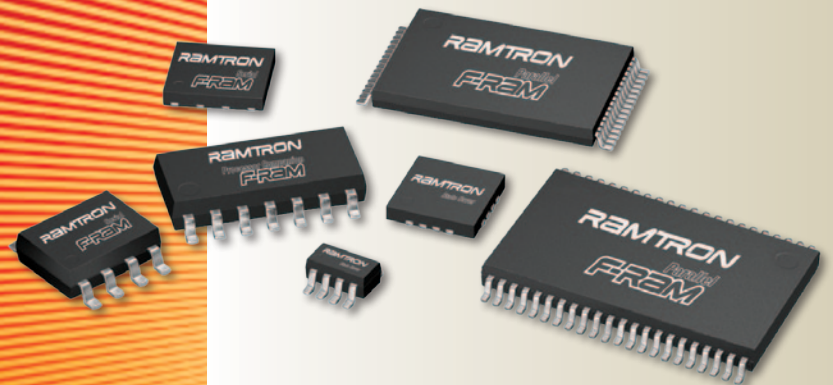
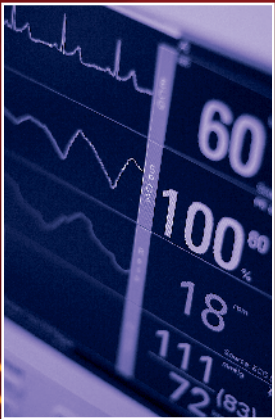


Short Form Catalog

Spring 2012

RAMTRON
International Corporation



Design to a Higher Standard

Ferroelectric random access memory (F-RAM) products combine the nonvolatile data storage capability of ROM with the benefits of RAM.

Ramtron's broad line of specialized semiconductor memory and integrated solutions benefit a wide range of applications including metering, computing, automotive, and consumer.

Ramtron products also improve industrial, scientific, and medical applications that thrive on the high-speed, high-endurance, and low power consumption of F-RAM.

Benefits of nonvolatile F-RAM



Fast Write

F-RAM performs read and write operations at the same speed. Because F-RAM writes data at bus speed, there are no delays before the written data becomes nonvolatile. Floating gate memories, such as EEPROM, have a long write delay of five milliseconds. F-RAM writes in nanoseconds – essential in applications like auto safety systems.



High Endurance

F-RAM offers virtually unlimited write endurance, which means it doesn't wear out like other nonvolatile memory devices. Floating gate devices experience a hard failure and stop writing in as little as 10^5 cycles, making them unsuitable for write-intensive applications.

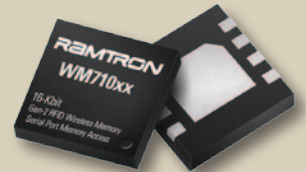


Low Power

F-RAM operates without a charge pump, enabling low power consumption. Floating gate devices demand high voltage during write operations. F-RAM writes at the native voltage of the manufacturing process: 5V, 3V, or even less on our advanced manufacturing processes.


MaxArias™
Wireless Solutions by Ramtron

**Our latest wireless
memory technology...
with no strings attached.**



Learn more, see pg. 9.

