

TENTATIVE TOSHIBA HYBRID DIGITAL INTEGRATED CIRCUIT
 16,777,216-WORD BY 64-BIT DYNAMIC RAM MODULE

DESCRIPTION

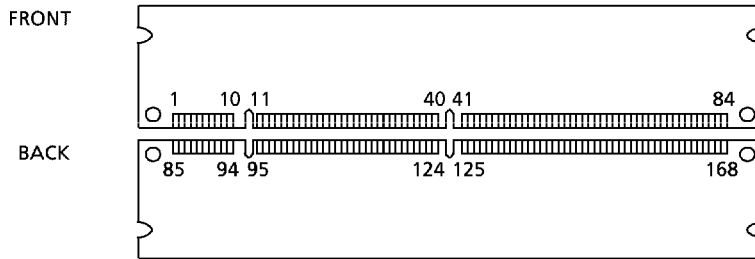
The THM65V1615ATG is a 16,777,216-word by 64-bit dynamic RAM module consisting of 16 TC5165405AFT DRAMs on a printed circuit board. This module is optimized for applications which require high density and high capacity, such as computer main memory and image memory, and also for applications which require compactness.

FEATURES

- 16,777,216-word by 64-bit organization
- Fast access and cycle times
- Single power supply of 3.3 V ± 5%
- Low power dissipation (max)
 - Operating 8884 mW (40-ns type)
 - 7218 mW (50-ns type)
 - Standby 27.8 mW (both devices)
- Read-Modify-Write, CAS-before-RAS refresh, RAS-Only refresh, Hidden refresh and EDO (Hyper Page mode) capability
- All inputs and outputs LVTTL-compatible
- 4096 refresh cycles per 64 ms
- Package: 168-pin Gold contacts

	-4	-5
t _{RAC} RAS Access Time	40 ns	50 ns
t _{AA} Column Address Access Time	20 ns	25 ns
t _{CAC} CAS Access Time	11 ns	13 ns
t _{RC} Cycle Time	69 ns	84 ns
t _{HPC} Hyper Page Mode Cycle Time	16 ns	20 ns

PIN ASSIGNMENT



PIN NAMES

A0 to 11	Address Inputs
DQ0 to 63	Data Inputs/ Outputs
RAS0,2	Row Address Strobe
CAS0 to 7	Column Address Strobe
WE0,2	Read / Write Input
OE0,2	Output Enable
V _{CC}	Power (+ 3.3 V)
V _{SS}	Ground
SCL	Presence Detect Clock
SDA	Serial Data-out
SA0 to 2	Serial PD Address
NC	No Connection

