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FRAM (Ferroelectric RAM) is a non-volatile memory that can retain data even with the power off and also a random access memory (RAM). FRAM has the superior performance as compared with conventional non-volatile memories in high-speed write and high endurance.

Fujitsu Semiconductor carries out from R&D through to mass production of FRAM. Since the introduction of FRAM products in 1999, Fujitsu has been the top supplier in the world. FRAM products are produced in Fujitsu and group companies. Fujitsu can stably supply high quality of FRAM products.
FRAM combines the advantages of ROM and RAM into a single package.

FRAM Advantage
- Non-volatile
- High endurance
- High speed writing
- Low power consumption

Features of FRAM compared with other memory products

<table>
<thead>
<tr>
<th></th>
<th>FRAM</th>
<th>E-ROM</th>
<th>Flash</th>
<th>SRAM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Memory type</td>
<td>Non-volatile</td>
<td>Non-volatile</td>
<td>Non-volatile</td>
<td>Volatile</td>
</tr>
<tr>
<td>Data rewrite method</td>
<td>Overwrite</td>
<td>Erase + Write</td>
<td>Sector erase + Write</td>
<td>Overwrite</td>
</tr>
<tr>
<td>Write cycle time</td>
<td>150ns</td>
<td>5ms</td>
<td>10µs</td>
<td>Unlimited</td>
</tr>
<tr>
<td>Endurance</td>
<td>10^8 to 10^14</td>
<td>10^8</td>
<td>10^8</td>
<td>Unlimited</td>
</tr>
<tr>
<td>Charge pump circuit</td>
<td>No-need</td>
<td>Need</td>
<td>Need</td>
<td>No-need</td>
</tr>
</tbody>
</table>

Example of Applications
- OA equipment: Counter, parameter data storage
- SSD: Logging management, cache memory
- Amusement: Resume and parameter data storage
- ATM: Transaction history, logging management
- Audio, AV equipment: Resume and parameter data storage
- Communication equipment: Communicating resume and logging management
- Measurement and Analyzing device: Measuring data and revised data storage
- FA: Parameter data storage, logging management

Stand alone FRAM Memory

Serial Memory
- Fully compliant with the world standard, I2C BUS. Controls every functions with two ports, Serial Clock (SCL) and Serial Data (SDA).

<table>
<thead>
<tr>
<th>Part number</th>
<th>Memory capacity</th>
<th>Power supply voltage</th>
<th>Operating frequency (MAX)</th>
<th>Operating temperature</th>
<th>Read/Write Cycles</th>
<th>Data retention guarantee</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>MB85RC128B</td>
<td>128Kbit</td>
<td>2.7 to 3.3V</td>
<td>400MHz</td>
<td>-40 to +85°C</td>
<td>10^10 times (10 billion times)</td>
<td>10 years (+85°C)</td>
<td>SOP-8</td>
</tr>
<tr>
<td>MB85RC64A</td>
<td>64Kbit</td>
<td>2.7 to 3.3V</td>
<td>400MHz</td>
<td>-40 to +85°C</td>
<td>10^12 times (1 trillion times)</td>
<td>10 years (+85°C)</td>
<td>SOP-8</td>
</tr>
<tr>
<td>MB85RC64V</td>
<td>64Kbit</td>
<td>3.0 to 3.5V</td>
<td>400MHz</td>
<td>-40 to +85°C</td>
<td>10^12 times (1 trillion times)</td>
<td>10 years (+85°C)</td>
<td>SOP-8</td>
</tr>
<tr>
<td>MB85RC16</td>
<td>16Kbit</td>
<td>2.7 to 3.3V</td>
<td>1MHz</td>
<td>-40 to +85°C</td>
<td>10^10 times (10 billion times)</td>
<td>10 years (+85°C)</td>
<td>SOP-8</td>
</tr>
<tr>
<td>MB85RC16V</td>
<td>16Kbit</td>
<td>3.0 to 3.5V</td>
<td>400MHz</td>
<td>-40 to +85°C</td>
<td>10^12 times (1 trillion times)</td>
<td>10 years (+85°C)</td>
<td>SOP-8</td>
</tr>
</tbody>
</table>

SPI Interface
- The maximum clock performance speed is at 25MHz (max.).

