FUJITSU SEMICONDUCTOR
DATA SHEET

DS05-50211-1E

Stacked MCP (Multi-Chip Package) FLASH MEMORY & SRAM

CMOS

64M (×8/×16) FLASH MEMORY & 8M (×8/×16) STATIC RAM

MB84VD23280EA-90/MB84VD23280EE-90

■ FEATURES

- **Power supply voltage of 2.7 V to 3.3 V**
- **High performance**
  90 ns maximum access time (Flash)
  70 ns maximum access time (SRAM)
- **Operating Temperature**
  –25 °C to +85 °C
- **Package 101-ball BGA**

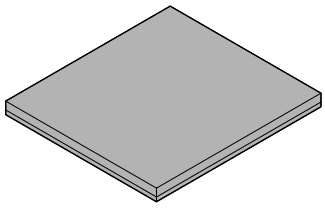
(Continued)

■ PRODUCT LINEUP

		Flash Memory	SRAM
Ordering Part No.	V_{CCf}, V_{CCS} = 3.0 V $^{+0.3V}_{-0.3V}$	MB84VD23280EA-90/MB84VD23280EE-90	
Max. Address Access Time (ns)		90	70
Max. $\overline{CE}$ Access Time (ns)		90	70
Max. $\overline{OE}$ Access Time (ns)		35	35

■ PACKAGE

101-pin plastic FBGA



BGA-101P-M01

(Continued)

— FLASH MEMORY

- **Simultaneous Read/Write operations (flex bank)**
  Two virtual Banks are chosen from the combination of four physical banks
  Host system can program or erase in one bank, then read immediately and simultaneously read from the other bank between read and write operations
  Read-while-erase
  Read-while-program
- **Minimum 100,000 write/erase cycles**
- **Sector erase architecture**
  Sixteen 4 K words and one hundred twenty-six 32 K word.
  Any combination of sectors can be concurrently erased. Also supports full chip erase.
- **Embedded Erase™* Algorithms**
  Automatically pre-programs and erases the chip or any sector
- **Embedded Program™* Algorithms**
  Automatically writes and verifies data at specified address
- **$\overline{\text{Data}}$ Polling and Toggle Bit feature for detection of program or erase cycle completion**
- **Ready-Busy output (RY/$\overline{\text{BY}}$)**
  Hardware method for detection of program or erase cycle completion
- **Automatic sleep mode**
  When addresses remain stable, automatically switch themselves to low power mode.
- **Low V_{CC} write inhibit ≤ 2.5 V**
- **Hidden ROM (Hi-ROM) region**
  256 byte of Hi-ROM, accessible through a new “Hi-ROM Enable” command sequence
  Factory serialized and protected to provide a secure electronic serial number (ESN)
- **$\overline{\text{WP}}$/ACC input pin**
  At V_{IL}, allows protection of 2 of 8 Kbytes on both ends of each boot sector, regardless of sector protection/unprotection status.
  At V_{IH}, allows removal of boot sector protection
  At V_{ACC}, increases program performance
- **Program Suspend/Resume**
  Suspends the program operation to allow a read in another address
- **Erase Suspend/Resume**
  Suspends the erase operation to allow a read in another sector within the same device
- **Please refer to “MBM29DL640E” data sheet in detailed function**

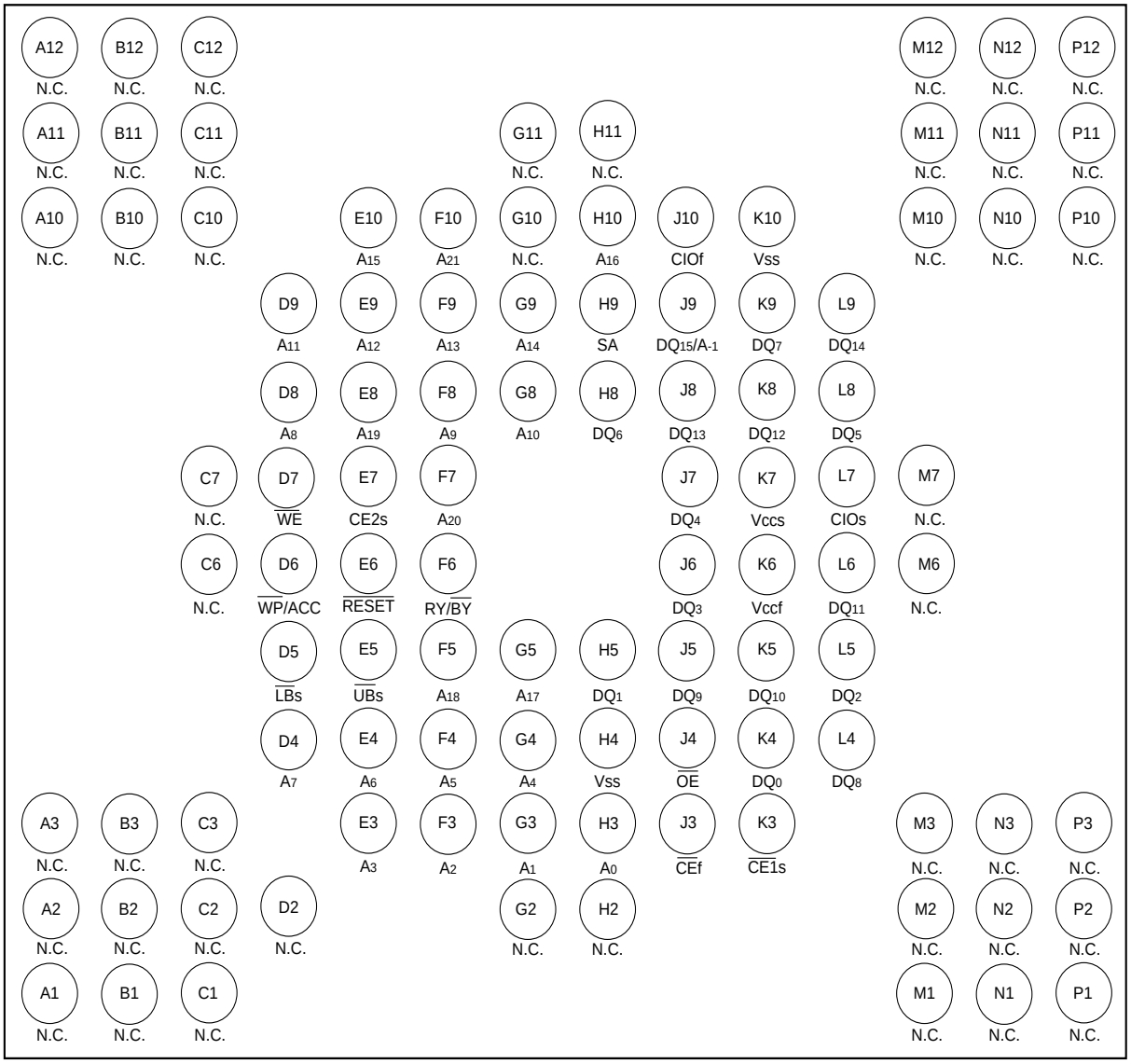
— SRAM

- **Power dissipation**
  Operating : 50 mA Max.
  Standby : 25 µA Max.
- **Power down features using $\overline{\text{CE1}}$s and CE2s**
- **Data retention supply voltage: 1.5 V to 3.3 V**
- **$\overline{\text{CE1}}$s and CE2s Chip Select**
- **Byte data control: $\overline{\text{LB}}$s (DQ_7-DQ_0), $\overline{\text{UB}}$s (DQ_{15}-DQ_8)**

*: Embedded Erase™ and Embedded Program™ are trademarks of Advanced Micro Devices, Inc.

■ PIN ASSIGNMENT

(TOP View)
Marking Side

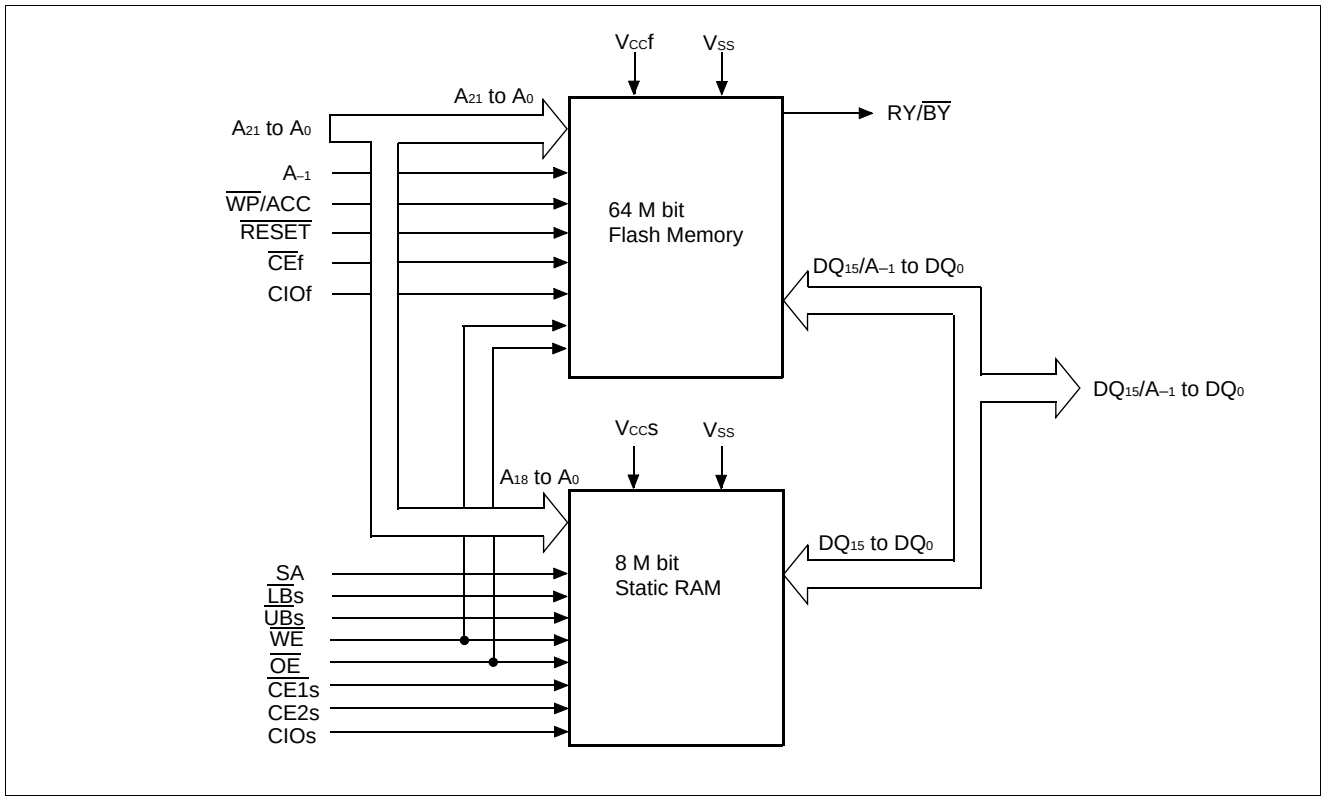


(BGA-101P-M01)

■ PIN DESCRIPTION

Pin name	Input/ Output	Description
A_{18} to A_0	I	Address Inputs (Common)
A_{21} to A_{19}, A_{-1}	I	Address Inputs (Flash)
SA	I	Address Input (SRAM)
DQ_{15} to DQ_0	I/O	Data Inputs/Outputs (Common)
$\overline{CE}$f	I	Chip Enable (Flash)
$\overline{CE1}$s	I	Chip Enable (SRAM)
CE2s	I	Chip Enable (SRAM)
$\overline{OE}$	I	Output Enable (Common)
$\overline{WE}$	I	Write Enable (Common)
RY/$\overline{BY}$	O	Ready/Busy Output (Flash) Open Drain Output
$\overline{UB}$s	I	Upper Byte Control (SRAM)
$\overline{LB}$s	I	Lower Byte Control (SRAM)
CIOf	I	I/O Configuration (Flash) CIOf = V_{IH} is Word mode (×16), CIOf = V_{IL} is Byte mode (×8)
CIOs	I	I/O Configuration (SRAM) CIOs = V_{IH} is Word mode (×16), CIOs = V_{IL} is Byte mode (×8)
$\overline{RESET}$	I	Hardware Reset Pin/Sector Protection Unlock (Flash)
$\overline{WP}$/ACC	I	Write Protect / Acceleration (Flash)
N.C.	—	No Internal Connection
V_{SS}	Power	Device Ground (Common)
V_{CC}f	Power	Device Power Supply (Flash)
V_{CC}s	Power	Device Power Supply (SRAM)

■ BLOCK DIAGRAM



■ DEVICE BUS OPERATIONS

Table 1. 1 User Bus Operations (Flash = Word mode; CIOf = V_{CC}f, SRAM = Word mode; CIOs = V_{CC}s)

Operation (1), (3)	$\overline{CE}$f	$\overline{CE1}$s	CE2s	$\overline{OE}$	$\overline{WE}$	SA (6)	$\overline{LB}$s	$\overline{UB}$s	DQ_7 to DQ_0	DQ_{15} to DQ_8	$\overline{RESET}$	$\overline{WP}$/ ACC (5)
Full Standby	H	H	X	X	X	X	X	X	HIGH-Z	HIGH-Z	H	X
		X	L									
Output Disable	H	L	H	H	H	X	X	X	HIGH-Z	HIGH-Z	H	X
				X	X	X	H	H	HIGH-Z	HIGH-Z		
	L	H	X	H	H	X	X	X	HIGH-Z	HIGH-Z		
		X	L									
Read from Flash (2)	L	H	X	L	H	X	X	X	D_{OUT}	D_{OUT}	H	X
		X	L									
Write to Flash	L	H	X	H	L	X	X	X	D_{IN}	D_{IN}	H	X
		X	L									
Read from SRAM	H	L	H	L	H	X	L	L	D_{OUT}	D_{OUT}	H	X
							H	L	HIGH-Z	D_{OUT}		
							L	H	D_{OUT}	HIGH-Z		
Write to SRAM	H	L	H	X	L	X	L	L	D_{IN}	D_{IN}	H	X
							H	L	HIGH-Z	D_{IN}		
							L	H	D_{IN}	HIGH-Z		
Temporary Sector Group Unprotection(4)	X	X	X	X	X	X	X	X	X	X	V_{ID}	X
Flash Hardware Reset	X	H	X	X	X	X	X	X	HIGH-Z	HIGH-Z	L	X
		X	L									
Boot Block Sector Write Protection	X	X	X	X	X	X	X	X	X	X	X	L

Legend: L = V_{IL}, H = V_{IH}, X = V_{IL} or V_{IH}. See DC Characteristics for voltage levels.

Notes:
1. Other operations except for indicated this column are inhibited.
2. $\overline{WE}$ can be V_{IL} if $\overline{OE}$ is V_{IL}, $\overline{OE}$ at V_{IH} initiates the write operations.
3. Do not apply $\overline{CE}$f = V_{IL}, $\overline{CE1}$s = V_{IL} and CE2s = V_{IH} at a time.
4. It is also used for the extended sector group protections.
5. Protect of 2 of 8 Kbytes on both ends of each boot sector.
6. SA; Don’t care or Open.

Table 1. 2 User Bus Operations (Flash = Word mode; CIOf = V_{CC}f, SRAM = Byte mode; CIOs = V_{SS})

Operation (1), (3)	$\overline{CE}$f	$\overline{CE1}$s	CE2s	$\overline{OE}$	$\overline{WE}$	SA	$\overline{LB}$s (6)	$\overline{UB}$s (6)	DQ_7 to DQ_0	DQ_{15} to DQ_8	$\overline{RESET}$	$\overline{WP}$/ ACC (5)
Full Standby	H	H	X	X	X	X	X	X	HIGH-Z	HIGH-Z	H	X
		X	L									
Output Disable	H	L	H	H	H	X	X	X	HIGH-Z	HIGH-Z	H	X
				X	X	X	X	X	HIGH-Z	HIGH-Z		
	L	H	X	H	H	X	X	X	HIGH-Z	HIGH-Z		
		X	L									
Read from Flash (2)	L	H	X	L	H	X	X	X	D_{OUT}	D_{OUT}	H	X
		X	L									
Write to Flash	L	H	X	H	L	X	X	X	D_{IN}	D_{IN}	H	X
		X	L									
Read from SRAM	H	L	H	L	H	SA	X	X	D_{OUT}	HIGH-Z	H	X
Write to SRAM	H	L	H	X	L	SA	X	X	D_{IN}	HIGH-Z	H	X
Temporary Sector Group Unprotection(4)	X	X	X	X	X	X	X	X	X	X	V_{ID}	X
Flash Hardware Reset	X	H	X	X	X	X	X	X	HIGH-Z	HIGH-Z	L	X
		X	L									
Boot Block Sector Write Protection	X	X	X	X	X	X	X	X	X	X	X	L

Legend: L = V_{IL}, H = V_{IH}, X = V_{IL} or V_{IH}. See DC Characteristics for voltage levels.

Notes:
1. Other operations except for indicated this column are inhibited.
2. $\overline{WE}$ can be V_{IL} if $\overline{OE}$ is V_{IL}, $\overline{OE}$ at V_{IH} initiates the write operations.
3. Do not apply $\overline{CE}$f = V_{IL}, $\overline{CE1}$s = V_{IL} and CE2s = V_{IH} at a time.
4. It is also used for the extended sector group protections.
5. Protect of 2 of 8 Kbytes on both ends of each boot sector.
6. $\overline{LB}$s , $\overline{UB}$s; Don't care or Open.

