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# FerVID family

## FRAM RFID LSI

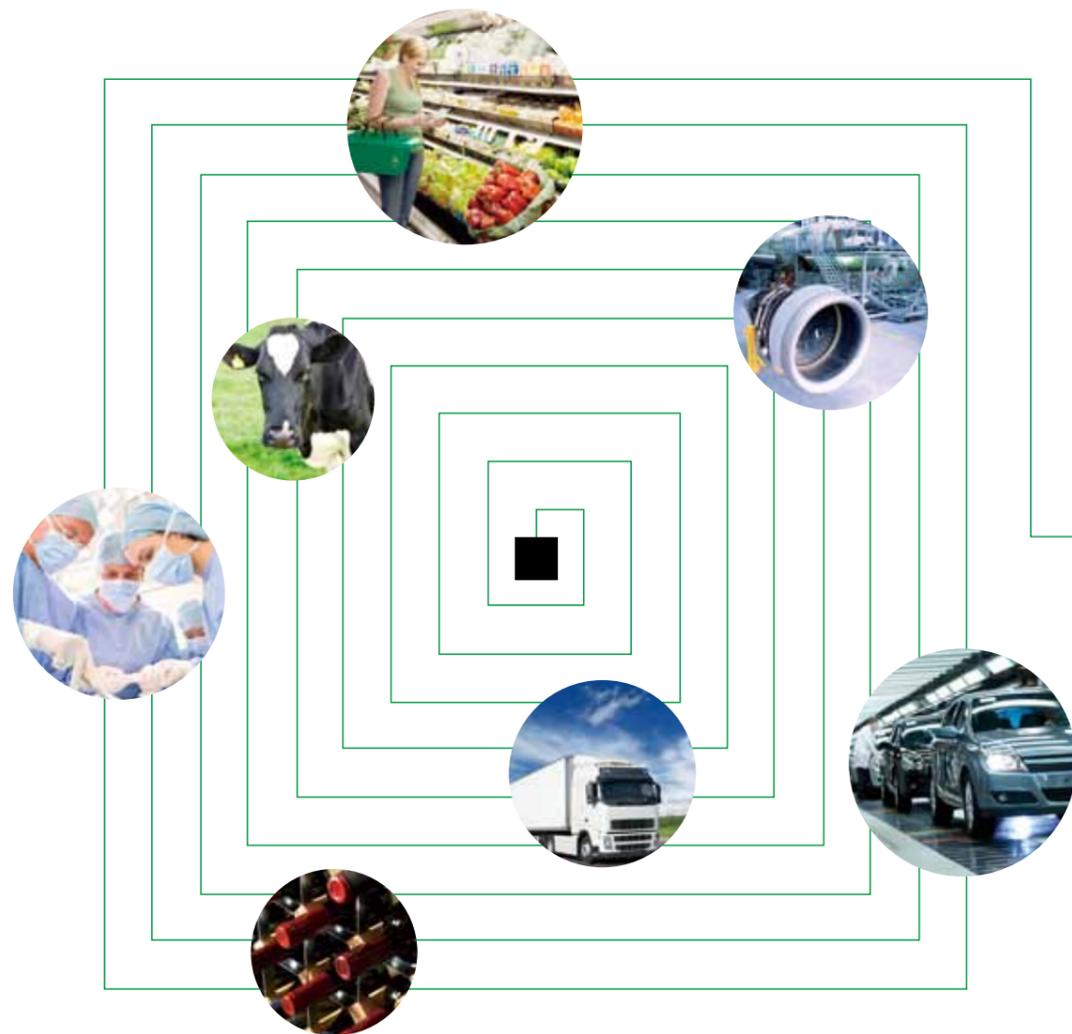
*FerVID family*™



## Expand the Possibilities of Your RFID Tags with FRAM

### Introducing Fujitsu Semiconductor's FRAM RFID LSI; *FerVID family*\*

FRAM ('Ferroelectric RAM') is the non-volatile memory that outperforms the conventional non-volatile memories E<sup>2</sup>PROM and Flash. Unlike E<sup>2</sup>PROM and Flash, FRAM does not require a higher internal voltage for writing operation, and this feature provides you with virtually unlimited read/write endurance, and fast writing speed. This advantage realizes large density of storage memory and stable communication distance for read and write operation. And unlike E<sup>2</sup>PROM and Flash, FRAM is resistant to sterilization by gamma-ray. Thus more and more RFID tag manufacturers around the world are selecting Fujitsu's *FerVID family* of FRAM RFID LSI as the best RFID for data carriers.



