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.

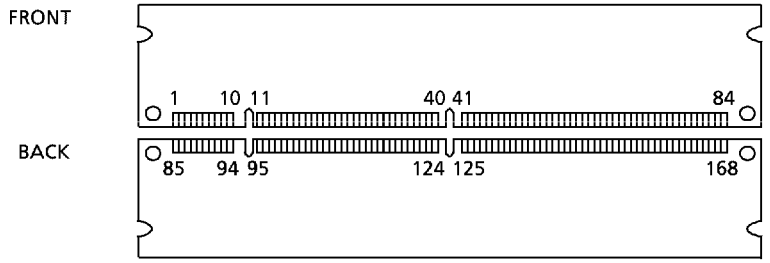
FEATURES

- 16,777,216-word by 64-bit organization
- Fast access and cycle times

	-4	-5
t_{RAC} $\overline{RAS}$ Access Time	40 ns	50 ns
t_{AA} Column Address Access Time	20 ns	25 ns
t_{CAC} $\overline{CAS}$ 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

- 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, $\overline{CAS}$-before-$\overline{RAS}$ refresh, $\overline{RAS}$-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

PIN ASSIGNMENT



1	Vss	85	Vss	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	Vcc	143	Vcc
4	DQ2	88	DQ34	32	Vss	116	Vss	60	DQ20	144	DQ52
5	DQ3	89	DQ35	33	A0	117	A1	61	NC	145	NC
6	Vcc	90	Vcc	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	Vss	148	Vss
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	Vss	96	Vss	40	Vcc	124	Vcc	68	Vss	152	Vss
13	DQ9	97	DQ41	41	Vcc	125	NC	69	DQ24	153	DQ56
14	DQ10	98	DQ42	42	NC	126	NC	70	DQ25	154	DQ57
15	DQ11	99	DQ43	43	Vss	127	Vss	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	Vcc	157	Vcc
18	VCC	102	Vcc	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	Vcc	133	Vcc	77	DQ31	161	DQ63
22	NC	106	NC	50	NC	134	NC	78	Vss	162	Vss
23	Vss	107	Vss	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	Vcc	110	Vcc	54	Vss	138	Vss	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	Vcc	168	Vcc

PIN NAMES

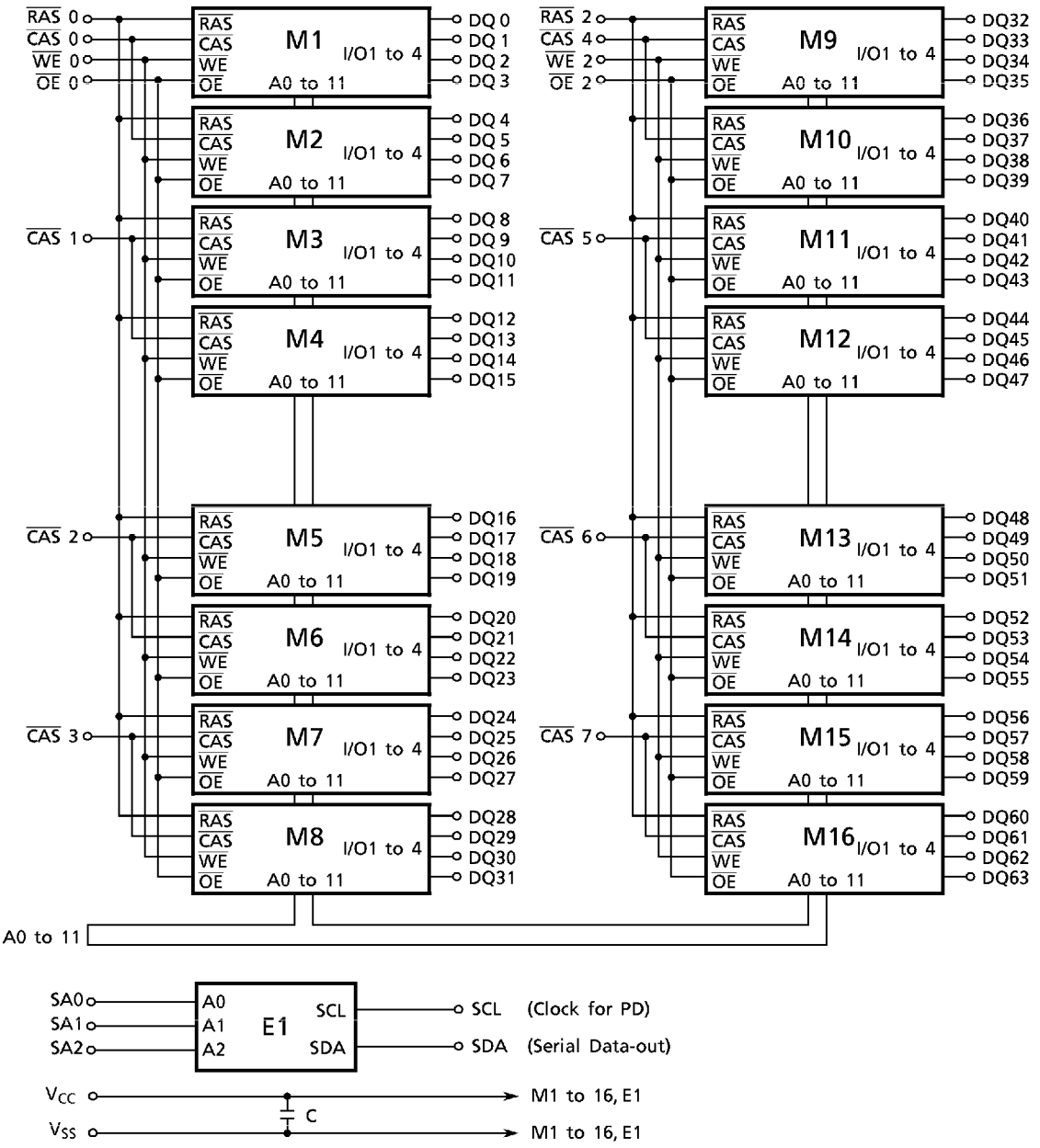
A0 to 11	Address Inputs
DQ0 to 63	Data Inputs / Outputs
$\overline{RAS}$0,2	Row Address Strobe
$\overline{CAS}$0 to 7	Column Address Strobe
$\overline{WE}$0,2	Read / Write Input
$\overline{OE}$0,2	Output Enable
V_{CC}	Power (+3.3 V)
V_{SS}	Ground
SCL	Presence Detect Clock
SDA	Serial Data-out
SA0 to 2	Serial PD Address
NC	No Connection

