

## AN113

### Migrating from FM1608 to FM1608B

**Author:** Girija Chougala

**Associated Project:** No

**Associated Part Family:** FM1608, FM1608B

**Software Version:** None

**Related Documents:** For a complete list, [click here](#)

AN113 discusses the key differences that need to be considered when migrating from FM1608 to FM1608B. FM1608 is now obsolete and this application note explains how FM1608B is a replacement for FM1608.

### Introduction

FM1608B, a 64-Kbit parallel F-RAM™, is a replacement device for FM1608, which is now obsolete. The two devices are identical in terms of package and composition and dimensions, read / write functionality, and address pin functionality. This application note discusses the key differences between the two devices that need to be considered when migrating from FM1608 to FM1608B.

### Drop-In Replacement or Not?

From a software point of view, the two devices are identical. From a hardware point of view, FM1608B has faster access time compared to FM1608. Due to this access time advantage, FM1608B has slightly higher standby current.

[Table 1](#) shows the compatibility chart of FM1608 and FM1608B. For a detailed comparison, see [Table 3](#).

Table 1. Compatibility Chart

FM1608 Feature or Spec	Is FM1608B compatible?
Package	Yes
Pinout	Yes
Temperature Range	Yes
Operating Voltage	Yes
Operating Current	Yes
Standby Current	No
Read / Write Function	Yes
Timing / Frequency	Yes
Data Retention	Refer to <a href="#">Table 3</a>
Endurance	Yes

### Ordering Part Numbers

[Table 2](#) gives the recommended FM1608B ordering part numbers that correspond to the now obsolete FM1608 ordering part numbers.

Table 2. Recommended Ordering Part Numbers for Migration

FM1608		FM1608B	
Ordering Part Number	Status	Ordering Part Number	Status
FM1608-SG	Obsolete	FM1608B-SG	In production
FM1608-SGTR		FM1608B-SGTR	

## Comparison of FM1608 and FM1608B

Table 3 gives a detailed comparison of the two devices.

Table 3. Detailed Comparison

	FM1608	FM1608B	Comment
Package Types	-SG, -PG	-SG	Identical "Green" SOIC package. FM1608B is not offered in DIP package.
Package Outlines	SOIC-28, DIP-28	SOIC-28	Identical SOIC package. FM1608B is not offered in DIP package.
Pinout	-	-	Identical
Temperature Range	-40 °C to +85 °C	-40 °C to +85 °C	Identical
Operating Voltage Range	4.5 V to 5.5 V	4.5 V to 5.5 V	Identical
Active Supply Current (I <sub>DD</sub> )	15 mA	15 mA	Identical
Standby Current (CMOS) Standby Current (TTL)	20 µA 400 µA	50 µA 1800 µA	FM1608B has higher standby currents
Input Levels	TTL	TTL	Identical
Access Time	120 ns	70 ns	Fast access time in FM1608B
Pre-charge Time	60 ns	60 ns	Identical
Cycle Time	180 ns	130 ns	FM1608B is faster
Read / Write Function	-	-	Identical number of address pins, Identical control pins
Address Setup Time (t <sub>AS</sub> )	0 ns	0 ns	Identical
Address Hold Time (t <sub>AH</sub> )	10 ns	15 ns	Slower timing on FM1608B, however address is typically held throughout entire cycle
Output Enable Access Time (t <sub>OE</sub> )	10 ns	12 ns	Slightly slower on FM1608B
Data Setup (t <sub>DS</sub> )	40 ns	30 ns	Slightly better in FM1608B
Data Retention	45 years (+85 °C)	10 years (+85 °C) 38 years (+75 °C) 151 years (+65 °C)	Data retention is lower
Endurance (Write/Read Cycles)	1E+12	1E+14	FM1608B has better endurance
V <sub>DD</sub> Power-Up Ramp Rate (t <sub>VR</sub> )	-	30 µs / V	Power-up ramp rate should be slower than 30 µs / V for FM1608B
V <sub>DD</sub> Power-Down Ramp Rate (t <sub>VF</sub> )	-	30 µs / V	Power-down ramp rate should be slower than 30 µs / V for FM1608B
Power-Up to First Access (t <sub>PU</sub> )	1 µs	10 ms	FM1608B is slower in first access

## Critical Considerations

You should consider all the parameter differences mentioned in Table 3 during the migration to FM1608B. This section discusses the critical differences. System designers should also review the [datasheet](#) when migrating to the new part.

### V<sub>DD</sub> Ramp Rate

V<sub>DD</sub> power-up and power-down ramp rate specifications are added in FM1608B device. Ensure that the power-up and power-down ramp rates are slower than 30 µs / V in your system.

## **Power-Up to First Access**

Power-up to first access spec is slower in FM1608B device. Ensure that the FM1608B device is accessed only after 10 ms from power-up.

## **Summary**

AN113 discussed the differences between FM1608 and FM1608B that need to be considered during migration to the FM1608B.