Table 1. 3 User Bus Operations (Flash = Byte mode; CIOf = V_{SS}, SRAM = Byte mode; CIOs = V_{SS})

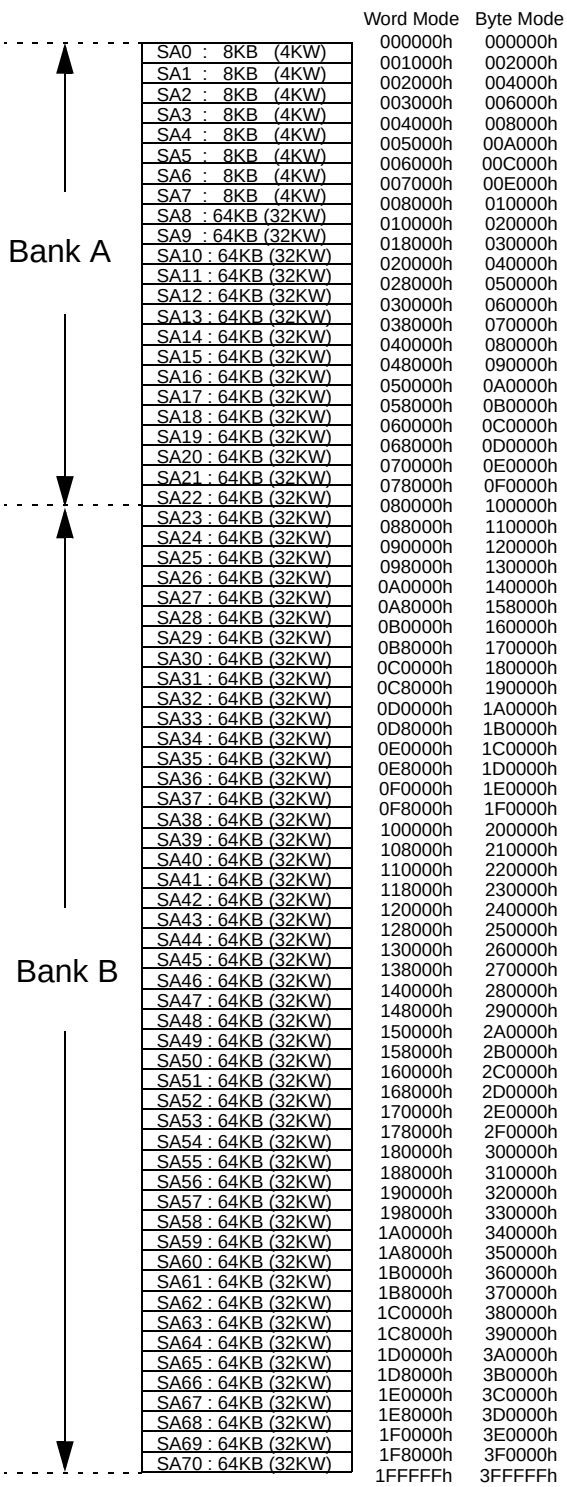
Operation (1), (3)	$\overline{CE}$f	$\overline{CE1}$s	CE2s	DQ_{15}/A_{-1}	$\overline{OE}$	$\overline{WE}$	SA	$\overline{LB}$s (6)	$\overline{UB}$s (6)	DQ_7 to DQ_0	DQ_{14} to DQ_8	$\overline{RESET}$	$\overline{WP}$/ ACC (5)
Full Standby	H	H	X	X	X	X	X	X	X	HIGH-Z	HIGH-Z	H	X
		X	L										
Output Disable	H	L	H	X	H	H	X	X	X	HIGH-Z	HIGH-Z	H	X
				X	X	X	X	X	X	HIGH-Z	HIGH-Z		
	L	H	X	A_{-1}	H	H	X	X	X	HIGH-Z	HIGH-Z		
		X	L										
Read from Flash (2)	L	H	X	A_{-1}	L	H	X	X	X	D_{OUT}	X	H	X
		X	L										
Write to Flash	L	H	X	A_{-1}	H	L	X	X	X	D_{IN}	X	H	X
		X	L										
Read from SRAM	H	L	H	X	L	H	SA	X	X	D_{OUT}	HIGH-Z	H	X
Write to SRAM	H	L	H	X	X	L	SA	X	X	D_{IN}	HIGH-Z	H	X
Temporary Sector Group Unprotection(4)	X	X	X	X	X	X	X	X	X	X	X	V_{ID}	X
Flash Hardware Reset	X	H	X	X	X	X	X	X	X	HIGH-Z	HIGH-Z	L	X
		X	L										
Boot Block Sector Write Protection	X	X	X	X	X	X	X	X	X	X	X	X	L

Legend: L = V_{IL}, H = V_{IH}, X = V_{IL} or V_{IH}. See DC Characteristics for voltage levels.

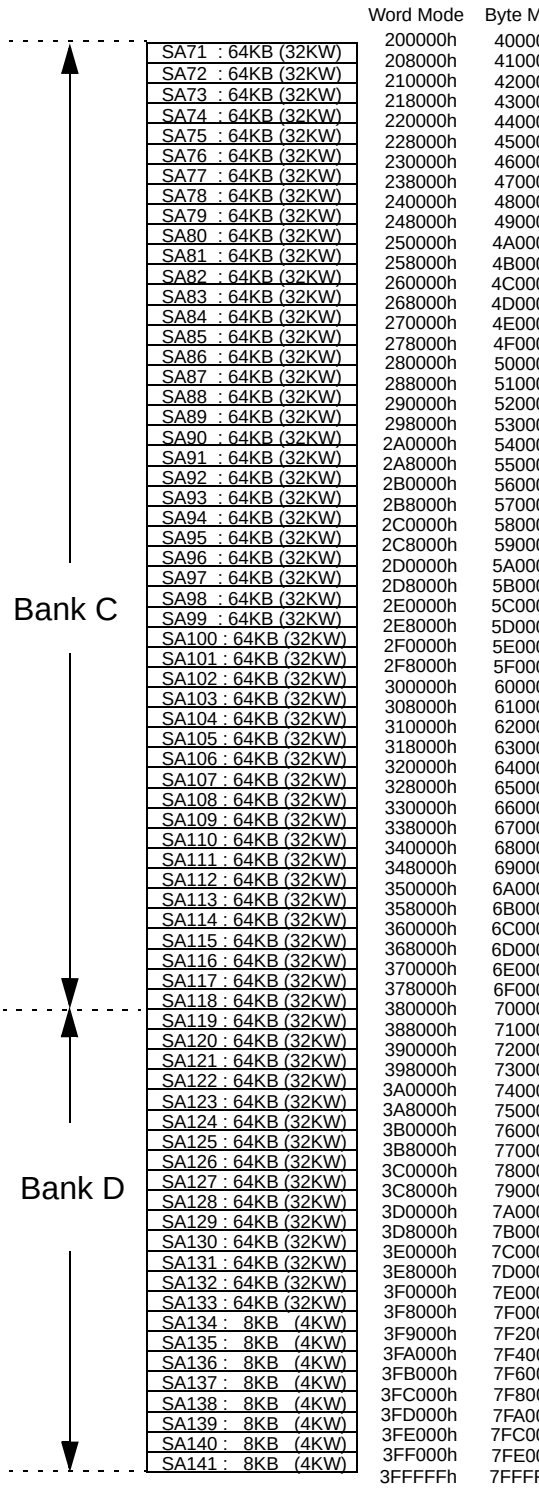
Notes:
1. Other operations except for indicated this column are inhibited.
2. $\overline{WE}$ can be V_{IL} if $\overline{OE}$ is V_{IL}, $\overline{OE}$ at V_{IH} initiates the write operations.
3. Do not apply $\overline{CE}$f = V_{IL}, $\overline{CE1}$s = V_{IL} and CE2s = V_{IH} at a time.
4. It is also used for the extended sector group protections.
5. Protect of 2 of 8 Kbytes on both ends of each boot sector.
6. $\overline{LB}_S$, $\overline{UB}_S$; Don't care or Open.

■ FLEXIBLE SECTOR-ERASE ARCHITECTURE on FLASH MEMORY

- Sixteen 4K words, and one hundred twenty-six 32 K words.
- Individual-sector, multiple-sector, or bulk-erase capability.



	Word Mode	Byte Mode
SA0 : 8KB (4KW)	000000h	000000h
SA1 : 8KB (4KW)	001000h	002000h
SA2 : 8KB (4KW)	002000h	004000h
SA3 : 8KB (4KW)	003000h	006000h
SA4 : 8KB (4KW)	004000h	008000h
SA5 : 8KB (4KW)	005000h	00A000h
SA6 : 8KB (4KW)	006000h	00C000h
SA7 : 8KB (4KW)	007000h	00E000h
SA8 : 64KB (32KW)	008000h	010000h
SA9 : 64KB (32KW)	010000h	020000h
SA10 : 64KB (32KW)	018000h	030000h
SA11 : 64KB (32KW)	020000h	040000h
SA12 : 64KB (32KW)	028000h	050000h
SA13 : 64KB (32KW)	030000h	060000h
SA14 : 64KB (32KW)	038000h	070000h
SA15 : 64KB (32KW)	040000h	080000h
SA16 : 64KB (32KW)	048000h	090000h
SA17 : 64KB (32KW)	050000h	0A0000h
SA18 : 64KB (32KW)	058000h	0B0000h
SA19 : 64KB (32KW)	060000h	0C0000h
SA20 : 64KB (32KW)	068000h	0D0000h
SA21 : 64KB (32KW)	070000h	0E0000h
SA22 : 64KB (32KW)	078000h	0F0000h
SA23 : 64KB (32KW)	080000h	100000h
SA24 : 64KB (32KW)	088000h	110000h
SA25 : 64KB (32KW)	090000h	120000h
SA26 : 64KB (32KW)	098000h	130000h
SA27 : 64KB (32KW)	0A0000h	140000h
SA28 : 64KB (32KW)	0A8000h	158000h
SA29 : 64KB (32KW)	0B0000h	160000h
SA30 : 64KB (32KW)	0B8000h	170000h
SA31 : 64KB (32KW)	0C0000h	180000h
SA32 : 64KB (32KW)	0C8000h	190000h
SA33 : 64KB (32KW)	0D0000h	1A0000h
SA34 : 64KB (32KW)	0D8000h	1B0000h
SA35 : 64KB (32KW)	0E0000h	1C0000h
SA36 : 64KB (32KW)	0E8000h	1D0000h
SA37 : 64KB (32KW)	0F0000h	1E0000h
SA38 : 64KB (32KW)	0F8000h	1F0000h
SA39 : 64KB (32KW)	100000h	200000h
SA40 : 64KB (32KW)	108000h	210000h
SA41 : 64KB (32KW)	110000h	220000h
SA42 : 64KB (32KW)	118000h	230000h
SA43 : 64KB (32KW)	120000h	240000h
SA44 : 64KB (32KW)	128000h	250000h
SA45 : 64KB (32KW)	130000h	260000h
SA46 : 64KB (32KW)	138000h	270000h
SA47 : 64KB (32KW)	140000h	280000h
SA48 : 64KB (32KW)	148000h	290000h
SA49 : 64KB (32KW)	150000h	2A0000h
SA50 : 64KB (32KW)	158000h	2B0000h
SA51 : 64KB (32KW)	160000h	2C0000h
SA52 : 64KB (32KW)	168000h	2D0000h
SA53 : 64KB (32KW)	170000h	2E0000h
SA54 : 64KB (32KW)	178000h	2F0000h
SA55 : 64KB (32KW)	180000h	300000h
SA56 : 64KB (32KW)	188000h	310000h
SA57 : 64KB (32KW)	190000h	320000h
SA58 : 64KB (32KW)	198000h	330000h
SA59 : 64KB (32KW)	1A0000h	340000h
SA60 : 64KB (32KW)	1A8000h	350000h
SA61 : 64KB (32KW)	1B0000h	360000h
SA62 : 64KB (32KW)	1B8000h	370000h
SA63 : 64KB (32KW)	1C0000h	380000h
SA64 : 64KB (32KW)	1C8000h	390000h
SA65 : 64KB (32KW)	1D0000h	3A0000h
SA66 : 64KB (32KW)	1D8000h	3B0000h
SA67 : 64KB (32KW)	1E0000h	3C0000h
SA68 : 64KB (32KW)	1E8000h	3D0000h
SA69 : 64KB (32KW)	1F0000h	3E0000h
SA70 : 64KB (32KW)	1F8000h	3F0000h
	1FFFFFh	3FFFFFh



	Word Mode	Byte Mode
SA71 : 64KB (32KW)	200000h	400000h
SA72 : 64KB (32KW)	208000h	410000h
SA73 : 64KB (32KW)	210000h	420000h
SA74 : 64KB (32KW)	218000h	430000h
SA75 : 64KB (32KW)	220000h	440000h
SA76 : 64KB (32KW)	228000h	450000h
SA77 : 64KB (32KW)	230000h	460000h
SA78 : 64KB (32KW)	238000h	470000h
SA79 : 64KB (32KW)	240000h	480000h
SA80 : 64KB (32KW)	248000h	490000h
SA81 : 64KB (32KW)	250000h	4A0000h
SA82 : 64KB (32KW)	258000h	4B0000h
SA83 : 64KB (32KW)	260000h	4C0000h
SA84 : 64KB (32KW)	268000h	4D0000h
SA85 : 64KB (32KW)	270000h	4E0000h
SA86 : 64KB (32KW)	278000h	4F0000h
SA87 : 64KB (32KW)	280000h	500000h
SA88 : 64KB (32KW)	288000h	510000h
SA89 : 64KB (32KW)	290000h	520000h
SA90 : 64KB (32KW)	298000h	530000h
SA91 : 64KB (32KW)	2A0000h	540000h
SA92 : 64KB (32KW)	2A8000h	550000h
SA93 : 64KB (32KW)	2B0000h	560000h
SA94 : 64KB (32KW)	2B8000h	570000h
SA95 : 64KB (32KW)	2C0000h	580000h
SA96 : 64KB (32KW)	2C8000h	590000h
SA97 : 64KB (32KW)	2D0000h	5A0000h
SA98 : 64KB (32KW)	2D8000h	5B0000h
SA99 : 64KB (32KW)	2E0000h	5C0000h
SA100 : 64KB (32KW)	2E8000h	5D0000h
SA101 : 64KB (32KW)	2F0000h	5E0000h
SA102 : 64KB (32KW)	2F8000h	5F0000h
SA103 : 64KB (32KW)	300000h	600000h
SA104 : 64KB (32KW)	308000h	610000h
SA105 : 64KB (32KW)	310000h	620000h
SA106 : 64KB (32KW)	318000h	630000h
SA107 : 64KB (32KW)	320000h	640000h
SA108 : 64KB (32KW)	328000h	650000h
SA109 : 64KB (32KW)	330000h	660000h
SA110 : 64KB (32KW)	338000h	670000h
SA111 : 64KB (32KW)	340000h	680000h
SA112 : 64KB (32KW)	348000h	690000h
SA113 : 64KB (32KW)	350000h	6A0000h
SA114 : 64KB (32KW)	358000h	6B0000h
SA115 : 64KB (32KW)	360000h	6C0000h
SA116 : 64KB (32KW)	368000h	6D0000h
SA117 : 64KB (32KW)	370000h	6E0000h
SA118 : 64KB (32KW)	378000h	6F0000h
SA119 : 64KB (32KW)	380000h	700000h
SA120 : 64KB (32KW)	388000h	710000h
SA121 : 64KB (32KW)	390000h	720000h
SA122 : 64KB (32KW)	398000h	730000h
SA123 : 64KB (32KW)	3A0000h	740000h
SA124 : 64KB (32KW)	3A8000h	750000h
SA125 : 64KB (32KW)	3B0000h	760000h
SA126 : 64KB (32KW)	3B8000h	770000h
SA127 : 64KB (32KW)	3C0000h	780000h
SA128 : 64KB (32KW)	3C8000h	790000h
SA129 : 64KB (32KW)	3D0000h	7A0000h
SA130 : 64KB (32KW)	3D8000h	7B0000h
SA131 : 64KB (32KW)	3E0000h	7C0000h
SA132 : 64KB (32KW)	3E8000h	7D0000h
SA133 : 64KB (32KW)	3F0000h	7E0000h
SA134 : 8KB (4KW)	3F8000h	7F0000h
SA135 : 8KB (4KW)	3F9000h	7F2000h
SA136 : 8KB (4KW)	3FA000h	7F4000h
SA137 : 8KB (4KW)	3FB000h	7F6000h
SA138 : 8KB (4KW)	3FC000h	7F8000h
SA139 : 8KB (4KW)	3FD000h	7FA000h
SA140 : 8KB (4KW)	3FE000h	7FC000h
SA141 : 8KB (4KW)	3FF000h	7FE000h
	3FFFFFh	7FFFFFh

MB84VD23280EA/EE Sector Architecture

Table 2 Example of Virtual Banks Combination

Bank Splits	Bank 1			Bank 2		
	Volume	Combination	Sector Size	Volume	Combination	Sector Size
1	8M bit	Bank A	8 of 8 Kbyte / 4 K word + 15 of 64 Kbyte / 32 K word	56 Mbit	Bank B + Bank C + Bank D	8 of 8 Kbyte / 4 K word + 111 of 64 Kbyte / 32 K word
2	16 Mbit	Bank A + Bank D	16 of 8 Kbyte / 4 K word + 30 of 64 Kbyte / 32 K word	48 Mbit	Bank B + Bank C	96 of 64 Kbyte / 32 K word
3	24 Mbit	Bank B	48 of 64 Kbyte / 32 K word	40 Mbit	Bank A + Bank C + Bank D	16 of 8 Kbyte / 4 K word + 78 of 64 Kbyte / 32 K word
4	32 Mbit	Bank A + Bank B	8 of 8 Kbyte / 4 K word + 63 of 64 Kbyte / 32 K word	32 Mbit	Bank C + Bank D	8 of 8 Kbyte / 4 K word + 63 of 64 Kbyte / 32 K word

BankA: Address 000000h to 07FFFFh (Word) , 000000h to 0FFFFFh (Byte)
BankB: Address 080000h to 1FFFFFh (Word) , 100000h to 3FFFFFh (Byte)
BankC: Address 200000h to 37FFFFh (Word) , 400000h to 6FFFFFh (Byte)
BankD: Address 380000h to 3FFFFFh (Word) , 700000h to 7FFFFFh (Byte)

Table 3 Sector Address Tables

Bank	Sector	Sector Address										Address Range	
		Bank Address										Byte Mode	Word Mode
		A_{21}	A_{20}	A_{19}	A_{18}	A_{17}	A_{16}	A_{15}	A_{14}	A_{13}	A_{12}		
Bank A	SA0	0	0	0	0	0	0	0	0	0	0	000000h to 001FFFh	000000h to 000FFFh
	SA1	0	0	0	0	0	0	0	0	0	1	002000h to 003FFFh	001000h to 001FFFh
	SA2	0	0	0	0	0	0	0	0	1	0	004000h to 005FFFh	002000h to 002FFFh
	SA3	0	0	0	0	0	0	0	0	1	1	006000h to 007FFFh	003000h to 003FFFh
	SA4	0	0	0	0	0	0	0	1	0	0	008000h to 009FFFh	004000h to 004FFFh
	SA5	0	0	0	0	0	0	0	1	0	1	00A000h to 00BFFFh	005000h to 005FFFh
	SA6	0	0	0	0	0	0	0	1	1	0	00C000h to 00DFFFh	006000h to 006FFFh
	SA7	0	0	0	0	0	0	0	1	1	1	00E000h to 00FFFFh	007000h to 007FFFh
	SA8	0	0	0	0	0	0	1	X	X	X	010000h to 01FFFFh	008000h to 00FFFFh
	SA9	0	0	0	0	0	1	0	X	X	X	020000h to 02FFFFh	010000h to 017FFFh
	SA10	0	0	0	0	0	1	1	X	X	X	030000h to 03FFFFh	018000h to 01FFFFh
	SA11	0	0	0	0	1	0	0	X	X	X	040000h to 04FFFFh	020000h to 027FFFh
	SA12	0	0	0	0	1	0	1	X	X	X	050000h to 05FFFFh	028000h to 02FFFFh
	SA13	0	0	0	0	1	1	0	X	X	X	060000h to 06FFFFh	030000h to 037FFFh
	SA14	0	0	0	0	1	1	1	X	X	X	070000h to 07FFFFh	038000h to 03FFFFh
	SA15	0	0	0	1	0	0	0	X	X	X	080000h to 08FFFFh	040000h to 047FFFh
	SA16	0	0	0	1	0	0	1	X	X	X	090000h to 09FFFFh	048000h to 04FFFFh
	SA17	0	0	0	1	0	1	0	X	X	X	0A0000h to 0AFFFFh	050000h to 057FFFh
	SA18	0	0	0	1	0	1	1	X	X	X	0B0000h to 0BFFFFh	058000h to 05FFFFh
	SA19	0	0	0	1	1	0	0	X	X	X	0C0000h to 0CFFFFh	060000h to 067FFFh
	SA20	0	0	0	1	1	0	1	X	X	X	0D0000h to 0DFFFFh	068000h to 06FFFFh
	SA21	0	0	0	1	1	1	0	X	X	X	0E0000h to 0EFFFFh	070000h to 077FFFh
	SA22	0	0	0	1	1	1	1	X	X	X	0F0000h to 0FFFFFh	078000h to 07FFFFh

