

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

16M (×8/×16) FLASH MEMORY & 2M (×8/×16) STATIC RAM

MB84VD2108X-85/MB84VD2109X-85

■ FEATURES

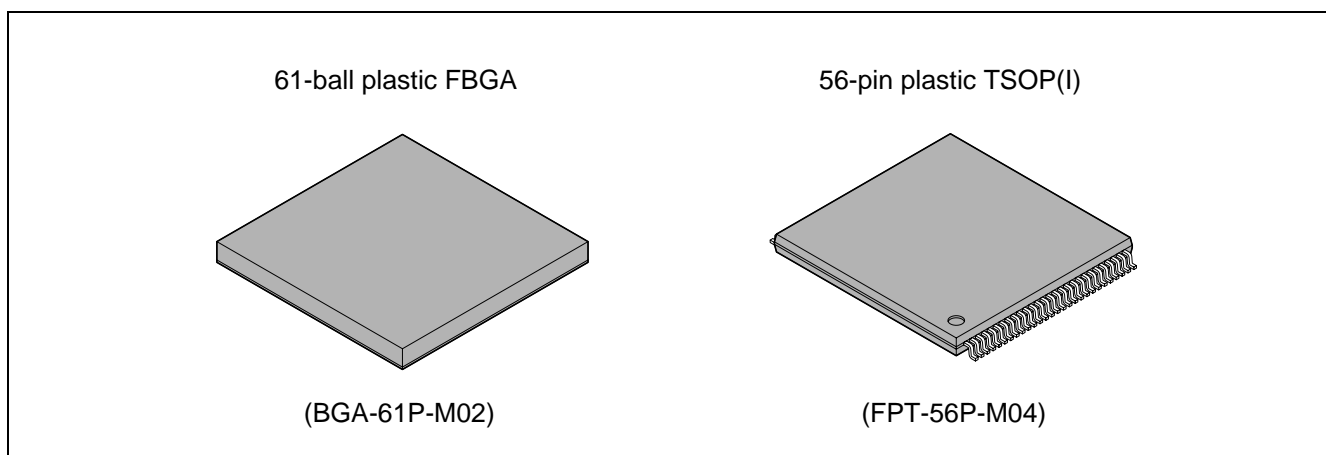
- Power supply voltage of 2.7 to 3.6 V
- High performance
85 ns maximum access time
- Operating Temperature
-25 to +85 °C
- Package 61-ball FBGA, 56-pin TSOP(I)

(Continued)

■ PRODUCT LINE UP

		Flash Memory	SRAM
Ordering Part No.	$V_{ccf}, V_{ccs} = 3.0 V \begin{smallmatrix} +0.6V \\ -0.3V \end{smallmatrix}$	MB84VD2108X-85/MB84VD2109X-85	
Max. Address Access Time (ns)		85	85
Max. \overline{CE} Access Time (ns)		85	85
Max. \overline{OE} Access Time (ns)		35	45

■ PACKAGES



MB84VD2108X-85/MB84VD2109X-85

(Continued)

1. FLASH MEMORY

- **Simultaneous Read/Write operations (dual bank)**

Multiple devices available with different bank sizes

Host system can program or erase in one bank, then immediately and simultaneously read from the other bank

Zero latency between read and write operations

Read-while-erase

Read-while-program

- **Minimum 100,000 write/erase cycles**

- **Sector erase architecture**

Eight 4 K words and thirty one 32 K words.

Any combination of sectors can be concurrently erased. Also supports full chip erase.

- **Boot Code Sector Architecture**

MB84VD2108X : Top sector

MB84VD2109X : Bottom sector

- **Embedded Erase™* Algorithms**

Automatically pre-programs and erases the chip or any sector

- **Embedded Program™* Algorithms**

Automatically writes and verifies data at specified address

- **Data Polling and Toggle Bit feature for detection of program or erase cycle completion**

- **Ready-Busy output (RY/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_{ccf} write inhibit ≤ 2.5 V**

- **Hidden ROM (Hi-ROM) region**

64K 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)

- **WP/ACC input pin**

At V_{IL}, allows protection of boot sectors, regardless of sector protection/unprotection status

(MB84VD2108X : SA37, SA38 MB84VD2109X : SA0, SA1)

At V_{IH}, allows removal of boot sector protection

At V_{ACC}, program time will reduce by 40%.

- **Erase Suspend/Resume**

Suspends the erase operation to allow a read in another sector within the same device

- **Please refer to “MBM29DL16XTD/BD” data sheet in detailed function**

2. SRAM

- **Power dissipation**

Operating: 50 mA max.

Standby: 7 μA max.

- **Power down features using $\overline{CE1s}$ and $CE2s$**

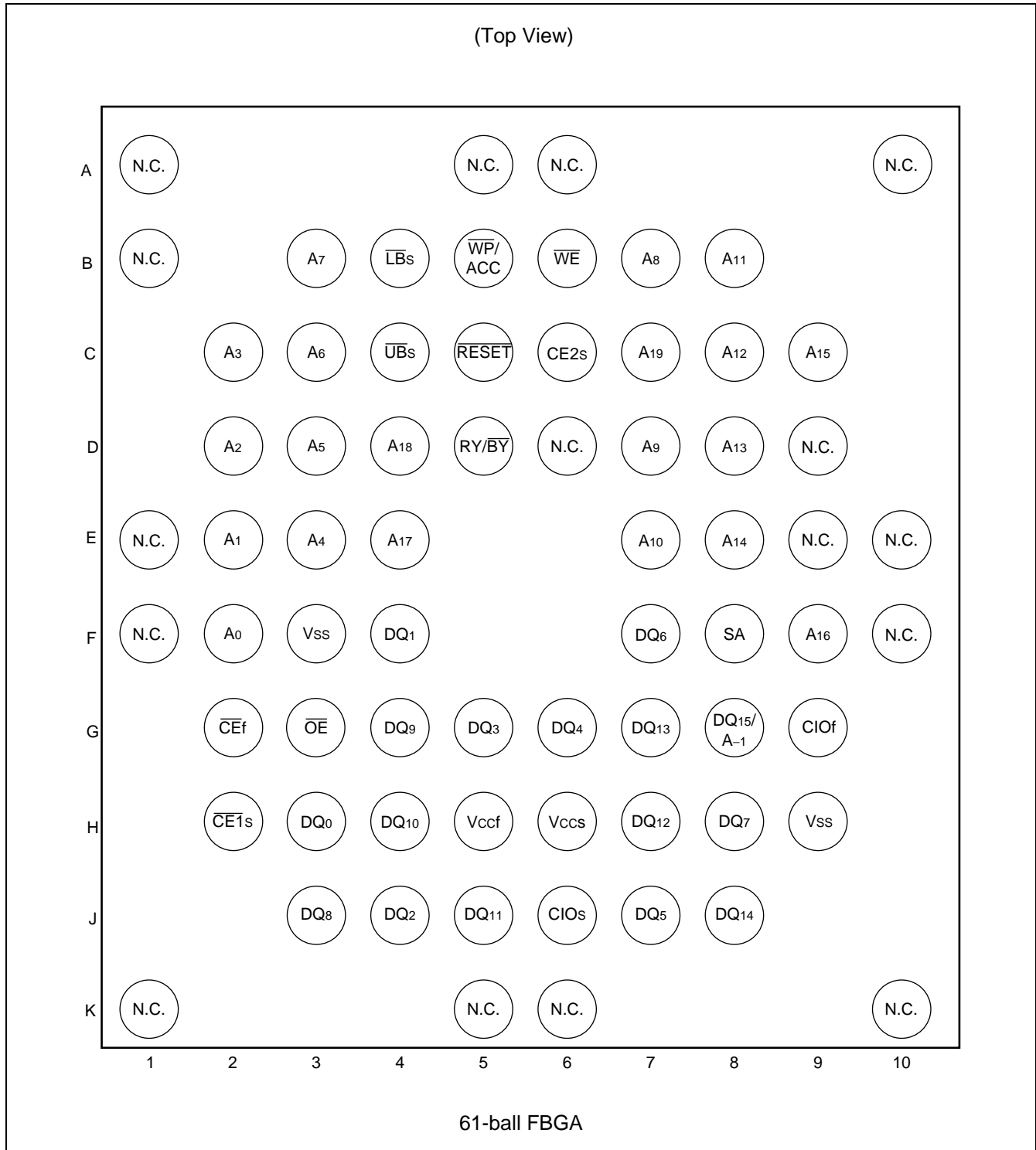
- **Data retention supply voltage : 1.5 V to 3.6 V**

- **$\overline{CE1s}$ and $CE2s$ Chip Select**

- **Byte data control : \overline{LBs} (DQ₀ to DQ₇) , \overline{UBs} (DQ₈ to DQ₁₅)**

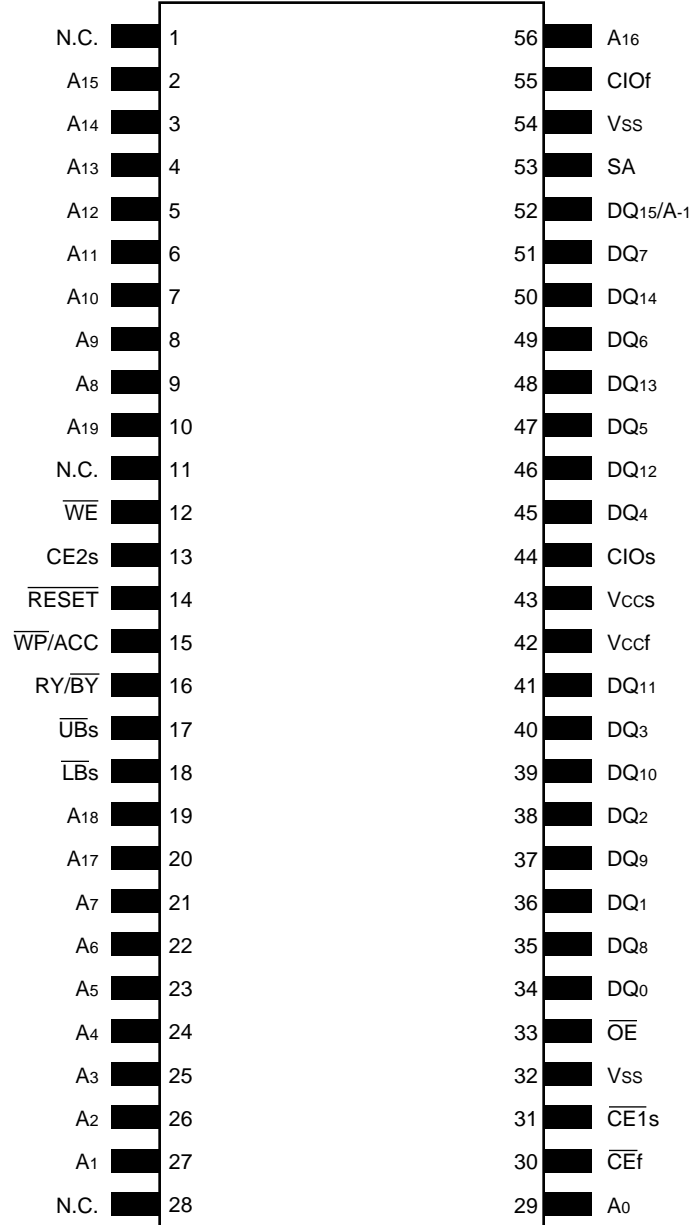
* : Embedded Erase™ and Embedded Program™ are trademarks of Advanced Micro Devices, Inc.

■ PIN ASSIGNMENTS



MB84VD2108X-85/MB84VD2109X-85

(Top View)



56-pin TSOP (I)

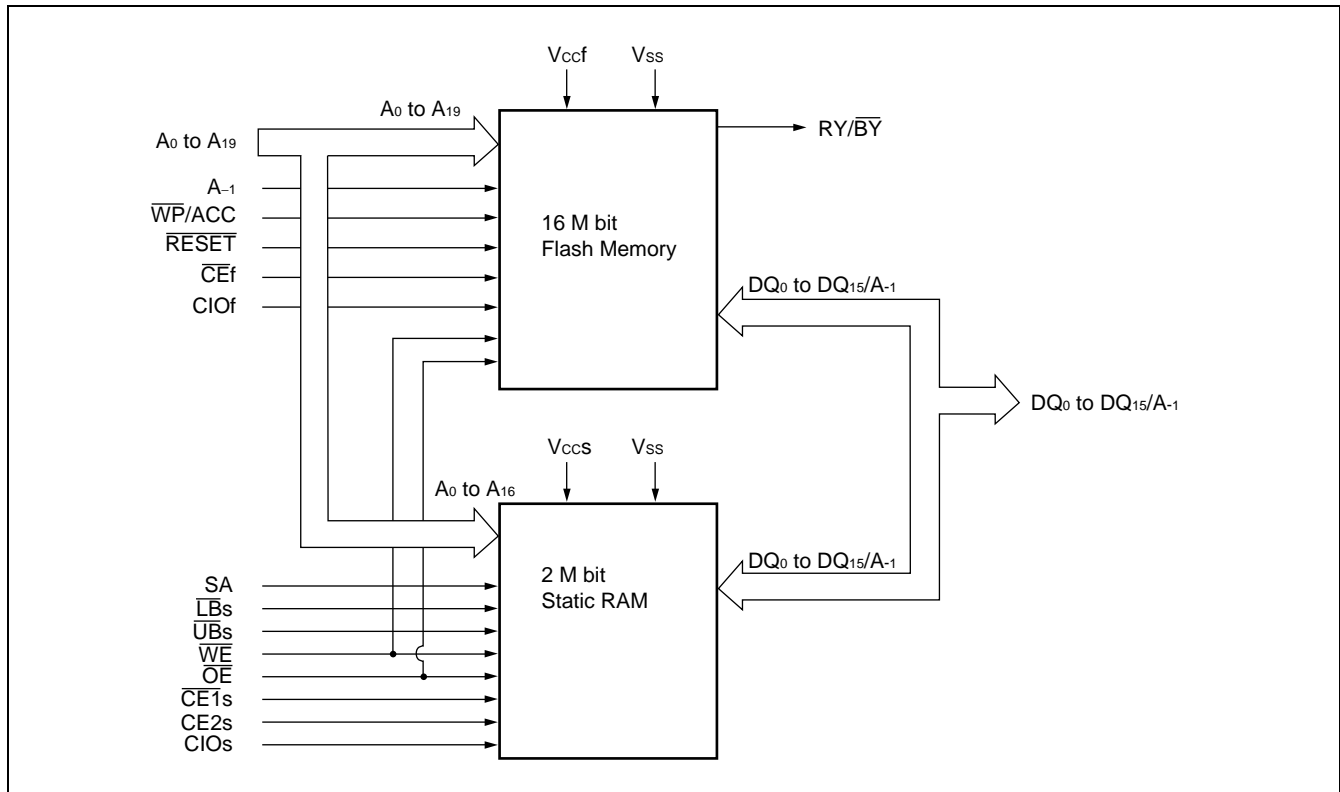
MB84VD2108X-85/MB84VD2109X-85

■ PIN DESCRIPTION

Pin	Function	Input/Output
A ₀ to A ₁₆	Address Inputs (Common)	I
A ₋₁ , A ₁₇ to A ₁₉	Address Input (Flash)	I
SA	Address Input (SRAM)	I
DQ ₀ to DQ ₁₅	Data Inputs/Outputs (Common)	I/O
$\overline{CE}f$	Chip Enable (Flash)	I
$\overline{CE}1s$	Chip Enable (SRAM)	I
CE2s	Chip Enable (SRAM)	I
\overline{OE}	Output Enable (Common)	I
\overline{WE}	Write Enable (Common)	I
RY/ \overline{BY}	Ready/Busy Outputs (Flash) Open Drain Output	O
$\overline{UB}s$	Upper Byte Control (SRAM)	I
$\overline{LB}s$	Lower Byte Control (SRAM)	I
CIO _f	I/O Configuration (Flash) CIO _f = V _{IH} is Word mode (×16) , CIO _f = V _{IL} is Byte mode (×8)	I
CIO _s	I/O Configuration (SRAM) CIO _s = V _{IH} is Word mode (×16) , CIO _s = V _{IL} is Byte mode (×8)	I
RESET	Hardware Reset Pin/Sector Protection Unlock (Flash)	I
\overline{WP}/ACC	Write Protect/Acceleration (Flash)	I
N.C.	No Internal Connection	—
V _{ss}	Device Ground (Common)	Power
V _{ccf}	Device Power Supply (Flash)	Power
V _{ccs}	Device Power Supply (SRAM)	Power

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■ BLOCK DIAGRAM



MB84VD2108X-85/MB84VD2109X-85

■ DEVICE BUS OPERATIONS

Table 2.1 User Bus Operations (Flash = Word mode; CIO_f = V_{ccf}, SRAM = Word mode; CIO_s = V_{ccs})

Operation (Note 1, 3)	\overline{CE}_f	\overline{CE}_{1s}	CE _{2s}	\overline{OE}	\overline{WE}	SA (Note 6)	\overline{LB}_s	\overline{UB}_s	DQ ₀ to DQ ₇	DQ ₈ to DQ ₁₅	\overline{RESET}	$\overline{WP/ACC}$ (Note 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		
Read from Flash (Note 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 (Note 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 "ELECTRICAL CHARACTERISTICS 1. DC Characteristics" for voltage levels.

- Notes :
- Other operations except for indicated this column are inhibited.
 - \overline{WE} can be V_{IL} if \overline{OE} is V_{IL}, \overline{OE} at V_{IH} initiates the write operations.
 - Do not apply $\overline{CE}_f = V_{IL}$, $\overline{CE}_{1s} = V_{IL}$ and CE_{2s} = V_{IH} at a time.
 - It is also used for the extended sector group protections.
 - $\overline{WP/ACC} = V_{IL}$; protection of boot sectors.
 $\overline{WP/ACC} = V_{IH}$; removal of boot sectors protection.
 $\overline{WP/ACC} = V_{ACC}$ (9 V) ; Program time will reduce by 40%.
 - SA ; Don't care or Open.

MB84VD2108X-85/MB84VD2109X-85

Table 2.2 User Bus Operations (Flash = Word mode; CIO_f = V_{ccf}, SRAM = Byte mode; CIO_s = V_{ss})

Operation (Note 1, 3)	\overline{CE}_f	\overline{CE}_{1s}	CE _{2s}	\overline{OE}	\overline{WE}	SA	LBs (Note 6)	UBs (Note 6)	DQ ₀ to DQ ₇	DQ ₈ to DQ ₁₅	RESET	WP/ACC (Note 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 (Note 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 (Note 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 "ELECTRICAL CHARACTERISTICS 1. 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 $\overline{CE}_f = V_{IL}$, $\overline{CE}_{1s} = V_{IL}$ and CE_{2s} = V_{IH} at a time.
 4. It is also used for the extended sector group protections.
 5. $\overline{WP}/ACC = V_{IL}$; protection of boot sectors.
 $\overline{WP}/ACC = V_{IH}$; removal of boot sectors protection.
 $\overline{WP}/ACC = V_{ACC}$ (9 V) ; Program time will reduce by 40%.
 6. LBs, UBs ; Don't care or Open.

