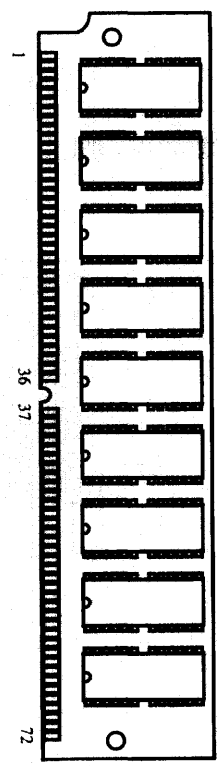
Description

The GMM7374100CNS/SG is a 4M x 36 bits Dynamic RAM MODULE which is assembled 9 pieces of 4M x 4bit DRAMs in 24 (26) pin SOJ package on the printed circuit board with decoupling capacitors. The GMM7374100CNS/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 GMM7374100CNS/SG provides common data inputs and outputs.

- **GMM7374100CNS/SG** (Single Side)



Features

- 72 pins Single In-Line Package
  - GMM7374100CNS : Solder plating
  - GMM7374100CNSG : Gold plating
- Fast Page Mode Capability
- Single Power Supply
- Fast Access Time & Cycle Time

(Unit: ns)

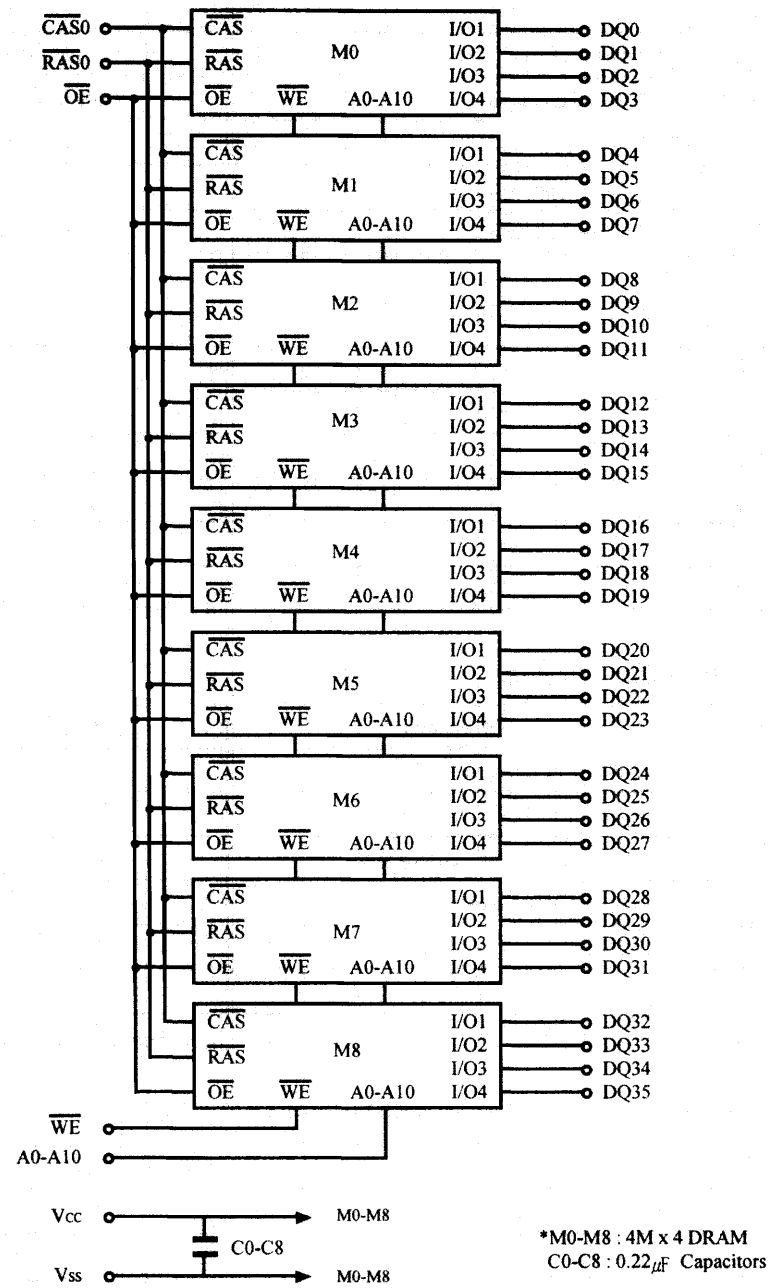
	t_{RAC}	t_{CAC}	t_{RC}	t_{PC}
GMM7374100CNS/SG-6	60	15	110	40
GMM7374100CNS/SG-7	70	18	130	45
GMM7374100CNS/SG-8	80	20	150	50