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Bank	Sector	Sector Address										Address Range	
		Bank Address										Byte Mode	Word Mode
		A_{21}	A_{20}	A_{19}	A_{18}	A_{17}	A_{16}	A_{15}	A_{14}	A_{13}	A_{12}		
Bank B	SA23	0	0	1	0	0	0	0	X	X	X	100000h to 10FFFFh	080000h to 087FFFh
	SA24	0	0	1	0	0	0	1	X	X	X	110000h to 11FFFFh	088000h to 08FFFFh
	SA25	0	0	1	0	0	1	0	X	X	X	120000h to 12FFFFh	090000h to 097FFFh
	SA26	0	0	1	0	0	1	1	X	X	X	130000h to 13FFFFh	098000h to 09FFFFh
	SA27	0	0	1	0	1	0	0	X	X	X	140000h to 14FFFFh	0A0000h to 0A7FFFh
	SA28	0	0	1	0	1	0	1	X	X	X	150000h to 15FFFFh	0A8000h to 0AFFFFh
	SA29	0	0	1	0	1	1	0	X	X	X	160000h to 16FFFFh	0B0000h to 0B7FFFh
	SA30	0	0	1	0	1	1	1	X	X	X	170000h to 17FFFFh	0B8000h to 0BFFFFh
	SA31	0	0	1	1	0	0	0	X	X	X	180000h to 18FFFFh	0C0000h to 0C7FFFh
	SA32	0	0	1	1	0	0	1	X	X	X	190000h to 19FFFFh	0C8000h to 0CFFFFh
	SA33	0	0	1	1	0	1	0	X	X	X	1A0000h to 1AFFFFh	0D0000h to 0D7FFFh
	SA34	0	0	1	1	0	1	1	X	X	X	1B0000h to 1BFFFFh	0D8000h to 0DFFFFh
	SA35	0	0	1	1	1	0	0	X	X	X	1C0000h to 1CFFFFh	0E0000h to 0E7FFFh
	SA36	0	0	1	1	1	0	1	X	X	X	1D0000h to 1DFFFFh	0E8000h to 0EFFFFh
	SA37	0	0	1	1	1	1	0	X	X	X	1E0000h to 1EFFFFh	0F0000h to 0F7FFFh
	SA38	0	0	1	1	1	1	1	X	X	X	1F0000h to 1FFFFFh	0F8000h to 0FFFFFh
	SA39	0	1	0	0	0	0	0	X	X	X	200000h to 20FFFFh	100000h to 107FFFh
	SA40	0	1	0	0	0	0	1	X	X	X	210000h to 21FFFFh	108000h to 10FFFFh
	SA41	0	1	0	0	0	1	0	X	X	X	220000h to 22FFFFh	110000h to 117FFFh
	SA42	0	1	0	0	0	1	1	X	X	X	230000h to 23FFFFh	118000h to 11FFFFh
	SA43	0	1	0	0	1	0	0	X	X	X	240000h to 24FFFFh	120000h to 127FFFh
	SA44	0	1	0	0	1	0	1	X	X	X	250000h to 25FFFFh	128000h to 12FFFFh
	SA45	0	1	0	0	1	1	0	X	X	X	260000h to 26FFFFh	130000h to 137FFFh
	SA46	0	1	0	0	1	1	1	X	X	X	270000h to 27FFFFh	138000h to 13FFFFh
	SA47	0	1	0	1	0	0	0	X	X	X	280000h to 28FFFFh	140000h to 147FFFh
	SA48	0	1	0	1	0	0	1	X	X	X	290000h to 29FFFFh	148000h to 14FFFFh
	SA49	0	1	0	1	0	1	0	X	X	X	2A0000h to 2AFFFFh	150000h to 157FFFh
	SA50	0	1	0	1	0	1	1	X	X	X	2B0000h to 2BFFFFh	158000h to 15FFFFh
	SA51	0	1	0	1	1	0	0	X	X	X	2C0000h to 2CFFFFh	160000h to 167FFFh
	SA52	0	1	0	1	1	0	1	X	X	X	2D0000h to 2DFFFFh	168000h to 16FFFFh
	SA53	0	1	0	1	1	1	0	X	X	X	2E0000h to 2EFFFFh	170000h to 177FFFh
	SA54	0	1	0	1	1	1	1	X	X	X	2F0000h to 2FFFFFh	178000h to 17FFFFh
	SA55	0	1	1	0	0	0	0	X	X	X	300000h to 30FFFFh	180000h to 187FFFh
	SA56	0	1	1	0	0	0	1	X	X	X	310000h to 31FFFFh	188000h to 18FFFFh
	SA57	0	1	1	0	0	1	0	X	X	X	320000h to 32FFFFh	190000h to 197FFFh
	SA58	0	1	1	0	0	1	1	X	X	X	330000h to 33FFFFh	198000h to 19FFFFh
	SA59	0	1	1	0	1	0	0	X	X	X	340000h to 34FFFFh	1A0000h to 1A7FFFh
	SA60	0	1	1	0	1	0	1	X	X	X	350000h to 35FFFFh	1A8000h to 1AFFFFh
	SA61	0	1	1	0	1	1	0	X	X	X	360000h to 36FFFFh	1B0000h to 1B7FFFh
	SA62	0	1	1	0	1	1	1	X	X	X	370000h to 37FFFFh	1B8000h to 1BFFFFh
	SA63	0	1	1	1	0	0	0	X	X	X	380000h to 38FFFFh	1C0000h to 1C7FFFh
	SA64	0	1	1	1	0	0	1	X	X	X	390000h to 39FFFFh	1C8000h to 1CFFFFh
	SA65	0	1	1	1	0	1	0	X	X	X	3A0000h to 3AFFFFh	1D0000h to 1D7FFFh
	SA66	0	1	1	1	0	1	1	X	X	X	3B0000h to 3BFFFFh	1D8000h to 1DFFFFh
	SA67	0	1	1	1	1	0	0	X	X	X	3C0000h to 3CFFFFh	1E0000h to 1E7FFFh
	SA68	0	1	1	1	1	0	1	X	X	X	3D0000h to 3DFFFFh	1E8000h to 1EFFFFh
	SA69	0	1	1	1	1	1	0	X	X	X	3E0000h to 3EFFFFh	1F0000h to 1F7FFFh
	SA70	0	1	1	1	1	1	1	X	X	X	3F0000h to 3FFFFFh	1F8000h to 1FFFFFh

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Bank	Sector	Sector Address										Address Range	
		Bank Address										Byte Mode	Word Mode
		A_{21}	A_{20}	A_{19}	A_{18}	A_{17}	A_{16}	A_{15}	A_{14}	A_{13}	A_{12}		
Bank C	SA71	1	0	0	0	0	0	0	X	X	X	400000h to 40FFFFh	200000h to 207FFFh
	SA72	1	0	0	0	0	0	1	X	X	X	410000h to 41FFFFh	208000h to 20FFFFh
	SA73	1	0	0	0	0	1	0	X	X	X	420000h to 42FFFFh	210000h to 217FFFh
	SA74	1	0	0	0	0	1	1	X	X	X	430000h to 43FFFFh	218000h to 21FFFFh
	SA75	1	0	0	0	1	0	0	X	X	X	440000h to 44FFFFh	220000h to 227FFFh
	SA76	1	0	0	0	1	0	1	X	X	X	450000h to 45FFFFh	228000h to 22FFFFh
	SA77	1	0	0	0	1	1	0	X	X	X	460000h to 46FFFFh	230000h to 237FFFh
	SA78	1	0	0	0	1	1	1	X	X	X	470000h to 47FFFFh	238000h to 23FFFFh
	SA79	1	0	0	1	0	0	0	X	X	X	480000h to 48FFFFh	240000h to 247FFFh
	SA80	1	0	0	1	0	0	1	X	X	X	490000h to 49FFFFh	248000h to 24FFFFh
	SA81	1	0	0	1	0	1	0	X	X	X	4A0000h to 4AFFFFh	250000h to 257FFFh
	SA82	1	0	0	1	0	1	1	X	X	X	4B0000h to 4BFFFFh	258000h to 25FFFFh
	SA83	1	0	0	1	1	0	0	X	X	X	4C0000h to 4CFFFFh	260000h to 267FFFh
	SA84	1	0	0	1	1	0	1	X	X	X	4D0000h to 4DFFFFh	268000h to 26FFFFh
	SA85	1	0	0	1	1	1	0	X	X	X	4E0000h to 4EFFFFh	270000h to 277FFFh
	SA86	1	0	0	1	1	1	1	X	X	X	4F0000h to 4FFFFFh	278000h to 27FFFFh
	SA87	1	0	1	0	0	0	0	X	X	X	500000h to 50FFFFh	280000h to 287FFFh
	SA88	1	0	1	0	0	0	1	X	X	X	510000h to 51FFFFh	288000h to 28FFFFh
	SA89	1	0	1	0	0	1	0	X	X	X	520000h to 52FFFFh	290000h to 297FFFh
	SA90	1	0	1	0	0	1	1	X	X	X	530000h to 53FFFFh	298000h to 29FFFFh
	SA91	1	0	1	0	1	0	0	X	X	X	540000h to 54FFFFh	2A0000h to 2A7FFFh
	SA92	1	0	1	0	1	0	1	X	X	X	550000h to 55FFFFh	2A8000h to 2AFFFFh
	SA93	1	0	1	0	1	1	0	X	X	X	560000h to 56FFFFh	2B0000h to 2B7FFFh
	SA94	1	0	1	0	1	1	1	X	X	X	570000h to 57FFFFh	2B8000h to 2BFFFFh
	SA95	1	0	1	1	0	0	0	X	X	X	580000h to 58FFFFh	2C0000h to 2C7FFFh
	SA96	1	0	1	1	0	0	1	X	X	X	590000h to 59FFFFh	2C8000h to 2CFFFFh
	SA97	1	0	1	1	0	1	0	X	X	X	5A0000h to 5AFFFFh	2D0000h to 2D7FFFh
	SA98	1	0	1	1	0	1	1	X	X	X	5B0000h to 5BFFFFh	2D8000h to 2DFFFFh
	SA99	1	0	1	1	1	0	0	X	X	X	5C0000h to 5CFFFFh	2E0000h to 2E7FFFh
	SA100	1	0	1	1	1	0	1	X	X	X	5D0000h to 5DFFFFh	2E8000h to 2EFFFFh
	SA101	1	0	1	1	1	1	0	X	X	X	5E0000h to 5EFFFFh	2F0000h to 2F7FFFh
	SA102	1	0	1	1	1	1	1	X	X	X	5F0000h to 5FFFFFh	2F8000h to 2FFFFFh
	SA103	1	1	0	0	0	0	0	X	X	X	600000h to 60FFFFh	300000h to 307FFFh
	SA104	1	1	0	0	0	0	1	X	X	X	610000h to 61FFFFh	308000h to 30FFFFh
	SA105	1	1	0	0	0	1	0	X	X	X	620000h to 62FFFFh	310000h to 317FFFh
	SA106	1	1	0	0	0	1	1	X	X	X	630000h to 63FFFFh	318000h to 31FFFFh
	SA107	1	1	0	0	1	0	0	X	X	X	640000h to 64FFFFh	320000h to 327FFFh
	SA108	1	1	0	0	1	0	1	X	X	X	650000h to 65FFFFh	328000h to 32FFFFh
	SA109	1	1	0	0	1	1	0	X	X	X	660000h to 66FFFFh	330000h to 337FFFh
	SA110	1	1	0	0	1	1	1	X	X	X	670000h to 67FFFFh	338000h to 33FFFFh
	SA111	1	1	0	1	0	0	0	X	X	X	680000h to 68FFFFh	340000h to 347FFFh
	SA112	1	1	0	1	0	0	1	X	X	X	690000h to 69FFFFh	348000h to 34FFFFh
	SA113	1	1	0	1	0	1	0	X	X	X	6A0000h to 6AFFFFh	350000h to 357FFFh
	SA114	1	1	0	1	0	1	1	X	X	X	6B0000h to 6BFFFFh	358000h to 35FFFFh
	SA115	1	1	0	1	1	0	0	X	X	X	6C0000h to 6CFFFFh	360000h to 367FFFh
	SA116	1	1	0	1	1	0	1	X	X	X	6D0000h to 6DFFFFh	368000h to 36FFFFh
	SA117	1	1	0	1	1	1	0	X	X	X	6E0000h to 6EFFFFh	370000h to 377FFFh
	SA118	1	1	0	1	1	1	1	X	X	X	6F0000h to 6FFFFFh	378000h to 37FFFFh

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Bank	Sector	Sector Address										Address Range	
		Bank Address										Byte Mode	Word Mode
		A_{21}	A_{20}	A_{19}	A_{18}	A_{17}	A_{16}	A_{15}	A_{14}	A_{13}	A_{12}		
Bank D	SA119	1	1	1	0	0	0	0	X	X	X	700000h to 70FFFFh	380000h to 387FFFh
	SA120	1	1	1	0	0	0	1	X	X	X	710000h to 71FFFFh	388000h to 38FFFFh
	SA121	1	1	1	0	0	1	0	X	X	X	720000h to 72FFFFh	390000h to 397FFFh
	SA122	1	1	1	0	0	1	1	X	X	X	730000h to 73FFFFh	398000h to 39FFFFh
	SA123	1	1	1	0	1	0	0	X	X	X	740000h to 74FFFFh	3A0000h to 3A7FFFh
	SA124	1	1	1	0	1	0	1	X	X	X	750000h to 75FFFFh	3A8000h to 3AFFFFh
	SA125	1	1	1	0	1	1	0	X	X	X	760000h to 76FFFFh	3B0000h to 3B7FFFh
	SA126	1	1	1	0	1	1	1	X	X	X	770000h to 77FFFFh	3B8000h to 3BFFFFh
	SA127	1	1	1	1	0	0	0	X	X	X	780000h to 78FFFFh	3C0000h to 3C7FFFh
	SA128	1	1	1	1	0	0	1	X	X	X	790000h to 79FFFFh	3C8000h to 3CFFFFh
	SA129	1	1	1	1	0	1	0	X	X	X	7A0000h to 7AFFFFh	3D0000h to 3D7FFFh
	SA130	1	1	1	1	0	1	1	X	X	X	7B0000h to 7BFFFFh	3D8000h to 3DFFFFh
	SA131	1	1	1	1	1	0	0	X	X	X	7C0000h to 7CFFFFh	3E0000h to 3E7FFFh
	SA132	1	1	1	1	1	0	1	X	X	X	7D0000h to 7DFFFFh	3E8000h to 3EFFFFh
	SA133	1	1	1	1	1	1	0	X	X	X	7E0000h to 7EFFFFh	3F0000h to 3F7FFFh
	SA134	1	1	1	1	1	1	1	0	0	0	7F0000h to 7F1FFFh	3F8000h to 3F8FFFh
	SA135	1	1	1	1	1	1	1	0	0	1	7F2000h to 7F3FFFh	3F9000h to 3F9FFFh
	SA136	1	1	1	1	1	1	1	0	1	0	7F4000h to 7F5FFFh	3FA000h to 3FAFFFh
	SA137	1	1	1	1	1	1	1	0	1	1	7F6000h to 7F7FFFh	3FB000h to 3FBFFFh
	SA138	1	1	1	1	1	1	1	1	0	0	7F8000h to 7F9FFFh	3FC000h to 3FCFFFh
	SA139	1	1	1	1	1	1	1	1	0	1	7FA000h to 7FBFFFh	3FD000h to 3FDFFFh
	SA140	1	1	1	1	1	1	1	1	1	0	7FC000h to 7FDFFFh	3FE000h to 3FEFFFh
	SA141	1	1	1	1	1	1	1	1	1	1	7FE000h to 7FFFFFh	3FF000h to 3FFFFFh

Table 4 Sector Group Addresses (MB84VD23280EA/EE)

Sector Group	A_{21}	A_{20}	A_{19}	A_{18}	A_{17}	A_{16}	A_{15}	A_{14}	A_{13}	A_{12}	Sectors
SGA0	0	0	0	0	0	0	0	0	0	0	SA0
SGA1	0	0	0	0	0	0	0	0	0	1	SA1
SGA2	0	0	0	0	0	0	0	0	1	0	SA2
SGA3	0	0	0	0	0	0	0	0	1	1	SA3
SGA4	0	0	0	0	0	0	0	1	0	0	SA4
SGA5	0	0	0	0	0	0	0	1	0	1	SA5
SGA6	0	0	0	0	0	0	0	1	1	0	SA6
SGA7	0	0	0	0	0	0	0	1	1	1	SA7
SGA8	0	0	0	0	0	0	0	X	X	X	SA8 to SA10
						0	1				
						1	0				
SGA9	0	0	0	0	1	X	X	X	X	X	SA11 to SA14
SGA10	0	0	0	1	0	X	X	X	X	X	SA15 to SA18
SGA11	0	0	0	1	1	X	X	X	X	X	SA19 to SA22
SGA12	0	0	1	0	0	X	X	X	X	X	SA23 to SA26
SGA13	0	0	1	0	1	X	X	X	X	X	SA27 to SA30
SGA14	0	0	1	1	0	X	X	X	X	X	SA31 to SA34
SGA15	0	0	1	1	1	X	X	X	X	X	SA35 to SA38
SGA16	0	1	0	0	0	X	X	X	X	X	SA39 to SA42
SGA17	0	1	0	0	1	X	X	X	X	X	SA43 to SA46
SGA18	0	1	0	1	0	X	X	X	X	X	SA47 to SA50
SGA19	0	1	0	1	1	X	X	X	X	X	SA51 to SA54
SGA20	0	1	1	0	0	X	X	X	X	X	SA55 to SA58
SGA21	0	1	1	0	1	X	X	X	X	X	SA59 to SA62
SGA22	0	1	1	1	0	X	X	X	X	X	SA63 to SA66
SGA23	0	1	1	1	1	X	X	X	X	X	SA67 to SA70
SGA24	1	0	0	0	0	X	X	X	X	X	SA71 to SA74
SGA25	1	0	0	0	1	X	X	X	X	X	SA75 to SA78
SGA26	1	0	0	1	0	X	X	X	X	X	SA79 to SA82
SGA27	1	0	0	1	1	X	X	X	X	X	SA83 to SA86
SGA28	1	0	1	0	0	X	X	X	X	X	SA87 to SA90
SGA29	1	0	1	0	1	X	X	X	X	X	SA91 to SA94
SGA30	1	0	1	1	0	X	X	X	X	X	SA95 to SA98
SGA31	1	0	1	1	1	X	X	X	X	X	SA99 to SA102
SGA32	1	1	0	0	0	X	X	X	X	X	SA103 to SA106
SGA33	1	1	0	0	1	X	X	X	X	X	SA107 to SA110
SGA34	1	1	0	1	0	X	X	X	X	X	SA111 to SA114
SGA35	1	1	0	1	1	X	X	X	X	X	SA115 to SA118
SGA36	1	1	1	0	0	X	X	X	X	X	SA119 to SA122
SGA37	1	1	1	0	1	X	X	X	X	X	SA123 to SA126
SGA38	1	1	1	1	0	X	X	X	X	X	SA127 to SA130
SGA39	1	1	1	1	1	0	0	X	X	X	SA131 to SA133
						0	1				
						1	0				
SGA40	1	1	1	1	1	1	1	0	0	0	SA134
SGA41	1	1	1	1	1	1	1	0	0	1	SA135
SGA42	1	1	1	1	1	1	1	0	1	0	SA136
SGA43	1	1	1	1	1	1	1	0	1	1	SA137
SGA44	1	1	1	1	1	1	1	1	0	0	SA138
SGA45	1	1	1	1	1	1	1	1	0	1	SA139
SGA46	1	1	1	1	1	1	1	1	1	0	SA140
SGA47	1	1	1	1	1	1	1	1	1	1	SA141

Table 5 Flash Memory Autoselect Codes

Type		A_{21} to A_{12}	A_6	A_3	A_2	A_1	A_0	A_{-1}*1	Code (HEX)
Manufacture's Code		BA*3	V_{IL}	V_{IL}	V_{IL}	V_{IL}	V_{IL}	V_{IL}	04h
Device Code	Byte	BA*3	V_{IL}	V_{IL}	V_{IL}	V_{IL}	V_{IH}	V_{IL}	7Eh
	Word							X	227Eh
Extended Device Code *4	Byte	BA*3	V_{IL}	V_{IH}	V_{IH}	V_{IH}	V_{IL}	V_{IL}	02h
	Word							X	2202h
	Byte	BA*3	V_{IL}	V_{IH}	V_{IH}	V_{IH}	V_{IH}	V_{IL}	01h
	Word							X	2201h
Sector Group Protection		Sector Group Addresses	V_{IL}	V_{IL}	V_{IL}	V_{IH}	V_{IL}	V_{IL}	01h*2

*1 : A_{-1} is for Byte mode.

