

Comparing Cypress® S29GL-S with Macronix MX29GL-G (512Mb/1Gb)

1. Introduction

This application note compares Macronix MX29GL-G and Cypress® S29GL-S Parallel NOR Flash. The comparison covers the general features, performance, command codes, and other differences. The document does not provide detailed information on individual devices, but highlights differences that may require additional attention for a successful migration.

The MX29GL-G is compatible with the common commands and features of the S29GL-S. Additionally, the supported package types have similar footprints and pin-out definitions.

The information in this document is based on the latest datasheets listed in "[11. References](#)". Newer versions of the datasheets may override the contents of this document.

Both flash device families have similar features and functions as shown in "[Table 1-1: Key Feature Comparison](#)".

Table 1-1: Key Feature Comparison

Feature	Macronix MX29GL-G	Cypress® S29GL-S
Technology	55nm Floating Gate	65nm MirrorBit
VCC Range	2.7V to 3.6V	2.7V to 3.6V
I/O Voltage Range	2.7V to 3.6V (H/L type) 1.65V to 3.6V (U/D type)	2.7V to 3.6V (01/02 type) 1.65V to 3.6V (V1/V2 type)
Data Bus Width	x16 / x8	x16 only
Sector Architecture	Uniform Sector 128KB	Uniform Sector 128KB
Read Page Size	16 Words / 32 Bytes	16 Words
Write Buffer Size	256 Words / 256 Bytes*	256 Words
Security OTP size	512 Words / 1024 Bytes	512 Words
Advanced Sector Protection	Yes**	Yes
ACC pin	Yes	-
Extended Status Register	Yes	Yes
Deep Power Down Mode	Yes	-
Blank Check	Yes	Yes
CFI Version	1.5	1.5
Read Performance	Up to 98 MB/s	Up to 98 MB/s
Buffer Program Performance	Up to 1.8MB/s	Up to 1.5MB/s
Sector Erase Performance	Up to 524 KB/s	Up to 477 KB/s

Notes: *Write Buffer size is 256 Bytes when using Macronix flash with a x8 Data Bus width.

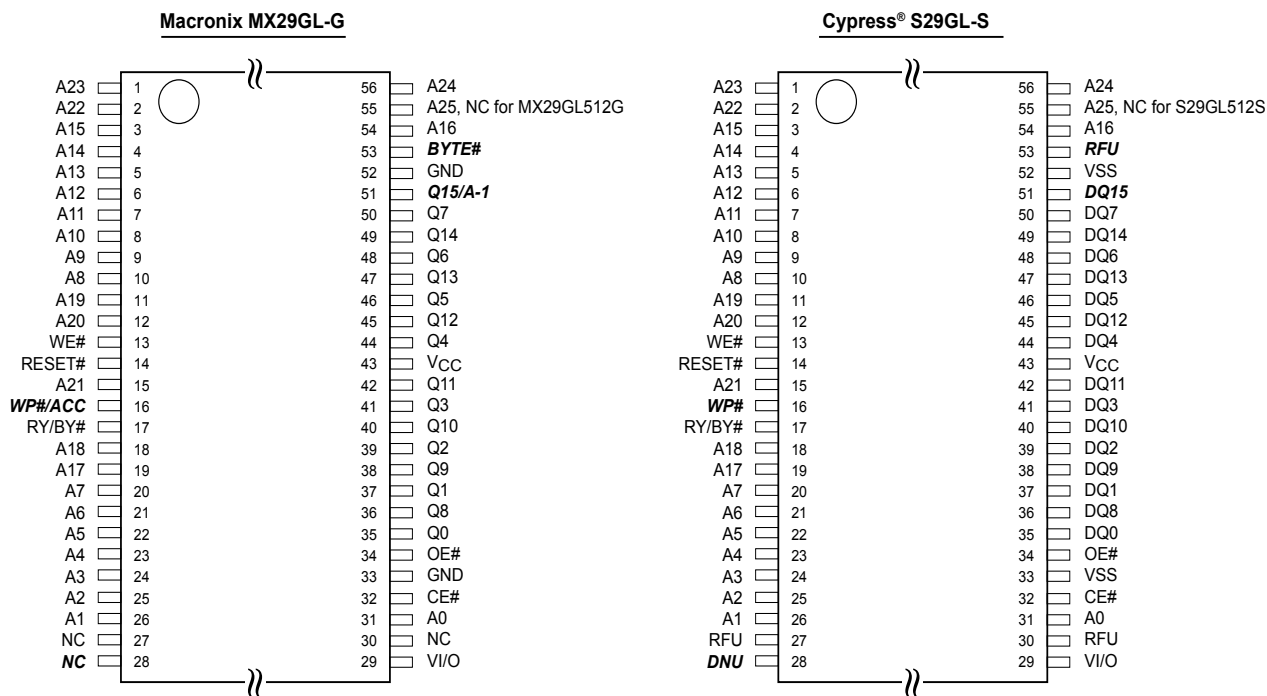
**Provide USPB feature.

