SIEMENS

3.3V 16M × 64-Bit EDO-DRAM Module — HYM64V1605GU-50/-60
3.3V 16M x 72-Bit EDO-DRAM Module — HYM64V1645GU-50/-60
HYM72V1605GU-50/-60
168pin unbuffered DIMM Module — HYM72V1645GU-50/-60
with serial presence detect

Advanced Information

- 168 Pin JEDEC Standard, Unbuffered 8 Byte Dual In-Line Memory Module
- 1 bank 16M x 64, 16M x 72 in 4k and 8k refresh organisations
- Optimized for byte-write non-parity or ECC applications
- Extended Data Out (EDO)
- Performance:

		-50	-60
tRAC	RAS Access Time	50 ns	60 ns
tCAC	CAS Access Time	13 ns	15 ns
tAA	Access Time from Address	25 ns	30 ns
tRC	Cycle Time	84 ns	104 ns
tHPC	EDO Mode Cycle Time	20 ns	25 ns

- Single +3.3 V ± 0.3 V Power Supply
- $\overline{\text{CAS}}$-before-$\overline{\text{RAS}}$ refresh, $\overline{\text{RAS}}$-only-refresh
- Decoupling capacitors mounted on substrate
- All inputs, outputs and clocks are fully LV-TTL compatible
- Serial presence detects (optional)
- Utilizes 16M x 4 -DRAMs in TSOPII packages
- 4096 refresh cycles / 64 ms with 12 / 12 addressing (Row / Column) for HYM64/72V1605GU
- 8192 refresh cycles / 128 ms with 13 / 11 addressing (Row / Column) for HYM64/72V1645GU
- Gold contact pads
- Card Size: 133,35mm x 32,00 mm x 4,00 mm
- This DRAM product module family is intended to be fully pin and architecture compatible with the 168pin unbuffered SDRAM DIMM module family

The HYM64(72)V1605/45GU-50/-60 are industry standard 168-pin 8-byte Dual In-Line Memory Modules (DIMMs) which are organized as 16M x 64 and 16M x 72 high speed memory arrays designed with EDO DRAMs for non-parity and ECC applications. 4k refresh with 12 / 12 addressing and 8k refresh modules with 13 / 11 addressing are available. The DIMMs use sixteen 16M x 4 EDO DRAMs for the 16M x 64 organisation and eighteen 16M x 4 DRAMs for the 16M x 72 organisation, both in TSOPII packages. Decoupling capacitors are mounted on the PC board.

The DIMMs use optional serial presence detects implemented via a serial E^2PROM using the two pin I^2C protocol. The first 128 bytes are utilized by the DIMM manufacturer and the second 128 bytes of serial PD data are available to the customer.

All 168-pin DIMMs provide a high performance, flexible 8-byte interface in a 133,35 mm long space-saving footprint.