### FRAM RFID Can Realize a Wider Range of RFID Applications than Ever Before

Fujitsu's *FerVID family* consists of large density FRAM which are available for HF (13.56MHz) and UHF (860MHz-960MHz) applications. The feature of large density memory is perfect for RFID use in factory automation, maintenance, asset management, and logistic tracking. And the feature of gamma-ray sterilization hardness is perfect for RFID use in the medical, pharmaceutical, biomedical, foods, and cosmetic industries. Moreover, the serial interface feature enables RFID to connect a microcontroller, and expands the possibilities of RFID into the realm of embedded applications.

- Large Density Memory
- Fast Writing Speed
- High Read/Write Endurance
- Gamma-ray Hardness
- Embedded RF

\* FerVID family is a trademark of Fujitsu Semiconductor Limited.

## FA, Maintenance

### Complete Visibility of Production and Real Time Operations

*Large density memory and fast writing will improve the operational efficiency and quality of production in the factory*

Because of large density memory and fast writing speed, FRAM RFID is the best solution for factory automation applications requiring frequent production data logging and efficiency of operation, and for maintenance applications requiring real time operation and on-site confirmation of maintenance history and parts information.

#### Production Management (Factory Automation)

The benefit of FRAM RFID tags as large density data carriers lies in their ability to store large amounts of information and to be written fast and frequently—which makes them ideal for use in production management in factories like automobile plants. The tags can record such information as production and inspection histories, customized parts and operation information, manuals, and so on. Off-line data management improves the flexibility of the production line, and shortens production lead times.



#### Aircraft Maintenance Management

Fujitsu's 64kByte FRAM RFID has been selected for use in the maintenance of Boeing's aircraft. In order to manage the many kinds of parts in an aircraft, the RFID tags have been standardized as data carriers to keep track of maintenance history, maintenance manuals, parts information, and more. This RFID solution is expected to enhance the accuracy of all Boeing aircraft maintenance, cut turnaround time, and result in much safer and more efficient aircraft management.

#### Great Promise as Data Carrier Tags

Because of the large density memory of FRAM RFID tags and their fast and frequent writing capability, the maintenance application fields are not just the FA and aviation industries, but other industries as well—a partial listing of which would include: the electricity industry, the construction industry, the infrastructure, transportation (vehicle, track, road), and rental machinery industries, and the facilities management industries (gas, water, chemicals, and oil).



## Medical / Pharmaceutical / Biomedical

### Gamma-ray Sterilization Hardness Enables Total Traceability

*Due to its resistance to gamma-ray sterilization, FRAM RFID makes possible total traceability of medical instruments and packages from production to waste management.*

The remarkable feature of FRAM RFID for healthcare applications is strong radiation hardness, which permits RFID to be attached to products to be sterilized by gamma-ray. Unlike conventional memory used for RFID, the data stored in FRAM survives gamma-ray sterilization. This feature is of great importance to the medical, pharmaceutical, and biomedical industries, which are continuously seeking to improve the safety and reliability of traceability management through the entire cycle from production and sterilization to logistics, warehousing, use in hospital, and waste.

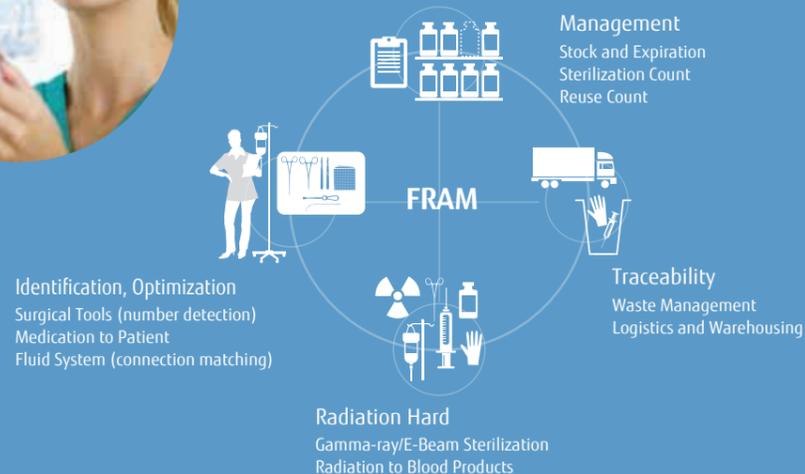
#### Traceability of Products

Unlike conventional RFID tags, FRAM RFID tags can be placed on a medical or pharmaceutical product at the production stage before gamma-ray sterilization takes place from outside the package. After shipment, RFID tags can record the history of the logistic process as well. Thus, FRAM RFID enables complete visibility during all stages of the process, and thereby prevents counterfeiting. Also, when connected with sensors, FRAM RFID will be able to improve the reliability of the logistic process by recording the environmental history, such as temperature and physical stress.



