SIEMENS

8M × 32-Bit Dynamic RAM Module — HYM 328020S/GS-50/-60

Preliminary Information

- 8 388 608 words by 32-bit organization (alternative 16 777 216 words by 16-bit)
- Fast access and cycle time
  50 ns access time
  90 ns cycle time (-50 version)
  60 ns access time
  110 ns cycle time (-60 version)
- Fast page mode capability
  35 ns cycle time (-50 version)
  40 ns cycle time (-60 version)
- Single + 5 V (± 10 %) supply
- Low power dissipation
  max. 5280 mW active (-50 version)
  max. 4840 mW active (-60 version)
  CMOS – 88 mW standby
  TTL – 176 mW standby
- $\overline{\text{CAS}}$-before-$\overline{\text{RAS}}$ refresh
  $\overline{\text{RAS}}$-only-refresh
  Hidden-refresh
- 16 decoupling capacitors mounted on substrate
- All inputs, outputs and clocks fully TTL compatible
- 72 pin Single in-Line Memory Module (L-SIM-72) with 25.40 mm height
- Utilizes sixteen 4M x 4-DRAMs in SOJ packages
- 2048 refresh cycles / 32 ms
- Optimized for use in byte-write non-parity applications
- Tin-Lead contact pads (S- version)
- Gold contact pads (GS -version)

The HYM 328020S/GS-50/-60 is a 32 MByte DRAM module organized as 8 388 608 words by 32-bit in a 72-pin single-in-line package comprising sixteen HYB 5117400BJ 4M × 4 DRAMs in 300 mil wide SOJ-packages mounted together with sixteen 0.2 µF ceramic decoupling capacitors on a PC board.

The HYM 328020S/GS-50/-60 can also be used as a 16 777 360 words by 16-bits dynamic RAM module by means of connecting DQ0 and DQ16, DQ1 and DQ17, DQ2 and DQ18, …, DQ15 and DQ31, respectively.

Each HYB 5117400BJ is described in the data sheet and is fully electrical tested and processed according to SIEMENS standard quality procedure prior to module assembly. After assembly onto the board, a further set of electrical tests is performed.

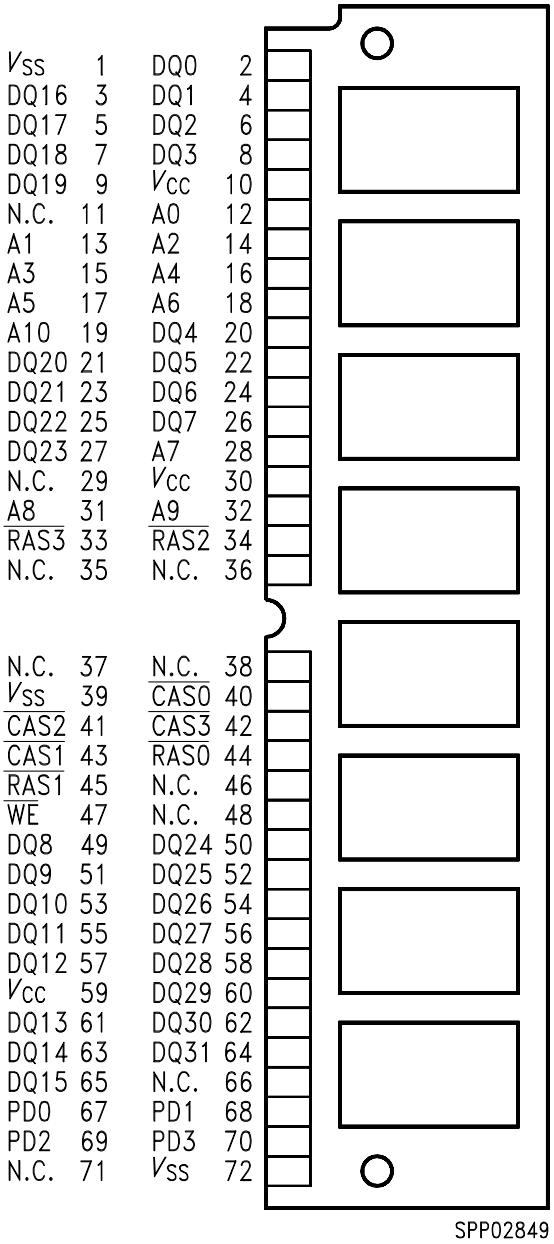
The speed of the module can be detected by the use of four presence detect pins.

The common I/O feature on the HYM 328020S/GS-50/-60 dictates the use of early write cycles.

