



The Comparison of Macronix Serial NOR Flash MX25R6435F and MX25L6433F

1. Introduction

This document compares Macronix Serial NOR Flash 75nm MX25R6435F and 75nm MX25L6433F industrial grade, and also provides detailed information on individual devices. The comparison covers the general features, performance, pin configurations, command set, protected area, registers, and device ID.

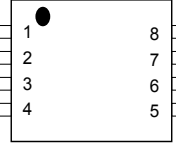
The information provided is based on the data available at the time; thus, MX25R6435F and MX25L6433F datasheets may override this application note if there is any different description and data for the same specifications in the datasheets.

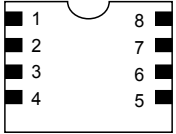
Table 1-1: Key Feature Comparison

Feature		Part Number		
		MX25R6435F	MX25L6433F (Benchmark)	
VCC		1.65V-3.6V	2.65V-3.6V	
Density		64Mb	64Mb	
Temperature		Industrial, -40°C to 85°C	Industrial, -40°C to 85°C	
Mode		High performance mode	Ultra low power mode	
Operation Frequency (MHz)	READ (1-1-1)	33	33	50
	FAST READ (1-1-1)	80	33	133
	DREAD (1-1-2)	80	8	133
	2READ (1-2-2)	80	8	133
	QREAD (1-1-4)	80	8	133
	4READ (1-4-4)	80	8	133
	4PP (1-4-4)	80	33	133
Sector Size		4KB	4KB	4KB
Block Size		32KB/64KB	32KB/64KB	32KB/64KB
Program Buffer Size		256 bytes	256 bytes	256 bytes
Endurance		100K cycles (Min.)	100K cycles (Min.)	100K cycles (Typ.)
Data Retention		20 years	20 years	20 years
tVSL	VCC (min) to CS# low (VCC Rise Time) (Min.)	800us	800us	800us
Hardware Features		HOLD# & RESET# (By EPN) / WP#	HOLD# & RESET# (By EPN) / WP#	HOLD# / WP#
Software Features	Suspend/Resume	YES	YES	YES
	Deep Power Down Mode	YES	YES	YES
	Secured OTP Size	4kbit (Customer) + 4kbit (Factory)	4kbit (Customer) + 4kbit (Factory)	4kbit (Customer) + 4kbit (Factory)
	Software Reset	YES	YES	YES
	Block Protect	YES	YES	YES
	ID Read	YES	YES	YES
	SFDP	YES	YES	YES
	Unique ID	YES	YES	YES

2. Packages

Table 2-1: Package Pins Comparison

8-PIN SOP (200mil)					
MX25R6435F	MX25L6433F			MX25R6435F	MX25L6433F
CS#	CS#			VCC	VCC
SO/SIO1	SO/SIO1			RESET#/SIO3 or HOLD#/SIO3	HOLD#/SIO3
WP#/SIO2	WP#/SIO2			SCLK	SCLK
GND	GND			SI/SIO0	SI/SIO0

8-LAND WSON(6x5mm), USON(4x4mm / 4x3mm)					
MX25R6435F	MX25L6433F			MX25R6435F	MX25L6433F
CS#	CS#			VCC	VCC
SO/SIO1	SO/SIO1			RESET#/SIO3 or HOLD#/SIO3	HOLD#/SIO3
WP#/SIO2	WP#/SIO2			SCLK	SCLK
GND	GND			SI/SIO0	SI/SIO0

3. Command Set

Table 3-1: Command Set Comparison

	Command	Description	MX25R6435F	MX25L6433F (Benchmark)
Array access	READ	Normal Read	03h	03h
	FAST READ	Fast Read Data	0Bh	0Bh
	DREAD	1I 2O Read	3Bh	3Bh
	2READ	2I/O Read	BBh	BBh
	QREAD	1I 4O Read	6Bh	6Bh
	4READ	4I/O Read	EBh	EBh
	PP	Page Program	02h	02h
	4PP	Quad Page Program	38h	38h
	SE	Sector Erase	20h	20h
	BE 32K	Block Erase 32KB	52h	52h
	BE	Block Erase 64KB	D8h	D8h
	CE	Chip Erase	60h or C7h	60h or C7h
Device operation	WREN	Write Enable	06h	06h
	WRDI	Write Disable	04h	04h
	PGM/ERS Suspend	Suspends Program/ Erase	75h or B0h	75h or B0h
	PGM/ERS Resume	Resumes Program/ Erase	7Ah or 30h	7Ah or 30h
	DP	Deep Power Down	B9h	B9h
	RDP	Release from Deep Power Down	CS# toggle	ABh
	NOP	No Operation	00h	00h
	RSTEN	Reset Enable	66h	66h
	RST	Reset Memory	99h	99h
Register Access	RDID	Read Identification	9Fh	9Fh
	RES	Read Electronic ID	ABh	ABh
	REMS	Read Electronic Manufacturer & Device ID	90h	90h
	RDSFDP	Read SFDP Table	5Ah	5Ah
	RDSR	Read Status Register	05h	05h
	RDCR	Read Configuration Register	15h	15h
	WRSR	Write Status/Configuration Register	01h	01h
	RDSCUR	Read Security Register	2Bh	2Bh
	WRSCUR	Write Security Register	2Fh	2Fh
	SBL	Set Burst Length	C0h	C0h
	ENSO	Enter Secured OTP	B1h	B1h
	EXSO	Exit Secured OTP	C1h	C1h