www.ramtron.com/go/maxarias

A Primer on F-RAM Memory

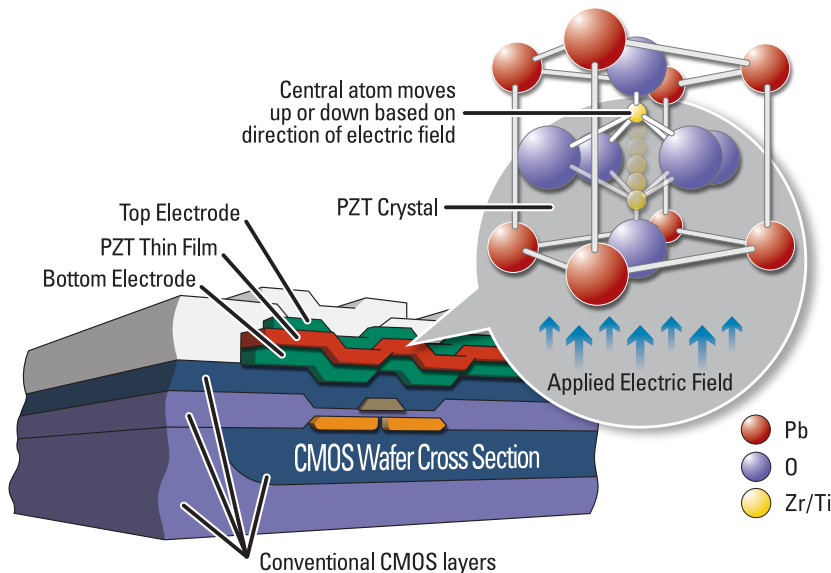


Figure 1: F-RAM die cross-section and PZT crystal

F-RAM offers a unique set of features relative to other semiconductor technologies. Established semiconductor memories can be divided into two categories: volatile and nonvolatile. Volatile memory includes SRAM (static random access memory) and DRAM (dynamic random access memory), among others. RAM type devices are easy to use, offer high performance, but they share a common vulnerability: stored memory is lost when the power supply is removed.

The F-RAM chip contains a thin ferroelectric film of lead zirconate titanate $[Pb(Zr,Ti)O_3]$, commonly referred to as PZT (Figure 1). The Zr/Ti atoms in the PZT change polarity in an electric field, thereby producing a power efficient binary switch. Unlike conventional RAM devices, F-RAM retains its data memory when power is interrupted. These unique properties makes F-RAM a low power, nonvolatile memory.

Like F-RAM, ROM (read only memory) is a nonvolatile memory that does not lose its data content when power is removed. Although newer generation ROM, like EEPROM (electrically erasable programmable read only memory) and flash memory, can be erased and re-programmed multiple times, they require high voltage and write very slowly. ROM-based technologies eventually wear out (in as little as 10^5 cycles), making them unsuitable for high-endurance industrial applications.

F-RAM has 10,000 times greater endurance and uses 3,000 times less energy than a typical serial EEPROM device, and offers nearly 500 times greater write speed.

F-RAM combines the best of RAM and ROM into a single package that outperforms other nonvolatile memories with remarkably fast writes, high endurance, and ultra-low power consumption.





Nonvolatile F-RAM for a World of Applications

Choose from Ramtron's line of specialized nonvolatile memory, state saver, and integrated solutions.

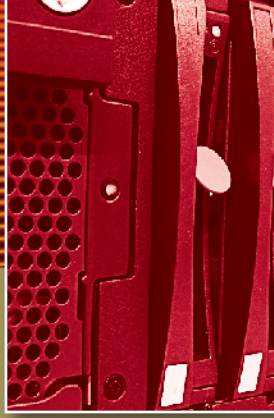
Nonvolatile F-RAM memory solutions offer powerful saving qualities, while delivering unparalleled performance in your applications. Use Ramtron semiconductor products in metering, computing, and automotive applications, as well as industrial, scientific, and medical applications to help you:

Where in the world is F-RAM? It's everywhere!

From automobiles and industrial equipment to the latest medical devices, our standalone F-RAM and integrated semiconductor products are embedded in a world of applications.

Consider the following system conditions and design parameters when evaluating F-RAM standalone or integrated memory:

- Do you need to capture critical system data during power down?
- Is memory endurance vital for storing mission critical data?
- Does power fail suddenly or frequently?
- Does your system need to collect data?
- Do your configurations change often?
- Is the system or MCU RAM-limited?
- Is the power supply very noisy?
- Is there a strict power budget?
- Is your data highly valuable?



Save Time.

Since durable F-RAM memory performs read and write operations in nanoseconds, you won't have to develop complex software to manage the write delays and low endurance that are inherent when using floating gate technologies.

Save Data.

Unlike SRAM, F-RAM retains its data when power is interrupted—without the need for back-up batteries. Plus, the fast write speed of F-RAM helps protect data during sudden power loss, reducing the possibility for data corruption.

Save Space.

F-RAM can save data instantly upon power down without the need for extra batteries or capacitors. Because it requires no additional components, F-RAM is your green memory alternative, too.

Save Power.

While floating gate devices demand high voltage, F-RAM writes data using as low as 2V. And, since F-RAM is faster, you'll save even more power as the system spends less time writing.

Save Life.

F-RAM offers virtually unlimited write endurance, extending the life of your system without compromising your data collection requirements.



