

# Apacer Memory Product Specification

## 2048MB DDR2 DIMM

2048M DDR2 DIMM based on 128MX8 , 8Banks, 1.8V DDR2 DIMM with SPD

### Features

Performance range		( Bandwidth: 6.4 GB/sec )
Part No.	Max Freq. (Clock)	Speed Grade
78.A1GAR.XX4	400MHz(2.5ns@CL6)	800 Mbps

- JEDEC standard 1.8V  $\pm$  0.1V Power Supply
- VDDQ = 1.8V  $\pm$  0.1V
- Internal Bank:8 Bank
- Posted CAS
- Programmable CAS Latency: 3, 4, 5
- Programmable Additive Latency: 0, 1, 2, 3 and 4
- Write Latency(WL) = Read Latency(RL) -1
- Burst Length: 4, 8(Interleave/nibble sequential)
- Programmable Sequential / Interleave Burst Mode
- Bi-directional Differential Data-Strobe (Single-ended data-strobe is an optional feature)
- Off-Chip Driver(OCD) Impedance Adjustment
- On Die Termination
- Refresh and Self Refresh  
Average Refresh Period 7.8us
- Serial presence detect with EEPROM
- Compliance with RoHS
- Compliance with CE
- DDR2 SDRAM Package: 60ball FBGA - 128Mx8
- Operating Temperature Rang TC(case) 0~85 degree

### Pin Description

Pin Name	Description	Pin Name	Description
A0-A13	DDR2 SDRAM address bus	CK0, CK1, CK2	DDR2 SDRAM clocks (positive line of differential pair)
BA0-BA2	DDR2 SDRAM bank select	$\overline{\text{CK0}}, \overline{\text{CK1}}, \overline{\text{CK2}}$	DDR2 SDRAM clocks (negative line of differential pair)
$\overline{\text{RAS}}$	DDR2 SDRAM row address strobe	SCL	I <sup>2</sup> C serial bus clock for EEPROM
$\overline{\text{CAS}}$	DDR2 SDRAM column address strobe	SDA	I <sup>2</sup> C serial bus data line for EEPROM
$\overline{\text{WE}}$	DDR2 SDRAM write enable	SA0-SA2	I <sup>2</sup> C serial address select for EEPROM
$\overline{\text{S0}}, \overline{\text{S1}}$	DIMM Rank Select Lines	V <sub>DD</sub> *	DDR2 SDRAM core power supply
CKE0,CKE1	DDR2 SDRAM clock enable lines	V <sub>DDQ</sub> *	DDR2 SDRAM I/O Driver power supply
ODT0, ODT1	On-die termination control lines	V <sub>REF</sub>	DDR2 SDRAM I/O reference supply
DQ0 - DQ63	DIMM memory data bus	V <sub>SS</sub>	Power supply return (ground)
CB0 - CB7	DIMM ECC check bits	V <sub>DDSPD</sub>	Serial EEPROM positive power supply
DQS0 - DQS8	DDR2 SDRAM data strobes	NC	Spare Pins(no connect)
DM(0-8)	DDR2 SDRAM data masks	RESET	Not used on UDIMM
$\overline{\text{DQS0}}-\overline{\text{DQS8}}$	DDR2 SDRAM differential data strobes	TEST	Used by memory bus analysis tools (unused on memory DIMMs)

\*The VDD and VDDQ pins are tied to the single power-plane on PCB.