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

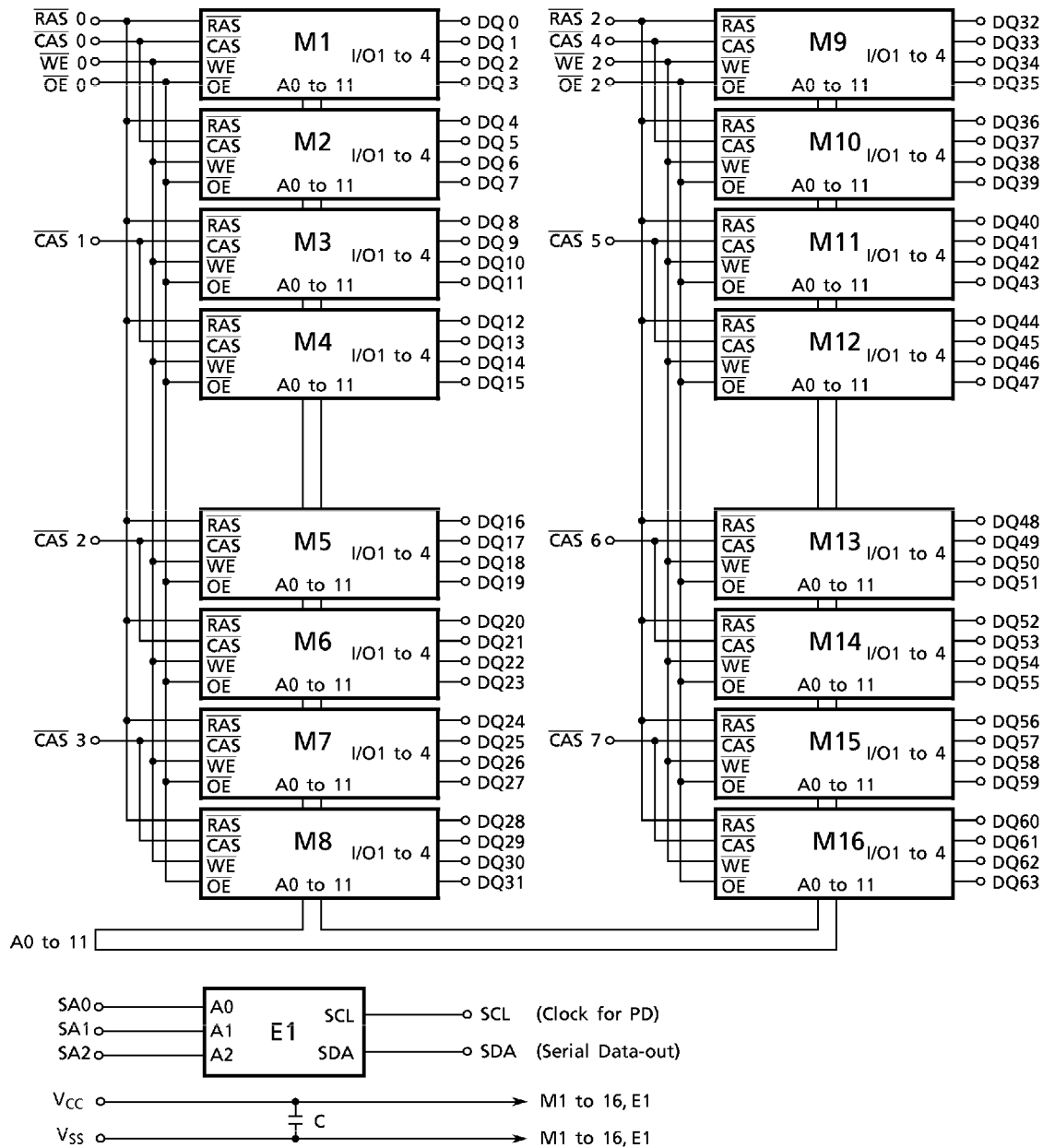
SERIAL PRESENCE DETECT

	-4 (hex)	-5 (hex)	Notes
Byte-0	80	80	128 bytes
Byte-1	08	08	256 bytes
Byte-2	02	02	EDO
Byte-3	0C	0C	A _R
Byte-4	0C	0C	A _C
Byte-5	01	01	DIMM Bank
Byte-6	40	40	x64
Byte-7	00	00	—
Byte-8	01	01	LVTTL
Byte-9	28	32	t _{RAC}
Byte-10	0B	0D	t _{CAC}
Byte-11	00	00	Non-Parity
Byte-12	00	00	15.625 μs (Normal)
Byte-13	04	04	x4
Byte-14	00	00	Non-Parity

961001EBA1

- TOSHIBA is continually working to improve the quality and the reliability of its products. Nevertheless, semiconductor devices in general can malfunction or fail due to their inherent electrical sensitivity and vulnerability to physical stress. It is the responsibility of the buyer, when utilizing TOSHIBA products, to observe standards of safety, and to avoid situations in which a malfunction or failure of a TOSHIBA product could cause loss of human life, bodily injury or damage to property. In developing your designs, please ensure that TOSHIBA products are used within specified operating ranges as set forth in the most recent products specifications. Also, please keep in mind the precautions and conditions set forth in the TOSHIBA Semiconductor Reliability Handbook.
- The products described in this document are subject to foreign exchange and foreign trade control laws.
- The information contained herein is presented only as a guide for the applications of our products. No responsibility is assumed by TOSHIBA CORPORATION for any infringements of intellectual property or other rights of the third parties which may result from its use. No license is granted by implication or otherwise under any intellectual property or other rights of TOSHIBA CORPORATION or others.
- The information contained herein is subject to change without notice.

BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS

SYMBOL	ITEM	RATING	UNIT	NOTES
V _{IN}	Input Voltage	- 0.3 to V _{CC} + 0.3	V	1
V _{OUT}	Output Voltage	- 0.3 to V _{CC} + 0.3	V	1
V _{CC}	Power Supply Voltage	- 0.3 to 4.6	V	1
T _{OPR}	Operating Temperature	0 to 70	°C	1
T _{STG}	Storage Temperature	- 55 to 125	°C	1
P _D	Power Dissipation	9.8	W	1
I _{OUT}	Short Circuit Output Current	50	mA	1

RECOMMENDED DC OPERATING CONDITIONS (Ta = 0° to 70°C)

SYMBOL	PARAMETER	MIN	TYP.	MAX	UNIT	NOTES
V _{CC}	Supply Voltage	3.13	3.3	3.47	V	2
V _{IH}	Input High Voltage	2.0	-	V _{CC} + 0.3*	V	2
V _{IL}	Input Low Voltage	- 0.3**	-	0.8	V	2

* V_{CC} + 1.2V at pulse width ≤ 20 ns (pulse width is measured at V_{CC})

** - 1.2V at pulse width ≤ 20 ns (pulse width is measured at V_{SS})

CAPACITANCE (V_{CC} = 3.3 V ± 5%, f = 1 MHz, Ta = 0° to 70°C)

SYMBOL	PARAMETER	MIN	MAX	UNIT
C _{I1}	Input Capacitance (A0 to 11)	-	T.B.D.	pF
C _{I2}	Input Capacitance ($\overline{WE}0,2$)	-	T.B.D.	pF
C _{I3}	Input Capacitance ($\overline{RAS}0,2$)	-	T.B.D.	pF
C _{I4}	Input Capacitance ($\overline{CAS}0$ to 7)	-	T.B.D.	pF
C _{I5}	Input Capacitance ($\overline{OE}0,2$)	-	T.B.D.	pF
C _{DQ}	I/O Capacitance (DQ0 to 63)	-	T.B.D.	pF

DC CHARACTERISTICS ($V_{CC} = 3.3\text{ V} \pm 5\%$, $T_a = 0^\circ$ to 70°C)

SYMBOL	PARAMETER		MIN	MAX	UNIT	NOTES
I _{CC1}	OPERATING CURRENT Average Power Supply Operating Current (\overline{RAS} , \overline{CAS} , Address Cycling: $t_{RC} = t_{RC\ min}$)	THMxxxxxx-4	-	2560	mA	3, 4
		THMxxxxxx-5	-	2080		5
I _{CC2}	STANDBY CURRENT Power Supply Standby Current ($\overline{RAS} = \overline{CAS} = V_{IH}$)		-	16	mA	
I _{CC3}	\overline{RAS} -ONLY REFRESH CURRENT Average Power Supply Current, \overline{RAS} -Only Mode (\overline{RAS} Cycling, $\overline{CAS} = V_{IH}$: $t_{RC} = t_{RC\ min}$)	THMxxxxxx-4	-	2560	mA	3, 5
		THMxxxxxx-5	-	2080		
I _{CC4}	HYPER PAGE MODE CURRENT Average Power Supply Current, Hyper Page Mode ($\overline{RAS} = \overline{CAS} = V_{IL}$, Address Cycling: $t_{HPC} = t_{HPC\ min}$)	THMxxxxxx-4	-	1920	mA	3, 4
		THMxxxxxx-5	-	1600		5
I _{CC5}	STANDBY CURRENT Power Supply Standby Current ($\overline{RAS} = \overline{CAS} = V_{CC} - 0.2\text{ V}$)		-	8	mA	
I _{CC6}	\overline{CAS} -BEFORE- \overline{RAS} REFRESH CURRENT Average Power Supply Current, \overline{CAS} -before- \overline{RAS} Mode (\overline{RAS} , \overline{CAS} Cycling: $t_{RC} = t_{RC\ min}$)	THMxxxxxx-4	-	2560	mA	3, 5
		THMxxxxxx-5	-	2080		
I _{I(L)}	INPUT LEAKAGE CURRENT Input Leakage Current, Any Input ($0\text{ V} \leq V_{IN} \leq V_{CC}$, All Other Pins Not under Test = 0 V)		- 10	10	μA	
I _{O(L)}	OUTPUT LEAKAGE CURRENT (D_{OUT} Is Disabled, $0\text{ V} \leq V_{OUT} \leq V_{CC}$)		- 10	10	μA	
V _{OH}	OUTPUT LEVEL Output H Level Voltage ($I_{OUT} = -2\text{ mA}$)		2.4	-	V	
V _{OL}	OUTPUT LEVEL Output L Level Voltage ($I_{OUT} = 2\text{ mA}$)		-	0.4	V	