- Low Power
  Active : 5,445/4,950/4,455mW (MAX)
  Standby : 49.5mW (CMOS level : MAX)
- $\overline{RAS}$ Only Refresh, $\overline{CAS}$ before $\overline{RAS}$ Refresh, Hidden Refresh Capability
- All inputs and outputs TTL Compatible
- 2048 Refresh Cycles/32ms

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	A_{10}	59	V_{CC}
6	DQ_4	24	DQ_{12}	42	NC	60	DQ_{32}
7	DQ_5	25	DQ_{13}	43	NC	61	DQ_{33}
8	DQ_6	26	DQ_{14}	44	$\overline{RAS_0}$	62	DQ_{34}
9	DQ_7	27	DQ_{15}	45	NC	63	DQ_{35}
10	V_{CC}	28	A_7	46	DQ_{21}	64	NC
11	PD_5	29	DQ_{16}	47	$\overline{WE}$	65	NC
12	A_0	30	V_{CC}	48	V_{SS}	66	NC
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	NC
18	A_6	36	DQ_{18}	54	DQ_{27}	72	V_{SS}

Block Diagram



*M0-M8 : 4M x 4 DRAM
C0-C8 : 0.22μF Capacitors

Pin Description

Pin	Function	Pin	Function
A0-A10	Address Inputs	PD1-PD5	Presence Detect
DQ0-DQ35	Data Input/Output	$\overline{OE}$	Output Enable
$\overline{RAS0}$	Row Address Strobe	Vcc	Power (+5V)
$\overline{CAS0}$	Column Address Strobe	Vss	Ground
$\overline{WE}$	Read/Write Enable	NC	No Connection

Presence Detect Pins (Optional)

Pin	60ns	70ns	80ns
PD1	Vss	Vss	Vss
PD2	NC	NC	NC
PD3	NC	Vss	NC
PD4	NC	NC	Vss
PD5	Vss	Vss	Vss

Absolute Maximum Ratings*

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	9.0	W

*Note: 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
V_{CC}	Supply Voltage	4.5	5.0	5.5	V
V_{IH}	Input High Voltage	2.4	-	6.5	V
V_{IL}	Input Low Voltage	-1.0	-	0.8	V

