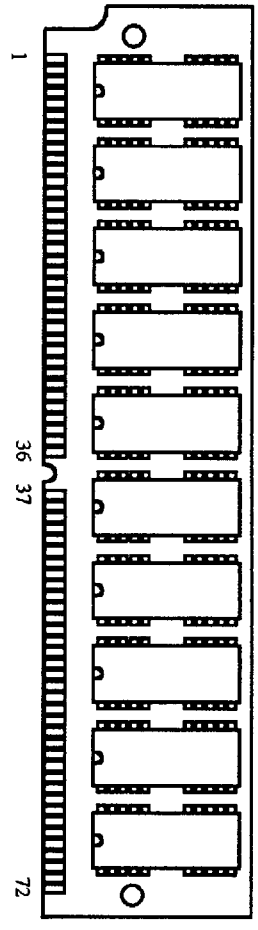
Description

The GMM7402010CS/SG is an 1M x 40 bits Dynamic RAM MODULE which is assembled 20 pieces of 1M x 4 bit EDO DRAMs in 24 (26) pin SOJ package on both side the printed circuit board with decoupling capacitors. The GMM7402010CS/SG is optimized for application to the systems which are required high density and large capacity such as main memory of the computers and an image memory systems, and to the others which are requested compact size. The GMM7402010CS/SG provides common data inputs and Extended Data outputs.

• **GMM7402010CS/SG** (Both Side)



Features

- 72 pins Single In-Line Package
  - GMM7402010CS : Solder plating
  - GMM7402010CSG : Gold plating
- Extended Data Out (EDO) Mode Capability
- Single Power Supply
- Fast Access Time & Cycle Time

(Unit: ns)

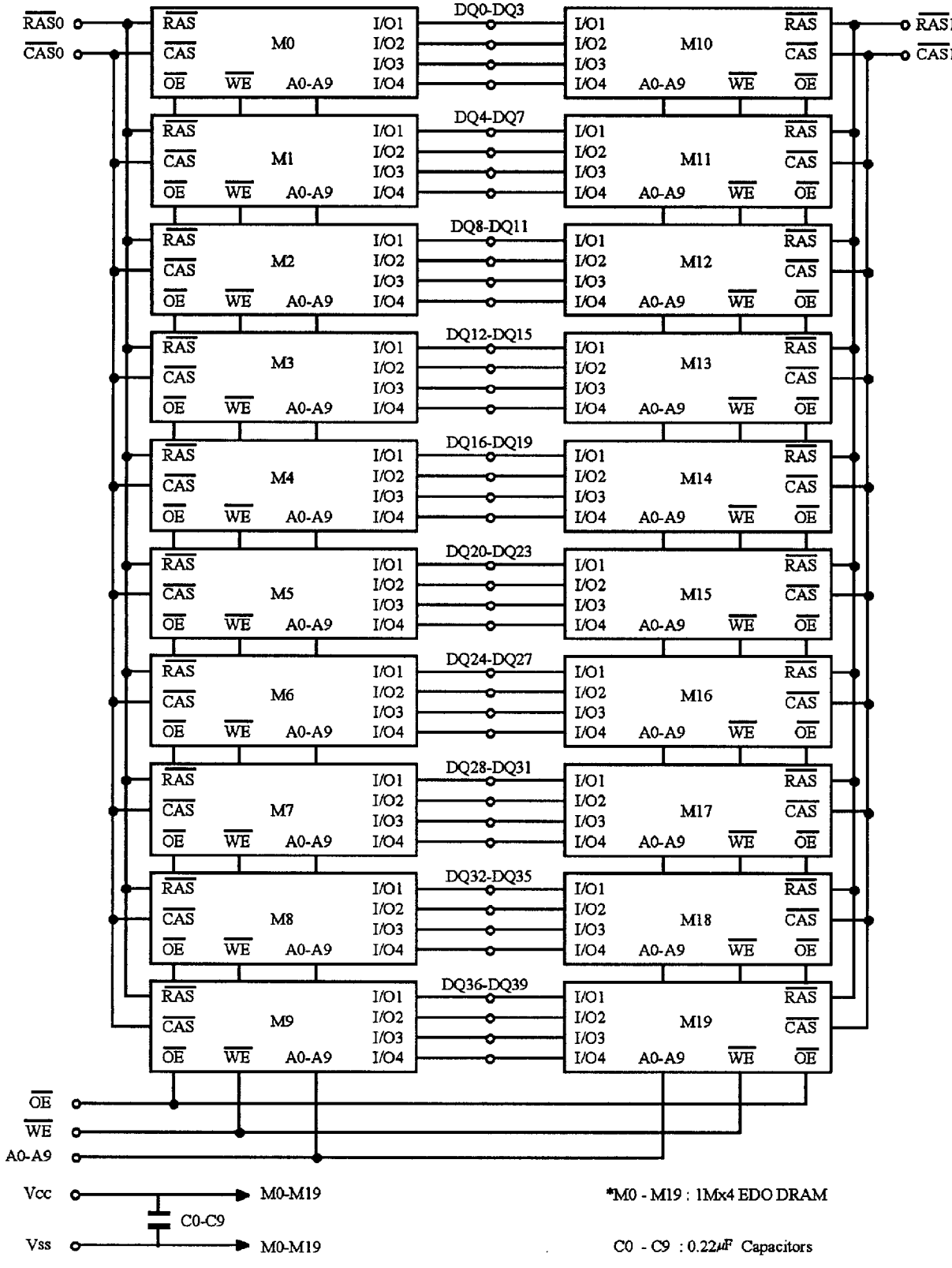
	t_{RAC}	t_{CAC}	t_{RC}	t_{HPC}
GMM7402010CS/SG-60	60	15	104	25
GMM7402010CS/SG-70	70	18	124	30
GMM7402010CS/SG-80	80	20	144	35

- Low Power
  Active : 6,160/5,610/5,060mW (MAX)
  Standby :110mW (CMOS level : MAX)
- $\overline{RAS}$ Only Refresh, $\overline{CAS}$ before $\overline{RAS}$ Refresh, Hidden Refresh Capability
- All inputs and outputs TTL Compatible
- 1024 Refresh Cycles/16ms

Pin Configuration (Top View)