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	tRAC
Byte-10	0B	0D	tCAC
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

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

** − 1.2 V 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 V ± 5%, Ta = 0° 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 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 V ≦ V_{IN} ≦ V_{CC}, All Other Pins Not under Test = 0 V)		– 10	10	μA	
$I_{O(L)}$	OUTPUT LEAKAGE CURRENT (D_{OUT} Is Disabled, 0 V ≦ V_{OUT} ≦ V_{CC})		– 10	10	μA	
V_{OH}	OUTPUT LEVEL Output H Level Voltage (I_{OUT} = – 2 mA)		2.4	–	V	
V_{OL}	OUTPUT LEVEL Output L Level Voltage (I_{OUT} = 2 mA)		–	0.4	V	

AC CHARACTERISTICS AND RECOMMENDED OPERATING CONDITIONS

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

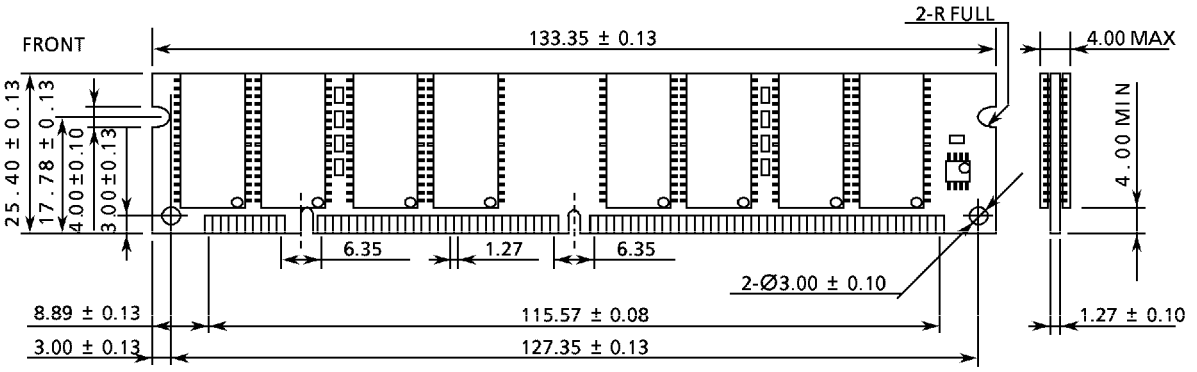
Please refer to DRAM MODULE AC CHARACTERISTICS AND RECOMMENDED OPERATING CONDITIONS No. 44

SERIAL PRESENCE DETECT AC CHARACTERISTICS AND RECOMMENDED OPERATING CONDITIONS

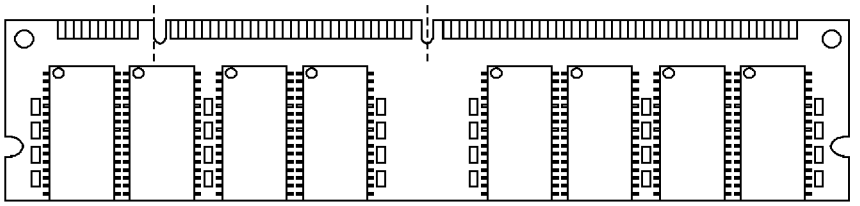
For information on SERIAL PRESENCE DETECT please refer to AC CHARACTERISTICS AND RECOMMENDED OPERATING CONDITIONS No. 100

PACKAGE DIMENSIONS (THM65V1615ATG)

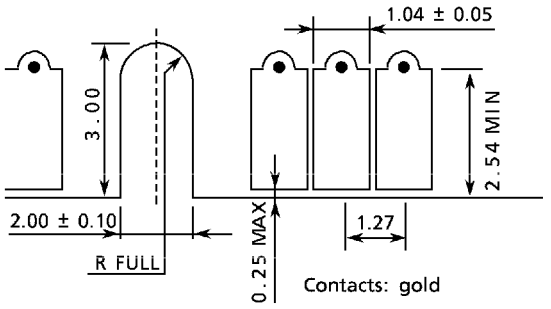
Unit: mm



BACK



CONTACT DIMENSIONS



Weight: 23.0g (typ.)