Speed comparison: F-RAM vs. EEPROM
ramtron.com/go/demos

F-RAM
by **RAMTRON**



Serial F-RAM Memory

F-RAM serial memories provide reliable data collection, perform reads and writes like a RAM, and eliminate the complexities, overhead, and system reliability problems of EEPROM. The I²C serial interface is common and many MCUs implement a dedicated I²C port. The serial peripheral interface (SPI) is capable of clock rates up to 40MHz.



Serial - I2C

Part	Density	Package	Max. Bus Speed	Vdd	Idd@Fmax	Temp. Range	AEC-Q100	Availability
FM24V(N)10 [†]	1Mb	SOIC8	3.4MHz	2.0V-3.6V	1mA	-40°C to +85°C		Now
FM24V05	512Kb	SOIC8	3.4MHz	2.0V-3.6V	1mA	-40°C to +85°C		Now
FM24V02	256Kb	SOIC8	3.4MHz	2.0V-3.6V	1mA	-40°C to +85°C		Now
FM24W256	256Kb	EIAJ8, SOIC8	1MHz	2.7V-5.5V	400µA	-40°C to +85°C	Grade 3	Now
FM24V01	128Kb	SOIC8	3.4MHz	2.0V-3.6V	1mA	-40°C to +85°C	Grade 3	Now
Now! FM24C64C	64Kb	SOIC8	1MHz	4.5V-5.5V	400µA	-40°C to +85°C		Sampling
FM24C64B	64Kb	SOIC8	1MHz	4.5-5.5V	400µA	-40°C to +85°C	Grade 3	Now
FM24CL64B	64Kb	SOIC8	1MHz	2.7-3.6V	300µA	-40°C to +85°C	Grade 3	Now
Now! FM24C16C	16Kb	SOIC8	1MHz	4.5V-5.5V	400µA	-40°C to +85°C		Sampling
FM24C16B	16Kb	SOIC8	1MHz	4.5V-5.5V	400µA	-40°C to +85°C	Grade 3	Now
FM24CL16B	16Kb	SOIC8	1MHz	2.7-3.6V	300µA	-40°C to +85°C	Grade 3	Now
Now! FM24C04C	4Kb	SOIC8	1MHz	4.5V-5.5V	400µA	-40°C to +85°C		Sampling
FM24C04B	4Kb	SOIC8	1MHz	4.5V-5.5V	400µA	-40°C to +85°C	Grade 3	Now
FM24CL04B	4Kb	SOIC8	1MHz	2.7V-3.6V	300µA	-40°C to +85°C	Grade 3	Now

Serial - SPI

Part	Density	Package	Max. Bus Speed	Vdd	Idd@Fmax	Temp. Range	AEC-Q100	Availability
FM25V20	2Mb	EIAJ8, TDFN8	40MHz	2.0V-3.6V	3mA	-40°C to +85°C		Sampling
FM25H20	2Mb	EIAJ8, TDFN8	40MHz	2.7V-3.6V	10mA	-40°C to +85°C		Now
FM25V(N)10 [†]	1Mb	SOIC8	40MHz	2.0V-3.6V	3mA	-40°C to +85°C	Grade 3	Now
FM25V05	512Kb	SOIC8	40MHz	2.0V-3.6V	3mA	-40°C to +85°C	Grade 3	Now
FM25V02	256Kb	SOIC8, TDFN8	40MHz	2.0V-3.6V	2.5mA	-40°C to +85°C	Grade 3	Now
FM25W256	256Kb	SOIC8	20MHz	2.7V-5.5V	2mA	-40°C to +85°C	Grade 3	Now
FM25V01	128Kb	SOIC8	40MHz	2.0V-3.6V	2.5mA	-40°C to +85°C	Grade 3	Now
Now! FM25640C	64Kb	SOIC8	20MHz	4.5V-5.5V	4mA	-40°C to +85°C		Sampling
FM25640B	64Kb	SOIC8	20MHz	4.5V-5.5V	4mA	-40°C to +85°C	Grade 3	Now
FM25CL64B	64Kb	SOIC8, TDFN8	20MHz	2.7V-3.6V	3mA	-40°C to +85°C	Grade 3	Now
Now! FM25CL64B-GA	64Kb	SOIC8	16MHz	2.7V-3.6V	3mA	-40°C to +125°C	Grade 1	Now
Now! FM25C160C	16Kb	SOIC8	20MHz	4.5V-5.5V	4mA	-40°C to +85°C		Sampling
FM25C160B	16Kb	SOIC8	20MHz	4.5V-5.5V	4mA	-40°C to +85°C	Grade 3	Now
Now! FM25C160B-GA	16Kb	SOIC8	15MHz	4.5V-5.5V	3mA	-40°C to +125°C	Grade 1	Now
FM25L16B	16Kb	SOIC8, TDFN8	20MHz	2.7V-3.6V	3mA	-40°C to +85°C	Grade 3	Now
Now! FM25040C	4Kb	SOIC8	20MHz	4.5V-5.5V	4mA	-40°C to +85°C		Sampling
FM25040B	4Kb	SOIC8	20MHz	4.5V-5.5V	4mA	-40°C to +85°C	Grade 3	Now
Now! FM25040B-GA	4Kb	SOIC8	14MHz	4.5V-5.5V	3mA	-40°C to +125°C	Grade 1	Now
FM25L04B	4Kb	SOIC8, TDFN8	20MHz	2.7V-3.6V	3mA	-40°C to +85°C	Grade 3	Now
Now! FM25L04B-GA	4Kb	SOIC8	10MHz	3.0V-3.6V	2mA	-40°C to +85°C	Grade 1	Now