*2 : Outputs 01h at protected sector group addresses and outputs 00h at unprotected sector group addresses.

*3 : When V_{ID} is applied, both Bank 1 and Bank 2 become Autoselect mode, which leads to the simultaneous operation unable to be executed. Consequently, specifying the bank address is not demanded. However, the bank address needs to be indicated when Autoselect mode is read out at command mode; because then it becomes OK to activate simultaneous operation.

*4 : At WORD mode, a read cycle at address (BA) 01h (at BYTE mode, (BA) 02h) outputs device code. When 227Eh (at BYTE mode, 7Eh) was output, this indicates that there will require two additional codes, called Extended Device Codes. Therefore the system may continue reading out these Extended Device Codes at the address of (BA) 0Eh (at BYTE mode, (BA) 1Ch) , as well as at (BA) 0Fh (at BYTE mode, (BA) 1Eh) .

Table 6 Flash Memory Command Definitions

Command Sequence		Bus Write Cycles Req'd	First Bus Write Cycle		Second Bus Write Cycle		Third Bus Write Cycle		Fourth Bus Read/Write Cycle		Fifth Bus Write Cycle		Sixth Bus Write Cycle	
			Addr.	Data	Addr.	Data	Addr.	Data	Addr.	Data	Addr.	Data	Addr.	Data
Read/Reset	Word	1	XXXh	F0h	—	—	—	—	—	—	—	—	—	—
	Byte													
Read/Reset	Word	3	555h	AAh	2AAh	55h	555h	F0h	RA	RD	—	—	—	—
	Byte		AAAh		555h		AAAh							
Autoselect	Word	3	555h	AAh	2AAh	55h	(BA) 555h	90h	—	—	—	—	—	—
	Byte		AAAh		555h		(BA) AAAh							
Program	Word	4	555h	AAh	2AAh	55h	555h	A0h	PA	PD	—	—	—	—
	Byte		AAAh		555h		AAAh							
Program Suspend		1	BA	B0h	—	—	—	—	—	—	—	—	—	—
Program Resume		1	BA	30h	—	—	—	—	—	—	—	—	—	—
Chip Erase	Word	6	555h	AAh	2AAh	55h	555h	80h	555h	AAh	2AAh	55h	555h	10h
	Byte		AAAh		555h		AAAh		AAAh		555h		AAAh	
Sector Erase	Word	6	555h	AAh	2AAh	55h	555h	80h	555h	AAh	2AAh	55h	SA	30h
	Byte		AAAh		555h		AAAh		AAAh		555h			
Erase Suspend		1	BA	B0h	—	—	—	—	—	—	—	—	—	—
Erase Resume		1	BA	30h	—	—	—	—	—	—	—	—	—	—
Extended Sector Group Protection *2	Word	4	XXXh	60h	SPA	60h	SPA	40h	SPA	SD	—	—	—	—
	Byte													
Set to Fast Mode	Word	3	555h	AAh	2AAh	55h	555h	20h	—	—	—	—	—	—
	Byte		AAAh		555h		AAAh							
Fast Program *1	Word	2	XXXh	A0h	PA	PD	—	—	—	—	—	—	—	—
	Byte		XXXh											
Reset from Fast Mode *1	Word	2	BA	90h	XXXh	*4 F0h	—	—	—	—	—	—	—	—
	Byte		BA		XXXh									
Query	Word	1	(BA) 55h	98h	—	—	—	—	—	—	—	—	—	—
	Byte		(BA) AAh											
Hi-ROM Entry	Word	3	555h	AAh	2AAh	55h	555h	88h	—	—	—	—	—	—
	Byte		AAAh		555h		AAAh							
Hi-ROM Program *3	Word	4	555h	AAh	2AAh	55h	555h	A0h	(HRA) PA	PD	—	—	—	—
	Byte		AAAh		555h		AAAh							
Hi-ROM Exit *3	Word	4	555h	AAh	2AAh	55h	(HRBA) 555h	90h	XXXh	00h	—	—	—	—
	Byte		AAAh		555h		(HRBA) AAAh							

(Continued)

(Continued)

*1: This command is valid while Fast Mode.

*2: This command is valid while $\overline{\text{RESET}}$ = V_{ID}.

*3: This command is valid while Hi-ROM mode.

*4: The data “00h” is also acceptable.

Notes: 1. Address bits A_{21} to A_{11} = X = “H” or “L” for all address commands except or Program Address (PA), Sector Address (SA), and Bank Address (BA), and Sector Group Address (SPA).

2. Bus operations are defined in Tables 3 and 4.

3. RA =Address of the memory location to be read
   PA = Address of the memory location to be programmed
   Addresses are latched on the falling edge of the write pulse.
   SA = Address of the sector to be erased. The combination of A_{21}, A_{20}, A_{19}, A_{18}, A_{17}, A_{16}, A_{15}, A_{14}, A_{13}, and A_{12} will uniquely select any sector.
   BA = Bank Address (A_{21}, A_{20}, A_{19})

4. RD = Data read from location RA during read operation.
   PD = Data to be programmed at location PA. Data is latched on the falling edge of write pulse.

5. SPA =Sector group address to be protected. Set sector group address and (A_6, A_3, A_2, A_1, A_0) = (0, 0, 0, 1, 0).
   SD = Sector group protection verify data. Output 01h at protected sector group addresses and output 00h at unprotected sector group addresses.

6. HRA = Address of the Hi-ROM area Word Mode:000000h to 00007Fh
   Byte Mode:000000h to 0000FFh

7. HRBA = Bank Address of the Hi-ROM area (A_{21} = A_{20} = A_{19} = V_{IL})

8. The system should generate the following address patterns:
   Word Mode: 555h or 2AAh to addresses A_{10} to A_0
   Byte Mode: AAAh or 555h to addresses A_{10} to A_0, and A_{-1}

9. Both Read/Reset commands are functionally equivalent, resetting the device to the read mode.

■ ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Rating		Unit
		Min.	Max.	
Storage Temperature	Tstg	–55	+125	°C
Ambient Temperature with Power Applied	Ta	–25	+85	°C
Voltage with Respect to Ground All pins except A_9,$\overline{OE}$,$\overline{RESET}$,$\overline{WP}$/ACC *1	V_{IN}, V_{OUT}	–0.3	V_{CCf} +0.3	V
			V_{CCs} +0.3	V
V_{CCf}/V_{CCs} Supply *1	V_{CCf}, V_{CCs}	–0.3	+4.0	V
A_9 and $\overline{OE}$ *2	V_{IN}	–0.3	+ 13.0	V
$\overline{RESET}$ *2	V_{IN}	–0.5	+ 13.0	V
$\overline{WP}$/ACC *3	V_{IN}	–0.5	+10.5	V

*1 Minimum DC voltage on input or I/O pins is –0.3 V. During voltage transitions, input or I/O pins may undershoot V_{SS} to –2.0 V for periods of up to 20 ns. Maximum DC voltage on input or I/O pins is V_{CCf} + 0.3 V or V_{CCs} + 0.3 V. During voltage transitions, input or I/O pins may overshoot to V_{CCf} + 2.0 V or V_{CCs} + 2.0 V for periods of up to 20 ns.

*2: Minimum DC input voltage on A_9 and $\overline{OE}$ pin is –0.3 V. Minimum DC input voltage on $\overline{RESET}$ pin is –0.5 V. During voltage transitions, A_9, $\overline{OE}$, and $\overline{RESET}$ pins may undershoot V_{SS} to –2.0 V for periods of up to 20 ns. Voltage difference between input and supply voltage (VIN-V_{CCf} or V_{CCs}) does not exceed +9.0 V. Maximum DC input voltage on A_9, $\overline{OE}$, and $\overline{RESET}$ pins is +13.0 V which may overshoot to +14.0 V for periods of up to 20 ns.

*3: Minimum DC input voltage on $\overline{WP}$/ACC pin is –0.5 V. During voltage transitions, $\overline{WP}$/ACC pin may undershoot Vss to –2.0 V for periods of up to 20 ns. Maximum DC input voltage on $\overline{WP}$/ACC pin is +10.5 V which may overshoot to +12.0 V for periods of up to 20 ns, when V_{CCf} is applied.

WARNING: Semiconductor devices can be permanently damaged by application of stress (voltage, current, temperature, etc.) in excess of absolute maximum ratings. Do not exceed these ratings.

■ RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Value		Unit
		Min.	Max.	
Ambient Temperature	Ta	–25	+85	°C
V_{CCf}/V_{CCs} Supply Voltages	V_{CCf}, V_{CCs}	+2.7	+3.3	V

Note: Operating ranges define those limits between which the functionality of the device is guaranteed.

WARNING: The recommended operating conditions are required in order to ensure the normal operation of the semiconductor device. All of the device's electrical characteristics are warranted when the device is operated within these ranges.

Always use semiconductor devices within their recommended operating condition ranges. Operation outside these ranges may adversely affect reliability and could result in device failure.

No warranty is made with respect to uses, operating conditions, or combinations not represented on the data sheet. Users considering application outside the listed conditions are advised to contact their FUJITSU representatives beforehand.

■ ELECTRICAL CHARACTERRISTICS

1. DC Characteristics

Parameter	Symbol	Conditions			Value			Unit
					Min.	Typ.	Max.	
Input Leakage Current	I_{LI}	V_{IN} = V_{SS} to V_{CCf}, V_{CCS}			–1.0	—	+1.0	µA
Output Leakage Current	I_{LO}	V_{OUT} = V_{SS} to V_{CCf}, V_{CCS}			–1.0	—	+1.0	µA
$\overline{RESET}$ Inputs Leakage Current	I_{LIT}	V_{CCf} = V_{CCf} Max., V_{CCS} = V_{CCS} Max., $\overline{RESET}$ = 12.5 V			—	—	35	µA
A_{CC} Input Leakage Current	I_{LIA}	V_{CCf} = V_{CCf} Max., V_{CCS} = V_{CCS} Max., $\overline{WP}/A_{CC}$ = V_{ACC} Max.			—	—	20	mA
Flash V_{CC} Active Current (Read) *1	I_{CC1f}	$\overline{CEf}$ = V_{IL}, $\overline{OE}$ = V_{IH}	t_{CYCLE} = 5 MHz	Byte	—	—	16	mA
			t_{CYCLE} = 5 MHz	Word	—	—	18	
			t_{CYCLE} = 1 MHz	Byte	—	—	7	mA
			t_{CYCLE} = 1 MHz	Word	—	—	7	
Flash V_{CC} Active Current (Program/Erase) *2	I_{CC2f}	$\overline{CEf}$ = V_{IL}, $\overline{OE}$ = V_{IH}			—	—	35	mA
Flash V_{CC} Active Current (Read-While-Program) *5	I_{CC3f}	$\overline{CEf}$ = V_{IL}, $\overline{OE}$ = V_{IH}		Byte	—	—	51	mA
				Word	—	—	53	
Flash V_{CC} Active Current (Read-While-Erase) *5	I_{CC4f}	$\overline{CEf}$ = V_{IL}, $\overline{OE}$ = V_{IH}		Byte	—	—	51	mA
				Word	—	—	53	
Flash V_{CC} Active Current (Erase-Suspend-Program)	I_{CC5f}	$\overline{CEf}$ = V_{IL}, $\overline{OE}$ = V_{IH}			—	—	35	mA
SRAM V_{CC} Active Current	I_{CC1S}	V_{CCS} = V_{CC} Max., $\overline{CE1s}$ = V_{IL}, CE2s = V_{IH}	t_{CYCLE} =10 MHz		—	—	50	mA
SRAM V_{CC} Active Current	I_{CC2S}	$\overline{CE1s}$ = 0.2 V, CE2s = V_{CCS} – 0.2 V	t_{CYCLE} = 10 MHz		—	—	50	mA
			t_{CYCLE} = 1 MHz		—	—	10	mA
Flash V_{CC} Standby Current	I_{SB1f}	V_{CCf} = V_{CCf} Max., $\overline{CEf}$ = V_{CCf} ± 0.3 V $\overline{RESET}$ = V_{CCf} ± 0.3 V, $\overline{WP}/A_{CC}$ = V_{CCf}± 0.3 V			—	—	5	µA
Flash V_{CC} Standby Current ($\overline{RESET}$)	I_{SB2f}	V_{CCf} = V_{CCf} Max., $\overline{RESET}$ = V_{SS} ± 0.3 V, $\overline{WP}/A_{CC}$ = V_{CCf}± 0.3 V			—	—	5	µA
Flash V_{CC} Current (Automatic Sleep Mode) *3	I_{SB3f}	V_{CCf} = V_{CCf} Max., $\overline{CEf}$ = V_{SS} ± 0.3 V $\overline{RESET}$ = V_{CCf} ± 0.3 V, $\overline{WP}/A_{CC}$ = V_{CCf}± 0.3 V, V_{IN} = V_{CCf}± 0.3 V or V_{SS} ± 0.3 V			—	—	5	µA
SRAM V_{CC} Standby Current	I_{SB1S}	$\overline{CE1s}$ ≥ V_{CCS} – 0.2 V, CE2s ≥ V_{CCS} – 0.2 V			—	—	25	µA
SRAM V_{CC} Standby Current	I_{SB2S}	CE2s ≤ 0.2V			—	—	25	µA

(Continued)

(Continued)

Parameter	Symbol	Conditions		Value			Unit
				Min.	Typ.	Max.	
Input Low Level	V_{IL}	—		–0.3	—	0.5	V
Input High Level	V_{IH}	—		2.4	—	V_{CC}+0.3 *6	V
Voltage for Sector Protection, and Temporary Sector Unprotection ($\overline{RESET}$) *4	V_{ID}	—		11.5	—	12.5	V
Voltage for Program Acceleration ($\overline{WP}$/ACC) *4	V_{ACC}	—		8.5	9.0	9.5	V
Output Low Voltage Level	V_{OL}	V_{CCf} = V_{CCf} Min., I_{OL}=4.0 mA	Flash	—	—	0.45	V
		V_{CCs} = V_{CCs} Min., I_{OL}=1.0 mA	SRAM	—	—	0.4	V
Output High Voltage Level	V_{OH}	V_{CCf} = V_{CCf} Min., I_{OH}=–0.1 mA	Flash	V_{CCf}–0.4	—	—	V
		V_{CCs} = V_{CCs} Min., I_{OH}=–0.5 mA	SRAM	2.2	—	—	V
Flash Low V_{CCf} Lock-Out Voltage	V_{LKO}	—		2.3	—	2.5	V

*1: The I_{CC} current listed includes both the DC operating current and the frequency dependent component.

*2: I_{CC} active while Embedded Algorithm (program or erase) is in progress.

*3: Automatic sleep mode enables the low power mode when address remains stable for 150 ns.

*4: Applicable for only V_{CCf} applying.

*5: Embedded Alogorithm (program or erase) is in progress. (@5 MHz)

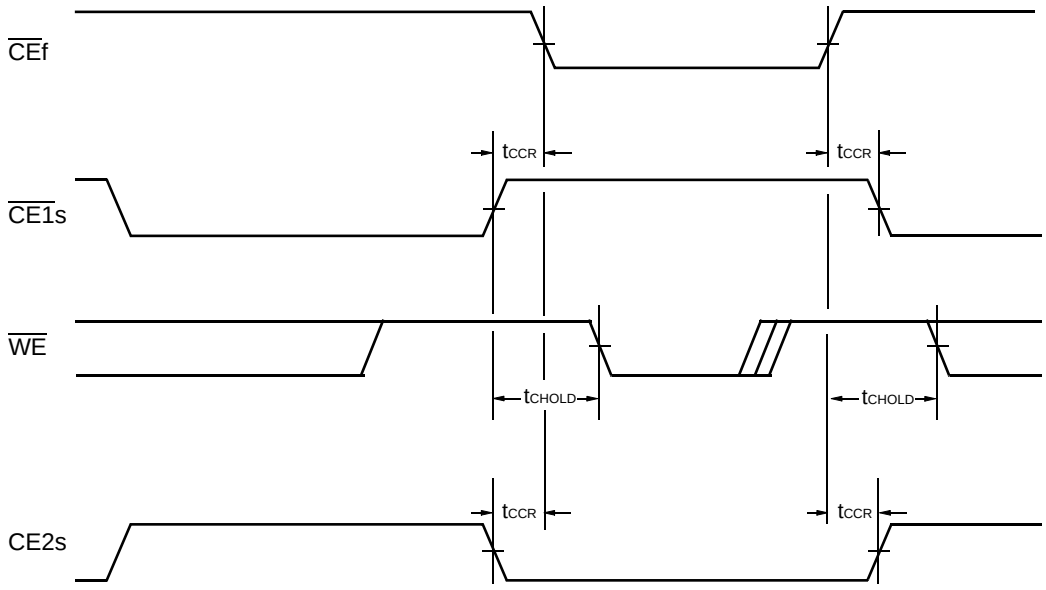
*6: V_{CC} indicates lower of V_{CCf} or V_{CCs}.