Pin	Symbol	Pin	Symbol	Pin	Symbol	Pin	Symbol
1	V_{SS}	19	$\overline{OE}$	37	DQ_{19}	55	DQ_{28}
2	DQ_0	20	DQ_8	38	DQ_{20}	56	DQ_{29}
3	DQ_1	21	DQ_9	39	V_{SS}	57	DQ_{30}
4	DQ_2	22	DQ_{10}	40	$\overline{CAS_0}$	58	DQ_{31}
5	DQ_3	23	DQ_{11}	41	NC	59	V_{CC}
6	DQ_4	24	DQ_{12}	42	NC	60	DQ_{32}
7	DQ_5	25	DQ_{13}	43	$\overline{CAS_1}$	61	DQ_{33}
8	DQ_6	26	DQ_{14}	44	$\overline{RAS_0}$	62	DQ_{34}
9	DQ_7	27	DQ_{15}	45	$\overline{RAS_1}$	63	DQ_{35}
10	V_{CC}	28	A_7	46	DQ_{21}	64	DQ_{36}
11	NC	29	DQ_{16}	47	$\overline{WE}$	65	DQ_{37}
12	A_0	30	V_{CC}	48	V_{SS}	66	DQ_{38}
13	A_1	31	A_8	49	DQ_{22}	67	PD_1
14	A_2	32	A_9	50	DQ_{23}	68	PD_2
15	A_3	33	NC	51	DQ_{24}	69	PD_3
16	A_4	34	NC	52	DQ_{25}	70	PD_4
17	A_5	35	DQ_{17}	53	DQ_{26}	71	DQ_{39}
18	A_6	36	DQ_{18}	54	DQ_{27}	72	V_{SS}

Block Diagram



Pin Description

Pin	Function	Pin	Function
A0-A9	Address Inputs	PD1-PD4	Presence Detect
DQ0-DQ39	Data Input/Output	$\overline{OE}$	Output Enable
$\overline{RAS0}$, $\overline{RAS1}$	Row Address Strobe	Vcc	Power (+5V)
$\overline{CAS0}$, $\overline{CAS1}$	Column Address Strobe	Vss	Ground
$\overline{WE}$	Read/Write Enable	NC	No Connection

Presence Detect Pins (Optional)

Pin	60ns	70ns	80ns
PD1	NC	NC	NC
PD2	NC	NC	NC
PD3	NC	Vss	NC
PD4	NC	NC	Vss

Absolute Maximum Ratings*[1]

Symbol	Parameter	Rating	Unit
T_A	Ambient Temperature under Bias	0 ~ 70	℃
T_{STG}	Storage Temperature (Plastic)	-55 ~ 125	℃
V_{IN}/V_{OUT}	Voltage on any Pin Relative to Vss	-1.0 ~ 7.0	V
V_{CC}	Power Supply Voltage	-1.0 ~ 7.0	V
I_{OUT}	Short Circuit Output Current	50	mA
P_D	Power Dissipation	20	W

*Note: 1. Stress greater than above "Absolute Maximum Ratings" may cause permanent damage to the device.

Recommended DC Operating Conditions (T_A = 0 ~ 70℃)

Symbol	Parameter	Min	Typ	Max	Unit	Note
V_{CC}	Supply Voltage	4.5	5.0	5.5	V	1
V_{IH}	Input High Voltage	2.4	-	6.5	V	1
V_{IL}	Input Low Voltage	-1.0	-	0.8	V	1

*Note: 1. All voltages referenced to Vss.

DC Electrical Characteristics (V_{CC} = 5V ± 10%, T_A = 0 ~ 70℃)

Symbol	Parameter		Min	Max	Unit	Note
V_{OH}	Output Level Output "H" Level Voltage (I_{OUT} = -5mA)		2.4	V_{CC}	V	
V_{OL}	Output Level Output "L" Level Voltage (I_{OUT} = 4.2mA)		0	0.4	V	
I_{CC1}	Operating Current Average Power Supply Operating Current ($\overline{RAS}$, $\overline{CAS}$, Address Cycling: t_{RC} = t_{RC} min)	60ns	-	1120	mA	1, 2
		70ns	-	1020		
		80ns	-	920		
I_{CC2}	Standby Current (TTL) Power Supply Standby Current ($\overline{RAS}$, $\overline{CAS}$ = V_{IH})		-	40	mA	
I_{CC3}	$\overline{RAS}$ Only Refresh Current Average Power Supply Current $\overline{RAS}$ Only Mode ($\overline{RAS}$ Cycling, $\overline{CAS}$ = V_{IH}, t_{RC} = t_{RC} min)	60ns	-	1120	mA	2
		70ns	-	1020		
		80ns	-	920		
I_{CC4}	Extended Data Out Mode Current Average Power Supply Current EDO Page Mode ($\overline{RAS}$ = V_{IL}, $\overline{CAS}$, Address Cycling: t_{HPC} = t_{HPC} min)	60ns	-	1320	mA	1, 3
		70ns	-	1220		
		80ns	-	1120		
I_{CC5}	Standby Current (CMOS) Power Supply Standby Current ($\overline{RAS}$, $\overline{CAS}$ ≥ V_{CC}-0.2V)		-	20	mA	
I_{CC6}	$\overline{CAS}$ before $\overline{RAS}$ Refresh Current (t_{RC} = t_{RC} min)	60ns	-	1120	mA	
		70ns	-	1020		
		80ns	-	920		
I_{CC7}	Standby Current $\overline{RAS}$ = V_{IH} $\overline{CAS}$ = V_{IL} D_{OUT} = Enable		-	100	mA	1
$I_{I(L)}$	Input Leakage Current Any Input (0V ≤ V_{IN} ≤ 7V) All Other Pins Not Under Test = 0V		-200	200	μA	
$I_{O(L)}$	Output Leakage Current (D_{OUT} is Disabled, 0V ≤ V_{OUT} ≤ 7V)		-20	20	μA	

Note: 1. I_{CC} depends on output load condition when the device is selected. I_{CC}(max) is specified at the output open condition.
2. Address can be changed once or less while $\overline{RAS}$ = V_{IL}.
3. Address can be changed once or less while $\overline{CAS}$ = V_{IH}.

Capacitance (V_{CC} = 5V ± 10%, T_A = 25°C, f = 1MHz)

Symbol	Parameter	Min	Max	Unit	Note
C_{I1}	Input Capacitance (A0~A9)	-	130	pF	1
C_{I2}	Input Capacitance ($\overline{WE}$, $\overline{OE}$)	-	160	pF	1, 2
C_{I3}	Input Capacitance ($\overline{RAS0}$, $\overline{RAS1}$)	-	90	pF	1, 2
C_{I4}	Input Capacitance ($\overline{CAS0}$, $\overline{CAS1}$)	-	90	pF	1, 2
$C_{I/O}$	I/O Capacitance (DQ0~DQ39)	-	25	pF	1, 2

Note: 1. Capacitance measured with Boonton Meter or effective capacitance measuring method.
2. $\overline{CAS}$ = V_{IH} to disable D_{OUT}.