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Table 2.3 User Bus Operations (Flash = Byte mode; CIO_f = V_{SS}, SRAM = Byte mode; CIO_s = V_{SS})

Operation (Note 1, 3)	\overline{CE}_f	\overline{CE}_{1s}	CE _{2s}	DQ _{15/} A ₋₁	\overline{OE}	\overline{WE}	SA	\overline{LB}_s (Note 6)	\overline{UB}_s (Note 6)	DQ ₀ to DQ ₇	DQ ₈ to DQ ₁₄	\overline{RESET}	$\overline{WP/}$ ACC (Note 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	HIGH-Z	HIGH-Z			
	L	H	X	A ₋₁	H	H	X	X	X	HIGH-Z	HIGH-Z		
		X	L										
Read from Flash (Note 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 (Note 4)	X	X	X	X	X	X	X	X	X	X	X	V _{ID}	X
Flash Hard- ware 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

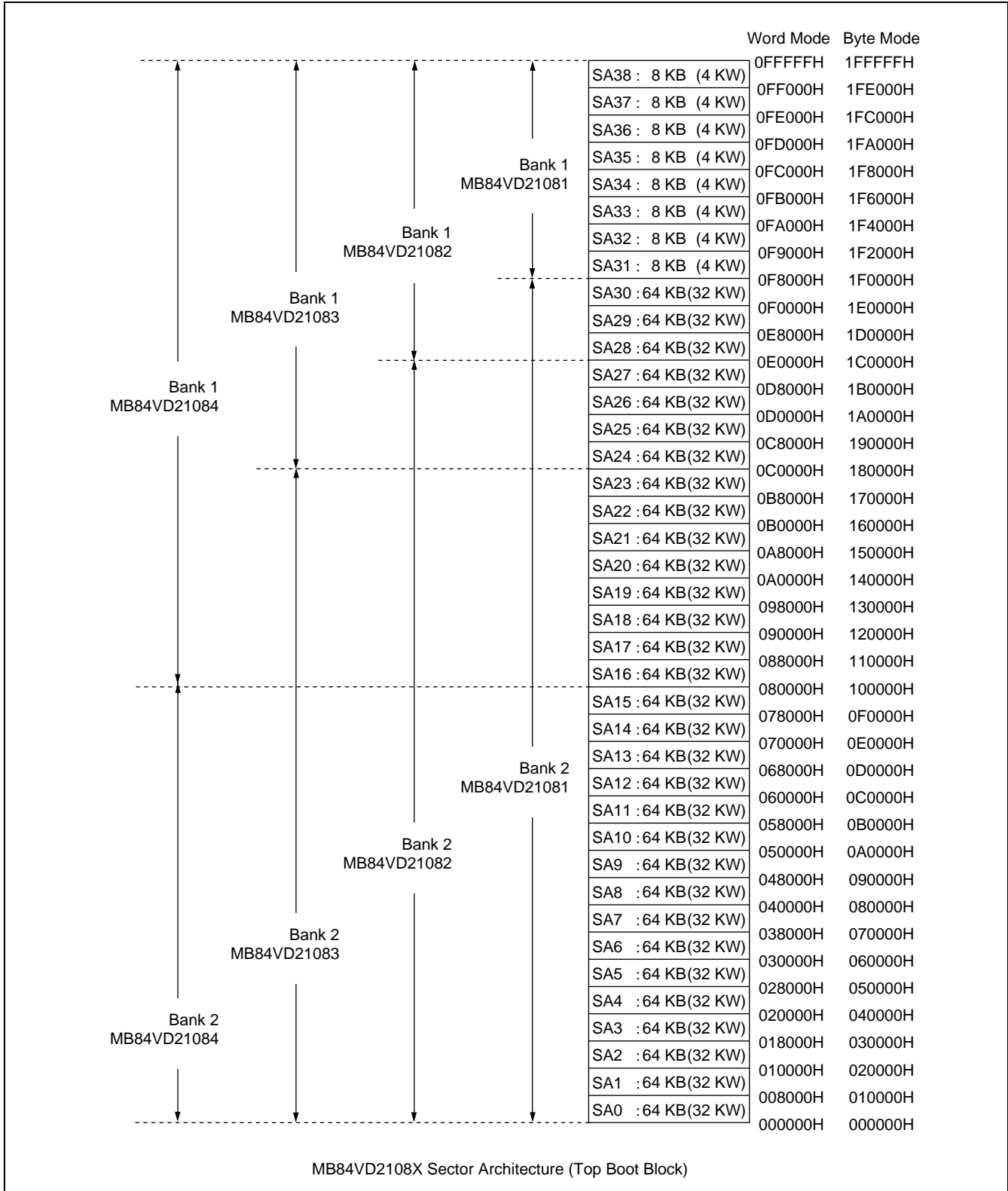
Legend : L = V_{IL}, H = V_{IH}, X = V_{IL} or V_{IH}. See "ELECTRICAL CHARACTERISTICS 1. DC Characteristics" for voltage levels.

- 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 $\overline{CE}_f = V_{IL}$, $\overline{CE}_{1s} = V_{IL}$ and CE_{2s} = V_{IH} at a time.
 4. It is also used for the extended sector group protections.
 5. $\overline{WP/ACC} = V_{IL}$; protection of boot sectors.
 $\overline{WP/ACC} = V_{IH}$; removal of boot sectors protection.
 $\overline{WP/ACC} = V_{ACC}$ (9 V) ; Program time will reduce by 40%.
 6. LB_s, UB_s; Don't care or Open.

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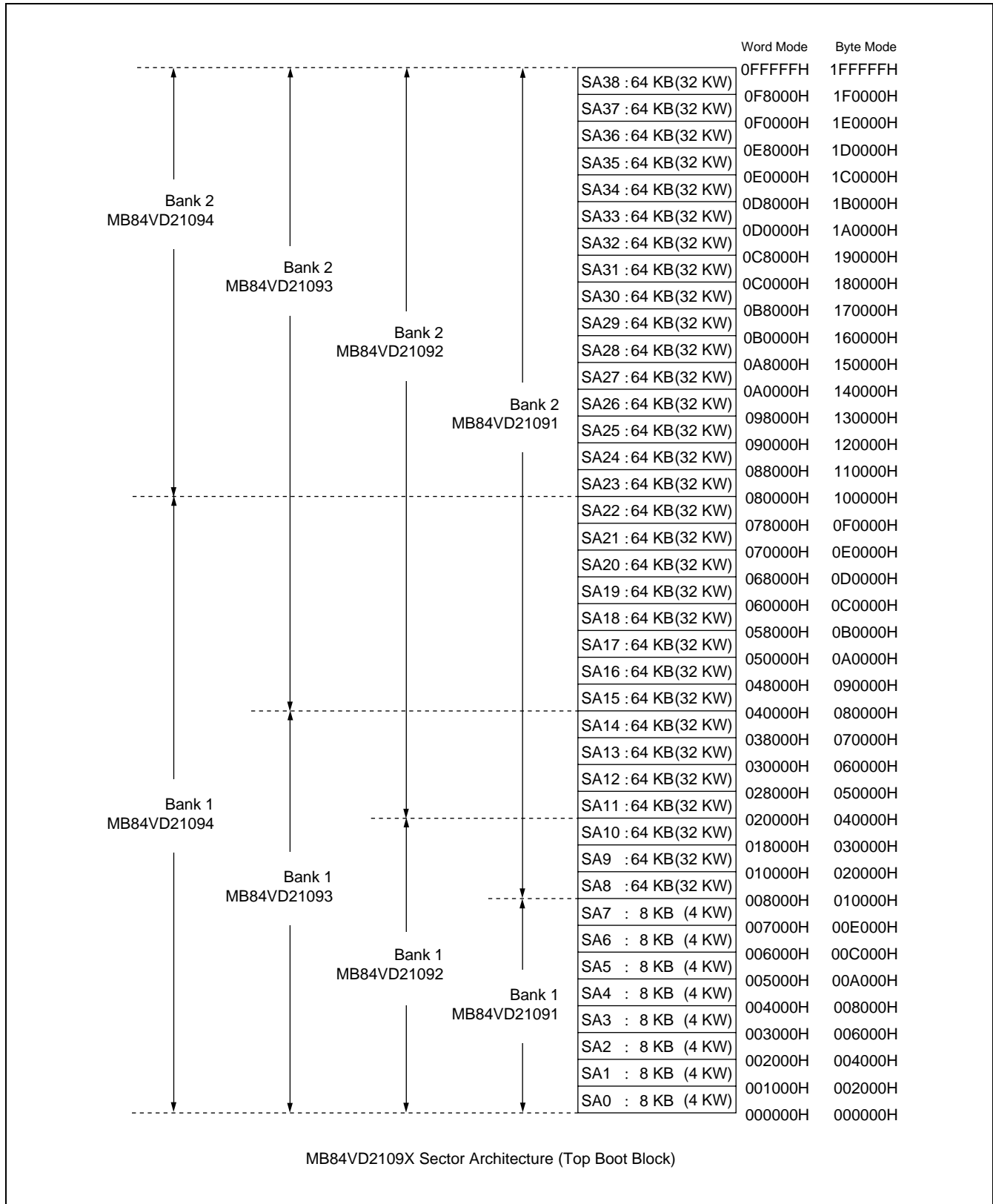
■ FLEXIBLE SECTOR-ERASE ARCHITECTURE on FLASH MEMORY

- Eight 4 K words, and thirty one 32 K words.
- Individual-sector, multiple-sector, or bulk-erase capability.



MB84VD2108X-85/MB84VD2109X-85

- Eight 4 K words, and thirty one 32 K words.
- Individual-sector, multiple-sector, or bulk-erase capability.



MB84VD2108X-85/MB84VD2109X-85

Table 3.1 Sector Address Tables (MB84VD21081)

Bank	Sector	Sector Address								Address Range (Byte mode)	Address Range (Word mode)
		Bank Address									
		A ₁₉	A ₁₈	A ₁₇	A ₁₆	A ₁₅	A ₁₄	A ₁₃	A ₁₂		
Bank 2	SA0	0	0	0	0	0	X	X	X	000000H to 00FFFFH	000000H to 007FFFH
	SA1	0	0	0	0	1	X	X	X	010000H to 01FFFFH	008000H to 00FFFFH
	SA2	0	0	0	1	0	X	X	X	020000H to 02FFFFH	010000H to 017FFFH
	SA3	0	0	0	1	1	X	X	X	030000H to 03FFFFH	018000H to 01FFFFH
	SA4	0	0	1	0	0	X	X	X	040000H to 04FFFFH	020000H to 027FFFH
	SA5	0	0	1	0	1	X	X	X	050000H to 05FFFFH	028000H to 02FFFFH
	SA6	0	0	1	1	0	X	X	X	060000H to 06FFFFH	030000H to 037FFFH
	SA7	0	0	1	1	1	X	X	X	070000H to 07FFFFH	038000H to 03FFFFH
	SA8	0	1	0	0	0	X	X	X	080000H to 08FFFFH	040000H to 047FFFH
	SA9	0	1	0	0	1	X	X	X	090000H to 09FFFFH	048000H to 04FFFFH
	SA10	0	1	0	1	0	X	X	X	0A0000H to 0AFFFFH	050000H to 057FFFH
	SA11	0	1	0	1	1	X	X	X	0B0000H to 0BFFFFH	058000H to 05FFFFH
	SA12	0	1	1	0	0	X	X	X	0C0000H to 0CFFFFH	060000H to 067FFFH
	SA13	0	1	1	0	1	X	X	X	0D0000H to 0DFFFFH	068000H to 06FFFFH
	SA14	0	1	1	1	0	X	X	X	0E0000H to 0EFFFFH	070000H to 077FFFH
	SA15	0	1	1	1	1	X	X	X	0F0000H to 0FFFFFH	078000H to 07FFFFH
	SA16	1	0	0	0	0	X	X	X	100000H to 10FFFFH	080000H to 087FFFH
	SA17	1	0	0	0	1	X	X	X	110000H to 11FFFFH	088000H to 08FFFFH
	SA18	1	0	0	1	0	X	X	X	120000H to 12FFFFH	090000H to 097FFFH
	SA19	1	0	0	1	1	X	X	X	130000H to 13FFFFH	098000H to 09FFFFH
	SA20	1	0	1	0	0	X	X	X	140000H to 14FFFFH	0A0000H to 0A7FFFH
	SA21	1	0	1	0	1	X	X	X	150000H to 15FFFFH	0A8000H to 0AFFFFH
	SA22	1	0	1	1	0	X	X	X	160000H to 16FFFFH	0B0000H to 0B7FFFH
	SA23	1	0	1	1	1	X	X	X	170000H to 17FFFFH	0B8000H to 0BFFFFH
	SA24	1	1	0	0	0	X	X	X	180000H to 18FFFFH	0C0000H to 0C7FFFH
	SA25	1	1	0	0	1	X	X	X	190000H to 19FFFFH	0C8000H to 0CFFFFH
	SA26	1	1	0	1	0	X	X	X	1A0000H to 1AFFFFH	0D0000H to 0D7FFFH
	SA27	1	1	0	1	1	X	X	X	1B0000H to 1BFFFFH	0D8000H to 0DFFFFH
	SA28	1	1	1	0	0	X	X	X	1C0000H to 1CFFFFH	0E0000H to 0E7FFFH
	SA29	1	1	1	0	1	X	X	X	1D0000H to 1DFFFFH	0E8000H to 0EFFFFH
SA30	1	1	1	1	0	X	X	X	1E0000H to 1EFFFFH	0F0000H to 0F7FFFH	
Bank 1	SA31	1	1	1	1	1	0	0	0	1F0000H to 1F1FFFH	0F8000H to 0F8FFFH
	SA32	1	1	1	1	1	0	0	1	1F2000H to 1F3FFFH	0F9000H to 0F9FFFH
	SA33	1	1	1	1	1	0	1	0	1F4000H to 1F5FFFH	0FA000H to 0FAFFFH
	SA34	1	1	1	1	1	0	1	1	1F6000H to 1F7FFFH	0FB000H to 0FBFFFH
	SA35	1	1	1	1	1	1	0	0	1F8000H to 1F9FFFH	0FC000H to 0FCFFFH
	SA36	1	1	1	1	1	1	0	1	1FA000H to 1FBFFFH	0FD000H to 0FDFFFH
	SA37	1	1	1	1	1	1	1	0	1FC000H to 1FDFFFH	0FE000H to 0FEFFFH
	SA38	1	1	1	1	1	1	1	1	1FE000H to 1FFFFFH	0FF000H to 0FFFFFH

MB84VD2108X-85/MB84VD2109X-85

Table 3.2 Sector Address Tables (MB84VD21091)

Bank	Sector	Sector Address								Address Range (BYTE mode)	Address Range (WORD mode)
		Bank Address									
		A ₁₉	A ₁₈	A ₁₇	A ₁₆	A ₁₅	A ₁₄	A ₁₃	A ₁₂		
Bank 1	SA0	0	0	0	0	0	0	0	0	000000H to 001FFFFH	000000H to 000FFFFH
	SA1	0	0	0	0	0	0	0	1	002000H to 003FFFFH	001000H to 001FFFFH
	SA2	0	0	0	0	0	0	0	1	004000H to 005FFFFH	002000H to 002FFFFH
	SA3	0	0	0	0	0	0	0	1	006000H to 007FFFFH	003000H to 003FFFFH
	SA4	0	0	0	0	0	1	0	0	008000H to 009FFFFH	004000H to 004FFFFH
	SA5	0	0	0	0	0	1	0	1	00A000H to 00BFFFFH	005000H to 005FFFFH
	SA6	0	0	0	0	0	1	1	0	00C000H to 00DFFFFH	006000H to 006FFFFH
	SA7	0	0	0	0	0	1	1	1	00E000H to 00FFFFFFH	007000H to 007FFFFH
Bank 2	SA8	0	0	0	0	1	X	X	X	010000H to 01FFFFFFH	008000H to 00FFFFFFH
	SA9	0	0	0	1	0	X	X	X	020000H to 02FFFFFFH	010000H to 017FFFFH
	SA10	0	0	0	1	1	X	X	X	030000H to 03FFFFFFH	018000H to 01FFFFFFH
	SA11	0	0	1	0	0	X	X	X	040000H to 04FFFFFFH	020000H to 027FFFFH
	SA12	0	0	1	0	1	X	X	X	050000H to 05FFFFFFH	028000H to 02FFFFFFH
	SA13	0	0	1	1	0	X	X	X	060000H to 06FFFFFFH	030000H to 037FFFFH
	SA14	0	0	1	1	1	X	X	X	070000H to 07FFFFFFH	038000H to 03FFFFFFH
	SA15	0	1	0	0	0	X	X	X	080000H to 08FFFFFFH	040000H to 047FFFFH
	SA16	0	1	0	0	1	X	X	X	090000H to 09FFFFFFH	048000H to 04FFFFFFH
	SA17	0	1	0	1	0	X	X	X	0A0000H to 0AFFFFFFH	050000H to 057FFFFH
	SA18	0	1	0	1	1	X	X	X	0B0000H to 0BFFFFFFH	058000H to 05FFFFFFH
	SA19	0	1	1	0	0	X	X	X	0C0000H to 0CFFFFFFH	060000H to 067FFFFH
	SA20	0	1	1	0	1	X	X	X	0D0000H to 0DFFFFFFH	068000H to 06FFFFFFH
	SA21	0	1	1	1	0	X	X	X	0E0000H to 0EFFFFFFH	070000H to 077FFFFH
	SA22	0	1	1	1	1	X	X	X	0F0000H to 0FFFFFFFH	078000H to 07FFFFFFH
	SA23	1	0	0	0	0	X	X	X	100000H to 10FFFFFFH	080000H to 087FFFFH
	SA24	1	0	0	0	1	X	X	X	110000H to 11FFFFFFH	088000H to 08FFFFFFH
	SA25	1	0	0	1	0	X	X	X	120000H to 12FFFFFFH	090000H to 097FFFFH
	SA26	1	0	0	1	1	X	X	X	130000H to 13FFFFFFH	098000H to 09FFFFFFH
	SA27	1	0	1	0	0	X	X	X	140000H to 14FFFFFFH	0A0000H to 0A7FFFFH
	SA28	1	0	1	0	1	X	X	X	150000H to 15FFFFFFH	0A8000H to 0AFFFFFFH
	SA29	1	0	1	1	0	X	X	X	160000H to 16FFFFFFH	0B0000H to 0B7FFFFH
	SA30	1	0	1	1	1	X	X	X	170000H to 17FFFFFFH	0B8000H to 0BFFFFFFH
	SA31	1	1	0	0	0	X	X	X	180000H to 18FFFFFFH	0C0000H to 0C7FFFFH
	SA32	1	1	0	0	1	X	X	X	190000H to 19FFFFFFH	0C8000H to 0CFFFFFFH
	SA33	1	1	0	1	0	X	X	X	1A0000H to 1AFFFFFFH	0D0000H to 0D7FFFFH
	SA34	1	1	0	1	1	X	X	X	1B0000H to 1BFFFFFFH	0D8000H to 0DFFFFFFH
	SA35	1	1	1	0	0	X	X	X	1C0000H to 1CFFFFFFH	0E0000H to 0E7FFFFH
	SA36	1	1	1	0	1	X	X	X	1D0000H to 1DFFFFFFH	0E8000H to 0EFFFFFFH
	SA37	1	1	1	1	0	X	X	X	1E0000H to 1EFFFFFFH	0F0000H to 0F7FFFFH
	SA38	1	1	1	1	1	X	X	X	1F0000H to 1FFFFFFFH	0F8000H to 0FFFFFFFH

MB84VD2108X-85/MB84VD2109X-85

Table 3.3 Sector Address Tables (MB84VD21082)

Bank	Sector	Sector Address								Address Range (BYTE mode)	Address Range (WORD mode)
		Bank Address									
		A ₁₉	A ₁₈	A ₁₇	A ₁₆	A ₁₅	A ₁₄	A ₁₃	A ₁₂		
Bank 2	SA0	0	0	0	0	0	X	X	X	000000H to 00FFFFH	000000H to 007FFFH
	SA1	0	0	0	0	1	X	X	X	010000H to 01FFFFH	008000H to 00FFFFH
	SA2	0	0	0	1	0	X	X	X	020000H to 02FFFFH	010000H to 017FFFH
	SA3	0	0	0	1	1	X	X	X	030000H to 03FFFFH	018000H to 01FFFFH
	SA4	0	0	1	0	0	X	X	X	040000H to 04FFFFH	020000H to 027FFFH
	SA5	0	0	1	0	1	X	X	X	050000H to 05FFFFH	028000H to 02FFFFH
	SA6	0	0	1	1	0	X	X	X	060000H to 06FFFFH	030000H to 037FFFH
	SA7	0	0	1	1	1	X	X	X	070000H to 07FFFFH	038000H to 03FFFFH
	SA8	0	1	0	0	0	X	X	X	080000H to 08FFFFH	040000H to 047FFFH
	SA9	0	1	0	0	1	X	X	X	090000H to 09FFFFH	048000H to 04FFFFH
	SA10	0	1	0	1	0	X	X	X	0A0000H to 0AFFFFH	050000H to 057FFFH
	SA11	0	1	0	1	1	X	X	X	0B0000H to 0BFFFFH	058000H to 05FFFFH
	SA12	0	1	1	0	0	X	X	X	0C0000H to 0CFFFFH	060000H to 067FFFH
	SA13	0	1	1	0	1	X	X	X	0D0000H to 0DFFFFH	068000H to 06FFFFH
	SA14	0	1	1	1	0	X	X	X	0E0000H to 0EFFFFH	070000H to 077FFFH
	SA15	0	1	1	1	1	X	X	X	0F0000H to 0FFFFFH	078000H to 07FFFFH
	SA16	1	0	0	0	0	X	X	X	100000H to 10FFFFH	080000H to 087FFFH
	SA17	1	0	0	0	1	X	X	X	110000H to 11FFFFH	088000H to 08FFFFH
	SA18	1	0	0	1	0	X	X	X	120000H to 12FFFFH	090000H to 097FFFH
	SA19	1	0	0	1	1	X	X	X	130000H to 13FFFFH	098000H to 09FFFFH
	SA20	1	0	1	0	0	X	X	X	140000H to 14FFFFH	0A0000H to 0A7FFFH
	SA21	1	0	1	0	1	X	X	X	150000H to 15FFFFH	0A8000H to 0AFFFFH
	SA22	1	0	1	1	0	X	X	X	160000H to 16FFFFH	0B0000H to 0B7FFFH
	SA23	1	0	1	1	1	X	X	X	170000H to 17FFFFH	0B8000H to 0BFFFFH
	SA24	1	1	0	0	0	X	X	X	180000H to 18FFFFH	0C0000H to 0C7FFFH
	SA25	1	1	0	0	1	X	X	X	190000H to 19FFFFH	0C8000H to 0CFFFFH
	SA26	1	1	0	1	0	X	X	X	1A0000H to 1AFFFFH	0D0000H to 0D7FFFH
SA27	1	1	0	1	1	X	X	X	1B0000H to 1BFFFFH	0D8000H to 0DFFFFH	
Bank 1	SA28	1	1	1	0	0	X	X	X	1C0000H to 1CFFFFH	0E0000H to 0E7FFFH
	SA29	1	1	1	0	1	X	X	X	1D0000H to 1DFFFFH	0E8000H to 0EFFFFH
	SA30	1	1	1	1	0	X	X	X	1E0000H to 1EFFFFH	0F0000H to 0F7FFFH
	SA31	1	1	1	1	1	0	0	0	1F0000H to 1F1FFFH	0F8000H to 0F8FFFH
	SA32	1	1	1	1	1	0	0	1	1F2000H to 1F3FFFH	0F9000H to 0F9FFFH
	SA33	1	1	1	1	1	0	1	0	1F4000H to 1F5FFFH	0FA000H to 0FAFFFH
	SA34	1	1	1	1	1	0	1	1	1F6000H to 1F7FFFH	0FB000H to 0FBFFFH
	SA35	1	1	1	1	1	1	0	0	1F8000H to 1F9FFFH	0FC000H to 0FCFFFH
	SA36	1	1	1	1	1	1	0	1	1FA000H to 1FBFFFH	0FD000H to 0FDFFFH
	SA37	1	1	1	1	1	1	1	0	1FC000H to 1FDFFFH	0FE000H to 0FEFFFH
	SA38	1	1	1	1	1	1	1	1	1FE000H to 1FFFFFH	0FF000H to 0FFFFFH

