MEMORY Mobile FCRAM™
CMOS
64M Bit (4 M word x 16 bit)
Mobile Phone Application Specific Memory

MB82DP04183C-65L

CMOS 4,194,304-WORD x 16 BIT
Fast Cycle Random Access Memory
with Low Power SRAM Interface

■ DESCRIPTION

The Fujitsu MB82DP04183C is a CMOS Fast Cycle Random Access Memory (FCRAM) with asynchronous Static Random Access Memory (SRAM) interface containing 67,108,864 storages accessible in a 16-bit format. This MB82DP04183C is suited for mobile applications such as Cellular Handset and PDA.

■ FEATURES

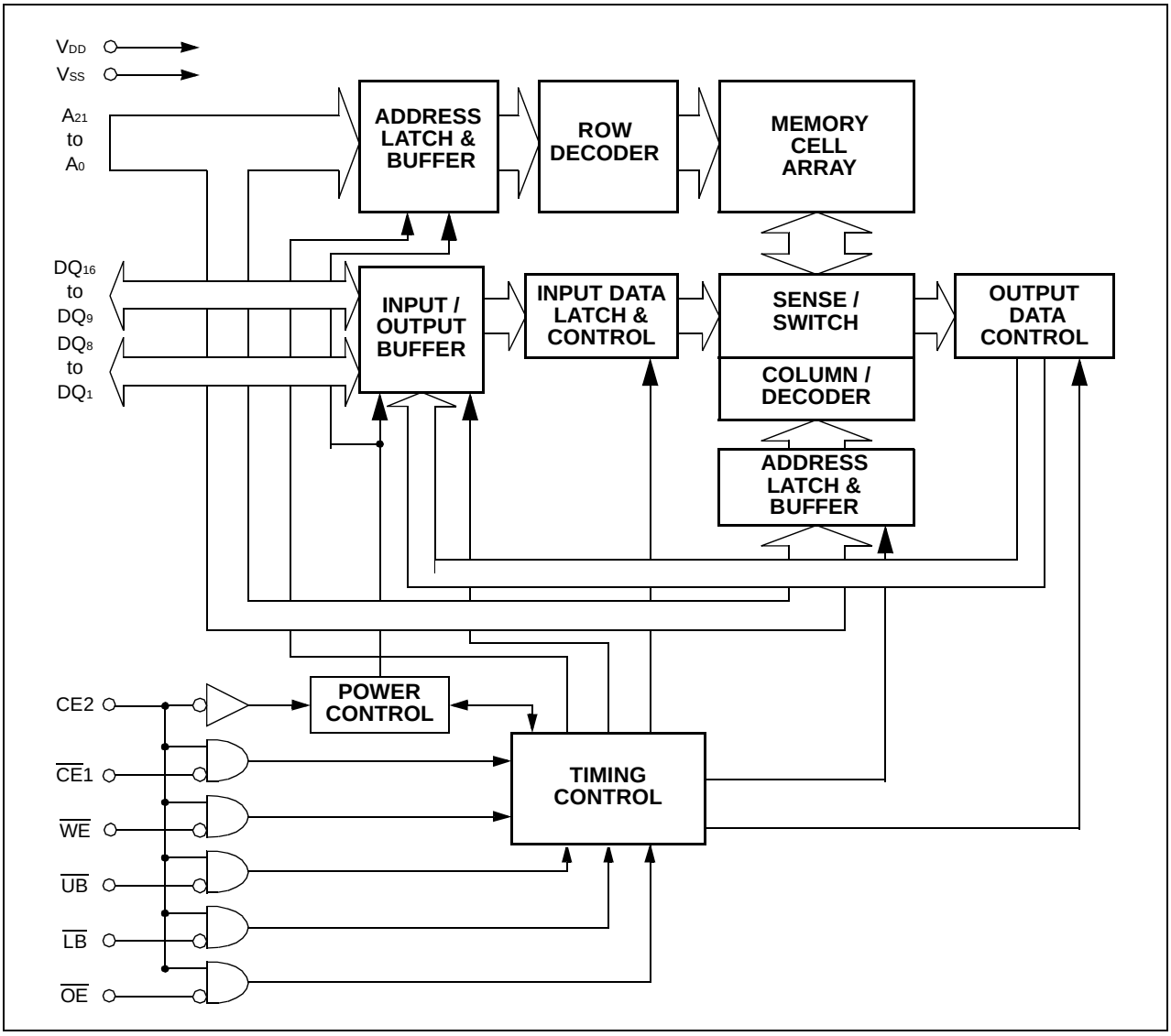
- Asynchronous SRAM Interface
- Fast Access Time
  t_{CE} = t_{AA} = 65ns max
- 8 words Page Access Capability
  t_{PAA} = 20ns max
- Low Voltage Operating Condition
  V_{DD} = +2.6V to +3.1V
- Wide Operating Temperature
  T_A = -30°C to +85°C
- Byte Control by $\overline{LB}$ and $\overline{UB}$
- Low Power Consumption
  I_{DDA1} = 40mA max
  I_{DDS1} = 90µA max (@ +40°C)
- Various Power Down mode
  Sleep
  8M-bit Partial
  16M-bit Partial

Notice: FCRAM is a trademark of Fujitsu Limited, Japan

■ PIN DESCRIPTION

Pin Name	Description
A_{21} to A_0	Address Input
$\overline{CE}1$	Chip Enable (Low Active)
CE2	Chip Enable (High Active)
$\overline{WE}$	Write Enable (Low Active)
$\overline{OE}$	Output Enable (Low Active)
$\overline{UB}$	Upper Byte Control (Low Active)
$\overline{LB}$	Lower Byte Control (Low Active)
DQ_{16-9}	Upper Byte Data Input/Output
DQ_{8-1}	Lower Byte Data Input/Output
V_{DD}	Power Supply
V_{SS}	Ground

■ BLOCK DIAGRAM



■ FUNCTION TRUTH TABLE

Mode	Note	CE2	$\overline{CE1}$	$\overline{WE}$	$\overline{OE}$	$\overline{UB}$	$\overline{LB}$	A21-0	DQ16-9	DQ8-1
Standby (Deselect)		H	H	X	X	X	X	X	High-Z	High-Z
Output Disable	*1	H	L	H	H	X	X	*3	High-Z	High-Z
Output Disable (No Read)				H	L	H	H	Valid	High-Z	High-Z
Read (Upper Byte)						L	H	Valid	Output Valid	High-Z
Read (Lower Byte)						H	L	Valid	High-Z	Output Valid
Read (Word)						L	L	Valid	Output Valid	Output Valid
No Write				L	H *4	H	H	Valid	Invalid	Invalid
Write (Upper Byte)						L	H	Valid	Input Valid	Invalid
Write (Lower Byte)						H	L	Valid	Invalid	Input Valid
Write (Word)						L	L	Valid	Input Valid	Input Valid
Power Down	*2	L	X	X	X	X	X	X	High-Z	High-Z

Notes L = V_{IL}, H = V_{IH}, X can be either V_{IL} or V_{IH}, High-Z = High Impedance

*1: Should not be kept this logic condition longer than 1µs.
Please contact local FUJITSU representative for the relaxation of 1µs limitation.

*2: Power Down mode can be entered from Standby state and all DQ pins are in High-Z state.
Data retention depends on the selection of Power Down Program.
Refer to POWER DOWN for the detail.

*3: Can be either V_{IL} or V_{IH} but must be valid before Read or Write.

*4: $\overline{OE}$ can be V_{IL} during Write operation if the following conditions are satisfied;
(1) Write pulse is initiated by $\overline{CE1}$. See Asynchronous Read / Write Timing #1-1 ($\overline{CE1}$ Control)
(2) $\overline{OE}$ stays V_{IL} during Write cycle.

■ POWER DOWN

Power Down

The Power Down is low power idle state controlled by CE2. CE2 Low drives the device in power down mode and maintains low power idle state as long as CE2 is kept low. CE2 High resume the device from power down mode.

This device has three power down mode, Sleep, 8M Partial and 16M Partial. The selection of power down mode can be programmed by series of read/write operation. Each mode has follwoing data retention features.

Mode	Data Retention	Retention Address
Sleep (default)	No	N/A
8M Partial	8M bit	000000h to 07FFFFh
16M Partial	16M bit	000000h to 0FFFFFh

The default state is Sleep and it is the lowest power consumption but all data will be lost once CE2 is brought to Low for Power Down. It is not required to program to Sleep mode after power-up.

Power Down Program Sequence

The program requires total 6 read/write operation with unique address. Between each read/write operation requires that device be in standby mode. Following table shows the detail sequence.

Cycle #	Operation	Address	Data
1st	Read	3FFFFFh (MSB)	Read Data (RDa)
2nd	Write	3FFFFFh	RDa
3rd	Write	3FFFFFh	RDa
4th	Write	3FFFFFh	Don't Care (X)
5th	Write	3FFFFFh	X
6th	Read	Address Key	Read Data (RDb)

The first cycle is to read from most significant address (MSB).
The second and third cycle are to write to MSB. If the second or third cycle is written into the different address, the program is cancelled. And the data written at the second or third cycle is valid as a normal write operation. It is recommended to write back the data (RDa) read by first cycle to MSB in order to secure the data.
The forth and fifth cycle is to write to MSB. The data of forth and fifth cycle is don't-care. If the forth or fifth cycle is written into different address, the program is also cancelled but write data may not be written as normal write operation.
The last cycle is to read from specific address key for mode selection. And read data (RDb) is invalid.

Once this program sequence is performed from a Partial mode to the other Partial mode, the write data may be lost. So, it should perform this program sequence prior to regular read/write operation if Partial mode is used.

Address Key

The address key has following format.

Mode	Address				
	A21	A20	A19	A18 - A0	Binary
Sleep (default)	1	1	1	1	3FFFFFh
8M Partial	1	0	1	1	2FFFFFh
16M Partial	1	0	0	1	27FFFFh

■ ABSOLUTE MAXIMUM RATINGS (See WARNING below.)

Parameter	Symbol	Value	Unit
Voltage of V_{DD} Supply Relative to V_{SS}	V_{DD}	-0.5 to +3.6	V
Voltage at Any Pin Relative to V_{SS}	V_{IN}, V_{OUT}	-0.5 to +3.6	V
Short Circuit Output Current	I_{OUT}	$\pm$50	mA
Storage Temperature	T_{STG}	-55 to +125	°C

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 (See WARNING below.)

(Referenced to V_{SS})

Parameter	Notes	Symbol	Min.	Max.	Unit
Supply Voltage		V_{DD}	2.6	3.1	
		V_{SS}	0	0	V
High Level Input Voltage	*1	V_{IH}	V_{DD}*0.8	V_{DD}+0.2	V
Low Level Input Voltage	*2	V_{IL}	-0.3	V_{DD}*0.2	V
Ambient Temperature		T_A	-30	85	°C

Notes *1: Maximum DC voltage on input and I/O pins are V_{DD}+0.2V. During voltage transitions, inputs may positive overshoot to V_{DD}+1.0V for periods of up to 5 ns.

*2: Minimum DC voltage on input or I/O pins are -0.3V. During voltage transitions, inputs may negative overshoot V_{SS} to -1.0V for periods of up to 5ns.

WARNING: Recommended operating conditions are normal operating ranges for the semiconductor device. All the device's electrical characteristics are warranted when operated within these ranges.

Always use semiconductor devices within the recommended operating conditions. 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 representative beforehand.

