

Technical Note

Migrating from Micron M29AW Devices to MT28EW NOR Flash Devices

Introduction

This technical note describes the process for converting a system design for the Micron M29AW multi-level cell NOR Flash device to a system design for the Micron MT28EW single-level cell NOR Flash device, 512Mb and 1Gb densities.

The MT28EW device is drop-in compatible with the M29AW device. This document highlights the following minor differences between the two devices: V_{PPH} level, Device code cycle 2 for 512Mb, Read password, and CFI values.

This document is written based on device information available at publication time. In case of inconsistency, information contained in the relevant MT28EW data sheet supersedes the information in this technical note. This technical note does not provide detailed device information. The standard density specific device data sheet provides a complete description of device functionality, operating modes, and specifications.



Comparative Overview

The MT28EW is compatible with the M29AW 512Mb and 1Gb devices, but provides superior program and erase performance.

Table 1: Part Number Comparison

Package Type	Density	Part Number	
		MT28EW	M29AW
56-pin TSOP (14mm x 20mm)	512Mb	MT28EW512ABA1HJS-0AAT	JS28F512M29AWHx
		MT28EW512ABA1LJS-0AAT	JS28F512M29AWLx
	1Gb	MT28EW01GABA1HJS-0AAT	JS28F00AM29AWHx
		MT28EW01GABA1LJS-0AAT	JS28F00AM29AWLx
64-ball LBGA (11mm x 13mm)	512Mb	MT28EW512ABA1HPC-0AAT	PC28F512M29AWHx
		MT28EW512ABA1LPC-0AAT	PC28F512M29AWLx
	1Gb	MT28EW01GABA1HPC-0AAT	PC28F00AM29AWHx
		MT28EW01GABA1LPC-0AAT	PC28F00AM29AWLx

- Notes:
1. To integrate line items on a variety of customer applications, the MT28EW device unifies the speed and voltage options.
 2. For valid combination details, refer to www.micron.com/products.
 3. All Micron MT28EW materials support the temperature range -40°C to $+105^{\circ}\text{C}$ (Grade 2 AEC-Q100).

Table 2: Features Comparison

Feature	MT28EW	M29AW	Notes
Process technology	Single-level cell (SLC) floating gate	Multi-level cell (MLC) floating gate	1
Density	512Mb, 1Gb	512M, 1Gb	-
Package	64-ball LBGA (11mm x 13mm), 56-pin TSOP (14mm x 20mm)	64-ball Fortified BGA (11mm x 13mm), 56-pin TSOP (14mm x 20mm)	-
Ambient operating temperature	-40°C to $+105^{\circ}\text{C}$	-40°C to $+85^{\circ}\text{C}$, $+105^{\circ}\text{C}$ supported in read mode only	-
Block architecture	Uniform 128KB	Uniform 128KB	-
Data bus	x8, x16	x8, x16	-
Page read size	16 words	16 words	-
Extended memory block	128 words (8 + 120)	128 words (8 + 120)	-
Program write buffer size	512 words	512 words	-
V_{CC} range	2.7V to 3.6V	2.7V to 3.6V	-
V_{CCQ} range	1.65 to V_{CC}	1.65 to V_{CC}	-
V_{PP} accelerated (TYP)	9V	12V	2
CFI version	1.3	1.3	-
High voltage auto select (A9)	No	No	-

Table 2: Features Comparison (Continued)

Feature	MT28EW	M29AW	Notes
Individual block write protection	Yes	Yes	–
Permanent block locking (OTP block)	Yes	Yes	–
Hardware protection (highest or lowest block)	Yes	Yes	–
V _{PPH} unlock bypass	Yes (V _{PPH} = 9V)	Yes (V _{PPH} = 12V)	2
Multi sector erase	Yes	Yes	–
Chip erase	Yes	Yes	–
RY/BY# pin	Yes	Yes	–
Blank check	Yes	Yes	–
Single word program	Yes	Yes	–
Data polling	Yes	Yes	–
Lock register	Yes	Yes	–
EFI CRC	Yes	No	–
Sleep mode	No	Yes	–

- Notes:
1. MT28EW SLC floating-gate technology provides improved performance, optimized quality, and reliability.
 2. The MT28EW device supports V_{PPH} unlock bypass, accelerated buffered programming, and accelerated chip erase operations, all by applying 9V (nominal) to the V_{pp}/WP# pad. To prevent damaging the device, designs applying V_{pp}/WP# voltages higher than 9.5V (Max) should be modified. V_{pp}/WP# should not remain at V_{PPH} for more than 80 hours cumulative.

