Migrating from FM18L08 to FM28V020

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Associated Project: No
Associated Part Family: FM18L08, FM28V020
Software Version: None
Related Documents: For a complete list, click here

AN108 discusses the key differences that need to be considered when migrating from FM18L08 to FM28V020. FM18L08 is now obsolete and this application note explains how FM28V020 is a replacement for FM18L08.

Introduction

FM28V020, a 256-Kbit parallel F-RAM™, is a replacement device for FM18L08, which is now obsolete. For most designs, the FM28V020 device can be considered equivalent or better than the FM18L08. The two devices are identical in terms of pinout, package composition and dimensions, and read/write functionality. The FM28V020 also incorporates a page-mode feature that allows read/write operations up to 25 MHz. This application note discusses the key differences between the two devices that need to be considered when migrating from FM18L08 to FM28V020.

Drop-In Replacement or Not?

From a software point of view, the two devices are identical. From a hardware point of view, the key difference between the two devices is the FM28V020's higher standby current. The FM28V020 adds more features like operation down to 2.0 V, page-mode, and lower active current. The page mode feature could present an issue in systems that change the address in the middle of an access. Figure 1 gives the timing diagram. Table 1 shows the compatibility chart of FM18L08 and FM28V020. For a detailed comparison, see Table 3.

Table 1. Compatibility chart

FM18L08 Feature or Spec	Is FM28V020 compatible?
Package	Yes
Pinout	Yes
Temperature Range	Yes
Operating Voltage	Yes
Operating Current	Yes
Standby Current	No
Read / Write Function	Yes
Timing / Frequency	Yes[1]
Data Retention	Refer to Table 3
Endurance	Yes

Note:
1. Assumes that the address is held throughout a read cycle and $\overline{OE}$ is not in the critical path.

Figure 1. Difference in Response to Address Change (Read Cycle)
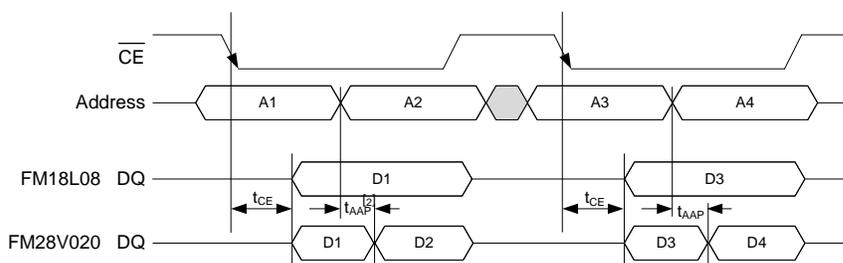
Note:
2. t_{AAP} is the page mode address access time. FM18L08 does not have page mode feature.

Ordering Part Numbers

Table 2 gives the recommended FM28V020 ordering part numbers that correspond to the now obsolete FM18L08 ordering part numbers.

Table 2. Recommended Ordering Part Numbers for Migration

FM18L08		FM28V020	
Ordering Part Number	Status	Ordering Part Number	Status
FM18L08-SG	Obsolete	FM28V020-SG	In production
FM18L08-SGTR		FM28V020-SGTR	
FM18L08-TG		FM28V020-TG	
FM18L08-TGTR		FM28V020-TGTR	

Comparison of FM18L08 and FM28V020

Table 3 gives a detailed comparison of the two devices.

Table 3. Detailed Comparison

	FM18L08	FM28V020	Comments
Package Types	-SG, -PG, -TG	-SG, -TG	Identical "Green" SOIC and TSOP package. "Green" DIP package is not offered in FM28V020.
Package Outlines	SOIC-28, DIP-28, TSOP-32	SOIC-28, TSOP-32	Identical SOIC and TSOP outline and board footprint. DIP package is not offered in FM28V020.
Pinout	-	-	Identical
Temperature Range	–40 ºC to +85 ºC	–40 ºC to +85 ºC	Identical
Operating Voltage Range	3.0 V to 3.65 V	2.0 V to 3.6 V	FM28V020 allows operation down to 2 V
Active Supply Current (I_{DD})	15 mA	8 mA	FM28V020 offers lower active current
Standby Current (CMOS)	15 µA	150 µA	FM28V020 has higher Standby Current
Standby Current (TTL)	400 µA	Not Specified	
Access Time	70 ns	70 ns	Identical
Cycle Time	140 ns	140 ns	Identical
Read / Write Function	-	-	Identical Read / Write function, Identical addressing
Address Hold Time (t_{AH})	15 ns	70 ns	FM28V020 requires a longer address hold time to avoid page mode access. Most systems will hold the address stable throughout the entire cycle but this is a timing parameter to check.
Output Enable Access Time (t_{OE})	10 ns	20 ns	In most system designs, $\overline{OE}$ is not in the critical path but this is a parameter to check
Data Retention	45 years (+85 ºC)	10 years (+85 ºC) 38 years (+75 ºC) 151 years (+65 ºC)	Data retention is lower
Endurance (Write/Read Cycles)	Unlimited	1E+14	FM28V020's endurance is large enough to be considered as unlimited for all practical applications. For a 256-byte loop, at 200 ns cycle time FM28V020's endurance is 182 years.