■ DC CHARACTERISTICS

(Under Recommended Operating Conditions unless otherwise noted) Note *1,*2,*3

Parameter	Symbol	Test Conditions		Min.	Max.	Unit
Input Leakage Current	I_{LI}	V_{IN} = V_{SS} to V_{DD}		-1.0	+1.0	µA
Output Leakage Current	I_{LO}	V_{OUT} = V_{SS} to V_{DD}, Output Disable		-1.0	+1.0	µA
Output High Voltage Level	V_{OH}	V_{DD} = V_{DD}(min), I_{OH} = –0.5mA		2.4	—	V
Output Low Voltage Level	V_{OL}	I_{OL} = 1mA		—	0.4	V
V_{DD} Power Down Current	I_{DDPS}	V_{DD} = V_{DD} max., V_{IN} = V_{IH} or V_{IL}, $\overline{CE2}$ ≤ 0.2V	SLEEP	—	10	µA
	I_{DDP8}		8M Partial	—	80	µA
	I_{DDP16}		16M Partial	—	100	µA
V_{DD} Standby Current	I_{DDS}	V_{DD} = V_{DD} max., $\overline{V_{IN}}$ = V_{IH} or V_{IL}, $\overline{CE1}$ = CE2 = V_{IH}		—	1.5	mA
	I_{DDS1}	V_{DD} = V_{DD} max., V_{IN} (including CLK) ≤ 0.2V or $\overline{V_{IN}}$ (including CLK) ≥ V_{DD} – 0.2V, $\overline{CE1}$ = CE2 ≥ V_{DD} – 0.2V	T_A ≤ +85°C	—	170	µA
			T_A ≤ +40°C	—	90	µA
V_{DD} Active Current	I_{DDA1}	V_{DD} = V_{DD} max., $\overline{V_{IN}}$ = V_{IH} or V_{IL}, $\overline{CE1}$ = V_{IL} and CE2= V_{IH}, I_{OUT}=0mA	t_{RC} / t_{WC} = minimum	—	40	mA
	I_{DDA2}		t_{RC} / t_{WC} = 1µs	—	5	mA
V_{DD} Page Read Current	I_{DDA3}	$\overline{V_{DD}}$ = V_{DD} max., V_{IN} = V_{IH} or V_{IL}, $\overline{CE1}$ = V_{IL} and CE2= V_{IH}, I_{OUT}=0mA, t_{PRC} = min.		—	10	mA

Notes *1: All voltages are referenced to Vss.
*2: DC Characteristics are measured after following POWER-UP timing.
*3: I_{OUT} depends on the output load conditions.

■ AC CHARACTERISTICS

(Under Recommended Operating Conditions unless otherwise noted)

READ OPERATION

Parameter	Symbol	Value		Unit	Notes
		Min.	Max.		
Read Cycle Time	t_{RC}	65	1000	ns	*1, *2
$\overline{CE}$1 Access Time	t_{CE}	—	65	ns	*3
$\overline{OE}$ Access Time	t_{OE}	—	40	ns	*3
Address Access Time	t_{AA}	—	65	ns	*3, *5
$\overline{LB}$ / $\overline{UB}$ Access Time	t_{BA}	—	30	ns	*3
Page Address Access Time	t_{PAA}	—	20	ns	*3, *6
Page Read Cycle Time	t_{PRC}	20	1000	ns	*1, *6, *7
Output Data Hold Time	t_{OH}	5	—	ns	*3
$\overline{CE}$1 Low to Output Low-Z	t_{CLZ}	5	—	ns	*4
$\overline{OE}$ Low to Output Low-Z	t_{OLZ}	10	—	ns	*4
$\overline{LB}$ / $\overline{UB}$ Low to Output Low-Z	t_{BLZ}	0	—	ns	*4
$\overline{CE}$1 High to Output High-Z	t_{CHZ}	—	20	ns	*3
$\overline{OE}$ High to Output High-Z	t_{OHZ}	—	14	ns	*3
$\overline{LB}$ / $\overline{UB}$ High to Output High-Z	t_{BHZ}	—	20	ns	*3
Address Setup Time to $\overline{CE}$1 Low	t_{ASC}	–6	—	ns	
Address Setup Time to $\overline{OE}$ Low	t_{ASO}	10	—	ns	
Address Invalid Time	t_{AX}	—	10	ns	*5, *8
Address Hold Time from $\overline{CE}$1 High	t_{CHAH}	–6	—	ns	*9
Address Hold Time from $\overline{OE}$ High	t_{OHAH}	–6	—	ns	
$\overline{WE}$ High to $\overline{OE}$ Low Time for Read	t_{WHOL}	25	1000	ns	*10
$\overline{CE}$1 High Pulse Width	t_{CP}	12	—	ns	

Notes *1: Maximum value is applicable if $\overline{CE}$1 is kept at Low without change of address input of A3 to A21. If needed by system operation, please contact local FUJITSU representative for the relaxation of 1µs limitation.

*2: Address should not be changed within minimum t_{RC}.

*3: The output load 50pF.

*4: The output load 5pF.

*5: Applicable to A3 to A21 when $\overline{CE}$1 is kept at Low.

*6: Applicable only to A0, A1 and A2 when $\overline{CE}$1 is kept at Low for the page address access.

*7: In case Page Read Cycle is continued with keeping $\overline{CE}$1 stays Low, $\overline{CE}$1 must be brought to High within 4µs. In other words, Page Read Cycle must be closed within 4µs.

*8: Applicable to address access when at least two of address inputs are switched from previous state.

*9: t_{RC}(min) and t_{PRC}(min) must be satisfied.

*10: If actual value of t_{WHOL} is shorter than specified minimum values, the actual t_{AA} of following Read may become longer by the amount of subtracting actual value from specified minimum value.

■ AC CHARACTERISTICS (Continued)

WRITE OPERATION

Parameter	Symbol	Value		Unit	Notes
		Min.	Max.		
Write Cycle Time	t_{WC}	65	1000	ns	*1, *2
Address Setup Time	t_{AS}	0	—	ns	*3
$\overline{CE1}$ Write Pulse Width	t_{CW}	40	—	ns	*3
$\overline{WE}$ Write Pulse Width	t_{WP}	40	—	ns	*3
$\overline{LB}$ / $\overline{UB}$ Write Pulse Width	t_{BW}	40	—	ns	*3
$\overline{LB}$ / $\overline{UB}$ Byte Mask Setup Time	t_{BS}	–5	—	ns	*4
$\overline{LB}$ / $\overline{UB}$ Byte Mask Hold Time	t_{BH}	–5	—	ns	*5
Write Recovery Time	t_{WR}	0	—	ns	*6
$\overline{CE1}$ High Pulse Width	t_{CP}	12	—	ns	
$\overline{WE}$ High Pulse Width	t_{WHP}	12	1000	ns	
$\overline{LB}$ / $\overline{UB}$ High Pulse Width	t_{BHP}	12	1000	ns	
Data Setup Time	t_{DS}	12	—	ns	
Data Hold Time	t_{DH}	0	—	ns	
$\overline{OE}$ High to $\overline{CE1}$ Low Setup Time for Write	t_{OHCL}	–5	—	ns	*7
$\overline{OE}$ High to Address Setup Time for Write	t_{OES}	0	—	ns	*8
$\overline{LB}$ and $\overline{UB}$ Write Pulse Overlap	t_{BWO}	30	—	ns	

Notes *1: Maximum value is applicable if $\overline{CE1}$ is kept at Low without any address change. If the relaxation is needed by system operation, please contact local FUJITSU representative for the relaxation of 1µs limitation.

*2: Minimum value must be equal or greater than the sum of write pulse (t_{CW}, t_{WP} or t_{BW}) and write recovery time (t_{WRC}, t_{WR} or t_{BR}).

*3: Write pulse is defined from High to Low transition of $\overline{CE1}$, $\overline{WE}$, or $\overline{LB}$ / $\overline{UB}$, whichever occurs last.

*4: Applicable for byte mask only. Byte mask setup time is defined to the High to Low transition of $\overline{CE1}$ or $\overline{WE}$ whichever occurs last.

*5: Applicable for byte mask only. Byte mask hold time is defined from the Low to High transition of $\overline{CE1}$ or $\overline{WE}$ whichever occurs first.

*6: Write recovery is defined from Low to High transition of $\overline{CE1}$, $\overline{WE}$, or $\overline{LB}$ / $\overline{UB}$, whichever occurs first.

*7: If $\overline{OE}$ is Low after minimum t_{OHCL}, read cycle is initiated. In other word, $\overline{OE}$ must be brought to High within 5ns after $\overline{CE1}$ is brought to Low. Once read cycle is initiated, new write pulse should be input after minimum t_{RC} is met.

*8: If $\overline{OE}$ is Low after new address input, read cycle is initiated. In other word, $\overline{OE}$ must be brought to High at the same time or before new address valid. Once read cycle is initiated, new write pulse should be input after minimum t_{RC} is met.

■ AC CHARACTERISTICS (Continued)

POWER DOWN PARAMETERS

Parameter	Symbol	Value		Unit	Note
		Min.	Max.		
CE2 Low Setup Time for Power Down Entry	t_{CSP}	10	—	ns	
CE2 Low Hold Time after Power Down Entry	t_{C2LP}	65	—	ns	
$\overline{CE}$1 High Hold Time following CE2 High after Power Down Exit [SLEEP mode only]	t_{CHH}	300	—	µs	*1
$\overline{CE}$1 High Hold Time following CE2 High after Power Down Exit [not in SLEEP mode]	t_{CHHP}	70	—	ns	*2
$\overline{CE}$1 High Setup Time following CE2 High after Power Down Exit	t_{CHS}	0	—	ns	*1

Notes *1: Applicable also to power-up.
*2: Applicable when 8M and 16M Partial mode is programmed.

OTHER TIMING PARAMETERS

Parameter	Symbol	Value		Unit	Note
		Min.	Max.		
$\overline{CE}$1 High to $\overline{OE}$ Invalid Time for Standby Entry	t_{CHOX}	10	—	ns	
$\overline{CE}$1 High to $\overline{WE}$ Invalid Time for Standby Entry	t_{CHWX}	10	—	ns	*1
CE2 Low Hold Time after Power-up	t_{C2LH}	50	—	µs	
$\overline{CE}$1 High Hold Time following CE2 High after Power-up	t_{CHH}	300	—	µs	
Input Transition Time	t_T	1	25	ns	*2

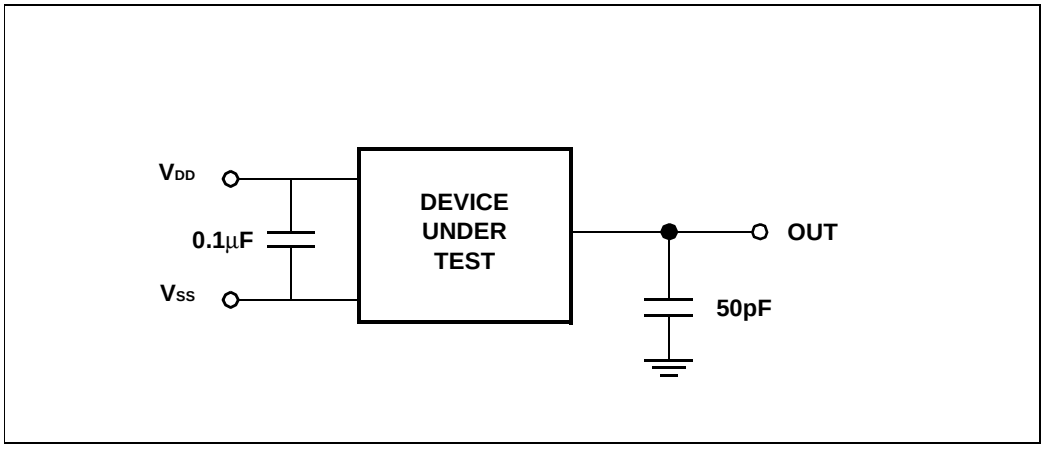
Notes *1: Some data might be written into any address location if t_{CHWX}(min) is not satisfied.
*2: The Input Transition Time (t_T) at AC testing is 5ns as shown in below. If actual t_T is longer than 5ns, it may violate AC specification of some timing parameters.

