Migrating from FM20L08 to FM28V100

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Associated Project: No
Associated Part Family: FM20L08, FM28V100
Software Version: None
Related Documents: For a complete list, click here

AN109 discusses the key differences that need to be considered when migrating from FM20L08 to FM28V100. FM20L08 is now obsolete and this application note explains how FM28V100 is a replacement for FM20L08.

Introduction

FM28V100, a 128-Kbit F-RAM™, is a replacement device for FM20L08, which is now obsolete. For most designs, the FM28V100 can be considered equivalent or better than the FM20L08. The two devices are identical in terms of package composition and dimensions, read / write functionality, and address pin functionality. The pinout is almost identical except for two pins (highlighted in Figure 1). This application note discusses the key differences between the two devices that should be considered when migrating from FM20L08 to FM28V100.

Drop-In Replacement or Not?

From a software point of view, the two devices are identical. From a hardware point of view, the key differences between the two devices are pinout, standby current, operating voltage and some timing parameters. Table 1 shows the compatibility chart of FM20L08 and FM28V100. For a detailed comparison, see Table 3.

Table 1. Compatibility Chart

FM20L08 Feature or Spec	Is FM28V100 compatible?
Package	Yes
Pinout	No
Temperature Range	Yes
Operating Voltage	Yes
Operating Current	Yes
Standby Current	No
Read / Write Function	Yes
Timing / Frequency	Yes
Data Retention	Yes
Endurance	Yes

Pinout

The two parts, FM20L08 and FM28V100 have differences at pin 6 and pin 9. The older part, FM20L08 has DNU on pin 6 and $\overline{LVL}$ on pin 9 while the FM28V100 has CE2 on pin 6 and NC on pin 9 as shown in Figure 1.

Figure 1. FM28V100 and FM20L08 Pin Assignments in 32-pin TSOP-I
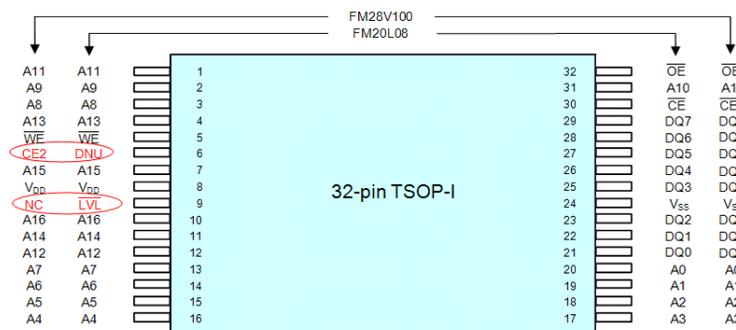
When replacing an FM20L08 with an FM28V100, the PCB will likely not require any change.

Pin 6: Since the pin is DNU on the FM20L08, there would be no connection on the PCB to pin 6. On the FM28V100, this pin is CE2 with an internal pull-up resistor. This ensures that CE2 is always enabled even without a PCB connection to the pin.

Pin 9: The $\overline{\text{LVL}}$ pin of the FM20L08 is an output pin. In the replacement part, FM28V100, pin 9 is NC. As most designs do not use the FM20L08 $\overline{\text{LVL}}$ pin, the pin would be left unconnected on the PCB and hence the FM28V100 can be a direct drop-in replacement with no PCB changes. In applications where $\overline{\text{LVL}}$ is used, it should be noted that $\overline{\text{LVL}}$ feature is not supported in the FM28V100. Also, since Pin 9 of FM28V100 is NC, the external circuitry will no longer be driven and hence it is recommended to add a pull-up resistor to pin 9.

The primary connections after migration are shown in Figure 2. The active-low chip enable is $\overline{\text{CE}}$ on the FM20L08 and $\overline{\text{CE1}}$ on the FM28V100. Both are identical in functionality.

Figure 2. Primary connections after migration
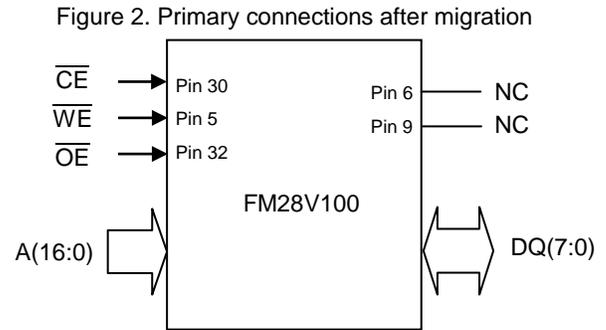
Ordering Part Numbers

Table 2 gives the recommended FM28V100 ordering part numbers that correspond to the now obsolete FM20L08 ordering part numbers.

