Migrating From FM25L256B To FM25V02A Or FM25W256

Author: Girija Chougala
Associated Part Family: FM25L256B, FM25V02A, and FM25W256
Related Documents: For a complete list, click here

AN308a discusses the key differences between FM25L256B, FM25V02A, and FM25W256 that need to be considered during migration from FM25L256B. FM25L256B is now obsolete and this application note explains how FM25V02A or FM25W256 is a replacement for FM25L256B.

1   Introduction

FM25V02A and FM25W256 are the potential replacement devices for FM25L256B which is obsolete. For most designs, the FM25V02A or FM25W256 devices can be considered equivalent or better than the FM25L256B. The three devices are identical in terms of pinout, package composition and dimensions, and read/write functionality. This application note points out the differences between the FM25L256B, FM25V02A, and FM25W256 F-RAM devices.

2   Device Compatibility

From a software point of view, the three devices are identical. From a hardware point of view, the key difference between the devices is the higher standby current and a change in the PCB assembly process for the DFN package. The EXPOSED PAD of the DFN package must not be soldered on the PCB in FM25V02A while FM25L256B does not have this restriction. Refer to "Critical Considerations" for more details.

The FM25V02A adds many features like operation down to 2.0 V, sleep mode capability, Device ID feature, and higher speed capability. The FM25W256 offers wide voltage operation up to 5.5 V and lower standby current than the FM25V02A. Table 1 shows the compatibility chart of FM25L256B, FM25V02A and FM25W256. For a detailed comparison, see Table 3.

Table 1. Compatibility Chart

FM25L256B Feature or Spec	Potential Replacements	
	Is FM25V02A compatible?	Is FM25W256 compatible?
Package/Pinout	Yes	Yes
Package Footprint	Yes*	Yes
Temperature Range	Yes	Yes
Operating Voltage	Yes	Yes
Operating Current	Yes	Yes
Standby Current	No	No
Read / Write Function	Yes	Yes
Status Register	Yes	Yes
Timing / Frequency	Yes	Yes
Data Retention	Yes	Yes
Endurance	Yes	Yes

* Packages are footprint compatible but DFN package requires change in the PCB assembly process. Refer to DFN Package Assembly Requirement for more details.

3 Ordering Part Numbers

Table 2 gives the recommended FM25V02A and FM25W256 ordering part numbers that correspond to the FM25L256B ordering part numbers.

Table 2. Recommended Ordering Part Numbers for Migration

FM25L256B		FM25V02A		FM25W256		Comments
Ordering Part Number	Status	Ordering Part Number	Status	Ordering Part Number	Status	
FM25L256B-G	Obsolete	FM25V02A-G	In production	FM25W256-G	In production	Hardware change is required only for DFN package in the PCB assembly process. System firmware update is required if you wish to use the additional Device ID feature supported in FM25V02A.
FM25L256B-GTR		FM25V02A-GTR		FM25W256-GTR		
FM25L256B-DG		FM25V02A-DG		Not supported		
FM25L256B-DGTR		FM25V02A-DGTR		Not supported		

4 Comparison of FM25L256B, FM25V02A, and FM25W256

Table 3 gives a detailed comparison of the three devices.