■ AC CHARACTERISTICS (Continued)

AC TEST CONDITIONS

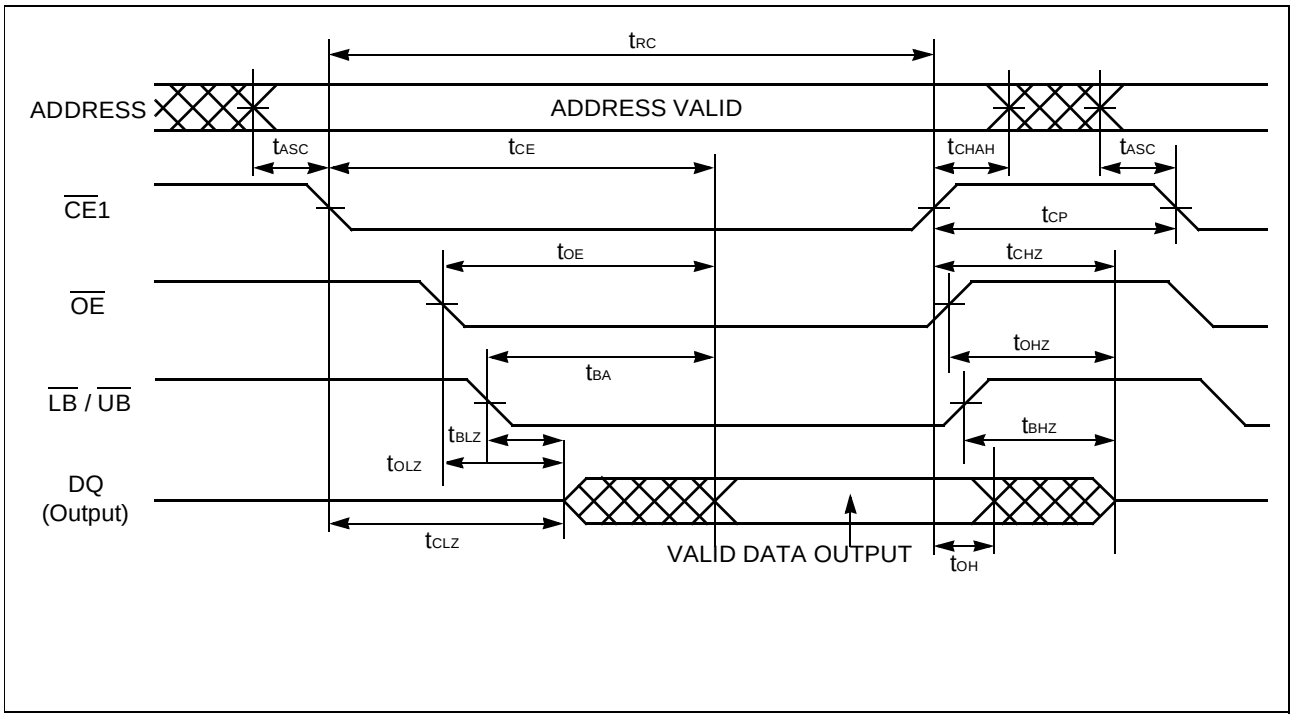
Symbol	Description	Test Setup	Value	Unit	Note
V_{IH}	Input High Level		V_{DD} * 0.8	V	
V_{IL}	Input Low Level		V_{DD} * 0.2	V	
V_{REF}	Input Timing Measurement Level		V_{DD} * 0.5	V	
t_T	Input Transition Time	Between V_{IL} and V_{IH}	5	ns	

AC MEASUREMENT OUTPUT LOAD CIRCUIT



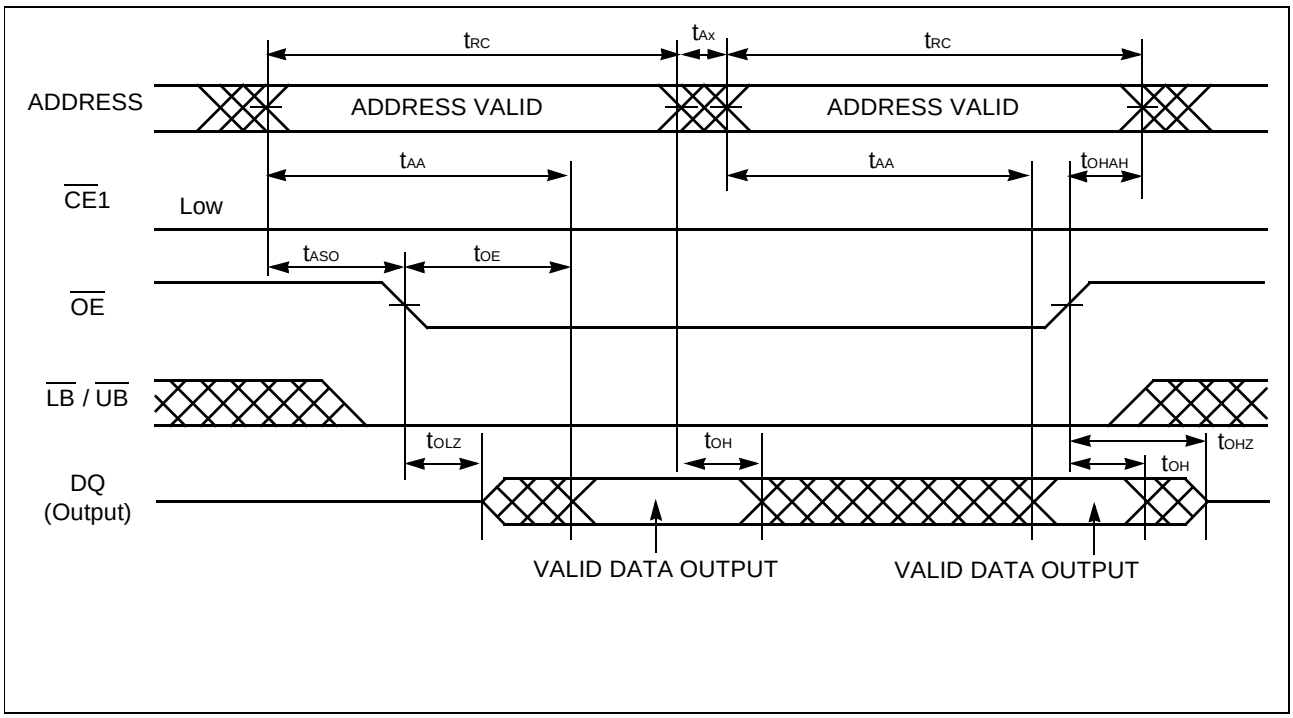
■ TIMING DIAGRAMS

READ Timing #1 (Basic Timing) See Note.



Note: This timing diagram assumes CE2=H and $\overline{WE}$=H.

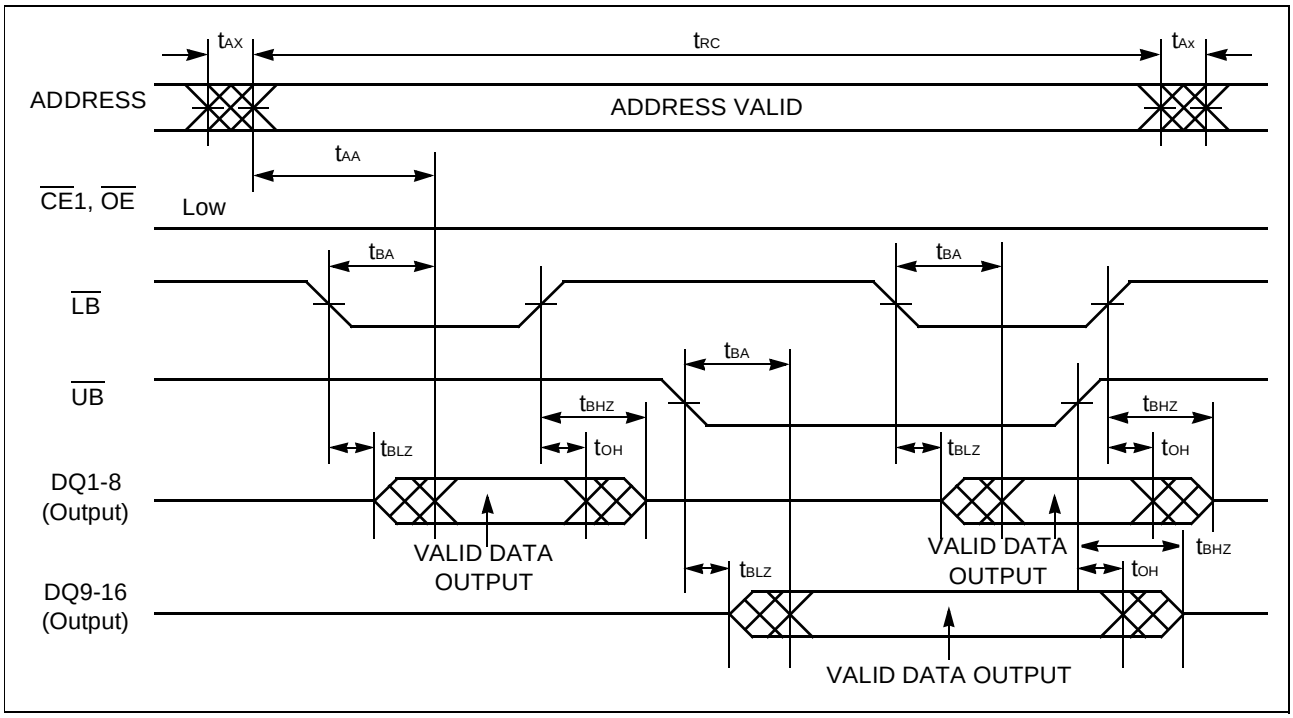
READ Timing #2 ($\overline{OE}$ & Address Access) See Note.



Notes: This timing diagram assumes CE2=H and $\overline{WE}$=H.