[†]Manufacturer ID and Part Number read-out. Read-only 64-bit Customer Identifier and Unique Serial Number upon request.

Parallel F-RAM Memory

Ramtron parallel memory offers high-performance reads and writes with true nonvolatility without a battery. F-RAM bitwise devices have standard SRAM pinouts and store data without battery backup.



Part	Organization	Package	Access Time	Vdd	Idd@Fmax	Temp. Range	Availability
FM23MLD16	512Kx16	FBGA-48	60ns	2.0V-3.6V	14mA	-40°C to +85°C	Now
FM22L16	256Kx16	TSOP-II-44	55ns	2.7V-3.6V	12mA	-40°C to +85°C	Now
FM22LD16	256Kx16	FBGA-48	55ns	2.7V-3.6V	12mA	-40°C to +85°C	Now
FM28V202	128Kx16	TSOP-II-44	60ns	2.0V-3.6V	12mA	-40°C to +85°C	Sampling
FM21L16	128Kx16	TSOP-II-44	60ns	2.7V-3.6V	12mA	-40°C to +85°C	Now
FM21LD16	128Kx16	FBGA48	60ns	2.7V-3.6V	12mA	-40°C to +85°C	Now
FM28V100	128Kx8	TSOP-I-32	60ns	2.0V-3.6V	12mA	-40°C to +85°C	Now
FM28V020	32Kx8	SOIC28, TSOP-I-32	60ns	2.0V-3.6V	12mA	-40°C to +85°C	Now
FM18W08	32Kx8	SOIC28	70ns	2.7V-5.5V	12mA	-40°C to +85°C	Now
FM1808B	32Kx8	SOIC28	70ns	4.5V-5.5V	15mA	-40°C to +85°C	Now
FM16W08	8Kx8	SOIC28	70ns	2.7V-5.5V	12mA	-40°C to +85°C	Now
FM1608B	8Kx8	SOIC28	70ns	4.5V-5.5V	15mA	-40°C to +85°C	Now

Environmental Policy

Ramtron International Corporation will be a responsible corporate citizen in protecting the environment. We will:

- Continually improve our environmental management system
- Minimize the creation of wastes and prevent pollution
- Comply with legal and other requirements
- Manage our processes, our materials, and our people in order to reduce the environmental impacts associated with our work



www.ramtron.com/go/green



F-RAM Processor Companion

Ramtron Processor Companions are complete peripheral solutions with highly integrated analog and digital functions for processor-based systems. These devices are available with F-RAM memory in a variety of densities, along with real-time clock, low-VDD reset, watchdog timer, battery-backed event counter, event driven interrupt output, lockable 64-bit serial number, and early power-fail interrupt (NMI).