Ordering Information

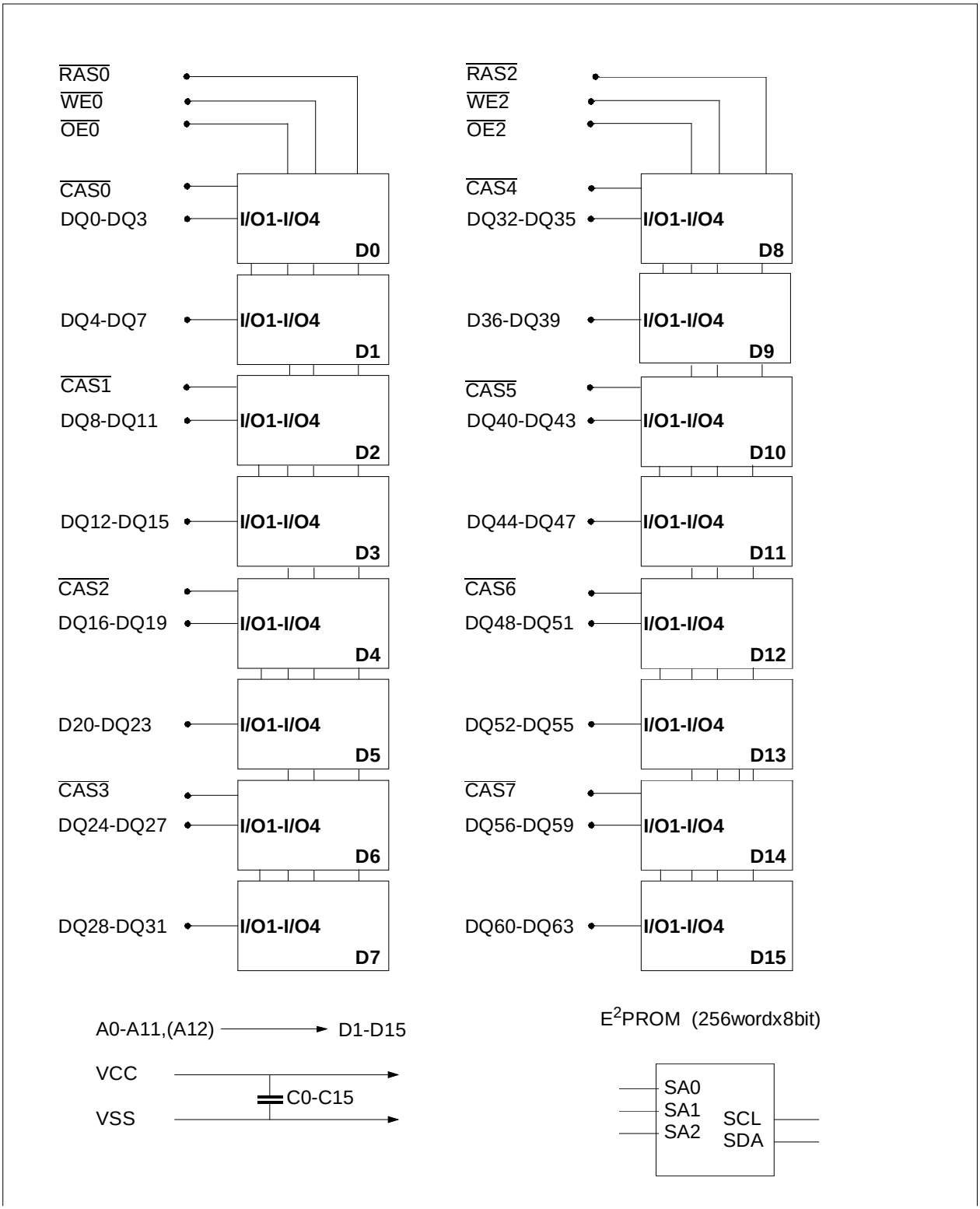
Type	Ordering Code	Package	Descriptions
4k-Refresh:			
HYM 64V1605GU-50	Q67100-Q2192	L-DIM-168-14	16M x 64 DRAM module (access time 50 ns)
HYM 64V1605GU-60	Q67100-Q2193	L-DIM-168-14	16M x 64 DRAM module (access time 60 ns)
HYM 72V1605GU-50	Q67100-Q2194	L-DIM-168-14	16M x 72 DRAM module (access time 50 ns)
HYM 72V1605GU-60	Q67100-Q2195	L-DIM-168-14	16M x 72 DRAM module (access time 60 ns)
8k-Refresh:			
HYM 64V1645GU-50	Q67100-Q2245	L-DIM-168-14	16M x 64 DRAM module (access time 50 ns)
HYM 64V1645GU-60	Q67100-Q2246	L-DIM-168-14	16M x 64 DRAM module (access time 60 ns)
HYM 72V1645GU-50		L-DIM-168-14	16M x 72 DRAM module (access time 50 ns)
HYM 72V1645GU-60		L-DIM-168-14	16M x 72 DRAM module (access time 60 ns)