Hardware and Mechanical Considerations

The MT28EW device is available in 56-pin TSOP and 64-ball LPGA packages, both lead-free. MT28EW and M29AW pin and ball assignments and physical dimensions are compatible.

Signal Differences

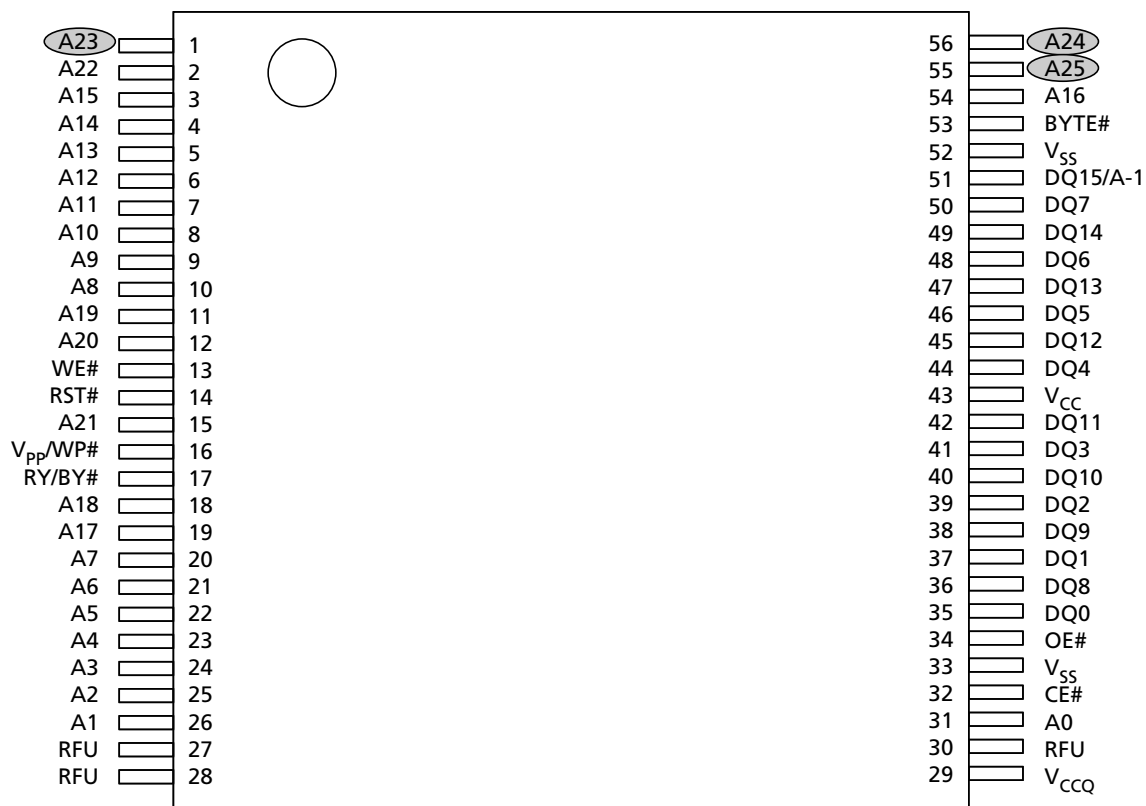
M29AW voltage level, V_{PPH} , can reach 12V while for MT28EW products it cannot be greater than 9V.

No other signal differences can be highlighted between the two devices.

Mechanical Dimension Comparison

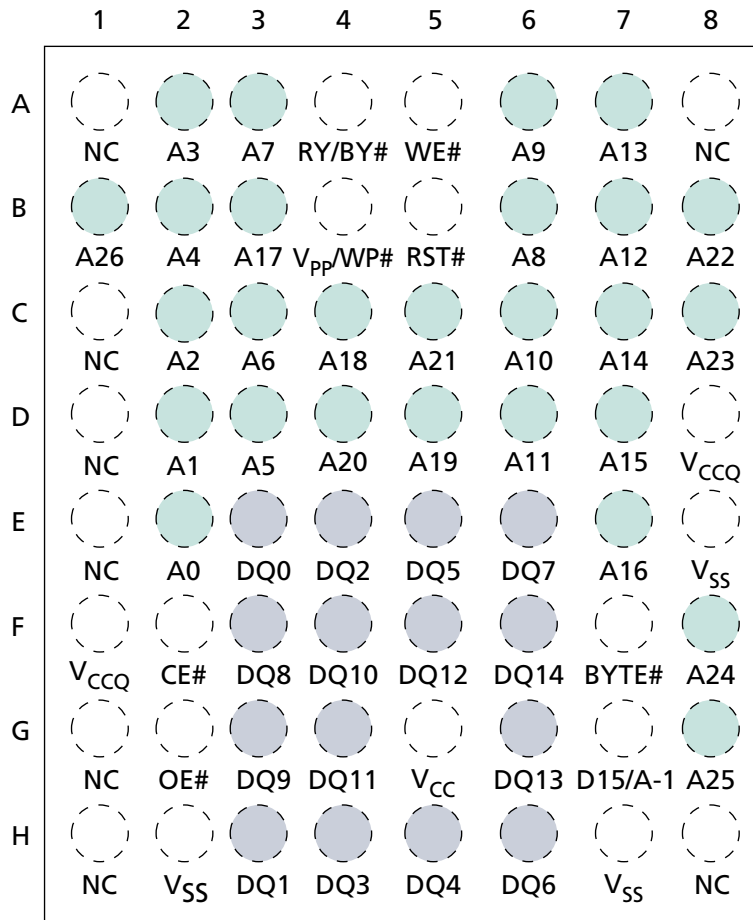
There are no mechanical dimension differences between the two device packages.

