

Comparing Spansion® S34ML01G1 with Macronix MX30LF1G08AA

1. Introduction

This application note is a guide for migrating to the Macronix MX30LF1G08AA from the Spansion® S34ML01G1 1Gb, 3V, NAND flash memory.

The document does not provide detailed information on the individual devices, but highlights the major similarities and differences between them. The comparison covers the general features, performance, command codes and other differences.

The information in this document is based on datasheets listed in Section 10. Newer versions of the datasheets may override the contents of this document.

2. Features

Both flash device families have similar features and functions as shown in Table 2-1.

Table 2-1: Feature Comparison

Feature	Macronix MX30LF1G08AA	Spansion S34ML01G1
Vcc voltage range	2.7V ~ 3.6V	2.7V ~ 3.6V
Bus Width	x8	x8
Operating Temperature	-40°C ~ 85°C	-40°C ~ 85°C
Interface	Standard NAND Interface	ONFI 1.0 Standard
Block Size	128KB+4KB	128KB+4KB
Page Size	2KB+64B	2KB+64B
ECC Requirement	1b/528B	1b/528B
OTP size	-	128KB
Guarantee Good blocks at shipping	Block 0	Block 0
Unique ID	-	ONFI standard
ID Code	C2h/F1h/80h/1Dh	01h/F1h/00h/1Dh
ONFI signature	-	4Fh/4Eh/46h/49h
Data Retention	10 Years	10 Years
Package	48-TSOP (12x20mm) 63-VFBGA (9x11mm)	48-TSOP (12x20mm) 63-VFBGA (9x11mm)

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3. Performance

Table 3-1 and Table 3-2 show MX30LF1G08AA and S34ML01G1 Read/Write performance.

Table 3-1: Read Function Performance (Read Latency time and Sequential Read)

Read function	Macronix MX30LF1G08AA	Spansion S34ML01G1
Read Latency time (tR)	25us (max.)	25us (max.)
Sequential Read time (tRC)	30ns (min.)	25ns (min.)

Table 3-2: Write Function Performance (Program and Erase)

Write Function	Macronix MX30LF1G08AA	Spansion S34ML01G1
Page Program time (tPROG)	250us (typ.)/700us (max.)	200us (typ.)/700us (max.)
Block Erase time (tERASE)	2ms (typ.)/3ms (max.)	2ms (typ.)/3ms (max.)
NOP	4 (max.)	4 (max.)
Write/Erase Cycles* ¹ (Endurance)	100,000	100,000

Note: 100K Endurance cycle with ECC protection.

4. DC Characteristics

Read/Write power requirements (Table 4-1) and I/O voltage limits (Table 4-2) are similar.

Table 4-1: Read / Write Current

DC Characteristic	Macronix MX30LF1G08AA	Spansion S34ML01G1
Sequential Read Current (ICC1)	15mA (typ.)/30mA (max.)	15mA (typ.)/30mA (max.)
Program Current (ICC2)	15mA (typ.)/30mA (max.)	15mA (typ.)/30mA (max.)
Erase Current (ICC3)	15mA (typ.)/30mA (max.)	15mA (typ.)/30mA (max.)
Standby Current – CMOS	10uA (typ.)/50uA (max.)	10uA (typ.)/50uA (max.)

Table 4-2: Input / Output Voltage

DC Characteristic	Macronix MX30LF1G08AA	Spansion S34ML01G1
Input Low Voltage (VIL)	-0.3V (min.) / 0.2VCC (max.)	-0.3V (min.) / 0.2VCC (max.)
Input High Voltage (VIH)	0.8VCC (min.) / VCC+0.3V (max.)	0.8VCC (min.) / VCC+0.3V (max.)
Output Low Voltage (VOL)	0.4V (max.)	0.4V (max.)
Output High Voltage (VOH)	2.4V (min.)	2.4V (min.)

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5. Package Pin/Ball Definition

Package physical dimensions are similar to each other. For detailed information, please refer to the individual datasheets. Tables 5-1 and 5-2 show differences in pin assignments between the Macronix and Spansion devices. However because the corresponding pins of the Macronix MX30LF1G08AA are NC (no connect / not bonded), the S34ML01G1 can be compared by the MX30LF1G08AA without pin conflicts. Only 48-TSOP pin #35 (ball G3 on VFBGA) may need special attention because the pin is designated “DNU” (Do Not Use) on the MX30LF1G08AA-TI. A DNU pin should not be connected to any signal or power trace on the board.