#### Traceability in Hospitals

FRAM RFID is also expected to improve safety management and operational efficiency in hospitals. For example, the right quantity of medicines must be kept in stock at all times, and any expired medicines must be detected. The number of surgical tools must be checked before and after operations. Patient medication must be executed with flawless accuracy. These are some of the areas where FRAM RFID can help. Also, the penetration of NFC smart phones and tablet terminals into the medical scene may increase potential applications of FRAM RFID.



## Embedded RF

### Serial Interface for Creating New Value

*New applications can be created by connecting FRAM RFID to microcontrollers and sensors*

The serial interface feature of RFID LSI makes it possible to add value not only for simple RFID applications but also for embedded microcontroller applications. Because the FRAM is commonly accessed from both interfaces, it can be used as the storage memory for environmental monitoring data taken by sensors through a microcontroller. And FRAM can also be used for storage of microcontroller parameters, which can be changed wirelessly.

#### Environment Monitoring

By connecting sensors and a microcontroller to RFID through a serial interface, you can monitor the environment of the logistic process, establishing better traceability management for quality control and product safety. For example, RFID can be used to record the temperature environment during the transportation of foods and wines, or to monitor the oscillation of delicate equipment during transportation. It can also be used to monitor the status of industrial equipment and facilities like railroads, in order to detect signs of fault or need for maintenance.



#### Operating Parameter Setting

The key feature of RFID is that data can be read and written by RF, even if RFID is embedded in products and packaging. This feature creates new value for the microcontroller with which RFID is connected. In product distribution, for example, the parameter data for individual customers can be written in FRAM even after the product is packed, and in the same way important traceability information and keys can be added during the logistic process or after arrival at the retail site. Then when the product is used for the first time, the microcontroller can load the data stored in FRAM to activate the product, or if the data is missing, the product may not be activated. Also if FRAM is used for parameter memory, the operational condition of the microcontroller can be changed by RF.



#### A Tool for the Realization of New RFID Possibilities

Fujitsu Semiconductor has developed an evaluation board for embedded use on which FRAM RFID is connected to a microcontroller, several sensors, and an LCD. Customers can use this board as a tool to explore new ideas and possibilities for RFID.



## FerVID family for UHF Passive RFID MB97R803A/B, MB97R804A/B, MB97R7051

- ISO/IEC18000-6C, EPC C1G2 Ver.1.2.0 compliant
- Worldwide UHF frequency (860–960MHz)
- Large memory density and fast writing performance
- Stable communication distance between writing and reading (the same distance)
- Write Lock and Read Lock feature with password
- Anti-collision feature
- Serial interface for Embedded RF solutions (Evaluation board with FM3 family microcontroller and sensors)

	MB97R803A	MB97R803B	MB97R804A	MB97R804B	MB97R7051
Memory size	4K Bytes (32K bits)				72K Bytes
User memory size	3,424 Bytes				64K Bytes
Operating frequency	860 — 960MHz				
Modulation	DSB-ASK, SSB-ASK, PR-ASK				
Data coding	FM0, Miller Subcarrier (M=2,4,8)				
Baudrate (Reader to RFID)	40kbps — 160kbps (0 data transmission)				
Baudrate (RFID to Reader)	40kbps — 640kbps				
Read/write sensitivity	-6 dBm				
Command (RF)	EPC C1G2 Ver.1.2.0 commands Block Permalock, Read Lock (custom)				
Serial interface	-	-	SPI		-
Serial input frequency	-	-	2MHz (Max)		-
Serial input voltage	-	-	2.3 — 3.6V		-
Command (serial)	-	-	Read, Write		-
Data retention	10 years (+55°C)				
Read/Write endurance	10 <sup>10</sup> times				
Evaluation kit	-	-	Yes		-
Shipping Form	Wafer	Package TSSOP-16	Wafer	Package TSSOP-16	Wafer, Package Thin type QFN-40

