

Features

- 240-pin JEDEC-compliant DIMM, 133.35 mm wide by 30 mm high
- Operating Voltage: 1.5 V ±0.075 V
- I/O Type: SSTL_15
- Data Transfer Rate: 10.6 Gigabytes/sec
- Data Bursts: 8 and burst chop 4 mode
- ZQ Calibration for Output Driver and On-Die Termination (ODT)
- Programmable ODT / Dynamic ODT during Writes
- Programmable CAS Latency: 6, 7, 8 and 9
- Differential Data Strobe signals
- SDRAM Addressing (Row/Col/Bank): 15/10/3
- Fully RoHS Compliant

Identification

DTM64329G 512Mx64

4GB 2Rx8 PC3-10600-U9

Performance range

Clock / Module Speed / CL-t_{RCD}-t_{RP}

667 MHz / PC3-10600 / 9-9-9

533 MHz / PC3-8500 / 8-8-8

533 MHz / PC3-8500 / 7-7-7

400 MHz / PC3-6400 / 6-6-6

Description

DTM64329G is an Unbuffered 512Mx64 memory module, which conforms to JEDEC's DDR3, PC3-10600 standard. The assembly is Dual-Rank containing sixteen 256Mx8 DDR3 Samsung SDRAMs. One 2K-bit EEPROM is used for Serial Presence Detect.

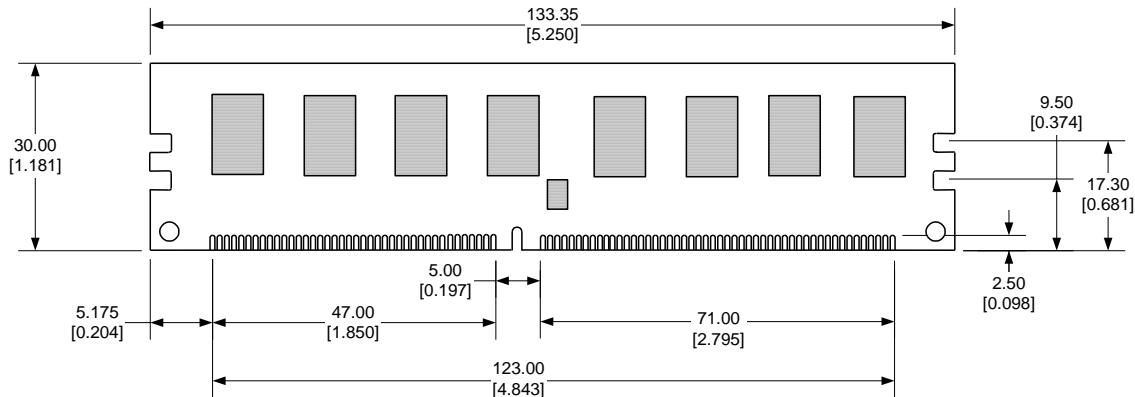
Both output driver strength and input termination impedance are programmable to maintain signal integrity on the I/O signals.