Ordering Information

Type	Ordering Code	Package	Description
HYM 328020S-50	on request	L-SIM-72-15	DRAM Module (access time 50 ns)
HYM 328020S-60	Q67100-Q2001	L-SIM-72-15	DRAM Module (access time 60 ns)
HYM 328020GS-50	on request	L-SIM-72-15	DRAM Module (access time 50 ns)
HYM 328020GS-60	Q67100-Q2008	L-SIM-72-15	DRAM Module (access time 60 ns)

Pin Configuration
(top view)

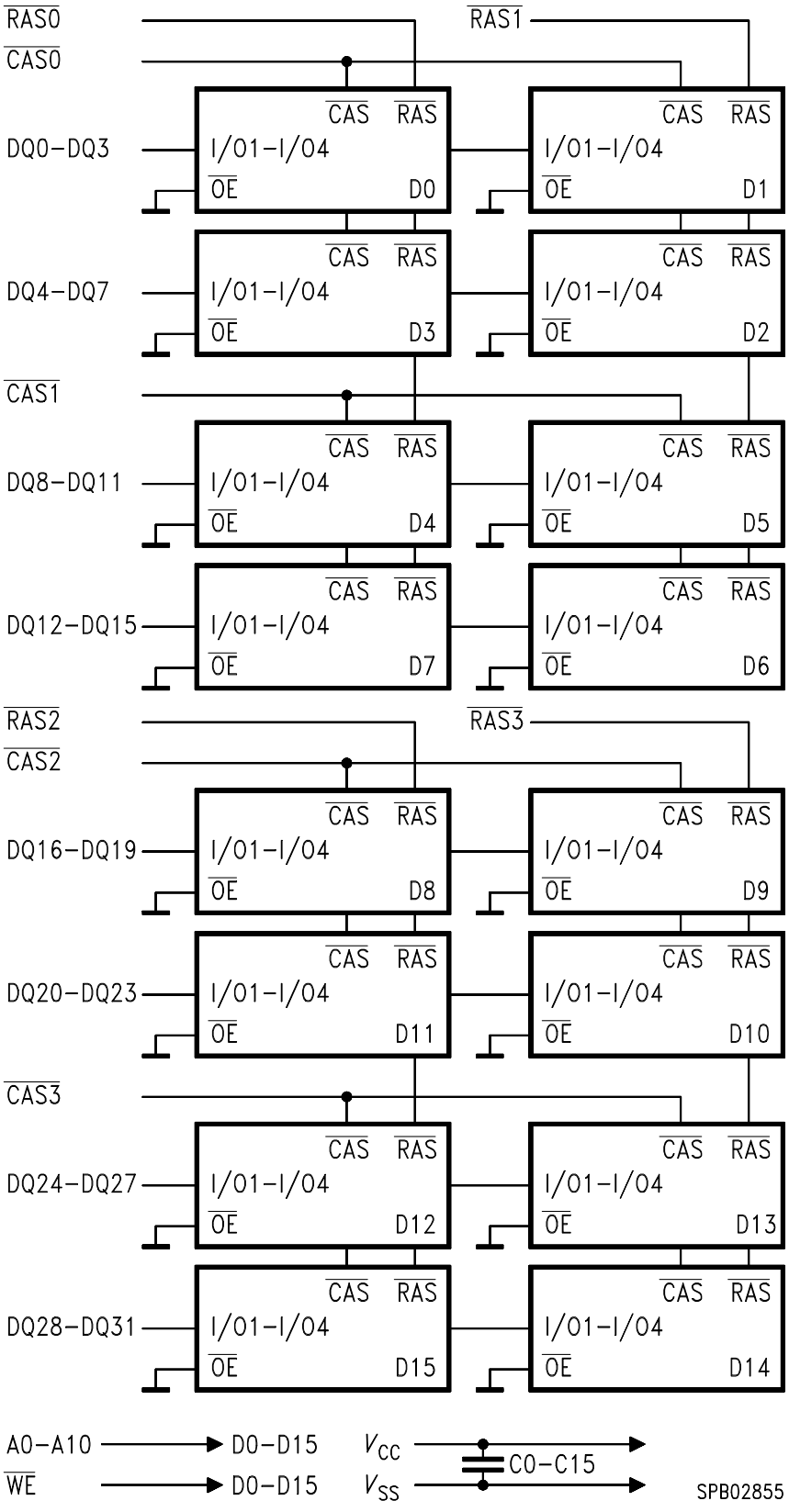


Pin Names

A0-A10	Address Inputs
DQ0-DQ31	Data Input/Output
$\overline{CAS0}$ - $\overline{CAS3}$	Column Address Strobe
$\overline{RAS0}$- $\overline{RAS3}$	Row Address Strobe
$\overline{WE}$	Read/Write Input
V_{CC}	Power (+ 5 V)
V_{SS}	Ground
PD	Presence Detect Pin
N.C.	No Connection

Presence Detect Pins

	-50	-60
PD0	N.C.	N.C.
PD1	V_{SS}	V_{SS}
PD2	V_{SS}	N.C.
PD3	V_{SS}	N.C.