Pin Names

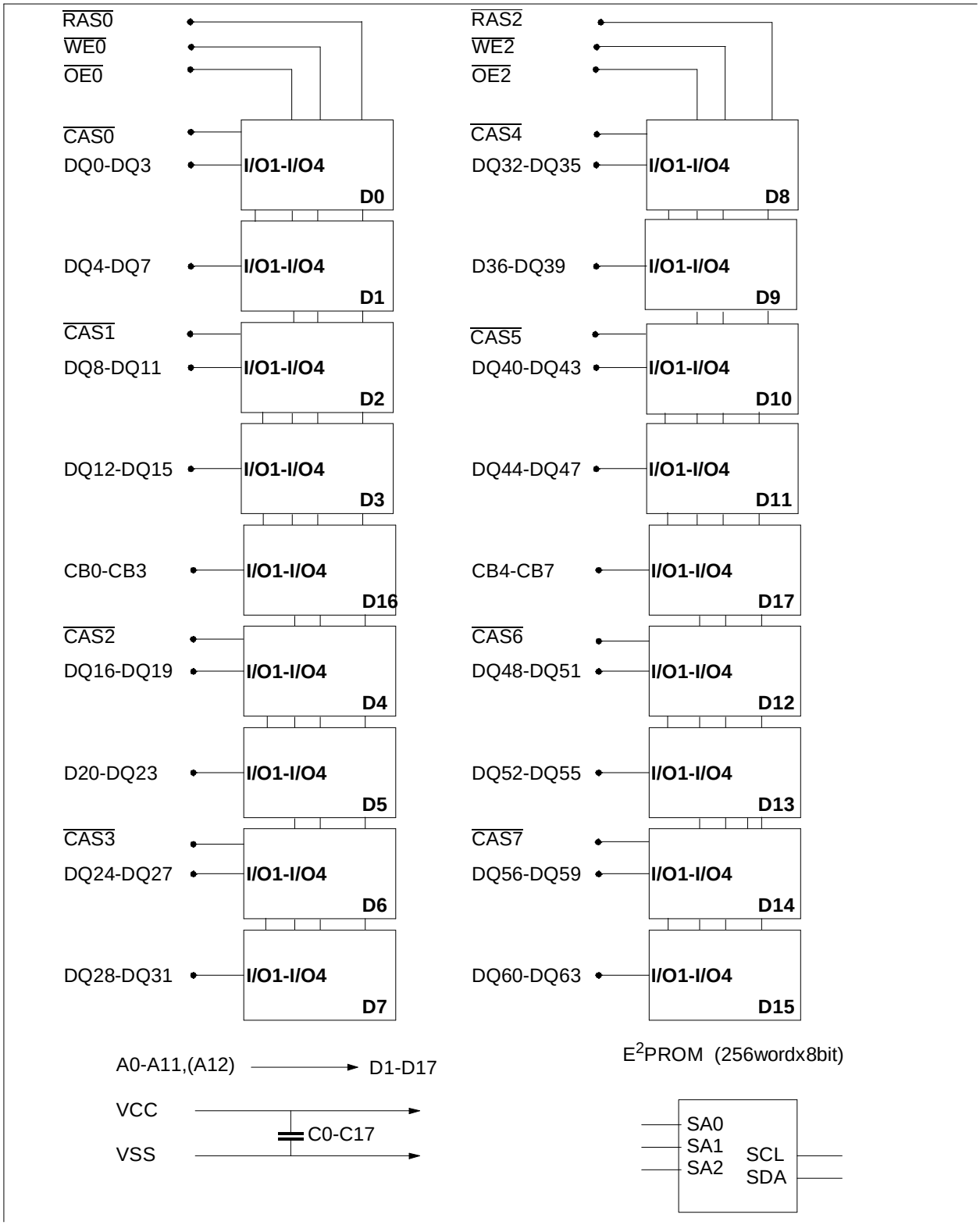
A0-A11	Row Address Input for HYB64/72V1605
A0-A11	Column Address Input for HYB64/72V1605
A0-A12	Row Address Input for HYB64/72V1645
A0-A10	Column Address Input for HYB64/72V1645
DQ0 - DQ63	Data Input/Output
CB0-CB7	Check Bit Data Input/Output (x72 only)
$\overline{RAS0}$, $\overline{RAS2}$	Row Address Strobe
$\overline{CAS0}$ - $\overline{CAS7}$	Column Address Strobe
$\overline{WE0}$, $\overline{WE2}$	Read / Write Input
$\overline{OE0}$, $\overline{OE2}$	Output Enable
Vcc	Power (+3.3 Volt)
Vss	Ground
SCL	Clock for Presence Detect
SDA	Serial Data Out for Presence Detect
SA0-SA2	Serial Presence Detect Addresses
N.C.	No Connection
DU	Don’t use