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Pin	Front	Pin	Back	Pin	Front	Pin	Back	Pin	Front	Pin	Back	Pin	Front	Pin	Back
1	V <sub>REF</sub>	121	V <sub>SS</sub>	31	DQ19	151	V <sub>SS</sub>	61	A4	181	V <sub>DDQ</sub>	91	V <sub>SS</sub>	211	DM5
2	V <sub>SS</sub>	122	DQ4	32	V <sub>SS</sub>	152	DQ28	62	V <sub>DDQ</sub>	182	A3	92	DQS5	212	NC
3	DQ0	123	DQ5	33	DQ24	153	DQ29	63	A2	183	A1	93	DQS5	213	V <sub>SS</sub>
4	DQ1	124	V <sub>SS</sub>	34	DQ25	154	V <sub>SS</sub>	64	V <sub>DD</sub>	184	V <sub>DD</sub>	94	V <sub>SS</sub>	214	DQ46
5	V <sub>SS</sub>	125	DM0	35	V <sub>SS</sub>	155	DM3	KEY							
6	DQS0	126	NC	36	DQS3	156	NC	65	V <sub>SS</sub>	185	CK0	95	DQ42	215	DQ47
7	DQS0	127	V <sub>SS</sub>	37	DQS3	157	V <sub>SS</sub>	66	V <sub>SS</sub>	186	CK0	96	DQ43	216	V <sub>SS</sub>
8	V <sub>SS</sub>	128	DQ6	38	V <sub>SS</sub>	158	DQ30	67	V <sub>DD</sub>	187	V <sub>DD</sub>	97	V <sub>SS</sub>	217	DQ52
9	DQ2	129	DQ7	39	DQ26	159	DQ31	68	NC	188	A0	98	DQ48	218	DQ53
10	DQ3	130	V <sub>SS</sub>	40	DQ27	160	V <sub>SS</sub>	69	V <sub>DD</sub>	189	V <sub>DD</sub>	99	DQ49	219	V <sub>SS</sub>
11	V <sub>SS</sub>	131	DQ12	41	V <sub>SS</sub>	161	NC	70	A10/AP	190	BA1	100	V <sub>SS</sub>	220	CK2
12	DQ8	132	DQ13	42	NC	162	NC	71	BA0	191	V <sub>DDQ</sub>	101	SA2	221	CK2
13	DQ9	133	V <sub>SS</sub>	43	NC	163	V <sub>SS</sub>	72	V <sub>DDQ</sub>	192	RA <sub>S</sub>	102	NC, TEST <sup>2</sup>	222	V <sub>SS</sub>
14	V <sub>SS</sub>	134	DM1	44	V <sub>SS</sub>	164	NC	73	WE	193	S <sub>0</sub>	103	V <sub>SS</sub>	223	DM6
15	DQS1	135	NC	45	NC	165	NC	74	CAS	194	V <sub>DDQ</sub>	104	DQS6	224	NC
16	DQS1	136	V <sub>SS</sub>	46	NC	166	V <sub>SS</sub>	75	V <sub>DDQ</sub>	195	ODT0	105	DQS6	225	V <sub>SS</sub>
17	V <sub>SS</sub>	137	CK1	47	V <sub>SS</sub>	167	NC	76	S <sub>1</sub>	196	NC/A13	106	V <sub>SS</sub>	226	DQ54
18	NC	138	CK1	48	NC	168	NC	77	ODT1	197	V <sub>DD</sub>	107	DQ50	227	DQ55
19	NC	139	V <sub>SS</sub>	49	NC	169	V <sub>SS</sub>	78	V <sub>DDQ</sub>	198	V <sub>SS</sub>	108	DQ51	228	V <sub>SS</sub>
20	V <sub>SS</sub>	140	DQ14	50	V <sub>SS</sub>	170	V <sub>DDQ</sub>	79	V <sub>SS</sub>	199	DQ36	109	V <sub>SS</sub>	229	DQ60
21	DQ10	141	DQ15	51	V <sub>DDQ</sub>	171	CKE1	80	DQ32	200	DQ37	110	DQ56	230	DQ61
22	DQ11	142	V <sub>SS</sub>	52	CKE0	172	V <sub>DD</sub>	81	DQ33	201	V <sub>SS</sub>	111	DQ57	231	V <sub>SS</sub>
23	V <sub>SS</sub>	143	DQ20	53	V <sub>DD</sub>	173	NC	82	V <sub>SS</sub>	202	DM4	112	V <sub>SS</sub>	232	DM7
24	DQ16	144	DQ21	54	NC	174	NC	83	DQS4	203	NC	113	DQS7	233	NC
25	DQ17	145	V <sub>SS</sub>	55	NC	175	V <sub>DDQ</sub>	84	DQS4	204	V <sub>SS</sub>	114	DQS7	234	V <sub>SS</sub>
26	V <sub>SS</sub>	146	DM2	56	V <sub>DDQ</sub>	176	A12	85	V <sub>SS</sub>	205	DQ38	115	V <sub>SS</sub>	235	DQ62
27	DQS2	147	NC	57	A11	177	A9	86	DQ34	206	DQ39	116	DQ58	236	DQ63
28	DQS2	148	V <sub>SS</sub>	58	A7	178	V <sub>DD</sub>	87	DQ35	207	V <sub>SS</sub>	117	DQ59	237	V <sub>SS</sub>
29	V <sub>SS</sub>	149	DQ22	59	V <sub>DD</sub>	179	A8	88	V <sub>SS</sub>	208	DQ44	118	V <sub>SS</sub>	238	VDDSPD
30	DQ18	150	DQ23	60	A5	180	A6	89	DQ40	209	DQ45	119	SDA	239	SA0
								90	DQ41	210	V <sub>SS</sub>	120	SCL	240	SA1