2. Package

Macronix MX29GL-G series is available in 56-pin TSOP, 64-pin LFBGA, and 56-pin FBGA package options, which have similar pin-outs with the Cypress® S29GL-S devices. The footprint comparisons are shown in "Figure 2-1: 56-TSOP Pin-Out" and "Figure 2-2: 64-LFBGA Pin-Out". A summary of pin-out differences is shown in "Table 2-1: Pin-Out Comparison".

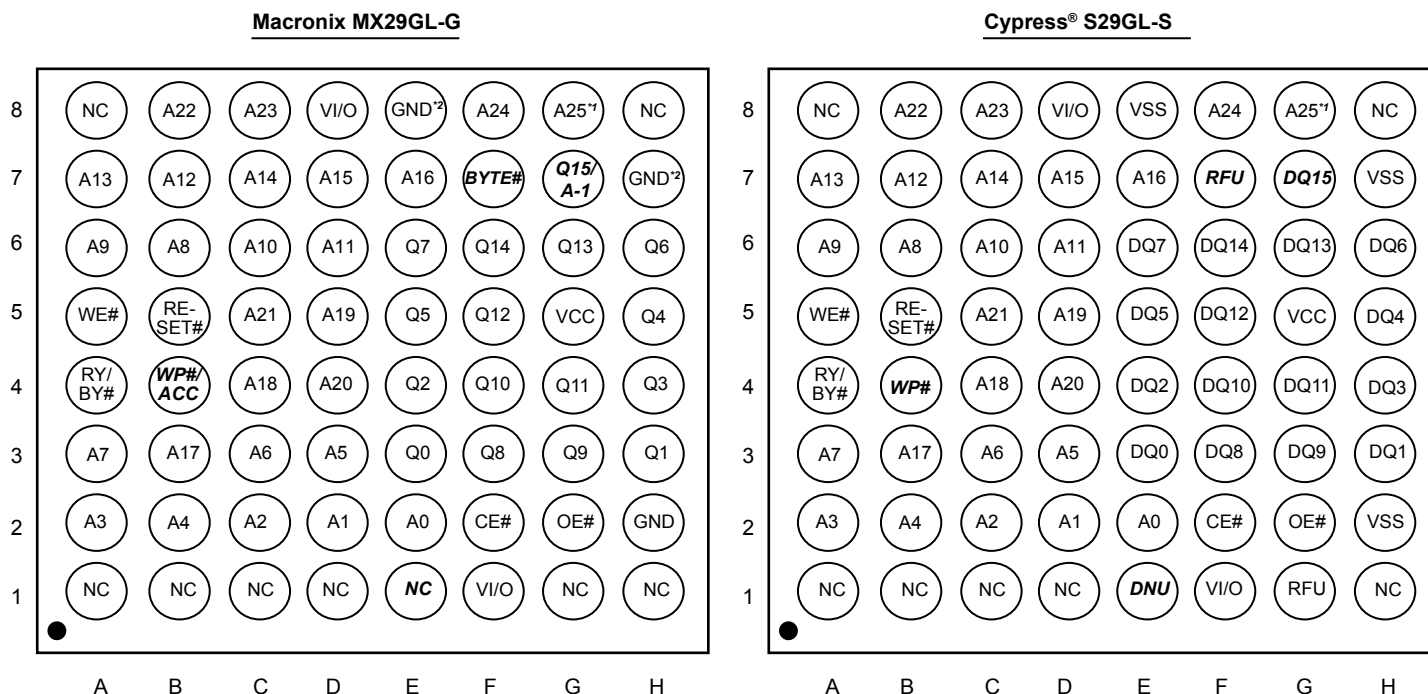
The 56-TSOP packages of the MX29GL-G are S29GL-S are pin compatible even though pin 53 is BYTE# on the Macronix MX29GL-G because BYTE# has an internal pull-up and can be left unconnected for x16 data bus width operation.