Figure 5-1: 48-TSOP (12x20mm) Package and Pin Layout Comparison

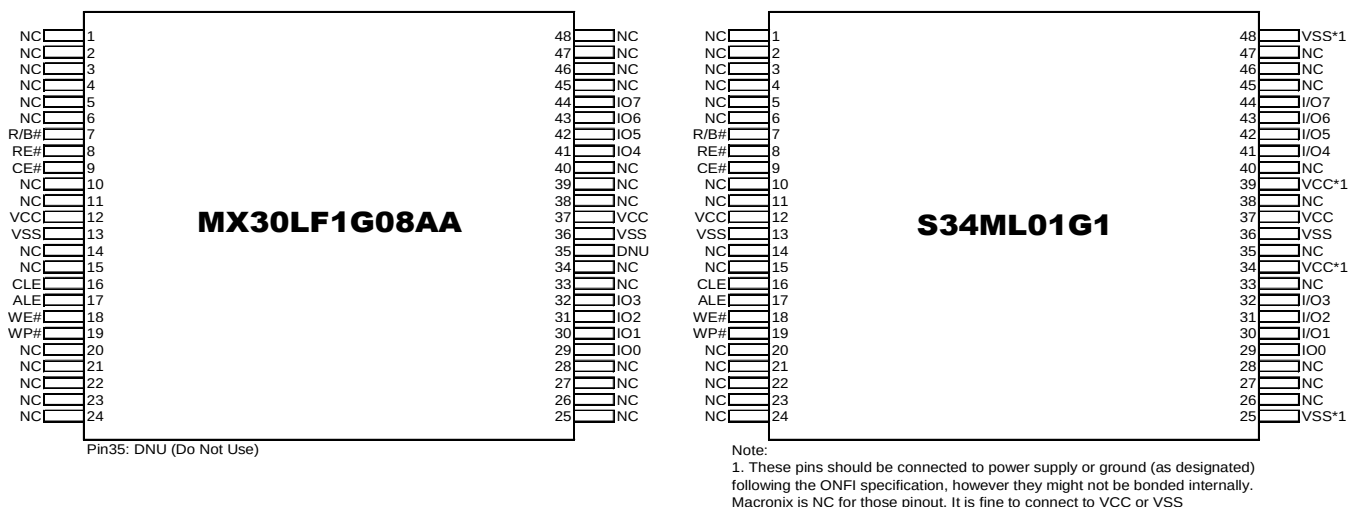
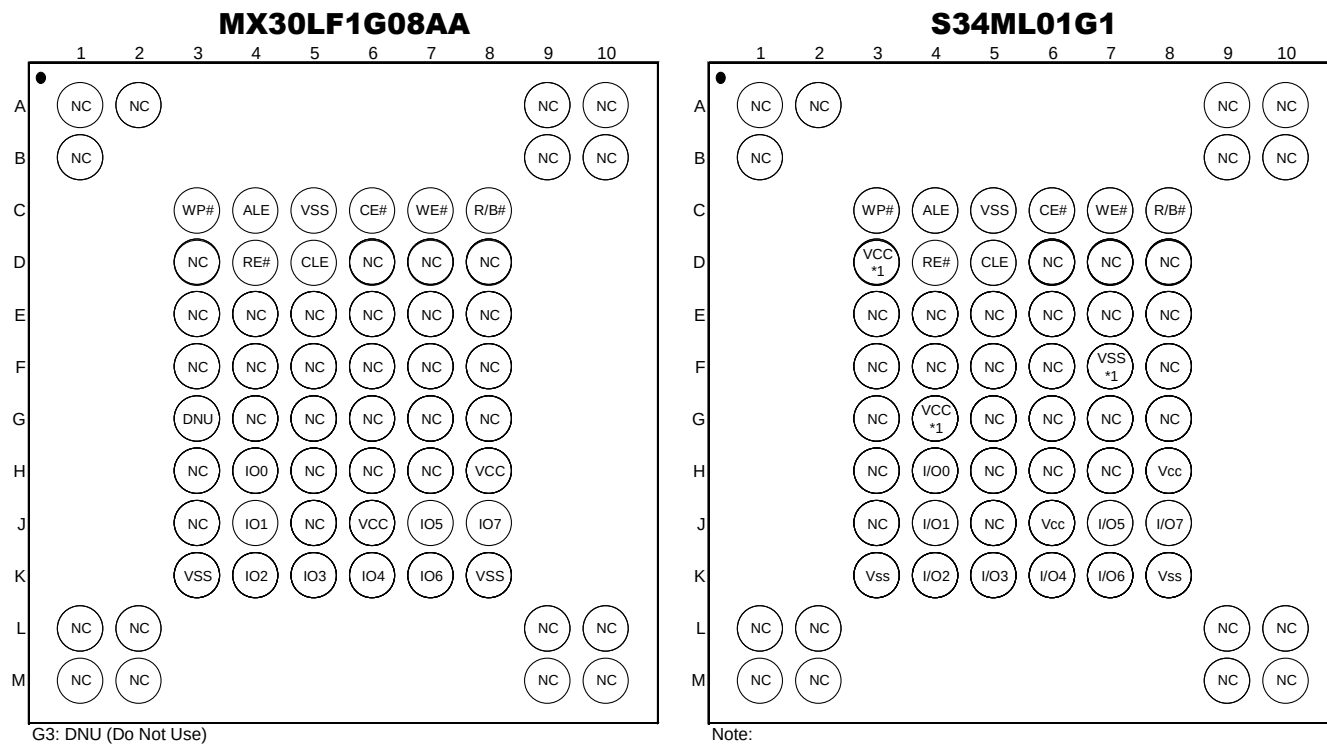