Table 3. Detailed Comparison

	FM25L256B	FM25V02A	FM25W256	Comments
Package Types	-G, -DG	-G, -DG	-G	Identical "Green (RoHS)" package for SOIC and DFN. FM25W256 is not offered in DFN package.
Pinout / Package Outlines	SOIC-8, DFN-8	SOIC-8, DFN-8	SOIC-8	FM25W256 is not offered in DFN package
Package Footprint	SOIC-8	SOIC-8	SOIC-8	Identical
	DFN-8	DFN-8	Not supported	The EXPOSED PAD in FM25V02A must not be soldered on the PCB. Refer to DFN Package Assembly Requirement for more details.
Temperature Range	–40 ºC to +85 ºC	–40 ºC to +85 ºC	–40 ºC to +85 ºC	Identical
Operating Voltage Range	2.7 V to 3.6 V	2.0 V to 3.6 V	2.7 V to 5.5 V	FM25V02A allows operation down to 2.0 V, FM25W256 allows operation up to 5.5 V
Active Supply Current	500 µA @ 1 MHz 10.0 mA @ 20 MHz	220 µA @ 1 MHz 2.5 mA @ 40 MHz	250 µA @ 1 MHz 2.0 mA @ 20 MHz	FM25V02A and FM25W256 offer lower active current
Standby Current	10 µA	150 µA	30 µA	Higher
Sleep Mode Current	-	8 µA	-	FM25V02A offers a sleep mode which can be used to reduce the standby/idle current. During wake-up from sleep mode, the device has a recovery time of 400 µs.

	FM25L256B	FM25V02A	FM25W256	Comments
Read / Write Function	-	-	-	Identical 2-byte addressing, Identical op-codes
Clock Frequency	20 MHz	40 MHz	20 MHz	FM25V02A offers higher speed
Data Retention	10 years (+85 ºC)	10 years (+85 ºC) 38 years (+75 ºC) 151 years (+65 ºC)	10 years (+85 ºC) 38 years (+75 ºC) 151 years (+65 ºC)	Identical
Endurance (Write/Read Cycles)	Unlimited	1E+14	1E+14	FM25V02A's and FM25W256's endurance is large enough to be considered as unlimited for all practical application. For a 64-byte loop, at 20 MHz, endurance is 85 years.
V_{DD} Power-Up Ramp Rate (t_{VR})	50 µs / V	50 µs / V	30 µs / V	Identical or better
V_{DD} Power-Down Ramp Rate (t_{VF})	50 µs / V	100 µs / V	30 µs / V	Worse or better
Power-Up to First Access (t_{PU})	10 ms	1 ms	1 ms	Better power-up to first access specification in FM25V02A and FM25W256
$\overline{HOLD}$ pin pull-up	-	Internal pull-up	-	FM25V02A does not require any external pull-up resistor
Device ID Feature	-	Yes	-	Additional feature
Fast Read Op-code	-	Yes	-	Additional feature

5   Critical Considerations

You should consider all the parameter differences mentioned in Table 3 during the migration to FM25V02A or FM25W256. This section discusses the critical differences. System designers should also review the datasheets when migrating to the new part.

5.1   Standby Current / Sleep Mode Current

The FM25V02A has higher standby current of 150 µA compared to FM25L256B. But FM25V02A offers an additional sleep mode which can be used to reduce the standby/idle current. The sleep mode current is as low as 8 µA. Note that during wake-up from the sleep mode, device needs a recovery time of 400 µs. The FM25W256 has a higher standby current of 30 µA compared to FM25L256B.

5.2   New Feature: Device ID

The FM25V02A incorporates a 9-byte read only Device ID (7F7F7F7F7F7F7FC22208h) to identify the product uniquely. The Device ID allows the host to determine the manufacturer, product density, and product revision. System firmware update is required when you wish to use this feature in FM25V02A.

5.3   DFN Package Assembly Requirement

In both the FM25L256B and FM25V02A, the EXPOSED PAD of the DFN package is not connected to the die and must be left floating (in other words, no connect in the schematic design). The EXPOSED PAD in FM25V02A shown in the Figure 1 must not be soldered on the PCB. Soldering the EXPOSED PAD will cause the die to be exposed to excessive heat, which can result in bit failures and margin loss. Therefore, ensure that the EXPOSED PAD of the DFN package is masked on the PCB during the soldering process of the FM25V02A device.

There are two ways of masking the EXPOSED PAD, which is explained below:

1. Mask the Stencil opening for the EXPOSED PAD during stencil creation which can be done without updating the existing board layout design.