Figure 1: 56-Pin TSOP (Top View)



- Notes:
1. A-1 is the least significant address bit in x8 mode.
 2. A23 is valid for 256Mb and above; otherwise, it is RFU.
 3. A24 is valid for 512Mb and above; otherwise, it is RFU.
 4. A25 is valid for 1Gb and above; otherwise, it is RFU.

Figure 2: 64-Ball LBGGA (Top View – Balls Down)



- Notes:
1. A-1 is the least significant address bit in x8 mode.
 2. A23 is valid for 256Mb and above; otherwise, it is RFU.
 3. A24 is valid for 512Mb and above; otherwise, it is RFU.
 4. A25 is valid for 1Gb and above; otherwise, it is RFU.

Input/Output Capacitance

Table 3: Input/Output Capacitance Comparison

Parameter	Description		MT28EW		M29AW		Unit
			Min	Max	Min	Max	
C _{IN}	Input capacitance	512Mb	3	11	3	8	pF
		1Gb			4	9	
C _{OUT}	Output capacitance		3	7	3	6	pF

Software Considerations

Command Set

MT28EW and M29AW command sets are compatible.

Manufacturer ID and Auto Select Comparison

MT28EW and M29AW 512Mb devices have different Device IDs (cycle 2); therefore, a slight modification in the software is required during migration.

To obtain the device ID of the secure version of MT28EW and M29EW devices, contact your local Micron sales offices for the Security Addendum.

Table 4: Auto Select Comparison–16-Bit Mode

Description		Address	MT28EW	M29AW
Manufacturer ID		(Base) + 00h	0089h	0089h
Device ID (cycle 1)		(Base) + 01h	227Eh	227Eh
Device ID (cycle 2)	512Mb	(Base) + 0Eh	2223h	22A3h
	1Gb		2228h	2228h
Device ID (cycle 3)		(Base) + 0Fh	2201h	2201h
Protection register indicator (V _{PP} /W/P# locks highest block)	Factory locked	(Base) + 03h	0099h	0099h
	Factory unlocked		0019h	0019h
Protection register indicator (V _{PP} /W/P# locks lowest block)	Factory locked		0089h	0089h
	Factory unlocked		0009h	0009h
Block protection	Protected	(Block) + 02h	0001h	0001h
	Unprotected		0000h	0000h

Read Password

The READ PASSWORD command is used to verify the password used in password protection mode. The complete command sequence must be entered four times at four consecutive addresses selected by A[1:0] in 16-bit mode.

When the MT28EW password mode lock bit is programmed and an attempt is made to read the password, the device will output 00h onto the I/O data bus; the M29AW device will output FFh onto the I/O data bus.

CFI Comparison

CFI differences exist between MT28EW and M29AW due to device features and performance characteristics.