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Table 3.4 Sector Address Tables (MB84VD21092)

Bank	Sector	Sector Address								Address Range (BYTE mode)	Address Range (WORD mode)
		Bank Address									
		A ₁₉	A ₁₈	A ₁₇	A ₁₆	A ₁₅	A ₁₄	A ₁₃	A ₁₂		
Bank 1	SA0	0	0	0	0	0	0	0	0	000000H to 001FFFFH	000000H to 000FFFFH
	SA1	0	0	0	0	0	0	0	1	002000H to 003FFFFH	001000H to 001FFFFH
	SA2	0	0	0	0	0	0	1	0	004000H to 005FFFFH	002000H to 002FFFFH
	SA3	0	0	0	0	0	0	1	1	006000H to 007FFFFH	003000H to 003FFFFH
	SA4	0	0	0	0	0	1	0	0	008000H to 009FFFFH	004000H to 004FFFFH
	SA5	0	0	0	0	0	1	0	1	00A000H to 00BFFFFH	005000H to 005FFFFH
	SA6	0	0	0	0	0	1	1	0	00C000H to 00DFFFFH	006000H to 006FFFFH
	SA7	0	0	0	0	0	1	1	1	00E000H to 00FFFFFFH	007000H to 007FFFFH
	SA8	0	0	0	0	1	X	X	X	010000H to 01FFFFFFH	008000H to 00FFFFFFH
	SA9	0	0	0	1	0	X	X	X	020000H to 02FFFFFFH	010000H to 017FFFFH
Bank 2	SA10	0	0	0	1	1	X	X	X	030000H to 03FFFFFFH	018000H to 01FFFFFFH
	SA11	0	0	1	0	0	X	X	X	040000H to 04FFFFFFH	020000H to 027FFFFH
	SA12	0	0	1	0	1	X	X	X	050000H to 05FFFFFFH	028000H to 02FFFFFFH
	SA13	0	0	1	1	0	X	X	X	060000H to 06FFFFFFH	030000H to 037FFFFH
	SA14	0	0	1	1	1	X	X	X	070000H to 07FFFFFFH	038000H to 03FFFFFFH
	SA15	0	1	0	0	0	X	X	X	080000H to 08FFFFFFH	040000H to 047FFFFH
	SA16	0	1	0	0	1	X	X	X	090000H to 09FFFFFFH	048000H to 04FFFFFFH
	SA17	0	1	0	1	0	X	X	X	0A0000H to 0AFFFFFFH	050000H to 057FFFFH
	SA18	0	1	0	1	1	X	X	X	0B0000H to 0BFFFFFFH	058000H to 05FFFFFFH
	SA19	0	1	1	0	0	X	X	X	0C0000H to 0CFFFFFFH	060000H to 067FFFFH
	SA20	0	1	1	0	1	X	X	X	0D0000H to 0DFFFFFFH	068000H to 06FFFFFFH
	SA21	0	1	1	1	0	X	X	X	0E0000H to 0EFFFFFFH	070000H to 077FFFFH
	SA22	0	1	1	1	1	X	X	X	0F0000H to 0FFFFFFFH	078000H to 07FFFFFFH
	SA23	1	0	0	0	0	X	X	X	100000H to 10FFFFFFH	080000H to 087FFFFH
	SA24	1	0	0	0	1	X	X	X	110000H to 11FFFFFFH	088000H to 08FFFFFFH
	SA25	1	0	0	1	0	X	X	X	120000H to 12FFFFFFH	090000H to 097FFFFH
	SA26	1	0	0	1	1	X	X	X	130000H to 13FFFFFFH	098000H to 09FFFFFFH
	SA27	1	0	1	0	0	X	X	X	140000H to 14FFFFFFH	0A0000H to 0A7FFFFH
	SA28	1	0	1	0	1	X	X	X	150000H to 15FFFFFFH	0A8000H to 0AFFFFFFH
	SA29	1	0	1	1	0	X	X	X	160000H to 16FFFFFFH	0B0000H to 0B7FFFFH
	SA30	1	0	1	1	1	X	X	X	170000H to 17FFFFFFH	0B8000H to 0BFFFFFFH
	SA31	1	1	0	0	0	X	X	X	180000H to 18FFFFFFH	0C0000H to 0C7FFFFH
	SA32	1	1	0	0	1	X	X	X	190000H to 19FFFFFFH	0C8000H to 0CFFFFFFH
	SA33	1	1	0	1	0	X	X	X	1A0000H to 1AFFFFFFH	0D0000H to 0D7FFFFH
	SA34	1	1	0	1	1	X	X	X	1B0000H to 1BFFFFFFH	0D8000H to 0DFFFFFFH
	SA35	1	1	1	0	0	X	X	X	1C0000H to 1CFFFFFFH	0E0000H to 0E7FFFFH
	SA36	1	1	1	0	1	X	X	X	1D0000H to 1DFFFFFFH	0E8000H to 0EFFFFFFH
	SA37	1	1	1	1	0	X	X	X	1E0000H to 1EFFFFFFH	0F0000H to 0F7FFFFH
SA38	1	1	1	1	1	X	X	X	1F0000H to 1FFFFFFFH	0F8000H to 0FFFFFFFH	

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Table 3.5 Sector Address Tables (MB84VD21083)

Bank	Sector	Sector Address								Address Range (BYTE mode)	Address Range (WORD mode)
		Bank Address									
		A ₁₉	A ₁₈	A ₁₇	A ₁₆	A ₁₅	A ₁₄	A ₁₃	A ₁₂		
Bank 2	SA0	0	0	0	0	0	X	X	X	000000H to 00FFFFH	000000H to 007FFFH
	SA1	0	0	0	0	1	X	X	X	010000H to 01FFFFH	008000H to 00FFFFH
	SA2	0	0	0	1	0	X	X	X	020000H to 02FFFFH	010000H to 017FFFH
	SA3	0	0	0	1	1	X	X	X	030000H to 03FFFFH	018000H to 01FFFFH
	SA4	0	0	1	0	0	X	X	X	040000H to 04FFFFH	020000H to 027FFFH
	SA5	0	0	1	0	1	X	X	X	050000H to 05FFFFH	028000H to 02FFFFH
	SA6	0	0	1	1	0	X	X	X	060000H to 06FFFFH	030000H to 037FFFH
	SA7	0	0	1	1	1	X	X	X	070000H to 07FFFFH	038000H to 03FFFFH
	SA8	0	1	0	0	0	X	X	X	080000H to 08FFFFH	040000H to 047FFFH
	SA9	0	1	0	0	1	X	X	X	090000H to 09FFFFH	048000H to 04FFFFH
	SA10	0	1	0	1	0	X	X	X	0A0000H to 0AFFFFH	050000H to 057FFFH
	SA11	0	1	0	1	1	X	X	X	0B0000H to 0BFFFFH	058000H to 05FFFFH
	SA12	0	1	1	0	0	X	X	X	0C0000H to 0CFFFFH	060000H to 067FFFH
	SA13	0	1	1	0	1	X	X	X	0D0000H to 0DFFFFH	068000H to 06FFFFH
	SA14	0	1	1	1	0	X	X	X	0E0000H to 0EFFFFH	070000H to 077FFFH
	SA15	0	1	1	1	1	X	X	X	0F0000H to 0FFFFFH	078000H to 07FFFFH
	SA16	1	0	0	0	0	X	X	X	100000H to 10FFFFH	080000H to 087FFFH
	SA17	1	0	0	0	1	X	X	X	110000H to 11FFFFH	088000H to 08FFFFH
	SA18	1	0	0	1	0	X	X	X	120000H to 12FFFFH	090000H to 097FFFH
	SA19	1	0	0	1	1	X	X	X	130000H to 13FFFFH	098000H to 09FFFFH
	SA20	1	0	1	0	0	X	X	X	140000H to 14FFFFH	0A0000H to 0A7FFFH
	SA21	1	0	1	0	1	X	X	X	150000H to 15FFFFH	0A8000H to 0AFFFFH
	SA22	1	0	1	1	0	X	X	X	160000H to 16FFFFH	0B0000H to 0B7FFFH
SA23	1	0	1	1	1	X	X	X	170000H to 17FFFFH	0B8000H to 0BFFFFH	
Bank 1	SA24	1	1	0	0	0	X	X	X	180000H to 18FFFFH	0C0000H to 0C7FFFH
	SA25	1	1	0	0	1	X	X	X	190000H to 19FFFFH	0C8000H to 0CFFFFH
	SA26	1	1	0	1	0	X	X	X	1A0000H to 1AFFFFH	0D0000H to 0D7FFFH
	SA27	1	1	0	1	1	X	X	X	1B0000H to 1BFFFFH	0D8000H to 0DFFFFH
	SA28	1	1	1	0	0	X	X	X	1C0000H to 1CFFFFH	0E0000H to 0E7FFFH
	SA29	1	1	1	0	1	X	X	X	1D0000H to 1DFFFFH	0E8000H to 0EFFFFH
	SA30	1	1	1	1	0	X	X	X	1E0000H to 1EFFFFH	0F0000H to 0F7FFFH
	SA31	1	1	1	1	1	0	0	0	1F0000H to 1F1FFFH	0F8000H to 0F8FFFH
	SA32	1	1	1	1	1	0	0	1	1F2000H to 1F3FFFH	0F9000H to 0F9FFFH
	SA33	1	1	1	1	1	0	1	0	1F4000H to 1F5FFFH	0FA000H to 0FAFFFH
	SA34	1	1	1	1	1	0	1	1	1F6000H to 1F7FFFH	0FB000H to 0FBFFFH
	SA35	1	1	1	1	1	1	0	0	1F8000H to 1F9FFFH	0FC000H to 0FCFFFH
	SA36	1	1	1	1	1	1	0	1	1FA000H to 1FBFFFH	0FD000H to 0FDFFFH
	SA37	1	1	1	1	1	1	1	0	1FC000H to 1FDFFFH	0FE000H to 0FEFFFH
	SA38	1	1	1	1	1	1	1	1	1FE000H to 1FFFFFH	0FF000H to 0FFFFFH

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Table 3.6 Sector Address Tables (MB84VD21093)

Bank	Sector	Sector Address								Address Range (BYTE mode)	Address Range (WORD mode)
		Bank Address									
		A ₁₉	A ₁₈	A ₁₇	A ₁₆	A ₁₅	A ₁₄	A ₁₃	A ₁₂		
Bank 1	SA0	0	0	0	0	0	0	0	0	000000H to 001FFFFH	000000H to 000FFFFH
	SA1	0	0	0	0	0	0	0	1	002000H to 003FFFFH	001000H to 001FFFFH
	SA2	0	0	0	0	0	0	0	1	004000H to 005FFFFH	002000H to 002FFFFH
	SA3	0	0	0	0	0	0	0	1	006000H to 007FFFFH	003000H to 003FFFFH
	SA4	0	0	0	0	0	1	0	0	008000H to 009FFFFH	004000H to 004FFFFH
	SA5	0	0	0	0	0	1	0	1	00A000H to 00BFFFFH	005000H to 005FFFFH
	SA6	0	0	0	0	0	1	1	0	00C000H to 00DFFFFH	006000H to 006FFFFH
	SA7	0	0	0	0	0	1	1	1	00E000H to 00FFFFFFH	007000H to 007FFFFH
	SA8	0	0	0	0	1	X	X	X	010000H to 01FFFFFFH	008000H to 00FFFFFFH
	SA9	0	0	0	1	0	X	X	X	020000H to 02FFFFFFH	010000H to 017FFFFH
	SA10	0	0	0	1	1	X	X	X	030000H to 03FFFFFFH	018000H to 01FFFFFFH
	SA11	0	0	1	0	0	X	X	X	040000H to 04FFFFFFH	020000H to 027FFFFH
	SA12	0	0	1	0	1	X	X	X	050000H to 05FFFFFFH	028000H to 02FFFFFFH
	SA13	0	0	1	1	0	X	X	X	060000H to 06FFFFFFH	030000H to 037FFFFH
SA14	0	0	1	1	1	X	X	X	070000H to 07FFFFFFH	038000H to 03FFFFFFH	
Bank 2	SA15	0	1	0	0	0	X	X	X	080000H to 08FFFFFFH	040000H to 047FFFFH
	SA16	0	1	0	0	1	X	X	X	090000H to 09FFFFFFH	048000H to 04FFFFFFH
	SA17	0	1	0	1	0	X	X	X	0A0000H to 0AFFFFFFH	050000H to 057FFFFH
	SA18	0	1	0	1	1	X	X	X	0B0000H to 0BFFFFFFH	058000H to 05FFFFFFH
	SA19	0	1	1	0	0	X	X	X	0C0000H to 0CFFFFFFH	060000H to 067FFFFH
	SA20	0	1	1	0	1	X	X	X	0D0000H to 0DFFFFFFH	068000H to 06FFFFFFH
	SA21	0	1	1	1	0	X	X	X	0E0000H to 0EFFFFFFH	070000H to 077FFFFH
	SA22	0	1	1	1	1	X	X	X	0F0000H to 0FFFFFFFH	078000H to 07FFFFFFH
	SA23	1	0	0	0	0	X	X	X	100000H to 10FFFFFFH	080000H to 087FFFFH
	SA24	1	0	0	0	1	X	X	X	110000H to 11FFFFFFH	088000H to 08FFFFFFH
	SA25	1	0	0	1	0	X	X	X	120000H to 12FFFFFFH	090000H to 097FFFFH
	SA26	1	0	0	1	1	X	X	X	130000H to 13FFFFFFH	098000H to 09FFFFFFH
	SA27	1	0	1	0	0	X	X	X	140000H to 14FFFFFFH	0A0000H to 0A7FFFFH
	SA28	1	0	1	0	1	X	X	X	150000H to 15FFFFFFH	0A8000H to 0AFFFFFFH
	SA29	1	0	1	1	0	X	X	X	160000H to 16FFFFFFH	0B0000H to 0B7FFFFH
	SA30	1	0	1	1	1	X	X	X	170000H to 17FFFFFFH	0B8000H to 0BFFFFFFH
	SA31	1	1	0	0	0	X	X	X	180000H to 18FFFFFFH	0C0000H to 0C7FFFFH
	SA32	1	1	0	0	1	X	X	X	190000H to 19FFFFFFH	0C8000H to 0CFFFFFFH
	SA33	1	1	0	1	0	X	X	X	1A0000H to 1AFFFFFFH	0D0000H to 0D7FFFFH
	SA34	1	1	0	1	1	X	X	X	1B0000H to 1BFFFFFFH	0D8000H to 0DFFFFFFH
	SA35	1	1	1	0	0	X	X	X	1C0000H to 1CFFFFFFH	0E0000H to 0E7FFFFH
	SA36	1	1	1	0	1	X	X	X	1D0000H to 1DFFFFFFH	0E8000H to 0EFFFFFFH
	SA37	1	1	1	1	0	X	X	X	1E0000H to 1EFFFFFFH	0F0000H to 0F7FFFFH
	SA38	1	1	1	1	1	X	X	X	1F0000H to 1FFFFFFFH	0F8000H to 0FFFFFFFH

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Table 3.7 Sector Address Tables (MB84VD21084)

Bank	Sector	Sector Address								Address Range (BYTE mode)	Address Range (WORD mode)
		Bank Address									
		A ₁₉	A ₁₈	A ₁₇	A ₁₆	A ₁₅	A ₁₄	A ₁₃	A ₁₂		
Bank 2	SA0	0	0	0	0	0	X	X	X	000000H to 00FFFFH	000000H to 007FFFH
	SA1	0	0	0	0	1	X	X	X	010000H to 01FFFFH	008000H to 00FFFFH
	SA2	0	0	0	1	0	X	X	X	020000H to 02FFFFH	010000H to 017FFFH
	SA3	0	0	0	1	1	X	X	X	030000H to 03FFFFH	018000H to 01FFFFH
	SA4	0	0	1	0	0	X	X	X	040000H to 04FFFFH	020000H to 027FFFH
	SA5	0	0	1	0	1	X	X	X	050000H to 05FFFFH	028000H to 02FFFFH
	SA6	0	0	1	1	0	X	X	X	060000H to 06FFFFH	030000H to 037FFFH
	SA7	0	0	1	1	1	X	X	X	070000H to 07FFFFH	038000H to 03FFFFH
	SA8	0	1	0	0	0	X	X	X	080000H to 08FFFFH	040000H to 047FFFH
	SA9	0	1	0	0	1	X	X	X	090000H to 09FFFFH	048000H to 04FFFFH
	SA10	0	1	0	1	0	X	X	X	0A0000H to 0AFFFFH	050000H to 057FFFH
	SA11	0	1	0	1	1	X	X	X	0B0000H to 0BFFFFH	058000H to 05FFFFH
	SA12	0	1	1	0	0	X	X	X	0C0000H to 0CFFFFH	060000H to 067FFFH
	SA13	0	1	1	0	1	X	X	X	0D0000H to 0DFFFFH	068000H to 06FFFFH
	SA14	0	1	1	1	0	X	X	X	0E0000H to 0EFFFFH	070000H to 077FFFH
SA15	0	1	1	1	1	X	X	X	0F0000H to 0FFFFFH	078000H to 07FFFFH	
Bank 1	SA16	1	0	0	0	0	X	X	X	100000H to 10FFFFH	080000H to 087FFFH
	SA17	1	0	0	0	1	X	X	X	110000H to 11FFFFH	088000H to 08FFFFH
	SA18	1	0	0	1	0	X	X	X	120000H to 12FFFFH	090000H to 097FFFH
	SA19	1	0	0	1	1	X	X	X	130000H to 13FFFFH	098000H to 09FFFFH
	SA20	1	0	1	0	0	X	X	X	140000H to 14FFFFH	0A0000H to 0A7FFFH
	SA21	1	0	1	0	1	X	X	X	150000H to 15FFFFH	0A8000H to 0AFFFFH
	SA22	1	0	1	1	0	X	X	X	160000H to 16FFFFH	0B0000H to 0B7FFFH
	SA23	1	0	1	1	1	X	X	X	170000H to 17FFFFH	0B8000H to 0BFFFFH
	SA24	1	1	0	0	0	X	X	X	180000H to 18FFFFH	0C0000H to 0C7FFFH
	SA25	1	1	0	0	1	X	X	X	190000H to 19FFFFH	0C8000H to 0CFFFFH
	SA26	1	1	0	1	0	X	X	X	1A0000H to 1AFFFFH	0D0000H to 0D7FFFH
	SA27	1	1	0	1	1	X	X	X	1B0000H to 1BFFFFH	0D8000H to 0DFFFFH
	SA28	1	1	1	0	0	X	X	X	1C0000H to 1CFFFFH	0E0000H to 0E7FFFH
	SA29	1	1	1	0	1	X	X	X	1D0000H to 1DFFFFH	0E8000H to 0EFFFFH
	SA30	1	1	1	1	0	X	X	X	1E0000H to 1EFFFFH	0F0000H to 0F7FFFH
	SA31	1	1	1	1	1	0	0	0	1F0000H to 1F1FFFH	0F8000H to 0F8FFFH
	SA32	1	1	1	1	1	0	0	1	1F2000H to 1F3FFFH	0F9000H to 0F9FFFH
	SA33	1	1	1	1	1	0	1	0	1F4000H to 1F5FFFH	0FA000H to 0FAFFFH
	SA34	1	1	1	1	1	0	1	1	1F6000H to 1F7FFFH	0FB000H to 0FBFFFH
	SA35	1	1	1	1	1	1	0	0	1F8000H to 1F9FFFH	0FC000H to 0FCFFFH
	SA36	1	1	1	1	1	1	0	1	1FA000H to 1FBFFFH	0FD000H to 0FDFFFH
	SA37	1	1	1	1	1	1	1	0	1FC000H to 1FDFFFH	0FE000H to 0FEFFFH
	SA38	1	1	1	1	1	1	1	1	1FE000H to 1FFFFFH	0FF000H to 0FFFFFH

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Table 3.8 Sector Address Tables (MB84VD21094)