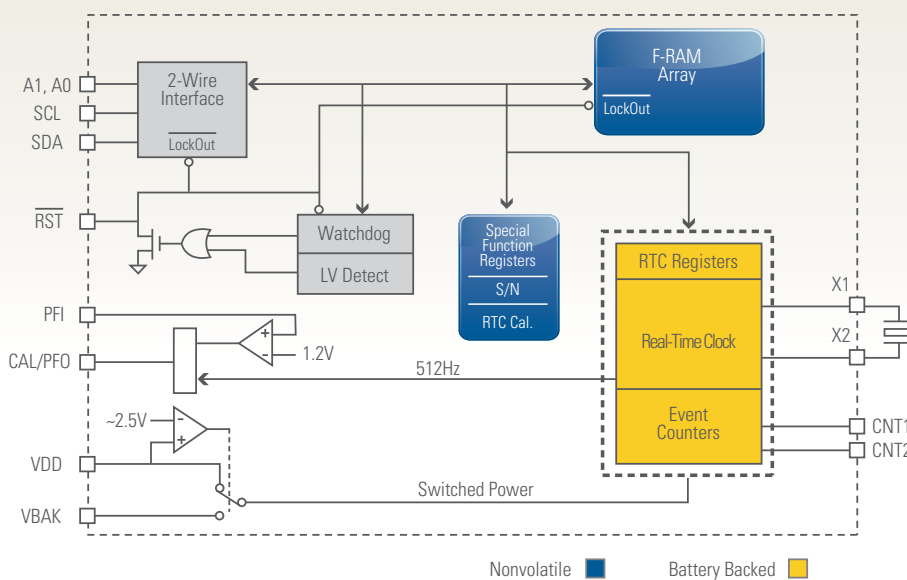
SPI F-RAM Processor Companion

Part	Vdd	Memory	RTC	RTC Alarm	Clock Output	Power Monitor	WDT	Early P/F	S/N	Battery Switch Over	Event Detect	Package	Temp. Range
FM33256B	3V	256Kb	✓	✓	1Hz; 512Hz; 4,096Hz; 32,768Hz	✓	✓	✓	✓	✓	Count	SOIC14	-40°C to +85°C

I2C F-RAM Processor Companion

Part	Vdd	Memory	RTC	RTC Alarm	Clock Output	Power Monitor	WDT	Early P/F	S/N	Battery Switch Over	Event Detect	Package	Temp. Range
FM31256	2.7V-5.5V	256Kb	✓			✓	✓	✓	✓	✓	Count	SOIC14	-40°C to +85°C
FM3164	2.7V-5.5V	64Kb	✓			✓	✓	✓	✓	✓	Count	SOIC14	-40°C to +85°C
FM31L278	3V	256Kb	✓			✓	✓	✓	✓	✓	Count	SOIC14	-40°C to +85°C
FM31L276	3V	64Kb	✓			✓	✓	✓	✓	✓	Count	SOIC14	-40°C to +85°C
FM31278	5V	256Kb	✓			✓	✓	✓	✓	✓	Count	SOIC14	-40°C to +85°C
FM31276	5V	64Kb	✓			✓	✓	✓	✓	✓	Count	SOIC14	-40°C to +85°C

Block Diagram: FM31xx Processor Companion with system supervisor and RTC with embedded crystal



The FM31xx is a family of integrated devices that includes the most commonly needed functions for processor-based systems. Major features include nonvolatile memory available in various sizes, real-time clock, low-VDD reset, watchdog timer, nonvolatile event counter, lockable 64-bit serial number area, and general purpose comparator that can be used for an early power-fail (NMI) interrupt or other purpose. The family operates from 2.7 to 5.5V.



Dual and Quad Nonvolatile State Saver

The Ramtron low-power nonvolatile state saver is a logic building block that provides continuous access to nonvolatile system settings without reading a memory. It enables storage of signals that may change frequently and without notice, and it allows the nonvolatile storage of system settings without the system overhead of a serial memory.



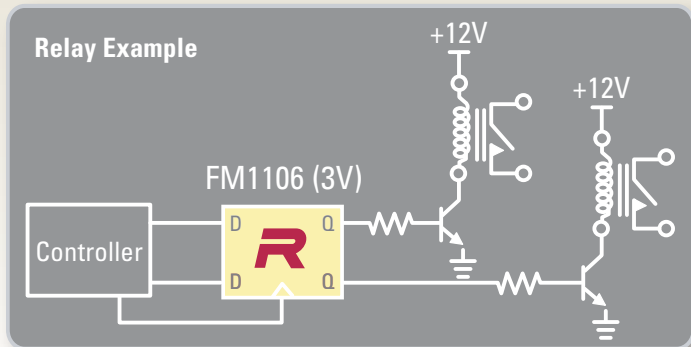
These Ramtron F-RAM-based devices save the state of signals on demand and automatically restore signals to their correct state upon power up.

