

# FRAM



## FUJITSU SEMICONDUCTOR LIMITED

Nomura Fudosan Shin-yokohama Bldg. 10-23, Shin-yokohama 2-Chome,  
Kohoku-ku Yokohama Kanagawa 222-0033, Japan  
Tel: +81-45-415-5858  
<http://jp.fujitsu.com/fsl/en/>

For further information please contact:

### North and South America

FUJITSU SEMICONDUCTOR AMERICA, INC.  
1250 E. Arques Avenue, M/S 333  
Sunnyvale, CA 94085-5401, U.S.A.  
Tel: +1-408-737-5600 Fax: +1-408-737-5999  
<http://us.fujitsu.com/micro/>

### Europe

FUJITSU SEMICONDUCTOR EUROPE GmbH  
Pittlerstrasse 47, 63225 Langen, Germany  
Tel: +49-6103-690-0 Fax: +49-6103-690-122  
<http://emea.fujitsu.com/semiconductor/>

### Korea

FUJITSU SEMICONDUCTOR KOREA LTD.  
902 Kosmo Tower Building, 1002 Daechi-Dong,  
Gangnam-Gu, Seoul 135-280, Republic of Korea  
Tel: +82-2-3484-7100 Fax: +82-2-3484-7111  
<http://kr.fujitsu.com/fsk/>

### Asia Pacific

FUJITSU SEMICONDUCTOR ASIA PTE. LTD.  
151 Lorong Chuan,  
#05-08 New Tech Park 556741 Singapore  
Tel : +65-6281-0770 Fax : +65-6281-0220  
<http://www.fujitsu.com/sg/services/micro/semiconductor/>

### FUJITSU SEMICONDUCTOR SHANGHAI CO., LTD.

Rm. 3102, Bund Center, No.222 Yan An Road (E),  
Shanghai 200002, China  
Tel : +86-21-6146-3688 Fax : +86-21-6335-1605  
<http://cn.fujitsu.com/fss/>

### FUJITSU SEMICONDUCTOR PACIFIC ASIA LTD.

10/F., World Commerce Centre, 11 Canton Road,  
Tsimshatsui, Kowloon, Hong Kong  
Tel : +852-2377-0226 Fax : +852-2376-3269  
<http://cn.fujitsu.com/fsp/>

Specifications are subject to change without notice. For further information please contact each office.

### All Rights Reserved.

The contents of this document are subject to change without notice.

Customers are advised to consult with sales representatives before ordering.

The information, such as descriptions of function and application circuit examples, in this document are presented solely for the purpose of reference to show examples of operations and uses of FUJITSU SEMICONDUCTOR device; FUJITSU SEMICONDUCTOR does not warrant proper operation of the device with respect to use based on such information. When you develop equipment incorporating the device based on such information, you must assume any responsibility arising out of such use of the information.

FUJITSU SEMICONDUCTOR assumes no liability for any damages whatsoever arising out of the use of the information.

Any information in this document, including descriptions of function and schematic diagrams, shall not be construed as license of the use or exercise of any intellectual property right, such as patent right or copyright, or any other right of FUJITSU SEMICONDUCTOR or any third party or does FUJITSU SEMICONDUCTOR warrant non-infringement of any third-party's intellectual property right or other right by using such information. FUJITSU SEMICONDUCTOR assumes no liability for any infringement of the intellectual property rights or other rights of third parties which would result from the use of information contained herein.

The products described in this document are designed, developed and manufactured as contemplated for general use, including without limitation, ordinary industrial use, general office use, personal use, and household use, but are not designed, developed and manufactured as contemplated (1) for use accompanying fatal risks or dangers that, unless extremely high safety is secured, could have a serious effect to the public, and could lead directly to death, personal injury, severe physical damage or other loss (i.e., nuclear reaction control in nuclear facility, aircraft flight control, air traffic control, mass transport control, medical life support system, missile launch control in weapon system), or (2) for use requiring extremely high reliability (i.e., submersible repeater and artificial satellite).

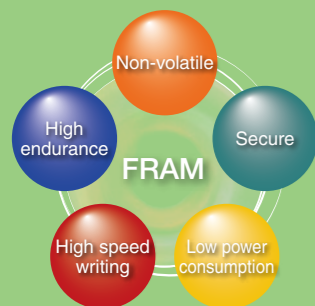
Please note that FUJITSU SEMICONDUCTOR will not be liable against you and/or any third party for any claims or damages arising in connection with above-mentioned uses of the products.

Any semiconductor devices have an inherent chance of failure. You must protect against injury, damage or loss from such failures by incorporating safety design measures into your facility and equipment such as redundancy, fire protection, and prevention of overcurrent levels and other abnormal operating conditions.