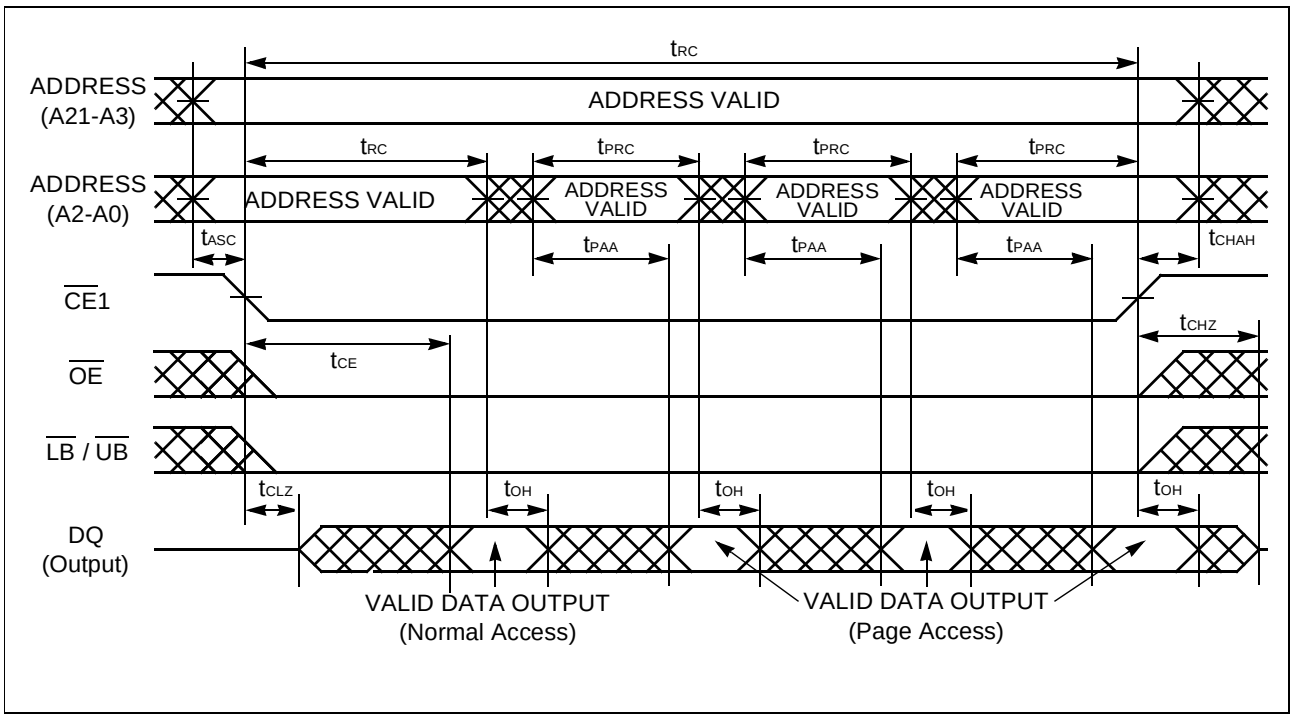
■ TIMING DIAGRAMS (Continued)

READ Timing #3 ($\overline{LB}$ / $\overline{UB}$ Byte Access) See Note.



Note: This timing diagram assumes CE2=H and $\overline{WE}$=H.

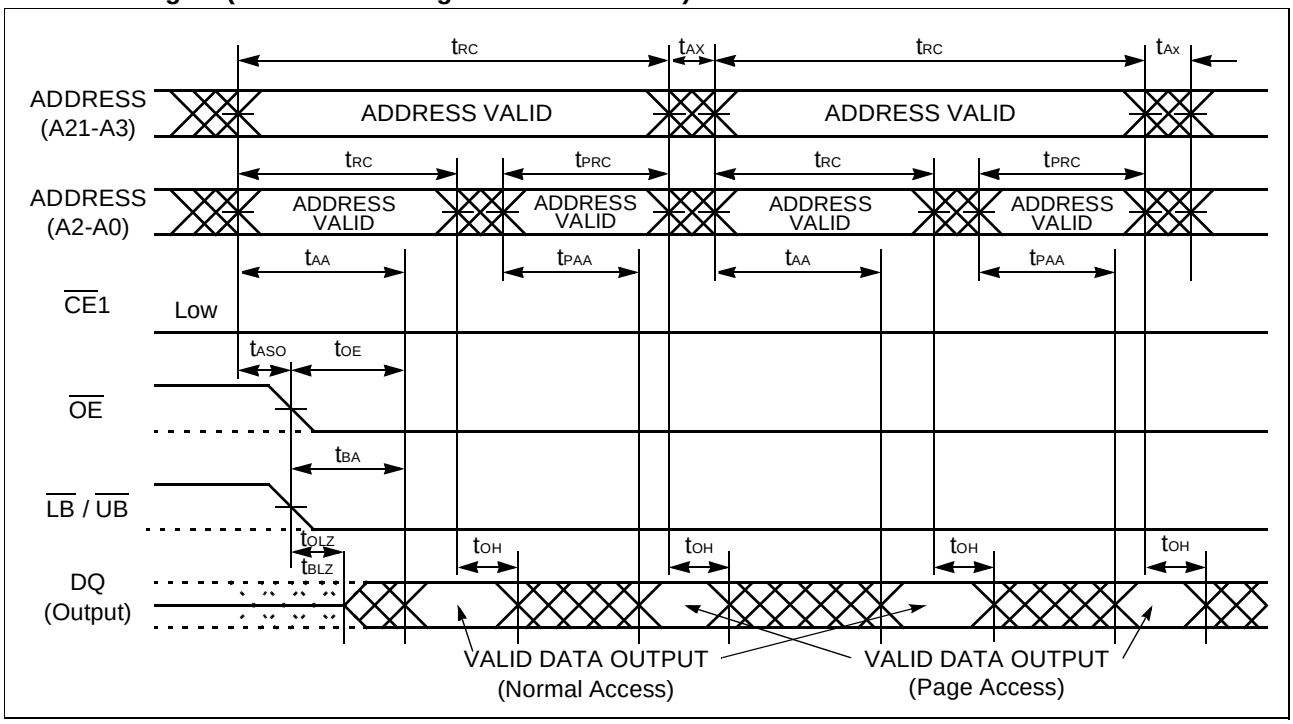
READ Timing #4 (Page Address Access after $\overline{CE1}$ Control Access) See Note.



Notes: This timing diagram assumes CE2=H and $\overline{WE}$=H.

■ TIMING DIAGRAMS (Continued)

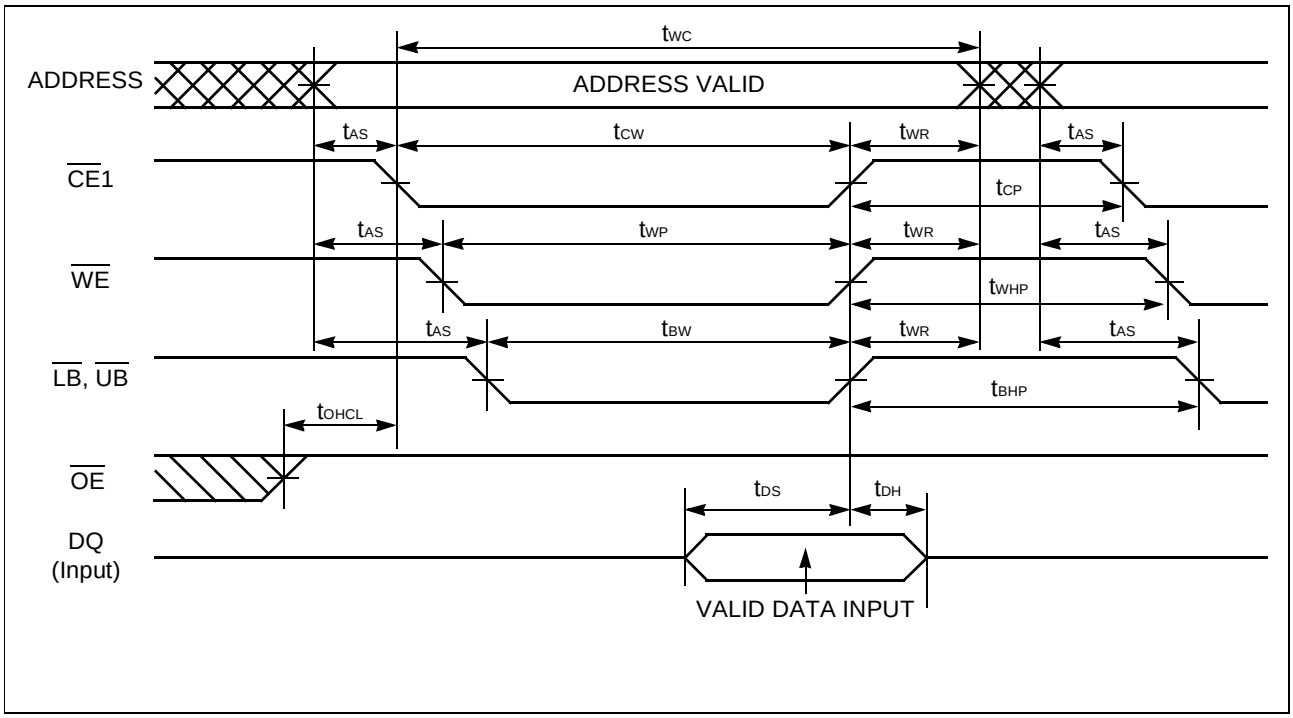
READ Timing #5 (Random and Page Address Access) See Note.



Notes *1: This timing diagram assumes CE2=H and $\overline{WE}$=H.
*2: Either or both $\overline{LB}$ and $\overline{UB}$ must be Low when both $\overline{CE}$1 and $\overline{OE}$ are Low.

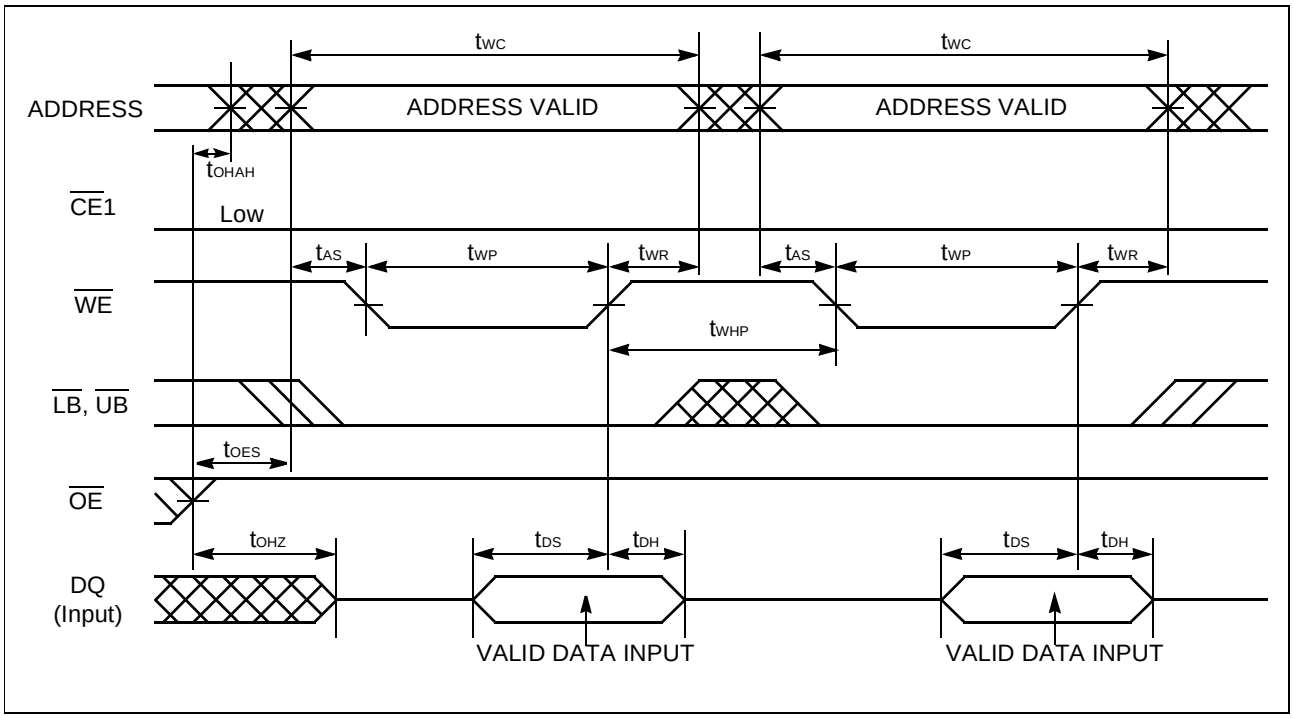
■ TIMING DIAGRAMS (Continued)

WRITE Timing #1 (Basic Timing) See Note.