2. AC Characteristics

- **$\overline{CE}$ Timing**

Parameter	Symbol		Condition	Value		Unit
	JEDEC	Standard		Min.	Max.	
$\overline{CE}$ Recover Time	—	t_{CCR}	—	0	—	ns
$\overline{CE}$ Hold Time	—	t_{CHOLD}	—	3	—	ns

- **Timing Diagram for alternating SRAM to Flash**

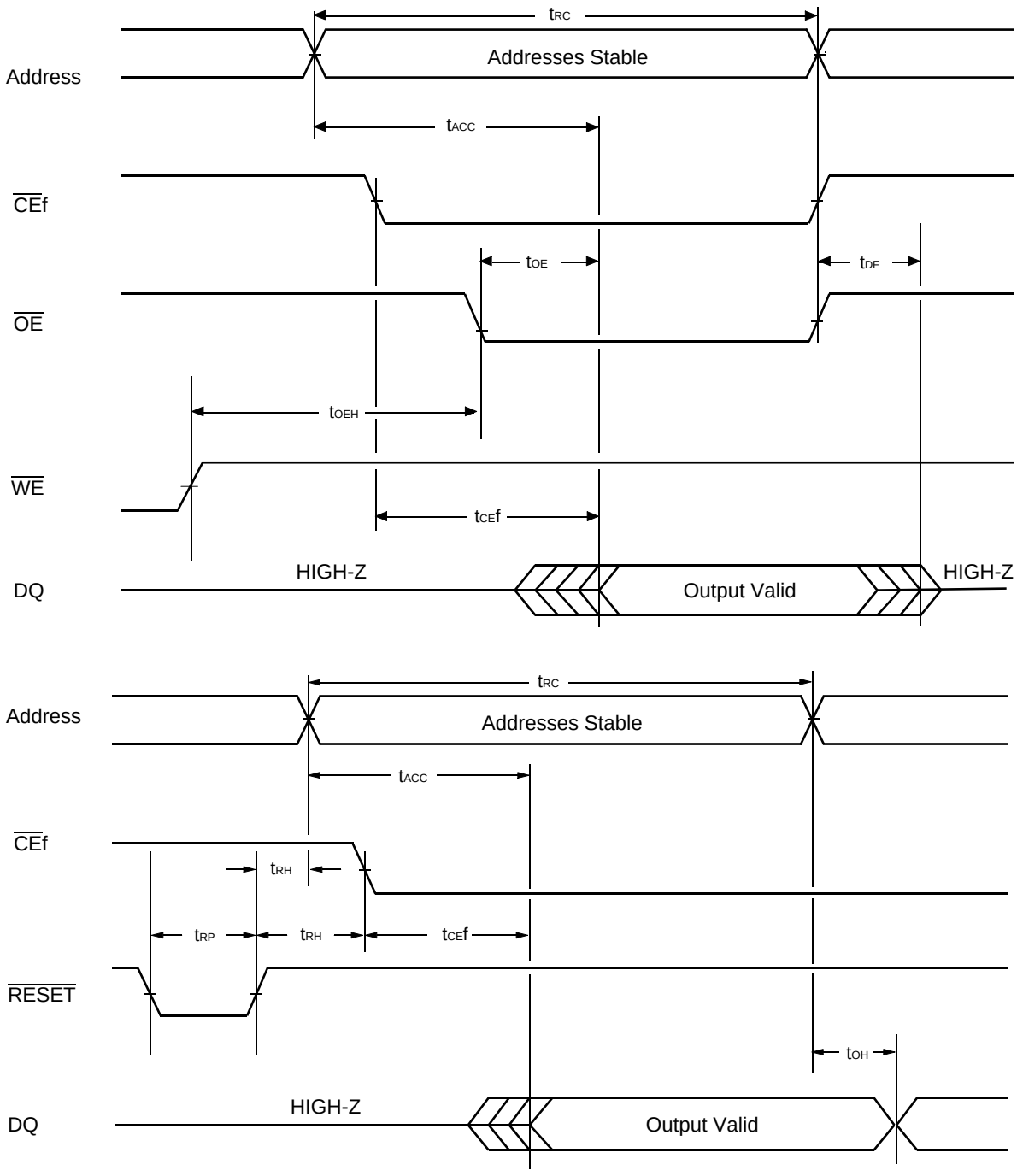


- **Read Only Operations Characteristics (Flash)**

Parameter	Symbol		Condition	Value (Note)		Unit
	JEDEC	Standard		Min.	Max.	
Read Cycle Time	t_{AVAV}	t_{RC}	—	90	—	ns
Address to Output Delay	t_{AVQV}	t_{ACC}	$\overline{CE}f = V_{IL}$ $\overline{OE} = V_{IL}$	—	90	ns
Chip Enable to Output Delay	t_{ELQV}	$t_{CE}f$	$\overline{OE} = V_{IL}$	—	90	ns
Output Enable to Output Delay	t_{GLQV}	t_{OE}	—	—	35	ns
Chip Enable to Output High-Z	t_{EHQZ}	t_{DF}	—	—	30	ns
Output Enable to Output High-Z	t_{GHQZ}	t_{DF}	—	—	30	ns
Output Hold Time From Addresses, $\overline{CE}f$ or $\overline{OE}$, Whichever Occurs First	t_{AXQX}	t_{OH}	—	0	—	ns
$\overline{RESET}$ Pin Low to Read Mode	—	t_{READY}	—	—	20	µs

Note: Test Conditions– Output Load:1 TTL gate and 30 pF
Input rise and fall times: 5 ns
Input pulse levels: 0.0 V to $V_{CC}f$
Timing measurement reference level
Input: $0.5 \times V_{CC}f$
Output: $0.5 \times V_{CC}f$

- **Read Cycle (Flash)**



- **Erase/Program Operations (Flash)**

Parameter		Symbol		Value			Unit
		JEDEC	Standard	Min.	Typ.	Max.	
Write Cycle Time		t_{AVAV}	t_{WC}	90	—	—	ns
Address Setup Time ($\overline{WE}$ to Addr.)		t_{AVWL}	t_{AS}	0	—	—	ns
Address Setup Time to $\overline{CE}$f Low During Toggle Bit Polling		—	t_{ASO}	15	—	—	ns
Address Hold Time ($\overline{WE}$ to Addr.)		t_{WLAX}	t_{AH}	45	—	—	ns
Address Hold Time from $\overline{CE}$f or $\overline{OE}$ High During Toggle Bit Polling		—	t_{AHT}	0	—	—	ns
Data Setup Time		t_{DVWH}	t_{DS}	35	—	—	ns
Data Hold Time		t_{WHDX}	t_{DH}	0	—	—	ns
Output Enable Hold Time	Read	—	t_{OEH}	0	—	—	ns
	Toggle and $\overline{Data}$ Polling			10	—	—	ns
$\overline{CE}$f High During Toggle Bit Polling		—	t_{CEPH}	20	—	—	ns
$\overline{OE}$ High During Toggle Bit Polling		—	t_{OEPH}	20	—	—	ns
Read Recover Time Before Write ($\overline{OE}$ to $\overline{CE}$f)		t_{GHEL}	t_{GHEL}	0	—	—	ns
Read Recover Time Before Write ($\overline{OE}$ to $\overline{WE}$)		t_{GHWL}	t_{GHWL}	0	—	—	ns
$\overline{WE}$ Setup Time ($\overline{CE}$f to $\overline{WE}$)		t_{WLEL}	t_{WS}	0	—	—	ns
$\overline{CE}$f Setup Time ($\overline{WE}$ to $\overline{CE}$f)		t_{ELWL}	t_{CS}	0	—	—	ns
$\overline{WE}$ Hold Time ($\overline{CE}$f to $\overline{WE}$)		t_{EHWH}	t_{WH}	0	—	—	ns
$\overline{CE}$f Hold Time ($\overline{WE}$ to $\overline{CE}$f)		t_{WHEH}	t_{CH}	0	—	—	ns
Write Pulse Width		t_{WLWH}	t_{WP}	35	—	—	ns
$\overline{CE}$f Pulse Width		t_{ELEH}	t_{CP}	35	—	—	ns
Write Pulse Width High		t_{WHWL}	t_{WPH}	30	—	—	ns
$\overline{CE}$f Pulse Width High		t_{EHEL}	t_{CPH}	30	—	—	ns
Word Programming Operation		t_{WHWH1}	t_{WHWH1}	—	16	—	µs
Sector Erase Operation *1		t_{WHWH2}	t_{WHWH2}	—	1	—	s
V_{CC}f Setup Time		—	t_{VCS}	50	—	—	µs
Voltage Transition Time *2		—	t_{VLHT}	4	—	—	µs
Rise Time to V_{ID} *2		—	t_{VIDR}	500	—	—	ns
Rise Time to V_{ACC}		—	t_{VACCR}	500	—	—	ns
Recover Time from RY/$\overline{BY}$		—	t_{RB}	0	—	—	ns
$\overline{RESET}$ Pulse Width		—	t_{RP}	500	—	—	ns
Delay Time from Embedded Output Enable		—	t_{EOE}	—	—	90	ns
$\overline{RESET}$ High Level Period Before Read		—	t_{RH}	200	—	—	ns
Program/Erase Valid to RY/$\overline{BY}$ Delay		—	t_{BUSY}	—	—	90	ns
Erase Time-out Time *3		—	t_{TOW}	50	—	—	µs
Erase Suspend Transition Time *4		—	t_{SPD}	—	—	20	µs

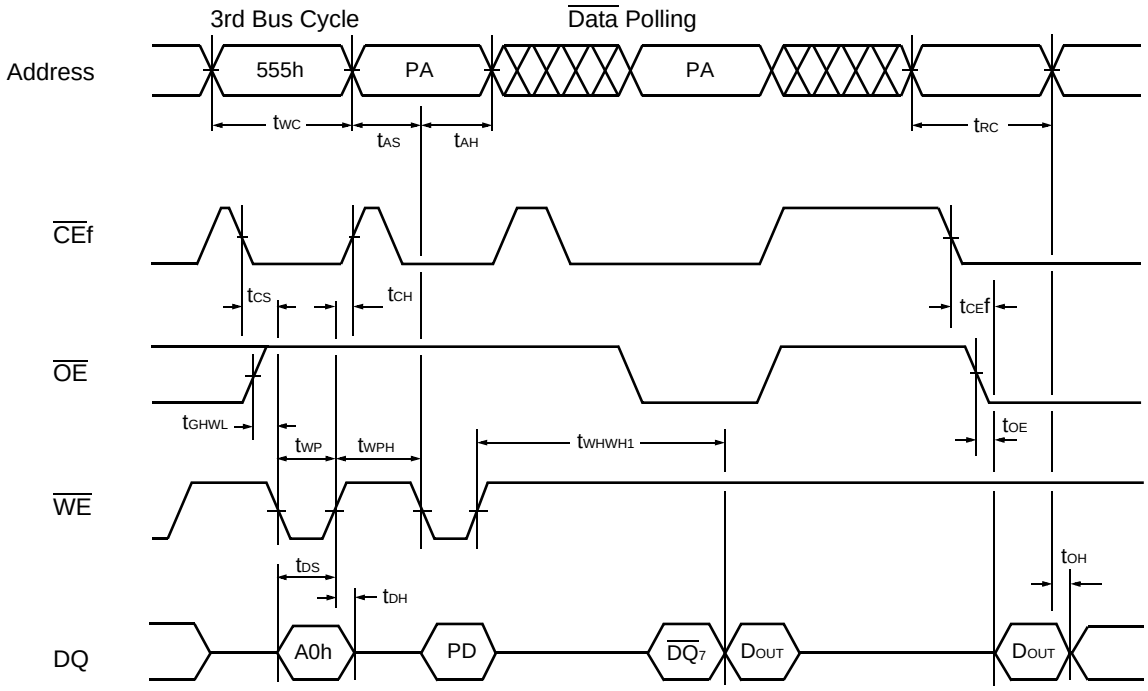
*1: This does not include the preprogramming time.

*2: This timing is for Sector group Protection Operation.

*3: The time between writes must be less than "t_{TOW}" otherwise that command will not be accepted and erasure will start. A time-out or "t_{TOW}" from the rising edge of last $\overline{CE}$f or $\overline{WE}$ whichever happens first will initiate the execution of the Sector Erase command(s).

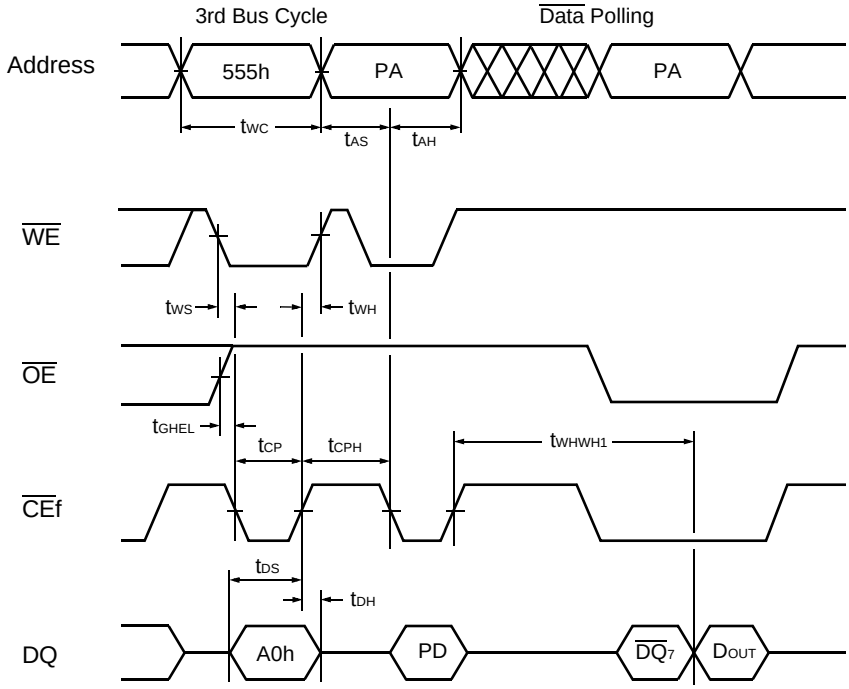
*4: When the Erase Suspend command is written during the Sector Erase operation, the device will take a maximum of "t_{SPD}" to suspend the erase operation.

- **Write Cycle ($\overline{WE}$ control) (Flash)**



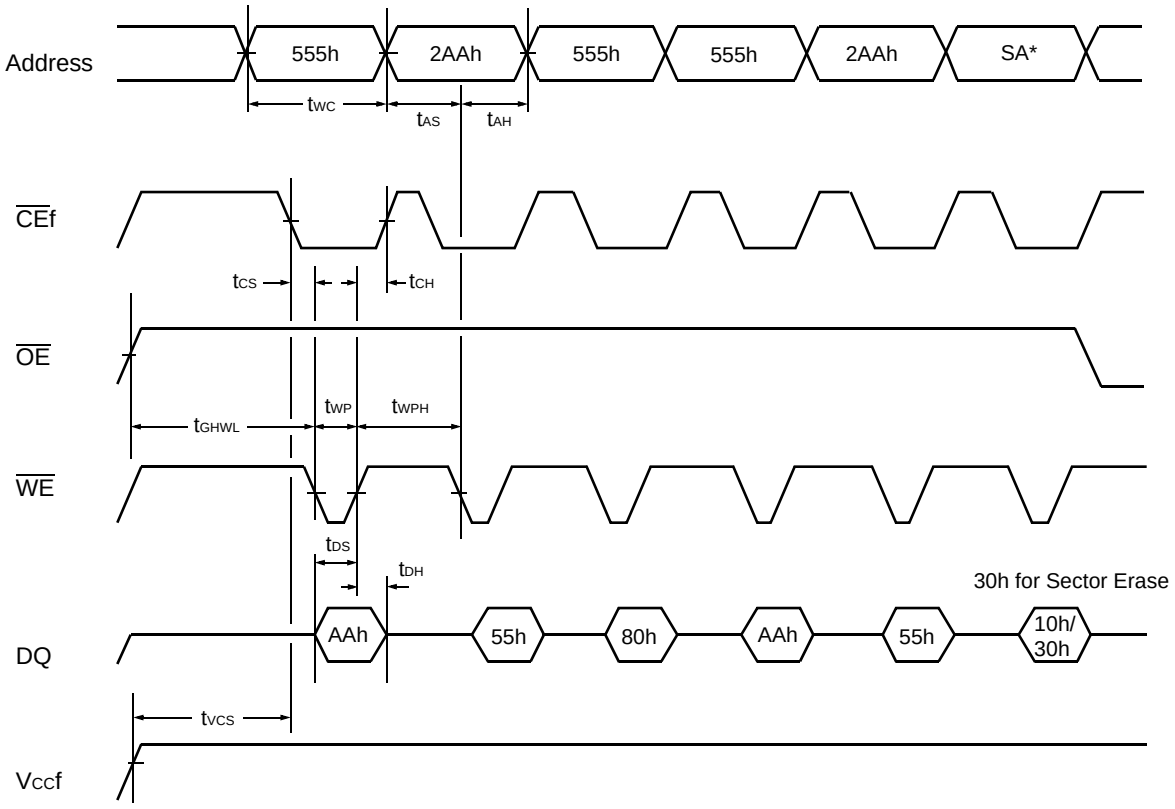
Notes: 1. PA is address of the memory location to be programmed.
2. PD is data to be programmed at byte address.
3. $\overline{DQ}_7$ is the output of the complement of the data written to the device.
4. D_{OUT} is the output of the data written to the device.
5. Figure indicates last two bus cycles out of four bus cycle sequence.
6. These waveforms are for the ×16 mode. (The addresses differ from ×8 mode.)

- **Write Cycle ($\overline{CE}$f control) (Flash)**



Notes: 1. PA is address of the memory location to be programmed.
2. PD is data to be programmed at byte address.
3. $\overline{DQ}_7$ is the output of the complement of the data written to the device.
4. D_{OUT} is the output of the data written to the device.
5. Figure indicates last two bus cycles out of four bus cycle sequence.
6. These waveforms are for the ×16 mode. (The addresses differ from ×8 mode.)

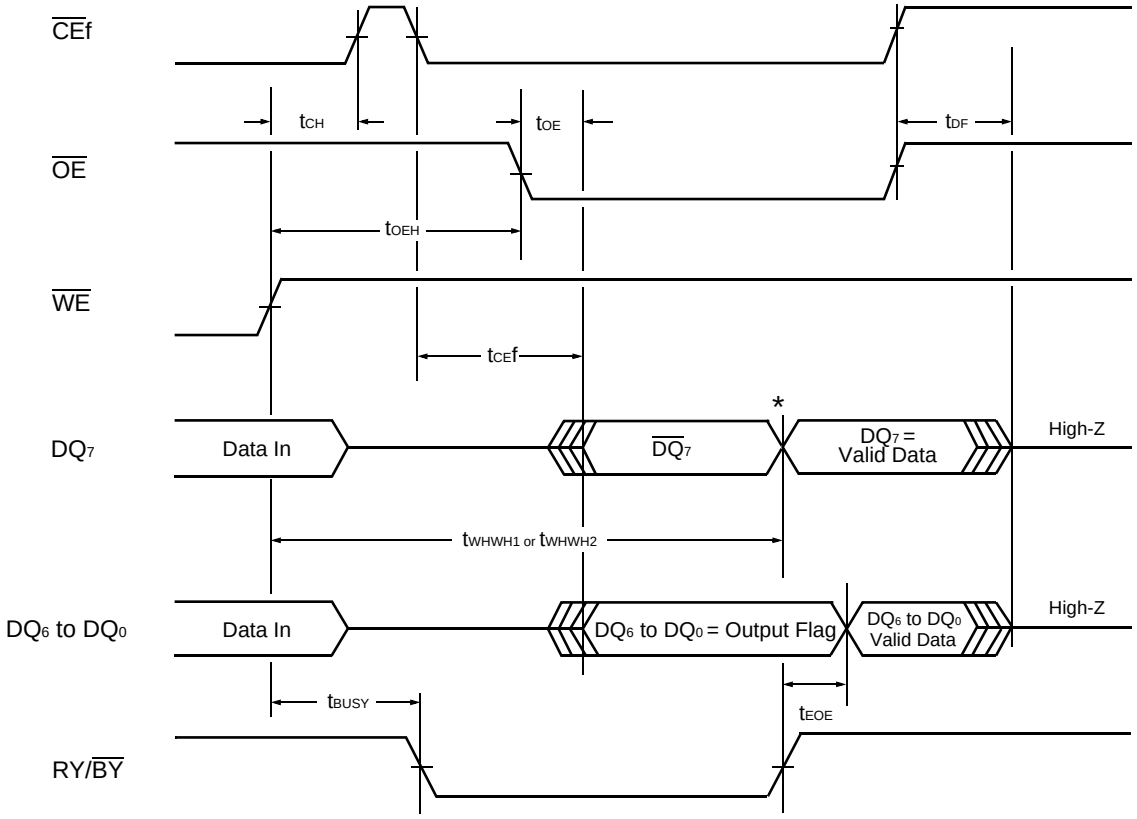
- **AC Waveforms Chip/Sector Erase Operations (Flash)**



*: SA is the sector address for Sector Erase. Addresses = 555h for Chip Erase.