Bank	Sector	Sector Address								Address Range (BYTE mode)	Address Range (WORD mode)
		Bank Address									
		A ₁₉	A ₁₈	A ₁₇	A ₁₆	A ₁₅	A ₁₄	A ₁₃	A ₁₂		
Bank 1	SA0	0	0	0	0	0	0	0	0	000000H to 001FFFFH	000000H to 000FFFFH
	SA1	0	0	0	0	0	0	0	1	002000H to 003FFFFH	001000H to 001FFFFH
	SA2	0	0	0	0	0	0	1	0	004000H to 005FFFFH	002000H to 002FFFFH
	SA3	0	0	0	0	0	0	1	1	006000H to 007FFFFH	003000H to 003FFFFH
	SA4	0	0	0	0	0	1	0	0	008000H to 009FFFFH	004000H to 004FFFFH
	SA5	0	0	0	0	0	1	0	1	00A000H to 00BFFFFH	005000H to 005FFFFH
	SA6	0	0	0	0	0	1	1	0	00C000H to 00DFFFFH	006000H to 006FFFFH
	SA7	0	0	0	0	0	1	1	1	00E000H to 00FFFFFFH	007000H to 007FFFFH
	SA8	0	0	0	0	1	X	X	X	010000H to 01FFFFFFH	008000H to 00FFFFFFH
	SA9	0	0	0	1	0	X	X	X	020000H to 02FFFFFFH	010000H to 017FFFFH
	SA10	0	0	0	1	1	X	X	X	030000H to 03FFFFFFH	018000H to 01FFFFFFH
	SA11	0	0	1	0	0	X	X	X	040000H to 04FFFFFFH	020000H to 027FFFFH
	SA12	0	0	1	0	1	X	X	X	050000H to 05FFFFFFH	028000H to 02FFFFFFH
	SA13	0	0	1	1	0	X	X	X	060000H to 06FFFFFFH	030000H to 037FFFFH
	SA14	0	0	1	1	1	X	X	X	070000H to 07FFFFFFH	038000H to 03FFFFFFH
	SA15	0	1	0	0	0	X	X	X	080000H to 08FFFFFFH	040000H to 047FFFFH
	SA16	0	1	0	0	1	X	X	X	090000H to 09FFFFFFH	048000H to 04FFFFFFH
	SA17	0	1	0	1	0	X	X	X	0A0000H to 0AFFFFFFH	050000H to 057FFFFH
	SA18	0	1	0	1	1	X	X	X	0B0000H to 0BFFFFFFH	058000H to 05FFFFFFH
	SA19	0	1	1	0	0	X	X	X	0C0000H to 0CFFFFFFH	060000H to 067FFFFH
	SA20	0	1	1	0	1	X	X	X	0D0000H to 0DFFFFFFH	068000H to 06FFFFFFH
	SA21	0	1	1	1	0	X	X	X	0E0000H to 0EFFFFFFH	070000H to 077FFFFH
SA22	0	1	1	1	1	X	X	X	0F0000H to 0FFFFFFFH	078000H to 07FFFFFFH	
Bank 2	SA23	1	0	0	0	0	X	X	X	100000H to 10FFFFFFH	080000H to 087FFFFH
	SA24	1	0	0	0	1	X	X	X	110000H to 11FFFFFFH	088000H to 08FFFFFFH
	SA25	1	0	0	1	0	X	X	X	120000H to 12FFFFFFH	090000H to 097FFFFH
	SA26	1	0	0	1	1	X	X	X	130000H to 13FFFFFFH	098000H to 09FFFFFFH
	SA27	1	0	1	0	0	X	X	X	140000H to 14FFFFFFH	0A0000H to 0A7FFFFH
	SA28	1	0	1	0	1	X	X	X	150000H to 15FFFFFFH	0A8000H to 0AFFFFFFH
	SA29	1	0	1	1	0	X	X	X	160000H to 16FFFFFFH	0B0000H to 0B7FFFFH
	SA30	1	0	1	1	1	X	X	X	170000H to 17FFFFFFH	0B8000H to 0BFFFFFFH
	SA31	1	1	0	0	0	X	X	X	180000H to 18FFFFFFH	0C0000H to 0C7FFFFH
	SA32	1	1	0	0	1	X	X	X	190000H to 19FFFFFFH	0C8000H to 0CFFFFFFH
	SA33	1	1	0	1	0	X	X	X	1A0000H to 1AFFFFFFH	0D0000H to 0D7FFFFH
	SA34	1	1	0	1	1	X	X	X	1B0000H to 1BFFFFFFH	0D8000H to 0DFFFFFFH
	SA35	1	1	1	0	0	X	X	X	1C0000H to 1CFFFFFFH	0E0000H to 0E7FFFFH
	SA36	1	1	1	0	1	X	X	X	1D0000H to 1DFFFFFFH	0E8000H to 0EFFFFFFH
	SA37	1	1	1	1	0	X	X	X	1E0000H to 1EFFFFFFH	0F0000H to 0F7FFFFH
	SA38	1	1	1	1	1	X	X	X	1F0000H to 1FFFFFFFH	0F8000H to 0FFFFFFFH

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**Table 4.1 Sector Group Addresses (MB84VD2108X)
(Top Boot Block)**

Sector Group	A ₁₉	A ₁₈	A ₁₇	A ₁₆	A ₁₅	A ₁₄	A ₁₃	A ₁₂	Sectors
SGA0	0	0	0	0	0	X	X	X	SA0
SGA1	0	0	0	0	1	X	X	X	SA1 to SA3
	0	0	0	1	0	X	X	X	
	0	0	0	1	1	X	X	X	
SGA2	0	0	1	X	X	X	X	X	SA4 to SA7
SGA3	0	1	0	X	X	X	X	X	SA8 to SA11
SGA4	0	1	1	X	X	X	X	X	SA12 to SA15
SGA5	1	0	0	X	X	X	X	X	SA16 to SA19
SGA6	1	0	1	X	X	X	X	X	SA20 to SA23
SGA7	1	1	0	X	X	X	X	X	SA24 to SA27
SGA8	1	1	1	0	0	X	X	X	SA28 to SA30
	1	1	1	0	1	X	X	X	
	1	1	1	1	0	X	X	X	
SGA9	1	1	1	1	1	0	0	0	SA31
SGA10	1	1	1	1	1	0	0	1	SA32
SGA11	1	1	1	1	1	0	1	0	SA33
SGA12	1	1	1	1	1	0	1	1	SA34
SGA13	1	1	1	1	1	1	0	0	SA35
SGA14	1	1	1	1	1	1	0	1	SA36
SGA15	1	1	1	1	1	1	1	0	SA37
SGA16	1	1	1	1	1	1	1	1	SA38

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**Table 4.2 Sector Group Addresses (MB84VD2109X)
(Bottom Boot Block)**

Sector Group	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	SA0
SGA1	0	0	0	0	0	0	0	1	SA1
SGA2	0	0	0	0	0	0	1	0	SA2
SGA3	0	0	0	0	0	0	1	1	SA3
SGA4	0	0	0	0	0	1	0	0	SA4
SGA5	0	0	0	0	0	1	0	1	SA5
SGA6	0	0	0	0	0	1	1	0	SA6
SGA7	0	0	0	0	0	1	1	1	SA7
SGA8	0	0	0	0	1	X	X	X	SA8 to SA10
	0	0	0	1	0	X	X	X	
	0	0	0	1	1	X	X	X	
SGA9	0	0	1	X	X	X	X	X	SA11 to SA14
SGA10	0	1	0	X	X	X	X	X	SA15 to SA18
SGA11	0	1	1	X	X	X	X	X	SA19 to SA22
SGA12	1	0	0	X	X	X	X	X	SA23 to SA26
SGA13	1	0	1	X	X	X	X	X	SA27 to SA30
SGA14	1	1	0	X	X	X	X	X	SA31 to SA34
SGA15	1	1	1	0	0	X	X	X	SA35 to SA37
	1	1	1	0	1	X	X	X	
	1	1	1	1	0	X	X	X	
SGA16	1	1	1	1	1	X	X	X	SA38

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Table 5 Flash Memory Autoselect Codes

Type		A ₁₂ to A ₁₉	A ₆	A ₁	A ₀	A ₋₁ *1	Code (HEX)	
Manufacturer's Code		X	V _{IL}	V _{IL}	V _{IL}	V _{IL}	04H	
Device Code	MB84VD21081	Byte	X	V _{IL}	V _{IL}	V _{IH}	V _{IL}	36H
		Word					X	2236H
	MB84VD21091	Byte	X	V _{IL}	V _{IL}	V _{IH}	V _{IL}	39
		Word					X	2239H
	MB84VD21082	Byte	X	V _{IL}	V _{IL}	V _{IH}	V _{IL}	2D
		Word					X	222DH
	MB84VD21092	Byte	X	V _{IL}	V _{IL}	V _{IH}	V _{IL}	2E
		Word					X	222EH
	MB84VD21083	Byte	X	V _{IL}	V _{IL}	V _{IH}	V _{IL}	28H
		Word					X	2228H
	MB84VD21093	Byte	X	V _{IL}	V _{IL}	V _{IH}	V _{IL}	2BH
		Word					X	222BH
	MB84VD21084	Byte	X	V _{IL}	V _{IL}	V _{IH}	V _{IL}	33H
		Word					X	2233H
	MB84VD21094	Byte	X	V _{IL}	V _{IL}	V _{IH}	V _{IL}	35
		Word					X	2235H
Sector Group protect		Sector Group Address	V _{IL}	V _{IH}	V _{IL}	V _{IL}	01H*2	

*1 : A₋₁ is for Byte mode.

*2 : Output 01H at protected sector address and output 00H at unprotected sector address.

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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 (Note 1)	1	XXXH	F0H	—	—	—	—	—	—	—	—	—	—
Read/Reset (Note 1)	3	555H	AAH	2AAH	55H	555H	F0H	RA	RD	—	—	—	—
		AAAH		555H		AAAH							
Autoselect	3	555H	AAH	2AAH	55H	(BA) 555H	90H	—	—	—	—	—	—
		AAAH		555H		(BA) AAAH							
Program	4	555H	AAH	2AAH	55H	555H	A0H	PA	PD	—	—	—	—
		AAAH		555H		AAAH							
Chip Erase	6	555H	AAH	2AAH	55H	555H	80H	555H	AAH	2AAH	55H	555H	10H
		AAAH		555H		AAAH		555H		AAAH			
Sector Erase	6	555H	AAH	2AAH	55H	555H	80H	555H	AAH	2AAH	55H	SA	30H
		AAAH		555H		AAAH		555H		AAAH			
Sector Erase Suspend	1	BA	B0H	—	—	—	—	—	—	—	—	—	—
Sector Erase Resume	1	BA	30H	—	—	—	—	—	—	—	—	—	—
Set to Fast Mode	3	555H	AAH	2AAH	55H	555H	20H	—	—	—	—	—	—
		AAAH		555H		AAAH							
Fast Program (Note 2)	2	XXXH	A0H	PA	PD	—	—	—	—	—	—	—	—
		Byte	—	—	—	—	—	—	—	—	—	—	—
Reset from Fast Mode (Note 2)	2	BA	90H	XXXH	F0H (Note6)	—	—	—	—	—	—	—	—
		Byte	—	—	—	—	—	—	—	—	—	—	—
Extended Sector Group Protection (Note 3)	4	XXXH	60H	SPA	60H	SPA	40H	SPA	SD	—	—	—	—
		Byte	—	—	—	—	—	—	—	—	—	—	—
Query (Note 4)	1	55H	98H	—	—	—	—	—	—	—	—	—	—
		Byte		AAH	—	—	—	—	—	—	—	—	—
Hi-ROM Entry	3	555H	AAH	2AAH	55H	555H	88H	—	—	—	—	—	—
		AAAH		555H		AAAH							
Hi-ROM Program (Note 5)	4	555H	AAH	2AAH	55H	555H	A0H	PA	PD	—	—	—	—
		AAAH		555H		AAAH							
Hi-ROM Erase (Note 5)	6	555H	AAH	2AAH	55H	555H	80H	555H	AAH	2AAH	55H	HRA	30H
		AAAH		555H		AAAH		555H		AAAH			
Hi-ROM Exit (Note 5)	4	555H	AAH	2AAH	55H	(HRBA) 555H	90H	XXXH	00H	—	—	—	—
		AAAH		555H		(HRBA) AAAH							

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- 1 : Both Read/Reset commands are functionally equivalent, resetting the device to the read mode.
- 2 : This command is valid while Fast Mode.
- 3 : This command is valid while RESET = V_{DD}.
- 4 : The valid Address is A₀ to A₆.
- 5 : This command is valid while Hi-ROM mode.
- 6 : The data "00H" is also acceptable.

Address bits A₁₂ to A₁₉ = X = "H" or "L" for all address commands except for Program Address (PA) , Sector Address (SA) , and Bank Address (BA) .
Bus operations are defined in Table 2 "User Bus Operations".

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 A₁₉, A₁₈, A₁₇, A₁₆, A₁₅, A₁₄, A₁₃, and A₁₂ will uniquely select any sector.

BA = Bank address (A₁₅ to A₁₉)

SPA = Sector group address to be protected. Set sector group address (SGA) and (A₆, A₁, A₀) = (0, 1, 0) .

HRA = Address of the Hidden-ROM area.

MB84VD2108X (Top Boot Type)	Word mode : 0F8000H to 0FFFFFFH
	Byte mode : 1F0000H to 1FFFFFFH
MB84VD2109X (Bottom Boot Type)	Word mode : 000000H to 007FFFH
	Byte mode : 000000H to 00FFFFFFH

HRBA = Bank address of the Hidden-ROM area.

MB84VD2108X (Top Boot Type)	: A ₁₅ = A ₁₆ = A ₁₇ = A ₁₈ = A ₁₉ = A ₂₀ = 1
MB84VD2109X (Bottom Boot Type)	: A ₁₅ = A ₁₆ = A ₁₇ = A ₁₈ = A ₁₉ = A ₂₀ = 0

RD = Data read from location RA during read operation.

PD = Data to be programmed at location PA.

SD = Sector protection verify data. Output 01H at protected sector addresses and output 00H at unprotected sector addresses.

The system should generate the following address patterns;

Word mode	: 555H or 2AAH to addresses A ₀ to A ₁₀
Byte mode	: AAAH or 555H to addresses A ₋₁ and A ₀ to A ₁₀

■ ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Rating		Unit
		Min.	Max.	
Storage Temperature	Tstg	-55	+125	°C
Ambient Temperature with Power Applied	T _A	-25	+85	°C
Voltage with Respect to Ground All pins except A ₉ , \overline{OE} , \overline{RESET} , \overline{WP}/ACC (Note 1)	V _{IN} , V _{OUT}	-0.3	V _{ccf} +0.4 V _{ccs} +0.4	V
V _{ccf} /V _{ccs} Supply (Note 1)	V _{ccf} , V _{ccs}	-0.3	+4.0	V
A ₉ and \overline{OE} (Note 2)	V _{IN}	-0.3	+13.0	V
\overline{RESET} (Note 2)	V _{IN}	-0.5	+13.0	V
\overline{WP}/ACC (Note 3)	V _{IN}	-0.5	+10.5	V

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.

- Notes
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} +0.4 V or V_{ccs}+0.4 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 A₉ and \overline{OE} pin is -0.3 V. Minimum DC input voltage on \overline{RESET} pin is -0.5 V. During voltage transitions, A₉, \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 (V_{IN}-V_{ccf} or V_{ccs}) does not exceed 9.0 V. Maximum DC input voltage on A₉, \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 V_{SS} 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.

■ RECOMMENDED OPERATING RANGES

Parameter	Symbol	Value		Unit
		Min.	Max.	
Ambient Temperature	T _A	-25	+85	°C
V _{ccf} /V _{ccs} Supply Voltages	V _{ccf} , V _{ccs}	+2.7	+3.6	V

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.

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■ ELECTRICAL CHARACTERISTICS

1. DC Characteristics

Parameter Symbol	Parameter Description	Test Conditions		Min.	Typ.	Max.	Unit	
I _{LI}	Input Leakage Current	V _{IN} = V _{SS} to V _{CCf} , V _{CCS}		-1.0	—	+1.0	μA	
I _{LO}	Output Leakage Current	V _{OUT} = V _{SS} to V _{CCf} , V _{CCS}		-1.0	—	+1.0	μA	
I _{LIT}	$\overline{\text{RESET}}$ Inputs Leakage Current	V _{CCf} = V _{CCf} Max., V _{CCS} = V _{CCS} Max., $\overline{\text{RESET}}$ = 12.5 V		—	—	35	μA	
I _{LIA}	ACC Input Leakage Current	V _{CCf} = V _{CCf} Max., V _{CCS} = V _{CCS} Max., WP/ACC = V _{ACC} Max.		—	—	20	mA	
I _{CC1f}	Flash V _{CC} Active Current (Read) (Note 1)	$\overline{\text{CE}}_f = V_{IL}$, $\overline{\text{OE}} = V_{IH}$	t _{CYCLE} = 5 MHz	Byte	—	—	13	mA
			t _{CYCLE} = 5 MHz	Word	—	—	15	
			t _{CYCLE} = 1 MHz	Byte	—	—	7	mA
			t _{CYCLE} = 1 MHz	Word	—	—	7	
I _{CC2f}	Flash V _{CC} Active Current (Program/Erase) (Note 2)	$\overline{\text{CE}}_f = V_{IL}$, $\overline{\text{OE}} = V_{IH}$		—	—	35	mA	
I _{CC3f}	Flash V _{CC} Active Current (Read-While-Program) (Note 5)	$\overline{\text{CE}}_f = V_{IL}$, $\overline{\text{OE}} = V_{IH}$	Byte	—	—	48	mA	
			Word	—	—	50		
I _{CC4f}	Flash V _{CC} Active Current (Read-While-Erase) (Note 5)	$\overline{\text{CE}}_f = V_{IL}$, $\overline{\text{OE}} = V_{IH}$	Byte	—	—	48	mA	
			Word	—	—	50		
I _{CC5f}	Flash V _{CC} Active Current (Erase-Suspend-Program)	$\overline{\text{CE}}_f = V_{IL}$, $\overline{\text{OE}} = V_{IH}$		—	—	35	mA	
I _{CC1S}	SRAM V _{CC} Active Current	V _{CCS} = V _{CC} Max., $\overline{\text{CE}}_{1s} = V_{IL}$, $\overline{\text{CE}}_{2s} = V_{IH}$	t _{CYCLE} = 10 MHz		—	—	50	mA
I _{CC2S}	SRAM V _{CC} Active Current	$\overline{\text{CE}}_{1s} = 0.2$ V, $\overline{\text{CE}}_{2s} = V_{CCS} - 0.2$ V	t _{CYCLE} = 10 MHz		—	—	40	mA
			t _{CYCLE} = 1 MHz		—	—	8	mA
I _{SB1f}	Flash V _{CC} Standby Current	V _{CCf} = V _{CC} Max., $\overline{\text{CE}}_f = V_{CCf} \pm 0.3$ V $\overline{\text{RESET}} = V_{CCf} \pm 0.3$ V, WP/ACC = V _{CCf} ± 0.3 V		—	1	5	μA	
I _{SB2f}	Flash V _{CC} Standby Current ($\overline{\text{RESET}}$)	V _{CCf} = V _{CC} Max., $\overline{\text{RESET}} = V_{SS} \pm 0.3$ V, WP/ACC = V _{CCf} ± 0.3 V		—	1	5	μA	
I _{SB3f}	Flash V _{CC} Current (Automatic Sleep Mode) (Note 3)	V _{CCf} = V _{CC} Max., $\overline{\text{CE}}_f = V_{SS} \pm 0.3$ V $\overline{\text{RESET}} = V_{CCf} \pm 0.3$ V, WP/ACC = V _{CCf} ± 0.3 V V _{IN} = V _{CCf} ± 0.3 V or V _{SS} ± 0.3 V		—	1	5	μA	
I _{SB1S}	SRAM V _{CC} Standby Current	$\overline{\text{CE}}_{1s} \geq V_{CCS} - 0.2$ V, $\overline{\text{CE}}_{2s} \geq V_{CCS} - 0.2$ V		—	0.2	7	μA	
I _{SB2S}	SRAM V _{CC} Standby Current	CE _{2s} ≤ 0.2 V		—	0.2	7	μA	

(Continued)

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(Continued)

Parameter Symbol	Parameter Description	Test Conditions	Min.	Typ.	Max.	Unit
V _{IL}	Input Low Level	—	-0.3	—	0.5	V
V _{IH}	Input High Level	—	2.4	—	V _{CC} +0.3*	V
V _{ID}	Voltage for Sector Protection, and Temporary Sector Unprotection ($\overline{\text{RESET}}$) (Note 4)	—	11.5	—	12.5	V
V _{ACC}	Voltage for Program Acceleration ($\overline{\text{WP/ACC}}$) (Note4)	—	8.5	9.0	9.5	V
V _{OL}	Output Low Voltage Level	V _{CCF} = V _{CCF} Min., V _{CCS} = V _{CCS} Min., I _{OL} = 1.0 mA	—	—	0.4	V
V _{OH}	Output High Voltage Level	V _{CCF} = V _{CCF} Min., V _{CCS} = V _{CCS} Min., I _{OH} = -0.5 mA	2.4	—	—	V
V _{LKO}	Flash Low V _{CCF} Lock-Out Voltage	—	2.3	—	2.5	V

