

## Migrating from FM24V02/FM24V01 to FM24V02A/FM24V01A

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Associated Part Family: FM24V02, FM24V01, FM24V02A, FM24V01A

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

AN94901 discusses the key differences that need to be considered when migrating from FM24V02/FM24V01 to FM24V02A/FM24V01A. FM24V02/FM24V01 is now “Not Recommended for New Designs”; this application note explains how FM24V02A/FM24V01A is a replacement for FM24V02/FM24V01.

### 1 Introduction

FM24V02A/FM24V01A, a 256-Kbit/128-Kbit I<sup>2</sup>C F-RAM™, is a replacement device for FM24V02/FM24V01, which is now “Not recommended for new designs”. The two devices are identical in terms of pinout, package composition and dimensions, and read/write functionality. This application note discusses the key differences between the two devices that need to be considered when migrating from FM24V02/FM24V01 to FM24V02A/ FM24V01A.

### 2 Drop-In Replacement or Not?

From a hardware point of view, the two devices are identical. From a software point of view as well, except for the Device ID, the two devices are identical.

Refer “[Critical Considerations](#)” section for more details.

[Table 1](#) highlights the compatibility chart of FM24V02/FM24V01 and FM24V02A/FM24V01A. For a detailed comparison, see [Table 3](#).

Table 1. Compatibility Chart

FM24V02/FM24V01 Feature or Spec	Is FM24V02A/FM24V01A compatible?
Package	Yes
Pinout	Yes
Temperature Range	Yes
Operating Voltage	Yes
Operating Current	Yes
Standby Current	Yes
Read / Write Function	Yes
Timing / Frequency	Yes
Data Retention	Yes
Endurance	Yes

### 3 Ordering Part Numbers

Table 2 gives the recommended FM24V02A/FM24V01A ordering part numbers that correspond to the FM24V02/FM24V01 (Not Recommended for New Designs) ordering part numbers.

Table 2. Recommended Ordering Part Numbers for Migration

FM24V02/FM24V01		FM24V02A/FM24V01A		Comments
Ordering Part Number	Status	Ordering Part Number	Status	
FM24V02-G	Not Recommended for New Designs	FM24V02A-G	In production	No hardware change required Software change required
FM24V02-GTR		FM24V02A-GTR		
FM24V01-G		FM24V01A-G		
FM24V01-GTR		FM24V01A-GTR		

### 4 Comparison of FM24V02/FM24V01 and FM24V02A/FM24V01A

Table 3 gives a detailed comparison of the two devices.

Table 3. Detailed Comparison Table

	FM24V02/FM24V01	FM24V02A/FM24V01A	Comments
Package Types	-G	-G	Identical "green (RoHS)" packages.
Pinout/ Package Outlines	SOIC-8	SOIC-8	Identical pinout, outline and board footprint.
Temperature Range	-40 °C to +85 °C	-40 °C to +85 °C	Identical
Operating Voltage Range	2.0 V to 3.6 V	2.0 V to 3.6 V	Identical
Active Supply Current (max)	175 $\mu$ A @ 100 KHz 400 $\mu$ A @ 1 MHz 1000 $\mu$ A @ 40 MHz	175 $\mu$ A @ 100 KHz 400 $\mu$ A @ 1 MHz 1000 $\mu$ A @ 40 MHz	Identical
Standby Current (max)	150 $\mu$ A @ 85 °C	150 $\mu$ A @ 85 °C	Identical
Sleep Current (max)	8 $\mu$ A @ 85 °C	8 $\mu$ A @ 85 °C	Identical
Read / Write Function	2-byte addressing, slave IDs, device select bits	2-byte addressing, slave IDs, device select bits	Identical
Clock Frequency	3.4 MHz	3.4 MHz	Identical
Data Retention	10 years (+85 °C) 38 years (+75 °C) 151 years (+65 °C)	10 years (+85 °C) 38 years (+75 °C) 151 years (+65 °C)	Identical
Endurance (Write/Read Cycles)	1E+14	1E+14	Identical
Power-Up to First Access ( $t_{PU}$ , max)	250 $\mu$ s	250 $\mu$ s	Identical
Device ID	004100h (FM24V01)  004200h (FM24V02)	004101h (FM24V01A)  004201h (FM24V02A)	Different. Refer to Device ID section in "Critical Considerations" for more details.
Sleep function	The I <sup>2</sup> C F-RAM enters Sleep Mode irrespective of the STOP condition	The I <sup>2</sup> C F-RAM enters Sleep Mode only if the STOP condition is issued	Different. Refer to Sleep Function section in "Critical Considerations" for more details.
Output LOW voltage (max)	$V_{OL} = 0.2$ V @ $I_{OL} = 150$ $\mu$ A, $V_{DD} \geq 2.0$ V	Not specified. This is not an industry standard specification	