AC Electrical Characteristics (V_{CC} = 5V ± 10%, T_A = 0 ~ 70°C, Notes 1, 15)

The GMM7402010CS/SG writes data only in early write cycle (twcs ≥ twcs(min)).
Delayed write cycle is not available because of I/O common.

Read, Write and Refresh Cycle (Common Parameters)

Symbol	Parameter	GMM7402010 CS/SG-60		GMM7402010 CS/SG-70		GMM7402010 CS/SG-80		Unit	Note
		Min	Max	Min	Max	Min	Max		
t_{RC}	Random Read or Write Cycle Time	104	-	124	-	144	-	ns	
t_{RP}	$\overline{RAS}$ Precharge Time	40	-	50	-	60	-	ns	
t_{CP}	$\overline{CAS}$ Precharge Time	10	-	13	-	15	-	ns	
t_{RAS}	$\overline{RAS}$ Pulse Width	60	10,000	70	10,000	80	10,000	ns	
t_{CAS}	$\overline{CAS}$ Pulse Width	10	10,000	13	10,000	15	10,000	ns	
t_{ASR}	Row Address Setup Time	0	-	0	-	0	-	ns	
t_{RAH}	Row Address Hold Time	10	-	10	-	10	-	ns	
t_{ASC}	Column Address Setup Time	0	-	0	-	0	-	ns	
t_{CAH}	Column Address Hold Time	10	-	13	-	15	-	ns	
t_{RCD}	$\overline{RAS}$ to $\overline{CAS}$ Delay Time	20	45	20	52	20	60	ns	9
t_{RAD}	$\overline{RAS}$ to Column Address Delay Time	15	30	15	35	15	40	ns	10
t_{RSH}	$\overline{RAS}$ Hold Time	15	-	18	-	20	-	ns	
t_{CSH}	$\overline{CAS}$ Hold Time	48	-	58	-	68	-	ns	
t_{CRP}	$\overline{CAS}$ to $\overline{RAS}$ Precharge Time	10	-	10	-	10	-	ns	
t_{ODD}	$\overline{OE}$ to D_{IN} Delay Time	15	-	18	-	20	-	ns	
t_{DZO}	$\overline{OE}$ Delay Time from D_{IN}	0	-	0	-	0	-	ns	
t_{DZC}	$\overline{CAS}$ Setup Time from D_{IN}	0	-	0	-	0	-	ns	
t_T	Transition Time (Rise and Fall)	2	50	2	50	2	50	ns	8
t_{REF}	Refresh Period	-	16	-	16	-	16	ms	

Read Cycle

Symbol	Parameter	GMM7402010 CS/SG-6		GMM7402010 CS/SG-7		GMM7402010 CS/SG-8		Unit	Note
		Min	Max	Min	Max	Min	Max		
t_{RAC}	Access Time from $\overline{RAS}$	-	60	-	70	-	80	ns	2, 3
t_{CAC}	Access Time from $\overline{CAS}$	-	15	-	18	-	20	ns	3, 4
t_{AA}	Access Time from Column Address	-	30	-	35	-	40	ns	3, 5
t_{OAC}	Access Time from $\overline{OE}$	-	15	-	18	-	20	ns	3
t_{RCS}	Read Command Setup Time	0	-	0	-	0	-	ns	
t_{RCH}	Read Command Hold Time to $\overline{CAS}$	0	-	0	-	0	-	ns	6
t_{RRH}	Read Command Hold Time to $\overline{RAS}$	0	-	0	-	0	-	ns	6
t_{RAL}	Column Address to $\overline{RAS}$ Lead Time	30	-	35	-	40	-	ns	
t_{CLZ}	$\overline{CAS}$ to Output in low-Z	0	-	0	-	0	-	ns	
t_{OH}	Output Data Hold Time	3	-	3	-	3	-	ns	
t_{OHO}	Output Data Hold Time from $\overline{OE}$	3	-	3	-	3	-	ns	
t_{OEZ}	Output Buffer Turn-off Time to $\overline{OE}$	-	15	-	15	-	15	ns	7
t_{OFF}	Output Buffer Turn-off Time	-	15	-	15	-	15	ns	7
t_{CDD}	$\overline{CAS}$ to D_{IN} Delay Time	15	-	18	-	20	-	ns	
t_{CAL}	Column Address to $\overline{CAS}$ Lead Time	18	-	23	-	28	-	ns	
t_{OFR}	Output Buffer Turn-off Time to $\overline{RAS}$	-	15	-	15	-	15	ns	7,16

Write Cycle

Symbol	Parameter	GMM7402010 CS/SG-6		GMM7402010 CS/SG-7		GMM7402010 CS/SG-8		Unit	Note
		Min	Max	Min	Max	Min	Max		
t_{WCS}	Write Command Setup Time	0	-	0	-	0	-	ns	11
t_{WCH}	Write Command Hold Time	10	-	13	-	15	-	ns	
t_{WP}	Write Command Pulse Width	10	-	10	-	10	-	ns	
t_{RWL}	Write Command to $\overline{RAS}$ Lead Time	10	-	13	-	15	-	ns	
t_{CWL}	Write Command to $\overline{CAS}$ Lead Time	10	-	13	-	15	-	ns	
t_{DS}	Data-in Setup Time	0	-	0	-	0	-	ns	12
t_{DH}	Data-in Hold Time	10	-	13	-	15	-	ns	12

Refresh Cycle

Symbol	Parameter	GMM7402010 CS/SG-60		GMM7402010 CS/SG-70		GMM7402010 CS/SG-80		Unit	Note
		Min	Max	Min	Max	Min	Max		
t_{CSR}	$\overline{CAS}$ Set-up Time ($\overline{CAS}$-before-$\overline{RAS}$ Refresh Cycle)	10	-	10	-	10	-	ns	
t_{CHR}	$\overline{CAS}$ Hold Time ($\overline{CAS}$-before-$\overline{RAS}$ Refresh Cycle)	10	-	10	-	10	-	ns	
t_{RPC}	$\overline{RAS}$ Precharge to $\overline{CAS}$ Hold Time	10	-	10	-	10	-	ns	
t_{WRP}	$\overline{WE}$ Set-up Time ($\overline{CAS}$-before-$\overline{RAS}$ Refresh Cycle)	0	-	0	-	0	-	ns	
t_{WRH}	$\overline{WE}$ Hold Time ($\overline{CAS}$-before-$\overline{RAS}$ Refresh Cycle)	10	-	10	-	10	-	ns	