Notes: This timing diagram assumes CE2=H.

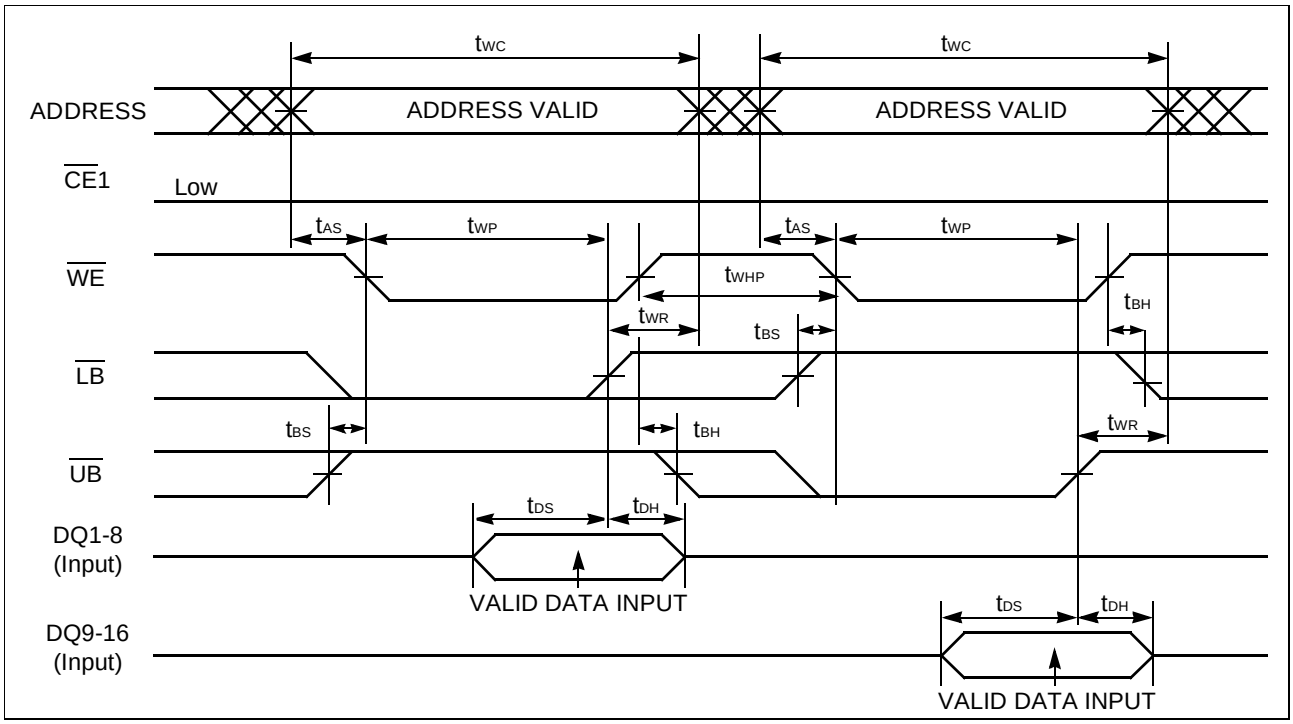
WRITE Timing #2 (WE Control) See Note.



Note: This timing diagram assumes CE2=H.

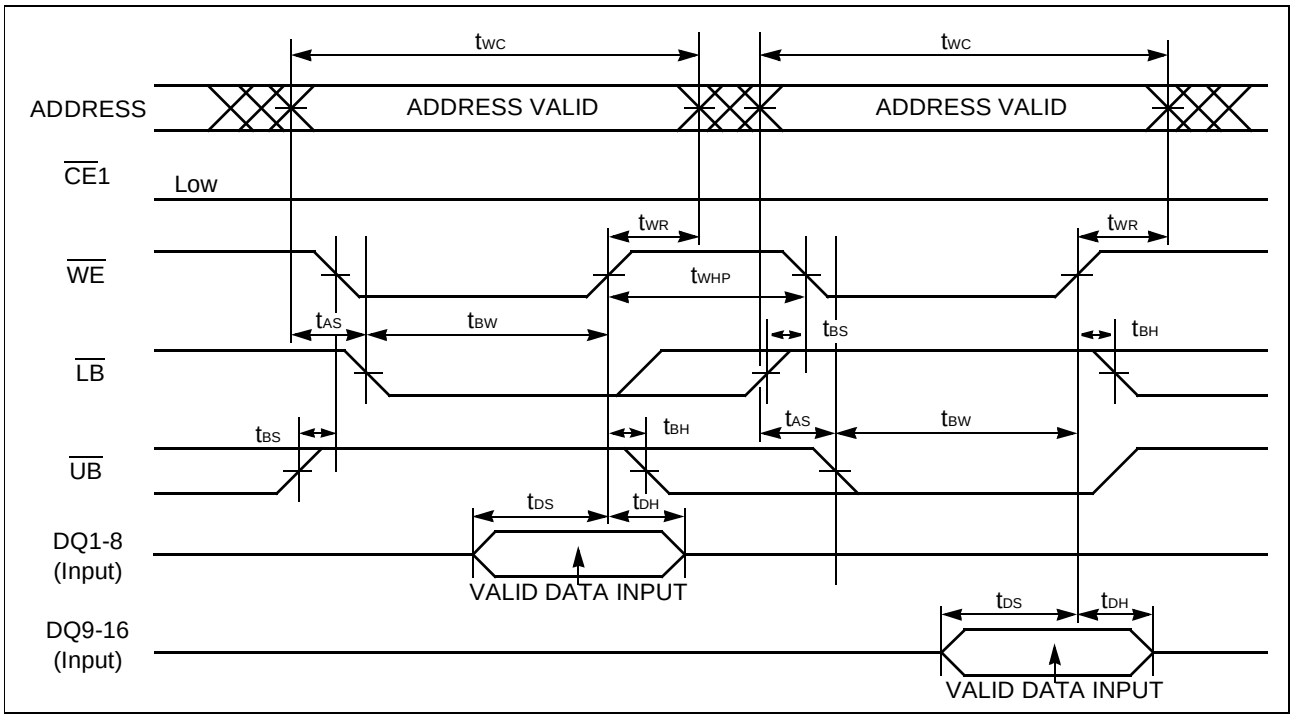
■ TIMING DIAGRAMS (Continued)

WRITE Timing #3-1 ($\overline{WE}$ / $\overline{LB}$ / $\overline{UB}$ Byte Write Control) See Note.



Note: This timing diagram assumes CE2=H and $\overline{OE}$=H.

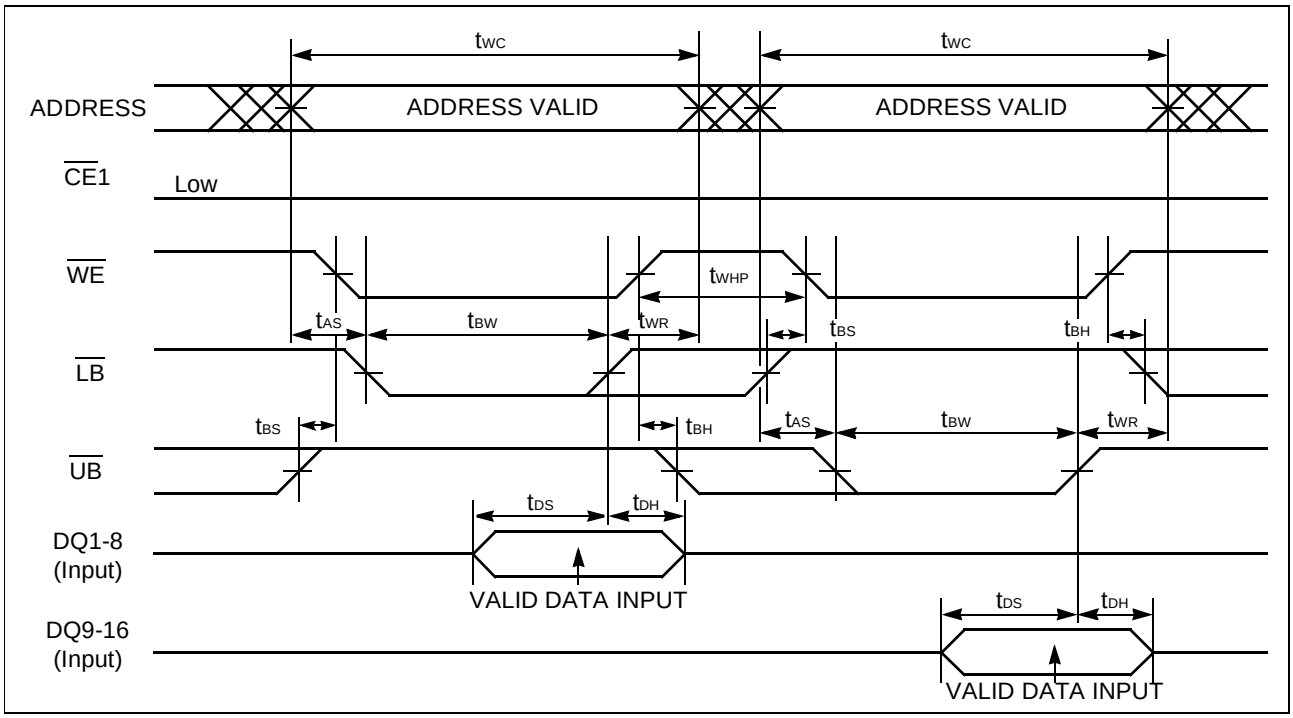
WRITE Timing #3-2 ($\overline{WE}$ / $\overline{LB}$ / $\overline{UB}$ Byte Write Control) See Note.



Note: This timing diagram assumes CE2=H and $\overline{OE}$=H.

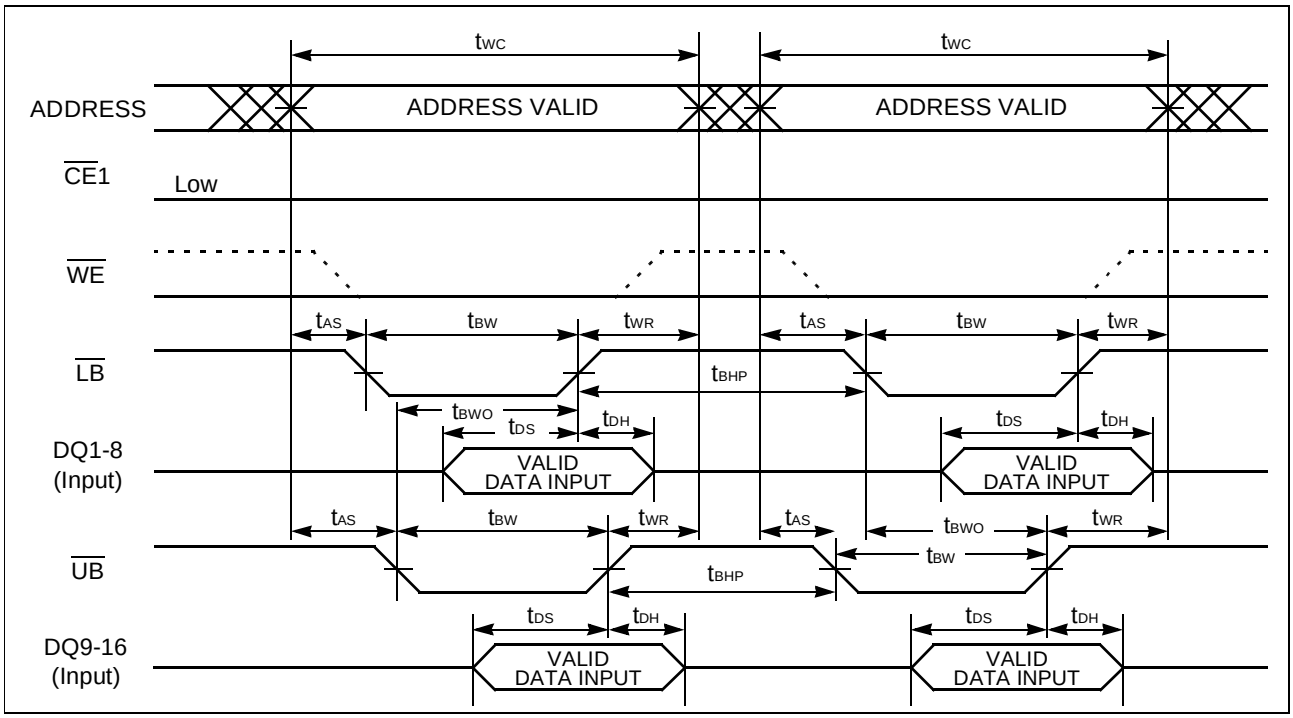
■ TIMING DIAGRAMS (Continued)

WRITE Timing #3-3 ($\overline{WE}$ / $\overline{LB}$ / $\overline{UB}$ Byte Write Control) See Note.



