The Comparison of Macronix Serial NOR Flash Products MX25U1633F and MX25U1635F

1. Introduction

This application note compares Macronix Serial NOR Flash products MX25U1633F and MX25U1635F. The document provides detailed information on individual devices. The comparison covers the general features, performance, command set and device ID.

The information provided is based on the data available at the time. MX25U1633F and MX25U1635F datasheets may override this application note if there is a different description for the same specifications in the datasheets.

Please refer to the contents and comparison tables below for more details.

2. General Features

2-1. Feature Comparison

For the features comparison between these products, please check the comparison tables below for details. For additional product differences, please refer to *Table 2-1: Feature Comparison* as below.

Table 2-1: Feature Comparison

Part no.		MX25U1633F	MX25U1635F
Technology		75nm	75nm
Density		16Mb	16Mb
VCC		1.65V - 2V	1.65V - 2V
Structure			
Operation Frequency	READ(1-1-1)	33MHz	50MHz
	FAST READ(1-1-1)	80MHz	104MHz
	DREAD(1-1-2)	80MHz	84MHz
	2READ(1-2-2)	80MHz	84MHz
	QREAD(1-1-4)	80MHz	84MHz
	4READ(1-4-4)	80MHz	84MHz
	QPI(4-4-4)	-	84MHz
Sector Size		4KB	4KB
Block Size		32KB/64KB	32KB/64KB
Program Buffer Size		256 bytes	256 bytes
SFDP		v	v
Unique ID		16 bytes	16 bytes
Endurance		100K cycles (min.)	100K cycles (typ.)
Data Retention (typ.)		20 years	20 years
tVSL	VCC(min) to CS# low (VCC Rise Time)	800us (min.)	800us (min.)
tRDP	Release from deep power mode	45us (min.)	30us (max.)
tDP	CS# High to Deep Power-down Mode	10us	10us
Hardware Pin#		Hold#	Reset#
Software Features			
Suspend/Resume		v	v
Deep Power Down Mode		v	v
Secured OTP Size		4Kb x 2	4Kb x 1
Individual Protect		-	v

2-2. Performance Comparison

Tables below are the comparison of the two products.

Table 2-2: DC Performance Comparison

DC Performance	Condition	Unit	MX25U1633F	MX25U1635F
Standby Current (ISB1)	Typ	uA	9	10
	Max	uA	50	35
Deep Power Down Current (ISB2)	Typ	uA	0.2	1.5
	Max	uA	2	15
Read Current (ICC1) (1I/O)	Typ	mA	3.8	-
	Max	mA	6.5@80MHz	20@104MHz
Program Current (ICC2)	Typ	mA	5.8	20
	Max	mA	10	25
Icc Write Status Reg. Current (ICC3)	Typ	mA	3.5	10
	Max	mA	10	20
Sector Erase Current (ICC4)	Typ	mA	3.5	18
	Max	mA	10	25
Chip Erase Current (ICC5)	Typ	mA	4	20
	Max	mA	10	25

Table 2-3: AC Performance Comparison

AC Performance		Condition	Unit	MX25U1633F	MX25U1635F
Page Program Time	256 Bytes	Typ	ms	0.85	0.5
		Max	ms	4	1.5
Byte Program Time		Typ	us	32	12
		Max	us	100	30
Erase Time	4KB	Typ	ms	40	35
		Max	ms	240	200
	32KB	Typ	s	0.24	0.2
		Max	s	1.5	1
	64KB	Typ	s	0.48	0.35
		Max	s	3	2
	Chip Erase	Typ	s	13	10
		Max	s	38	20
Write Status Register Cycle Time		Typ	ms	9.5	-
		Max	ms	20	40
tCLQV (Clock Low to Output Valid)	30pF (max)	Max	ns	8	8
	15pF (max)	Max	ns	6	6

3. Command Code Comparison

User has to check the differences in detail by comparison table below. For the details of command sets function, please refer to the datasheet of each product

Table 3-1: Command Code Comparison

Command	Symbol	Description	MX25U1633F	MX25U1635F
ID Read	RDID	Read Identification	9Fh	9Fh
	RES	Read Electronic ID	ABh	ABh
	REMS	Read Electronic Manufacturer & Device ID	90h	90h
	QPIID	QPI ID Read	-	AFh
	RDSFDP	Read SFDP	5Ah	5Ah
Read	READ	Read Data	03h	03h
	FAST READ	Fast Read	0Bh	0Bh
	2READ	2 x I/O Fast Read	BBh	BBh
	DREAD	1I 2O Fast Read	3Bh	3Bh
	4READ	4 x I/O Fast Read	EBh	EBh
	QREAD	1I 4O Fast Read	6Bh	6Bh
	W4READ	4 x I/O Fast Read with 4 dummy clock cycles	-	E7h
Erase	SE	Sector Erase	20h	20h
	BE (64K)	Block Erase 64KB	D8h	D8h
	BE (32K)	Block Erase 32KB	52h	52h
	CE	Chip Erase	60h or C7h	60h or C7h
Program	PP	Page Program	02h	02h
	4PP	Quad Page Program	38h	38h
Device operation	WREN	Write Enable	06h	06h
	WRDI	Write Disable	04h	04h
	DP	Deep Power Down	B9h	B9h
	RDP	Release from Deep Power Down	CS# toggle	ABh
	EQIO	Enable QPI	-	35h
	RSTQIO	Reset (Exit) QPI	-	F5h
	SBL	Set Burst Length	C0h	C0h
	WPSEL	Write Protect Selection	-	68h
	PGM/ERS Suspend	Suspend Program/Erase	75h or B0h	B0h
	PGM/ERS Resume	Resume Program/Erase	7Ah or 30h	30h
	NOP	No Operation	00h	00h
	RSTEN	Reset Enable	66h	66h
	RST	Reset Memory	99h	99h
Register	WRSR	Write Status Register	01h	01h
	RDSR	Read Status Register	05h	05h
	RDSCUR	Read Security Register	2Bh	2Bh
	WRSCUR	Write Security Register	2Fh	2Fh
	RDCR	Read Configuration Register	15h	-
	ENSO	Enter Secured OTP	B1h	B1h
	EXSO	Exit Secured OTP	C1h	C1h
Protection	SBLK	Single Block Lock	-	36h
	SBULK	Single Block Unlock	-	39h
	RDBLOCK	Block Protect Read	-	3Ch
	GBLK	Gang Block Lock	-	7Eh
	GBULK	Gang Block Unlock	-	98h

4. Device ID Code Comparison

The following tables show that the Manufacturer and Device IDs have not changed, as shown in *Table 4-1: ID Code Comparison*.

Table 4-1: ID Code Comparison

Electronic Identification			MX25U1633F	MX25U1635F
RDID	9Fh	Manufacturer ID	C2h	
		Type	25h	
		Density	35h	
RES	ABh	Electronic ID	35h	
REMS	90h	Manufacturer ID	C2h	
		Device ID	35h	

5. References

Table 5-1 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 5-1: Datasheet Version

Datasheet	Location	Date Issued	Versions
MX25U1633F	Macronix Website	February 23, 2018	1.1
MX25U1635F	Macronix Website	January 17, 2017	1.6

6. Revision History

Table 6-1: Revision History

Revision No.	Description	Page	Date
Rev. 1	Initial Release	ALL	November 15, 2019
Rev. 2	1. Revised Table 2-1; 2. Modified Table 3-1; 3. Modified the format of Table 4-1	2, 4-5	November 25, 2019

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