Extended Data Out (EDO) Mode Cycle

Symbol	Parameter	GMM7402010 CS/SG-6		GMM7402010 CS/SG-7		GMM7402010 CS/SG-8		Unit	Note
		Min	Max	Min	Max	Min	Max		
t_{HPC}	EDO Mode Cycle Time	25	-	30	-	35	-	ns	
t_{CP}	EDO Mode $\overline{CAS}$ Precharge Time	10	-	13	-	15	-	ns	
t_{RASP}	EDO Mode $\overline{RAS}$ Pulse Width	-	100,000	-	100,000	-	100,000	ns	13
t_{ACP}	Access Time from $\overline{CAS}$ Precharge	-	35	-	40	-	45	ns	3,14
t_{RHCP}	$\overline{RAS}$ Hold Time from $\overline{CAS}$ Precharge	35	-	40	-	45	-	ns	
t_{RCHP}	Read Command Hold Time from $\overline{CAS}$ Precharge	35	-	40	-	45	-	ns	
t_{DOH}	Output Data Hold Time from $\overline{CAS}$ Low	3	-	3	-	3	-	ns	

Notes:

1. AC measurements assume $t_T = 2ns$.
2. Assumes that $t_{RCD} \leq t_{RCD}(max)$ and $t_{RAD} \leq t_{RAD}(max)$. If t_{RCD} or t_{RAD} is greater than the maximum recommended value shown in this table, t_{RAC} exceeds the value shown.
3. Measured with a load circuit equivalent to 1TTL loads and 100pF.
4. Assumes that $t_{RCD} \geq t_{RCD}(max)$ and $t_{RAD} \leq t_{RAD}(max)$.
5. Assumes that $t_{RCD} \leq t_{RCD}(max)$ and $t_{RAD} \geq t_{RAD}(max)$.
6. Either t_{RCD} or t_{RRH} must be satisfied for a read cycles.
7. $t_{OFF}(max)$ defines the time at which the outputs achieve the open circuit condition and is not referenced to output voltage levels.
8. $V_{IH}(min)$ and $V_{IL}(max)$ are reference levels for measuring timing of input signals. Also, transition times are measured between V_{IH} and V_{IL}.
9. Operation with the $t_{RCD}(max)$ limit insures that $t_{RAC}(max)$ can be met, $t_{RCD}(max)$ is specified as a reference point only, if t_{RCD} is greater than the specified $t_{RCD}(max)$ limit, then access time is controlled exclusively be t_{CAC}.
10. Operation with the $t_{RAD}(max)$ limit insures that $t_{RAC}(max)$ can be met, $t_{RAD}(max)$ is specified as a reference point only, if t_{RAD} is greater than the specified $t_{RAD}(max)$ limit, then access time is controlled exclusively by t_{AA}.
11. t_{WCS} is not restrictive operating parameter. It is included in the data sheet as electrical characteristics only; If $t_{WCS} \geq wcs(min)$, the cycle is an early write cycle and the data out pin will remain open circuit (high impedance) throughout the entire cycle.
12. These parameters are referenced to $\overline{CAS}$ leading edge in early write cycles.
13. t_{RASP} is defines $\overline{RAS}$ pulse width in Fast Page Mode cycles.
14. Access time is determined by the longer of t_{AA} or t_{CAC} or t_{ACP}.
15. An initial pause of 200μs is required after power up followed by a minimum of eight initialization cycles (any combination of cycles containing $\overline{RAS}$ clock such as $\overline{RAS}$ only refresh). If the internal refresh counter is used, a minimum of eight $\overline{CAS}$ before $\overline{RAS}$ refresh cycles are required.
16. t_{OFF} and t_{OFR} are determined by the later rising edge of $\overline{RAS}$ or $\overline{CAS}$.

