

FRAM Standalone Memory Products

Non-Volatile Ferroelectric Random-Access Memory (FRAM)



Description

FRAM is a high-performance and low-power non-volatile memory that combines the benefits of conventional non-volatile memories (Flash and E²PROM) and high-speed RAM (SRAM and DRAM). FRAM, which Fujitsu has been mass producing for more than a decade, represents the new generation of universal memory.

FRAM technology stores information using the polarization of ferroelectric material (lead zirconate titanate or PZT) placed between two electrodes in the form of a thin film. FRAM cell structure—similar to the transistor and capacitor structure of a DRAM cell—does not require the same high programming voltages that Flash or E²PROM do to operate. As a result, FRAM offers non-volatile data storage, but is significantly more energy-efficient compared to other conventional non-volatile memories. FRAM also delivers write and read access times in the 2- to 3-digit nanosecond range, making its performance comparable to standard RAM. FRAM thus combines the benefits of non-volatile memories with the higher performance of RAM.

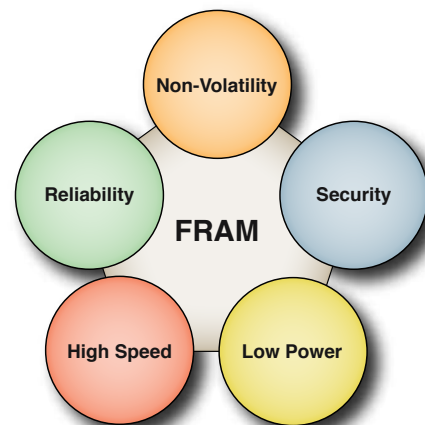
FRAM technology has key advantages compared to other types of memories. The ferroelectric material in FRAM is highly resistant to magnetic fields and radiation, making it well-suited for medical or aerospace applications, as well as for applications in the food industry in which radiation is used for sterilization. The maximum number of read/write cycles for Flash and E²PROM is between 5,000 and 100,000 times. With more than

10 billion read/write cycles (10¹⁰)—equivalent to writing to the memory cell at 1 second intervals for 300 years—the lifetime of an FRAM memory is essentially unlimited.

Fujitsu FRAM products will soon be operating internally at 1.8V and specified up to 10¹⁵ read/write cycles, further reducing power consumption and extending endurance several times over.

FRAM combines the benefits of Flash/E²PROM and SRAM/DRAM.

	SRAM/DRAM	FLASH E ² PROM	FUJITSU FRAM
Fast Unlimited Read/Write Access	Fast Unlimited R/W Access ✓	Slow Block Access ROM	Fast Unlimited R/W Access ✓
Non-Volatile	Volatile - Power Required	Non-Volatile ✓	Non-Volatile ✓



Line-up of Fujitsu standalone FRAM devices

Memory size (kbit)	8Mb	*Planning		MB85R8001/2* Parallel I/F
	4Mb			MB85R4001/2A* Parallel I/F
	1Mb	MB85RS1000* Serial SPI	MB85R1001/2A Parallel I/F	
	256kb	MB85RS256A Serial SPI	MB85R256G Parallel I/F	
	128kb	MB85RC128 Serial I ² C	MB85RS128A Serial SPI	
	64kb	MB85RC64 Serial I ² C	MB85RS64A Serial SPI	
	16kb	MB85RC16 Serial I ² C		

Applications

- Factory automation
- Metering
- Data logging
- Parameter storage
- Back-up memory
- Real-time data writing

Features

- Fast writing speed.
 - Overwriting (no need to erase)
 - Write Cycle = Read Cycle
- High endurance. Guaranteed 10¹⁰ times
- High tamper resistance. Data written in FRAM cannot be stolen by physical analysis
- Low power consumption
- Eco-friendly memory operates like SRAM, with no requirement for battery backup

Comparison of FRAM with other memory devices

	FRAM	E ² PROM	Flash	SRAM
Type	Non-volatile	Non-volatile	Non-volatile	Volatile
Method writing	Overwriting	Erase (byte) + write	Erase (sector) + write	Overwriting
Write cycle time	150ns	3ms	1s	55ns
Endurance	10 billion	1 million	1 million	Unlimited

Part Number	Size	Operating Voltage	Write Cycle Time / Clock Frequency	Operating Temperature	Data Retention	Endurance	Package
Parallel Interface							
MB85R1001A MB85R1002A	1Mbit	3.0 – 3.6V	150ns	-40 ±85°C	10 years	10 billion times	TSOP-48
MB85R256G	256kbit	3.0 – 3.6V	150ns	-40 ±85°C	10 years	10 billion times	TSOP-28 SOP-28
Serial Interface (SPI)							
MB85RS256A	256kbit	3.0 – 3.6V	25MHz	-40 ±85°C	10 years	10 billion times	SOP-8
MB85RS128A	128kbit	3.0 – 3.6V	25MHz	-40 ±85°C	10 years	10 billion times	SOP-8
MB85RS64A	64kbit	3.0 – 3.6V	25MHz	-40 ±85°C	10 years	10 billion times	SOP-8
Serial interface (I²C)							
MB85RC128	128kbit	2.7 – 3.6V	400kHz	-40 ±85°C	10 years	10 billion times	SOP-8
MB85RC64	64kbit	2.7 – 3.6V	400kHz	-40 ±85°C	10 years	10 billion times	SOP-8
MB85RC16	16kbit	2.7 – 3.6V	400kHz/1MHz	-40 ±85°C	10 years	10 billion times	SOP-8

28-pin SOP-28 package 28-pin TSOP-28 package 48-pin TSOP-48 package 8-pin SOP-8 package



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