

## 4GB Unbuffered DDR3 SDRAM DIMM with SPD

### Ordering Information

| Part Number  | Bandwidth  | Speed Grade | Max Frequency | CAS Latency | Density | Organization | Component Composition | Number of Rank |
|--------------|------------|-------------|---------------|-------------|---------|--------------|-----------------------|----------------|
| 78.B1GDE.AF1 | 10.6GB/sec | 1333Mbps    | 666MHz        | CL9         | 4GB     | 512Mx64      | 256Mx8*16EA           | 2              |

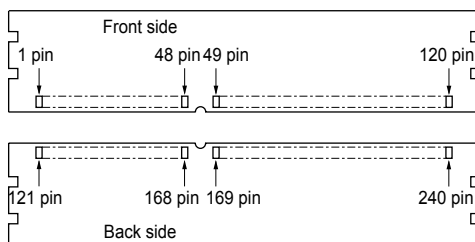
### Specifications

- On Dimm Thermal Sensor: No
- Density: 4GB
- Organization
  - 512M words × 64 bits, 2 ranks
- Mounting 16 pieces of 2G bits DDR3 SDRAM sealed in FBGA
- Package: 240-pin socket type dual in line memory module (DIMM)
  - PCB height: 30.0mm
  - Lead pitch: 1.0mm (pin)
  - Lead-free (RoHS compliant)
- Power supply: VDD = 1.5V ± 0.075V
- Eight internal banks for concurrent operation (components)
- Interface: SSTL\_15
- Burst lengths (BL): 8 and 4 with Burst Chop (BC)
- /CAS Latency (CL): 6, 7, 8, 9
- /CAS write latency (CWL): 5, 6, 7
- Precharge: auto precharge option for each burst access
- Refresh: auto-refresh, self-refresh
- Refresh cycles
  - Average refresh period
    - 7.8μs at 0°C ≤ TC ≤ +85°C
    - 3.9μs at +85°C < TC ≤ +95°C
- Operating case temperature range
  - TC = 0°C to +95°C

### Features

- Double-data-rate architecture; two data transfers per clock cycle
- The high-speed data transfer is realized by the 8 bits prefetch pipelined architecture
- Bi-directional differential data strobe (DQS and /DQS) is transmitted/received with data for capturing data at the receiver
- DQS is edge-aligned with data for READs; center-aligned with data for WRITEs
- Differential clock inputs (CK and /CK)
- DLL aligns DQ and DQS transitions with CK transitions
- Commands entered on each positive CK edge; data and data mask referenced to both edges of DQS
- Data mask (DM) for write data
- Posted /CAS by programmable additive latency for better command and data bus efficiency
- On-Die-Termination (ODT) for better signal quality
  - Synchronous ODT
  - Dynamic ODT
  - Asynchronous ODT
- Multi Purpose Register (MPR) for temperature read out
- ZQ calibration for DQ drive and ODT
- Programmable Partial Array Self-Refresh (PASR)
- /RESET pin for Power-up sequence and reset function
- SRT range:
  - Normal/extended
  - Auto/manual self-refresh
- Programmable Output driver impedance control