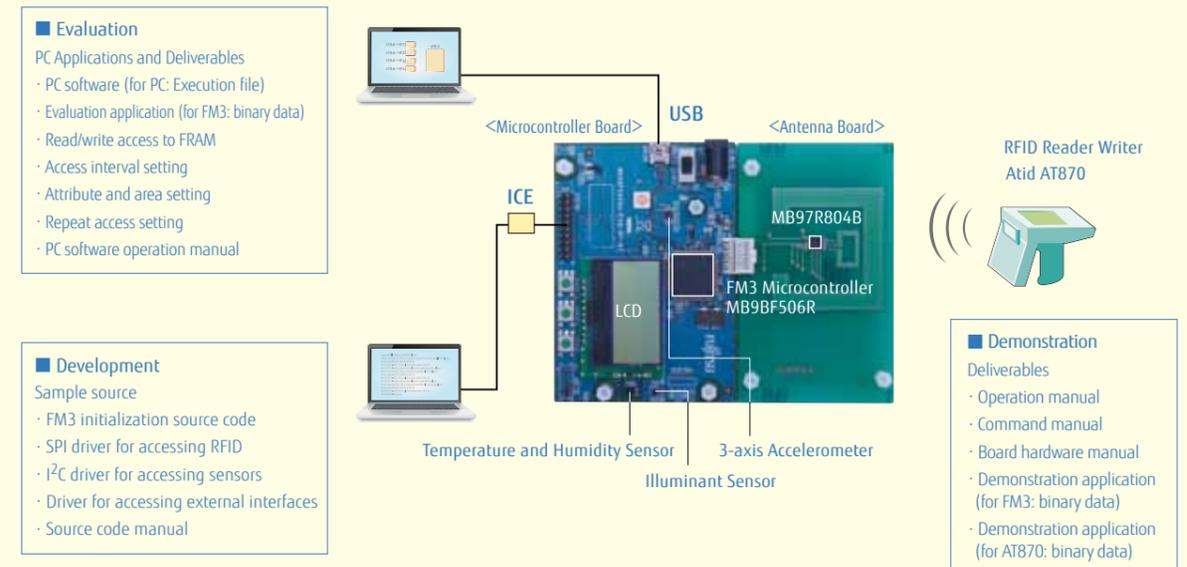
## FerVID family for HF Passive RFID MB89R118C, MB89R119B, MB89R112

- ISO/IEC15693, 18000-3/Mode1 compliant
- Large memory density and fast writing performance
- Fast reading performance with custom commands
- Outstanding gamma-ray radiation hardness
- Anti-collision feature
- High-input capacitance for antenna downsizing requirements
- Serial interface for embedded RF solutions (in development)
- Ucode tag certification by Ubiquitous ID Center

	MB89R118C	MB89R119B	MB89R112
Memory size	2K (16K bits)	256Bytes (2,048 bits)	9K Bytes (72K bits)
User memory size	2,000Bytes	232Bytes	8192Bytes
Block structure	8Bytes, 256Blocks	4Bytes, 64Blocks	32Bytes, 256Blocks
Operating frequency	13.56MHz ± 7kHz		
Modulation	ASK10/100%		
Data coding	1 out of 4 (1 out of 256 is not supported)		
Sub-carrier	One sub-carrier (Two sub-carrier is not supported)		
Baudrate	26.48, 52.97kbps (Response to Fast command)		
Commands	ISO15693 commands, Custom commands (Fast Read/Write, EAS)	ISO15693 commands, Custom commands (Kill, Fast Read/Write, EAS)	ISO15693 commands, Custom commands (Fast Read/Write)
Input capacitance	24pF/96pF		
Serial interface	-	-	SPI
Data retention	10 years (+85°C)		
Read/Write endurance	10 <sup>12</sup> times		
Shipping Form	Diced Wafer (Plating bump, Backwrapped up to 150um)		Diced Wafer (Plating bump, Backwrapped up to 150um) Package QFN-24
Fail Die detection	MAP (.xml format), Bad Mark (option)		

## RFID Development Kit for Embedded Use MB9BF506RA-EVB-RF-01

The microcontroller board, equipped with the FM3 Microcontroller MB9BF506R, and the antenna board, equipped with the MB97R804B, are joined through an SPI interface. The microcontroller board has temperature, humidity and illuminant sensors, a 3-axis accelerometer, a clock function and an LCD, which are connected to it through a I<sup>2</sup>C interface. Sensor data collected periodically can be LCD displayed, and applications which can read by a reader/writer can be run. The main frequency of the antenna board is about 920MHz. When the board is connected to a PC through a USB connector on it, microcontroller firmware can be written on the board. Demos and programs can be created and executed for evaluation. And the board can be used through an ICE interface as firmware for a microcontroller development kit.



## FerVID family Production Roadmap