2. Mask the EXPOSED PAD in the solder paste film of the PCB design layout if you are designing a new board layout.

Figure 1. 8-Pin DFN Package Outline
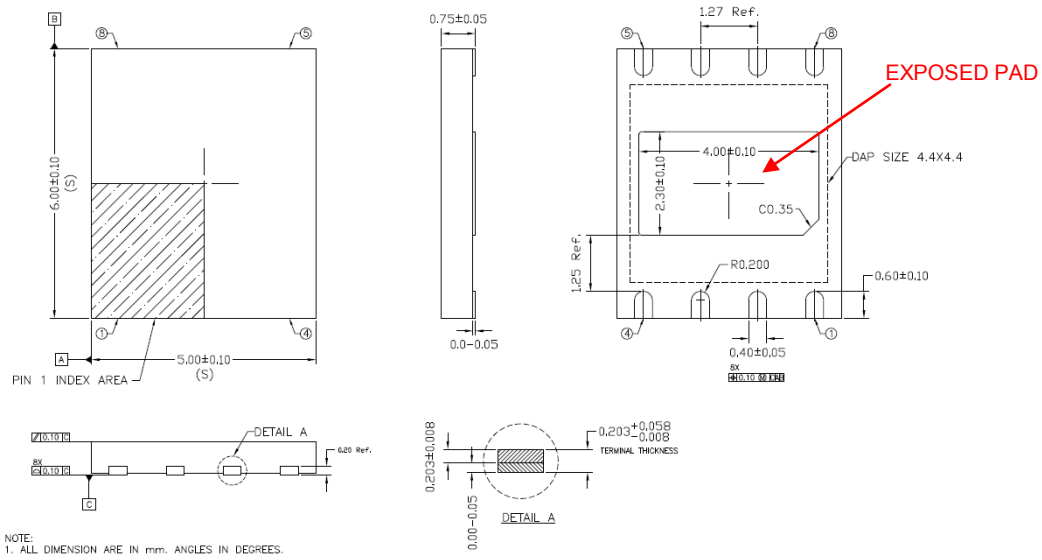
6   Summary

AN308a discussed the differences between FM25L256B, FM25V02A, and FM25W256 that need to be considered during migration from FM25L256B to FM25V02A or FM25W256.

7   Related Documents

Datasheet

FM25V02A: 256-Kbit (32 K × 8) Serial (SPI) F-RAM datasheet

FM25W256: 256-Kbit (32 K × 8) Serial (SPI) F-RAM datasheet

Document History

Document Title: AN308a - Migrating from FM25L256B to FM25V02A or FM25W256

Document Number: 001-86831

Revision	ECN	Orig. of Change	Submission Date	Description of Change
**	3944550	GVCH	03/26/2013	New Spec.
*A	4278908	MEDU	03/05/2014	Updated to Cypress Template. Updated "V_{DD} Power-Down Ramp Rate" for FM25L256B from "100 µs / V" to "50 µs / V". Updated "Power-Up to First Access" for FM25W256 from 10 ms to 1 ms.
*B	4514175	GVCH	09/26/2014	Updated abstract. Added "Ordering Part Numbers" section. Added title for Table 3. Added "Related Documents" section.
*C	4759382	GVCH	06/26/2015	Replaced FM25V02 (Not Recommended For New Design) with FM25V02A (In production) for migration. Updated Device Compatibility for DFN EXPOSED PAD details. Updated Table 1 through Table 3 for DFN package compatibility. Added DFN Package Assembly Requirement.

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	cypress.com/go/automotive
Clocks & Buffers	cypress.com/go/clocks
Interface	cypress.com/go/interface
Lighting & Power Control	cypress.com/go/powerpsoc
	cypress.com/go/plc
Memory	cypress.com/go/memory
PSoC	cypress.com/go/psoc
Touch Sensing	cypress.com/go/touch
USB Controllers	cypress.com/go/usb
Wireless/RF	cypress.com/go/wireless

PSoC® Solutions

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

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