4. DATA PROTECTION

Table 4-1: Block Protection (BP) Comparison of MX25R6435F and MX25L6433F

Protected Area Sizes (T/B bit = 0)

Status bit				Protect Level	
BP3	BP2	BP1	BP0	MX25R6435F	MX25L6433F (Benchmark)
0	0	0	0	0(none)	0(none)
0	0	0	1	1(1block, block 127th)	1(1block, block 127th)
0	0	1	0	2(2block, block 126th-127th)	2(2block, block 126th-127th)
0	0	1	1	3(4block, block 124th-127th)	3(4block, block 124th-127th)
0	1	0	0	4(8block, block 120th-127th)	4(8block, block 120th-127th)
0	1	0	1	5(16block, block 112nd-127th)	5(16block, block 112nd-127th)
0	1	1	0	6(32block, block 96th-127th)	6(32block, block 96th-127th)
0	1	1	1	7(64block, block 64th-127th)	7(64block, block 64th-127th)
1	0	0	0	8(128block, protect all)	8(128block, protect all)
1	0	0	1	9(128block, protect all)	9(128block, protect all)
1	0	1	0	10(128block, protect all)	10(128block, protect all)
1	0	1	1	11(128block, protect all)	11(128block, protect all)
1	1	0	0	12(128block, protect all)	12(128block, protect all)
1	1	0	1	13(128block, protect all)	13(128block, protect all)
1	1	1	0	14(128block, protect all)	14(128block, protect all)
1	1	1	1	15(128block, protect all)	15(128block, protect all)

Table 4-2: Block Protection (BP) Comparison of MX25R6435F and MX25L6433F

Protected Area Sizes (T/B bit = 1)

Status bit				Protect Level	
BP3	BP2	BP1	BP0	MX25R6435F	MX25L6433F (Benchmark)
0	0	0	0	0(none)	0(none)
0	0	0	1	1(1block, block 0th)	1(1block, block 0th)
0	0	1	0	2(2block, block 0th-1st)	2(2block, block 0th-1st)
0	0	1	1	3(4block, block 0th-3rd)	3(4block, block 0th-3rd)
0	1	0	0	4(8block, block 0th-7th)	4(8block, block 0th-7th)
0	1	0	1	5(16block, block 0th-15th)	5(16block, block 0th-15th)
0	1	1	0	6(32block, block 0th-31st)	6(32block, block 0th-31st)
0	1	1	1	7(64block, block 0th-63rd)	7(64block, block 0th-63rd)
1	0	0	0	8(128block, protect all)	8(128block, protect all)
1	0	0	1	9(128block, protect all)	9(128block, protect all)
1	0	1	0	10(128block, protect all)	10(128block, protect all)
1	0	1	1	11(128block, protect all)	11(128block, protect all)
1	1	0	0	12(128block, protect all)	12(128block, protect all)
1	1	0	1	13(128block, protect all)	13(128block, protect all)
1	1	1	0	14(128block, protect all)	14(128block, protect all)
1	1	1	1	15(128block, protect all)	15(128block, protect all)

Table 4-3: Secured OTP Definition

MX25R6435F	Address range	Size	Lock-down
	xxx000~xxx1FF	4096-bit	Determined by Customer
	xxx200~xxx3FF	4096-bit	Determined by Factory
MX25L6433F (Benchmark)	Address range	Size	Lock-down
	xxx000~xxx1FF	4096-bit	Determined by Customer
	xxx200~xxx3FF	4096-bit	Determined by Factory

5. Register Comparison

Table 5-1: Status Register Comparison

	MX25R6435F	MX25L6433F (Benchmark)
Bit0	WIP (Write in Progress Bit)	WIP (Write in Progress Bit)
Bit1	WEL (Write Enable Latch)	WEL (Write Enable Latch)
Bit2	Block Protected: BP0	Block Protected: BP0
Bit3	Block Protected: BP1	Block Protected: BP1
Bit4	Block Protected: BP2	Block Protected: BP2
Bit5	Block Protected: BP3	Block Protected: BP3
Bit6	QE (Quad Enable)	QE (Quad Enable)
Bit7	SRWD (Status Register Write Protect)	SRWD (Status Register Write Protect)

Table 5-2: Configuration Register Comparison-1

	MX25R6435F	MX25L6433F (Benchmark)
Bit0	Reserved	ODS
Bit1	Reserved	Reserved
Bit2	Reserved	Reserved
Bit3	TB (Top/Bottom selected)	TB (Top/Bottom selected)
Bit4	Reserved	Reserved
Bit5	Reserved	Reserved
Bit6	DC (Dummy Cycles)	DC (Dummy Cycles)
Bit7	Reserved	Reserved