Block Diagram

Absolute Maximum Ratings

Operation temperature range ..... 0 to + 70 ˚C
Storage temperature range..... – 55 to 125 ˚C
Input/output voltage ..... – 0.5 V to min (V_{CC} + 0.5, 7.0) V
Power supply voltage..... – 1 to + 7 V
Power dissipation..... 6.72 W
Data out current (short circuit) ..... 50 mA

Note: *Stresses above those listed under "Absolute Maximum Ratings" may cause permanent damage of the device. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.*

DC Characteristics

T_A = 0 to 70 ˚C, V_{SS} = 0 V, V_{CC} = 5 V ± 10 %; t_T = 5 ns

Parameter	Symbol	Limit Values		Unit	Test Condition
		min.	max.		
Input high voltage	V_{IH}	2.4	V_{CC} + 0.5	V	1)
Input low voltage	V_{IL}	– 0.5	0.8	V	1)
Output high voltage (I_{OUT} = – 5 mA)	V_{OH}	2.4	–	V	1)
Output low voltage (I_{OUT} = 4.2 mA)	V_{OL}	–	0.4	V	1)
Input leakage current (0 V ≤ V_{IH} ≤ V_{CC} + 0.3 V, all other pins = 0 V)	$I_{I(L)}$	– 20	20	µA	1)
Output leakage current (DO is disabled, 0 V ≤ V_{OUT} ≤ V_{CC} + 0.3 V)	$I_{O(L)}$	– 10	10	µA	1)
Average V_{CC} supply current: -50 ns version -60 ns version (RAS, CAS, address cycling: t_{RC} = t_{RC} min.)	I_{CC1}	 – –	 960 880	 mA mA	 2) 3) 4) 2) 3) 4)
Standby V_{CC} supply current ($\overline{RAS}$ = $\overline{CAS}$ = V_{IH})	I_{CC2}	–	32	mA	–
Average V_{CC} supply current, during $\overline{RAS}$-only refresh cycles: -50 ns version -60 ns version ($\overline{RAS}$ cycling, $\overline{CAS}$ = V_{IH}, t_{RC} = t_{RC} min.)	I_{CC3}	 – –	 960 880	 mA mA	 2) 4) 2) 4)
Average V_{CC} supply current, during fast page mode: -50 ns version -60 ns version ($\overline{RAS}$ = V_{IL}, $\overline{CAS}$, address cycling: t_{PC} = t_{PC} min.)	I_{CC4}	 – –	 320 280	 mA mA	 2) 3) 4) 2) 3) 4)

DC Characteristics (cont'd)

T_A = 0 to 70 °C, V_{SS} = 0 V, V_{CC} = 5 V ± 10 %; t_T = 5 ns

Parameter	Symbol	Limit Values		Unit	Test Condition
		min.	max.		
Standby V_{CC} supply current ($\overline{RAS}$ = $\overline{CAS}$ = V_{CC} – 0.2 V)	I_{CC5}	–	16	mA	1)
Average V_{CC} supply current, during $\overline{CAS}$-before-RAS refresh mode: -50 ns version -60 ns version ($\overline{RAS}$, $\overline{CAS}$ cycling: t_{RC} = t_{RC} min.)	I_{CC6}	– –	960 880	mA mA	2) 4) 2) 4)

Capacitance

T_A = 0 to 70 °C, V_{CC} = 5 V ± 10 %, f = 1 MHz

Parameter	Symbol	Limit Values		Unit
		min.	max.	
Input capacitance (A0 to A10,$\overline{WE}$)	C_{I1}	–	120	pF
Input capacitance ($\overline{RAS0}$ - $\overline{RAS3}$)	C_{I2}	–	45	pF
Input capacitance ($\overline{CAS0}$ - $\overline{CAS3}$)	C_{I3}	–	40	pF
I/O capacitance (DQ0-DQ31)	C_{IO}	–	25	pF

AC Characteristics [5)6)]