Table 5-1: 48-TSOP Package Pin Definition

Brand	Macronix	Spansion
Part Name	MX30LF1G08AA-TI	S34ML01G1
#48 pin	NC	VSS (might not be bonded, just for ONFI compatibility)
#39 pin	NC	VCC (might not be bonded, just for ONFI compatibility)
#35 pin	DNU	NC
#34 pin	NC	VCC (might not be bonded, just for ONFI compatibility)
#25 pin	NC	VSS (might not be bonded, just for ONFI compatibility)

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Figure 5-2: 63-VFBGA (9x11mm) Package and Pin Layout Comparison



Note:

1. These pins should be connected to power supply or ground (as designated) following the ONFI specification, however they might not be bonded internally. Macronix is NC for those pinout, and it is fine to connect to Vcc or Vss

Table 5-2: 63-VFBGA Package Ball Definition

Brand	Macronix	Spansion
Part Name	MX30LF1G08AA-XKI	S34ML01G1
#D3 ball	NC	VCC (might not be bonded, just for ONFI compatibility)
#G3 ball	DNU	NC
#G4 ball	NC	VCC (might not be bonded, just for ONFI compatibility)
#F7 ball	NC	VSS (might not be bonded, just for ONFI compatibility)

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6. Command Set

Basic command sets and status checking methods are similar.

The Read and Write operation commands are identical, but the devices have different command sequences when accessing the cache read function. Additionally, Macronix supports a cache program function and Spansion® does not (Table 6-1).

Table 6-1: Command Table

Command	Macronix MX30LF1G08AA		Spansion S34ML01G1	
	1st Cycle	2nd Cycle	1st Cycle	2nd Cycle
Random Data Input	85h	-	85h	-
Random Data Output	05h	E0h	05h	E0h
Cache Read Begin	00h	31h	31h	-
Read Mode	00h	30h	00h	30h
Cache Read End	34h	-	3Fh	-
Read ID	90h	-	90h	-
Reset	FFh	-	FFh	-
Page Program	80h	10h	80h	10h
Cache Program	80h	15h	-	-
Block Erase	60h	D0h	60h	D0h
Read Status	70h	-	70h	-
Read Parameter Pg.	-	-	ECh	-

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6-2 Status Register

When a flash read/program/erase operation is in progress, either the “Ready/Busy# pin checking” or “Status output checking” may be used to monitor the operation. Both are standard NAND flash algorithms and can be used for both device families. Table 6-2 shows that Status output content provided by the Read Status command (70h) is compatible.

Table 6-2: Status Output

Status Output	Macronix MX30LF1G08AA	Spansion S34ML01G1
SR[0]	PGM/ERS status: Pass/Fail	PGM/ERS status: Pass/Fail
SR[1]	Cache Program status: Pass/Fail	Cache Program status: Pass/Fail
SR[2]	Reserved	Reserved
SR[3]	Reserved	Reserved
SR[4]	Reserved	Reserved
SR[5]	PGM/ERS/Read internal controller: Ready/Busy	PGM/ERS/Read internal controller: Ready/Busy
SR[6]	PGM/ERS/Read status: Ready/Busy	PGM/ERS/Read status: Ready/Busy
SR[7]	Write Protect	Write Protect

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7. Read ID Command

The ID of the Macronix MX30LF1G08AA begins with a one-byte Manufacturer Code followed by a three-byte Device ID. While the same command set is used to read the Manufacturer ID, Device ID, and flash structure, the IDs are different, allowing software to identify the device manufacturer and device type (Table 7-1).