Table 5-3: Configuration Register Comparison-2

	MX25R6435F	MX25L6433F (Benchmark)
bit 0	Reserved	N/A
bit 1	L/H Switch	N/A
bit 2	Reserved	N/A
bit 3	Reserved	N/A
bit 4	Reserved	N/A
bit 5	Reserved	N/A
bit 6	Reserved	N/A
bit 7	Reserved	N/A

Table 5-4: Security Register

	MX25R6435F	MX25L6433F (Benchmark)
bit 0	Secured OTP Indicator bit (The 2nd 4K-bit Secured OTP)	Secured OTP Indicator bit (The 2nd 4K-bit Secured OTP)
bit 1	LDSO (Lock-down the 1st 4K-bit Secured OTP)	LDSO (Lock-down the 1st 4K-bit Secured OTP)
bit 2	PSB	PSB
bit 3	ESB	ESB
bit 4	Reserved	Reserved
bit 5	P_FAIL	P_FAIL
bit 6	E_FAIL	E_FAIL
bit 7	Reserved	Reserved

6. Electrical Characteristics

The comparison of DC and AC characteristics are shown in Tables 6-1 and 6-2:

Table 6-1: DC Characteristics

DC Performance		Unit	MX25R6435F		MX25L6433F (Benchmark)
			High performance mode	Ultra low power mode	
VCC Standby Current (ISB1)	Typ.	uA	9	5	10
	Max.	uA	50	24	50
Deep Power Down Current (ISB2)	Typ.	uA	0.007	0.007	3
	Max.	uA	0.35	0.35	20
Read Current (ICC1) (4I/O)	Typ.	mA	6.5	2.2	10
	Max.	mA	9	4	17
Program Current (ICC2)	Typ.	mA	5.8	3.5	10
	Max.	mA	10	6	15
VCC Write Status Register WRSR Current (ICC3)	Typ.	mA	3.5	3.1	10
	Max.	mA	10	6	15
VCC Sector Erase Current (ICC4)	Typ.	mA	3.5	3.1	10
	Max.	mA	10	6	15
VCC Chip Erase Current (ICC5)	Typ.	mA	4	3.1	10
	Max.	mA	10	6	15

Table 6-2: AC Characteristics

AC Performance			Unit	MX25R6435F		MX25L6433F (Benchmark)	
				High performance mode	Ultra low power mode		
Byte Program Time			Typ.	us	32	40	10
			Max.	us	100	100	50
Page Program Time	256 Bytes	Typ.	ms	0.85	3.2	0.33	
		Max.	ms	4	10	1.2	
Erase Time	4KB	Typ.	ms	40	58	25	
		Max.	ms	240	240	200	
	32KB	Typ.	s	0.24	1	0.14	
		Max.	s	1.5	3	0.6	
	64KB	Typ.	s	0.48	0.8	0.25	
		Max.	s	3	3.5	1	
	Chip Erase	Typ.	s	50	120	20	
		Max.	s	150	240	60	
tCLQV (Clock Low to Output Valid)	30pF	Max.	ns	8	12	8	
	15pF	Max.	ns	6	10	6	
tDP (CS# High to Deep Power-down Mode)			Max.	us	10	10	10
tDPDD	Delay Time for Release from Deep Power-Down Mode once entering Deep Power-Down Mode	Min.	us	30	30	-	
tCRDP	CS# Toggling time before Release from Deep Power-Down Mode to enter Standby Mode	Min.	ns	20	20	-	
tRDP	Recovery Time for Release from deep power down mode	Min.	us	45	35	-	
tRES1	CS# High to Standby Mode without Electronic Signature Read	Max.	us	-	-	100	
tRES2	CS# High to Standby Mode with Electronic Signature Read	Max.	us	-	-	100	
tW	Write Status Register Cycle Time	Typ.	ms	9.5	10	-	
		Max.	ms	20	30	40	
Suspend & Resume Timing	tESL	Max.	us	40	60	20	
	tPSL	Max.	us	40	60	20	
	tPRS (Note 1)	Min.	us	0.3	0.3	0.3	
	tERS (Note 1)	Min.	us	0.3	0.3	0.3	

Note 1: Please check the Notes in the datasheets.

7. Device Identification

The Manufacturer ID and Device ID values of the MX25R6435F are identical to MX25L6433F Flash memory.

Table 7-1: Manufacturer ID & Device ID

ID Item		MX25R6435F	MX25L6433F (Benchmark)
RDID	Manufacturer ID	C2	C2
	Memory type	28	20
	Memory density	17	17
RES	Electronic ID	17	16
REMS	Manufacturer ID	C2	C2
	Device ID	17	16

8. Reference Documents

Table 8-1 shows the datasheet versions used for comparison in this application note. For the most current Macronix specification, please refer to the Macronix Website at <http://www.macronix.com>

Table 8-1: Datasheet Version

Datasheet	Location	Date Issued	Versions
MX25R6435F	Macronix website	August 08, 2022	1.6
MX25L6433F	Macronix website	April 09, 2025	1.9

9. Revision History

Table 9-1: Revision History

Revision No.	Description	Page	Date
REV. 1	Initial Release	ALL	April 29, 2025



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