Pin Configuration

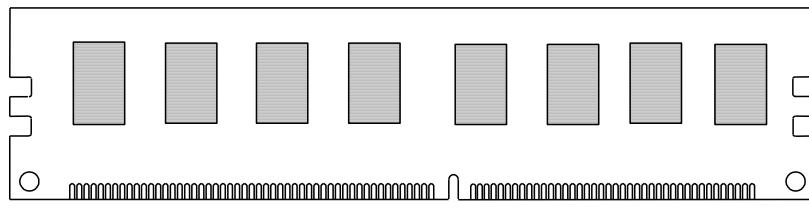
Front Side				Back Side				Name	Function
1 VREFDQ	31 DQ25	61 A2	91 DQ41	121 V _{SS}	151 V _{SS}	181 A1	211 V _{SS}	CB[7:0]	Data Check Bits
2 V _{SS}	32 V _{SS}	62 V _{DD}	92 V _{SS}	122 DQ4	152 DM3	182 V _{DD}	212 DM5	DQ[63:0]	Data Bits
3 DQ0	33 /DQS3	63 CK1	93 /DQS5	123 DQ5	153 NC	183 V _{DD}	213 NC	DQS[8:0], /DQS[8:0]	Differential Data Strobes
4 DQ1	34 DQS3	64 /CK1	94 DQS5	124 V _{SS}	154 V _{SS}	184 CK0	214 V _{SS}	DM[8:0]	Data Mask
5 V _{SS}	35 V _{SS}	65 V _{DD}	95 V _{SS}	125 DM0	155 DQ30	185 /CK0	215 DQ46	CK[1:0], /CK[1:0]	Differential Clock Inputs
6 /DQS0	36 DQ26	66 V _{DD}	96 DQ42	126 NC	156 DQ31	186 V _{DD}	216 DQ47	CKE[1:0]	Clock Enables
7 DQSO	37 DQ27	67 V _{REFCA}	97 DQ43	127 V _{SS}	157 V _{SS}	187 NC	217 V _{SS}	/CAS	Column Address Strobe
8 V _{SS}	38 V _{SS}	68 NC	98 V _{SS}	128 DQ6	158 CB4, NC*	188 A0	218 DQ52	/RAS	Row Address Strobe
9 DQ2	39 CB0, NC*	69 VDD	99 DQ48	129 DQ7	159 CB5, NC*	189 V _{DD}	219 DQ53	/S[3:0]	Chip Selects
10 DQ3	40 CB1, NC*	70 A10/AP	100 DQ49	130 V _{SS}	160 V _{SS}	190 BA1	220 V _{SS}	/WE	Write Enable
11 V _{SS}	41 V _{SS}	71 BA0	101 V _{SS}	131 DQ12	161 DM8, NC*	191 V _{DD}	221 DM6	A[15:0]	Address Inputs
12 DQ8	42 /DQS8**	72 V _{DD}	102 /DQS6	132 DQ13	162 NC	192 /RAS	222 NC	BA[2:0]	Bank Addresses
13 DQ9	43 DQS8**	73 WE	103 DQ56	133 V _{SS}	163 V _{SS}	193 /SO	223 V _{SS}	ODT[1:0]	On Die Termination Inputs
14 V _{SS}	44 V _{SS}	74 /CAS	104 V _{SS}	134 DM1	164 CB6, NC*	194 V _{DD}	224 DQ54	SA[2:0]	SPD Address
15 /DQS1	45 CB2, NC*	75 V _{DD}	105 DQ50	135 NC	165 CB7, NC*	195 ODT0	225 DQ55	SCL	SPD Clock Input
16 DQS1	46 CB3, NC	76 /S1	106 DQ51	136 V _{SS}	166 V _{SS}	196 A13	226 V _{SS}	SDA	SPD Data Input/Output
17 V _{SS}	47 V _{SS}	77 ODT1	107 V _{SS}	137 DQ14	167 NC(TEST)	197 V _{DD}	227 DQ60	/RESET	Reset for register and DRAMs
18 DQ10	48 V _{TT}	78 V _{DD}	108 DQ56	138 DQ15	168 /RESET	198 /S3, NC*	228 DQ61	A12/BC	Combination input: Addr12/Burst Chop
19 DQ11	49 V _{TT}	79 /S2, NC*	109 DQ57	139 V _{SS}	169 CKE1	199 V _{SS}	229 V _{SS}	A10/AP	Combination input: Addr10/Auto-precharge
20 V _{SS}	50 CKE0	80 V _{SS}	110 V _{SS}	140 DQ20	170 V _{DD}	200 DQ36	230 DM7	V _{SS}	Ground
21 DQ16	51 V _{DD}	81 DQ32	111 /DQS7	141 DQ21	171 A15 *	201 DQ37	231 NC	V _{DD}	Power
22 DQ17	52 BA2	82 DQ33	112 DQ57	142 V _{SS}	172 A14	202 V _{SS}	232 V _{SS}	V _{DDSPD}	SPD EEPROM Power
23 V _{SS}	53 NC	83 V _{SS}	113 V _{SS}	143 DM2	173 V _{DD}	203 DM4	233 DQ62	V _{REFDQ}	Reference Voltage for DQ's
24 /DQS2	54 V _{DD}	84 /DQS4	114 DQ58	144 NC	174 A12/BC	204 NC	234 DQ63	V _{REFCA}	Reference Voltage for CA
25 DQS2	55 A11	85 DQS4	115 DQ59	145 V _{SS}	175 A9	205 V _{SS}	235 V _{SS}	V _{TT}	Termination Voltage
26 V _{SS}	56 A7	86 V _{SS}	116 V _{SS}	146 DQ22	176 V _{DD}	206 DQ38	236 V _{DDSPD}	NC	No Connection
27 DQ18	57 V _{DD}	87 DQ34	117 SA0	147 DQ23	177 A8	207 DQ39	237 SA1		
28 DQ19	58 A5	88 DQ35	118 SCL	148 V _{SS}	178 A6	208 V _{SS}	238 SDA		
29 V _{SS}	59 A4	89 V _{SS}	119 SA2	149 DQ28	179 V _{DD}	209 DQ44	239 V _{SS}		
30 DQ24	60 V _{DD}	90 DQ40	120 V _{TT}	150 DQ29	180 A3	210 DQ45	240 V _{TT}		