Exportation/release of any products described in this document may require necessary procedures in accordance with the regulations of the Foreign Exchange and Foreign Trade Control Law of Japan and/or US export control laws.

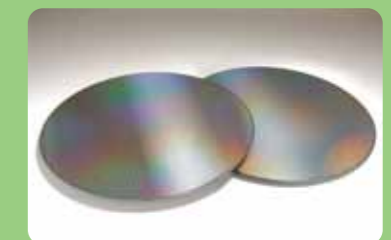
The company names and brand names herein are the trademarks or registered trademarks of their respective owners.

# FRAM, for your system innovation



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 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

FRAM combines the advantages of ROM and RAM into a single package.

FRAM = ROM + RAM









## FRAM Advantage

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

## Features of FRAM compared with other memory products

	FRAM	E <sup>2</sup> PROM	Flash	SRAM
Memory type	Non-volatile	Non-volatile	Non-volatile	Volatile
Data rewrite method	Overwrite	Erase + Write	Sector erase + Write	Overwrite
Write cycle time	150ns	5ms	10μs	55ns
Endurance	10 <sup>10</sup> to 10 <sup>15</sup>	10 <sup>6</sup>	10 <sup>5</sup>	Unlimited
Charge pump circuit	No-need	Need	Need	No-need

## Example of Applications

 <b>OA equipment</b> Counter, parameter data storage	 <b>SSD</b> Logging management, cache memory
 <b>Amusement</b> Resume and parameter data storage	 <b>ATM</b> Transaction history, logging management
 <b>Audio, AV equipment</b> Resume and parameter data storage	 <b>Communication equipment</b> Communicating resume and logging management
 <b>Measurement and Analyzing device</b> Measuring data and revised data storage	 <b>FA</b> Parameter data storage, logging management

## Stand alone FRAM Memory

### Serial Memory

#### I<sup>2</sup>C Interface

Fully compliant with the world standard, I<sup>2</sup>C BUS. Controls every functions with two ports, Serial Clock (SCL) and Serial Data (SDA).

Part number	Memory capacity	Power supply voltage	Operating frequency (MAX)	Operating temperature	Write/erase cycle	Data retention guarantee	Package
MB85RC128	128Kbit	2.7 to 3.6V	400KHz	-40 to +85°C	10 billion times	10 years	SOP-8
MB85RC64	64Kbit	2.7 to 3.6V	400KHz	-40 to +85°C	10 billion times	10 years	SOP-8
MB85RC16	16Kbit	2.7 to 3.6V	1MHz	-40 to +85°C	10 billion times	10 years	SOP-8

#### SPI Interface

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

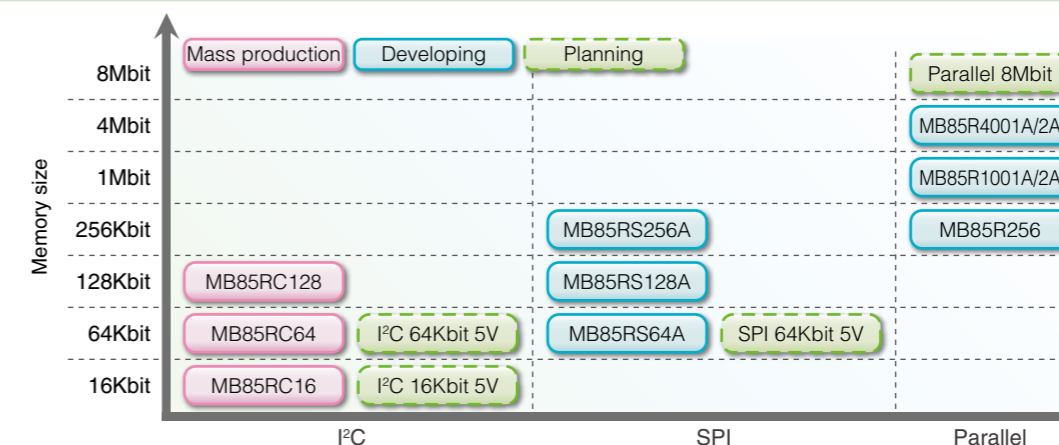
Part number	Memory capacity	Power supply voltage	Operating frequency (MAX)	Operating temperature	Write/erase cycle	Data retention guarantee	Package
MB85RS256A	256Kbit	3.0 to 3.6V	25MHz	-40 to +85°C	10 billion times	10 years	SOP-8
MB85RS128A	128Kbit	3.0 to 3.6V	25MHz	-40 to +85°C	10 billion times	10 years	SOP-8
MB85RS64A	64Kbit	3.0 to 3.6V	25MHz	-40 to +85°C	10 billion times	10 years	SOP-8

### Parallel Memory

Parallel reading and writing is available like SRAM.