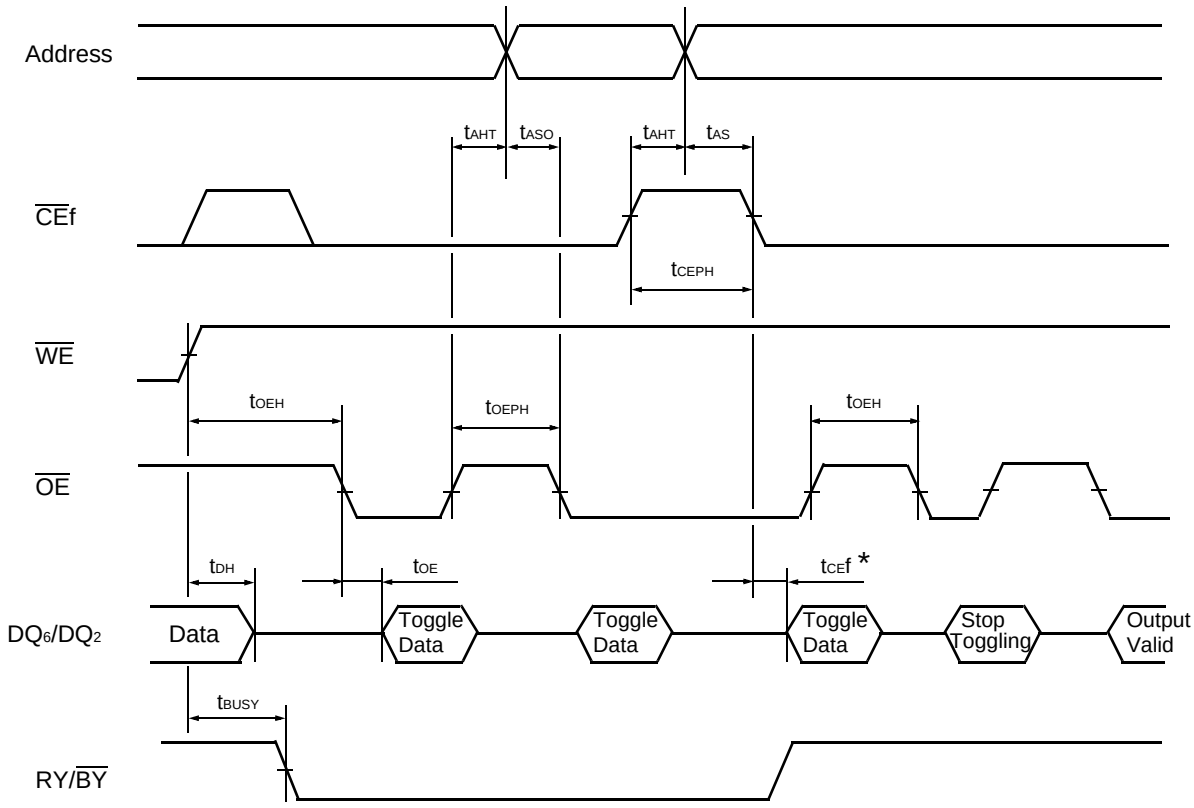
Note: These waveforms are for the ×16 mode. (The addresses differ from ×8 mode.)

- **AC Waveforms for $\overline{\text{Data}}$ Polling during Embedded Algorithm Operations (Flash)**



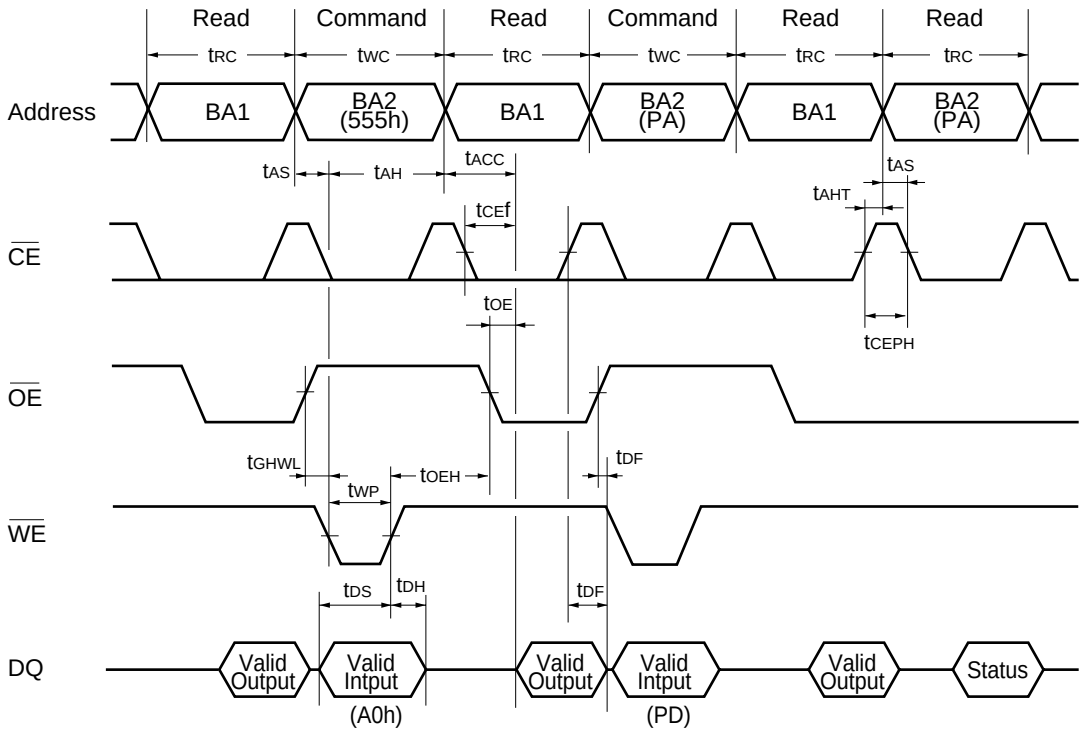
*: DQ_7 = Valid Data (The device has completed the Embedded operation.)

- **AC Waveforms for Toggle Bit during Embedded Algorithm Operations (Flash)**



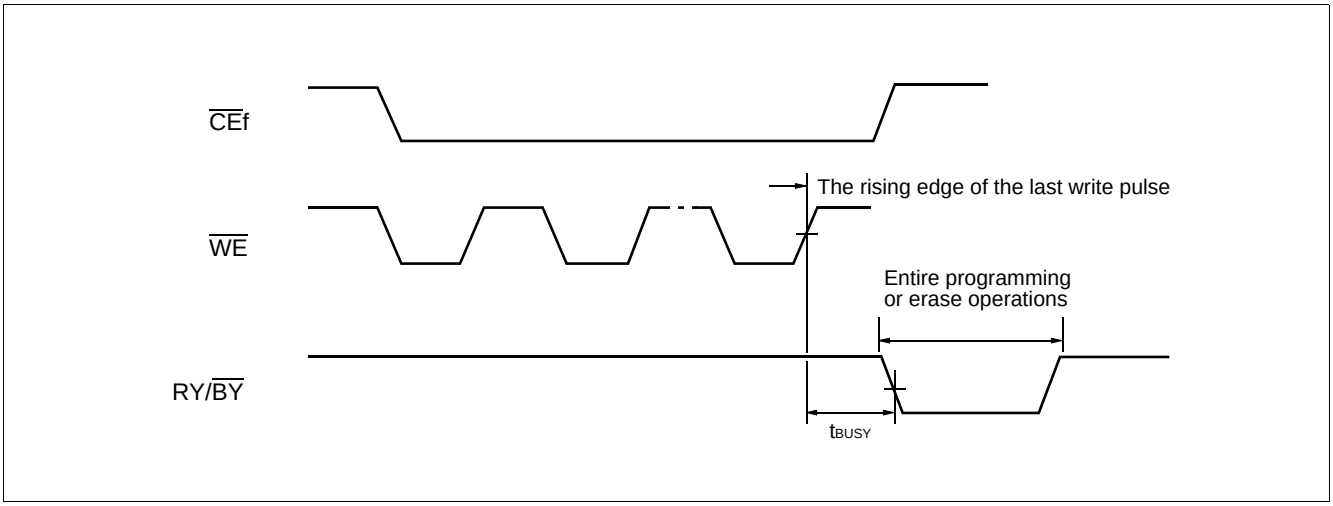
*: DQ_6 stops toggling (The device has completed the Embedded operation).

- **Back-to-back Read/Write Timing Diagram (Flash)**

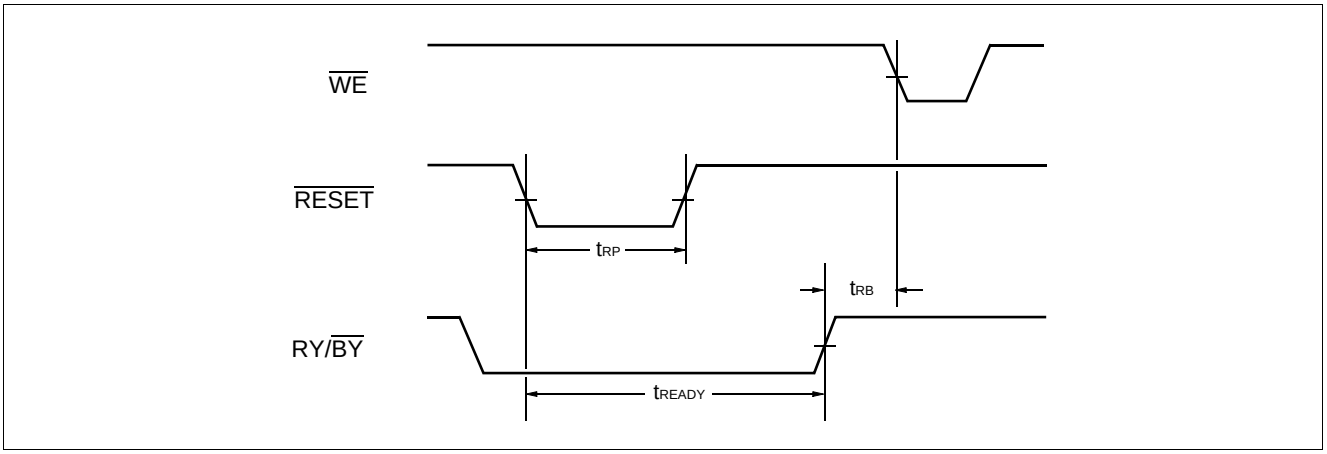


Note: This is an example of Read for Bank 1 and Embedded Algorithm (program) for Bank 2.
BA1: Address of Bank 1.
BA2: Address of Bank 2.

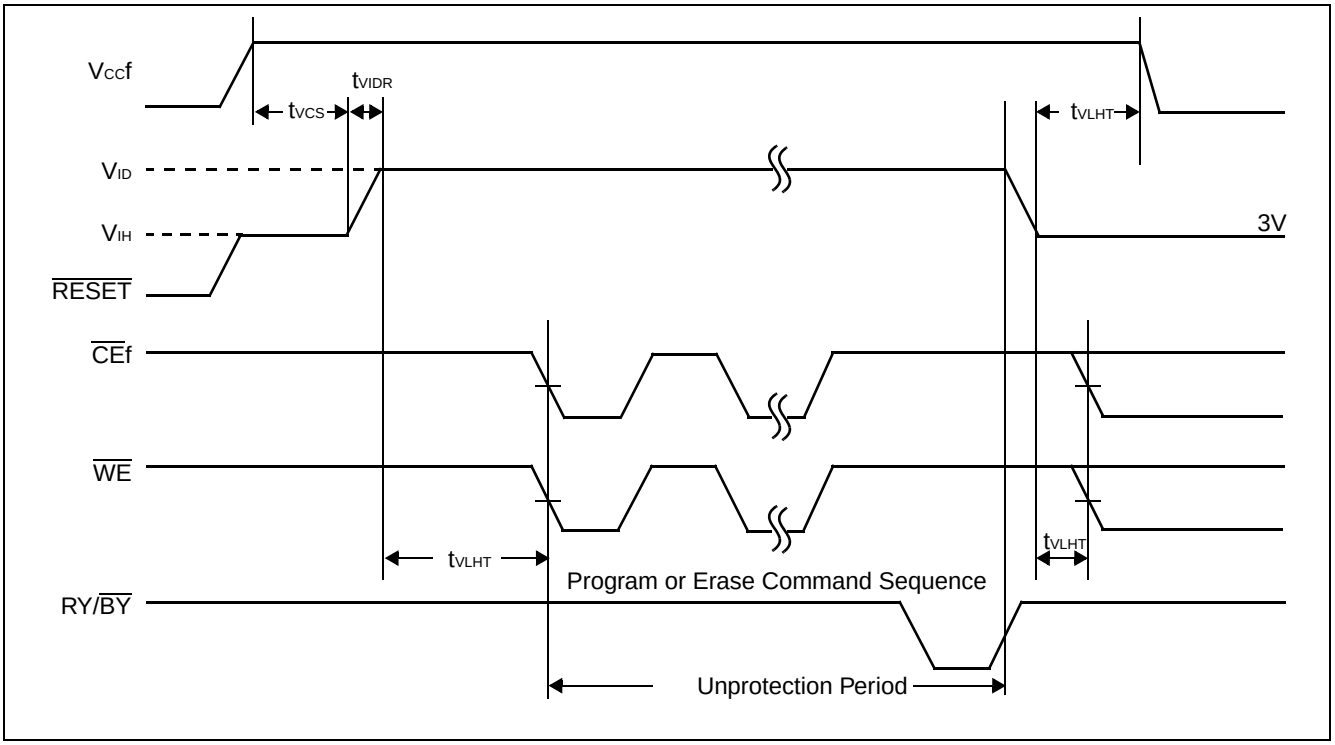
- **RY/$\overline{BY}$ Timing Diagram during Write/Erase Operations (Flash)**



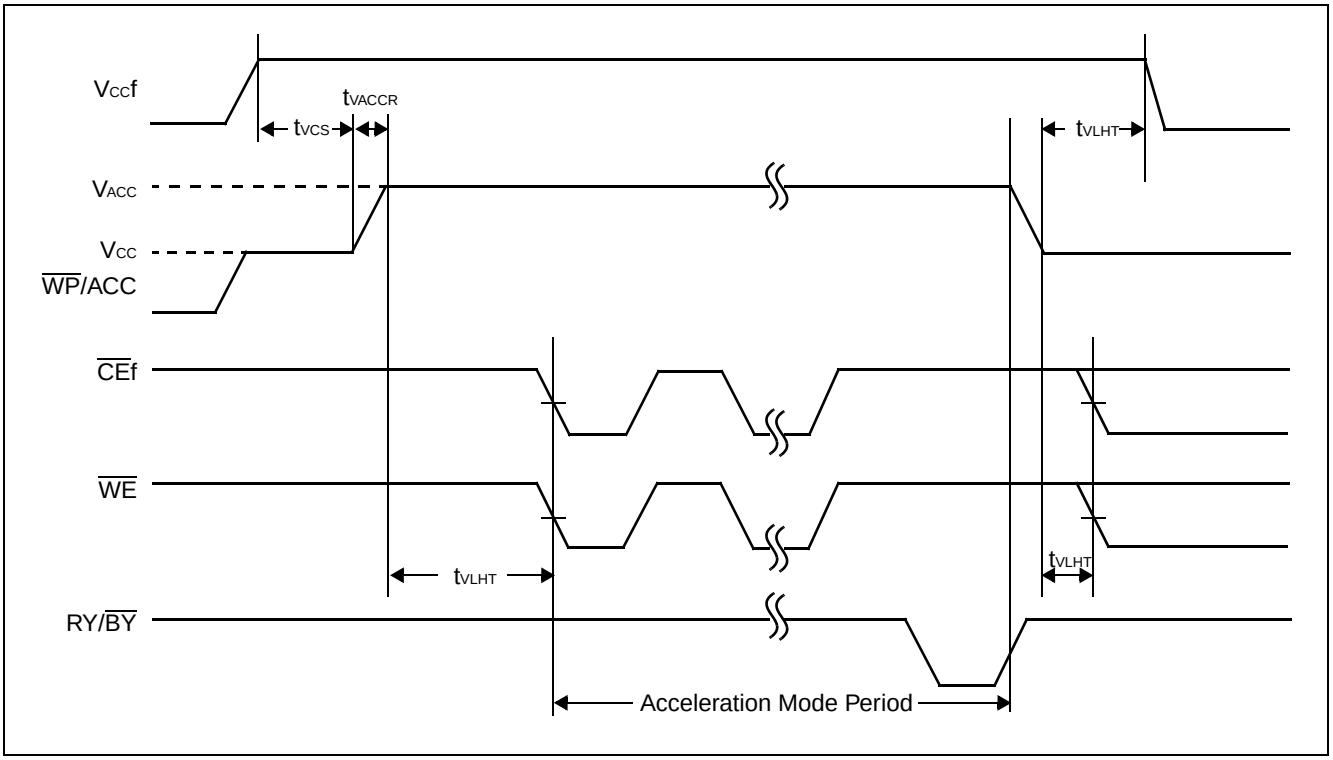
- **$\overline{RESET}$, RY/$\overline{BY}$ Timing Diagram (Flash)**