* = Not used

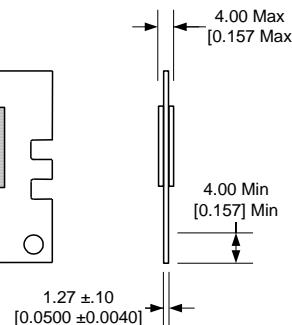
Front view



Back view



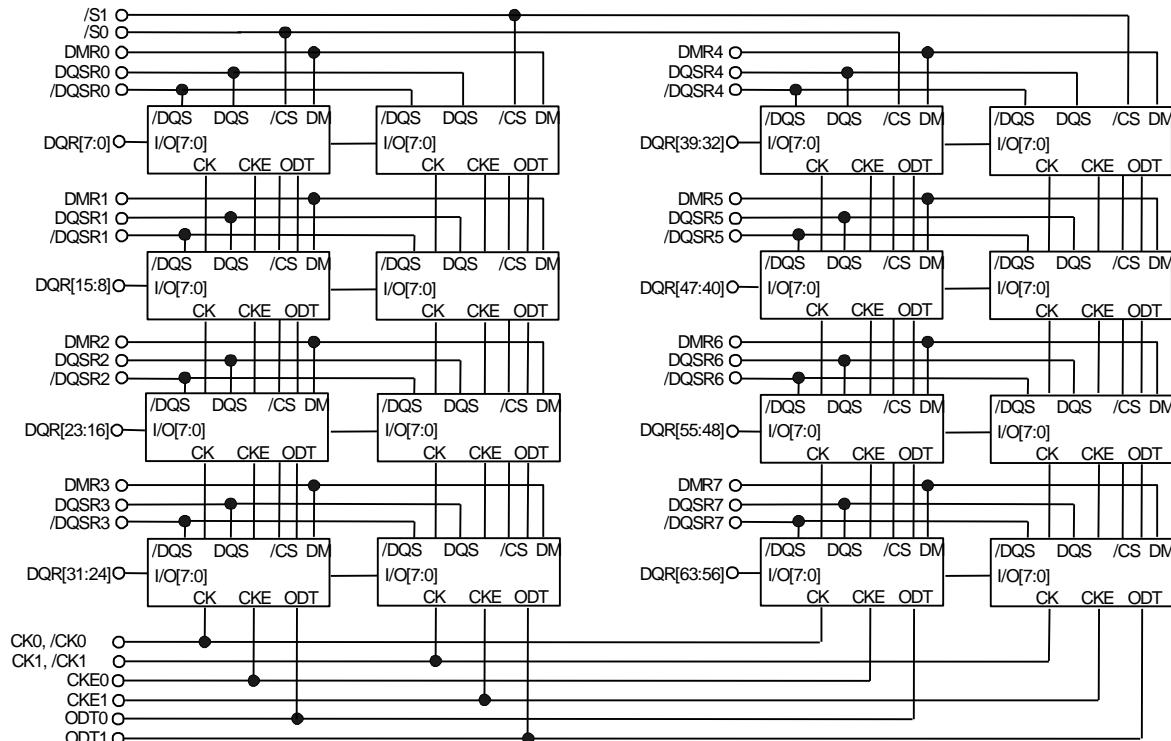
Side view



Notes

Tolerances on all dimensions except where otherwise indicated are $\pm .13$ (.005).