Note: This timing diagram assumes CE2=H and $\overline{OE}$=H.

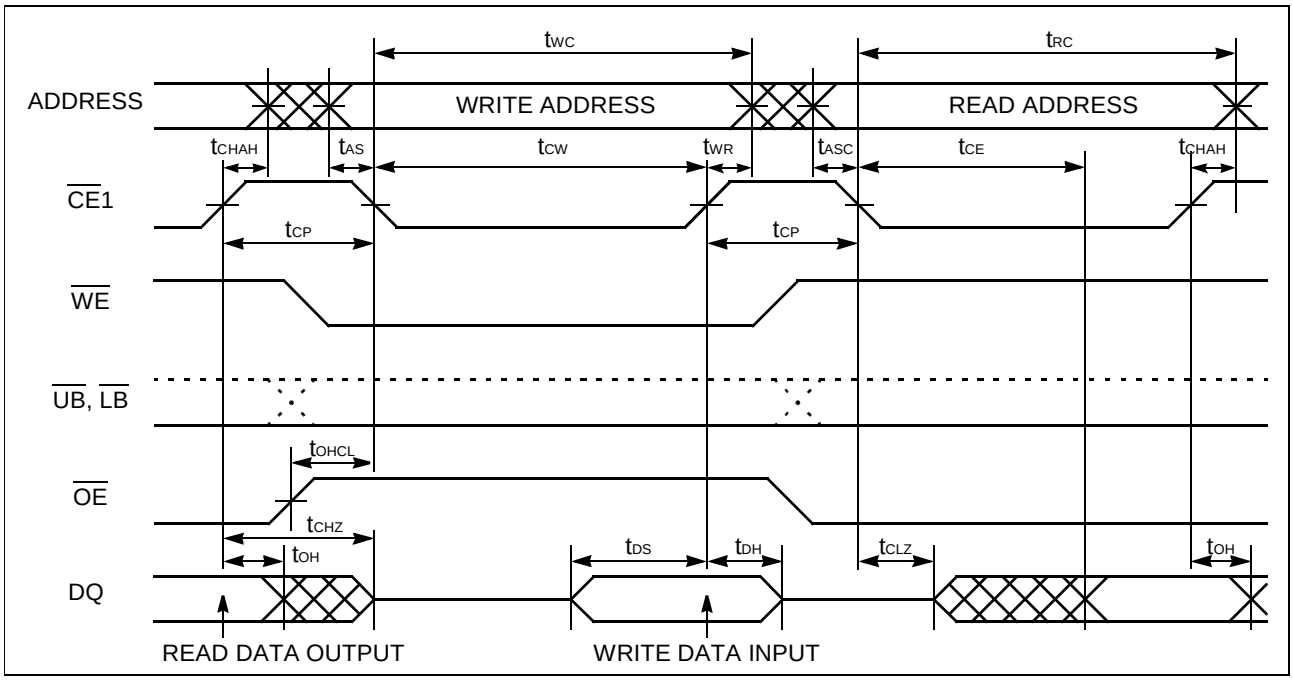
WRITE Timing #3-4 ($\overline{WE}$ / $\overline{LB}$ / $\overline{UB}$ Byte Write Control) See Note.



Note: This timing diagram assumes CE2=H and $\overline{OE}$=H.

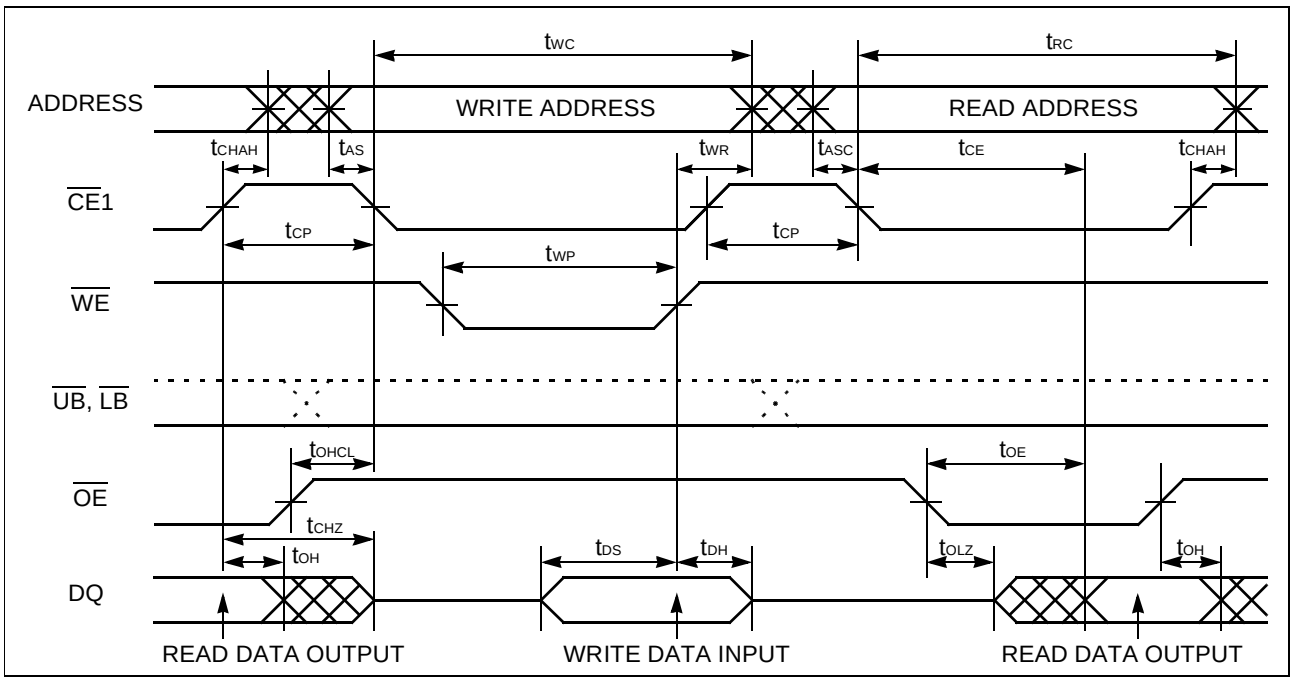
■ TIMING DIAGRAMS (Continued)

READ / WRITE Timing #1-1 ($\overline{CE}$1 Control) See Note.



Notes *1: This timing diagram assumes CE2=H.
*2: Write address is valid from either $\overline{CE}$1 or $\overline{WE}$ of last falling edge.

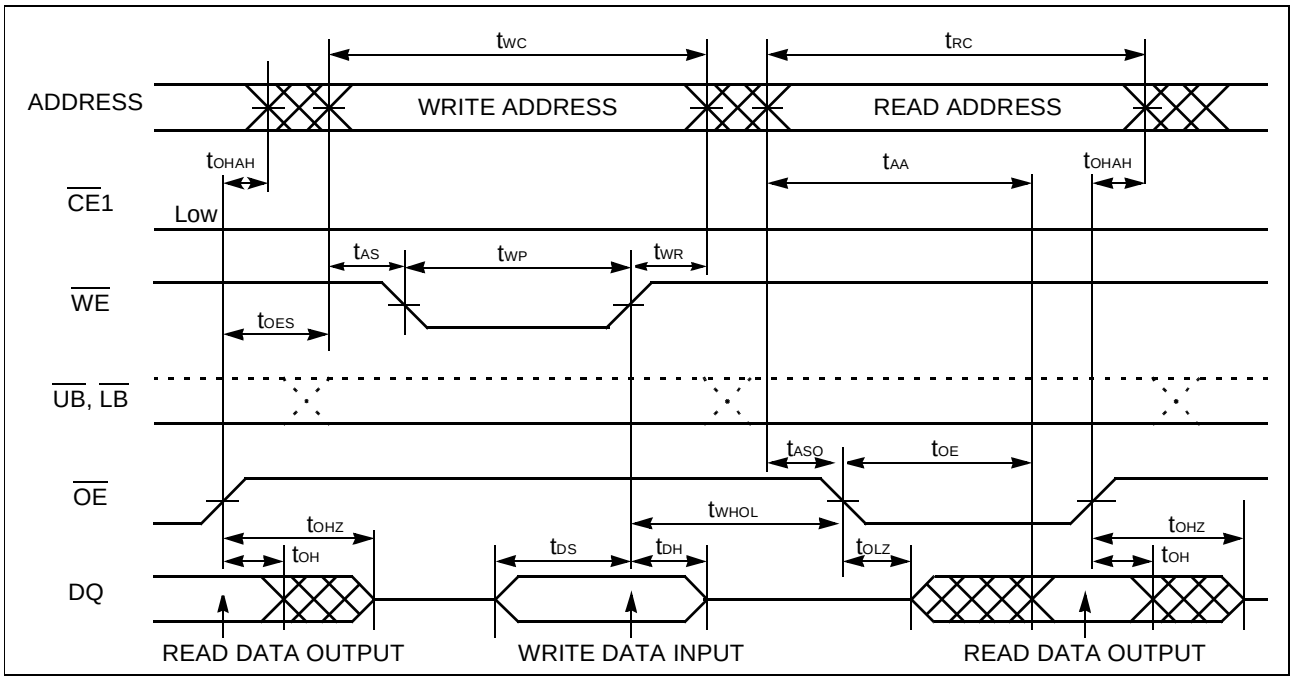
READ / WRITE Timing #1-2 ($\overline{CE}$1 / $\overline{WE}$ / $\overline{OE}$ Control) See Note.



Notes *1: This timing diagram assumes CE2=H.
*2: $\overline{OE}$ can be fixed Low during write operation if it is $\overline{CE}$1 controlled write at Read-Write-Read sequence.