Table 7-1: Manufacturer and Device IDs

ID code		Macronix MX30LF1G08AA	Spansion S34ML01G1
Value		C2h/F1h/80h/1Dh	01h/F1h/00h/1Dh
1 st Code		Manufacturer Code	Manufacturer Code
2 nd Code		Device Identifier	Device Identifier
3 rd Code	IO1, IO0	Number of Die per Chip Enable	Number of Die per Chip Enable
	IO3, IO2	Cell Structure	Cell Structure
	IO5, IO4	Number of Simultaneously Programmed Pages	Number of Simultaneously Programmed Pages
	IO6	Interleaved Programming Between Multiple Chips	Interleaved Programming Between Multiple Chips
	IO7	Cache Program	Cache Program
4 th Code	IO1, IO0	Page Size (exclude Spare Area)	Page Size (exclude Spare Area)
	IO2	Size of Spare Area (Byte per 512Byte)	Size of Spare Area (Byte per 512Byte)
	IO7, IO3	Sequential Read Cycle Time (tRC)	Serial Access Time (tRC)
	IO5, IO4	Block Size (exclude Spare Area)	Block Size (exclude Spare Area)
	IO6	Organization	Organization

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8. Power-Up Timing

Macronix and Spansion® power-up sequences are similar, but the timing is slightly different. Macronix defines 2.5V (V_{th}) as the measurement point while Spansion® uses 2.7V ($V_{cc \text{ min.}}$) as the measurement point. Check the system timing to determine if adjustments are needed.

Table 8-1: Power-Up Timing

H/W Timing Characteristic	Macronix MX30LF1G08AA	Spansion S34ML01G1
V_{th} (2.5V) to WE# low	1 μ s (min.)	N/A
$V_{cc \text{ (min.)}}$ to WE# low	N/A	100 μ s (max.)
V_{th} (2.5V) to R/B# low	1ms (max.)	N/A
$V_{cc \text{ (min.)}}$ to R/B# low	N/A	5ms (max.)

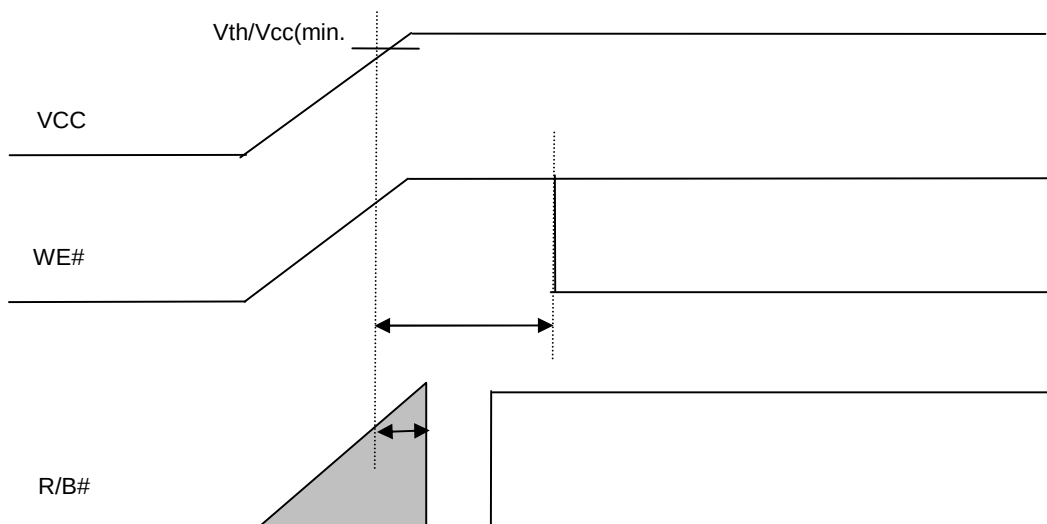


Figure 8-1: Power-Up Timing

9. Summary

Macronix MX30LF1G08AA and Spansion® S34ML01G1 NAND have similar features and pinouts. While basic read/program/erase commands are the same, more advanced features such as cache access are implemented slightly differently. Overall, device migration may require minimal or no firmware modifications.

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10. Reference

Table 10-1 shows the datasheet versions used for comparison in this application note. For the most current, detailed Macronix specification, please refer to the Macronix Website at <http://www.macronix.com>

Table 10-1: Datasheet Version

Datasheet	Location	Date Issue	Revision
MX30LF1G08AA	-	MAR. 28, 2013	Rev. 1.2
S34ML01G1_04G1	-	MAR. 7, 2013	Rev. 15

Note: Macronix data sheet is subject to change without notice.

11. Appendix

Cross Reference Table 11-1 shows basic part number and package information for the Macronix MX30LF1G08AA and Spansion® S34ML01G1 product families.

Table 11-1: Part Number Cross Reference

Density	Macronix Part No.	Spansion Part No.	Package	Dimension
1Gb	MX30LF1G08AA-TI	S34ML01G100TFI00	48-TSOP	12x20mm
	MX30LF1G08AA-XKI	S34ML01G100BHI00	63-VFBGA	9x11x1.0mm

12. Revision History

Revision	Description	Date
1.0	Initial Release	Sep. 11, 2013



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