

A new generation of high memory RF-enabled ICs

Introduction

Auto-identification utilizing radio frequency-enabled (RF) technologies is quickly expanding in logistics, supply chain, and asset tracking applications in almost every conceivable area around the globe. With the adoption and implementation of [EPCglobal](#) Class-1 Generation-2 protocol, which establishes interoperable, global standards, along with faster and more accurate performance, the RFID market may well explode in the coming years, making RF-enabled technology ubiquitous as it touches every area of our lives.

RF-enabled technology itself has dramatically improved over the last 3-5 years. Both range and sensitivity have improved to the point that companies around the world are implementing the technology or investigating the benefits of doing so. One area has not been fully exploited is the *memory capability* of the tag to store more information than just a few identifying bits. While not every application requires more information to be stored on an RF transponder, many applications are emerging that could benefit—even demand—RF transponders that have larger data collection capability.



Ramtron International Corporation, with its industry leading Ferroelectric Random Access Memory (F-RAM) technology, has surveyed the current landscape of available UHF EPC Class 1 Generation 2 RF-enabled ICs and we believe that there is an opportunity for a new class of RF-enabled IC that can capitalize on the capabilities of the F-RAM memory technology and expand the potential for mobile data translation in RF-enabled applications. F-RAM memory has several performance benefits in relation to standard EEPROM memory that is utilized in nearly all of the current industry tags available today. First, F-RAM has 100s of times faster write and read speed capability vs. EEPROM. F-RAM, with its lower voltage requirement over EEPROM, can be more sensitive to weak RF read/write fields and therefore have greater write range.

High memory applications

Almost every week new applications utilizing RF-enabled technologies, including passive, semi-passive and active ICs are reported in industry trade press. Among these are new applications where users require, or would like to have the opportunity to store more information about the asset on the RF-enabled IC being affixed to the asset. Thus far, only a few suppliers have offered tags that have higher memory capabilities. Most of these are limited to only a few hundred more bits than the traditional EPC code only tags. A few tags may have up to a few kilobits of memory but suffer from the inherent slowness of EEPROM memory reads and writes. Due to the slow nature of writing and reading EEPROM tags, which can range up to tens of seconds for memory

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capacities of 10Kb to 20Kb, tag users and tag vendors have not seen fit to offer these higher memories using standard EEPROM.

The table below presents some of the applications that are emerging where higher memory capability on tag is a desired, even demanded capability.

Table 1 – Applications for high memory RF-enabled ICs

- High value asset tracking
- Pharmaceutical track and trace information (*ePedigree*)
- Animal immunization history
- Manufacturer information with the item
- Electronic Vehicle Registration
- Embedded RFID for manufacturing
- Inventory control
- Access control
- Aircraft manufacturing
- Laboratory analysis
- Lap-counting e.g. the number of laps runners have completed are recorded automatically
- Airline baggage tracking
- Time and place data-logging e.g. security guards on patrol can automatically log their patrolling route and shift
- Vehicle identification e.g. Singapore's Electronic Road Pricing System
- Ticketing e.g. some theme parks issue wrist-bands to customers for rides
- Building security
- Biometrics
- Facilities maintenance records stored on the equipment asset RFID tags.
- Smart Cards

MaxArias™ products revealed



Ramtron has developed its new MaxArias wireless memory family of UHF EPC Class1 Generation 2 ICs to serve the requirements of emerging higher memory RF-enabled applications. MaxArias is a new class of RF-enabled IC that

combines the sensitivity of a Schottky Diode RF front end for range with Ramtron F-RAM memory cell technology. The resulting integrated technology enables heretofore unparalleled tag sensitivity, greater range, and superior write-speed. System integrators can also extend RF-enabled capabilities with the option of utilizing MaxArias wireless memory as “mobile databases,” storing asset information locally on a high performance IC. The first products in the MaxArias family offer F-RAM memory capabilities in 4Kb, 8Kb, and 16Kb densities. This allows the user to store from 250 16-bit words to 1000 16-bit words of data on the IC.

Performance benefits

The MaxArias memory map is configured to give the user maximum flexibility to write data and protect areas of memory using block write protect commands. The memory has almost unlimited data write endurance at up to 1E14 (100-trillion) writes. That means that the tag can be written to in excess of 100-trillion times before memory wear becomes an issue. Standard EEPROM memory can fail in as little as 100,000 writes. MaxArias wireless memory can be written to at up to 6x faster than EEPROM based tags and respond to read commands up to 2x faster. This performance benefit can be realized in applications where hundreds of tags need to be written in succession or in road tolling applications where memory speed is required to guarantee accurate reads and writes. The written data on the tag offers data retention of greater than 20 years, making it ideal for asset tracking. The MaxArias family of products is designed to be compliant to the EPC Class1 Gen-2 standard for UHF passive ICs. As such, it is compliant to worldwide frequency standards for the UHF band (860 – 960MHz).

Conclusion

For a quarter century, Ramtron has been mastering F-RAM memory technology, which is designed into demanding metering, automotive, industrial, scientific instruments, and computing applications all over the world. Today, these developments are being leveraged by Ramtron's MaxArias wireless memory, a new class of high memory RF-enabled ICs, that can bring new capabilities and options to RF system integrators and users the world over.

For more information

You can find out more about how F-RAM semiconductor products can improve your next system design via the following resources:

- For general information, visit www.ramtron.com
- For more information about MaxArias wireless memory, visit www.ramtron.com/go/maxarias
- To contact your local authorized sales representative, visit www.ramtron.com/sales/buy-now.aspx
- Call Customer Service at 719-481-7181, or email info@ramtron.com

About Ramtron International Corporation

Ramtron International Corporation, headquartered in Colorado Springs, Colorado, is a fabless semiconductor company that designs, develops, and markets specialized semiconductor memory and integrated semiconductor solutions used in a wide range of product applications and markets worldwide. For more information, visit www.ramtron.com. Ramtron International Corporation, 1850 Ramtron Drive, Colorado Springs, CO 80921.