*: V_{CC} indicates lower of V_{CCF} or V_{CCS}

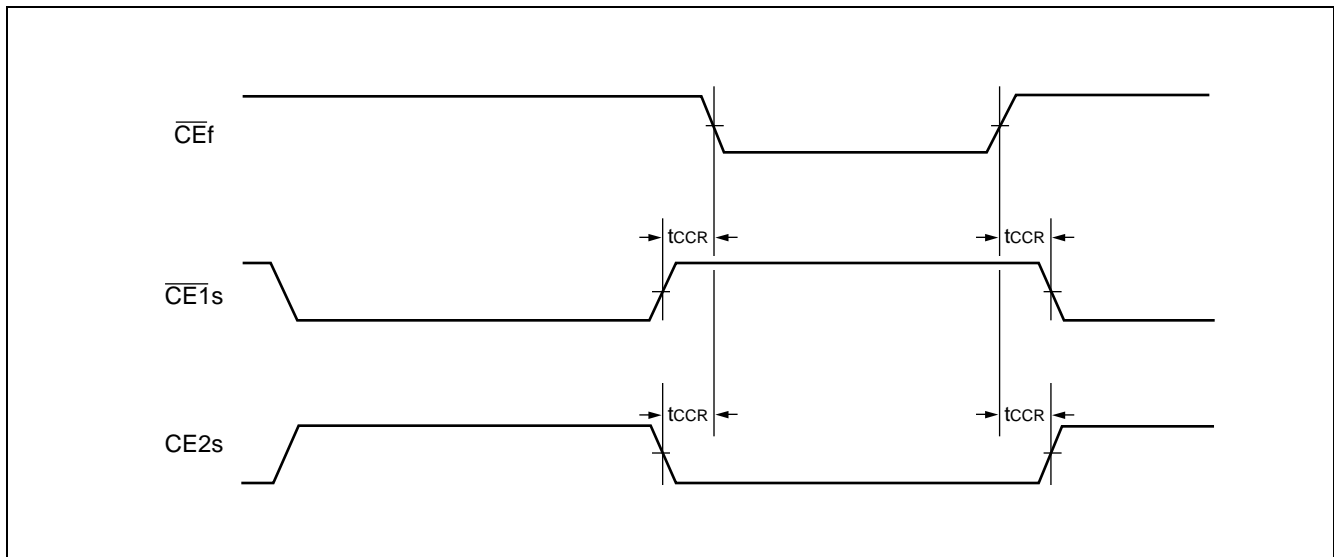
- Notes :
1. The I_{CC} current listed includes both the DC operating current and the frequency dependent component.
 2. I_{CC} active while Embedded Algorithm (program or erase) is in progress.
 3. Automatic sleep mode enables the low power mode when address remain stable for 150 ns.
 4. Applicable for only V_{CCF} applying.
 5. Embedded Algorithm (program or erase) is in progress. (@5 MHz)

2. AC Characteristics

• \overline{CE} Timing

Parameter Symbols		Description	Test Setup		-85	Unit
JEDEC	Standard					
—	t_{CCR}	\overline{CE} Recover Time	—	Min.	0	ns

• Timing Diagram for alternating SRAM to Flash



MB84VD2108X-85/MB84VD2109X-85

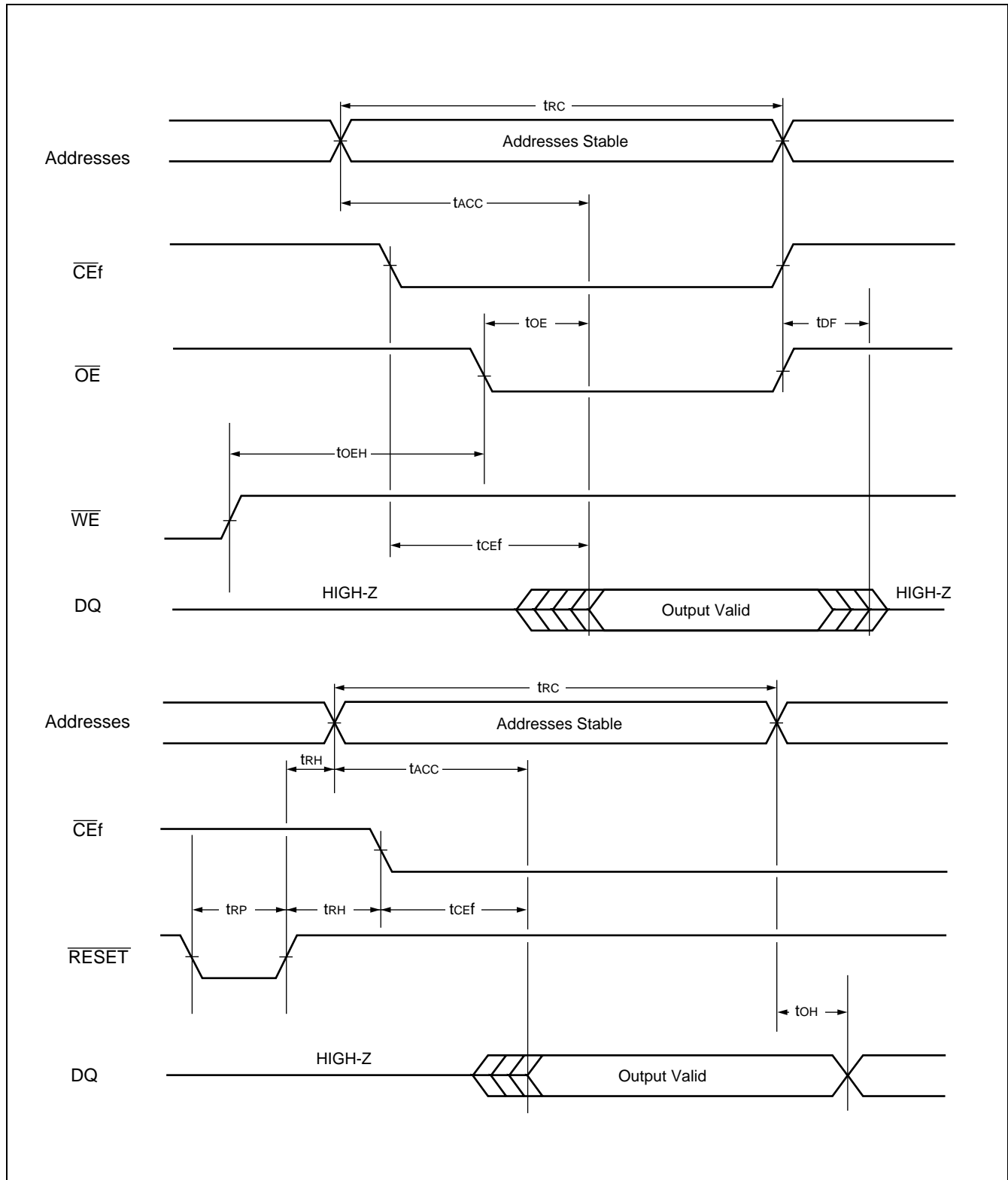
• Read Only Operations Characteristics (Flash)

Parameter Symbols		Description	Test Setup	-85 (Note)		Unit
JEDEC	Standard			Min.	Max.	
t _{AVAV}	t _{RC}	Read Cycle Time	—	85	—	ns
t _{AVQV}	t _{ACC}	Address to Output Delay	$\overline{CE}f = V_{IL}$ $\overline{OE} = V_{IL}$	—	85	ns
t _{ELQV}	t _{CEf}	Chip Enable to Output Delay	$\overline{OE} = V_{IL}$	—	85	ns
t _{GLQV}	t _{OE}	Output Enable to Output Delay	—	—	35	ns
t _{EHQZ}	t _{DF}	Chip Enable to Output High-Z	—	—	30	ns
t _{GHQZ}	t _{DF}	Output Enable to Output High-Z	—	—	30	ns
t _{AXQX}	t _{OH}	Output Hold Time From Addresses, $\overline{CE}f$ or \overline{OE} , Whichever Occurs First	—	0	—	ns
—	t _{READY}	\overline{RESET} Pin Low to Read Mode	—	—	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 3.0 V
 Timing measurement reference level
 Input : 1.5 V
 Output : 1.5 V

MB84VD2108X-85/MB84VD2109X-85

• Read Cycle (Flash)



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• Erase/Program Operations (Flash)

Parameter Symbols		Description	-85			Unit
JEDEC	Standard		Min.	Typ.	Max.	
t _{AVAV}	t _{WC}	Write Cycle Time	85	—	—	ns
t _{AVWL}	t _{AS}	Address Setup Time (\overline{WE} to Addr.)	0	—	—	ns
—	t _{ASO}	Address Setup Time to \overline{CEf} Low During Toggle Bit Polling	15	—	—	ns
t _{WLAX}	t _{AH}	Address Hold Time (\overline{WE} to Addr.)	45	—	—	ns
—	t _{AHT}	Address Hold Time from \overline{CEf} or \overline{OE} High During Toggle Bit Polling	0	—	—	ns
t _{DVWH}	t _{DS}	Data Setup Time	35	—	—	ns
t _{WHDX}	t _{DH}	Data Hold Time	0	—	—	ns
—	t _{OES}	Output Enable Setup Time	0	—	—	ns
—	t _{OEH}	Output Enable Hold Time	0	—	—	ns
		Read Toggle and \overline{Data} Polling	10	—	—	ns
—	t _{CEPH}	\overline{CEf} High During Toggle Bit Polling	20	—	—	ns
—	t _{OEPH}	\overline{OE} High During Toggle Bit Polling	20	—	—	ns
t _{GHEL}	t _{GHEL}	Read Recover Time Before Write (\overline{OE} to \overline{CEf})	0	—	—	ns
t _{GHWL}	t _{GHWL}	Read Recover Time Before Write (\overline{OE} to \overline{WE})	0	—	—	ns
t _{WLEL}	t _{WS}	\overline{WE} Setup Time (\overline{CEf} to \overline{WE})	0	—	—	ns
t _{ELWL}	t _{CS}	\overline{CEf} Setup Time (\overline{WE} to \overline{CEf})	0	—	—	ns
t _{EHWH}	t _{WH}	\overline{WE} Hold Time (\overline{CEf} to \overline{WE})	0	—	—	ns
t _{WHEH}	t _{CH}	\overline{CEf} Hold Time (\overline{WE} to \overline{CEf})	0	—	—	ns
t _{WLWH}	t _{WP}	Write Pulse Width	35	—	—	ns
t _{ELEH}	t _{CP}	\overline{CEf} Pulse Width	35	—	—	ns
t _{WHWL}	t _{WPH}	Write Pulse Width High	30	—	—	ns
t _{EHEL}	t _{CPH}	\overline{CEf} Pulse Width High	30	—	—	ns
t _{WHWH1}	t _{WHWH1}	Byte Programming Operation	—	8	—	μs
		Word Programming Operation	—	16	—	μs
t _{WHWH2}	t _{WHWH2}	Sector Erase Operation (Note 1)	—	1	—	s

(Continued)

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(Continued)

Parameter Symbols		Description	-85			Unit
JEDEC	Standard		Min.	Typ.	Max.	
—	t _{VCS}	V _{CCf} Setup Time	50	—	—	μs
—	t _{VLHT}	Voltage Transition Time (Note 2)	4	—	—	μs
—	t _{VIDR}	Rise Time to V _{ID} (Note 2)	500	—	—	ns
—	t _{VACCR}	Rise Time to V _{ACC}	500	—	—	ns
—	t _{RB}	Recover Time from RY/ $\overline{\text{BY}}$	0	—	—	ns
—	t _{RP}	$\overline{\text{RESET}}$ Pulse Width	500	—	—	ns
—	t _{EOE}	Delay Time from Embedded Output Enable	—	—	85	ns
—	t _{RH}	$\overline{\text{RESET}}$ High Level Period Before Read	200	—	—	ns
—	t _{BUSY}	Program/Erase Valid to RY/ $\overline{\text{BY}}$ Delay	—	—	90	ns
—	t _{TOW}	Erase Time-out Time (Note 3)	50	—	—	μs
—	t _{SPD}	Erase Suspend Transition Time (Note 4)	—	—	20	μs

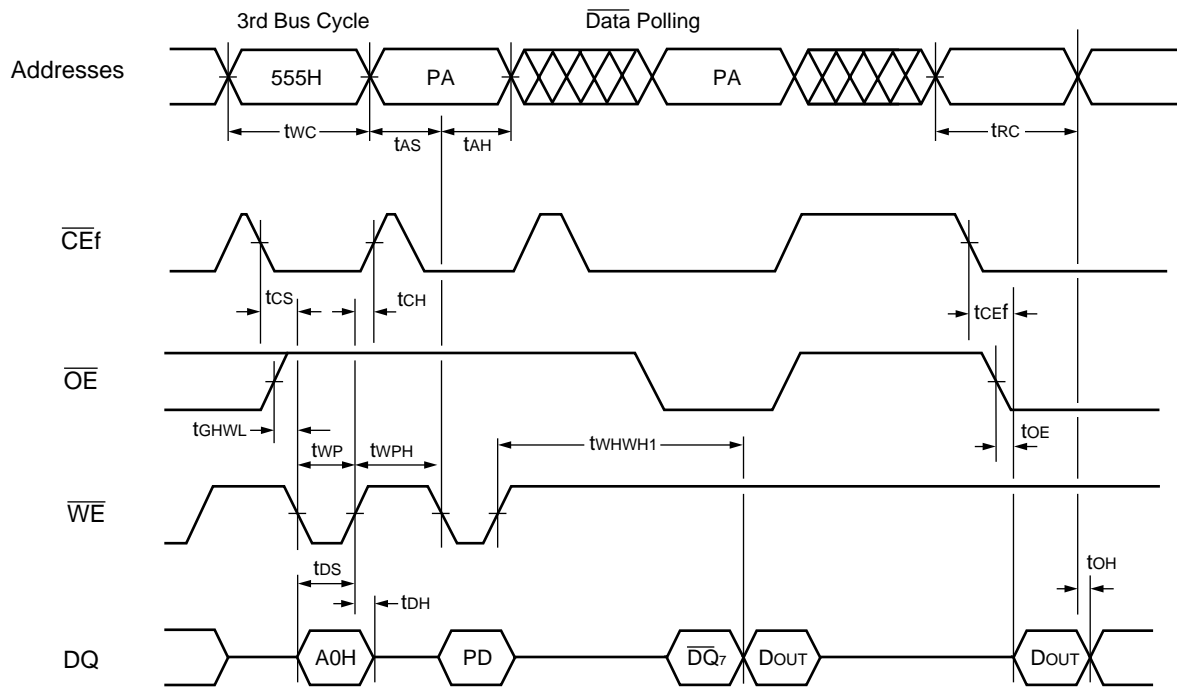
Notes : 1. This does not include the preprogramming time.

2. This timing is for Sector 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 $\overline{\text{CEf}}$ or $\overline{\text{WE}}$ whichever happens first will initiate the execution of the Sector Erase command (s) .

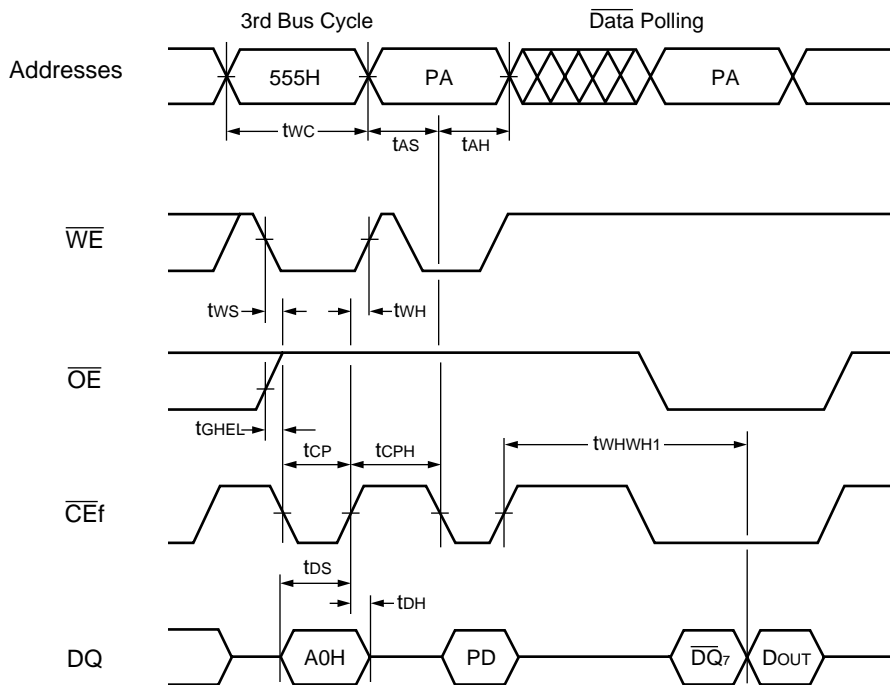
4. When the Erase Suspend command is written during the Sector Erase operation, the device will take a maximum of "t_{SPD}" to suspend the erase operation.

• 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 $\times 16$ mode. (The addresses differ from $\times 8$ mode.)

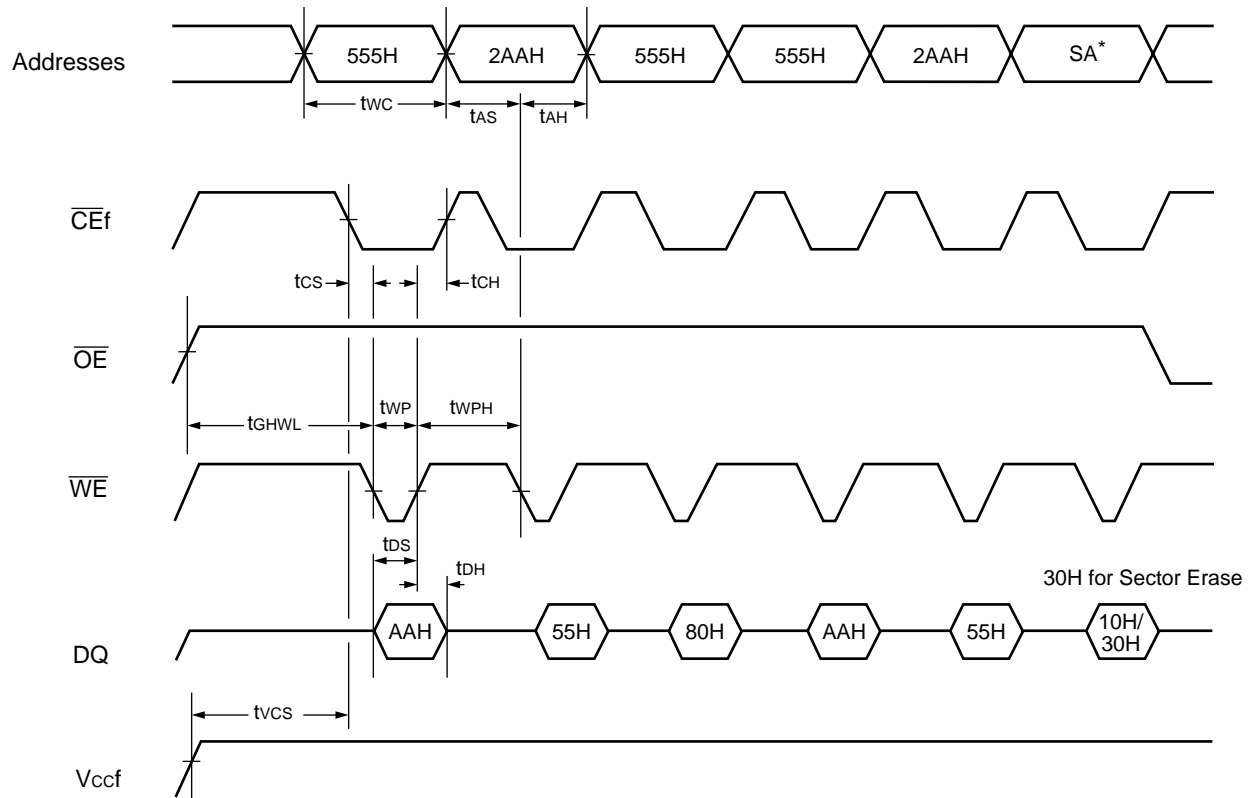
• Write Cycle ($\overline{\text{CEf}}$ control) (Flash)



- Notes :
1. PA is address of the memory location to be programmed.
 2. PD is data to be programmed at byte address.
 3. $\overline{\text{DQ}}_7$ is the output of the complement of the data written to the device.
 4. DOUT 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 $\times 16$ mode. (The addresses differ from $\times 8$ mode.)

