SIEMENS

2M × 32-Bit Dynamic RAM Module (Hyper Page Mode - EDO Version)

HYM 322005S/GS-50/-60

- SIMM modules with 2 097 152 words by 32-bit organization for PC main memory application
- Fast access and cycle time
  50 ns access time
  84 ns cycle time (-50 version)
  60 ns access time
  104 ns cycle time (-60 version)
- Hyper page mode - EDO capability with
  20 ns cycle time (-50 version)
  25 ns cycle time (-60 version)
- Single + 5 V (± 10 %) supply
- Low power dissipation
  max. 2200 mW active (-50 version)
  max. 1980 mW active (-60 version)
  CMOS – 22 mW standby
  TTL – 44 mW standby
- $\overline{\text{CAS}}$-before-$\overline{\text{RAS}}$ refresh, $\overline{\text{RAS}}$-only-refresh, Hidden refresh
- 4 decoupling capacitors mounted on substrate
- All inputs, outputs and clock fully TTL compatible
- 72 pin Single in-Line Memory Module
- Utilizes four 1M × 16 -DRAMs in SOJ-42 packages
- 1024 refresh cycles / 16 ms
- Optimized for use in byte-write non-parity applications
- Tin-Lead contact pad HYM 322005S
- Gold-Lead contact pad HYM 322005GS
- single sided module with 20.32 mm (800 mil) height

The HYM 322005S/GS-50/-60 is a 8 MByte EDO - DRAM module organized as 2 097 152 words by 32-bit in a 72-pin single-in-line package comprising four HYB 5118160BSJ 1M × 16 EDO - DRAMs in 400 mil wide SOJ-packages mounted together with four 0.2 µF ceramic decoupling capacitors on a PC board.

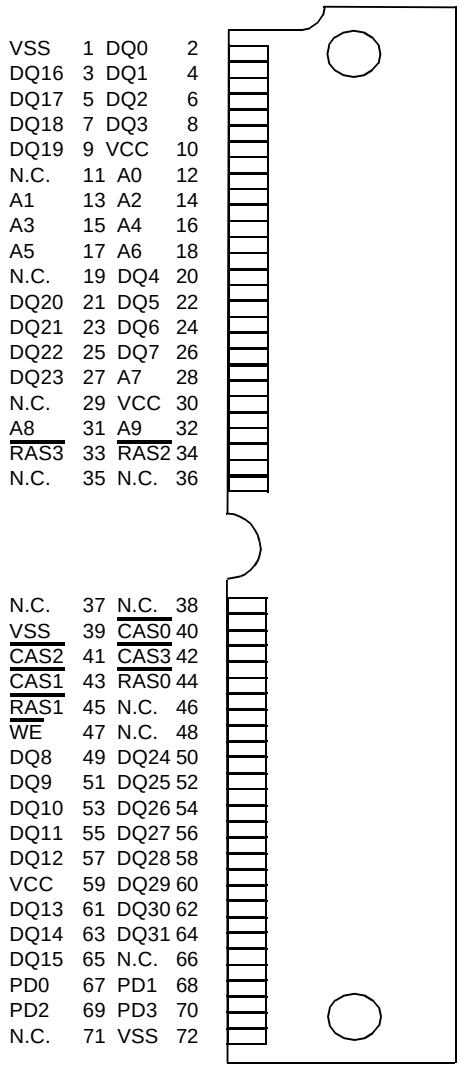
Each HYB 5118165BSJ is described in the data sheet and is fully electrically tested and processed according to Siemens standard quality procedure prior to module assembly. After assembly onto the board, a further set of electrical tests is performed.

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

The common I/O feature on the HYM 322005S/GS-50/-60 dictates the use of early write cycles.