Timing Waveforms

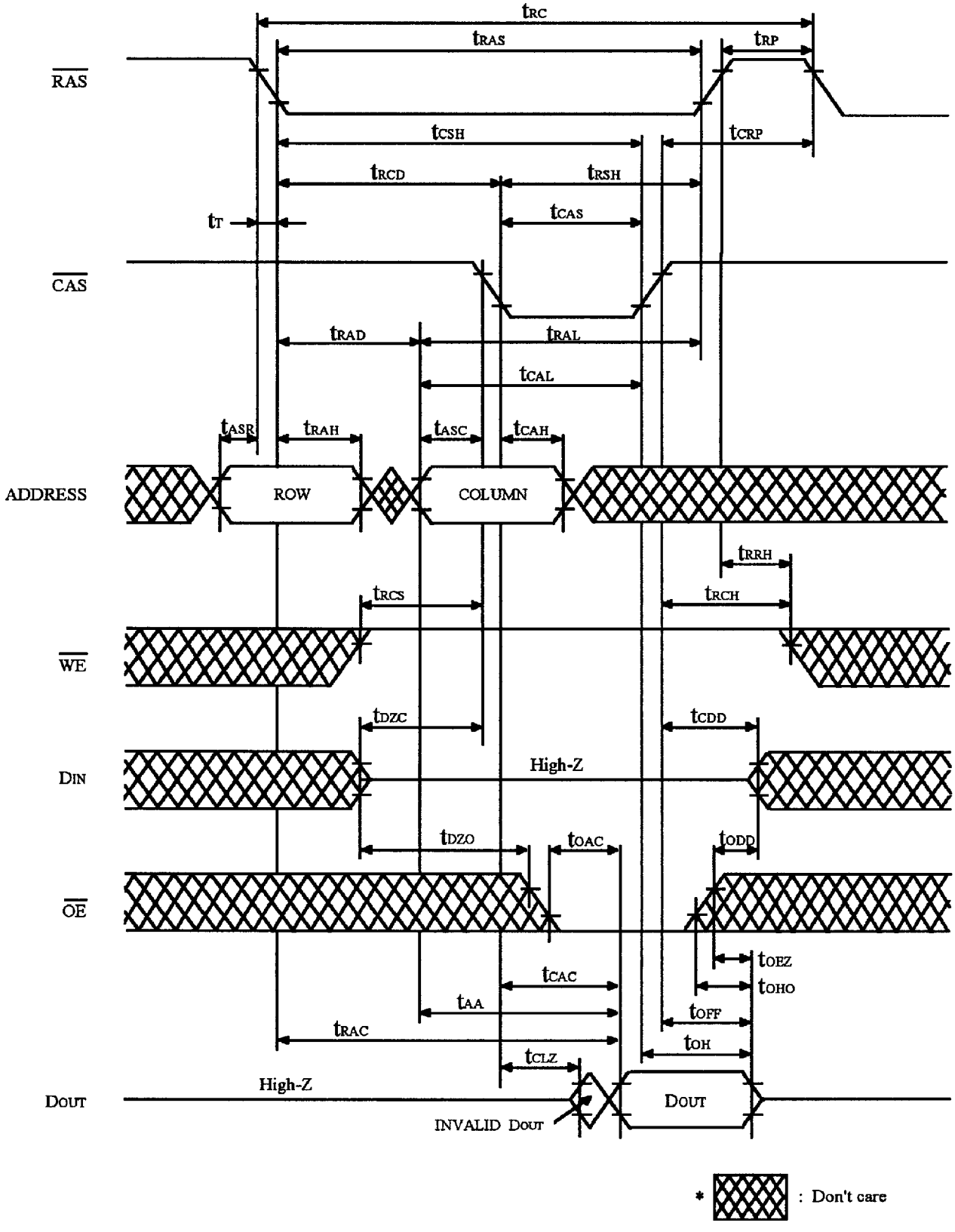


FIGURE 1. READ CYCLE

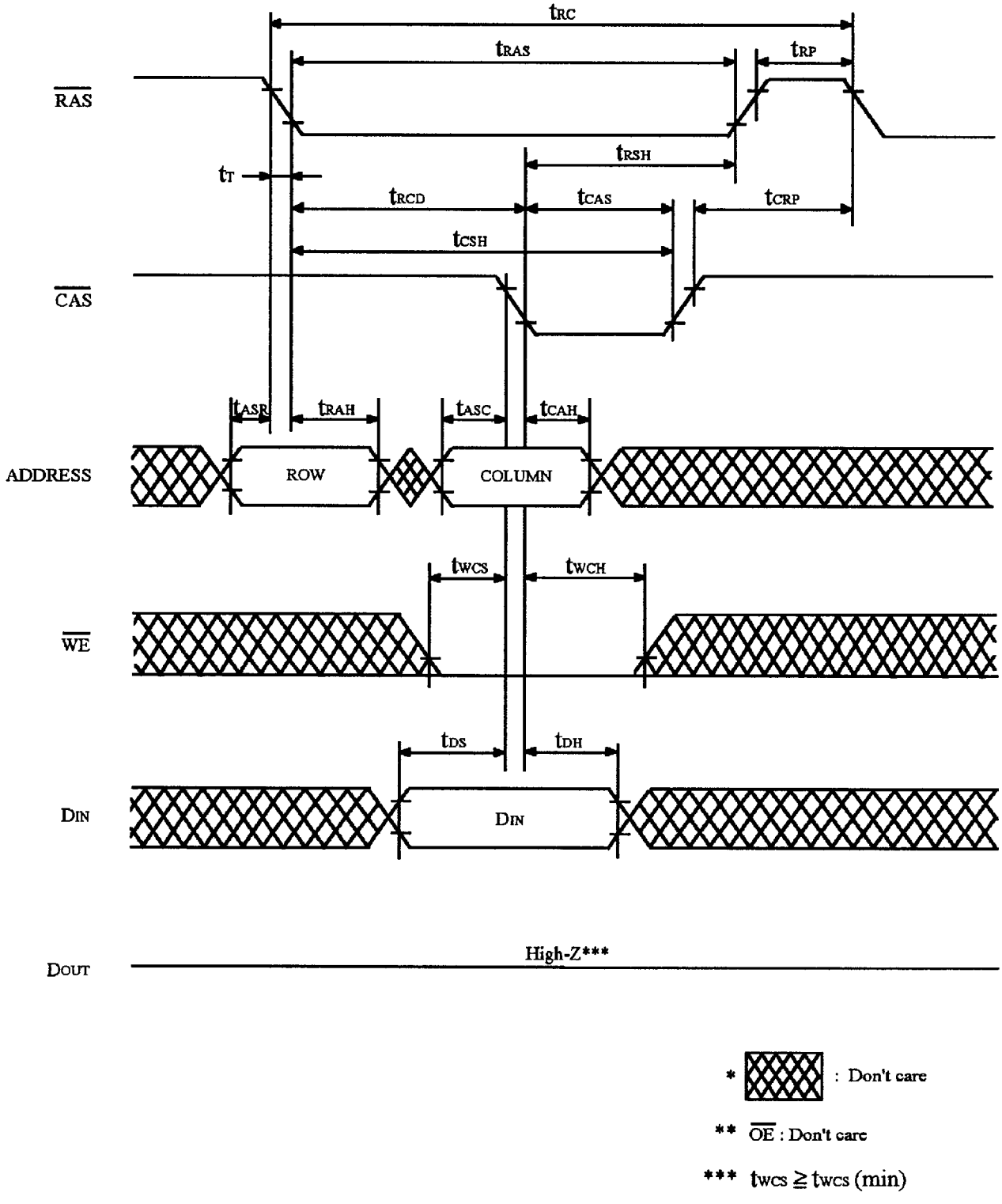
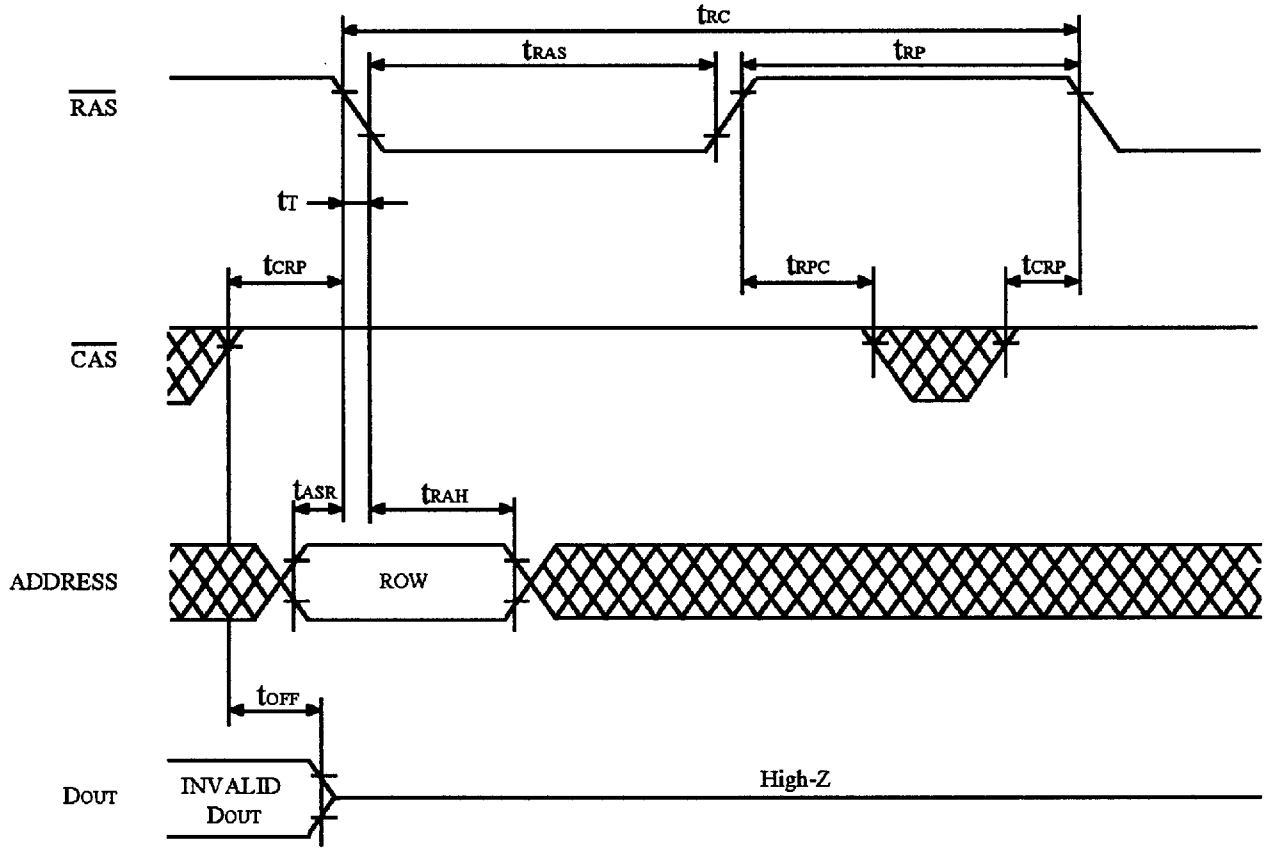