All dimensions are expressed: millimeters [inches]



All 15 OHMS

- DQ[63:0] $\text{O} \sim \text{V} \sim \text{O}$ DQR[63:0]
- DQS[7:0] $\text{O} \sim \text{V} \sim \text{O}$ DQRS[7:0]
- /DQS[7:0] $\text{O} \sim \text{V} \sim \text{O}$ /DQRS[7:0]
- DM[7:0] $\text{O} \sim \text{V} \sim \text{O}$ DMR[7:0]

CK[1:0] $\text{O} \sim \text{V} \sim \text{O}$ 2.2 pF $\text{O} \sim \text{V} \sim \text{O}$ /CK[1:0]

GLOBAL SDRAM CONNECTS

All 39 OHMS

- BA[2:0] $\text{O} \sim \text{V} \sim \text{O}$
- A[15:0] $\text{O} \sim \text{V} \sim \text{O}$
- /RAS $\text{O} \sim \text{V} \sim \text{O}$
- /CAS $\text{O} \sim \text{V} \sim \text{O}$
- /WE $\text{O} \sim \text{V} \sim \text{O}$ VTT

All 36 OHMS 100 nf

- /CK0 $\text{O} \sim \text{V} \sim \text{O}$
- CK0 $\text{O} \sim \text{V} \sim \text{O}$
- /CK1 $\text{O} \sim \text{V} \sim \text{O}$
- CK1 $\text{O} \sim \text{V} \sim \text{O}$

All 39 OHMS

- CKE[1:0] $\text{O} \sim \text{V} \sim \text{O}$
- ODT[1:0] $\text{O} \sim \text{V} \sim \text{O}$
- /S[1:0] $\text{O} \sim \text{V} \sim \text{O}$ VTT

DECOUPLING

- V_{DDSPD} $\text{O} \sim \text{V} \sim \text{O}$ Serial PD
- V_{DD} $\text{O} \sim \text{V} \sim \text{O}$ All SDRAMs
- V_{REF_DQ} $\text{O} \sim \text{V} \sim \text{O}$ All SDRAMs
- V_{SS} $\text{O} \sim \text{V} \sim \text{O}$ All SDRAMs
- V_{REF_CA} $\text{O} \sim \text{V} \sim \text{O}$ All SDRAMs
- V_{TT} $\text{O} \sim \text{V} \sim \text{O}$ All SDRAMs

All 240 OHMS

- ZQ $\text{O} \sim \text{V} \sim \text{O}$ V_{SS}

SCL \rightarrow SERIAL PD \leftarrow SDA

- SA0 $\text{O} \sim \text{V} \sim \text{O}$
- SA1 $\text{O} \sim \text{V} \sim \text{O}$
- SA2 $\text{O} \sim \text{V} \sim \text{O}$

Absolute Maximum Ratings

(Note: Operation at or above Absolute Maximum Ratings can adversely affect module reliability.)

PARAMETER	Symbol	Minimum	Maximum	Unit
Temperature, non-Operating	T _{STORAGE}	-55	100	C
Ambient Temperature, Operating	T _A	0	70	C
DRAM Case Temperature, Operating	T _{CASE}	0	95	C
Voltage on V _{DD} relative to V _{SS}	V _{DD}	-0.4	1.975	V
Voltage on Any Pin relative to V _{SS}	V _{IN,V_{OUT}}	-0.4	1.975	V

Notes:

DRAM Operating Case Temperature above 85C requires 2X refresh.