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• AC Waveforms Chip/Sector Erase Operations (Flash)

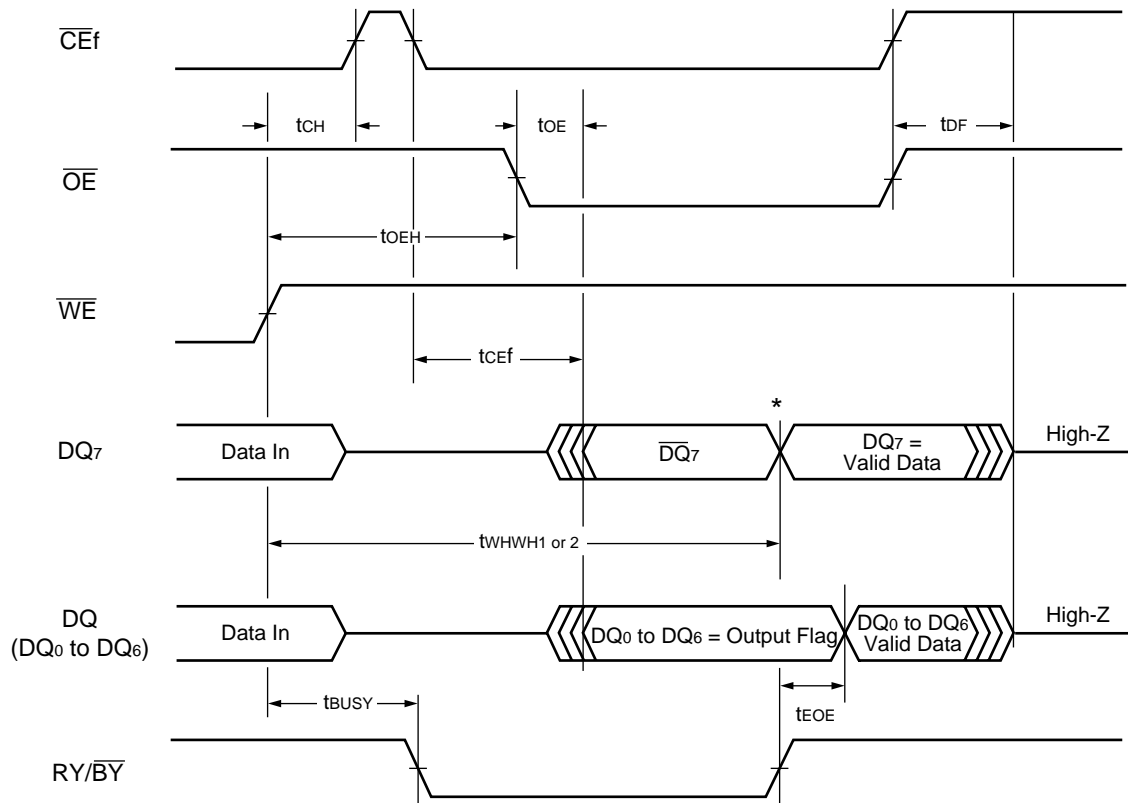


* : SA is the sector address for Sector Erase. Addresses = 555H for Chip Erase.

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

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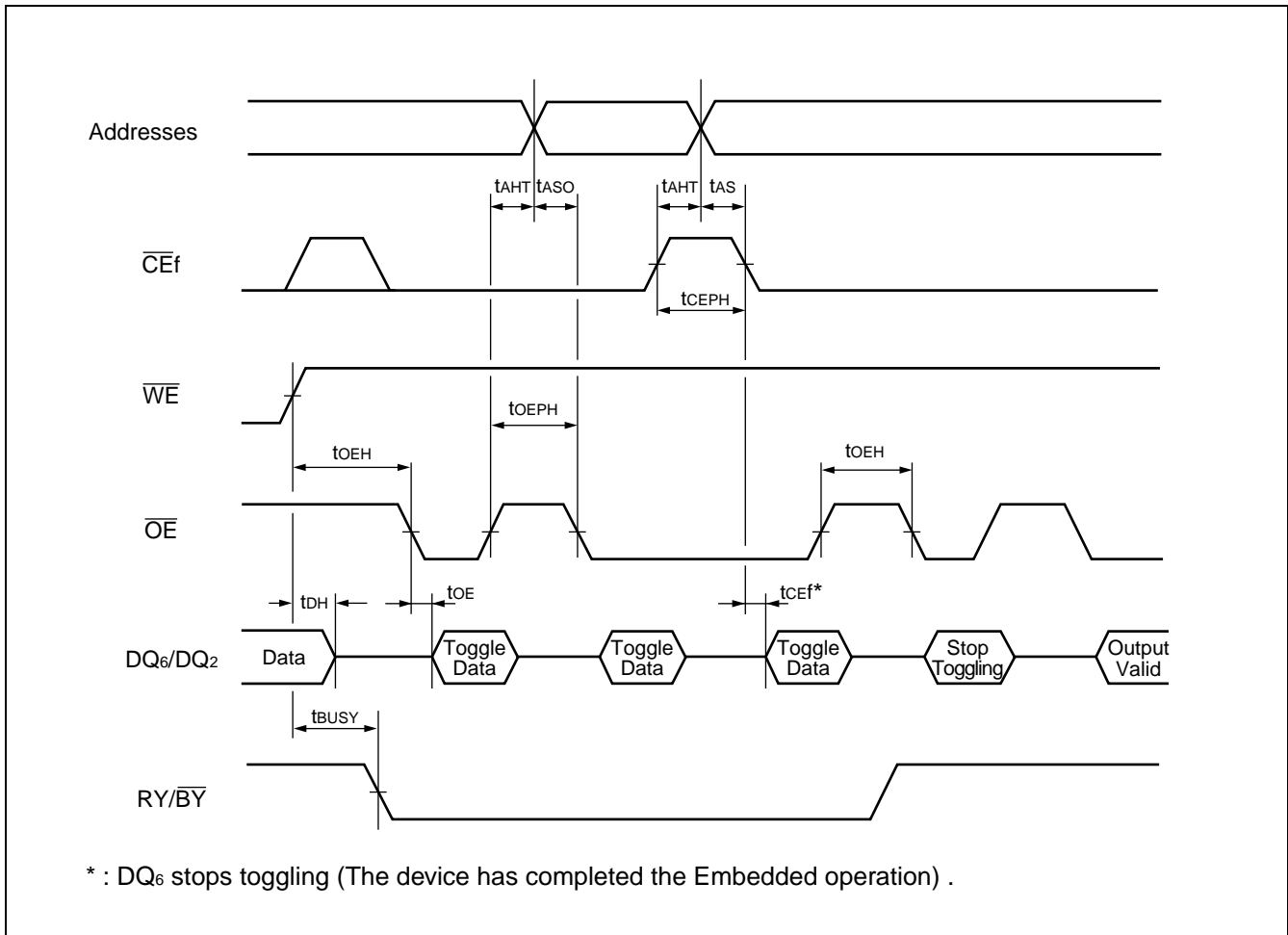
• AC Waveforms for Data Polling during Embedded Algorithm Operations (Flash)



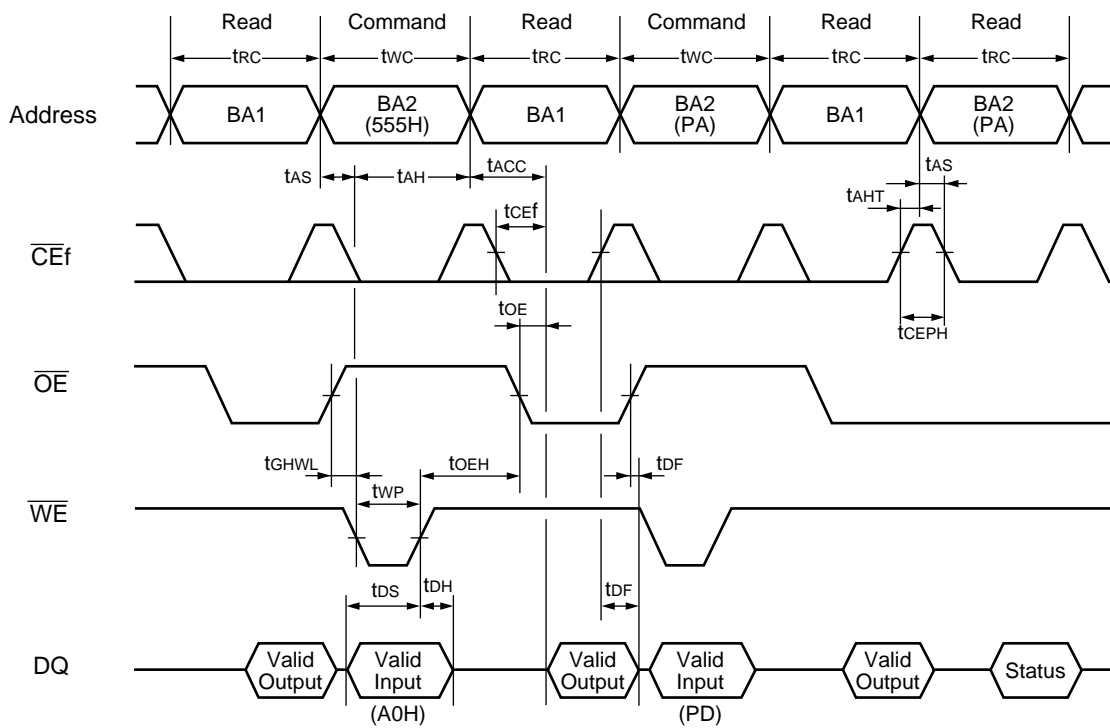
* : DQ_7 = Valid Data (The device has completed the Embedded operation.)

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

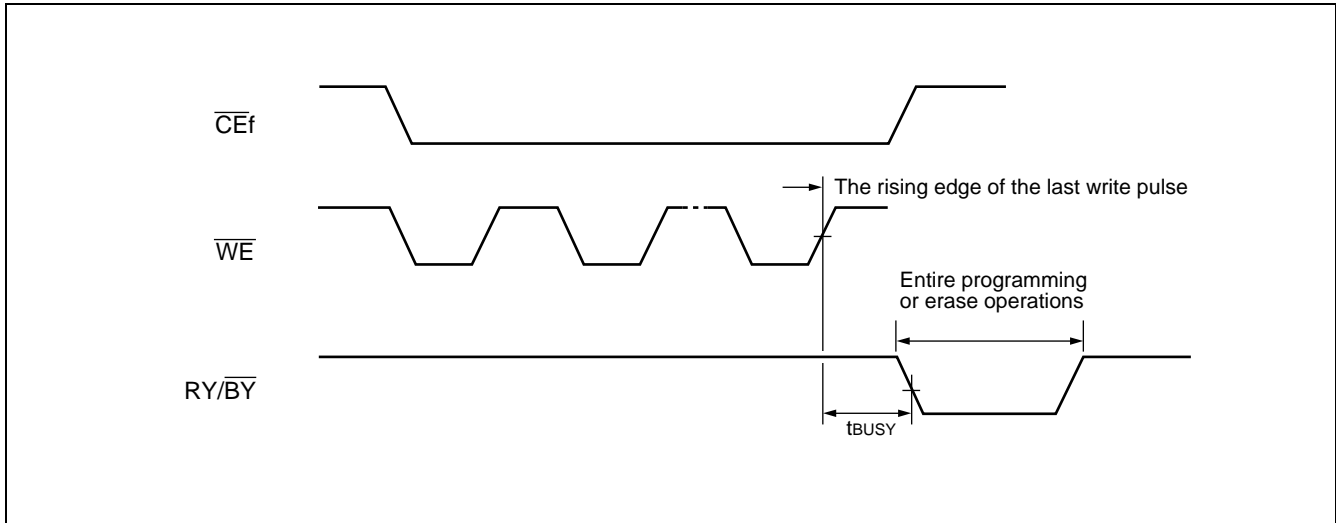


• Back-to-back Read/Write Timing Diagram (Flash)

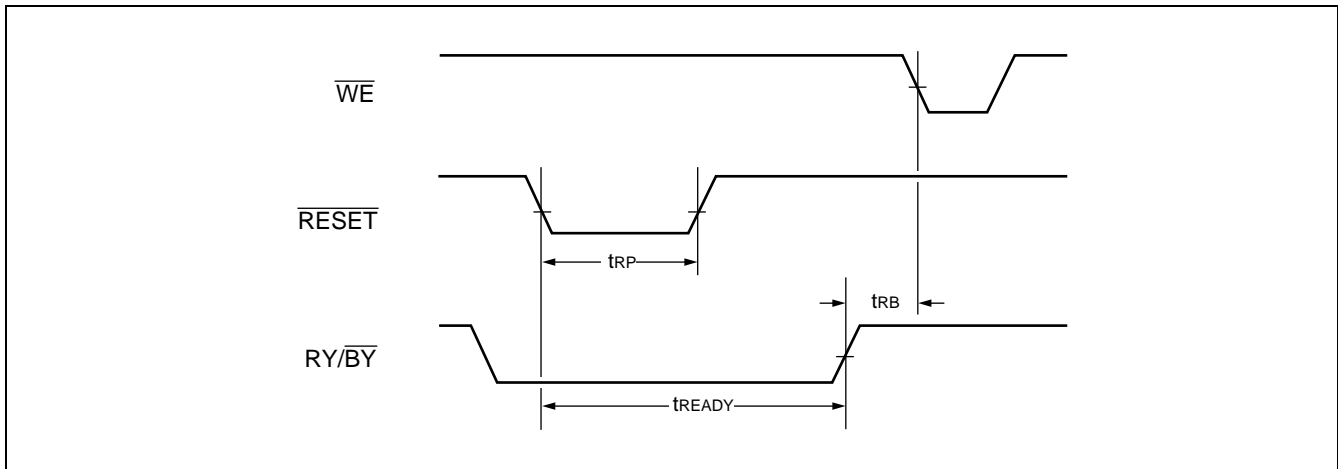


Note : This is example of Read for Bank 1 and Embedded Algorithm (program) for Bank 2.
 BA1 : Address of Bank 1.
 BA2 : Address of Bank 2.

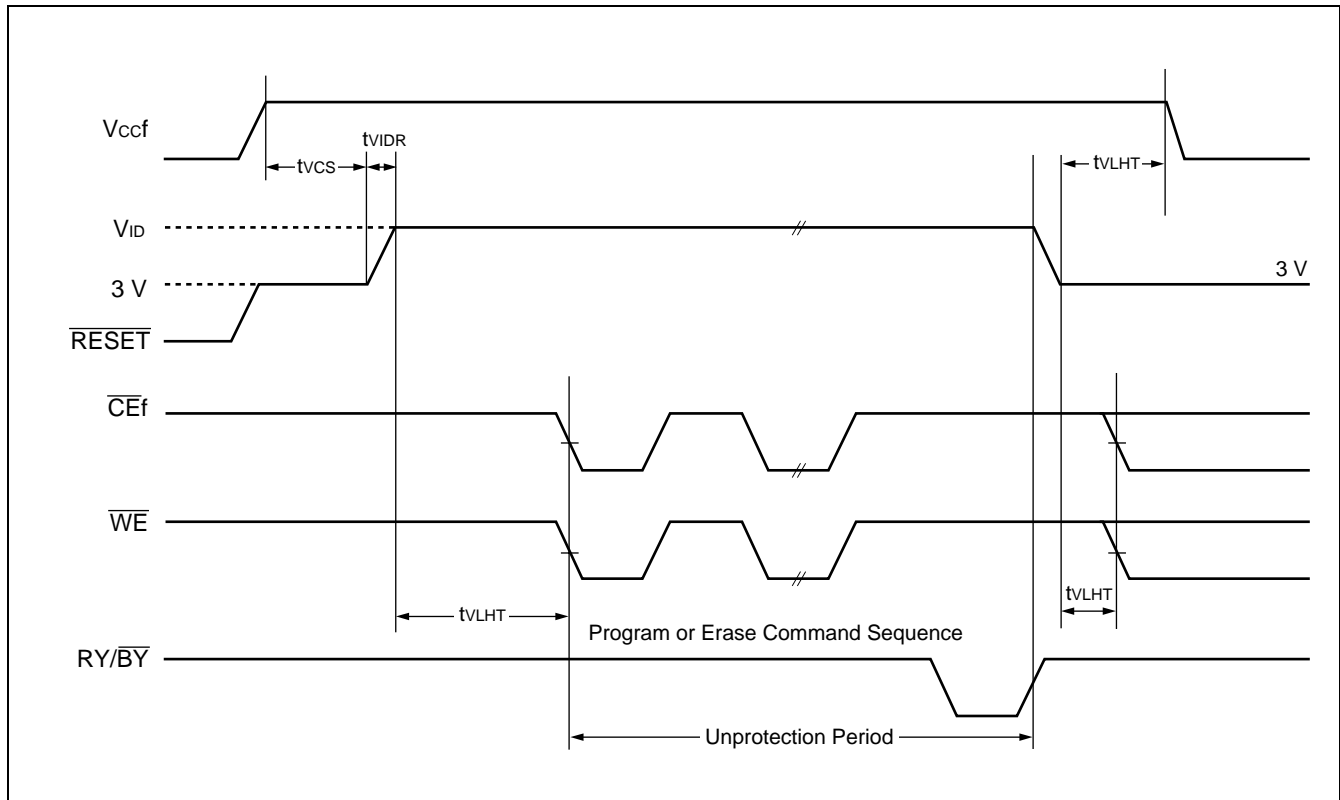
• RY/BY Timing Diagram during Write/Erase Operations (Flash)



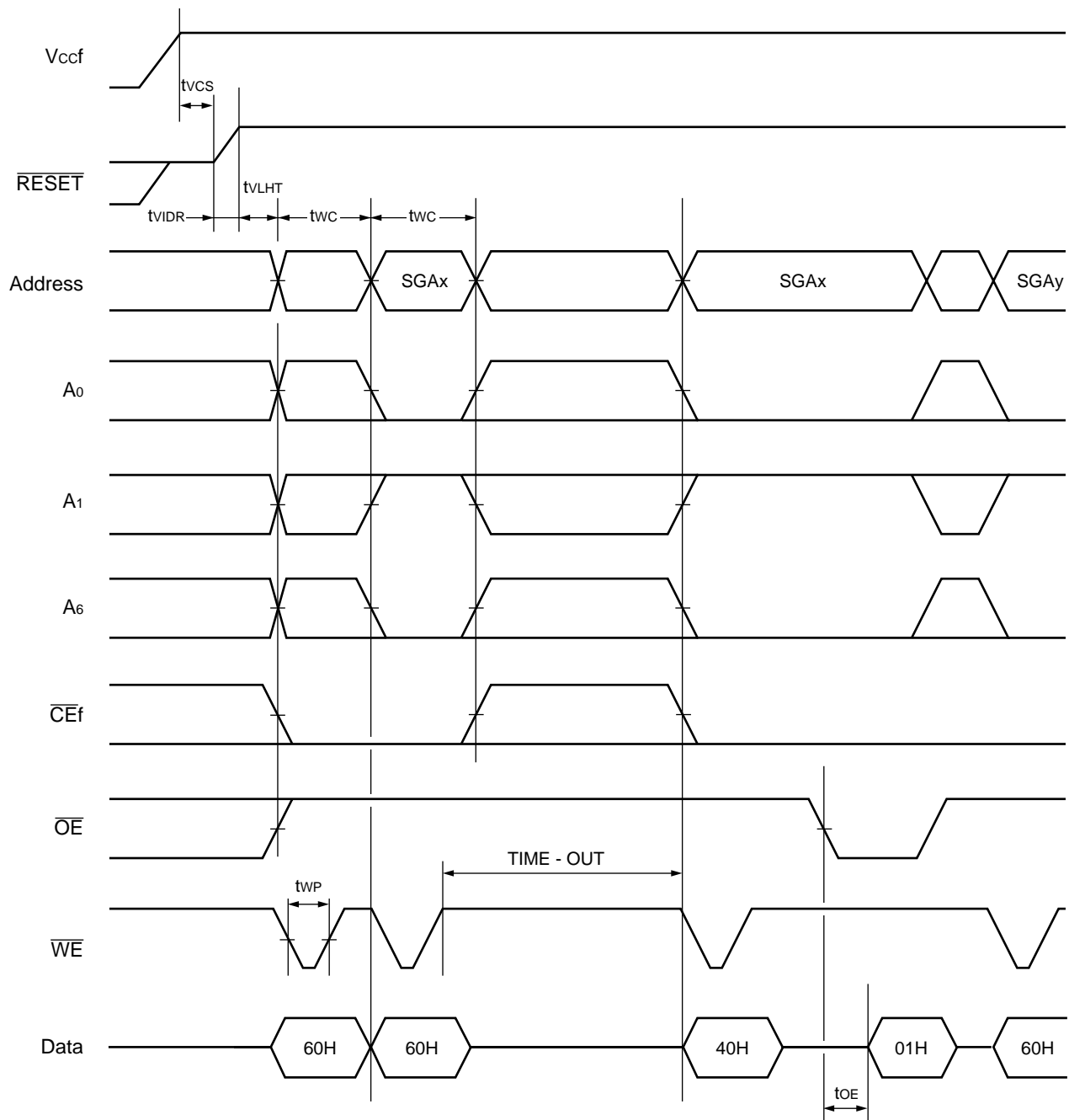
• \overline{RESET} , RY/\overline{BY} Timing Diagram (Flash)



• Temporary Sector Unprotection (Flash)

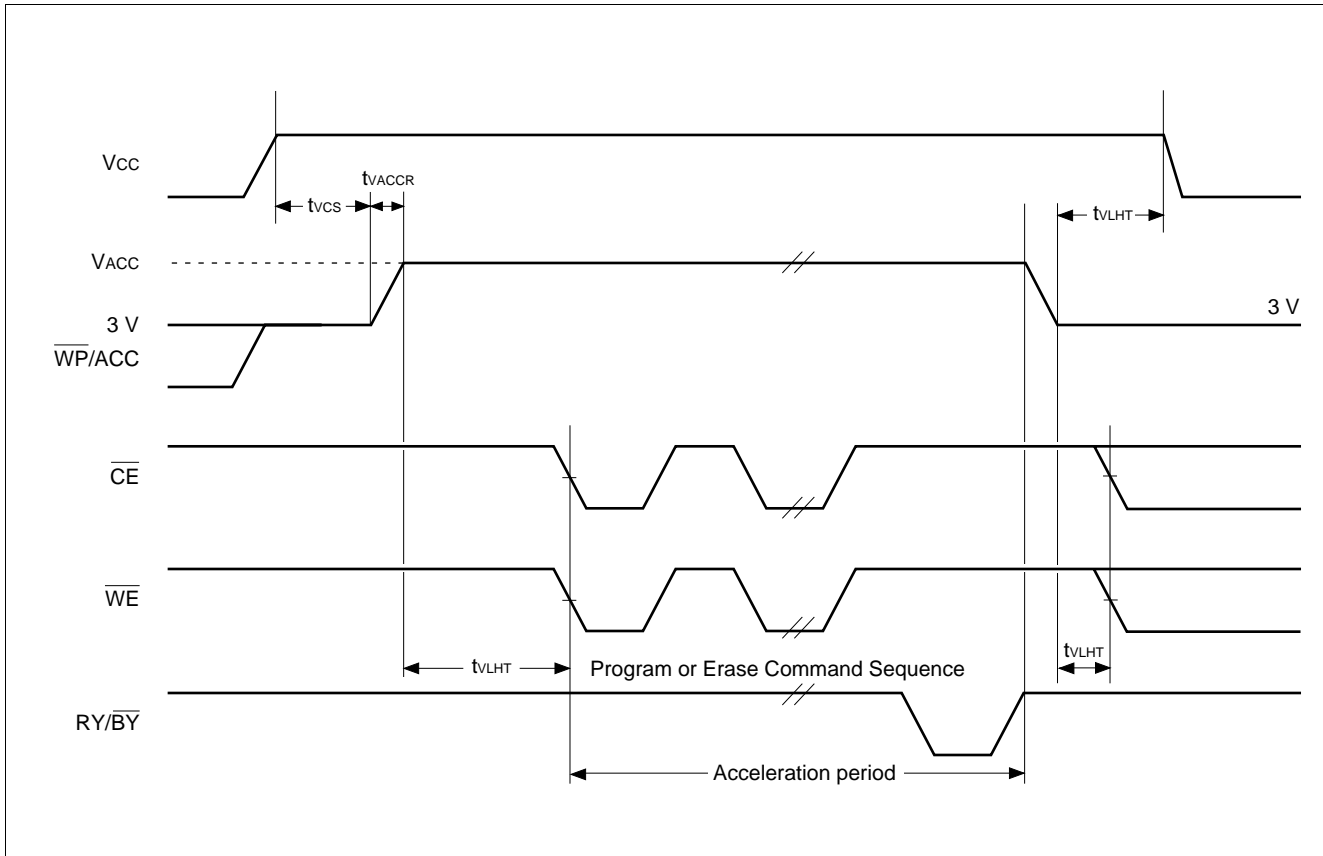


• Extended Sector Protection (Flash)



SGAx : Sector Group Address to be protected
 SGAY : Next Group Sector Address to be protected
 TIME-OUT : Time-Out window = 250 μ s (min.)