Figure 2-1: 56-TSOP Pin-Out



The 64-LFBGA packages of the MX29GL-G and S29GL-S are pin compatible even though pin F7 is BYTE# on the Macronix MX29GL-G because BYTE# has an internal pull-up and can be left unconnected for x16 data bus width operation.

Figure 2-2: 64-LFBGA Pin-Out



Notes: 1. G8(A25) is NC for MX29GL512G
2. Macronix F7 is BYTE# and should be left floating or pulled up to VI/O for x16 operation. Cypress F7 is RFU.

Notes: 1. G8(A25) is NC for S29GL512S

Table 2-1: Pin-Out Comparison

Package Pin		Signal Name		Remarks
56-TSOP (14x20mm)	64-LFBGA (11x13mm)	Macronix MX29GL-G	Cypress® S29GL-S	
16	B4	WP#/ACC	WP#	Cypress® S29GL-S does not support program acceleration voltage.
28	E1	NC	DNU	NC = Pin not connected internally. DNU = Do Not Use. Leave pin unconnected.
53	F7	BYTE#	RFU	Macronix MX29GL-G supports BYTE mode in the 56 TSOP and 64-LFBGA packages. The BYTE# pin should be left unconnected or pulled up to VI/O.
51	G7	Q15/A-1	DQ15	Cypress® S29GL-S does not support BYTE mode and does not have an A-1 pin.
-	-	NC	DNU	NC = Pin not connected internally. DNU = Do Not Use. Leave pin unconnected.
-	-	NC	RFU	NC = Pin not connected internally. RFU = Reserved for Future Use.

3. Commands

Macronix MX29GL-G is command compatible with the Cypress® S29GL-S. Please refer to the product datasheet for detailed descriptions the command set.

4. Electrical Characteristics

DC and AC characteristics are compared in ["Table 4-1: DC Characteristics"](#), ["Table 4-2: AC Characteristics"](#), and ["Table 4-3: Timing"](#) below.

Table 4-1: DC Characteristics

Parameter	Description		Type	Macronix MX29GL-G		Cypress® S29GL-S		Unit
				512Mb	1Gb	512Mb	1Gb	
Icr1	Read Current	f=1MHz	typ	5		-		mA
		f=5MHz		12		55		
		f=10MHz		20		-		
Icr2	Page Read Current	f=10MHz	typ	4	8	-		mA
		f=33MHz		6	12	9		
Icw	Write Current		typ	35		45		mA
Isb	Standby Current		typ	20	40	70		uA
Isbr	Reset Current		typ	20	40	10		uA
Isbs	Sleep Mode Current		typ	20	40	100		uA
Idpd	Vcc deep power down current		typ	3	6	-		uA
Vhv	Very High Voltage for Auto Select/Accelerated Program		min	9.5		-		V
			max	10.5		-		
Vil	Input Low Voltage		min	-0.1		-0.5		V
			max	0.3xVI/O		0.3xVI/O		
Vih	Input High Voltage		min	0.7xVI/O		0.7xVI/O		V
			max	VI/O+0.3		VI/O+0.4		
Vol	Output Low Voltage		max	0.45		0.15xVI/O		V
Voh	Output High Voltage		min	0.85xVI/O		0.85xVI/O		V
Vlko	Low Vcc Lock-out voltage		min	2.1		2.25		V
			max	2.4		2.5		