FIGURE 2. EARLY WRITE CYCLE



* : Don't care

** $\overline{OE}$, $\overline{WE}$: Don't care

*** Refresh Address : A0 - A9 (RA0 - RA9)

FIGURE 3. $\overline{RAS}$ ONLY REFRESH CYCLE

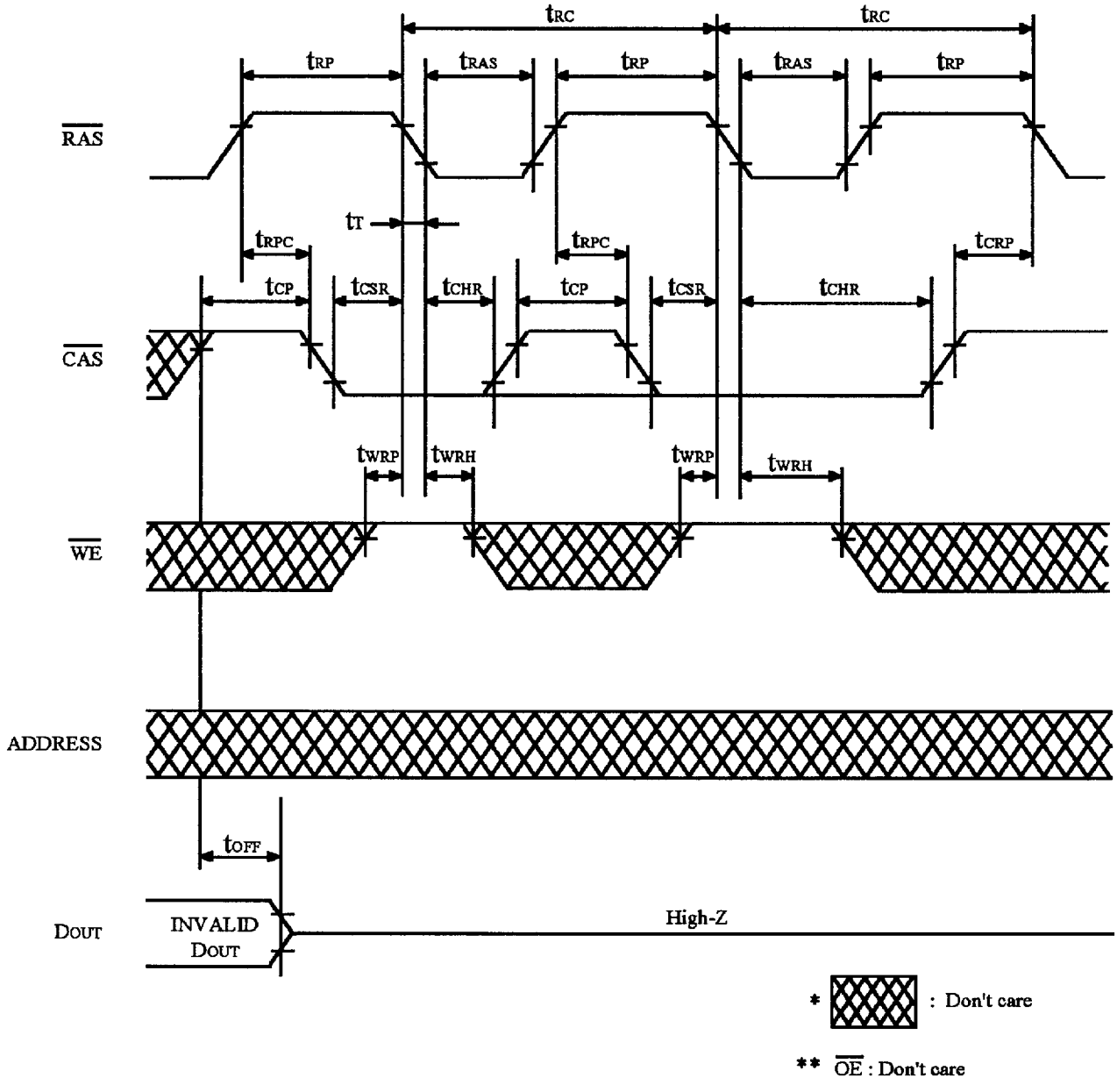