Pin Configuration

PIN #	Symbol	PIN #	Symbol		PIN #	Symbol	PIN #	Symbol
1	VSS	43	VSS		85	VSS	127	VSS
2	DQ0	44	OE2		86	DQ32	128	DU
3	DQ1	45	RAS2		87	DQ33	129	NC
4	DQ2	46	CAS2		88	DQ34	130	CAS6
5	DQ3	47	CAS3		89	DQ35	131	CAS7
6	VCC	48	WE2		90	VCC	132	DU
7	DQ4	49	VCC		91	DQ36	133	VCC
8	DQ5	50	NC		92	DQ37	134	NC
9	DQ6	51	NC		93	DQ38	135	NC
10	DQ7	52	CB3		94	DQ39	136	CB6
11	DQ8	53	CB3		95	DQ40	137	CB7
12	VSS	54	VSS		96	VSS	138	VSS
13	DQ9	55	DQ16		97	DQ41	139	DQ48
14	DQ10	56	DQ17		98	DQ42	140	DQ49
15	DQ11	57	DQ18		99	DQ43	141	DQ50
16	DQ12	58	DQ19		100	DQ44	142	DQ51
17	DQ13	59	VCC		101	DQ45	143	VCC
18	VCC	60	DQ20		102	VCC	144	DQ52
19	DQ14	61	NC		103	DQ46	145	NC
20	DQ15	62	DU		104	DQ47	146	DU
21	CB0	63	NC		105	CB4	147	NC
22	CB1	64	VSS		106	CB5	148	VSS
23	VSS	65	DQ21		107	VSS	149	DQ53
24	NC	66	DQ22		108	NC	150	DQ54
25	NC	67	DQ23		109	NC	151	DQ55
26	VCC	68	VSS		110	VCC	152	VSS
27	WE0	69	DQ24		111	DU	153	DQ56
28	CAS0	70	DQ25		112	CAS4	154	DQ57
29	CAS1	71	DQ26		113	CAS5	155	DQ58
30	RAS0	72	DQ27		114	NC	156	DQ59
31	OE0	73	VCC		115	DU	157	VCC
32	VSS	74	DQ28		116	VSS	158	DQ60
33	A0	75	DQ29		117	A1	159	DQ61
34	A2	76	DQ30		118	A3	160	DQ62
35	A4	77	DQ31		119	A5	161	DQ63
36	A6	78	VSS		120	A7	162	VSS
37	A8	79	NC		121	A9	163	NC
38	A10	80	NC		122	A11	164	NC
39	A12	81	NC		123	NC	165	SA0
40	VCC	82	SDA		124	VCC	166	SA1
41	VCC	83	SCL		125	DU	167	SA2
42	DU	84	VCC		126	DU	168	VCC



4M x 64 DIMM Module Block Diagram



4M x 72 DIMM Module Block Diagram

TRUTH TABLE

FUNCTION		$\overline{RAS}$	$\overline{CAS}$	$\overline{WRITE}$	$\overline{OE}$	ROW ADDR	COL ADDR	DQ0-DQ63
Standby		H	X	X	X	X	X	High Impedance
Read		L	L	H	L	ROW	COL	Data Out
Early-Write		L	L	L	X	ROW	COL	Data In
Late-Write		L	L	H - L	H	ROW	COL	Data In
Read-Modify-Write (RMW)		L	L	H - L	L - H	ROW	COL	Data Out, Data In
EDO Page Mode Read	1st Cycle	L	H - L	H	L	ROW	COL	Data Out
	2nd Cycle	L	H - L	H	L	n/a	COL	Data Out
EDO Page Mode Write	1st Cycle	L	H - L	L	X	ROW	COL	Data In
	2nd Cycle	L	H - L	L	X	n/a	COL	Data In
EDO Page Mode RMW	1st Cycle	L	H - L	H - L	L - H	ROW	COL	Data Out, Data In
	2st Cycle	L	H - L	H - L	L - H	n/a	COL	Data Out, Data In
$\overline{RAS}$ only refresh		L	H	X	X	ROW	n/a	High Impedance
$\overline{CAS}$-before-$\overline{RAS}$ refresh		H - L	L	H	X	X	n/a	High Impedance
Hidden Refresh	READ	L-H-L	L	H	L	ROW	COL	Data Out
	WRITE	L-H-L	L	L	X	ROW	COL	Data In
Self Refresh		H - L	L	H	X	X	X	High Impedance

