# FM24C64
## *64Kb FRAM Serial Memory*

**RAMTRON**

## Features

### 64K bit Ferroelectric Nonvolatile RAM
- Organized as 8,192 x 8 bits
- High endurance 10 Billion ($10^{10}$) read/writes
- 10 year data retention at 85° C
- NoDelay™ write
- Advanced high-reliability ferroelectric process

### Fast Two-wire Serial Interface
- Up to 1 MHz maximum bus frequency
- Direct hardware replacement for EEPROM
- Supports legacy timing for 100 kHz & 400 kHz

### Low Power Operation
- True 5V operation
- 150 µA Active current (100 kHz)
- 10 µA standby current

### Industry Standard Configuration
- Industrial temperature -40° C to +85° C
- 8-pin SOP or DIP

## Description

The FM24C64 is a 64-kilobit nonvolatile memory employing an advanced ferroelectric process. A ferroelectric random access memory or FRAM is nonvolatile but operates in other respects as a RAM. It provides reliable data retention for 10 years while eliminating the complexities, overhead, and system level reliability problems caused by EEPROM and other nonvolatile memories.

The FM24C64 performs write operations at bus speed. No write delays are incurred. Data is written to the memory array mere hundreds of nanoseconds after it has been successfully transferred to the device. The next bus cycle may commence immediately. In addition, the product offers substantial write endurance compared with other nonvolatile memories. The FM24C64 is capable of supporting up to 1E10-read/write cycles -- far more than most systems will require from a serial memory.

These capabilities make the FM24C64 ideal for nonvolatile memory applications requiring frequent or rapid writes. Examples range from data collection where the number of write cycles may be critical, to demanding industrial controls where the long write time of EEPROM can cause data loss. The combination of features allows more frequent data writing with less overhead for the system.

The FM24C64 provides substantial benefits to users of serial EEPROM, yet these benefits are available in a hardware drop-in replacement. The FM24C64 is provided in industry standard 8-pin packages using a familiar two-wire protocol. They are guaranteed over an industrial temperature range of -40°C to +85°C.

## Pin Configuration
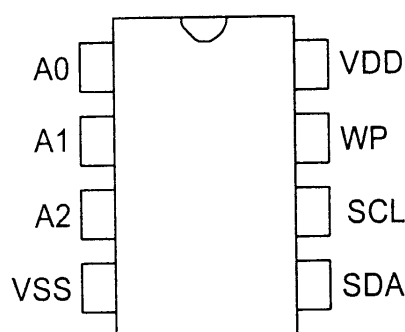


| Pin Names | Function |
|-----------|----------|
| A0-A2 | Device Select Address |
| SDA | Serial Data/address |
| SCL | Serial Clock |
| WP | Write Protect |
| VSS | Ground |
| VDD | Supply Voltage 5V |

| Ordering Information | |
|----------------------|--|
| FM24C64-P | 8-pin plastic DIP |
| FM24C64-S | 8-pin SOP |

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## Electrical Specifications

**Absolute Maximum Ratings**

| Description | Ratings |
|---|---|
| Ambient storage or operating temperature | -40°C to +85°C |
| Voltage on any pin with respect to ground | -1.0V to +7.0V |
| D.C. output current on any pin | 5 mA |
| Lead temperature (Soldering, 10 seconds) | 300° C |

Stresses above those listed under Absolute Maximum Ratings may cause permanent damage to the device. This is a stress rating only, and the functional operation of the device at these or any other conditions above those listed in the operational section of this specification is not implied. Exposure to absolute maximum ratings conditions for extended periods may affect device reliability

**DC Operating Conditions**  TA = -40° C to +85° C, VDD = 4.5V to 5.5V unless otherwise specified

| Symbol | Parameter | Min | Typ | Max | Units | Notes |
|---|---|---|---|---|---|---|
| $V_{DD}$ | Main Power Supply | 4.5 | 5.0 | 5.5 | V | 1 |
| $I_{DD}$ | VDD Supply Current | | | | | 2 |
| | @ SCL = 100 kHz | | 115 | 150 | μA | |
| | @ SCL = 400 kHz | | 400 | 500 | μA | |
| | @ SCL = 1 MHz | | 1 | 1.2 | mA | |
| $I_{SB}$ | Standby Current | | 1 | 10 | uA | 3 |
| $I_{LI}$ | Input Leakage Current | | | 10 | uA | 4 |
| $I_{LO}$ | Output Leakage Current | | | 10 | uA | 4 |
| $V_{IL}$ | Input Low Voltage | -0.3 | | VDD x 0.3 | V | 1,5 |
| $V_{IH}$ | Input High Voltage | VDD x 0.7 | | VDD + 0.5 | V | 1,5 |
| $V_{OL}$ | Output Low Voltage @ IOL = 3 mA | | | 0.4 | V | 1 |
| $V_{HYS}$ | Input Hysteresis | VDD x .05 | | | V | 1, 5 |

**Notes**
1. Referenced to VSS.
2. SCL toggling between VDD-0.3V and VSS, other inputs VSS or VDD-0.3V
3. SCL = SDA = VDD. All inputs VSS or VDD. Stop command issued.
4. VIN or VOUT = VSS to VDD
5. This parameter is characterized but not tested.