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

Symbol	Parameter		Min	Max	Unit	Note
V_{OH}	Output Level Output 밒 □Level Voltage (I_{OUT} = -5mA)		2.4	V_{CC}	V	
V_{OL}	Output Level Output 밠 □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	-	990	mA	1, 2
		70ns	-	900		
		80ns	-	810		
I_{CC2}	Standby Current (TTL) Power Supply Standby Current ($\overline{RAS}$, $\overline{CAS}$ = V_{IH})		-	18	mA	
I_{CC3}	$\overline{RAS}$ Only Refresh Current Average Power Supply Current $\overline{RAS}$ Only Refresh Mode ($\overline{RAS}$ Cycling, $\overline{CAS}$ = V_{IH}, t_{RC} = t_{RC} min)	60ns	-	990	mA	2
		70ns	-	900		
		80ns	-	810		
I_{CC4}	Fast Page Mode Current Average Power Supply Current Fast Page Mode ($\overline{RAS}$ = V_{IL}, $\overline{CAS}$, Address Cycling: t_{PC} = t_{PC} min)	60ns	-	720	mA	1, 3
		70ns	-	630		
		80ns	-	585		
I_{CC5}	Standby Current (CMOS) Power Supply Standby Current ($\overline{RAS}$, $\overline{CAS}$ ≥ V_{CC}-0.2V)		-	9	mA	
I_{CC6}	$\overline{CAS}$ before $\overline{RAS}$ Refresh Current (t_{RC} = t_{RC} min)	60ns	-	990	mA	
		70ns	-	900		
		80ns	-	810		
I_{CC7}	Standby Current $\overline{RAS}$ = V_{IH} $\overline{CAS}$ = V_{IL} D_{OUT} = Enable		-	45	mA	1
$I_{I(L)}$	Input Leakage Current Any Input (0V ≤ V_{IN} ≤ 7V) All Other Pins Not Under Test = 0V		-90	90	μA	
$I_{O(L)}$	Output Leakage Current (D_{OUT} is Disabled, 0V ≤ V_{OUT} ≤ 7V)		-10	10	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℃)

Symbol	Parameter	Min	Max	Unit	Note
C_{I1}	Input Capacitance (A0-A10)	-	70	pF	1
C_{I2}	Input Capacitance (Clocks)	-	80	pF	1
$C_{I/O}$	I/O Capacitance (DQ0-DQ35)	-	17	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℃, Notes 1, 15)

The GMM7374100CNS/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	GMM7374100 CNS/SG-6		GMM7374100 CNS/SG-7		GMM7374100 CNS/SG-8		Unit	Note
		Min	Max	Min	Max	Min	Max		
t_{RC}	Random Read or Write Cycle Time	110	-	130	-	150	-	ns	
t_{RP}	$\overline{RAS}$ Precharge Time	40	-	50	-	60	-	ns	
t_{CP}	$\overline{CAS}$ Precharge Time	10	-	10	-	10	-	ns	
t_{RAS}	$\overline{RAS}$ Pulse Width	60	10,000	70	10,000	80	10,000	ns	
t_{CAS}	$\overline{CAS}$ Pulse Width	15	10,000	18	10,000	20	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	-	15	-	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	60	-	70	-	80	-	ns	
t_{CRP}	$\overline{CAS}$ to $\overline{RAS}$ Precharge Time	5	-	5	-	5	-	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}	$\overline{CAS}$ Set-up Time from D_{IN}	0	-	0	-	0	-	ns	
t_T	TransitionTime (Rise and Fall)	3	50	3	50	3	50	ns	8
t_{REF}	Refresh Period (2048 Cycles)	-	32	-	32	-	32	ms	

Read Cycle

Symbol	Parameter	GMM7374100 CNS/SG-6		GMM7374100 CNS/SG-7		GMM7374100 CNS/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	30	-	35	-	40	-	ns	

Write Cycle

Symbol	Parameter	GMM7374100 CNS/SG-6		GMM7374100 CNS/SG-7		GMM7374100 CNS/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	-	15	-	15	-	ns	
t_{WP}	Write Command Pulse Width	10	-	10	-	10	-	ns	
t_{RWL}	Write Command to $\overline{RAS}$ Lead Time	15	-	18	-	20	-	ns	
t_{CWL}	Write Command to $\overline{CAS}$ Lead Time	15	-	18	-	20	-	ns	
t_{DS}	Data-in Setup Time	0	-	0	-	0	-	ns	12
t_{DH}	Data-in Hold Time	15	-	15	-	15	-	ns	12