T_A = 0 to 70 °C, V_{CC} = 5 V ± 10 %, t_T = 5 ns

Parameter	Symbol	Limit Values				Unit	Note
		-50		-60			
		min.	max.	min.	max.		
Common Parameters							
Random read or write cycle time	t_{RC}	90	–	110	–	ns	
$\overline{RAS}$ precharge time	t_{RP}	30	–	40	–	ns	
$\overline{RAS}$ pulse width	t_{RAS}	50	10k	60	10k	ns	
$\overline{CAS}$ pulse width	t_{CAS}	13	10k	15	10k	ns	
Row address setup time	t_{ASR}	0	–	0	–	ns	
Row address hold time	t_{RAH}	8	–	10	–	ns	
Column address setup time	t_{ASC}	0	–	0	–	ns	
Column address hold time	t_{CAH}	10	–	15	–	ns	
$\overline{RAS}$ to $\overline{CAS}$ delay time	t_{RCD}	18	37	20	45		
$\overline{RAS}$ to column address delay time	t_{RAD}	13	25	15	30	ns	
$\overline{RAS}$ hold time	t_{RSH}	13		15	–	ns	
$\overline{CAS}$ hold time	t_{CSH}	50		60	–	ns	
$\overline{CAS}$ to $\overline{RAS}$ precharge time	t_{CRP}	5	–	5	–	ns	
Transition time (rise and fall)	t_T	3	50	3	50	ns	7
Refresh period	t_{REF}	–	32	–	32	ms	
Read Cycle							
Access time from $\overline{RAS}$	t_{RAC}	–	50	–	60	ns	8, 9
Access time from $\overline{CAS}$	t_{CAC}	–	13	–	15	ns	8, 9
Access time from column address	t_{AA}	–	25	–	30	ns	8,10
Column address to $\overline{RAS}$ lead time	t_{RAL}	25	–	30	–	ns	
Read command setup time	t_{RCS}	0	–	0	–	ns	
Read command hold time	t_{RCH}	0	–	0	–	ns	11
Read command hold time referenced to $\overline{RAS}$	t_{RRH}	0	–	0	–	ns	11
$\overline{CAS}$ to output in low-Z	t_{CLZ}	0	–	0	–	ns	8
Output buffer turn-off delay	t_{OFF}	0	13	0	15	ns	12

AC Characteristics (cont'd) [5)6)]

T_A = 0 to 70 °C, V_{CC} = 5 V ± 10 %, t_T = 5 ns

Parameter	Symbol	Limit Values				Unit	Note
		-50		-60			
		min.	max.	min.	max.		
Early Write Cycle							
Write command hold time	t_{WCH}	8	–	10	–	ns	
Write command pulse width	t_{WP}	8	–	10	–	ns	
Write command setup time	t_{WCS}	0	–	0	–	ns	13
Write command to $\overline{RAS}$ lead time	t_{RWL}	13	–	15	–	ns	
Write command to $\overline{CAS}$ lead time	t_{CWL}	13	–	15	–	ns	
Data setup time	t_{DS}	0	–	0	–	ns	14
Data hold time	t_{DH}	10	–	10	–	ns	14
Fast Page Mode Cycle							
Fast page mode cycle time	t_{PC}	35	–	40	–	ns	
$\overline{CAS}$ precharge time	t_{CP}	10	–	10	–	ns	
Access time from $\overline{CAS}$ precharge	t_{CPA}	–	30	–	35	ns	7
$\overline{RAS}$ pulse width	t_{RAS}	50	200k	60	200k	ns	
$\overline{CAS}$ precharge to $\overline{RAS}$ Delay	t_{RHCP}	30	–	35	–	ns	
$\overline{CAS}$-before-$\overline{RAS}$ Refresh Cycle							
$\overline{CAS}$ setup time	t_{CSR}	10	–	10	–	ns	
$\overline{CAS}$ hold time	t_{CHR}	10	–	10	–	ns	
$\overline{RAS}$ to $\overline{CAS}$ precharge time	t_{RPC}	5	–	5	–	ns	
Write to $\overline{RAS}$ precharge time	t_{WRP}	10	–	10	–	ns	
Write hold time referenced to $\overline{RAS}$	t_{WRH}	10	–	10	–	ns	

Notes:

1) All voltages are referenced to V_{SS}.

2) I_{CC1}, I_{CC3}, I_{CC4} and I_{CC6} depend on cycle rate.

3) I_{CC1} and I_{CC4} depend on output loading. Specified values are measured with the output open.

4) Address can be changed once or less while $\overline{RAS}$ = V_{IL}. In the case of I_{CC4} it can be changed once or less during a fast page mode cycle (t_{PC}).