• Accelerated Program (Flash)



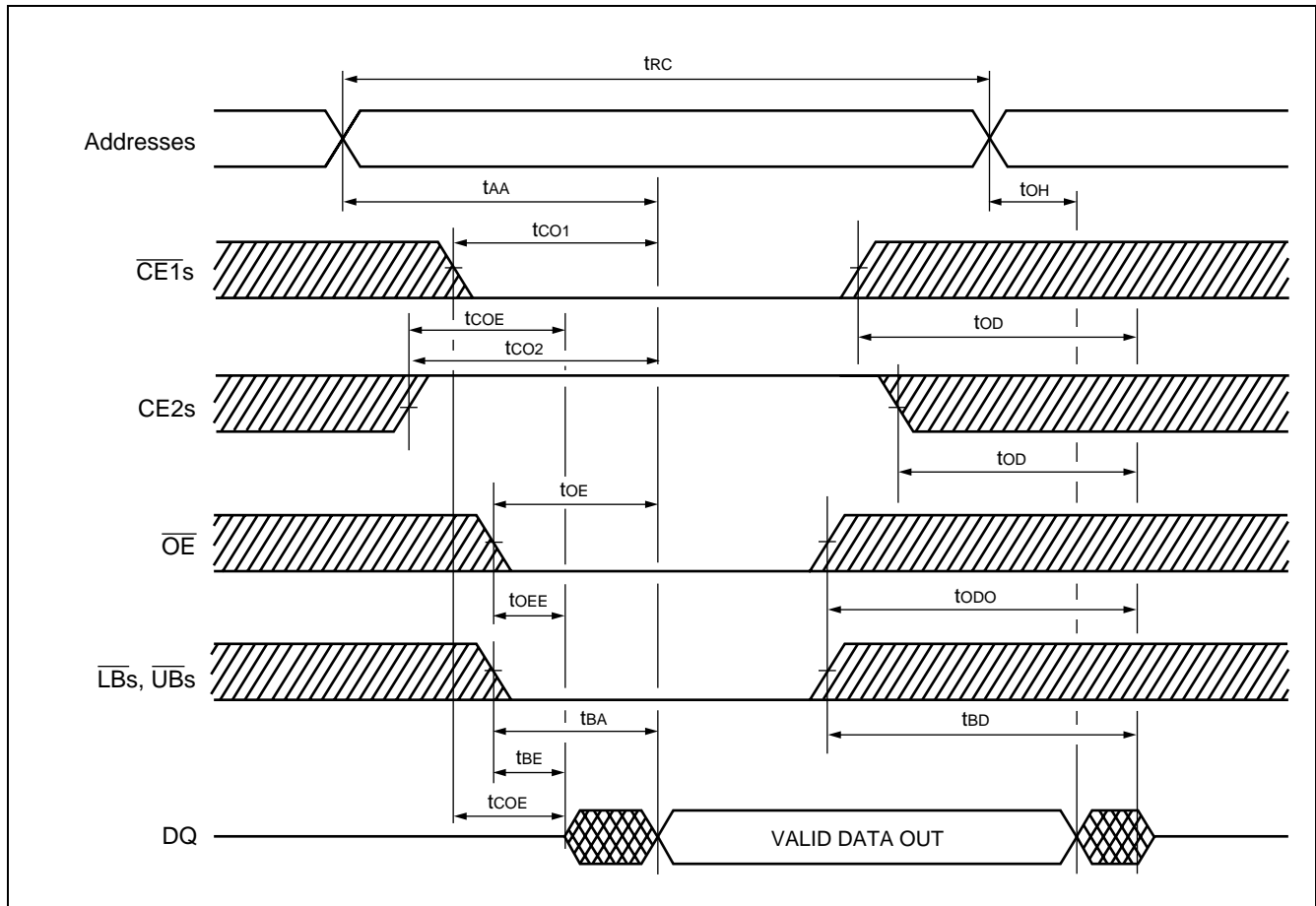
MB84VD2108X-85/MB84VD2109X-85

• Read Cycle (SRAM)

Parameter Symbol	Parameter Description	Min.	Max.	Unit
t _{RC}	Read Cycle Time	85	—	ns
t _{AA}	Address Access Time	—	85	ns
t _{CO1}	Chip Enable ($\overline{CE1}$ s) Access Time	—	85	ns
t _{CO2}	Chip Enable (CE2s) Access Time	—	85	ns
t _{OE}	Output Enable Access Time	—	45	ns
t _{BA}	\overline{UBs} , \overline{LBs} to Output Valid	—	85	ns
t _{COE}	Chip Enable ($\overline{CE1}$ s Low and CE2s High) to Output Active	5	—	ns
t _{OOE}	Output Enable Low to Output Active	0	—	ns
t _{BE}	\overline{UBs} , \overline{LBs} Enable Low to Output Active	0	—	ns
t _{OD}	Chip Enable ($\overline{CE1}$ s High or CE2s Low) to Output High-Z	—	35	ns
t _{ODO}	Output Enable High to Output High-Z	—	35	ns
t _{BD}	\overline{UBs} , \overline{LBs} Output Enable to Output High-Z	—	35	ns
t _{OH}	Output Data Hold Time	10	—	ns

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• Read Cycle (Note) (SRAM)



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

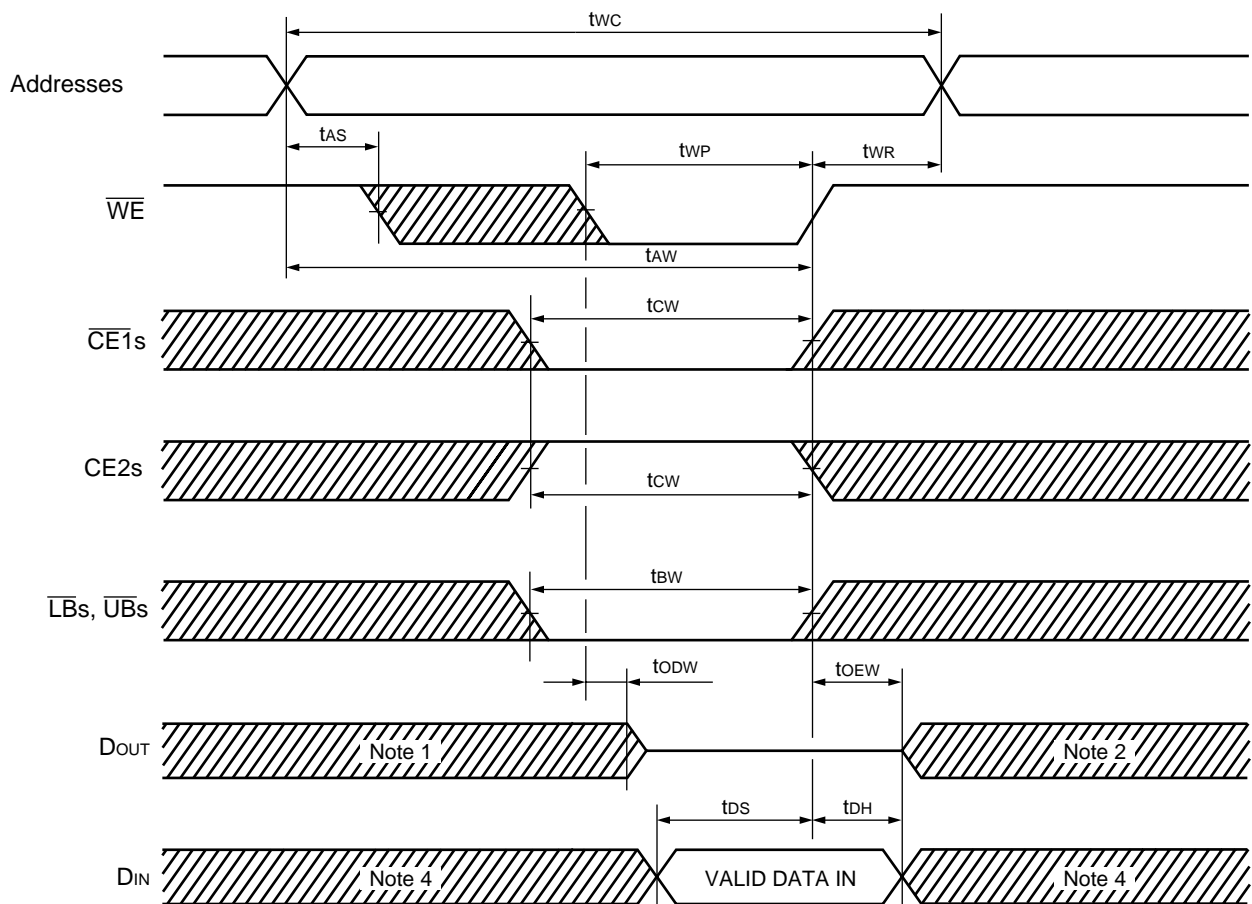
MB84VD2108X-85/MB84VD2109X-85

• Write Cycle (SRAM)

Parameter Symbol	Parameter Description	Min.	Max.	Unit
t _{WC}	Write Cycle Time	85	—	ns
t _{WP}	Write Pulse Width	55	—	ns
t _{CW}	Chip Enable to End of Write	70	—	ns
t _{AW}	Address valid to End of Write	70	—	ns
t _{BW}	\overline{UB}_s , \overline{LB}_s to End of Write	55	—	ns
t _{AS}	Address Setup Time	0	—	ns
t _{WR}	Write Recovery Time	0	—	ns
t _{ODW}	\overline{WE} Low to Output High-Z	—	35	ns
t _{OEW}	\overline{WE} High to Output Active	0	—	ns
t _{DS}	Data Setup Time	35	—	ns
t _{DH}	Data Hold Time	0	—	ns

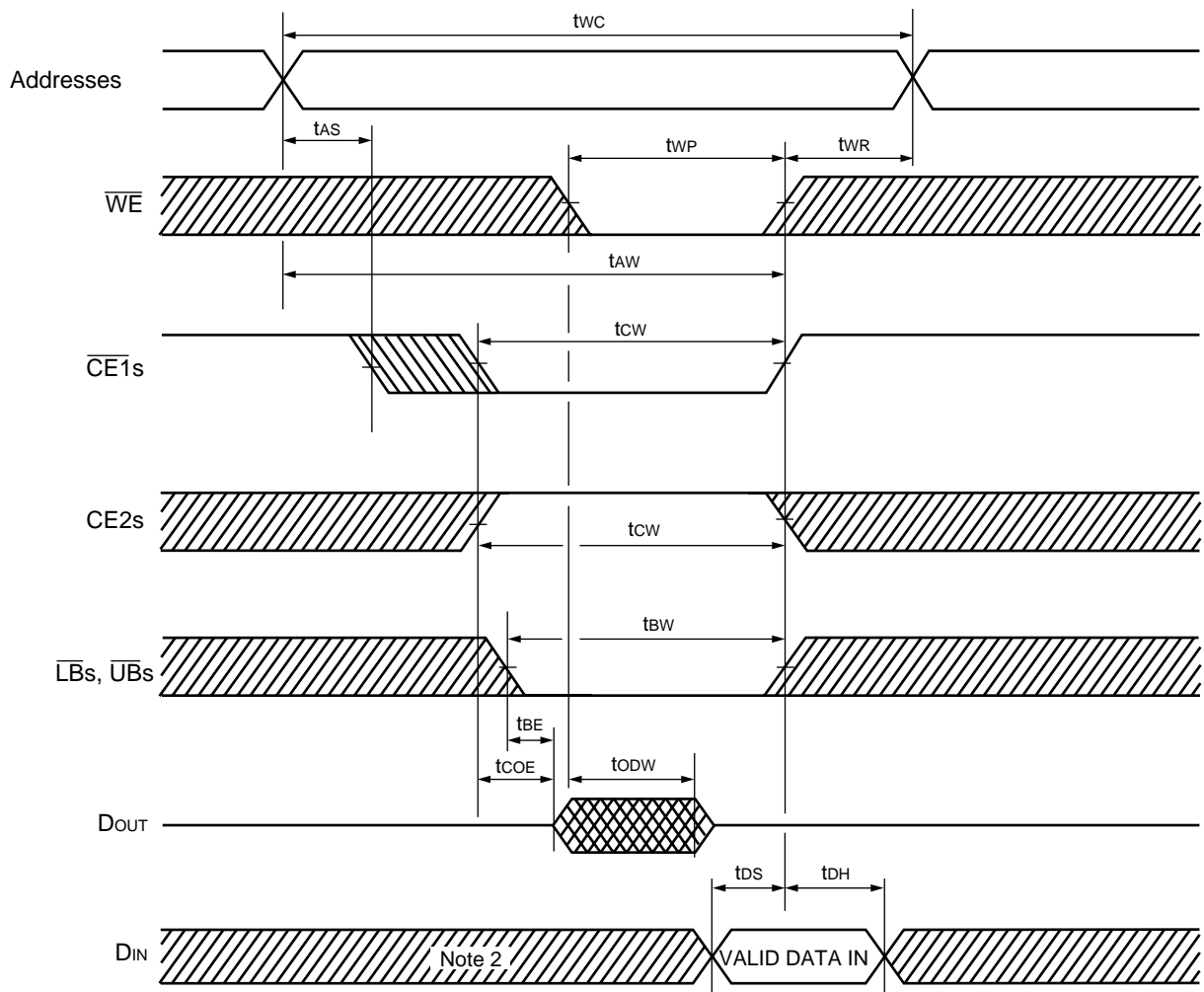
MB84VD2108X-85/MB84VD2109X-85

• Write Cycle (Note 3) (\overline{WE} control) (SRAM)



- Notes :
- 1.If $\overline{CE1s}$ goes LOW (or $CE2s$ goes HIGH) coincident with or after \overline{WE} goes LOW, the output will remain at high impedance.
 - 2.If $\overline{CE1s}$ 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.

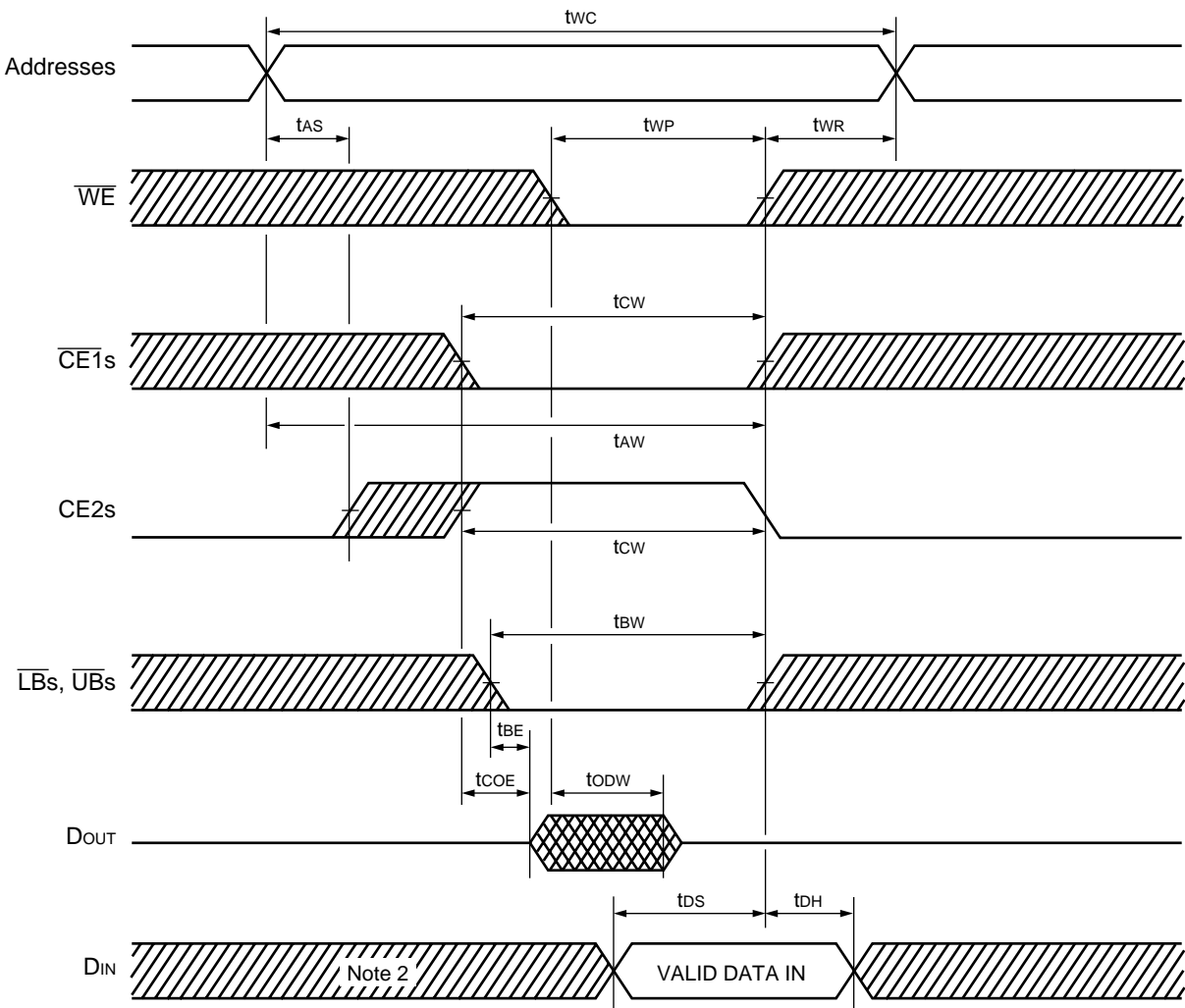
• Write Cycle (Note 1) ($\overline{\text{CE1s}}$ control) (SRAM)



Notes : 1.If $\overline{\text{OE}}$ 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.

