

Migrating from FM24V02/FM24V01 to CY15B256J/CY15B128J Automotive F-RAM™

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Associated Part Family: FM24V02, FM24V01, CY15B256J, CY15B128J

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

AN97793 discusses the key differences that need to be considered when migrating from FM24V02/FM24V01 to CY15B256J/CY15B128J Automotive F-RAM. FM24V02/FM24V01 is now “Not Recommended for New Designs”; this application note explains how CY15B256J/CY15B128J is a replacement for FM24V02/FM24V01.

1 Introduction

CY15B256J/CY15B128J, a 256-Kbit/128-Kbit Automotive I2C 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 CY15B256J/CY15B128J.

2 Device Compatibility

From a hardware point of view, the two devices are identical. From a software point of view, the two devices are identical except for the Device ID. Refer to [Critical Considerations](#) section for more details.

[Table 1](#) highlights the compatibility chart of FM24V02/FM24V01 and CY15B256J/CY15B128J. For a detailed comparison, see [Table 3](#).

Table 1. Compatibility Chart

FM24V02/FM24V01 Feature or Spec	Is CY15B256J/CY15B128J 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 provides the recommended CY15B256J/CY15B128J 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		CY15B256J/CY15B128J		Comments
Ordering Part Number	Status	Ordering Part Number	Status	
FM24V02-G	Not Recommended for New Designs	CY15B256J-SXA	In production	No hardware change required Software change required
FM24V02-GTR		CY15B256J-SXAT		
FM24V01-G		CY15B128J-SXA		
FM24V01-GTR		CY15B128J-SXAT		

4 Comparison of FM24V02/FM24V01 and CY15B256J/CY15B128J

Table 3. Detailed Comparison Table

	FM24V02/FM24V01	CY15B256J/CY15B128J	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 µA @ 100 KHz 400 µA @ 1 MHz 1000 µA @ 40 MHz	175 µA @ 100 KHz 400 µA @ 1 MHz 1000 µA @ 40 MHz	Identical
Standby Current (max)	150 µA @ 85 °C	150 µA @ 85 °C	Identical
Sleep Current (max)	8 µA @ 85 °C	8 µA @ 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 µs	250 µs	Identical
Device ID	004100h (FM24V01)	004121h (CY15B128J)	Different. Refer to Device ID section in Critical Considerations for more details.
	004200h (FM24V02)	004221h (CY15B256J)	
Sleep function	The I ² C F-RAM enters Sleep Mode irrespective of the STOP condition	The I ² 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.

	FM24V02/FM24V01	CY15B256J/CY15B128J	Comments
Output LOW voltage (max)	$V_{OL} = 0.2 \text{ V} @ I_{OL} = 150 \mu\text{A}, V_{DD} \geq 2.0 \text{ V}$	Not specified. This is not an industry standard specification	—
Output LOW voltage (max)	$V_{OL} = 0.4 \text{ V} @ I_{OL} = 2 \text{ mA}, V_{DD} \geq 2.7 \text{ V}$	$V_{OL} = 0.4 \text{ V} @ I_{OL} = 3 \text{ mA}, V_{DD} \geq 2.0 \text{ V}$	CY15B256J/CY15B128J has better spec of higher drive current at lower V_{DD}
Output LOW voltage (max)	—	$V_{OL} = 0.6 \text{ V} @ I_{OL} = 6 \text{ mA}, V_{DD} \geq 2.0 \text{ V}$	CY15B256J/CY15B128J has additional spec to meet the NXP I ² C specification
Data in hold ($t_{HD:DAT}$) @ 3.4 MHz	Min: 0 ns	Min: 0 ns Max: 70 ns	CY15B256J/CY15B128J has additional max spec to meet the NXP I ² C specification
Input rise time (t_R) @ 3.4 MHz	Max: 80 ns	Min: 10 ns Max: 80 ns	CY15B256J/CY15B128J has additional min spec to meet the NXP I ² C specification
Input fall time (t_F) @ 3.4 MHz	Max: 80 ns	Min: 10 ns Max: 80 ns	CY15B256J/CY15B128J has additional min spec to meet the NXP I ² 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	CY15B256J/CY15B128J has additional min spec to meet the NXP I ² C specification
ACK output valid time ($t_{VD:ACK}$) @ 3.4 MHz	—	Max: 130 ns	CY15B256J/CY15B128J has additional max spec to meet the NXP I ² C specification
ACK output valid time ($t_{VD:ACK}$) @ 1 MHz	—	Max: 450 ns	CY15B256J/CY15B128J has additional max spec to meet the NXP I ² C specification
Output fall time from V_{IH} min to V_{IL} max (t_{OF}) @ 3.4 MHz	—	Max: 80 ns	CY15B256J/CY15B128J has additional max spec to meet the NXP I ² 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	CY15B256J/CY15B128J has additional spec to meet the NXP I ² C specification

5 Critical Considerations

You should consider all the parameter differences mentioned in [Table 3](#) during the migration to CY15B256J/CY15B128J. 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 CY15B256J/CY15B128J 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](#) provides a Device ID of FM24V02/FM24V01 and CY15B256J/CY15B128J. System software needs to be updated for Device ID while migrating to the CY15B256J/CY15B128J.

Table 4. Device ID

Device ID ^[Note]	
FM24V01	CY15B128J
004100h	004121h
FM24V02	CY15B256J
004200h	004221h

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 CY15B256J/CY15B128J 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 I2C-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 I2C-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 CY15B256J/CY15B128J, 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 CY15B256J/CY15B128J.

6 Summary

AN97793 discussed the differences between FM24V02/FM24V01 and CY15B256J/CY15B128J that need to be considered during migration to the CY15B256J/CY15B128J.

7 Related Documents

Datasheets

- [CY15B256J: 256-Kbit \(32K × 8\) Automotive Serial \(I2C\) F-RAM](#)
- [CY15B128J: 128-Kbit \(16K × 8\) Automotive Serial \(I2C\) F-RAM](#)

Document History

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Revision	ECN	Orig. of Change	Submission Date	Description of Change
**	4800997	GVCH	06/17/2015	New application note
*A	5623862	GVCH	02/08/2017	Updated "Device Compatibility" section. Updated Table 3 : Changed "Power-Up to First Access (t _{PU})" parameter spec value from 1 ms to 250 μs for FM25V02A part. Critical Considerations section: Removed "Power-Up to First Access (t _{PU})" description (not applicable).
*B	5711657	HARA	08/17/2017	Updated logo and copyright.

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