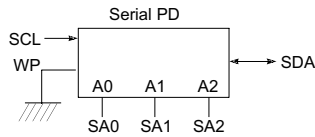
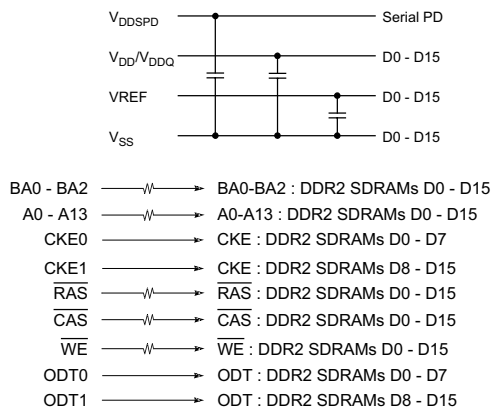
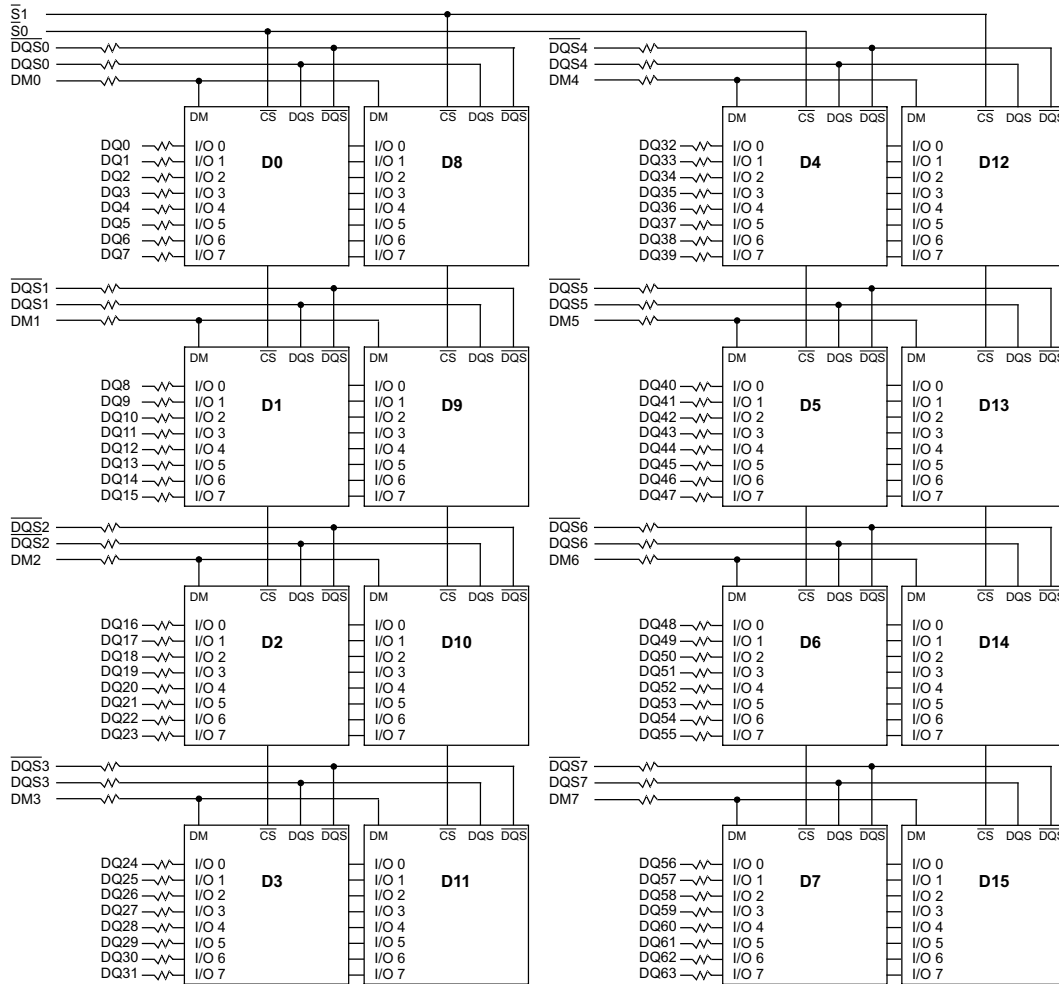
NC = No Connect, RFU = Reserved for Future Use