Ramtron nonvolatile state savers:

- Provide continuous access to nonvolatile system settings without performing a memory read operation
- Enable storage of signals that may change frequently and without notice
- Allow the nonvolatile storage of a system setting without the system overhead of a serial memory

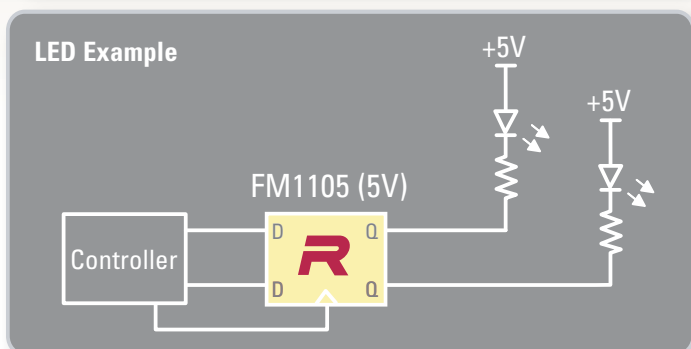
Part	Vdd	Savers	Idd	Isb	Package	Temp. Range	AEC-Q100
FM1105	5V	2	10mA	15µA	SOT23-8	-40°C to +85°C	
FM1105-GA	5V	2	10mA	20µA	SOIC8	-40°C to +125°C	Grade 1
FM1106	3V	2	10mA	5µA	SOT23-8	-40°C to +85°C	
FM1106-GA	3V	2	10mA	8µA	SOIC8	-40°C to +125°C	Grade 1
FM1110	5V	4	10mA	30µA	QFN16	-40°C to +85°C	
FM1112	3V	4	10mA	10µA	QFN16	-40°C to +85°C	

F-RAM State Saver Application Examples



Restores switches and relays

Ramtron nonvolatile state savers restore the state of switches and relays on power up.



Restore the state of LEDs

Ramtron nonvolatile state savers restore the state of LEDs on power up.

Need help?

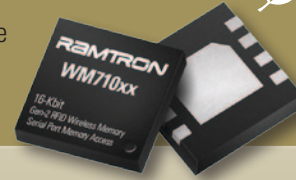
Contact a technical applications engineer at framinfo@ramtron.com or download a datasheet at www.ramtron.com





Gen2 UHF Wireless Memory

Ramtron MaxArias wireless memory combines the low power, high speed and high endurance benefits of nonvolatile F-RAM memory technology with industry-standard wireless access (Gen2 UHF) to enable innovative data collection capabilities for a broad range of applications. Ramtron's wireless memory offers unique benefits:



Symmetrical read & write at distance

Write operations are zero power, resulting in no power or speed penalty for executing writes. Device reads and writes at the same distance.



Superior write-speed

With speeds up to 6x faster than EEPROM, MaxArias wireless memory enables full memory block-write operations, allowing more data to be stored faster without "soak-time."



Block-write integrity

SureWrite™ feature prevents data corruption during full block-writes, ensuring complete data integrity.



Gamma tolerant

F-RAM is gamma radiation tolerant, which makes MaxArias wireless memory an ideal choice for applications that require sterilization.

Wireless Memory

Part	Package	Memory
WM71004-6-DG*	8-pin UDFN**	4Kb
WM71008-6-DG*	8-pin UDFN**	8Kb
WM71016-6-DG*	8-pin UDFN**	16Kb
WM71004-6-NF1*	Near-field inlay	4Kb

Wireless Memory with Serial Port Access

Part	Package	Memory
WM72016-6-DG*	8-pin UDFN**	16Kb

*Commercial Temperature Range (0°C to +70°C).