Absolute Maximum Ratings

Operating temperature range ..... 0 to + 70 ℃
Storage temperature range..... – 55 to + 125 ℃
Input/output voltage ..... –0.5 to min (Vcc+0.5, 4.6) V
Power supply voltage..... –0.5 to 4.6 V
Power dissipation..... 11.6 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 ℃; V_{CC} = 3.3 V ± 0.3 V

Parameter	Symbol	x 64/ x72		Unit	Notes
		min.	max.		
Input high voltage	V_{IH}	2.0	Vcc + 0.5	V	1)
Input low voltage	V_{IL}	– 0.5	0.8	V	1)
Output high voltage (LVTTL) Output „H“ level voltage (I_{OUT} = – 2 mA)	V_{OH}	2.4	–	V	1)
Output low voltage (LVTTL) Output „L“ level voltage (I_{OUT} = + 2 mA)	V_{OL}	–	0.4	V	1)
Output high voltage (LVCMOS) Output „H“ level voltage (I_{OUT} =– 100µA)	V_{OH}	Vcc-0.2	–	V	1)
Output low voltage (LVCMOS) Output „L“ level voltage (I_{OUT} =+100 µA)	V_{OL}	–	0.4	V	1)
Input leakage current (0 V < V_{IN} < Vcc, all other pins = 0 V)	$I_{I(L)}$	– 10	10	µA	1)
Output leakage current (DO is disabled, 0 V < V_{OUT} < Vcc)	$I_{O(L)}$	– 10	+10	µA	1)

DC Characteristics for HYM64/72V1605 (4k-refresh)
T_A = 0 to 70 °C; V_{CC} = 3.3 V ± 0.3 V

Parameter	Symbol	x 64		x 72		Unit	Notes
		min.	max.	min.	max.		
Average V_{CC} supply current:	I_{CC1}						2) 3) 4)
-50 version		–	2240	–	2520	mA	
-60 version		–	1840	–	2070	mA	
($\overline{RAS}$,$\overline{CAS}$,address cycling, t_{RC}=t_{RC} min.)							
Standby V_{CC} supply current ($\overline{RAS}$ = $\overline{CAS}$ = $V_{IH,}$ one address change)	I_{CC2}	–	32	–	36	mA	–
Average V_{CC} supply current during $\overline{RAS}$ only refresh cycles:	I_{CC3}						2) 4)
-50 version		–	2240	–	2520	mA	
-60 version		–	1840	–	2070	mA	
($\overline{RAS}$ cycling, $\overline{CAS}$ = V_{IH} , t_{RC} = t_{RC} min.)							
Average V_{CC} supply current during hyper page mode (EDO):	I_{CC4}						2) 3) 4)
-50 version		–	1680	–	1890	mA	
-60 version		–	1360	–	1530	mA	
($\overline{RAS}$ = $V_{IL,}$ $\overline{CAS}$, address cycling t_{PC} = t_{PC} min.)							
Standby V_{CC} supply current ($\overline{RAS}$ = $\overline{CAS}$ = V_{CC} – 0.2 V, one address change)	I_{CC5}	–	16	–	18	mA	–
Average V_{CC} supply current during $\overline{CAS}$-before-$\overline{RAS}$ refresh mode:	I_{CC6}						2) 4)
-50 version		–	2240	–	2520	mA	
-60 version		–	1840	–	2070	mA	
($\overline{RAS}$, $\overline{CAS}$ cycling, t_{RC} = t_{RC} min.)							

DC Characteristics for HYM64/72V1645 (8k-refresh)
T_A = 0 to 70 °C; V_{CC} = 3.3 V ± 0.3 V