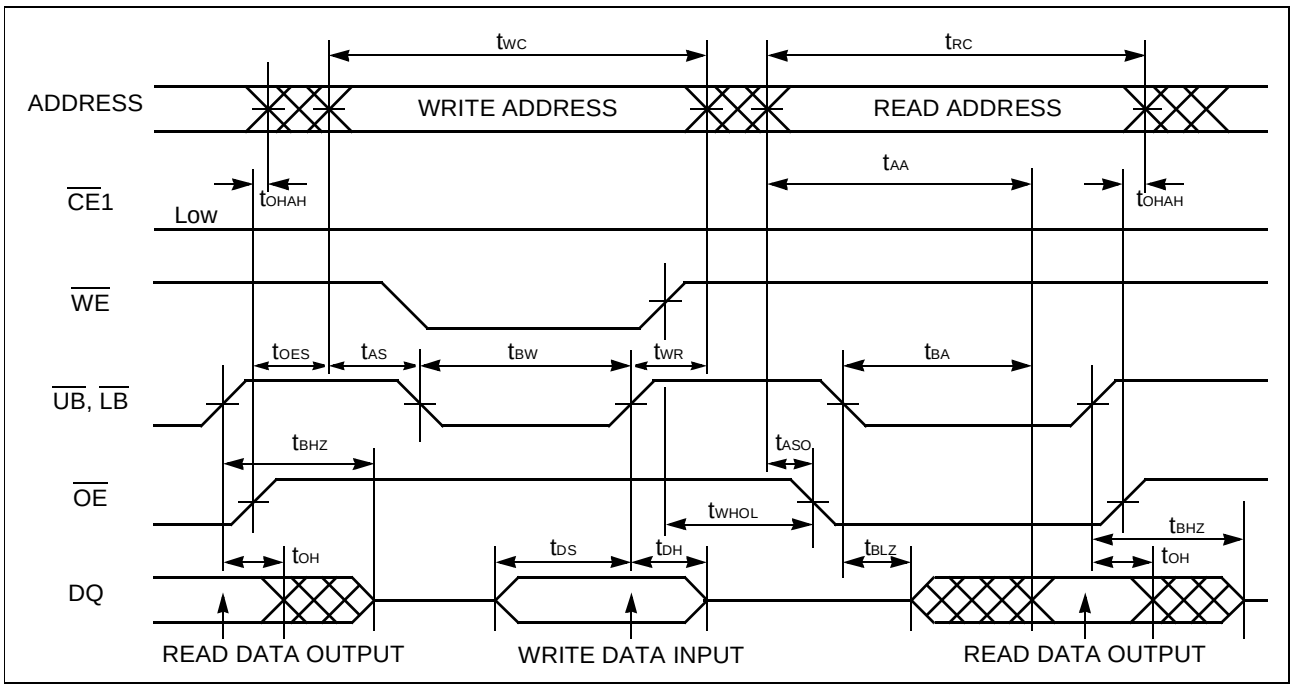
■ TIMING DIAGRAMS (Continued)

READ / WRITE Timing #2 ($\overline{OE}$, $\overline{WE}$ Control) See Note.



Notes *1: This timing diagram assumes CE2=H.
*2: $\overline{CE}$1 can be tied to Low for $\overline{WE}$ and $\overline{OE}$ controlled operation.

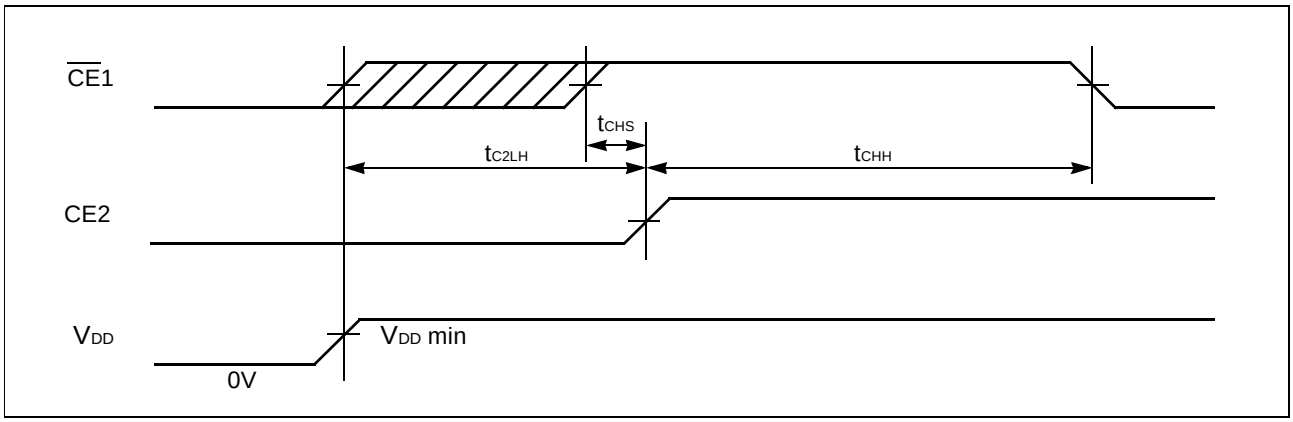
READ / WRITE Timing #3 ($\overline{OE}$, $\overline{WE}$, $\overline{LB}$, $\overline{UB}$ Control) See Note.



Notes *1: This timing diagram assumes CE2=H.
*2: $\overline{CE}$1 can be tied to Low for $\overline{WE}$ and $\overline{OE}$ controlled operation.

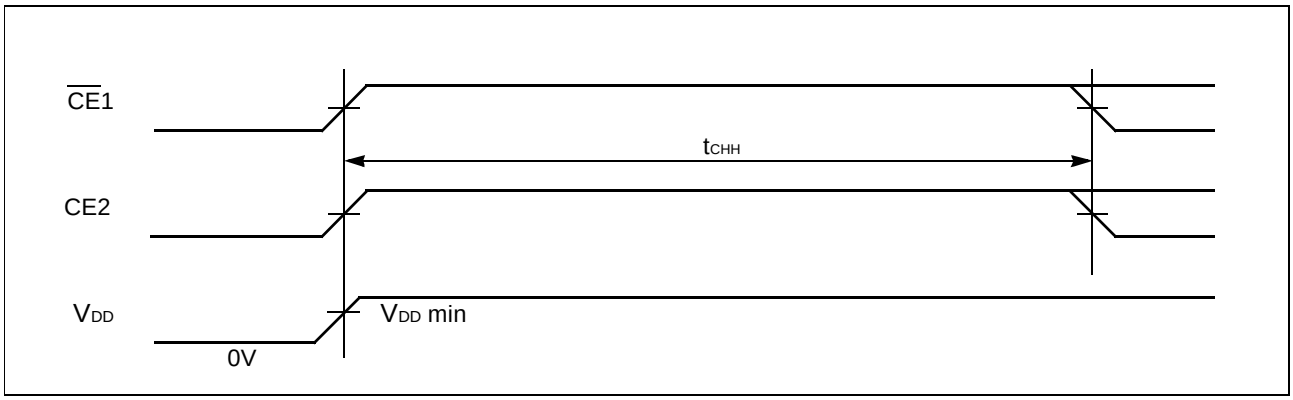
■ TIMING DIAGRAMS (Continued)

POWER-UP Timing #1 See Note.



Note: The t_{C2LH} specifies after V_{DD} reaches specified minimum level.

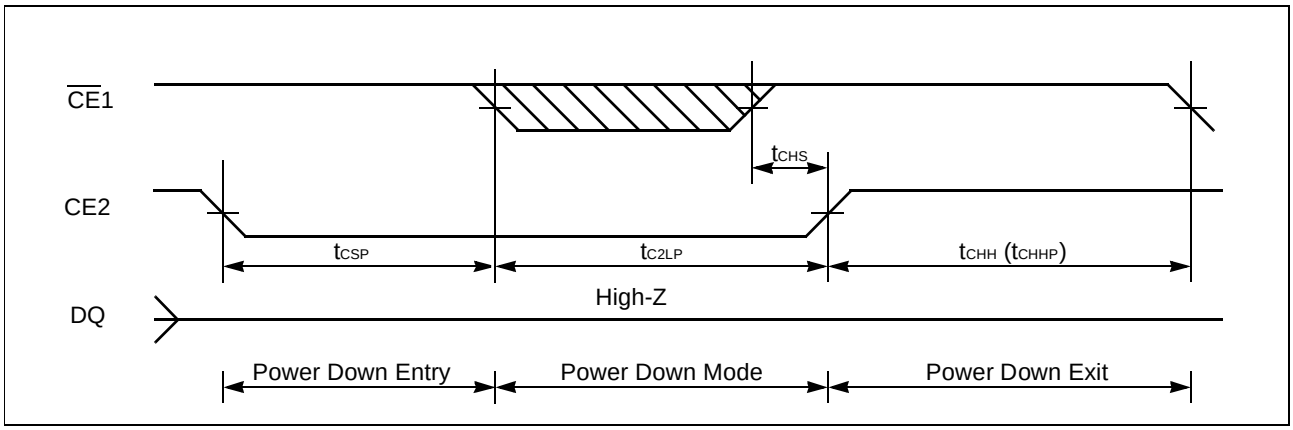
POWER-UP Timing #2 See Note.



Note: The t_{CHH} specifies after V_{DD} reaches specified minimum level and applicable to both $\overline{CE}1$ and CE2.

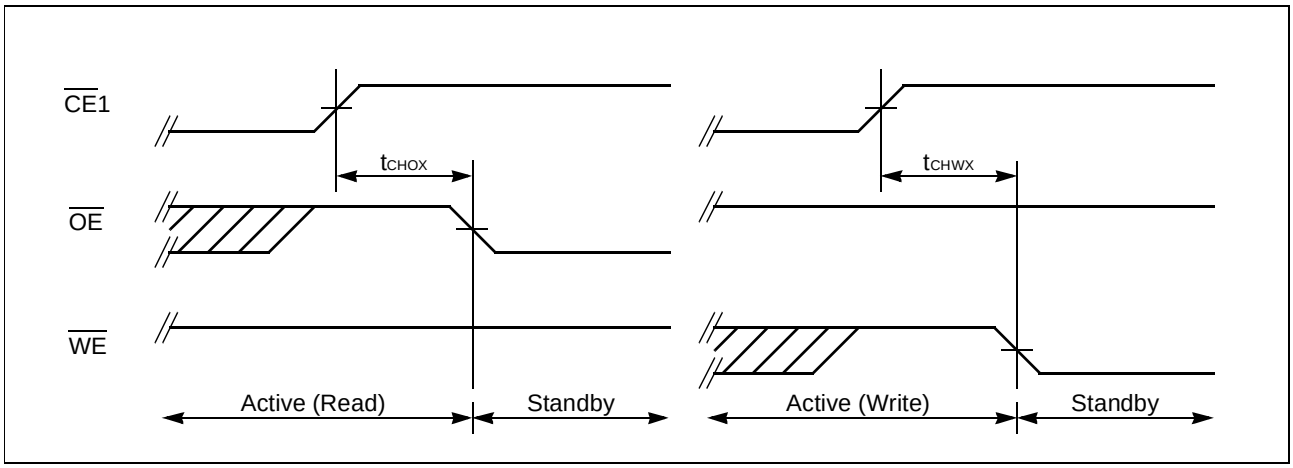
■ TIMING DIAGRAMS (Continued)

POWER DOWN Entry and Exit Timing See Note.



Note: This Power Down mode can be also used as a reset timing if POWER-UP timing above could not be satisfied and Power-Down program was not performed prior to this reset.