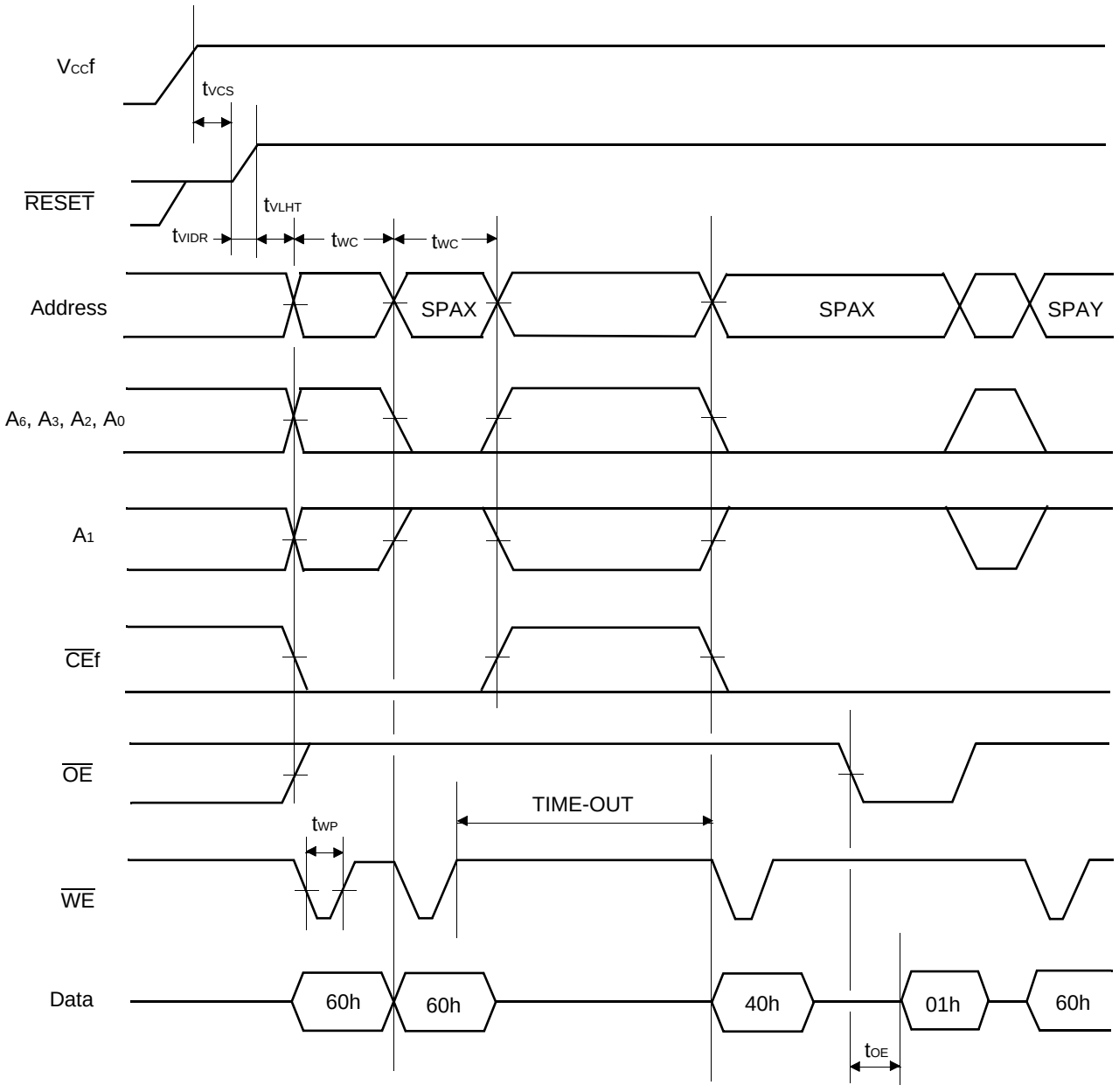
- **Temporary Sector Unprotection (Flash)**



- **Acceleration Mode Timing Diagram (Flash)**



- **Extended Sector Group Protection (Flash)**

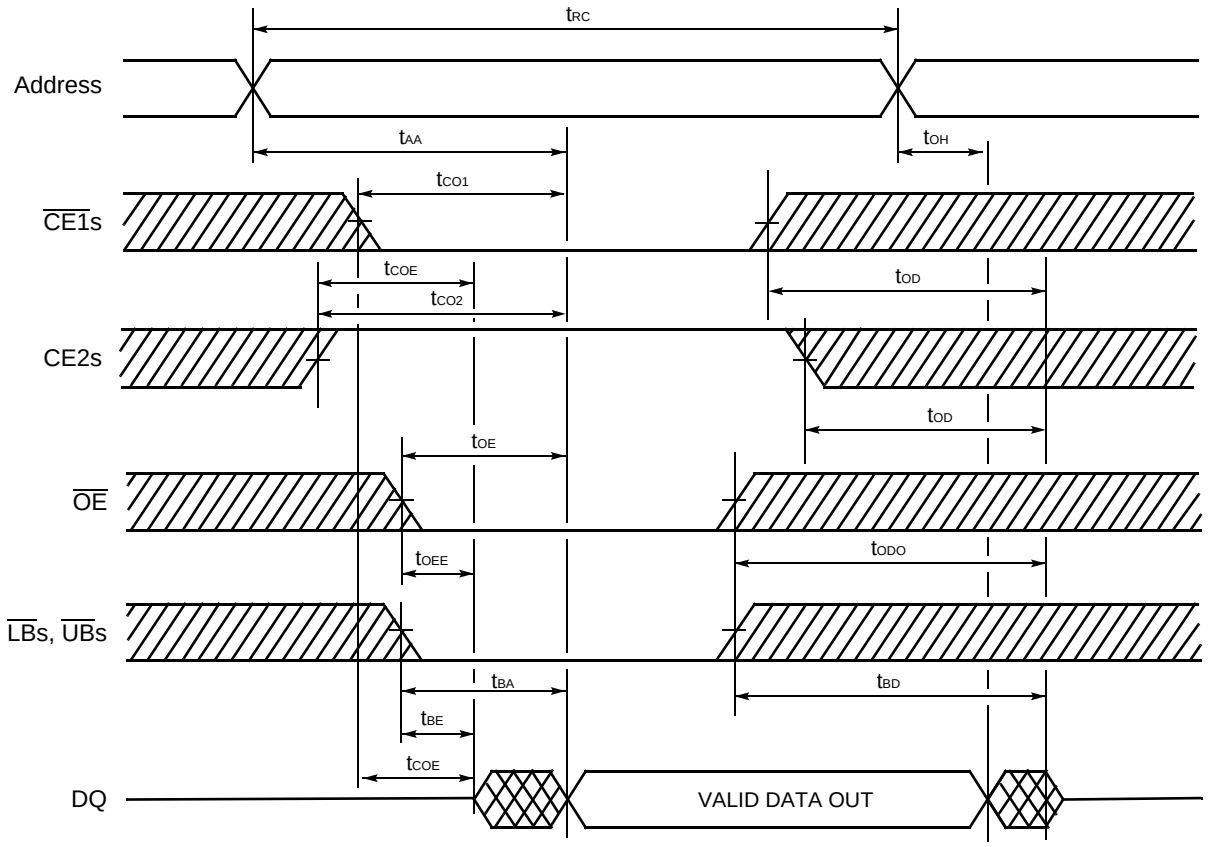


SPAX: Sector Group Address to be protected
SPAY : Next Group Sector Address to be protected
TIME-OUT : Time-Out window = 250 µs (Min.)

- **Read Cycle (SRAM)**

Parameter	Symbol	Value		Unit
		Min.	Max.	
Read Cycle Time	t_{RC}	70	—	ns
Address Access Time	t_{AA}	—	70	ns
Chip Enable ($\overline{CE1}$s) Access Time	t_{CO1}	—	70	ns
Chip Enable (CE2s) Access Time	t_{CO2}	—	70	ns
Output Enable Access Time	t_{OE}	—	35	ns
$\overline{LB}$s, $\overline{UB}$s to Output Valid	t_{BA}	—	70	ns
Chip Enable ($\overline{CE1}$s Low and CE2s High) to Output Active	t_{COE}	5	—	ns
Output Enable Low to Output Active	t_{OEE}	0	—	ns
$\overline{UB}$s, $\overline{LB}$s Enable Low to Output Active	t_{BE}	0	—	ns
Chip Enable ($\overline{CE1}$s High or CE2s Low) to Output High-Z	t_{OD}	—	25	ns
Output Enable High to Output High-Z	t_{ODO}	—	25	ns
$\overline{UB}$s, $\overline{LB}$s Output Enable to Output High-Z	t_{BD}	—	25	ns
Output Data Hold Time	t_{OH}	10	—	ns

- **Read Cycle (SRAM)**

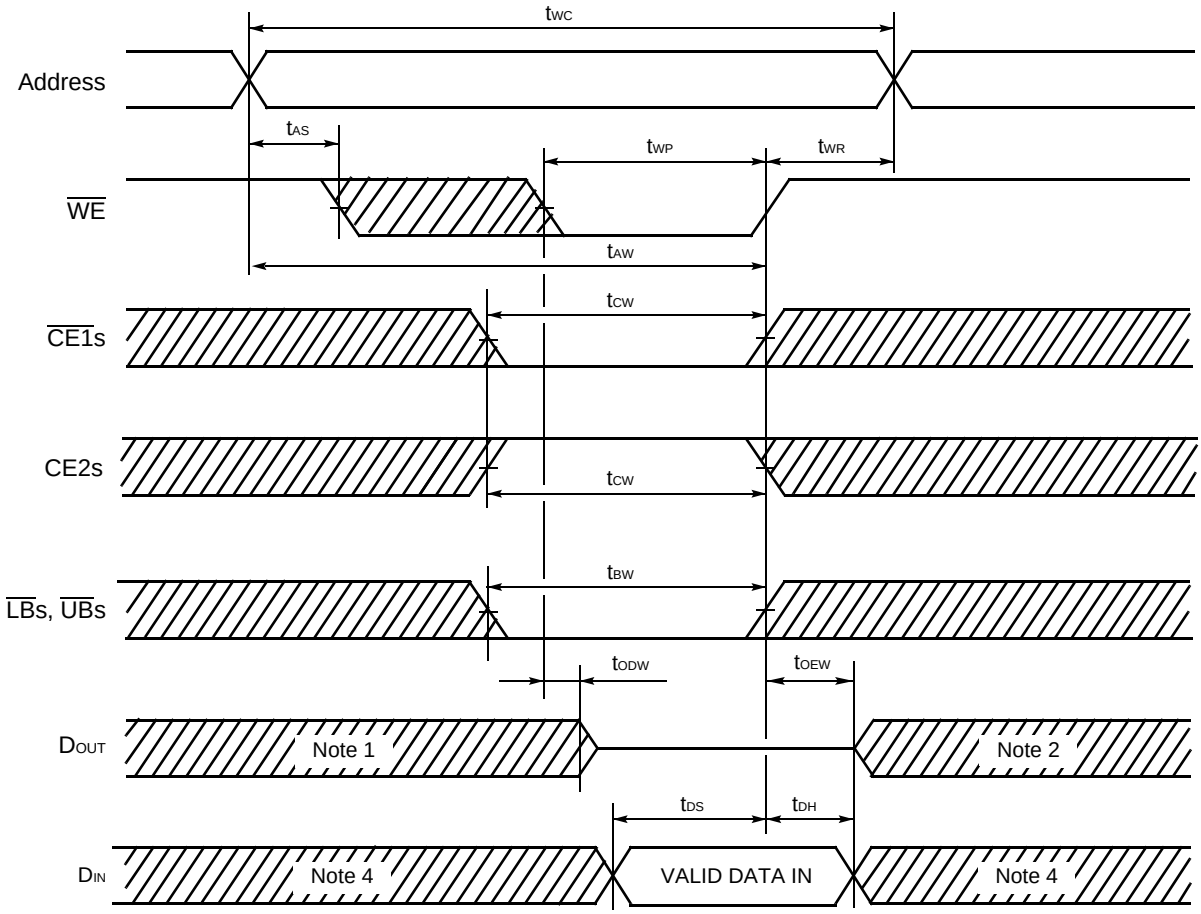


Note: $\overline{WE}$ remains HIGH for the read cycle.

- **Write Cycle (SRAM)**

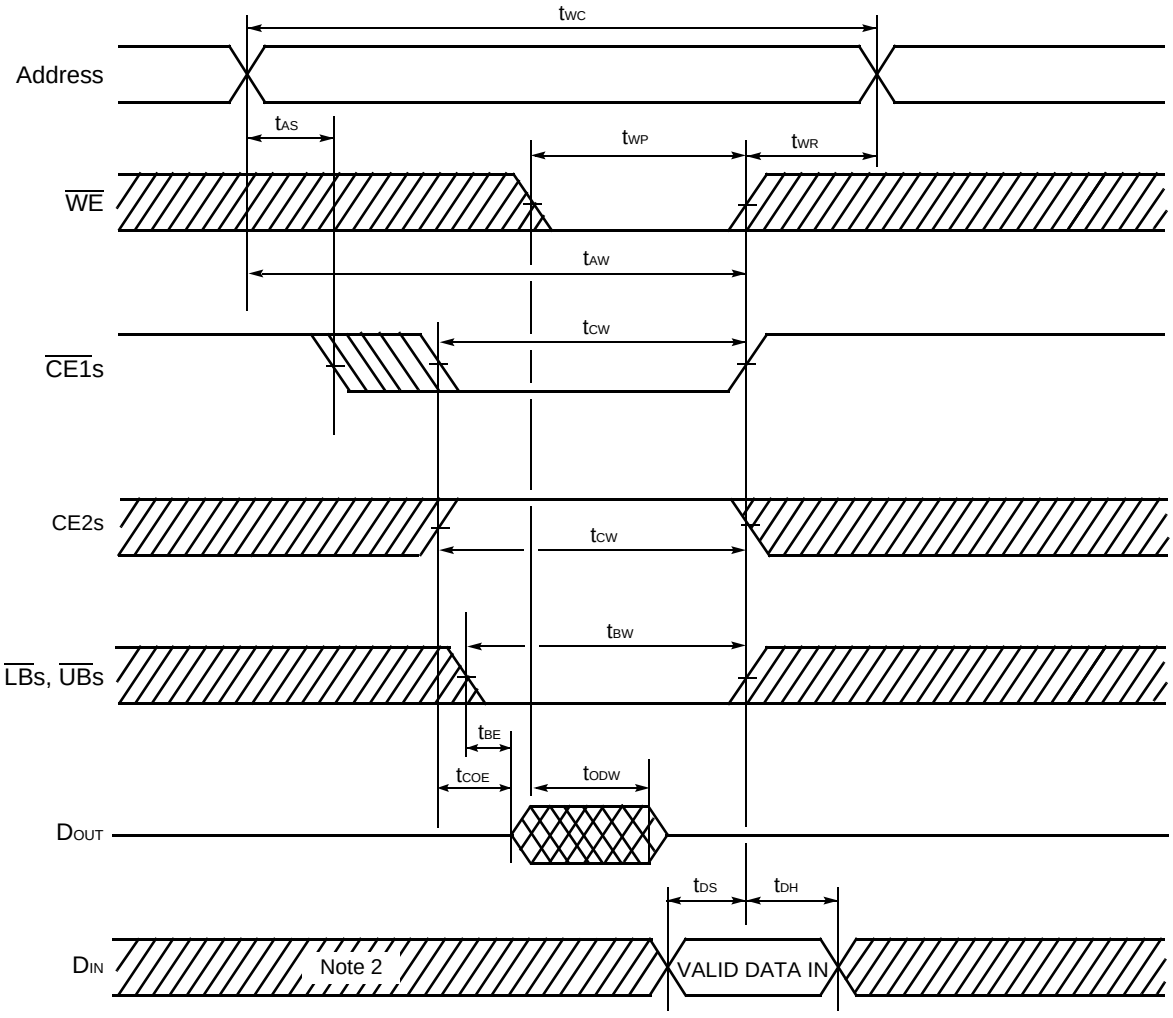
Parameter	Symbol	Value		Unit
		Min.	Max.	
Write Cycle Time	t_{WC}	70	—	ns
Write Pulse Width	t_{WP}	55	—	ns
Chip Enable to End of Write	t_{CW}	60	—	ns
Address valid to End of Write	t_{AW}	60	—	ns
$\overline{UB}$s, $\overline{LB}$s to End of Write	t_{BW}	60	—	ns
Address Setup Time	t_{AS}	0	—	ns
Write Recovery Time	t_{WR}	0	—	ns
$\overline{WE}$ Low to Output High-Z	t_{ODW}	—	25	ns
$\overline{WE}$ High to Output Active	t_{OEW}	0	—	ns
Data Setup Time	t_{DS}	30	—	ns
Data Hold Time	t_{DH}	0	—	ns

- **Write Cycle (Note 3) ($\overline{WE}$ control) (SRAM)**



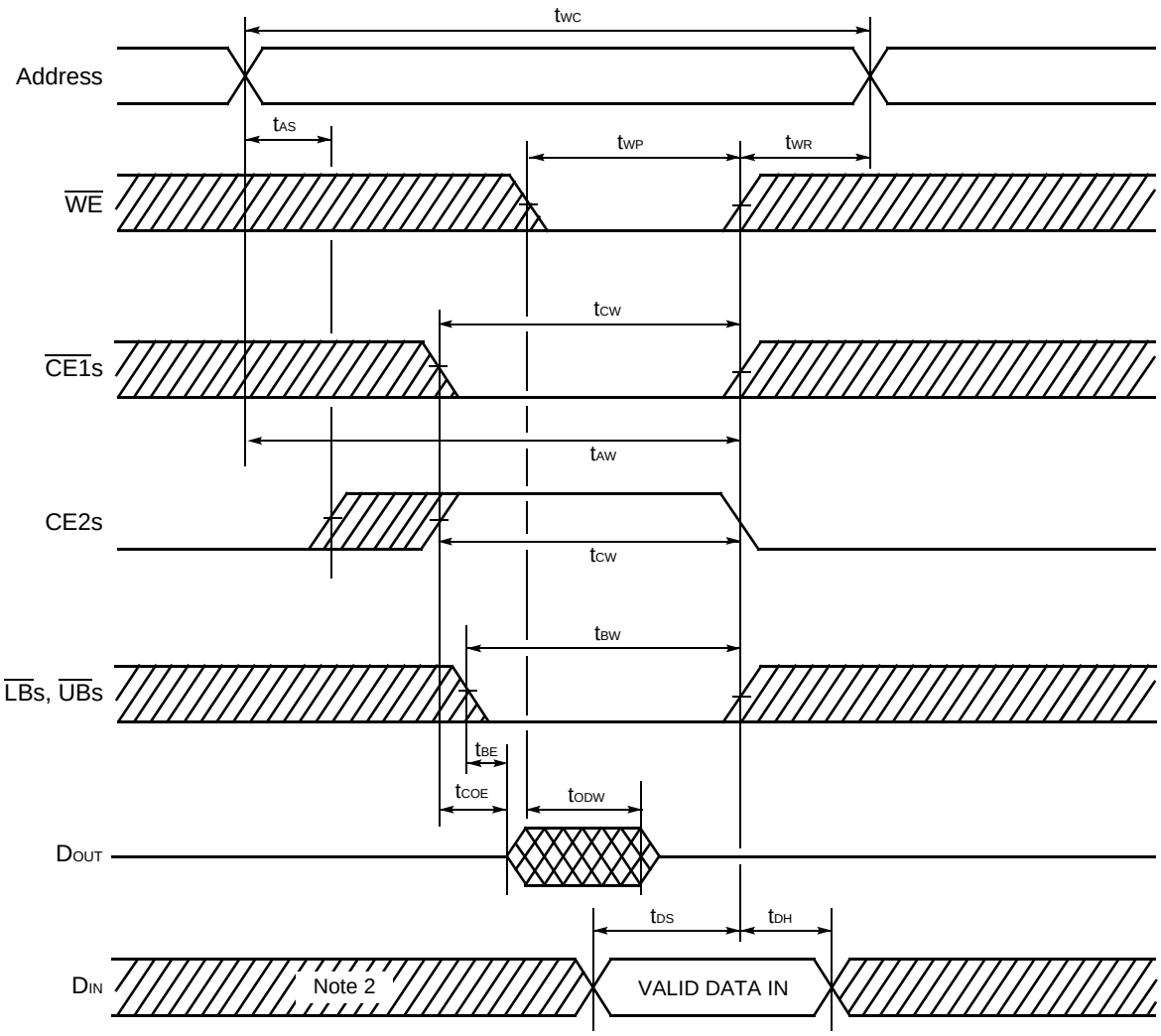
Notes:
1. If $\overline{CE1}$s goes LOW (or CE2s goes HIGH) coincident with or after $\overline{WE}$ goes LOW, the output will remain at high impedance.
2. If $\overline{CE1}$s goes HIGH (or CE2s goes LOW) coincident with or before $\overline{WE}$ goes HIGH, the output will remain at high impedance.
3. If $\overline{OE}$ is HIGH during the write cycle, the outputs will remain at high impedance.
4. Because I/O signals may be in the output state at this Time, input signals of reverse polarity must not be applied.