AC CHARACTERISTICS AND RECOMMENDED OPERATING CONDITIONS

($V_{CC} = 3.3\text{ V} \pm 5\%$, $T_a = 0^\circ$ to 70°C)

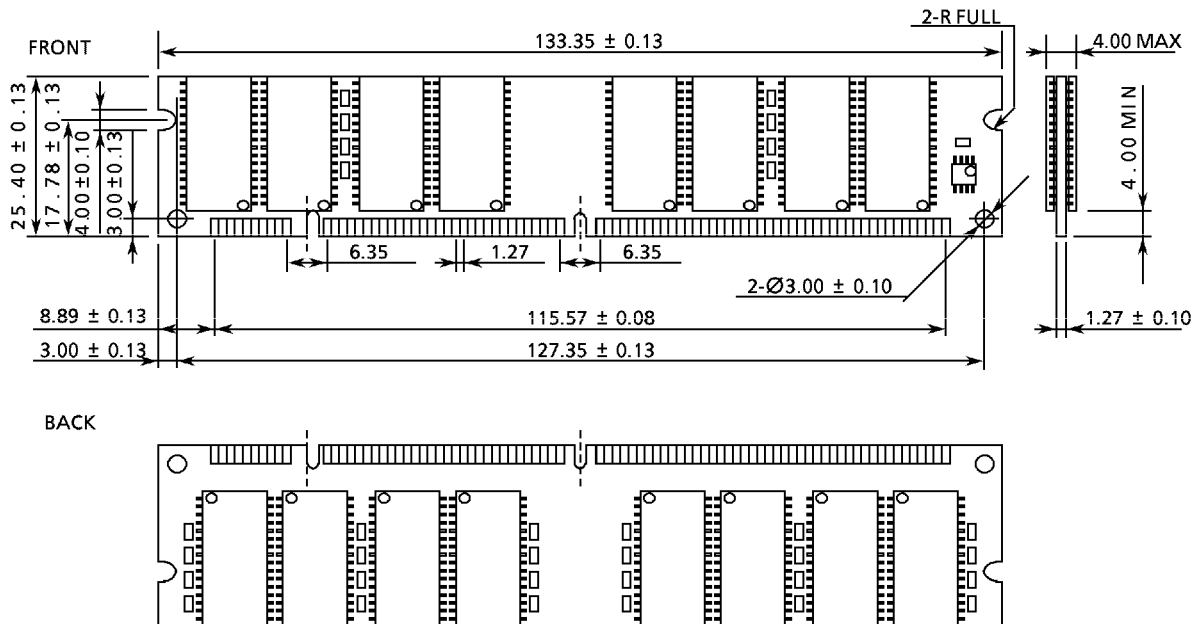
Please refer to DRAM MODULE AC CHARACTERISTICS AND RECOMMENDED OPERATING CONDITIONS No. 44

SERIAL PRESENCE DETECT AC CHARACTERISTICS AND RECOMMENDED OPERATING CONDITIONS

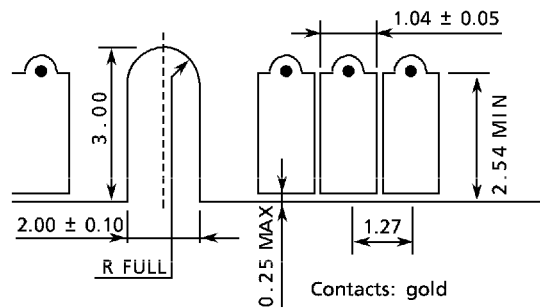
For information on SERIAL PRESENCE DETECT please refer to AC CHARACTERISTICS AND RECOMMENDED OPERATING CONDITIONS No. 100

PACKAGE DIMENSIONS (THM65V1615ATG)

Unit: mm



CONTACT DIMENSIONS



Weight: 23.0g (typ.)