Ordering Information

Type	Ordering Code	Package	Descriptions
HYM 322005S-50	Q67100-Q2066	L-SIM-72-10	EDO - DRAM module (access time 50 ns)
HYM 322005S-60	Q67100-Q2067	L-SIM-72-10	EDO - DRAM module (access time 60 ns)
HYM 322005GS-50	Q67100-Q2068	L-SIM-72-10	EDO - DRAM module (access time 50 ns)
HYM 322005GS-60	Q67100-Q2069	L-SIM-72-10	EDO - DRAM module (access time 60 ns)



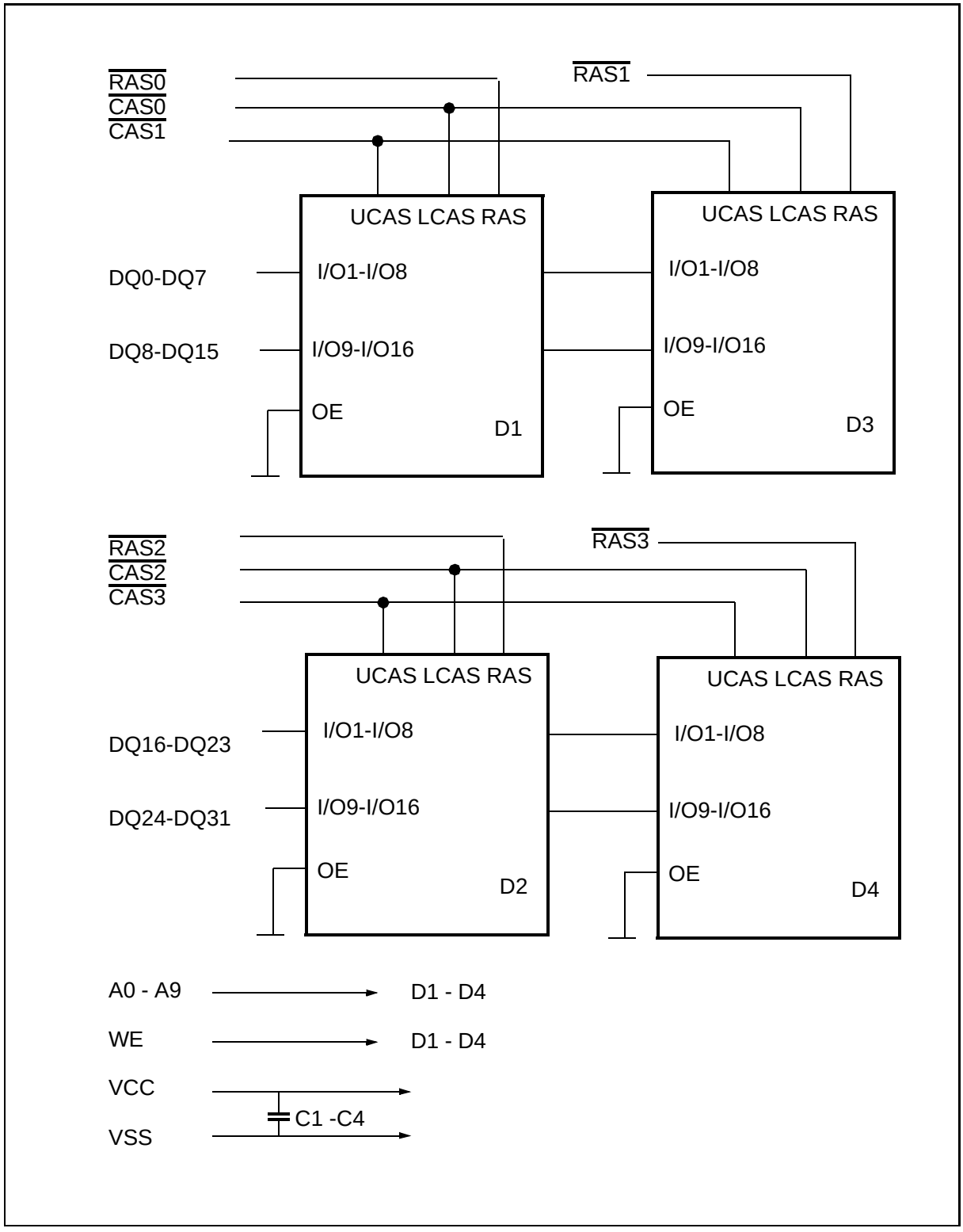
Pin Names

A0-A9	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	N.C.	N.C
PD2	V_{SS}	N.C.
PD3	V_{SS}	N.C.