Parameter	Symbol	x 64		x 72		Unit	Notes
		min.	max.	min.	max.		
Average V_{CC} supply current:	I_{CC1}						2) 3) 4)
-50 version		–	1600	–	1800	mA	
-60 version		–	1360	–	1530	mA	
($\overline{RAS}$,$\overline{CAS}$,address cycling, t_{RC}=t_{RC} min.)							
Standby V_{CC} supply current ($\overline{RAS}$ = $\overline{CAS}$ = $V_{IH,}$ one address change)	I_{CC2}	–	32	–	36	mA	–
Average V_{CC} supply current during $\overline{RAS}$ only refresh cycles:	I_{CC3}						2) 4)
-50 version		–	1600	–	1800	mA	
-60 version		–	1360	–	1530	mA	
($\overline{RAS}$ cycling, $\overline{CAS}$ = V_{IH} , t_{RC} = t_{RC} min.)							
Average V_{CC} supply current during hyper page mode (EDO):	I_{CC4}						2) 3) 4)
-50 version		–	1680	–	1890	mA	
-60 version		–	1360	–	1530	mA	
($\overline{RAS}$ = $V_{IL,}$ $\overline{CAS}$, address cycling t_{PC} = t_{PC} min.)							
Standby V_{CC} supply current ($\overline{RAS}$ = $\overline{CAS}$ = V_{CC} – 0.2 V, one address change)	I_{CC5}	–	16	–	18	mA	–
Average V_{CC} supply current during $\overline{CAS}$-before-$\overline{RAS}$ refresh mode:	I_{CC6}						2) 4)
-50 version		–	2240	–	2520	mA	
-60 version		–	1840	–	2070	mA	
($\overline{RAS}$, $\overline{CAS}$ cycling, t_{RC} = t_{RC} min.)							

AC Characteristics 5)6) 16E

T_A = 0 to 70 °C, V_{CC} = 3.3 V ± 0.3 V, 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	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 for 2k-refresh	t_{REF}	–	32	–	32	ms	
Refresh period for 4k-refresh	t_{REF}	–	64	–	64	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
$\overline{OE}$ access time	t_{OEA}	–	13	–	15	ns	
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)] 16E

T_A = 0 to 70 °C, V_{CC} = 3.3 V ± 0.3 V, t_T = 2 ns

Parameter	Symbol	Limit Values				Unit	Note
		-50		-60			
		min.	max.	min.	max.		
Output turn-off delay from $\overline{OE}$	t_{OEZ}	0	13	0	15	ns	12
Data to $\overline{CAS}$ low delay	t_{DZC}	0	–	0	–	ns	13
Data to $\overline{OE}$ low delay	t_{DZO}	0	–	0	–	ns	13
$\overline{CAS}$ high to data delay	t_{CDD}	10	–	13	–	ns	14
$\overline{OE}$ high to data delay	t_{ODD}	10	–	13	–	ns	14
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	15
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	16
Data hold time	t_{DH}	8	–	10	–	ns	16
Read-modify-Write Cycle							
Read-write cycle time	t_{RWC}	113	–	138	–	ns	
$\overline{RAS}$ to WE delay time	t_{RWD}	64	–	77	–	ns	15
$\overline{CAS}$ to $\overline{WE}$ delay time	t_{CWD}	27	–	32	–	ns	15
Column address to $\overline{WE}$ delay time	t_{AWD}	39	–	47	–	ns	15
$\overline{OE}$ command hold time	t_{OEH}	10	–	13	–	ns	
Hyper Page Mode (EDO) Cycle							
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 EDO mode	t_{RAS}	50	200k	60	200k	ns	
$\overline{CAS}$ precharge to $\overline{RAS}$ Delay	t_{RHPC}	27	–	32	–	ns	
$\overline{OE}$ setup time prior to $\overline{CAS}$	t_{OES}	5	–	5	–	ns	

AC Characteristics (cont'd) [5)6)] 16E

T_A = 0 to 70 °C, V_{CC} = 3.3 V ± 0.3 V, t_T = 2 ns

Parameter	Symbol	Limit Values				Unit	Note
		-50		-60			
		min.	max.	min.	max.		
Hyper Page Mode (EDO) Read-modify-Write Cycle							
Hyper page mode (EDO) read-write cycle time	t_{PRWC}	58	–	68	–	ns	
$\overline{CAS}$ precharge to $\overline{WE}$	t_{CPWD}	41	–	49	–	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	