- **Write Cycle (Note 1) ($\overline{CE}$1s control) (SRAM)**



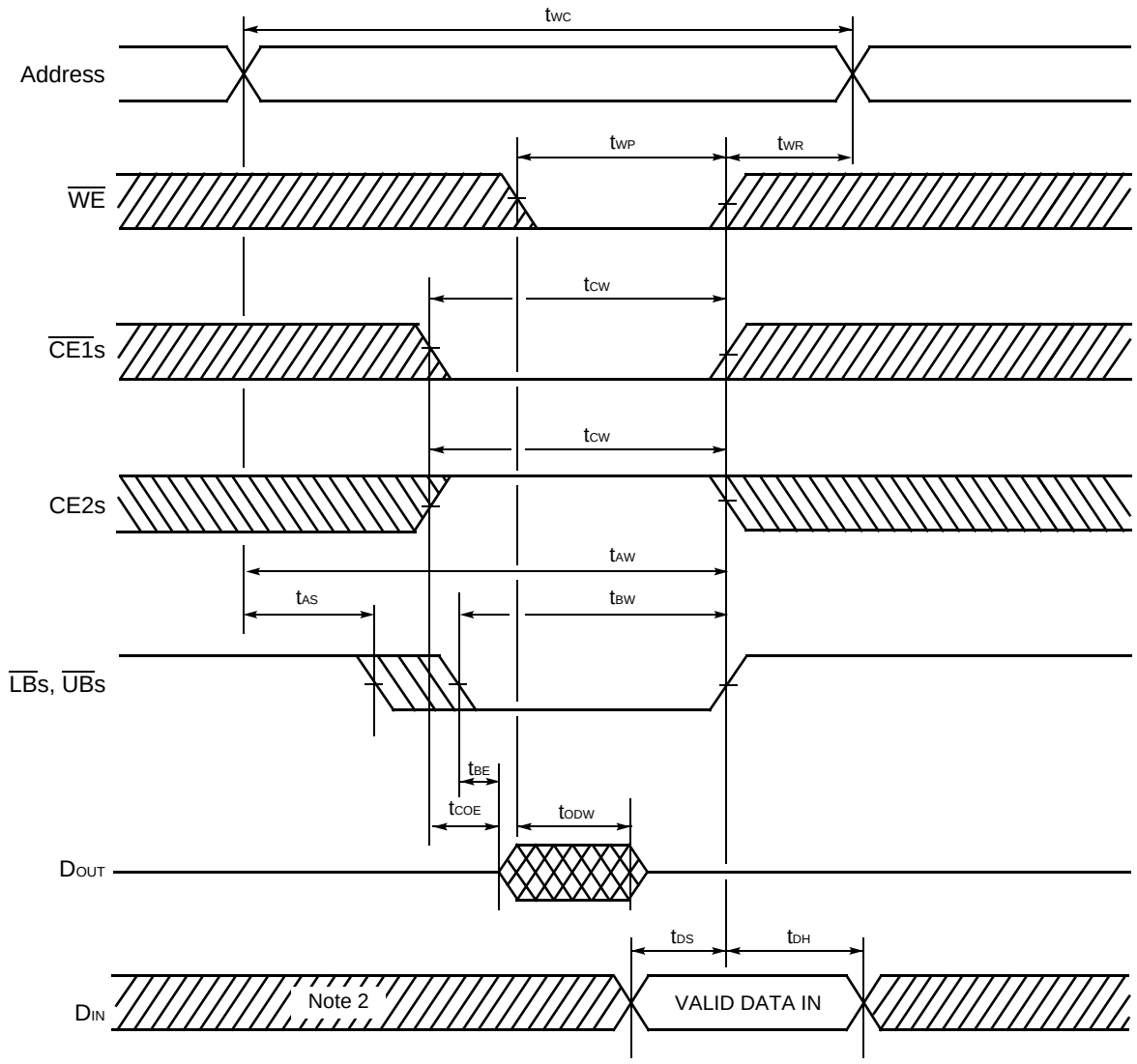
Notes: 1. If $\overline{OE}$ is HIGH during the write cycle, the outputs will remain at high impedance.
2. Because I/O signals may be in the output state at this Time, input signals of reverse polarity must not be applied.

- **Write Cycle (Note 1) (CE2s Control) (SRAM)**



Notes: 1. If $\overline{OE}$ is HIGH during the write cycle, the outputs will remain at high impedance.
2. Because I/O signals may be in the output state at this Time, input signals of reverse polarity must not be applied.

- **Write Cycle (Note 1) ($\overline{LB}$s, $\overline{UB}$s Control) (SRAM)**



Notes: 1. If $\overline{OE}$ is HIGH during the write cycle, the outputs will remain at high impedance.
2. Because I/O signals may be in the output state at this Time, input signals of reverse polarity must not be applied.

■ ERASE AND PROGRAMMING PERFORMANCE (Flash)

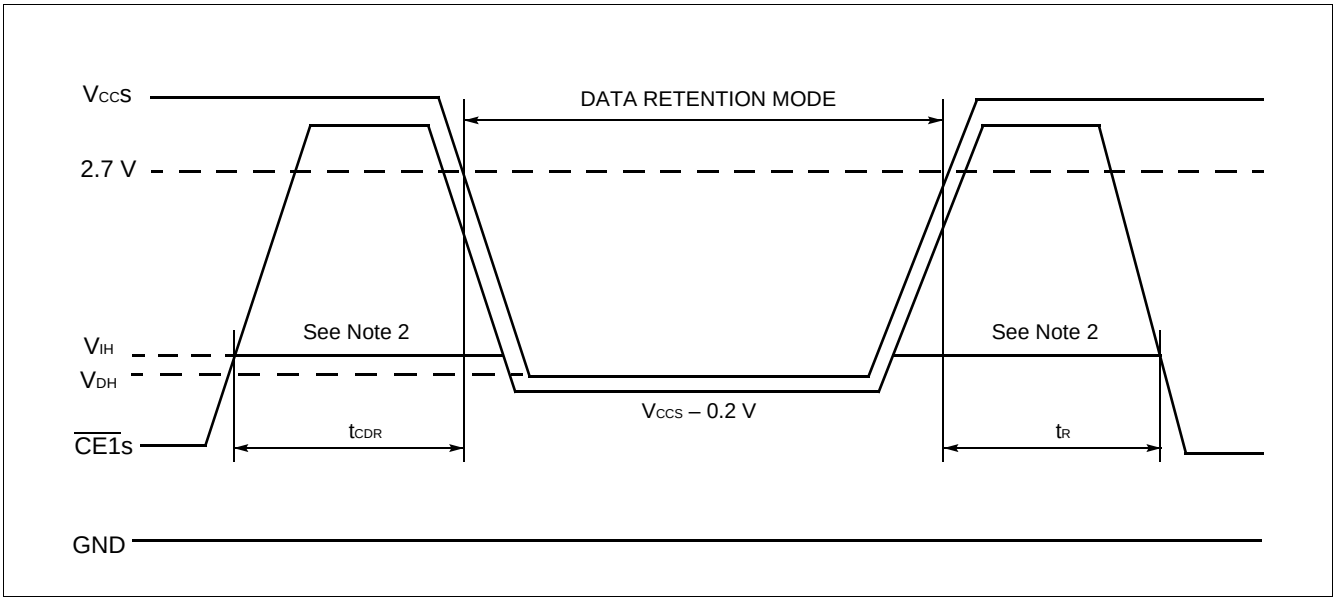
Parameter	Value			Unit	Remarks
	Min.	Typ.	Max.		
Sector Erase Time	—	1	10	s	Excludes programming time prior to erasure
Byte Programming Time	—	8	300	µs	Excludes system-level overhead
Word Programming Time	—	16	360	µs	Excludes system-level overhead
Chip Programming Time	—	—	200	s	Excludes system-level overhead
Erase/Program Cycle	100,000	—	—	cycle	

■ DATA RETENTION CHARACTERISTICS (SRAM)

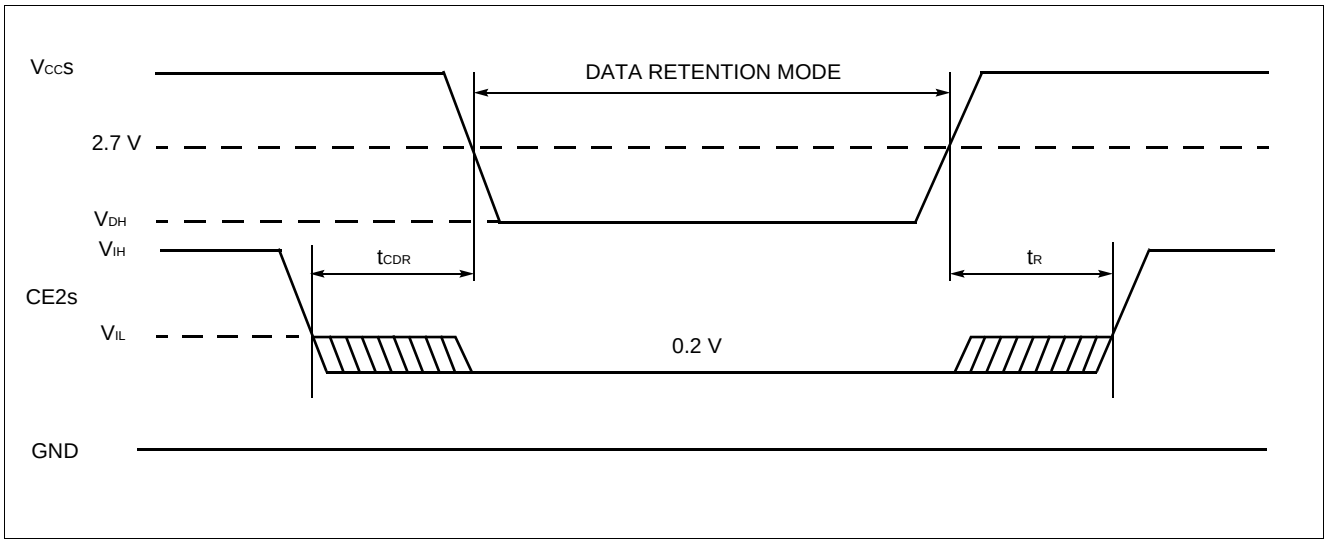
Parameter		Symbol	Value			Unit
			Min.	Typ.	Max.	
Data Retention Supply Voltage		V_{DH}	1.5	—	3.3	V
Standby Current	V_{DH} = 3.0 V	I_{DDS2}	—	TBD	15	µA
Chip Deselect to Data Retention Mode Time		t_{CDR}	0	—	—	ns
Recovery Time		t_R	t_{RC}	—	—	ns

Note t_{RC}: Read cycle time

- **$\overline{CE1}$s Controlled Data Retention Mode (Note 1)**



- **CE2s Controlled Data Retention Mode (Note 3)**



Notes: 1. In $\overline{CE1}$s controlled data retention mode, input level of CE2s should be fixed Vccs to Vccs–0.2 V or Vss to 0.2 V during data retention mode. Other input and input/output pins can be used between –0.3 V to Vccs+0.3 V.
2. When $\overline{CE1}$s is operating at the V_{IH} Min. level, the standby current is given by I_{SB1}s during the transition of V_{CC}s from 3.3V to V_{IH} Min. level.
3. In CE2s controlled data retention mode, input and input/output pins can be used between –0.3 V to Vccs+0.3V.

■ PIN CAPACITANCE

Parameter	Symbol	Condition	Value			Unit
			Min.	Typ.	Max.	
Input Capacitance	C_{IN}	V_{IN} = 0	—	TBD	TBD	pF
Output Capacitance	C_{OUT}	V_{OUT} = 0	—	TBD	TBD	pF
Control Pin Capacitance	C_{IN2}	V_{IN} = 0	—	TBD	TBD	pF
$\overline{WP}$/ACC Pin Capacitance	C_{IN3}	V_{IN} = 0	—	TBD	TBD	pF

Note: Test conditions Ta = 25°C, f = 1.0 MHz

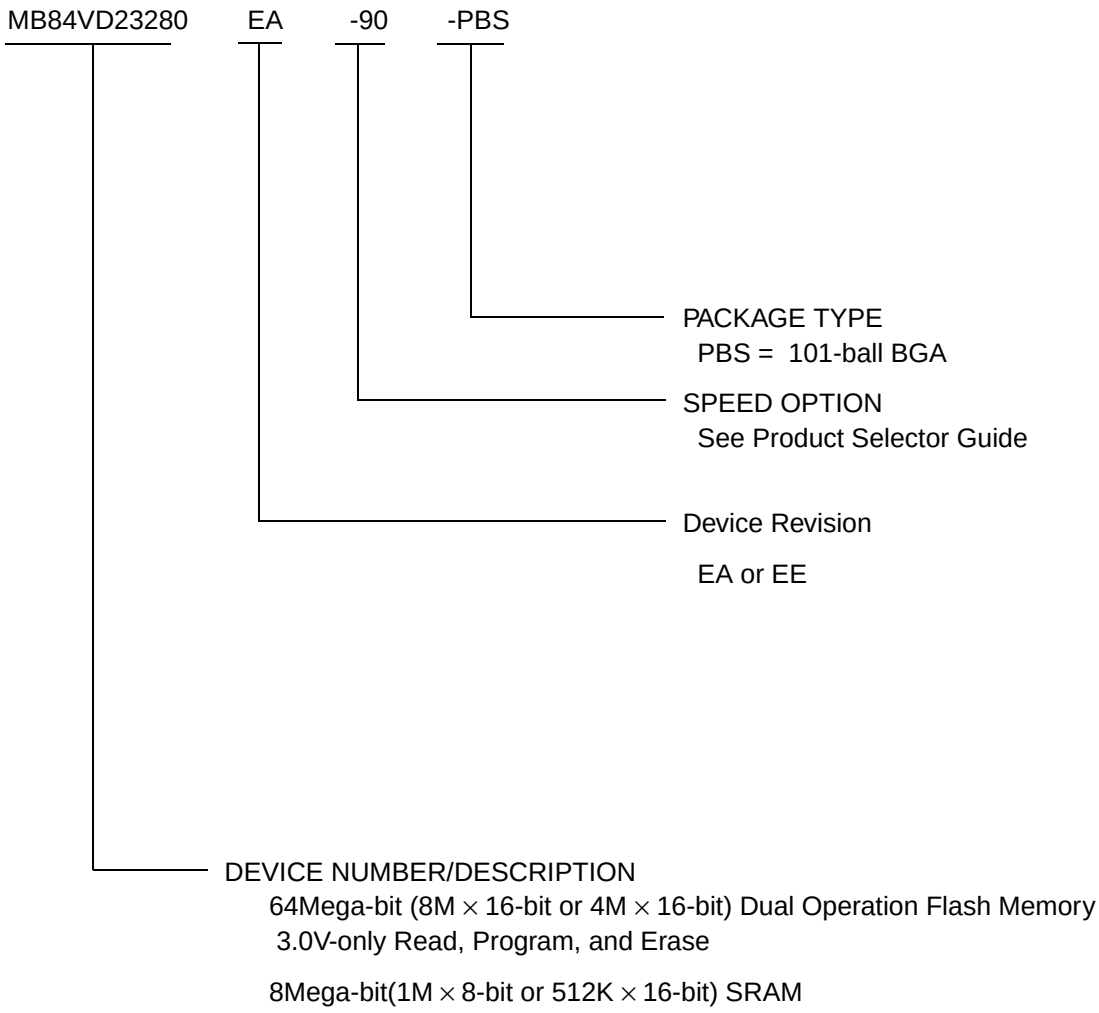
■ HANDLING OF PACKAGE

Please handle this package carefully since the sides of packages are right angle.

■ CAUTION

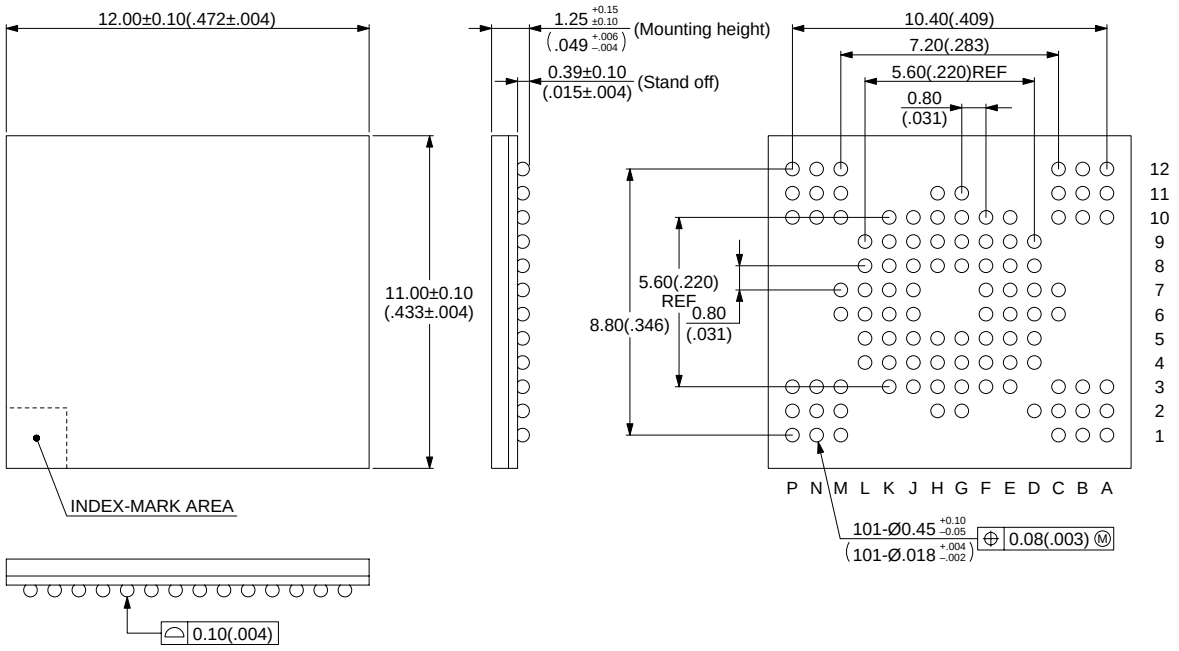
1) The high voltage (V_{ID}) can not apply to address pins and control pins except $\overline{RESET}$. Therefore, it can not use autoselect and sector protect function by applying the high voltage (V_{ID}) to specific pins.
2) For the sector protection, since the high voltage (V_{ID}) can be applied to the $\overline{RESET}$, it can be protected the sector useing “Extended sector protect” command.

■ ORDERING INFORMATION



■ PACKAGE DIMENSION

101-pin plastic FBGA
(BGA-101P-M01)



Dimensions in mm (inches).

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