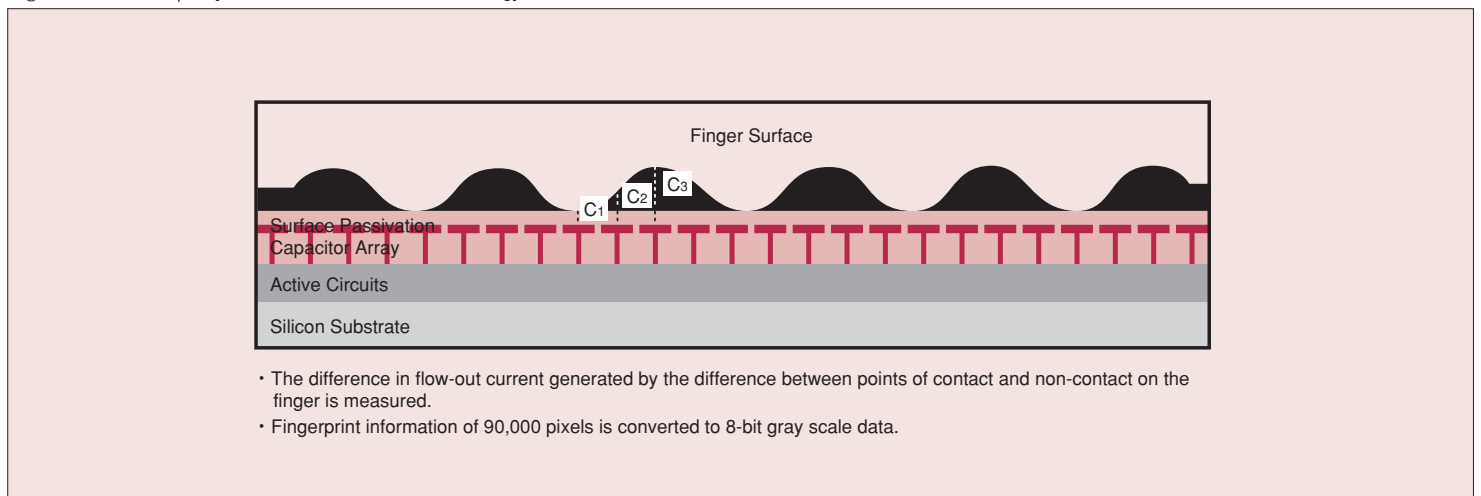


Figure 2 Operation Principle