Capacitance

T_A = 0 to 70 °C; V_{CC} = 3.3 V ± 0.3 V; f = 1 MHz

Parameter	Symbol	Limit Values		Unit
		min.	max.	
Input Capacitance (A0 to A12)	C_{I1}	–	100	pF
Input Capacitance ($\overline{RAS0}$, $\overline{RAS2}$)	C_{I2}	–	75	pF
Input Capacitance ($\overline{CAS0}$-$\overline{CAS7}$)	C_{I3}	–	18	pF
Input Capacitance ($\overline{WE0}$,$\overline{WE2}$,$\overline{OE0}$,$\overline{OE2}$)	C_{I4}	–	75	pF
I/O Capacitance (DQ0-DQ63,CB0-CB8)	C_{IO1}	–	11	pF
Input Capacitance (SCL, SA0-2)	C_S	–	8	pF
Input/Output Capacitance (SDA)	Cs	–	10	pF

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 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 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 CAS-before-$\overline{RAS}$ initialization cycles instead of 8 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_{OEA}. t_{CAC} is measured from tristate.

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) $t_{OFF\ (max.)}$, $t_{OEZ\ (max.)}$ 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) Either t_{DZC} or t_{DZO} must be satisfied.

14) Either t_{CDD} or t_{ODD} must be satisfied.

15) t_{WCS}, t_{RWD}, t_{CWD} and t_{AWD} are not restrictive operating parameters. They are 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; if $t_{RWD} > t_{RWD\ (min.)}$, $t_{CWD} > t_{CWD\ (min.)}$ and $t_{AWD} > t_{AWD\ (min.)}$, the cycle is a read-write cycle and I/O will contain data read from the selected cells. If neither of the above sets of conditions is satisfied, the condition of I/O (at access time) is indeterminate.

16) These parameters are referenced to the $\overline{CAS}$ leading edge in early write cycles and to the $\overline{WE}$ leading edge in read-write cycles.

Serial Presence Detects:

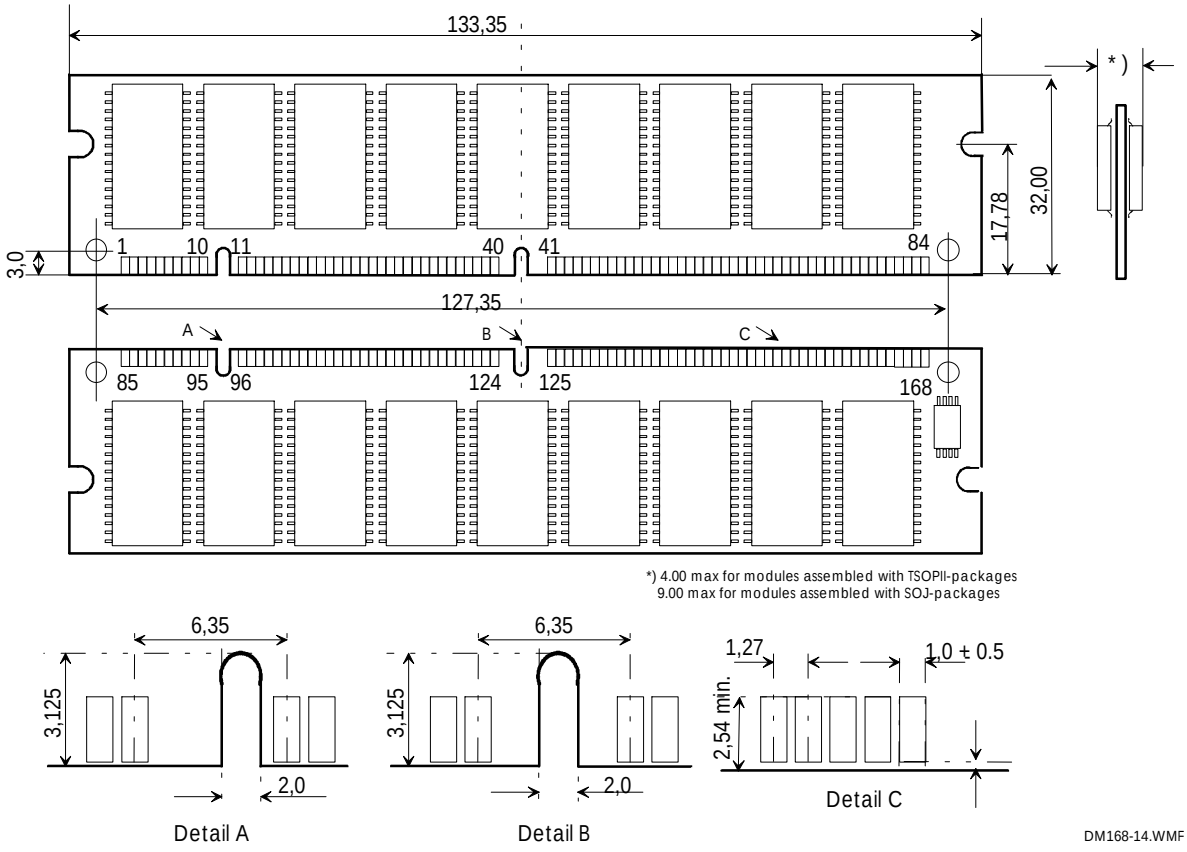
A serial presence detect storage device -- EEPROM 24C02 -- is assembled on to the module. Information about the modul confuguration, speed, etc. is written into the EEPROM device during module production using a serial presence detect protocol (I^2C synchronous 2-wire bus).