Pin Configuration



Block Diagram

Absolute Maximum Ratings

Operating temperature range ..... 0 to + 70 °C
Storage temperature range..... – 55 to + 125 °C
Input/output voltage ..... – 1 to + 7 V
Power supply voltage..... – 1 to + 7 V
Power dissipation..... 2.52 W
Data out current (short circuit) ..... 50 mA

Note: *Stresses above those listed under "Absolute Maximum Ratings" may cause permanent damage to 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 = 2 ns

Parameter	Symbol	Limit Values		Unit	Test Condition
		min.	max.		
Input high voltage	V_{IH}	2.4	Vcc+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} ≤ Vcc + 0.3V, all other pins = 0 V)	$I_{I(L)}$	– 10	10	µA	1)
Output leakage current (DO is disabled, 0 V ≤ V_{OUT} ≤ Vcc + 0.3V)	$I_{O(L)}$	– 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}	 – –	 400 360	 mA mA	 2) 3) 4) 2) 3) 4)
Standby V_{CC} supply current ($\overline{RAS}$ = $\overline{CAS}$ = V_{IH})	I_{CC2}	–	8	mA	–
Average V_{CC} supply current, during $\overline{RAS}$-only refresh cycles: -50 ns version -60 ns version ($\overline{RAS}$ cycling, $\overline{CAS}$ = $V_{I,H,}$ t_{RC} = t_{RC} min.)	I_{CC3}	 – –	 400 360	 mA mA	 2) 4) 2) 4)
Average V_{CC} supply current,during hyper page mode (EDO): -50 ns version -60 ns version ($\overline{RAS}$ = V_{IL}, $\overline{CAS}$, address cycling: (t_{HPC} = t_{HPC} min.)	I_{CC4}	 – –	 180 150	 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 = 2 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}	–	4	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}	 – –	 400 360	 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 A9)	C_{I1}	–	35	pF
Input capacitance ($\overline{RAS0}$, $\overline{RAS2}$)	C_{I2}	–	20	pF
Input capacitance ($\overline{CAS0}$-$\overline{CAS3}$)	C_{I3}	–	20	pF
Input capacitance ($\overline{WE}$)	C_{I4}	–	35	pF
I/O capacitance (DQ0-DQ31)	C_{IO1}	–	25	pF

AC Characteristics [5)6)]

T_A = 0 to 70 °C, V_{CC} = 5 V ± 10 %, t_T = 2 ns

Parameter	Symbol	Limit Values				Unit	Note
		-50		-60			
		min.	max.	min.	max.		
common parameters							
Random read or write cycle time	t_{RC}	84	–	104	–	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}	8	10k	10	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}	8	–	10	–	ns	
$\overline{RAS}$ to $\overline{CAS}$ delay time	t_{RCD}	12	37	14	45	ns	
$\overline{RAS}$ to column address delay time	t_{RAD}	10	25	12	30	ns	
$\overline{RAS}$ hold time	t_{RSH}	13		15	–	ns	
$\overline{CAS}$ hold time	t_{CSH}	40		50	–	ns	
$\overline{CAS}$ to $\overline{RAS}$ precharge time	t_{CRP}	5	–	5	–	ns	
Transition time (rise and fall)	t_T	1	50	1	50	ns	7
Refresh period	t_{REF}	–	16	–	16	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 = 2 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}	8	–	10	–	ns	14
Hyper Page Mode (EDO) Cycle							
Hyper page mode (EDO) cycle time	t_{HPC}	20	–	25	–	ns	
$\overline{CAS}$ precharge time	t_{CP}	8	–	10	–	ns	
Access time from $\overline{CAS}$ precharge	t_{CPA}	–	27	–	32	ns	7
Output data hold time	t_{COH}	5	–	5	–	ns	
$\overline{RAS}$ pulse width in hyper page mode	t_{RAS}	50	200k	60	200k	ns	
$\overline{CAS}$ precharge to $\overline{RAS}$ Delay	t_{RHCP}	27	–	32	–	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}.
Vil may undershoot to -2.0 V for pulse width of less than or equal to 4 ns. Pulse width is measured at 50% points with amplitude measured peak to the DC reference.