Recommended DC Operating Conditions (T_A = 0 to 70 C, Voltage referenced to V_{SS} = 0 V)

PARAMETER	Symbol	Minimum	Typical	Maximum	Unit	Note
Power Supply Voltage	V _{DD}	1.425	1.5	1.575	V	
I/O Reference Voltage	V _{REFDQ}	0.49 V _{DD}	0.50 V _{DD}	0.51 V _{DD}	V	1
I/O Reference Voltage	V _{REFCA}	0.49 V _{DD}	0.50 V _{DD}	0.51 V _{DD}	V	1

Notes:

The value of V_{REF} is expected to equal one-half V_{DD} and to track variations in the V_{DD} DC level. Peak-to-peak noise on V_{REF} may not exceed $\pm 1\%$ of its DC value. For Reference V_{DD}/2 ± 15 mV.

DC Input Logic Levels, Single-Ended (T_A = 0 to 70 C, Voltage referenced to V_{SS} = 0 V)

PARAMETER	Symbol	Minimum	Maximum	Unit
Logical High (Logic 1)	V _{IH(DC)}	V _{REF} + 0.1	V _{DD}	V
Logical Low (Logic 0)	V _{IL(DC)}	V _{SS}	V _{REF} - 0.1	V

AC Input Logic Levels, Single-Ended (T_A = 0 to 70 C, Voltage referenced to V_{SS} = 0 V)

PARAMETER	Symbol	Minimum	Maximum	Unit
Logical High (Logic 1)	V _{IH(AC)}	V _{REF} + 0.175	-	V
Logical Low (Logic 0)	V _{IL(AC)}	-	V _{REF} - 0.175	V

Differential Input Logic Levels ($T_A = 0$ to 70 C, Voltage referenced to $V_{ss} = 0$ V)

PARAMETER	Symbol	Minimum	Maximum	Unit
Differential Input Logic High	$V_{IH,DIFF}$	+0.200	DC: V_{DD} AC: $V_{DD}+0.4$	V
Differential Input Logic Low	$V_{IL,DIFF}$	DC: V_{ss} AC: $V_{ss}-0.4$	-0.200	V
Differential Input Cross Point Voltage relative to $V_{DD}/2$	V_{IX}	- 0.150	+ 0.150	V

Capacitance ($T_A = 25$ C, $f = 100$ MHz)

PARAMETER	Pin	Symbol	Minimum	Maximum	Unit
Input Capacitance, Clock	$CK[1:0], /CK[1:0]$	C_{CK}	8.6	13.4	pF
Input Capacitance, Address	$BA[2:0], A[14:0], /RAS, /CAS, /WE$	C_I	12	20.8	pF
Input Capacitance Control	$/S[1:0], CKE[1:0], ODT[1:0]$	C_I	6	10.4	pF
Input/Output Capacitance	$DQ[63:0], DQS[7:0], /DQS[7:0], DM[7:0]$	C_{DIO}	3	5	pF

DC Characteristics ($T_A = 0$ to 70 C, Voltage referenced to $V_{ss} = 0$ V)

PARAMETER	Symbol	Minimum	Maximum	Unit	Note
Input Leakage Current (Any input 0 V < V_{IN} < V_{DD})	I_{IL}	-16	+32	μA	1,2
Output Leakage Current (0V < V_{OUT} < V_{DDQ})	I_{OL}	-10	+10	μA	2,3

Notes:

- 1) All other pins not under test = 0 V
- 2) Values are shown per pin
- 3) DQ, DQS, DQS and ODT are disabled

I_{DD} Specifications and Conditions (T_A = 0 to 70 C, Voltage referenced to V_{SS} = 0 V)

PARAMETER	Symbol	Test Condition	Max Value	Unit
Operating One Bank Active-Precharge Current	I _{DD0} *	Operating current : One bank ACTIVATE-to-PRECHARGE	435	mA
Operating One Bank Active-Read-Precharge Current	I _{DD1} *	Operating current : One bank ACTIVATE-to-READ-to-PRECHARGE	504	mA
Precharge Power-Down Current	I _{DD2P} **	Precharge power down current: Slow exit	173	mA
Precharge Power-Down Current	I _{DD2P} **	Precharge power down current: Fast exit	216	mA
Precharge Quiet Standby Current	I _{DD2Q} **	Precharge quiet standby current	288	mA
Precharge Standby Current	I _{DD2N} **	Precharge standby current	288	mA
Active Power-Down Current	I _{DD3P} **	Active power-down current	272	mA
Active Standby Current	I _{DD3N} **	Active standby current	218	mA
Operating Burst Write Current	I _{DD4W} *	Burst write operating current	720	mA
Operating Burst Read Current	I _{DD4R} *	Burst read operating current	684	mA
Burst Refresh Current	I _{DD5} **	Refresh current	1656	mA
Self Refresh Current	I _{DD6} **	Self-refresh temperature current: MAX T _c = 85°C	173	mA
Operating Bank Interleave Read Current	I _{DD7} **	All bank interleaved read current	1944	mA