<table>
<thead>
<tr>
<th>Part number</th>
<th>Memory capacity</th>
<th>Power supply voltage</th>
<th>Operating frequency (MAX)</th>
<th>Operating temperature</th>
<th>Read/Write Cycles</th>
<th>Data retention guarantee</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>MB85RS128A</td>
<td>256Kbit</td>
<td>3.0 to 3.6V</td>
<td>250MHz</td>
<td>-40 to +85°C</td>
<td>10^12 times (1 trillion times)</td>
<td>10 years (+85°C)</td>
<td>SOP-8</td>
</tr>
<tr>
<td>MB85RS128B</td>
<td>128Kbit</td>
<td>3.0 to 3.6V</td>
<td>250MHz</td>
<td>-40 to +85°C</td>
<td>10^12 times (1 trillion times)</td>
<td>10 years (+85°C)</td>
<td>SOP-8</td>
</tr>
<tr>
<td>MB85RS64A</td>
<td>64Kbit</td>
<td>2.7 to 3.3V</td>
<td>200MHz</td>
<td>-40 to +85°C</td>
<td>10^12 times (1 trillion times)</td>
<td>10 years (+85°C)</td>
<td>SOP-8</td>
</tr>
<tr>
<td>MB85RS64V</td>
<td>64Kbit</td>
<td>3.0 to 3.5V</td>
<td>200MHz</td>
<td>-40 to +85°C</td>
<td>10^12 times (1 trillion times)</td>
<td>10 years (+85°C)</td>
<td>SOP-8</td>
</tr>
<tr>
<td>MB85RS16</td>
<td>16Kbit</td>
<td>2.7 to 3.3V</td>
<td>1MHz</td>
<td>-40 to +85°C</td>
<td>10^12 times (1 trillion times)</td>
<td>10 years (+85°C)</td>
<td>SOP-8</td>
</tr>
</tbody>
</table>

Parallel Memory
- Parallel reading and writing is available like SRAM.

<table>
<thead>
<tr>
<th>Part number</th>
<th>Memory capacity</th>
<th>Power supply voltage</th>
<th>Operating frequency (MAX)</th>
<th>Operating temperature</th>
<th>Read/Write Cycles</th>
<th>Data retention guarantee</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>MB85BA4001A</td>
<td>4MBbit (128K×32bit)</td>
<td>3.0 to 3.6V</td>
<td>150ns</td>
<td>-40 to +85°C</td>
<td>10^10 times (10 billion times)</td>
<td>10 years (+85°C)</td>
<td>TSOP-48</td>
</tr>
<tr>
<td>MB85BA4002A</td>
<td>4MBbit (256K×16bit)</td>
<td>3.0 to 3.6V</td>
<td>150ns</td>
<td>-40 to +85°C</td>
<td>10^10 times (10 billion times)</td>
<td>10 years (+85°C)</td>
<td>TSOP-48</td>
</tr>
<tr>
<td>MB85BR1001A</td>
<td>1MBbit (128K×8bit)</td>
<td>3.0 to 3.6V</td>
<td>150ns</td>
<td>-40 to +85°C</td>
<td>10^10 times (10 billion times)</td>
<td>10 years (+85°C)</td>
<td>TSOP-48</td>
</tr>
<tr>
<td>MB85BR1002A</td>
<td>1MBbit (64K×16bit)</td>
<td>3.0 to 3.6V</td>
<td>150ns</td>
<td>-40 to +85°C</td>
<td>10^10 times (10 billion times)</td>
<td>10 years (+85°C)</td>
<td>TSOP-48</td>
</tr>
<tr>
<td>MB85BR256F</td>
<td>256Kbit</td>
<td>2.7 to 3.3V</td>
<td>150ns</td>
<td>-40 to +85°C</td>
<td>10^10 times (10 billion times)</td>
<td>10 years (+85°C)</td>
<td>SOP-8</td>
</tr>
</tbody>
</table>
FRAM RFID LSI
FRAM RFID LSI is widely used as data carrier RFID for both HF (High-Frequency: 13.56 MHz) and UHF (Ultra High-Frequency: 860 to 960 MHz).
FRAM RFID LSI has the following advantages compared to E²PROM RFID LSI.

Advantages of FRAM RFID
- Fast write speed
- Large density Memory for data carrier (traceability, maintenance)
- High endurance for frequent memory access and reuse
- Stable read/write communication distance because of low power writing
- Radiation Hardness for Gamma-ray sterilization (data survives)
- SPI interface for embedded solution with sensors, electronic papers, etc.

FRAM MCU
FRAM MCU adopts the nonvolatile memory "FRAM" for its embedded memory.
FRAM MCU has the following advantages compared to Flash MCU.

Advantages of FRAM MCU
- Faster write speed than conventional Flash MCU
- Data overwritten by Byte is available without erase operation
- Lower power consumption is available when data rewrite operation, not required high-voltage being applied
- FRAM memory area is available for both data storage and code storage

Custom LSI with FRAM
FRAM is suitable for one-chip solution with logic and analog circuit. Fujitsu can customize LSI for RFID and FRAM MCU, or provide the customized LSI with FRAM according to your request.

Part number | Frequency | Interface Modulation method | Memory size
---|---|---|---
MB89R118C | 13.56MHz | ISO/IEC 15693, 18000-3 ASK 10%/100% | 2Kbyte
MB89R119B | 13.56MHz | ISO/IEC 15693, 18000-3 ASK 10%/100% | 256byte
MB97R803A/B | 860-960MHz | ISO/IEC 18000-6C DSB/SSB/PR-ASK | 4Kbyte
MB97R804A/B | 860-960MHz | ISO/IEC 18000-6C, SPI DSB/SSB/PR-ASK | 4Kbyte

Applications
- Non-volatility
- Fast write speed
- High endurance
- Low power consumption
- Security

Custom LSI with FRAM
- Various IPs
- FRAM
- SRAM
- ROM

- Contact our sales for the available use.