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 obtained with the output open.

4) Address can be changed once or less while RAS = Vil. In case of ICC4 it can be changed once or less during a hyper page mode (EDO) cycle.

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 the 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 = 2 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 the specified current load and 100 pF at Vol = 0.8 V and Voh = 2.0 V. Access time is determined by the latter of t_{RAC}, t_{CAC}, t_{AA},t_{CPA}. t_{CAC} is measured from tristate.

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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}.

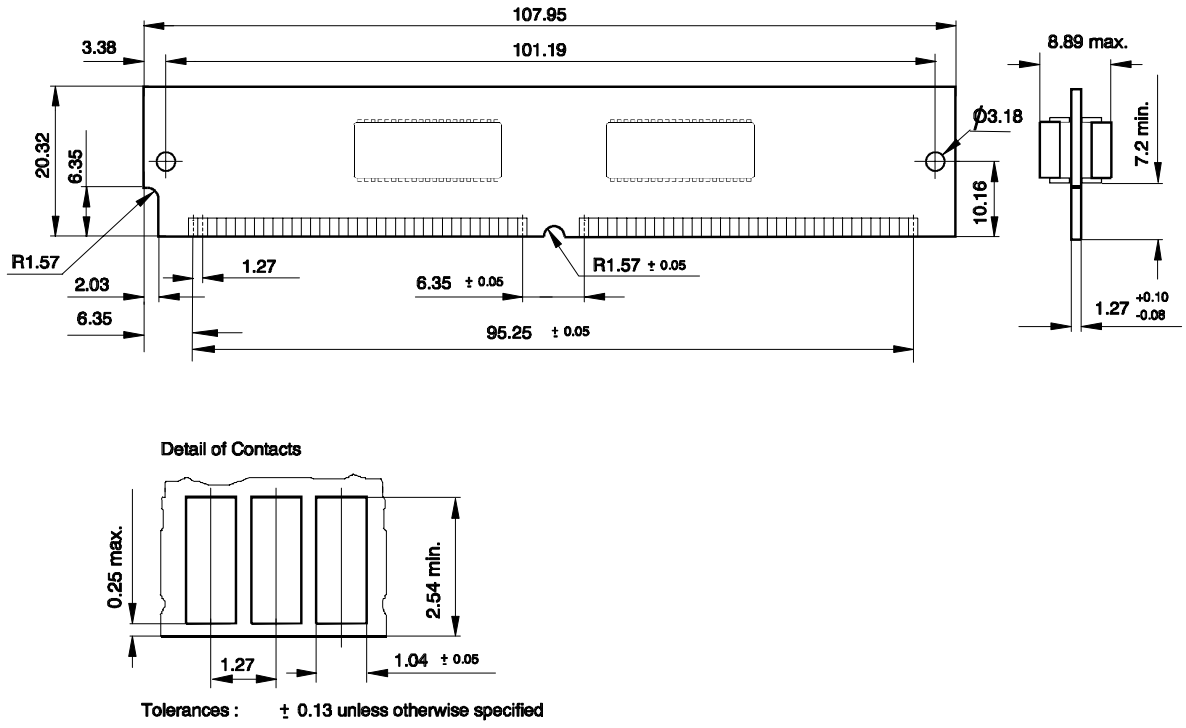
11) Either t_{RCH} or t_{RRH} must be satisfied for a read cycle.

12) $t_{OFF\ (max.)}$ define the time at which the output achieves the open-circuit conditions and are not referenced to output voltage levels. t_{OFF} is referenced from the rising edge of $\overline{RAS}$ or $\overline{CAS}$, whichever occurs last.

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 data out pin will remain open-circuit (high impedance) through the entire cycle.

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

L-SIM-72-10
Module package
(single in-line memory module)



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