	FM18L08	FM28V020	Comments
V_{DD} Power-Up Ramp Rate (t_{VR})	-	50 μs / V	Power-up ramp rate should be slower than 50 μs / V for FM28V020
V_{DD} Power-Down Ramp Rate (t_{VF})	-	100 μs / V	Power-down ramp rate should be slower than 100 μs / V for FM28V020
Power-Up to First Access (t_{PU})	1 μs	250 μs	FM28V020 slower to first access
Chip Enable Active Time Max (t_{CA})	2000 ns	-	FM28V020 has no restrictions
$\overline{CE}$ pulsed every access	Yes	-	FM28V020 responds to address changes while $\overline{CE}$ is low
Page Mode Access (t_{AAP})	-	Yes	FM28V020 in-page accesses up to 25 MHz

Critical Considerations

You should consider all the parameter differences mentioned in Table 3 during the migration to FM28V020. This section discusses the critical differences. System designers should also review the datasheet when migrating to the new part.

Page Mode Access

The FM28V020 supports page mode access while the FM18L08 doesn't. This could pose an issue in systems that change the address in the middle of an access. In such systems, when FM18L08 is replaced by FM28V020, the output data could change in the middle of an access. System designers should consider this during migration.

Address Hold Time (t_{AH})

The FM28V020 requires a longer address hold time to avoid page mode access. It is 70 ns in FM28V020 compared to 15 ns in FM18L08. Most systems will hold the address stable throughout the entire cycle but this timing parameter should be considered during migration.

Output Enable Access Time (t_{OE})

The output enable access time is higher in FM28V020. It is 20 ns in FM28V020 compared to 10 ns in FM18L08. In most system designs, $\overline{OE}$ is not in the critical path but this parameter should be considered during migration.

V_{DD} Ramp Rate

V_{DD} power-up and power-down ramp rate specifications are added in FM28V020 device. Ensure that the power-up ramp rate is slower than 50 μs / V and power-down ramp rate is slower than 100 μs / V in your system.

Power-Up to First Access

Power-up to first access specification is slower in FM28V020 device. Ensure that the FM28V020 device is accessed only after 250 μs from power-up.

Summary

AN108 discussed the differences between FM18L08 and FM28V020 that need to be considered during migration to the FM28V020.

Related Documents

Datasheet

FM28V020: 256-Kbit (32 K × 8) F-RAM Memory datasheet

Document History

Document Title: Migrating from FM18L08 to FM28V020 - AN108

Document Number: 001-86810

Revision	ECN	Orig. of Change	Submission Date	Description of Change
**	3944550	GVCH	03/26/2013	New Spec
*A	4280097	MEDU	03/05/2014	Updated to Cypress Template
				Updated Active Supply Current for FM28V020 from "12 mA @ 90ns cycle" to "8 mA @ 140 ns cycle"
				Updated Access Time for FM28V020 from 60 ns to 70 ns
				Updated Cycle Time for FM28V020 from 90 ns to 140 ns
				Updated "Address Hold Time" for FM28V020 from 60 ns to 70 ns
				Updated "Output Enable Access Time" for FM28V020 from 15 ns to 20 ns
				Added data retention spec to FM28V020 at 85 ºC
				Added Standby Current (TTL) spec in
*B	4498657	GVCH	09/25/2014	Changed title from "Differences between FM18L08 and FM28V020" to "Migrating from FM18L08 to FM28V020."
				Updated abstract.
				Added "Ordering Part Numbers" section.
				Added title for Table 3.
				Added "Related Documents" section.

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