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Expanding the Use of FRAM Smart Cards——Your Passport to the Net!

FRAM FOR SMART CARDS

FRAM (Ferroelectric RAM) is a nonvolatile memory, which uses ferroelectric film as a capacitor for data storing.

The outstanding features: low power consumption, fast rewrite speed and tamper resistance, are well suited for smart cards and mobile devices, which requires extremely low power consumption and high level of security.

Based on advanced technology and production know-how, Fujitsu became the world’s first to successfully incorporate FRAM in microprocessors and to produce in mass volume. And many successful installations for various applications, such as transportation, government, company and amusement cards can be already seen.

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FRAM FOR SMART CARDS

What is FRAM?
FRAM (ferroelectric random access memory) is a nonvolatile memory that uses ferroelectric film as a capacitor for storing data. Possessing characteristics of both ROM and RAM devices, FRAM features high speed access, high endurance in write mode, low power consumption, and excellent tamper resistance. It is therefore ideal for use in smart cards, mobile phones and other devices, which requires high security and low power consumption.

What is Ferroelectric material?
PZT (Pb(Zr/Ti)O3) material which has a perovskite-type structure (ABO3), is commonly used as a typical ferroelectric material. An electric polarization of PZT (shift up/down of Zr/Ti atom) remains after applying and removing an external electric field, from which a nonvolatile property results. As a result of this, the power consumption required for data storage is very low.

Crystal structure of Ferroelectric material

Comparison of FRAM with other memory products

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<td>20</td>
<td>12</td>
<td>3.3</td>
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<tr>
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<td>5</td>
<td>5</td>
</tr>
<tr>
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<td>5</td>
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<td>4</td>
</tr>
<tr>
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<td>0.00001</td>
<td>0.00001</td>
<td>0.00001</td>
<td>0.00001</td>
<td>0.00001</td>
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</table>

Features of FRAM
Currently, EEPROM is mainly used for data memory in smart cards. However, FRAM is superior to EEPROM in terms of speed, power consumption, and endurance in write mode. Compared with EEPROM, Fujitsu FRAM has the following features:
1. 1/30,000 high-speed write time
2. 1/400 or less power consumption
3. 100,000 times or more rewrite capability (count)

Characteristics of FRAM (Comparison with EEPROM)

Write time of 1 byte data on FRAM is 1/30,000 of EEPROM.

Energy consumption of FRAM is 1/400 or less of EEPROM.

Endurance

Endurance of FRAM is 100,000 times of EEPROM.
FRAM FOR SMART CARDS

MB89R076
● LSI for contactless smart cards
The MB89R076 is an LSI for contactless smart cards, in which a 4K bytes FRAM is embedded in an 8-bit microcontroller. The LSI also features an encryption circuit for preventing misuse via counterfeiting or tampering, as well as an RF circuit, which is an essential element of contactless smart cards, a power source circuit, and other features.

Features
- 8 bit CPU
- 4KByte FRAM
- 512 Byte SRAM
- 32KByte Mask ROM
- Contactless Interface: ISO14443 Type B
- Target Applications: Student/employee ID card, electronic money, etc.
- Encryption: DES (Data Encryption Standard)

MB89R116
● LSI for RFID transponders
The MB89R116 is a product complying with ISO/IEC15693, which is the international standard for vicinity transponders. Compared with the conventional EEPROM-based RFID transponders, this device is equipped with high-capacity 2K bytes FRAM that can store large amount of data in distribution channels and can read/write the product information.

Features
- 2KByte FRAM
- Operating Frequency: 13.56MHz
- Contactless Interface: ISO15693
- Applications: Inventory management, supply chain management, anti-theft
- Operating Distance: 50cm or longer (depending on the antenna and other factors)
- With anti-collision algorithm

HIFERRON Series
● Multi-application smart card LSI
The HIFERRON series is an LSI for multi-purpose card in which Java DS and 64K bytes of FRAM are embedded with a 32-bit Fujitsu FR RISC processor. By incorporating FRAM and an encryption circuit (DES, RSA or ECC), multiple applications can be executed at high speed and with high security. It is truly an LSI that meets the needs of the e-commerce era.

Features
- 32 bit RISC CPU
- 32K, 64KByte FRAM
- 96K–128KByte Mask ROM
- 4KByte SRAM
- DES, RSA, or ECC (F2m)
- ISO7816, T=0, 1 contact interface
- Contactless Interface: ISO14443 Type B
- Target Applications: Government card, amusement card, electronic money, etc.
- OS Supported: Native and Java Card v2.2

MB89R111
● LSI for contactless memory cards
The MB89R111 is an LSI for contactless memory cards with 2K bytes FRAM memory. Well matched for various ID cards and RFID tags.

Features
- 32 bit RISC CPU
- 32K, 64KByte FRAM
- 96K–128KByte Mask ROM
- 4KByte SRAM
- DES, RSA, or ECC (F2m)
- ISO7816, T=0, 1 contact interface
- Contactless Interface: ISO14443 Type B
- Target Applications: Access control, inventory management, production/distribution management, etc.
- Operating Distance: 10cm