* One module rank in this operation, the other in IDD2N.

** All module ranks in this operation.

AC Operating Conditions

PARAMETER	Symbol	Min	Max	Unit
Internal read command to first data	t _{AA}	13.125	20	ns
CAS-to-CAS Command Delay	t _{CCD}	4	-	t _{CCK}
Clock High Level Width	t _{CH(avg)}	0.47	0.53	t _{CCK}
Clock Cycle Time	t _{CCK}	1.5	3.3	ns
Clock Low Level Width	t _{CL(avg)}	0.47	0.53	t _{CCK}
Data Input Hold Time after DQS Strobe	t _{DH}	65	-	ps
DQ Input Pulse Width	t _{DIPW}	400	-	ps
DQS Output Access Time from Clock	t _{DQSCK}	-255	+255	ps
Write DQS High Level Width	t _{DQSH}	0.45	0.55	t _{CCK(avg)}
Write DQS Low Level Width	t _{DQL}	0.45	0.55	t _{CCK(avg)}
DQS-Out Edge to Data-Out Edge Skew	t _{DQSQ}	-	125	ps
Data Input Setup Time Before DQS Strobe	t _{DS}	30	-	ps
DQS Falling Edge from Clock, Hold Time	t _{DSH}	0.2	-	t _{CCK(avg)}
DQS Falling Edge to Clock, Setup Time	t _{DSS}	0.2	-	t _{CCK(avg)}
Clock Half Period	t _{HP}	minimum of t _{CH} or t _{CL}	-	ns
Address and Command Hold Time after Clock	t _{IH}	140	-	ps
Address and Command Setup Time before Clock	t _{IS}	190	-	ps
Load Mode Command Cycle Time	t _{MRD}	4	-	t _{CCK}
DQ-to-DQS Hold	t _{QH}	0.38	-	t _{CCK(avg)}
Active-to-Precharge Time	t _{RAS}	36	9*t _{REFI}	ns
Active-to-Active / Auto Refresh Time	t _{RC}	49.125	-	ns
RAS-to-CAS Delay	t _{RCD}	13.125	-	ns
Average Periodic Refresh Interval	t _{REFI}	-	7.8	μs
Auto Refresh Row Cycle Time	t _{RFC}	160	-	ns
Row Precharge Time	t _{RP}	13.125	-	ns
Read DQS Preamble Time	t _{RPRE}	0.9	Note-1	t _{CCK(avg)}
Read DQS Postamble Time	t _{RPST}	0.3	Note-2	t _{CCK(avg)}
Row Active to Row Active Delay	t _{RRD}	Max(4nCK, 6ns)	-	ns
Internal Read to Precharge Command Delay	t _{RTP}	Max(4nCK, 7.5ns)	-	ns
Write DQS Preamble Setup Time	t _{WPRE}	0.9	-	t _{CCK(avg)}
Write DQS Postamble Time	t _{WPST}	0.4	-	t _{CCK(avg)}
Write Recovery Time	t _{WR}	15	-	ns
Internal Write to Read Command Delay	t _{WTR}	Max(4nCK, 7.5ns)	-	ns

Notes:

1. The maximum preamble is bound by tLZDQS(min)
2. The maximum postamble is bound by tHZDQS(max)

**DTM64329G****4GB - 240-Pin 2Rx8 Unbuffered Non-ECC DDR3
DIMM**

DATARAM Memory, USA Corporate Headquarters, P.O. Box 7528, Princeton, NJ 08543-7528;
Voice: 609-799-0071, Fax: 609-799-6734; www.dataram.com

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