FIGURE 4. $\overline{CAS}$ BEFORE $\overline{RAS}$ REFRESH CYCLE

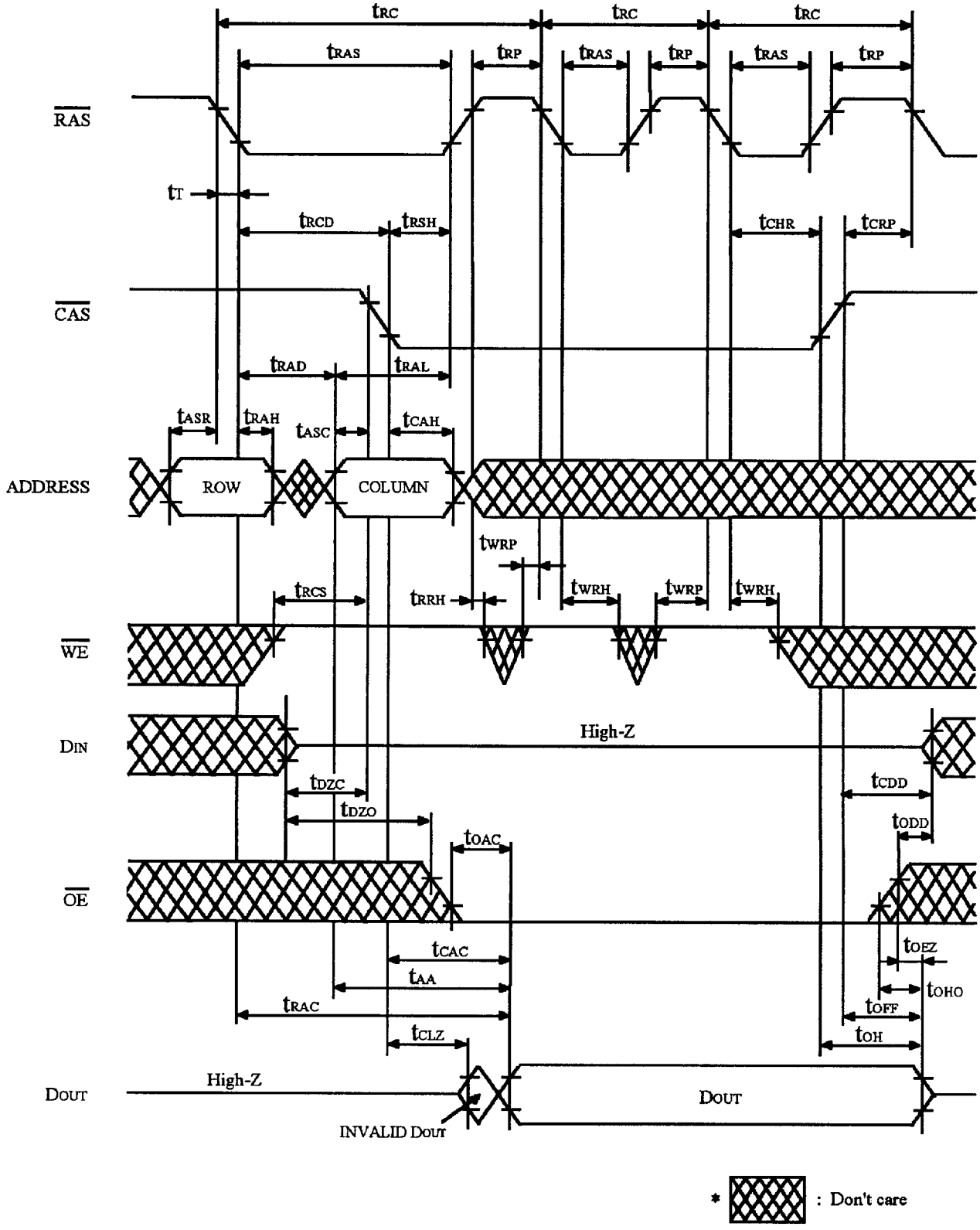


FIGURE 5. HIDDEN REFRESH CYCLE

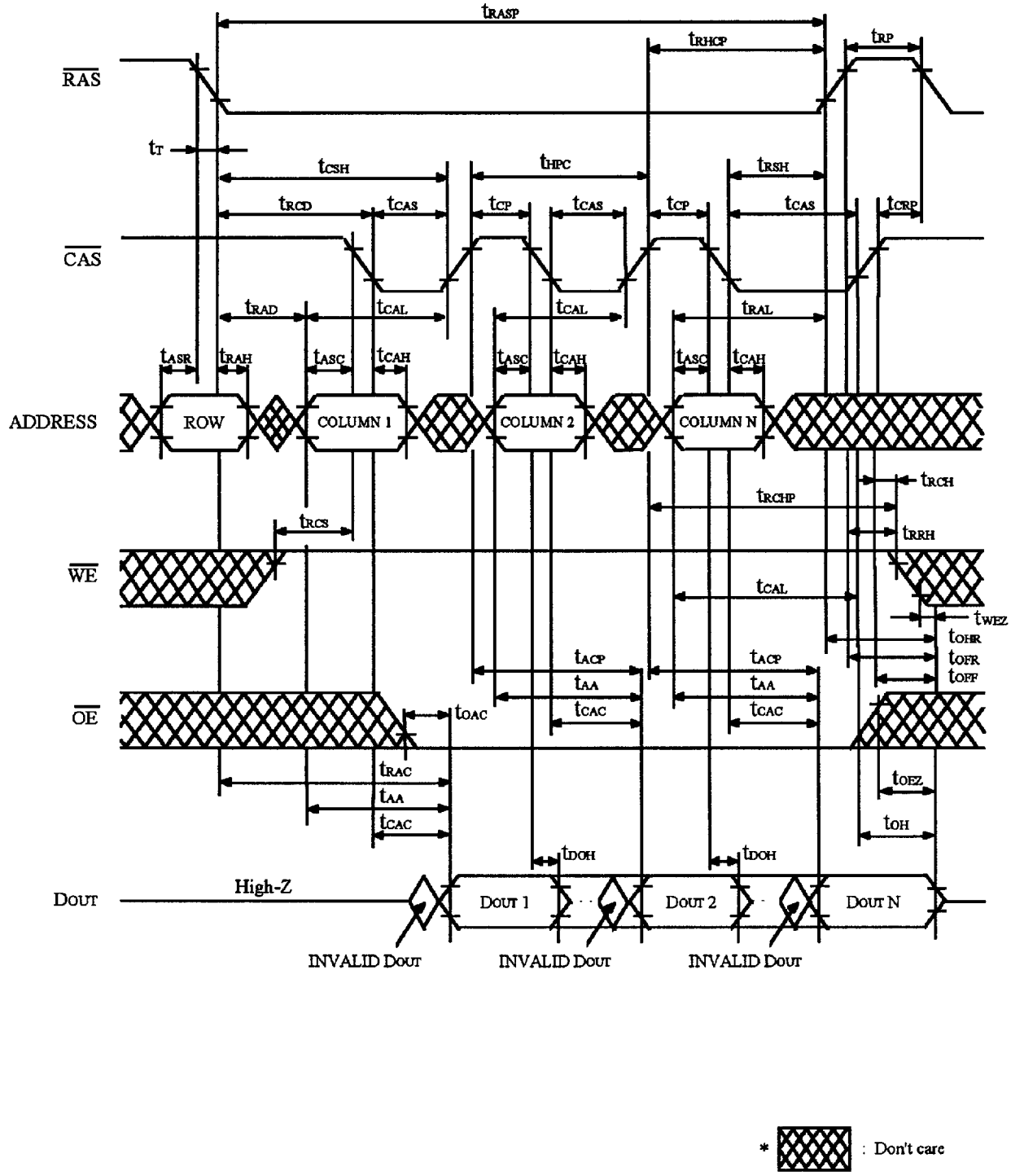


FIGURE 6. EXTENDED DATA OUT MODE READ CYCLE