Byte# Description SPD Entry Value			Hex HYM			
			64 V1605 GU-50	64 V1605 GU-60	72 V1605 GU-50	72 V1605 GU-60
0	Number of SPD bytes	128	80	80	80	80
1	Total bytes in Serial PD	256	08	08	08	08
2	Memory Type	EDO	02	02	02	02
3	Number of Row Addresses	12	0C	0C	0C	0C
4	Number of Column Addresses	12	0C	0C	0C	0C
5	Number of DIMM Banks	1	01	01	01	01
6	Module Data Width	x64 / x72	40	40	48	48
7	Module Data Width (cont'd)	0	00	00	00	00
8	Module Interface Levels	LVTTL	01	01	01	01
9	RAS access time	50 / 60 ns	32	3C	32	3C
10	CAS access time	13 / 15 ns	0D	0F	0D	0F
11	Dimm Config (Error Det/Corr.)	none / ECC	00	00	02	02
12	Refresh Rate/Type	normal 15.6µs	00	00	00	00
13	Primary DRAM data width	x4	04	04	04	04
14	Error checking DRAM data width	none / x4	00	00	04	04
15-31	reserved for future offerings		FF	FF	FF	FF
32	Superset Memory Type	NA	FF	FF	FF	FF
33-61	Superset information (may be used in future)	NA	FF	FF	FF	FF
62	SPD Revision Designator	Rev. 1.0	01	01	01	01
63	Checksum for bytes 0-62		XX	XX	XX	XX
64-127	Manufacturer Information (optional)		FF	FF	FF	FF
128-255	Unused Storage Locations		FF	FF	FF	FF

Serial Presence Detects (cont'd):

Byte# Description SPD Entry Value			Hex HYM			
			64 V1645 GU-50	64 V1645 GU-60	72 V1645 GU-50	72 V1645 GU-60
0	Number of SPD bytes	128	80	80	80	80
1	Total bytes in Serial PD	256	08	08	08	08
2	Memory Type	EDO	02	02	02	02
3	Number of Row Addresses	13	0D	0D	0D	0D
4	Number of Column Addresses	11	0B	0B	0B	0B
5	Number of DIMM Banks	1	01	01	01	01
6	Module Data Width	x64 / x72	40	40	48	48
7	Module Data Width (cont'd)	0	00	00	00	00
8	Module Interface Levels	LVTTL	01	01	01	01
9	RAS access time	50 / 60 0 ns	32	3C	32	3C
10	CAS access time	13 / 15 0 ns	0D	0F	0D	0F
11	Dimm Config (Error Det/Corr.)	none / ECC	00	00	02	02
12	Refresh Rate/Type	normal 15.6µs	00	00	00	00
13	Primary DRAM data width	x4	04	04	04	04
14	Error checking DRAM data width	none / x4	00	00	04	04
15-31	reserved for future offerings		FF	FF	FF	FF
32	Superset Memory Type	NA	FF	FF	FF	FF
33-61	Superset information (may be used in future)	NA	FF	FF	FF	FF
62	SPD Revision Designator	Rev. 1.0	01	01	01	01
63	Checksum for bytes 0-62		XX	XX	XX	XX
64-127	Manufacturer Information (optional)		FF	FF	FF	FF
128-255	Unused Storage Locations		FF	FF	FF	FF

L-DIM-168-14
Module package
(168 pin, dual read-out, single in-line memory module)



preliminary drawing