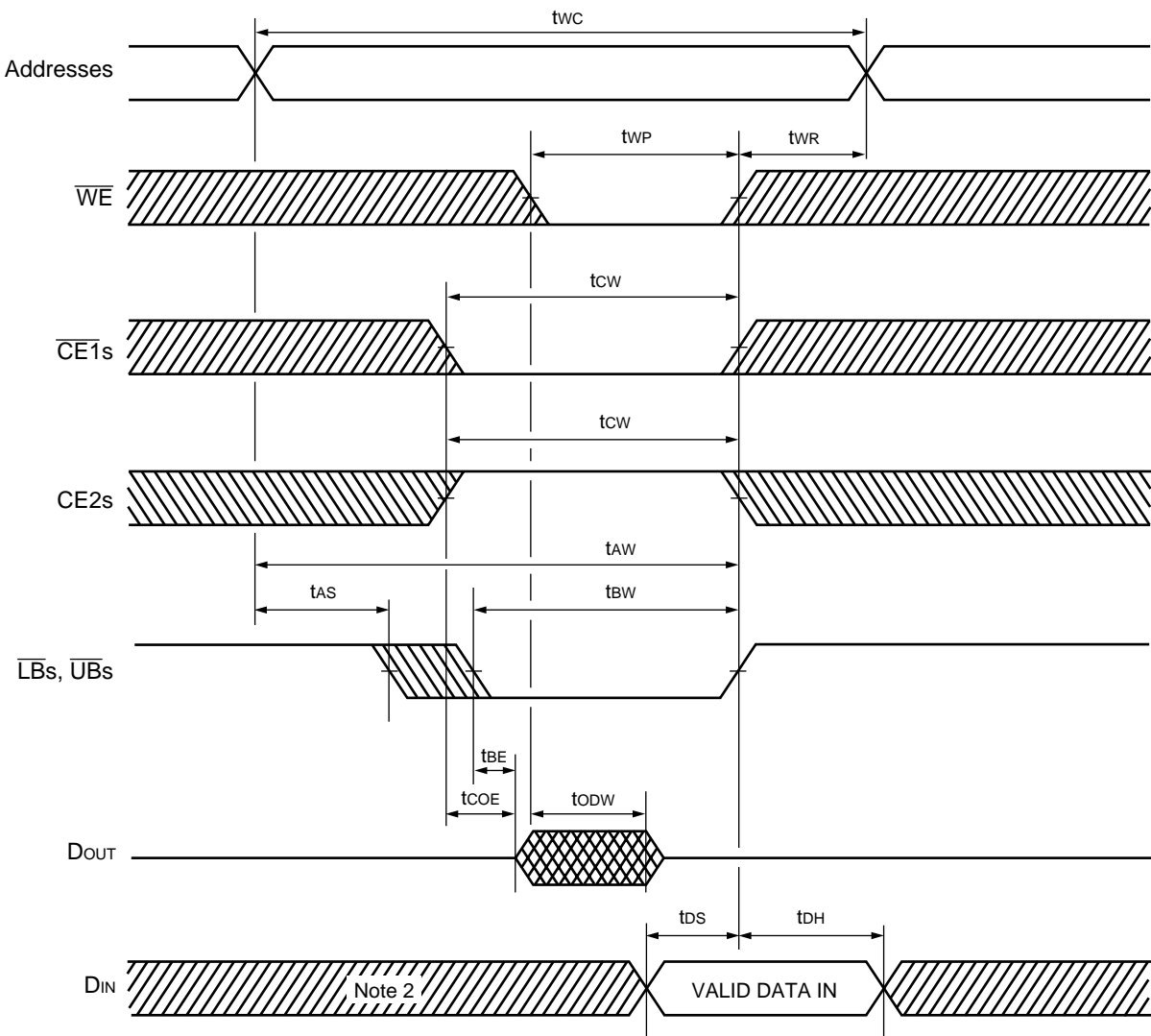
MB84VD2108X-85/MB84VD2109X-85

• 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) ($\overline{\text{LB}}_s, \overline{\text{UB}}_s$ Control) (SRAM)



- Notes :
1. If $\overline{\text{OE}}$ 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.

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■ ERASE AND PROGRAMMING PERFORMANCE (Flash)

Parameter	Limits			Unit	Comment
	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	—	—	50	s	Excludes system-level overhead
Erase/Program Cycle	100,000	—	—	cycle	

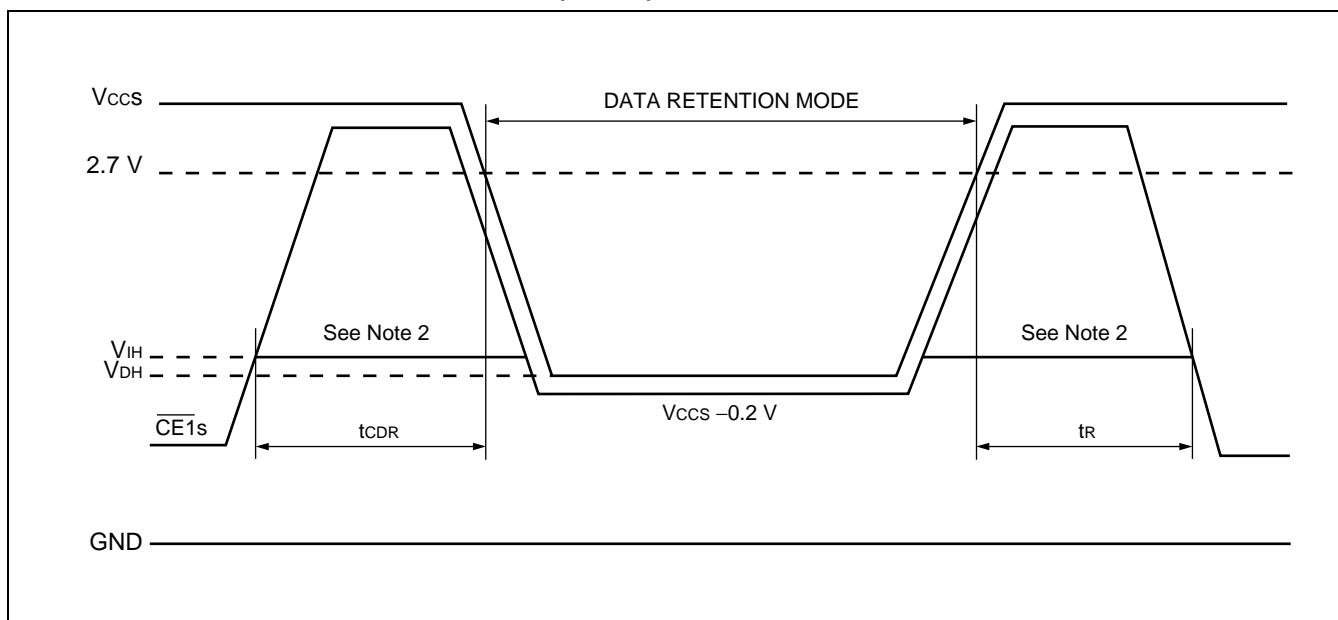
■ DATA RETENTION CHARACTERISTICS (SRAM)

Parameter Symbol	Parameter Description	Min.	Typ.	Max.	Unit
V _{DH}	Data Retention Supply Voltage	1.5	—	3.6	V
I _{DDs2}	Standby Current	—	0.2	5*	μA
t _{CDR}	Chip Deselect to Data Retention Mode Time	0	—	—	ns
t _R	Recovery Time	t _{RC}	—	—	ns

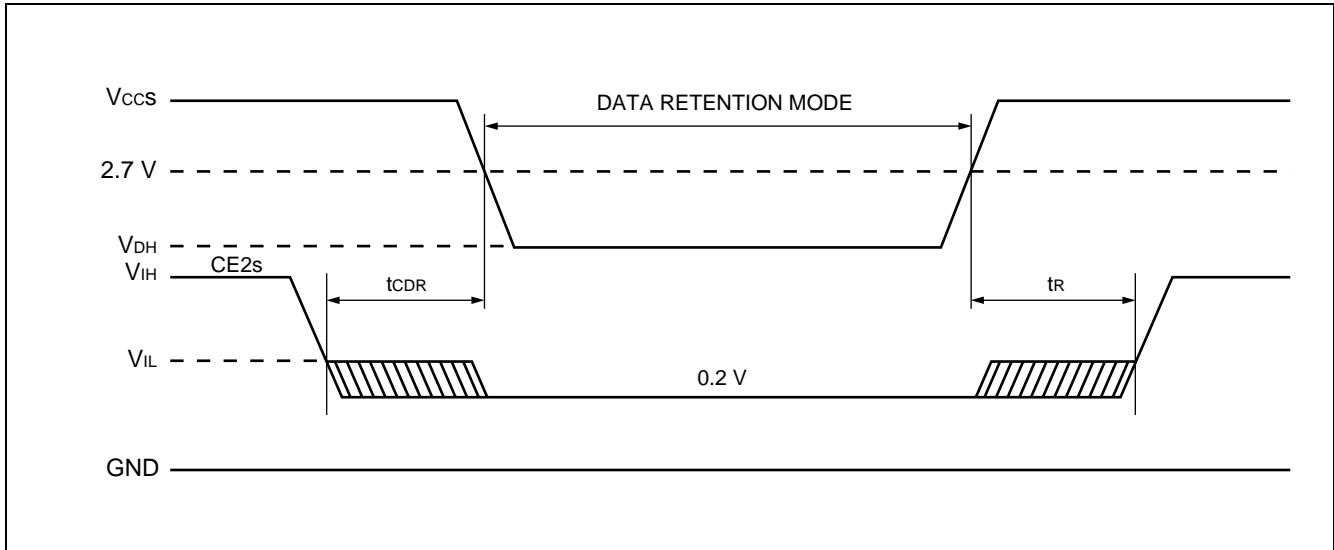
Note : t_{RC} : Read cycle time

* : 1 μA Max. at T_A ≤ 40 °C

• $\overline{CE1}$ 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 V_{CCS} to $V_{CCS}-0.2\text{ V}$ or V_{SS} to 0.2 V during data retention mode. Other input and input/output pins can be used between -0.3 V and $V_{CCS} + 0.3\text{ V}$.
 2. When $\overline{CE1}$ s is operating at the V_{IH} min. level (2.2 V), the standby current is given by I_{SB1S} during the transition of V_{CCS} from 3.6 to 2.2 V .
 3. In CE2s controlled data retention mode, input and input/output pins can be used between -0.3 V and $V_{CCS} + 0.3\text{ V}$.

■ PIN CAPACITANCE

Parameter Symbol	Parameter Description	Test Setup	Typ.	Max.	Unit
C_{IN}	Input Capacitance	$V_{IN} = 0$	11	14	pF
C_{OUT}	Output Capacitance	$V_{OUT} = 0$	12	16	pF
C_{IN2}	Control Pin Capacitance	$V_{IN} = 0$	14	16	pF
C_{IN3}	\overline{WP}/ACC Pin Capacitance	$V_{IN} = 0$	17	20	pF

Note : Test conditions $T_A = 25\text{ }^\circ\text{C}$, $f = 1.0\text{ MHz}$

■ HANDLING OF PACKAGE

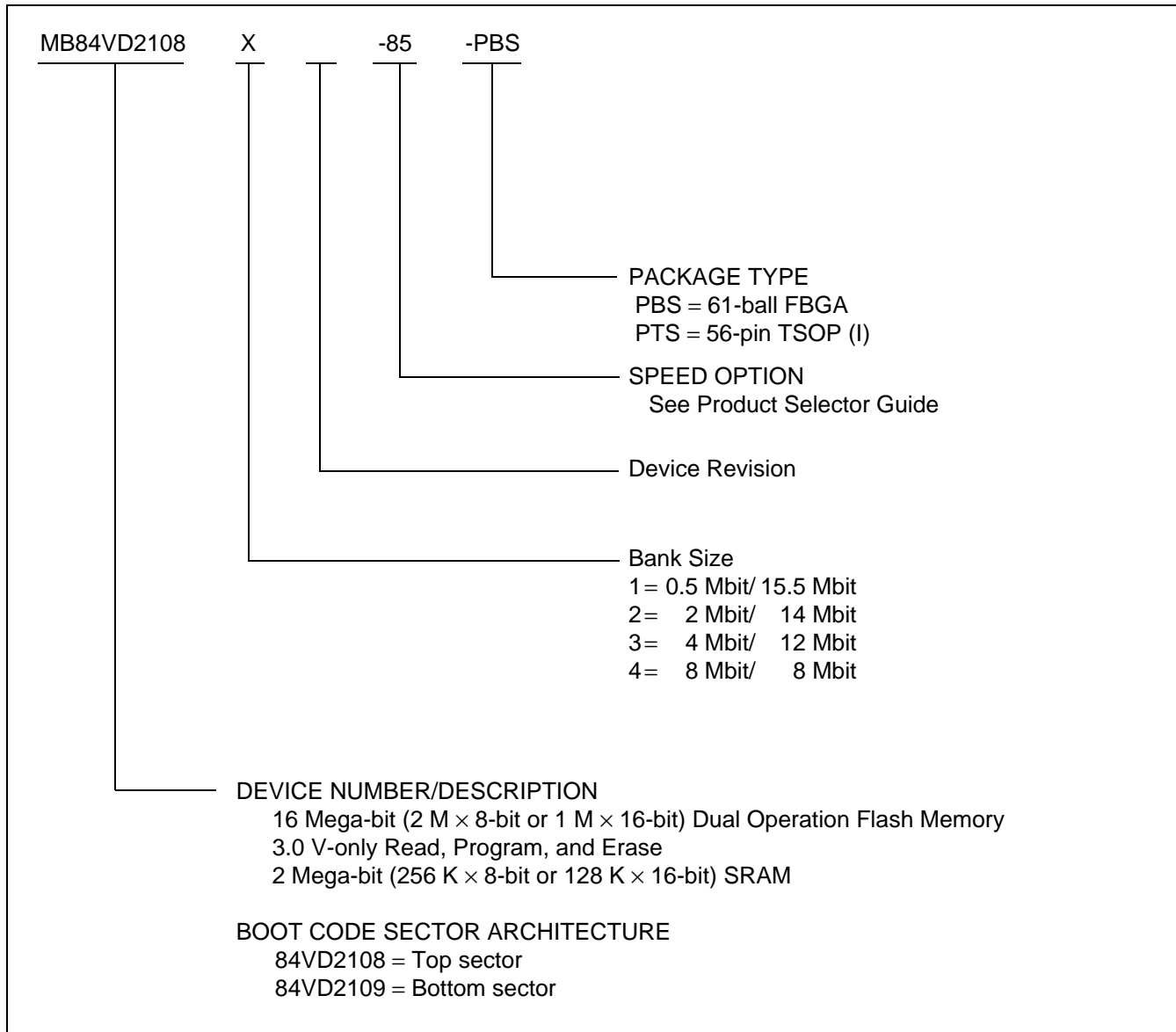
Please handle this package carefully since the sides of packages are right angle.

■ 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 using "Extended sector protect" command.

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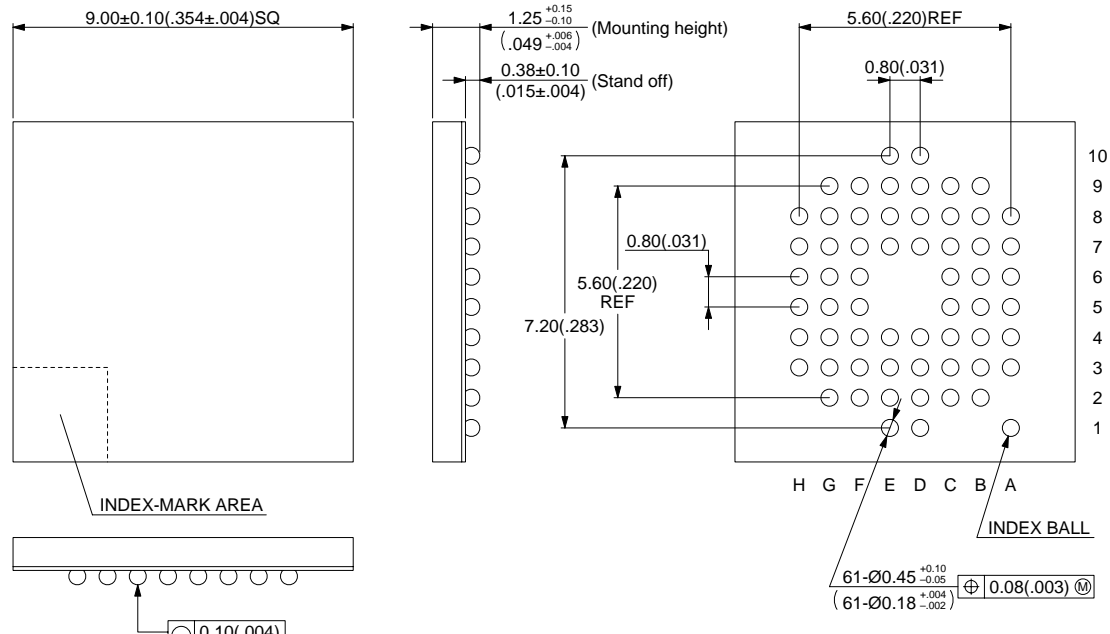
■ ORDERING INFORMATION



MB84VD2108X-85/MB84VD2109X-85

PACKAGE DIMENSIONS

61-ball plastic FBGA
(BGA-61P-M02)



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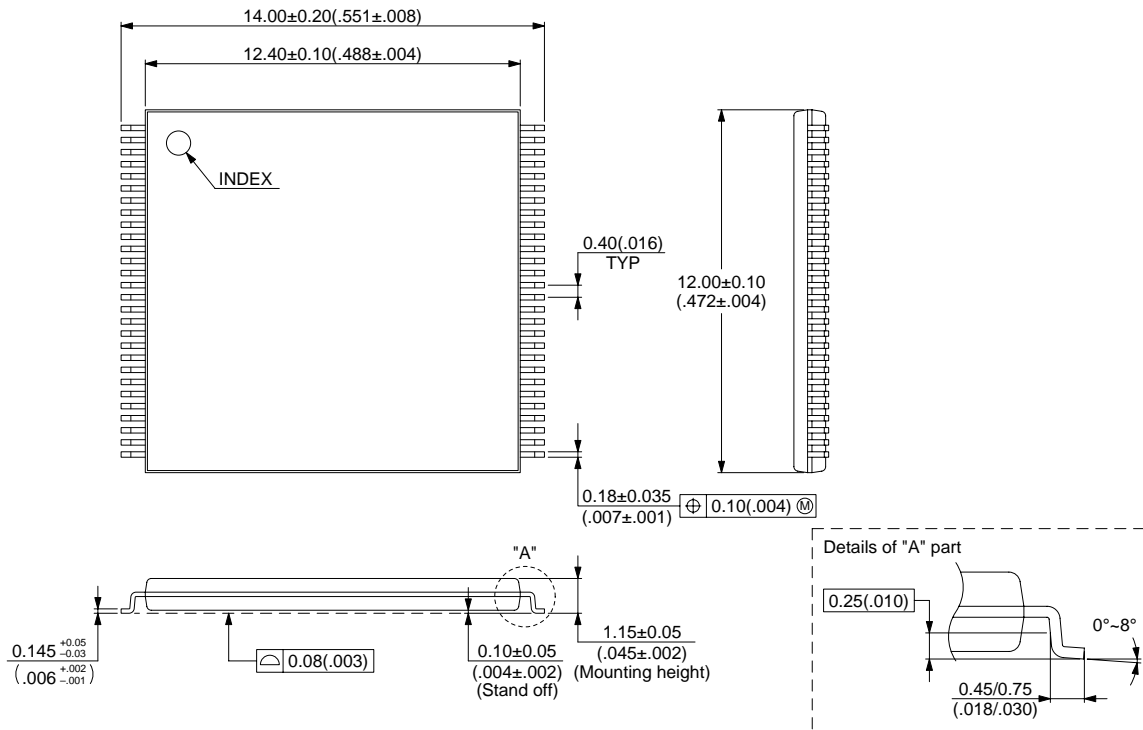
Dimensions in mm (inches)

(Continued)

MB84VD2108X-85/MB84VD2109X-85

(Continued)

56-pin plastic TSOP(I)
(FPT-56P-M04)



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Dimensions in mm (inches)

FUJITSU LIMITED

For further information please contact:

Japan

FUJITSU LIMITED
Corporate Global Business Support Division
Electronic Devices
KAWASAKI PLANT, 4-1-1, Kamikodanaka,
Nakahara-ku, Kawasaki-shi,
Kanagawa 211-8588, Japan
Tel: +81-44-754-3763
Fax: +81-44-754-3329

<http://www.fujitsu.co.jp/>

North and South America

FUJITSU MICROELECTRONICS, INC.
3545 North First Street,
San Jose, CA 95134-1804, U.S.A.
Tel: +1-408-922-9000
Fax: +1-408-922-9179

Customer Response Center
Mon. - Fri.: 7 am - 5 pm (PST)
Tel: +1-800-866-8608
Fax: +1-408-922-9179

<http://www.fujitsumicro.com/>

Europe

FUJITSU MICROELECTRONICS EUROPE GmbH
Am Siebenstein 6-10,
D-63303 Dreieich-Buchsschlag,
Germany
Tel: +49-6103-690-0
Fax: +49-6103-690-122

<http://www.fujitsu-fme.com/>

Asia Pacific

FUJITSU MICROELECTRONICS ASIA PTE. LTD.
#05-08, 151 Lorong Chuan,
New Tech Park,
Singapore 556741
Tel: +65-281-0770
Fax: +65-281-0220

<http://www.fmap.com.sg/>

Korea

FUJITSU MICROELECTRONICS KOREA LTD.
1702 KOSMO TOWER, 1002 Daechi-Dong,
Kangnam-Gu, Seoul 135-280
Korea
Tel: +82-2-3484-7100
Fax: +82-2-3484-7111

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