## Pin Configurations



| Pin No. | Pin name | Pin No. | Pin name | Pin No. | Pin name | Pin No. | Pin name |
|---------|----------|---------|----------|---------|----------|---------|----------|
| 1       | VREFDQ   | 61      | A2       | 121     | VSS      | 181     | A1       |
| 2       | VSS      | 62      | VDD      | 122     | DQ4      | 182     | VDD      |
| 3       | DQ0      | 63      | CK1      | 123     | DQ5      | 183     | VDD      |
| 4       | DQ1      | 64      | /CK1     | 124     | VSS      | 184     | CK0      |
| 5       | VSS      | 65      | VDD      | 125     | DM0      | 185     | /CK0     |
| 6       | /DQS0    | 66      | VDD      | 126     | NC       | 186     | VDD      |
| 7       | DQS0     | 67      | VREFCA   | 127     | VSS      | 187     | NC       |
| 8       | VSS      | 68      | NC       | 128     | DQ6      | 188     | A0       |
| 9       | DQ2      | 69      | VDD      | 129     | DQ7      | 189     | VDD      |
| 10      | DQ3      | 70      | A10(AP)  | 130     | VSS      | 190     | BA1      |
| 11      | VSS      | 71      | BA0      | 131     | DQ12     | 191     | VDD      |
| 12      | DQ8      | 72      | VDD      | 132     | DQ13     | 192     | /RAS     |
| 13      | DQ9      | 73      | /WE      | 133     | VSS      | 193     | /CS0     |
| 14      | VSS      | 74      | /CAS     | 134     | DM1      | 194     | VDD      |
| 15      | /DQS1    | 75      | VDD      | 135     | NC       | 195     | ODT0     |
| 16      | DQS1     | 76      | /CS1     | 136     | VSS      | 196     | A13      |
| 17      | VSS      | 77      | ODT1     | 137     | DQ14     | 197     | VDD      |
| 18      | DQ10     | 78      | VDD      | 138     | DQ15     | 198     | NC       |
| 19      | DQ11     | 79      | NC       | 139     | VSS      | 199     | VSS      |
| 20      | VSS      | 80      | VSS      | 140     | DQ20     | 200     | DQ36     |
| 21      | DQ16     | 81      | DQ32     | 141     | DQ21     | 201     | DQ37     |
| 22      | DQ17     | 82      | DQ33     | 142     | VSS      | 202     | VSS      |
| 23      | VSS      | 83      | VSS      | 143     | DM2      | 203     | DM4      |
| 24      | /DQS2    | 84      | /DQS4    | 144     | NC       | 204     | NC       |
| 25      | DQS2     | 85      | DQS4     | 145     | VSS      | 205     | VSS      |
| 26      | VSS      | 86      | VSS      | 146     | DQ22     | 206     | DQ38     |
| 27      | DQ18     | 87      | DQ34     | 147     | DQ23     | 207     | DQ39     |
| 28      | DQ19     | 88      | DQ35     | 148     | VSS      | 208     | VSS      |
| 29      | VSS      | 89      | VSS      | 149     | DQ28     | 209     | DQ44     |
| 30      | DQ24     | 90      | DQ40     | 150     | DQ29     | 210     | DQ45     |
| 31      | DQ25     | 91      | DQ41     | 151     | VSS      | 211     | VSS      |
| 32      | VSS      | 92      | VSS      | 152     | DM3      | 212     | DM5      |
| 33      | /DQS3    | 93      | /DQS5    | 153     | NC       | 213     | NC       |
| 34      | DQS3     | 94      | DQS5     | 154     | VSS      | 214     | VSS      |
| 35      | VSS      | 95      | VSS      | 155     | DQ30     | 215     | DQ46     |
| 36      | DQ26     | 96      | DQ42     | 156     | DQ31     | 216     | DQ47     |

## Apacer Memory Product Specification

| Pin No. | Pin name | Pin No. | Pin name | Pin No. | Pin name | Pin No. | Pin name |
|---------|----------|---------|----------|---------|----------|---------|----------|
| 37      | DQ27     | 97      | DQ43     | 157     | VSS      | 217     | VSS      |
| 38      | VSS      | 98      | VSS      | 158     | NC       | 218     | DQ52     |
| 39      | NC       | 99      | DQ48     | 159     | NC       | 219     | DQ53     |
| 40      | NC       | 100     | DQ49     | 160     | VSS      | 220     | VSS      |
| 41      | VSS      | 101     | VSS      | 161     | NC       | 221     | DM6      |
| 42      | NC       | 102     | /DQS6    | 162     | NC       | 222     | NC       |
| 43      | NC       | 103     | DQS6     | 163     | VSS      | 223     | VSS      |
| 44      | VSS      | 104     | VSS      | 164     | NC       | 224     | DQ54     |
| 45      | NC       | 105     | DQ50     | 165     | NC       | 225     | DQ55     |
| 46      | NC       | 106     | DQ51     | 166     | VSS      | 226     | VSS      |
| 47      | VSS      | 107     | VSS      | 167     | NC       | 227     | DQ60     |
| 48      | NC       | 108     | DQ56     | 168     | /RESET   | 228     | DQ61     |
| 49      | NC       | 109     | DQ57     | 169     | CKE1     | 229     | VSS      |
| 50      | CKE0     | 110     | VSS      | 170     | VDD      | 230     | DM7      |
| 51      | VDD      | 111     | /DQS7    | 171     | A15/NC*  | 231     | NC       |
| 52      | BA2      | 112     | DQS7     | 172     | A14/NC*  | 232     | VSS      |
| 53      | NC       | 113     | VSS      | 173     | VDD      | 233     | DQ62     |
| 54      | VDD      | 114     | DQ58     | 174     | A12      | 234     | DQ63     |
| 55      | A11      | 115     | DQ59     | 175     | A9       | 235     | VSS      |
| 56      | A7       | 116     | VSS      | 176     | VDD      | 236     | VDDSPD   |
| 57      | VDD      | 117     | SA0      | 177     | A8       | 237     | SA1      |
| 58      | A5       | 118     | SCL      | 178     | A6       | 238     | SDA      |
| 59      | A4       | 119     | SA2      | 179     | VDD      | 239     | VSS      |
| 60      | VDD      | 120     | VTT      | 180     | A3       | 240     | VTT      |