Table 5: CFI Comparison

Address	Description	MT28EW	M29AW
1Dh	V _{PPH} (programming) supply minimum program/erase voltage Bits[7:4] hex value in volts Bits[3:0] BCD value in 100mV	0085h	00B5h
1Eh	V _{PPH} (programming) supply maximum program/erase voltage Bits[7:4] hex value in volts Bits[3:0] BCD value in 10mV	0095h	00C5h
1Fh	Typical timeout for single byte/word program = 2 ^N μs	0005h	0009h
20h	Typical timeout for maximum size buffer program = 2 ^N μs	0009h	000Ah
21h	Typical timeout per individual block erase = 2 ^N ms	0008h	000Ah
22h	Typical timeout for full chip erase = 2 ^N ms	512Mb	0011h
		1Gb	0012h
23h	Maximum timeout for byte/word program = 2 ^N times typical	0003h	0001h
26h	Maximum timeout for chip erase = 2 ^N times typical	0003h	0002h
2Ah	Maximum number of bytes in multi-byte program or page = 2 ^N	000Ah (x16), 08h (x8)	000Ah
45h	Address sensitive unlock (bits[1:0]): 00b = Required 01b = Not required Process technology (bits [7:2]): 0111b: 2nd generation 0110b: 1st generation	001Ch	0018h
4Dh	V _{PPH} supply minimum program/erase voltage Bits[7:4] hex value in volts Bits[3:0] BCD value in 100mV	0085h	00B5h
4Eh	V _{PPH} supply maximum program/erase voltage Bits[7:4] hex value in volts Bits[3:0] BCD value in 10mV	0095h	00C5h



Performance Comparison

Table 6: Program and Erase Performance Comparison

Parameter		MT28EW		M29AW		Unit
		Typ	Max	Typ	Max	
Block erase		200	1100	800	4000	ms
Chip erase	512Mb	104	–	–	–	s
	1Gb	208	–	–	–	
Accelerated chip erase	512Mb	95	–	–	–	
	1Gb	190	–	–	–	
Erase suspend latency time		15	20	27	37	µs
Program suspend latency time		10	15	27	37	µs
Single byte/word program		25	200	210	456	µs
Write-to-buffer	64 bytes	92	460	270	716	µs
	128 bytes	117	600	310	900	
	256 bytes	171	900	375	1140	
Write-to-buffer	16 words	50 (0.64 MB/s)	–	–	–	µs
	32 words	92 (0.7 MB/s)	460	270	716	
	64 words	117 (1.1 MB/s)	600	310	900	
	128 words	171 (1.5 MB/s)	900	375	1140	
	256 words	285 (1.8 MB/s)	1500	505	1690	
	512 words	512 (2.0 MB/s)	2000	900	3016	
Accelerated full buffered program		410 (2.5 MB/s)	–	–	–	µs
Blank check: main block		–	3.2	–	3.2	ms

Table 7: Read AC Performance Comparison – 3V

Parameter	Symbol		MT28EW		M29AW		Unit	Notes
	Legacy	JEDEC	Min	Max	Min	Max		
Address valid to output valid	t ^{ACC}	t ^{AVQV}	–	105	–	100 (FBGA) 110 (TSOP)	ns	1
Page address access	t ^{PAGE}	t ^{AVQV1}	–	25	–	25	ns	–
CE# LOW to output valid	t ^{CE}	t ^{ELQV}	–	105	–	100 (FBGA) 110 (TSOP)	ns	1
OE# LOW to output valid	t ^{OE}	t ^{GLQV}	–	25	–	25	ns	–

Note: 1. The random access time of M29AW device varies according to the package type (FBGA and TSOP).



Table 8: Power Consumption Comparison

Parameter	Symbol	MT28EW		M29EW		Unit
		Typ	Max	Typ	Max	
V _{CC} random read current	I _{CC1}	26	31	26	31	mA
V _{CC} page read current		12	16	12	16	
V _{CC} standby current	I _{CC2}	512Mb 70	200	70	225	μA
		1Gb 75	230	75	240	
V _{CC} erase current	I _{CC3}	35	50	35	50	mA
V _{CC} program current		35	50	35	50	

Power-on and Reset Timings

Table 9: Reset Timing Comparison

Parameter	Symbol		MT28EW		M29AW		Unit
	Legacy	JEDEC	Min	Max	Min	Max	
V _{CC} power valid to RST# HIGH	t ^{VCS}	t ^{VCHPH}	300	–	300	–	μs
RST# LOW to read mode during program or erase	t ^{READY}	t ^{PLRH}	–	25	–	32	μs
RST# pulse width	t ^{RP}	t ^{PLPH}	100	–	100	–	ns
RST# HIGH to CE# LOW, OE# LOW	t ^{RH}	t ^{PHEL} , t ^{PHGL}	50	–	50	–	ns
RY/BY# HIGH to CE# LOW, OE# LOW	t ^{RB}	t ^{RHEL} , t ^{RHGL}	0	–	0	–	ns



Related Information

Table 10: Document List

Document/Tool
Parallel NOR Flash Automotive Memory MT28EW datasheet (all densities)
Parallel NOR Flash Automotive Memory M29AW datasheet (all densities)

- Notes:
1. Contact your local Micron or distribution sales office to request additional documentation.
 2. Visit www.micron.com for technical documentation.



Revision History

Rev. B – 1/15

- MT28EW specification changes

Rev. A – 10/14

- Initial release

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