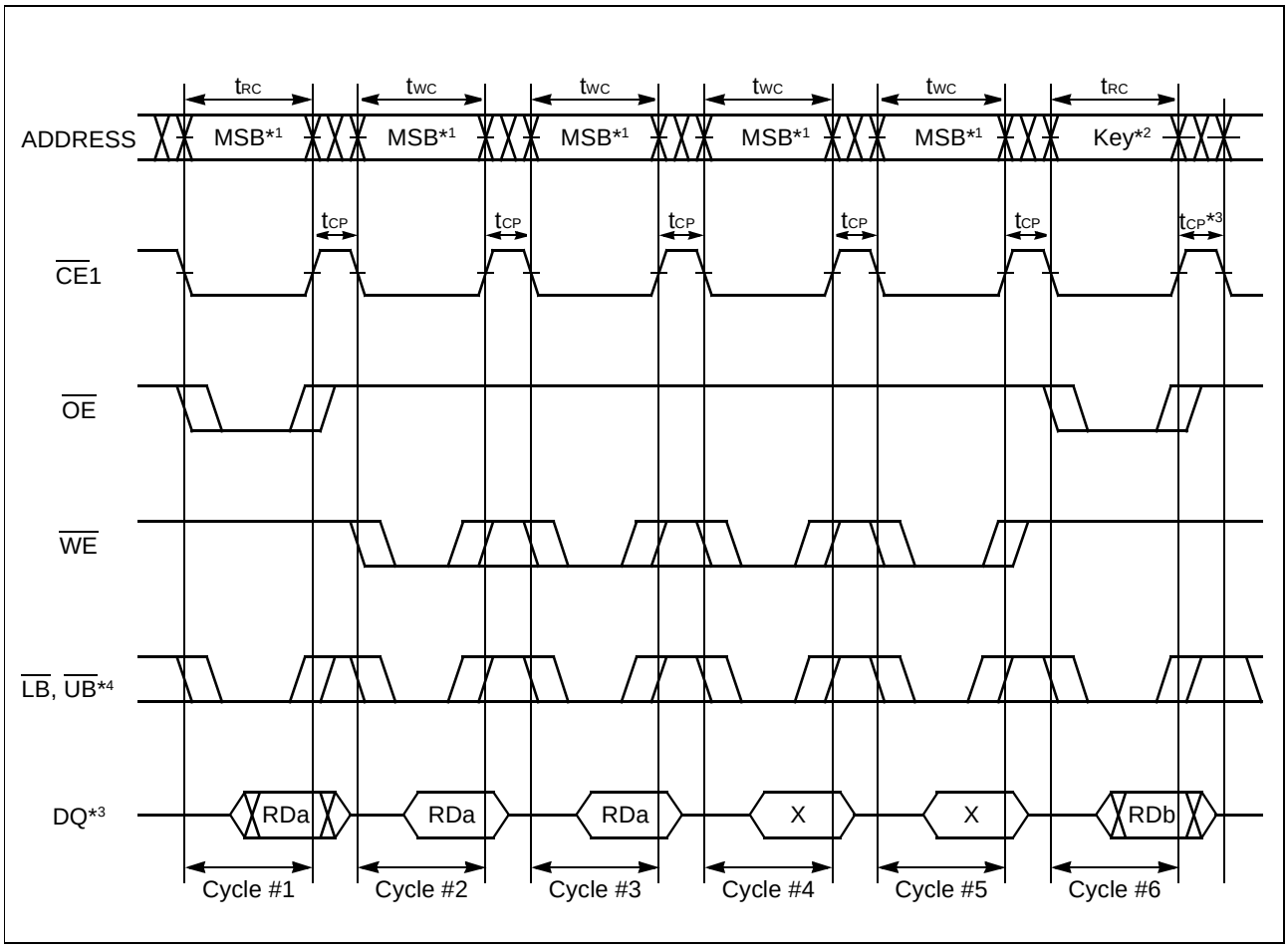
Standby Entry Timing after Read or Write See Note.



Note: Both t_{CHOX} and t_{CHWX} define the earliest entry timing for Standby mode.
If either of timing is not satisfied, it takes t_{RC} (min) period for Standby mode from $\overline{CE}1$ Low to High transition.

■ TIMING DIAGRAMS (Continued)

POWER DOWN PROGRAM Timing See Note.



Notes *1: The all address inputs must be High from Cycle #1 to #5.

*2: The address key must confirm the format specified in page 5. If not, the operation and data are not guaranteed.

*3: After t_{CP} following Cycle #6, the Power Down Program is completed and returned to the normal operation.

*4: Byte read or write is available in addition to Word read or write. At least one byte control signal ($\overline{LB}$ or $\overline{UB}$) need to be Low.

■ PAD LAYOUT

Please contact local FUJITSU representative for pad layout and pad coordinate information.

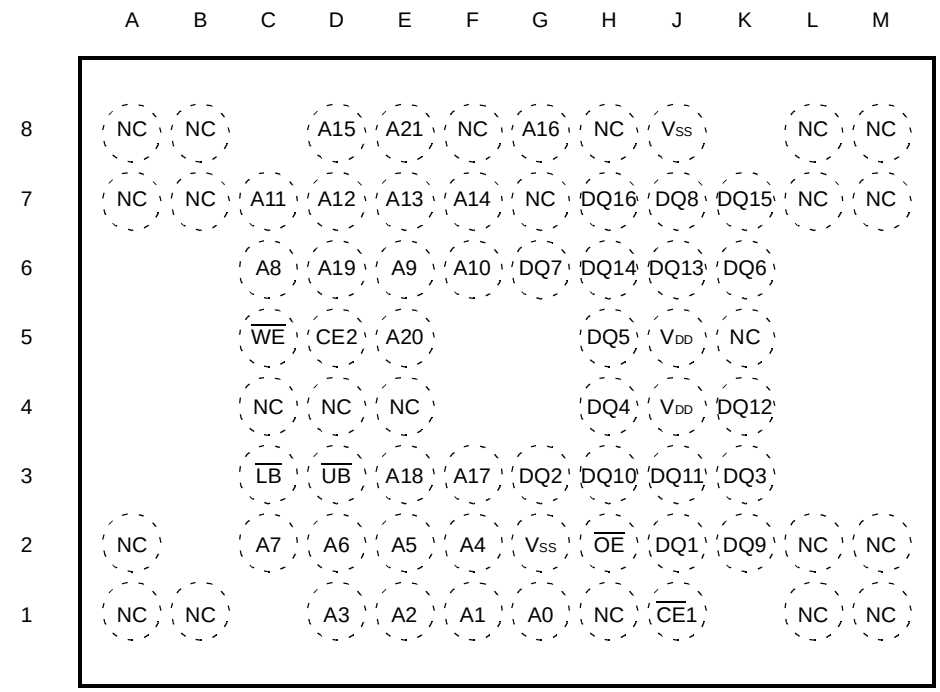
■ PAD DESCRIPTION

Pin Name	Description
A_{21} to A_0	Address Input
$\overline{CE}1$	Chip Enable (Low Active)
CE2	Chip Enable (High Active)
$\overline{WE}$	Write Enable (Low Active)
$\overline{OE}$	Output Enable (Low Active)
$\overline{UB}$	Upper Byte Control (Low Active)
$\overline{LB}$	Lower Byte Control (Low Active)
DQ_{16-9}	Upper Byte Data Input/Output
DQ_{8-1}	Lower Byte Data Input/Output
V_{DD}	Power Supply
V_{SS}	Ground
TEST/OPEN	Test/Open (This pad should be left open. Do not use.)

■ PACKAGE FOR ENGINEERING SAMPLES

Pin Assignment

(TOP VIEW)



(BGA-71P-M03)

Pin Description

Pin Name	Description
A_{21} to A_0	Address Input
$\overline{CE}1$	Chip Enable (Low Active)
CE2	Chip Enable (High Active)
$\overline{WE}$	Write Enable (Low Active)
$\overline{OE}$	Output Enable (Low Active)
$\overline{UB}$	Upper Byte Control (Low Active)
$\overline{LB}$	Lower Byte Control (Low Active)
DQ_{16-9}	Upper Byte Data Input/Output
DQ_{8-1}	Lower Byte Data Input/Output
V_{DD}	Power Supply
V_{SS}	Ground
NC	No Connection

■ PACKAGE FOR ENGINEERING SAMPLES (Continued)

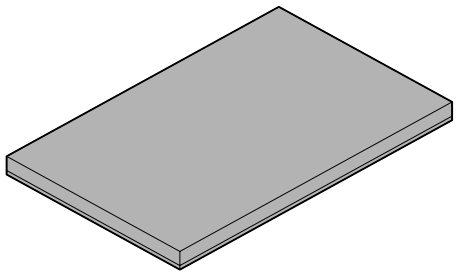
Package Pin Capacitance

Test conditions: T_A = 25°C, f = 1.0 MHz

Symbol	Description	Test Setup	Typ.	Max.	Unit
C_{IN1}	Address Input Capacitance	V_{IN} = 0V	—	5	pF
C_{IN2}	Control Input Capacitance	V_{IN} = 0V	—	5	pF
C_{IO}	Data Input/Output Capacitance	V_{IO} = 0V	—	8	pF

Package View

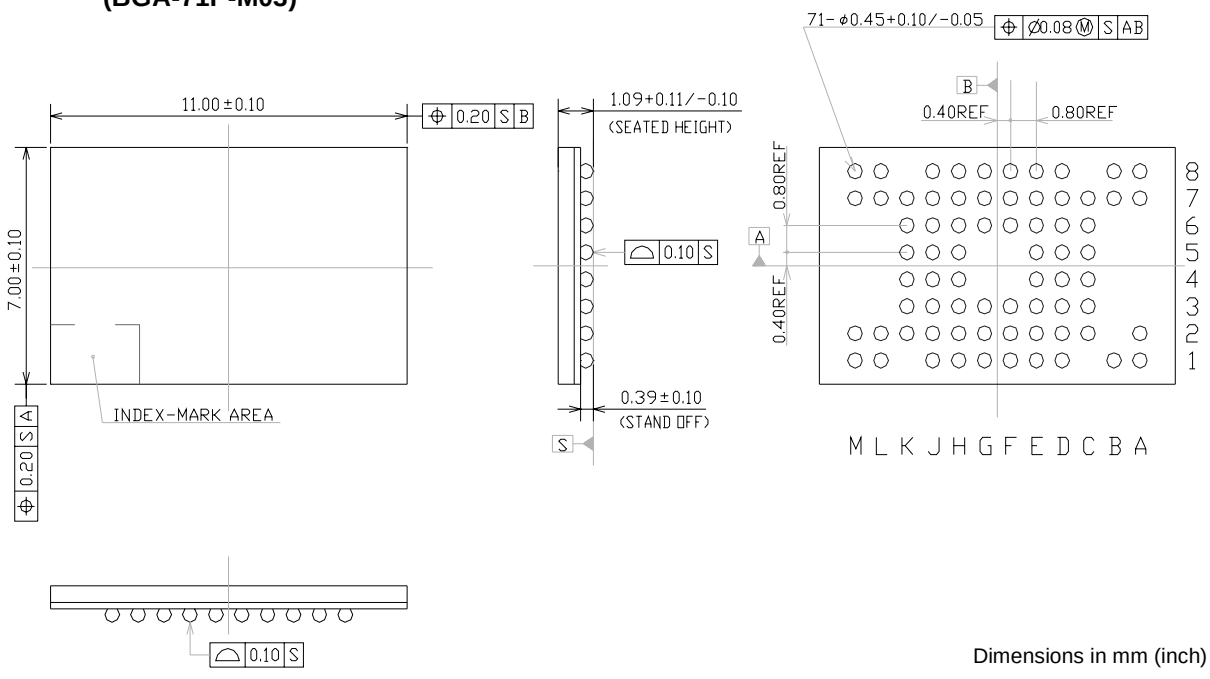
71-pin Plastic FBGA Package



(BGA-71P-M03)

Package Dimentions (Preliminary Drawing)

71-pin plastic FBGA
(BGA-71P-M03)



Dimensions in mm (inch)

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