# Migrating from FM25L256B to FM25V02A or FM25W256

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**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FM25V02A and FM25W256 are the potential replacement devices for FM25L256B which is obsolete.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

| | Potential Replacements | |
|---|---|---|
| **FM25L256B Feature or Spec** | **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<br>10.0 mA @ 20 MHz | 220 µA @ 1 MHz<br>2.5 mA @ 40 MHz | 250 µA @ 1 MHz<br>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. |
| **Read / Write Function** | - | - | - | Identical 2-byte addressing, Identical op-codes |
| **Clock Frequency** | 20 MHz | 40 MHz | 20 MHz | FM25V02A offers higher speed |

| | FM25L256B | FM25V02A | FM25W256 | Comments |
|---|---|---|---|---|
| **Data Retention** | 10 years (+85 ºC) | 10 years (+85 ºC)<br>38 years (+75 ºC)<br>151 years (+65 ºC) | 10 years (+85 ºC)<br>38 years (+75 ºC)<br>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 | 250 µs | 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.

## 1.1 New Feature: Device ID

The FM25V02A incorporates a 9-byte read only Device ID (7F7F7F7F7F7FC22208h) 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.

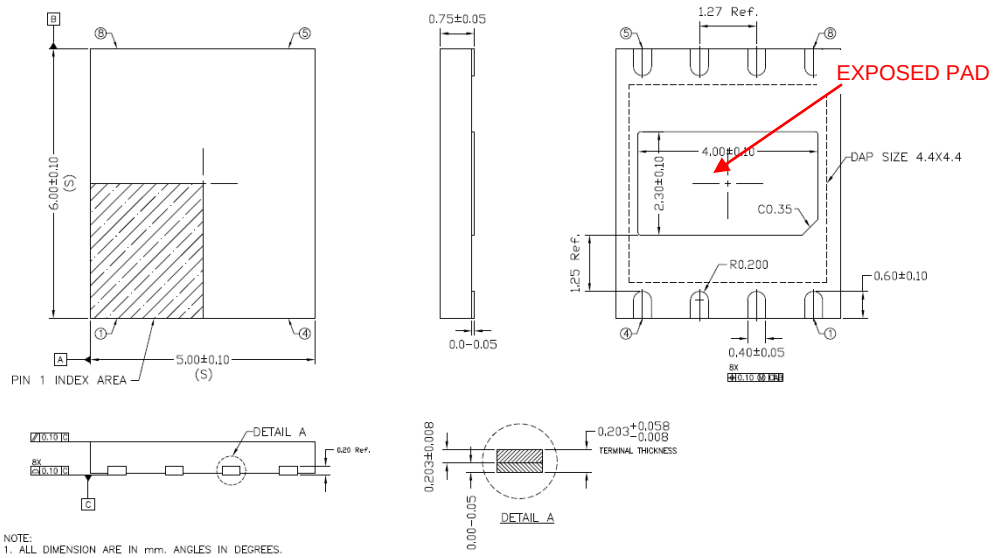
## 1.2 DFN Package Assembly Requirement

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

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| Revision | ECN | Orig. of Change | Submission Date | Description of Change |
|---|---|---|---|---|
| ** | 3946074 | GVCH | 03/26/2013 | New Spec. |
| *A | 4278908 | MEDU | 03/05/2014 | Updated to Cypress Template.<br>Updated "$V_{DD}$ Power-Down Ramp Rate" for FM25L256B from "100 µs / V" to "50 µs / V".<br>Updated "Power-Up to First Access" for FM25W256 from 10 ms to 1 ms. |
| *B | 4514175 | GVCH | 09/26/2014 | Updated abstract.<br>Added "Ordering Part Numbers" section.<br>Added title for Table 3.<br>Added "Related Documents" section. |
| *C | 4759382 | GVCH | 06/26/2015 | Replaced FM25V02 (Not Recommended For New Design) with FM25V02A (In production) for migration.<br>Updated Device Compatibility for DFN EXPOSED PAD details.<br>Updated Table 1 through Table 3 for DFN package compatibility.<br>Added DFN Package Assembly Requirement. |
| *D | 5623862 | GVCH | 02/08/2017 | Table 3: Updated "Power-Up to First Access (tPU)" parameter spec value from 1 ms to 250 µs for FM25V02A part<br>Updated template |

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