WM72016

16-Kbit Secure F-RAM Memory with Gen-2 RFID Access and
Serial Port Direct Memory Access

RAMTRON
*International Corporation*

Description

The WM72016 is an RFID transponder IC with nonvolatile memory employing an advanced ferroelectric process. A ferroelectric random access memory, or F-RAM, is nonvolatile and performs reads and writes like a RAM. It provides reliable data retention for 20 years while eliminating the complexities, overhead, and system level reliability problems caused by EEPROM and other nonvolatile memories.

Unlike EEPROM's, the WM72016 write operations are zero power; there is no power or speed penalty for executing writes into the WM72016, as compared to read power and speed. Operation of the memory is fully symmetric: identical read and write characteristics in terms of power, speed, and reliability.

Secondary Serial Interface

The WM72016 employs a secondary serial interface bus. It is specified to operate at speeds up to 640kHz. This serial bus provides communication to a host microcontroller for the purpose of reading and writing the memory map. The interface uses a total of four pins: chip select, clock, and two bidirectional data pins. The serial protocol is controlled by op-codes. These op-codes specify the commands to the device. This secondary interface can be utilized creatively to implement an ultra-low power, RFID protocol based radio interface embedded in a MCU based systems such as battery powered instruments, Smart Meters, portable medical instrumentation, etc. (Figure 1).

Figure 1: Application example— zero power meter interface using wireless F-RAM with serial port direct memory interface
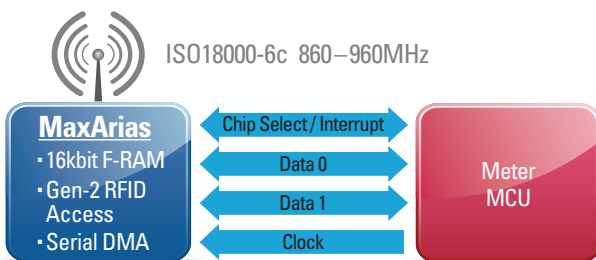
Features

16-Kilobit Nonvolatile Ferroelectric RAM

- Organized as 1024 x 16 bits
- Virtually unlimited read/write endurance (> 1E14)
- 20-year data retention
- Symmetrical read/write operation
- Advanced high-reliability ferroelectric process
- Global UHF Frequency range (860MHz—960MHz)

Interface and Security Features

- EPC Class-1 Generation-2 (ISO18000-6C) RFID compliant interface (revision 1.2.0)
- 192-bit memory: 96-bit electronic product code™ (EPC), 32-bit access password, 32-bit KILL password, 32-bit TID memory (factory programmed and locked)
- Additional TID memory to support unique serial number (total=4)
- Inventory, read, write and erase features
- Kill command
- Block permalock command
- Access command
- UHF carrier frequencies from 860 MHz to 960 MHz ISM band, ASK demodulation
- Up to 640kbps and 128kbps read and write transmission, respectively

Custom Features

- Stored address pointer to improve data write speed
- Stored address pointer lock

Ultra Low Power Symmetric Operation

- Memory read/write sensitivity: –6dBm, typical

Industry Standard Configurations

- Industrial temperature –40°C to +85°C
- 8-pin UDFN (-G)
- Bumped wafers or tape and reel die
- ISO-18000-6C compliant transponder antenna inlay

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Figure 2: UDFN 8-pin package (top view, PCB layout)

Ser_clk	1	8	ANT-
Ser_dat1	2	7	ANT+
Ser_dat0	3	6	V_{ddr}
Ser_CS	4	5	V_{ddraw}
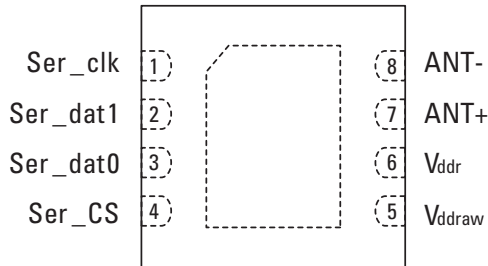
Table 1: Pin configuration and description

Pin Name	Type	Description
Ser_clk	Input	Serial clock for D0/D1. Maximum supported rate: 1MHz.
Ser_dat1/0	I/O	This pin is a bi-directional data pin.
Ser_CS	Input	This pin enables the chip for direct inputs to/from the chip on pins D0/D1.
ANT-, ANT+	Input	RFID antenna: Connect to external RFID antenna terminal. Connect ANT- to external RFID antenna terminal, also acts as ground.
Vddraw	Power	Power supply pin to DC supply of 1.8v to 3.6v.
Vddr	Power	Tie directly to Vddraw for applications which operate only under RF power. Tie to Vddraw through diode for applications which use independent power from local serial host.

Applications

High-density wireless memory is ideal for a broad range of applications and industries:

- 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

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