**Bumped die available. Contact Ramtron for details.



Ramtron MaxArias wireless memory serves broad industries by helping to improve production efficiencies and deliver rapid ROI. High-density wireless memory is ideal for host of applications and markets:

- Access control
- Aircraft and industrial manufacturing
- Amusement/resort ticketing
- Animal immunization records
- Building security
- Electronic toll collection
- Electronic vehicle registration
- Facilities maintenance records
- High-value asset tracking Inventory control
- Laboratory analysis
- Maintenance history
- Personnel tracking
- Pharmaceutical track and trace information
- Product authentication
- Secure Identification
- Time and place data-logging
- Utility metering

MaxArias wireless memory allows system integrators to extend their capabilities to create wireless databases, capable of storing greater amounts of information locally on high-performance RF-enabled ICs.



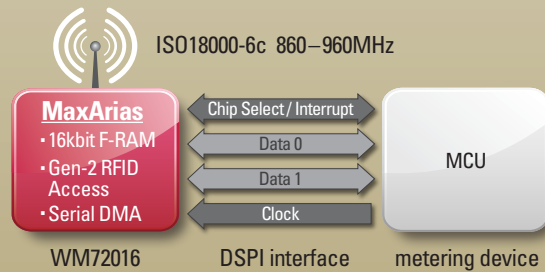
MaxArias enables RF-based wireless meter reading

Situation

For utility meters that require on-site data reads and writes, wireless memory saves time and effort while improving worker safety. For example, meters in underground pits that exist in less-than-hospitable conditions are an ideal application for the efficiency and convenience of wireless memory from Ramtron.

Benefits

MaxArias wireless memory has direct serial port access (WM72016) that allows fully connected in-system data collection, as well as the convenience of wireless data extraction via an industry-standard RF communication protocol. Ramtron's novel ultra-low power device also enables wireless system updates. Ramtron MaxArias devices promote environmental responsibility by powering up only in the presence of a Gen2 reader in an RF field — eliminating unnecessary drain of the system battery. In addition to smart grid applications, MaxArias wireless memory with serial port access is ideal for battery-powered scientific instruments and portable medical monitors and equipment.



For more information on MaxArias wireless memory by Ramtron, visit www.ramtron.com/go/maxarias
www.maxarias.com

MaxReader Development Kit

Experience the potential of MaxArias through the MaxReader Development Kit. This versatile development tool is designed for engineers to develop and thoroughly test the capabilities of MaxArias wireless memory.

Contact maxarias@ramtron.com for availability.





About Ramtron International Corporation

Ramtron International Corporation is a fabless semiconductor company that designs, develops, and markets specialized semiconductor memory and integrated semiconductor solutions for a broad range of applications across targeted vertical markets. Founded in 1984, Ramtron pioneered the integration of ferroelectric materials into semiconductor products, which enabled the development of a new class of nonvolatile, high-performance memory known as ferroelectric random access memory or F-RAM.

Since its inception, Ramtron has supplied over a half-billion F-RAM products worldwide, fueling the company's product revenue growth. Ramtron is a public company traded on the NASDAQ Global Market under the symbol RMTR.

For Ramtron corporate and financial information, contact the company at 719-481-7213 and ask for Ramtron Investor Relations.



Sales Offices

Americas' Sales Office

americassales@ramtron.com
Tel: 905-475-7721
Fax: 719-488-9095

Europe Sales Office

eurosales@ramtron.com
Tel: +44 (0)118 927 2677
Fax: +44 (0)118 927 2686

Japan Sales Office

japansales@ramtron.com
Tel: 81-45-473-9372
Fax: 81-45-473-9373

China/Taiwan/India

asiasales@ramtron.com
Tel: 86-755-8261-7311
Fax: 86-755-8261-7313

Korea

koreasales@ramtron.com
Tel: 82-10-3322-1826
Fax: 82-2-6007-2703

General Information

Ramtron International Headquarters

1850 Ramtron Drive
Colorado Springs, CO 80921
719-481-7000 or 800-545-3726
www.ramtron.com

F-RAM Products

framinfo@ramtron.com

Sales Support and Service

customerservice@ramtron.com



Scan and discover how our **low-power** F-RAM can make your application a **high-power** success. Or type in bit.ly/ramtron.

Package Dimensions

Package dimensions are shown as nominal measurements and are intended for quick reference only. Please refer to detailed product datasheets for precise package dimensions and complete specifications. Datasheets are available at www.ramtron.com/support/datasheets.aspx.