Table 4-2: AC Characteristics

Parameter	Description		Type	Macronix MX29GL-G	Cypress® S29GL-S	Unit
Taa	Valid data output after address	VI/O=VCC	max	100	100	ns
		VI/O=1.65 to VCC		110	110	
Tpa	Page access time	VI/O=VCC	max	15	15	ns
		VI/O=1.65 to VCC		25	25	
Tce	Valid data output after CE# low	VI/O=VCC	max	100	100	ns
		VI/O=1.65 to VCC		110	110	
Toe	Valid data output after OE# low	VI/O=VCC	max	25	25	ns
		VI/O=1.65 to VCC		30	35	

Table 4-3: Timing

Parameter	Description	Type	Macronix MX29GL-G	Cypress® S29GL-S	Unit
Tvcs	VCC Setup Time	min	300	300	us
Tvios	VI/O Setup Time	min	300	300	us
Trh	RESET# High Time Before Read	min	50	50	ns
Trp1	RESET# Pulse Width (During Automatic Algorithms)	min	10	0.2	us
Trp2	RESET# Pulse Width (Not During Automatic Algorithms)	min	0.2	0.2	us
Tready1	RESET# PIN Low (During Automatic Algorithms) to Read or Write	min	-	200	us
		max	30	-	
Tready2	RESET# PIN Low (Not During Automatic Algorithms) to Read or Write	min	-	200	us
		max	0.5	-	

5. Erase and Programming Performance

A comparison of erase and programming performance is shown in ["Table 5-1: Erase and Programming Performance"](#).

Table 5-1: Erase and Programming Performance

Description		Type	Macronix MX29GL-G		Cypress® S29GL-S		Unit
			512Mb	1Gb	512Mb	1Gb	
Chip Erase Time		typ	100	200	N/A		sec
Sector Erase Time		typ	0.25		0.28		sec
Word Program Time		typ	30		125		us
Total Write Buffer Time	32 Words	typ	-		175		us
	256 Words		284		340		
Total ACC Write Buffer Time		typ	200		N/A*		us
Write Buffer Program Throughput		typ	1.8		1.5		MB/Sec
ACC Write Buffer Program Throughput		typ	2.6		N/A*		MB/Sec
Erase/Program Cycles		typ	100,000		100,000		cycles

Note: Spansion® S29GL-S series do not support High Voltage ACC programming.

6. Memory Organization

The memory and sector architecture of Macronix MX29GL-G is identical to the Cypress® S29GL-S.

7. Device Identification

Manufacturer IDs are different, but Device IDs are the same.

Table 7-1: Manufacturer ID and Device ID

Parameter		Macronix MX29GL-G	Cypress® S29GL-S
Manufacturer ID		00C2h	0001h
Device ID (cycle 1)		227Eh	227Eh
Device ID (cycle 2)	512Mb	2223h	2223h
	1Gb	2228h	2228h
Device ID (cycle 3)		2201h	2201h

8. CFI Difference

The Common Flash Interface Register values are compared in ["Table 8-1: CFI Table Comparison"](#).