Part number	Memory capacity	Power supply voltage	Write cycle time	Operating temperature	Write/erase cycle	Data retention guarantee	Package
MB85R4001A	4Mbit (512K×8bit)	3.0 to 3.6V	150ns	-40 to +85°C	10 billion times	10 years	TSOP-48
MB85R4002A	4Mbit (256K×16bit)	3.0 to 3.6V	150ns	-40 to +85°C	10 billion times	10 years	TSOP-48
MB85R1001A	1Mbit (128K×8bit)	3.0 to 3.6V	150ns	-40 to +85°C	10 billion times	10 years	TSOP-48
MB85R1002A	1Mbit (64K×16bit)	3.0 to 3.6V	150ns	-40 to +85°C	10 billion times	10 years	TSOP-48
MB85R256	256Kbit	3.0 to 3.6V	150ns	-40 to +85°C	10 billion times	10 years	SOP-28/ TSOP-28

## Product line up



## 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 E<sup>2</sup>PROM RFID LSI.

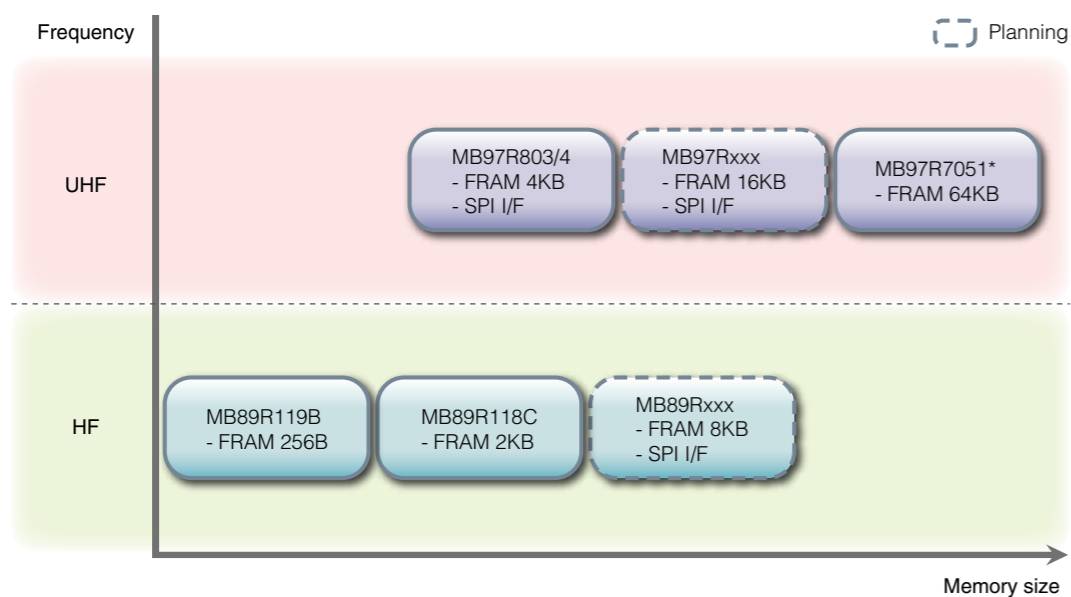
### Advantages of FRAM RFID

- Fast write speed
- Large size of Memory for data carrier (traceability, maintenance)
- High endurance for frequent memory access and reuse
- Stable read/write communication distance because of low power writing
- Data is survived after sterilization
- SPI interface for embedded solution with sensors, electronic papers, etc.

### LSI for FRAM RFID Tag

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
MB97R803/4	860-960MHz	ISO/IEC 18000-6C	DSB/SSB/PR-ASK	4Kbyte

### Product line up



\*: Contact our sales for the available use.

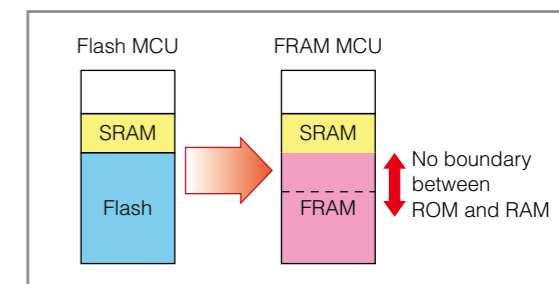
## FRAM MCU

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



### FRAM MCU

Part number	CPU	FRAM	RAM	Operation voltage	Peripherals
MB95R203A	8bit F <sup>2</sup> MC-8FX	8Kbyte	496byte	1.8 to 3.6V	A/D converter : 6ch, Composite timer, UART/SIO : 1ch, I/O port : 16

## 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.