## **Related Documents**

### **Datasheet**

[FM1608B: 64-Kbit \(8 K × 8\) Byte-wide F-RAM Memory datasheet](#)

## Document History

Document Title: Migrating from FM1608 to FM1608B - AN113

Document Number: 001-86813

Revision	ECN	Orig. of Change	Submission Date	Description of Change
**	3944550	GVCH	03/26/2013	New Spec
*A	4280097	MEDU	02/13/2014	<p>Updated to Cypress Template</p> <p>Updated Active Supply Current for FM1608 from 25 mA to 15 mA</p> <p>Updated "Standby Current (CMOS)" spec value for FM1608 from 1 <math>\mu</math>A to 20 <math>\mu</math>A</p> <p>Updated "Standby Current (CMOS)" spec value for FM1608B from 6 <math>\mu</math>A to 50 <math>\mu</math>A</p> <p>Updated Access Time for FM1608 from 70 ns to 120 ns</p> <p>Updated Cycle Time for FM1608 from 130 ns to 180 ns</p> <p>Updated "Address Setup Time" for FM1608 from 4 ns to 0 ns</p> <p>Changed "Data Hold Time" to "Data Setup Time"</p> <p>Added data retention spec to FM1608B at 85 <math>^{\circ}</math>C</p> <p>Updated the endurance spec for FM1608B</p> <p>Updated "Power-up to First Access" for FM1608B from 500 <math>\mu</math>s to 10 ms</p>
*B	4498657	GVCH	09/25/2014	<p>Changed title from "Differences between FM1608 and FM1608B" to "Migrating from FM1608 to FM1608B."</p> <p>Updated abstract.</p> <p>Added "<a href="#">Ordering Part Numbers</a>" section.</p> <p>Added title for <a href="#">Table 3</a>.</p> <p>Added "<a href="#">Related Documents</a>" section.</p>

## Worldwide Sales and Design Support

Cypress maintains a worldwide network of offices, solution centers, manufacturer's representatives, and distributors. To find the office closest to you, visit us at [Cypress Locations](#).

### Products

Automotive	<a href="http://cypress.com/go/automotive">cypress.com/go/automotive</a>
Clocks & Buffers	<a href="http://cypress.com/go/clocks">cypress.com/go/clocks</a>
Interface	<a href="http://cypress.com/go/interface">cypress.com/go/interface</a>
Lighting & Power Control	<a href="http://cypress.com/go/powerpsoc">cypress.com/go/powerpsoc</a> <a href="http://cypress.com/go/plc">cypress.com/go/plc</a>
Memory	<a href="http://cypress.com/go/memory">cypress.com/go/memory</a>
PSoC	<a href="http://cypress.com/go/psoc">cypress.com/go/psoc</a>
Touch Sensing	<a href="http://cypress.com/go/touch">cypress.com/go/touch</a>
USB Controllers	<a href="http://cypress.com/go/usb">cypress.com/go/usb</a>
Wireless/RF	<a href="http://cypress.com/go/wireless">cypress.com/go/wireless</a>

### PSoC<sup>®</sup> Solutions

[psoc.cypress.com/solutions](http://psoc.cypress.com/solutions)

[PSoC 1](#) | [PSoC 3](#) | [PSoC 4](#) | [PSoC 5LP](#)

### Cypress Developer Community

[Community](#) | [Forums](#) | [Blogs](#) | [Video](#) | [Training](#)

### Technical Support

[cypress.com/go/support](http://cypress.com/go/support)

PSoC is a registered trademark of Cypress Semiconductor Corp. All other trademarks or registered trademarks referenced herein are the property of their respective owners.



Cypress Semiconductor    Phone : 408-943-2600  
198 Champion Court    Fax : 408-943-4730  
San Jose, CA 95134-1709    Website : [www.cypress.com](http://www.cypress.com)

© Cypress Semiconductor Corporation, 2013-2014. The information contained herein is subject to change without notice. Cypress Semiconductor Corporation assumes no responsibility for the use of any circuitry other than circuitry embodied in a Cypress product. Nor does it convey or imply any license under patent or other rights. Cypress products are not warranted nor intended to be used for medical, life support, life saving, critical control or safety applications, unless pursuant to an express written agreement with Cypress. Furthermore, Cypress does not authorize its products for use as critical components in life-support systems where a malfunction or failure may reasonably be expected to result in significant injury to the user. The inclusion of Cypress products in life-support systems application implies that the manufacturer assumes all risk of such use and in doing so indemnifies Cypress against all charges.

This Source Code (software and/or firmware) is owned by Cypress Semiconductor Corporation (Cypress) and is protected by and subject to worldwide patent protection (United States and foreign), United States copyright laws and international treaty provisions. Cypress hereby grants to licensee a personal, non-exclusive, non-transferable license to copy, use, modify, create derivative works of, and compile the Cypress Source Code and derivative works for the sole purpose of creating custom software and or firmware in support of licensee product to be used only in conjunction with a Cypress integrated circuit as specified in the applicable agreement. Any reproduction, modification, translation, compilation, or representation of this Source Code except as specified above is prohibited without the express written permission of Cypress.

Disclaimer: CYPRESS MAKES NO WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, WITH REGARD TO THIS MATERIAL, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Cypress reserves the right to make changes without further notice to the materials described herein. Cypress does not assume any liability arising out of the application or use of any product or circuit described herein. Cypress does not authorize its products for use as critical components in life-support systems where a malfunction or failure may reasonably be expected to result in significant injury to the user. The inclusion of Cypress' product in a life-support systems application implies that the manufacturer assumes all risk of such use and in doing so indemnifies Cypress against all charges.

Use may be limited by and subject to the applicable Cypress software license agreement.