\*IC Component Composition :

256Mx8 A0~A14

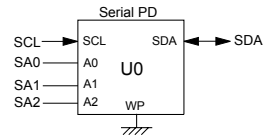
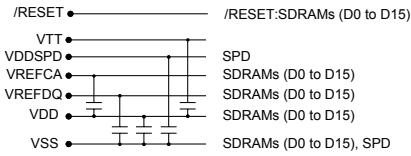
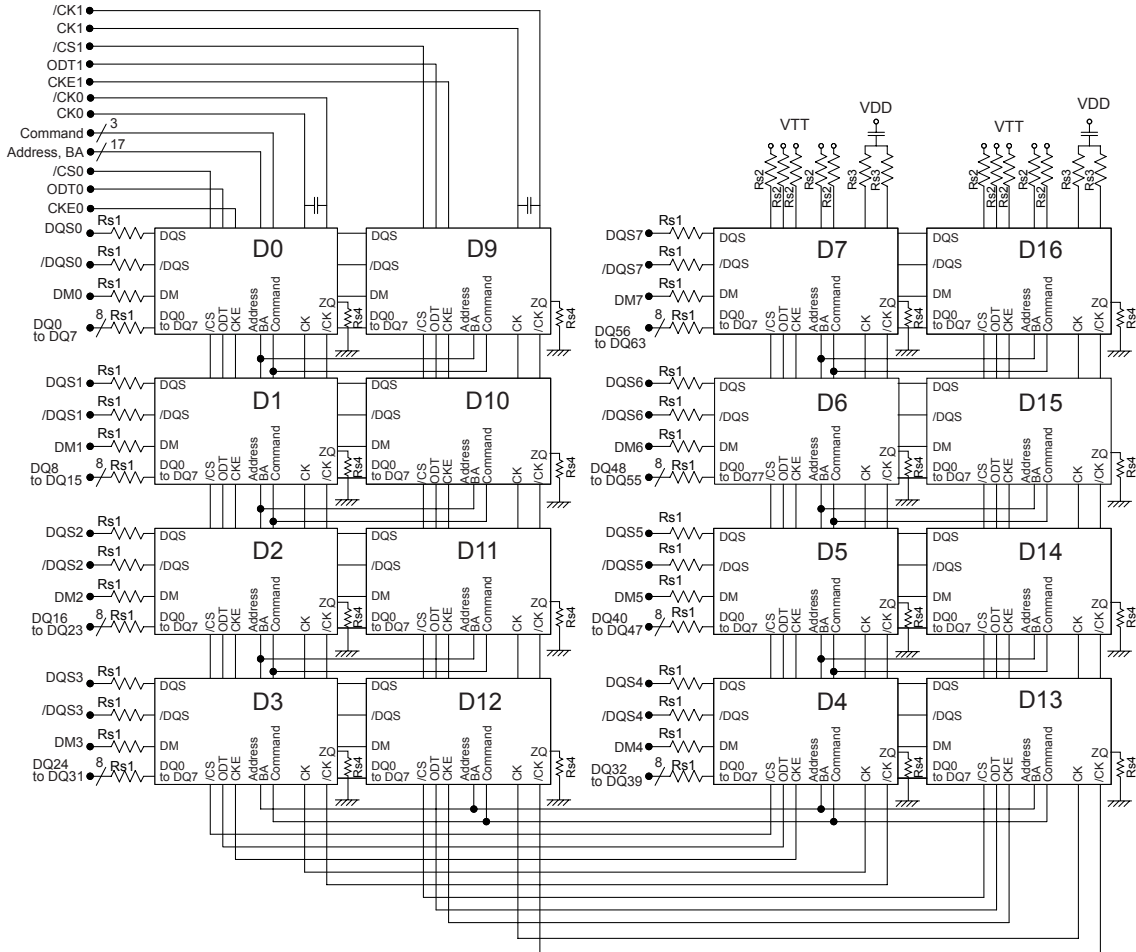
512Mx8 A0~A15