5) An initial pause of 200 µs is required after power-up followed by 8 $\overline{RAS}$ cycles of which at least one cycle has to be a refresh cycle, before proper device operation is achieved. In case of using internal refresh counter, a minimum of 8 $\overline{CAS}$-before-$\overline{RAS}$ initialization cycles instead of 8 $\overline{RAS}$ cycles are required.

6) AC measurements assume t_T = 5 ns.

7) $V_{IH\ (min.)}$ and $V_{IL\ (max.)}$ are reference levels for measuring timing of input signals. Transition times are also measured between V_{IH} and V_{IL}.

8) Measured with a load equivalent to 2 TTL loads and 100 pF.

9) Operation within the $t_{RCD\ (max.)}$ limit ensures 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 by t_{CAC}.

10) Operation within the $t_{RAD\ (max.)}$ limit ensures 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 by t_{AA}.

11) Either t_{RCH} or t_{RRH} must be satisfied for a read cycle.

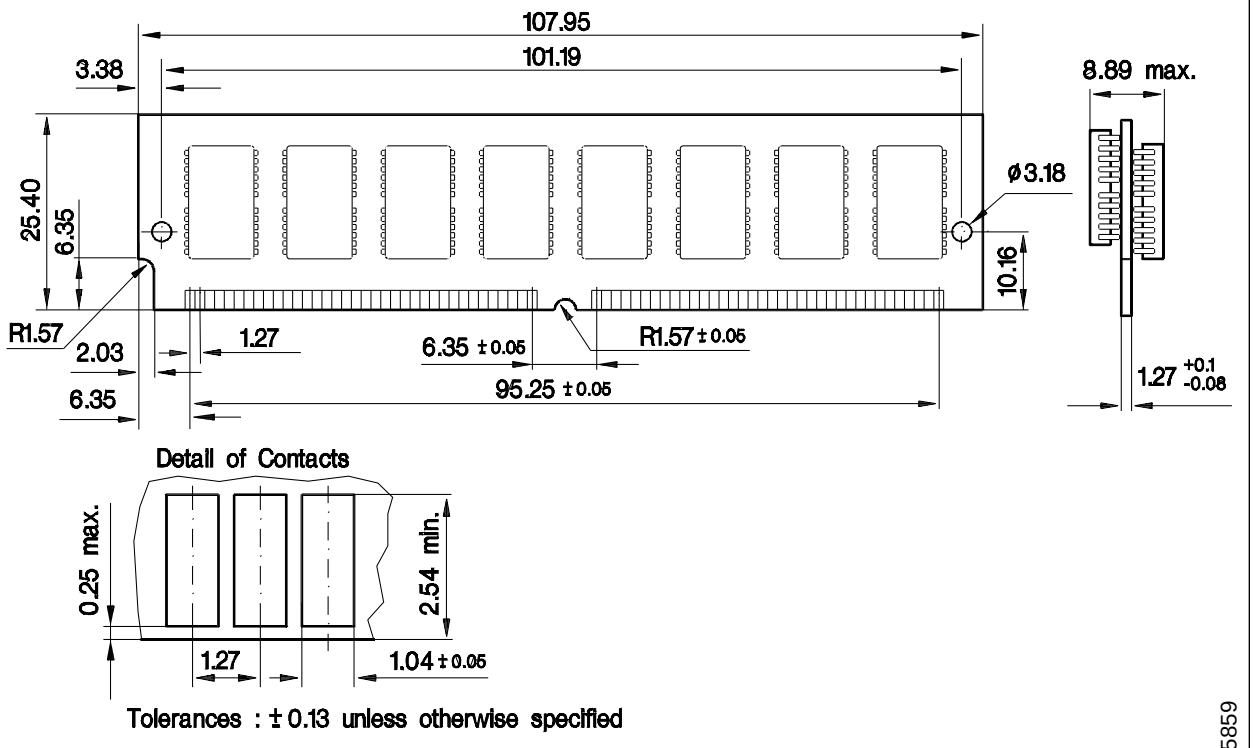
12) $t_{OFF\ (max.)}$ define the time at which the outputs achieve the open-circuit condition and are not referenced to output voltage levels.

13) t_{WCS} is not a restrictive operating parameter. This is included in the data sheet as electrical characteristics only. If $t_{WCS} > t_{WCS\ (min.)}$, the cycle is an early write cycle and the I/O pin will remain open-circuit (high impedance) through the entire cycle.

14) These parameters are referenced to the $\overline{CAS}$ leading edge.

Package Outlines

L-SIM-72-15
(Single In-line Module)



Sorts of Packing
Package outlines for tubes, trays etc. are contained in our Data Book “Package Information”.

Dimensions in mm