Table 2. Recommended Ordering Part Numbers for Migration

FM20L08		FM28V100	
Ordering Part Number	**Status**	**Ordering Part Number**	**Status**
FM20L08-TG	Obsolete	FM28V100-TG	In production
FM20L08-TGTR		FM28V100-TGTR	

Comparison of FM20L08 and FM28V100

Table 3 gives a detailed comparison of the two devices.

Table 3. Detailed Comparison

	FM20L08	FM28V100	Comments
Package Types	-TG	-TG	Identical "green" package
Package Outlines	TSOP-32	TSOP-32	Identical
Pinout	Pin 6 is DNU and Pin 9 is $\overline{\text{LVL}}$	Pin 6 is CE2 and Pin 9 is NC	The design considerations for the differences in Pin 6 and Pin 9 have been discussed in the previous section
Temperature Range	–40 ºC to +85 ºC	–40 ºC to +85 ºC	Identical
Operating Voltage Range	3.0 V to 3.6 V	2.0 V to 3.6 V	FM28V100 allows operation down to 2 V
Active Supply Current	22 mA @ 350 ns cycle	12 mA @ 90 ns cycle	The FM28V100 offers lower active current
Standby Current	25 µA	150 µA	FM28V100 has higher standby current
Read / Write Function	-	-	Identical Read / Write function, Identical addressing
Access Time	60 ns	60 ns	Identical
Cycle Time	350 ns	90 ns	FM28V100 is faster

	FM20L08	FM28V100	Comments
Output Hold Time (t_{OH})	50 ns	20 ns	FM28V100 requires that the system latch the read data sooner than in the FM20L08. This is only a concern for the Read Cycle Timing 1 case (address controlled read). Most systems latch data when address changes and hence this is not an issue for replacement. However check this timing parameter in your system design.
Page Mode Address Access Time (t_{AAP})	25 ns	30 ns	FM28V100 is slower for page mode reads. Hence this timing parameter in the system should be checked if the Page Mode addressing is used.
Data Retention	10 years (+85 ºC)	10 years (85 ºC) 38 years (+75 ºC) 151 years (+65 ºC)	Identical
Endurance (Write/Read Cycles)	Unlimited	1E+14	FM28V100's endurance is large enough to be considered as unlimited for all practical applications. For a 256-byte loop, at 200 ns cycle time, FM28V100's endurance is 182 years.
V_{DD} Power-Up Ramp Rate (t_{VR})	50 µs / V	50 µs / V	Identical
V_{DD} Power-Down Ramp Rate (t_{VF})	100 µs / V	100 µs / V	Identical
Power-Up to First Access (t_{PU})	5 ms (t_{PULV} + t_{PU})	0.25 ms	FM28V100 is faster in first access
V_{IH} / V_{IL} Input Trip Points	2.2 V / 0.6 V	0.7 V_{DD} / 0.3 V_{DD}	Most controllers swing outputs rail-to-rail but this DC parameter should be checked

Critical Considerations

You should consider all the parameter differences mentioned in Table 3 during the migration to FM28V100. This section discusses the critical differences. System designers should also review the datasheet when migrating to the new part.

Pinout

Pinout of FM20L08 and FM28V100 are different with respect to Pin 9 and Pin 6. The system designer should consider this during migration.

Output Hold Time

FM28V100 requires the system to latch the read data sooner than in the FM20L08. This is only a concern for the Read Cycle Timing 1 case (address controlled read). Most systems latch data when address changes and hence this is not an issue for replacement. However check this timing parameter in your system design.

Summary

AN109 discussed the differences between FM20L08 and FM28V100 that need to be considered during migration to the FM28V100.

Related Documents

Datasheet

FM28V100: 1-Mbit (128 K × 8) F-RAM Memory datasheet

Document History

Document Title: Migrating from FM20L08 to FM28V100 - AN109

Document Number: 001-86811

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
*B	4498657	GVCH	09/25/2014	Changed title from "Differences between FM20L08 and FM28V100" to "Migrating from FM20L08 to FM28V100." Updated abstract. Added "Ordering Part Numbers" section. Added title for Table 3. Added "Related Documents" section.

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