Refresh Cycle

Symbol	Parameter	GMM7374100 CNS/SG-6		GMM7374100 CNS/SG-7		GMM7374100 CNS/SG-8		Unit	Note
		Min	Max	Min	Max	Min	Max		
t_{CSR}	$\overline{CAS}$ Setup Time ($\overline{CAS}$-before-$\overline{RAS}$ Refresh Cycle)	5	-	5	-	5	-	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	0	-	0	-	0	-	ns	
t_{WRP}	$\overline{WE}$ Setup 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	

Fast Page Mode Cycle

Symbol	Parameter	GMM7374100 CNS/SG-6		GMM7374100 CNS/SG-7		GMM7374100 CNS/SG-8		Unit	Note
		Min	Max	Min	Max	Min	Max		
t_{PC}	Fast Page Mode Cycle Time	40	-	45	-	50	-	ns	
t_{CP}	Fast Page Mode $\overline{CAS}$ Precharge Time	10	-	10	-	10	-	ns	
t_{RASP}	Fast Page 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	14
t_{RHCP}	$\overline{RAS}$ Hold Time from $\overline{CAS}$ Precharge	35	-	40	-	45	-	ns	

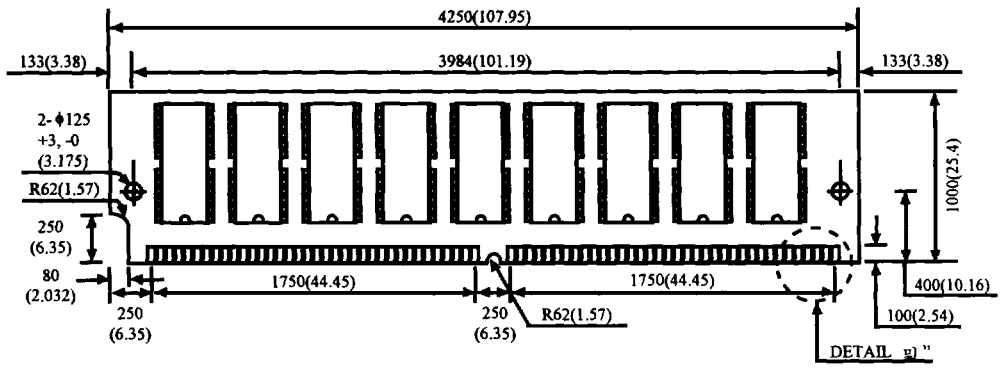
Notes:

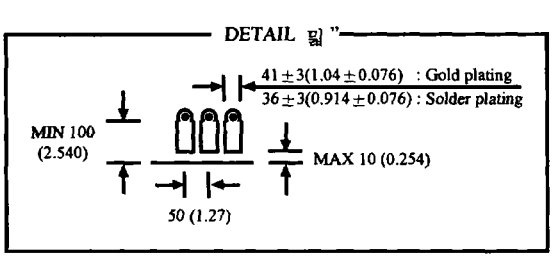
1. AC measurements assume t_T = 5ns.
2. Assumes that $t_{RCD} \leq t_{RCD}(max)$ and $t_{RAD} \leq t_{RAD}(max)$. If t_{RCD} or t_{RAD} is greater than the maximum recommended value shown in this table, t_{RAC} exceeds the value shown.
3. Measured with a load circuit equivalent to 2TTL loads and 100pF.
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_{RCH} 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 $V_{IH}(min)$ and $V_{IL}(max)$.
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 $t_{WCS} \geq t_{WCS}(min)$, 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.

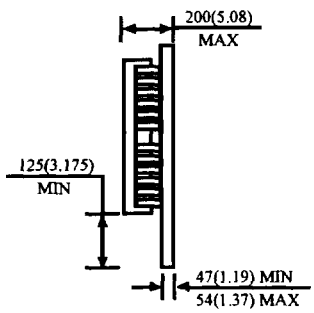
Timing Waveforms : Please refer to attached Timing Waveform-6

Package Dimension

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







Tolerances : ±5(0.127) unless otherwise specified.