	FM24V02/FM24V01	FM24V02A/FM24V01A	Comments
Output LOW voltage (max)	$V_{OL} = 0.4 \text{ V} @ I_{OL} = 2 \text{ mA}, V_{DD} \geq 2.7 \text{ V}$	$V_{OL} = 0.4 \text{ V} @ I_{OL} = 3 \text{ mA}, V_{DD} \geq 2.0 \text{ V}$	FM24V02A/FM24V01A has better spec of higher drive current at lower $V_{DD}$
Output LOW voltage (max)	-	$V_{OL} = 0.6 \text{ V} @ I_{OL} = 6 \text{ mA}, V_{DD} \geq 2.0 \text{ V}$	FM24V01A/FM24V02A has additional spec to meet the NXP I <sup>2</sup> C specification
Data in hold ( $t_{HD:DAT}$ ) @ 3.4 MHz	Min: 0 ns	Min: 0 ns Max: 70 ns	FM24V01A/FM24V02A has additional max spec to meet the NXP I <sup>2</sup> C specification
Input rise time ( $t_R$ ) @ 3.4 MHz	Max: 80 ns	Min: 10 ns Max: 80 ns	FM24V01A/FM24V02A has additional min spec to meet the NXP I <sup>2</sup> C specification
Input fall time ( $t_F$ ) @ 3.4 MHz	Max: 80 ns	Min: 10 ns Max: 80 ns	FM24V01A/FM24V02A has additional min spec to meet the NXP I <sup>2</sup> C specification
Input fall time ( $t_F$ ) @ 1.0 MHz	Max: 120 ns	Min: $20 * (V_{DD} / 5.5 \text{ V}) \text{ ns}$ Max: 120 ns	FM24V01A/FM24V02A has additional min spec to meet the NXP I <sup>2</sup> C specification
ACK output valid time ( $t_{VD:ACK}$ ) @ 3.4 MHz	-	Max: 130 ns	FM24V01A/FM24V02A has additional max spec to meet the NXP I <sup>2</sup> C specification
ACK output valid time ( $t_{VD:ACK}$ ) @ 1 MHz	-	Max: 450 ns	FM24V01A/FM24V02A has additional max spec to meet the NXP I <sup>2</sup> C specification
Output fall time from $V_{IH}$ min to $V_{IL}$ max ( $t_{oF}$ ) @ 3.4 MHz	-	Max: 80 ns	FM24V01A/FM24V02A has additional max spec to meet the NXP I <sup>2</sup> C specification
Output fall time from $V_{IH}$ min to $V_{IL}$ max ( $t_{oF}$ ) @ 1 MHz	-	Min: $20 * (V_{DD} / 5.5 \text{ V}) \text{ ns}$ Max: 120 ns	FM24V01A/FM24V02A has additional spec to meet the NXP I <sup>2</sup> C specification

## 5 Critical Considerations

You should consider all the parameter differences mentioned in [Table 3](#) during the migration to FM24V02A/FM24V01A. This section discusses the critical differences. System designers should also review the datasheet when migrating to the new part.

### 5.1 Device ID Feature

The FM24V02A/FM24V01A and FM24V02/FM24V01 incorporates a 9-byte read-only Device ID to identify the product uniquely. The Device ID allows the host to determine the manufacturer, product density, and product revision. [Table 4](#) gives a Device ID of FM24V02/FM24V01 and FM24V02A/FM24V01A. System software needs to be updated for Device ID while migrating to the FM24V02A/FM24V01A.

Table 4. Device ID

Device ID <sup>[Note]</sup>	
FM24V01	FM24V01A
004100h	004101h
FM24V02	FM24V02A
004200h	004201h

**Note:** Device ID difference highlighted in red color.

## 5.2 Sleep Function

A low power state called Sleep Mode is supported by FM24V02/FM24V01 and FM24V02A/FM24V01A devices. The devices will enter in to sleep mode when the Reserved Slave ID 86h is clocked-in as explained in the following sequence:

1. The master sends a START command.
2. The master sends Reserved Slave ID F8h.
3. The F-RAM (slave device) sends an ACK.
4. The master sends the I<sup>2</sup>C-bus slave address of the slave (F-RAM) device it needs to identify. The last bit is a 'Don't care' value (R/W bit).
5. The F-RAM sends an ACK. Only one device whose I<sup>2</sup>C-bus slave address matches with the address byte sent by master must acknowledge it.
6. The master sends a Re-START command.
7. The master sends Reserved Slave ID 86h.
8. The F-RAM sends an ACK.
9. The master sends STOP and the slave device enters into sleep mode.

However there is a minor difference in the sleep mode entry. Step 9 – Sending STOP condition, is mandatory for FM24V02A/FM24V01A, whereas it is an optional step for FM24V02/FM24V01.

FM24V02/FM24V01 generates an unintended STOP during sleep mode entry. Refer to Errata section of FM24V02/FM24V01 datasheet for more details. The Errata is not applicable for FM24V02A/FM24V01A.

## 6 Summary

AN94901 discussed the differences between FM24V02/FM24V01 and FM24V02A/FM24V01A that need to be considered during migration to the FM24V02A/FM24V01A.

## 7 Related Documents

### Datasheet

[FM24V02: 256-Kbit \(32K × 8\) Serial \(I2C\) F-RAM](#)

[FM24V01: 128-Kbit \(16K × 8\) Serial \(I2C\) F-RAM](#)

[FM24V02A: 256-Kbit \(32K × 8\) Serial \(I2C\) F-RAM](#)

[FM24V01A: 128-Kbit \(16K × 8\) Serial \(I2C\) F-RAM](#)

## Document History

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Revision	ECN	Orig. of Change	Submission Date	Description of Change
**	4701473	GVCH	03/26/2015	New Spec.
*A	5623862	GVCH	02/08/2017	Updated "Drop-In Replacement or Not?" section. Updated <a href="#">Table 3</a> : Changed "Power-Up to First Access (t <sub>PU</sub> )" parameter spec value from 1 ms to 250 μs for FM25V02A part. Critical Considerations section: Removed "Power-Up to First Access (t <sub>PU</sub> )" description (not applicable).
*B	5848906	HARA	08/17/2017	Updated logo and copyright.

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