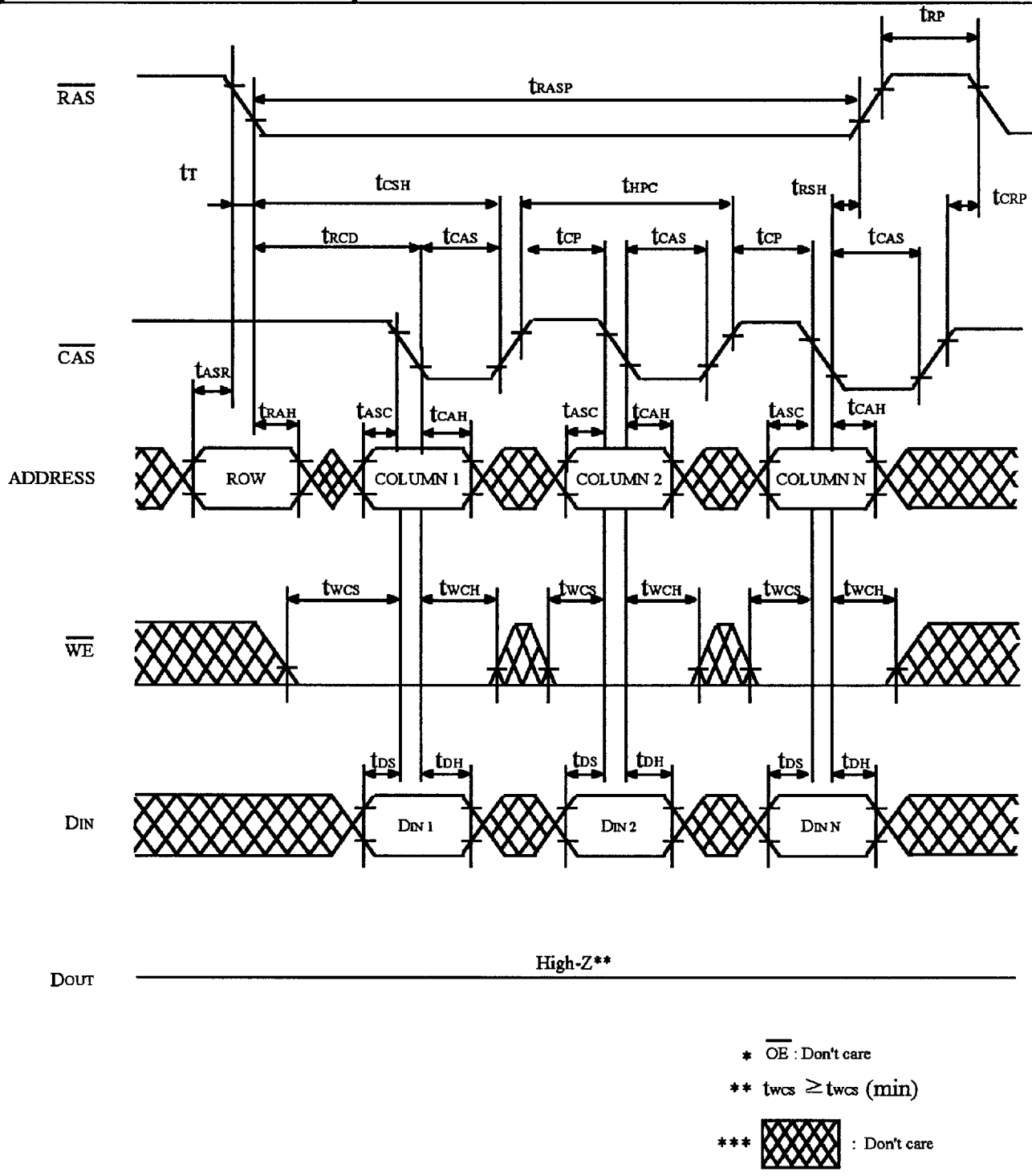
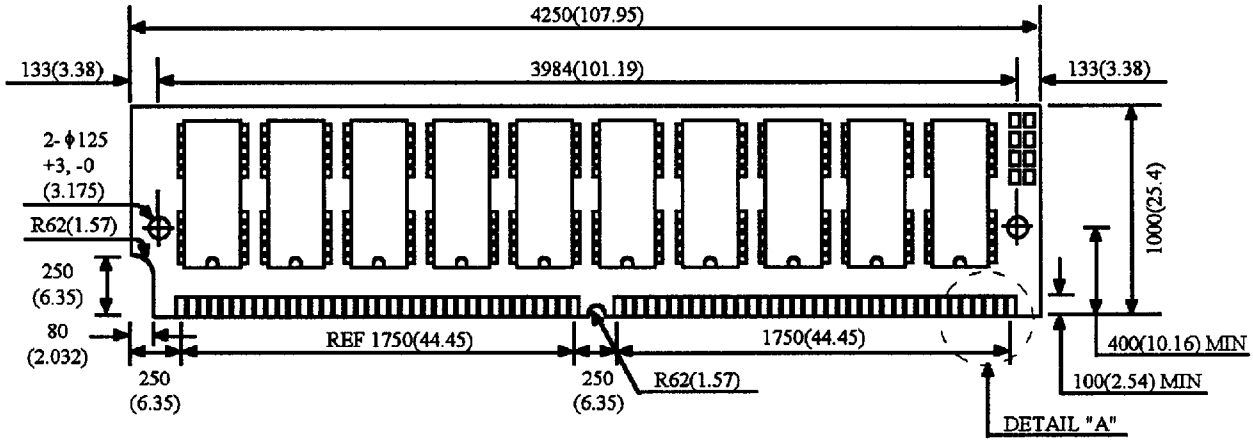


FIGURE 7. EXTENDED DATA OUT MODE EARLY WRITE CYCLE

Package Dimensions

Unit: mil (mm)
* (1mil = 1/1000 inches)

FRONT



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