1. Pin173 Pin174 are reserved for 2Gb/4Gb comp. base Unbuffered DIMM.

2. The TEST pin is reserved for bus analysis tools and is not connected on standard memory module products (DIMMs.)

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## FUNCTIONAL BLOCK DIAGRAM



* Clock Wiring	
Clock Input	DDR2 SDRAMs
*CK0/CK0	4 DDR2 SDRAMs
*CK1/CK1	6 DDR2 SDRAMs
*CK2/CK2	6 DDR2 SDRAMs

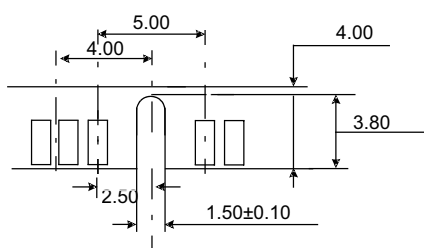
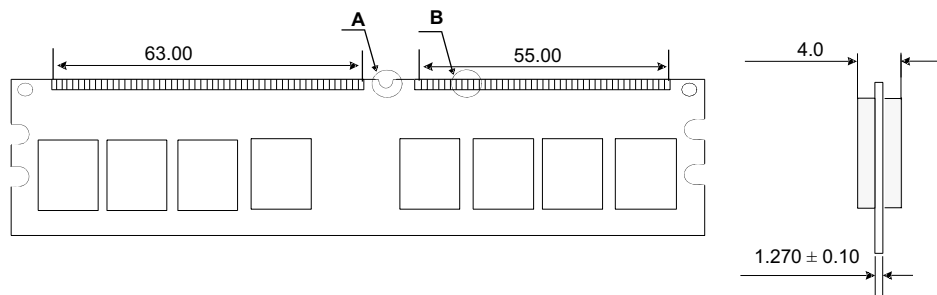
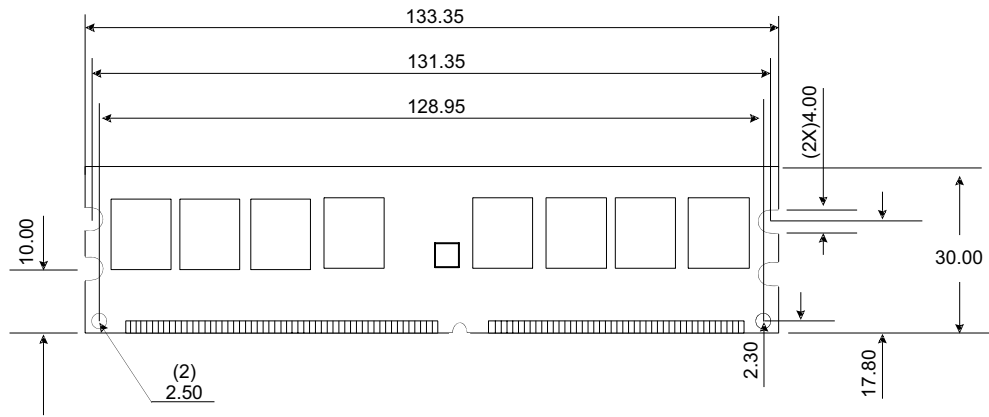
\*Wire per Clock Loading Table/Wiring Diagrams

### Notes :

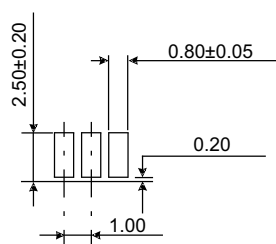
1. DQ,DM, DQS/DQS resistors : 22 Ohms " 5%.
2. BAx, Ax, RAS, CAS, WE resistors : 3 Ohms " 5%.

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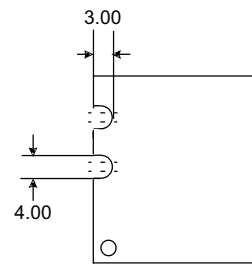
## PACKAGE DIMENSIONS



Detail A



Detail B



The used device is 128M x8 DDR2,FBGA.