Table 8-1: CFI Table Comparison

Description	Address (h) (Word Mode)	Address (h) (Byte Mode)	Macronix MX29GL-G Data (h)	Cypress® S29GL-S Data (h)
Typical timeout per single word write, 2 ⁿ us	1F	3E	0005	0008
Max. timeout for single word write, 2 ⁿ times typical	23	46	0003	0001
Max. timeout for full chip erase, 2 ⁿ times typical (00h = not supported)	26	4C	0001	0003
Flash Device Interface Description 0 = x8-only, 1 = x16-only, 2 = x8/x16 capable	28	50	0002	0001
Temporary sector unprotect (1=supported)	48	90	0001	0000
Minimum ACC(acceleration) supply (0= not supported), [D7:D4] for volt, [D3:D0] for 100mV	4D	9A	0095	0000
Maximum ACC(acceleration) supply (0= not supported), [D7:D4] for volt, [D3:D0] for 100mV	4E	9C	00A5	0000
Erase Suspend Timeout Maximum < 2 ⁿ (us)	55	AA	0005	0006
Program Suspend Timeout Maximum < 2 ⁿ (us)	56	AC	0005	0006
Embedded Hardware Reset Timeout Maximum < 2 ⁿ (us) Reset with Reset Pin	78	F0	0005	0006

9. Part Number Cross-Reference

Cross Reference "[Table 9-1: Part Number Cross-Reference](#)" shows basic part number and package information for the Macronix MX29GL-G and Cypress® S29GL-S devices.

Table 9-1: Part Number Cross-Reference

Please contact Macronix regional sales for the latest product selection and available form factors.

Density	Package	Macronix MX29/68GL-G P/N	Cypress® S29GL-S P/N
512Mb	56-TSOP	MX29GL512GHT2I-10G	S29GL512S10TFI01
		MX29GL512GLT2I-10G	S29GL512S10TFI02
		MX29GL512GUT2I-11G	S29GL512S11TFIV1
		MX29GL512GDT2I-11G	S29GL512S11TFIV2
	64-LFBGA	MX29GL512GHXFI-10G	S29GL512S10FHI01
		MX29GL512GLXFI-10G	S29GL512S10FHI02
		MX29GL512GUXFI-11G	S29GL512S11FHIV1
		MX29GL512GDXFI-11G	S29GL512S11FHIV2
1Gb	56-TSOP	MX68GL1G0GHT2I-10G	S29GL01GS10TFI01
		MX68GL1G0GLT2I-10G	S29GL01GS10TFI02
		MX68GL1G0GUT2I-11G	S29GL01GS11TFIV1
		MX68GL1G0GDT2I-11G	S29GL01GS11TFIV2

Note: MX68GL1G0G is a 2-die solution and is included in the MX29GL-G family referenced in this document.

10. Summary

The MX29GL-G is command compatible with the S29GL-S. Additionally, the package options of the S29GL-S are also supported by the MX29GL-G with similar footprints and pin-out definitions. The 56-TSOP and 64-LFBGA packages of the MX29GL-G and S29GL-S are pin compatible.

11. References

"[Table 11-1: Datasheet Version](#)" 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 11-1: Datasheet Version

Datasheet	Date Issued	Version
MX29GL512G-MX68GL1G0G	Nov. 26, 2015	1.1
S29GL-S	Oct. 09, 2013	08

12. Revision History

Table 12-1: Application Note Revision

Revision No.	Description	Page	Date
Rev. 1	Initial Release	ALL	July 05, 2013
Rev. 2	Revised " Table 1-1: Key Feature Comparison ", " 2. Package ", " Table 4-1: DC Characteristics ", " Table 4-3: Timing ", " Table 5-1: Erase and Programming Performance ", " Table 8-1: CFI Table Comparison ", " Table 9-1: Part Number Cross-Reference ", " Table 11-1: Datasheet Version "	1, 4-9	May 30, 2014
Rev. 3	1. Content modification. 2. Revised and added a statement for " Table 9-1: Part Number Cross-Reference ". 3. Added "Macronix Proprietary" footnote.	ALL	January 26, 2018



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