1024Mx8 A0~A15

## Pin Description

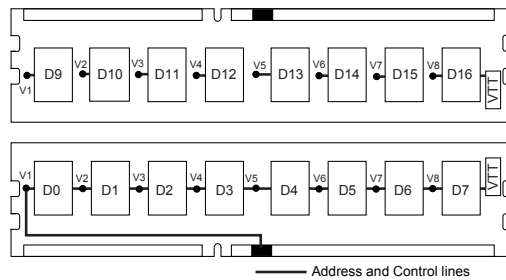
| Pin name                     | Function   |
|------------------------------|--|
|                              | Address input  |
| A0 to A14                    | Row address      A0 to A14<br>Column address    A0 to A9 |
| A10 (AP)                     | Auto precharge   |
| A12 (/BC)                    | Burst chop   |
| BA0, BA1, BA2                | Bank select address                                      |
| DQ0 to DQ63                  | Data input/output  |
| /RAS                         | Row address strobe command                               |
| /CAS                         | Column address strobe command                            |
| /WE                          | Write enable   |
| /CS0, /CS1                   | Chip select  |
| CKE0, CKE1                   | Clock enable   |
| CK0, CK1                     | Clock input  |
| /CK0, /CK1                   | Differential clock input                                 |
| DQS0 to DQS7, /DQS0 to /DQS7 | Input and output data strobe                             |
| DM0 to DM7                   | Input mask   |
| SCL                          | Clock input for serial PD                                |
| SDA                          | Data input/output for serial PD                          |
| SA0, SA1, SA2                | Serial address input                                     |
| VDD                          | Power for internal circuit                               |
| VDDSPD                       | Power for serial EEPROM                                  |
| VREFCA                       | Reference voltage for CA                                 |
| VREFDQ                       | Reference voltage for DQ                                 |
| VSS                          | Ground   |
| VTT                          | I/O termination supply for SDRAM                         |
| /RESET                       | Set DRAM to known state                                  |
| ODT0, ODT1                   | ODT control  |
| NC                           | No connection  |

## Block Diagram



Notes:  
 1. DQ wiring may be changed within a byte.  
 2. DQ, DQS, /DQS, ODT, DM, CKE, /CS relationships must be maintained as shown.

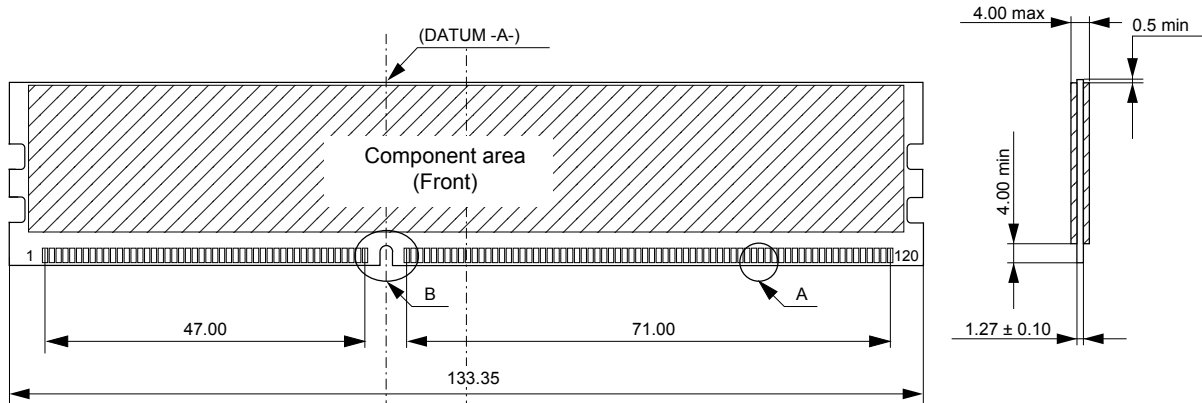
\* D0 to D15: 2G bits DDR3 SDRAM  
 Address, BA: A0 to A14, BA0 to BA2  
 Command: /RAS, /CAS, /WE  
 U0: 256 bytes EEPROM  
 Rs1: 15Ω  
 Rs2: 39Ω  
 Rs3: 36Ω  
 Rs4: 240Ω



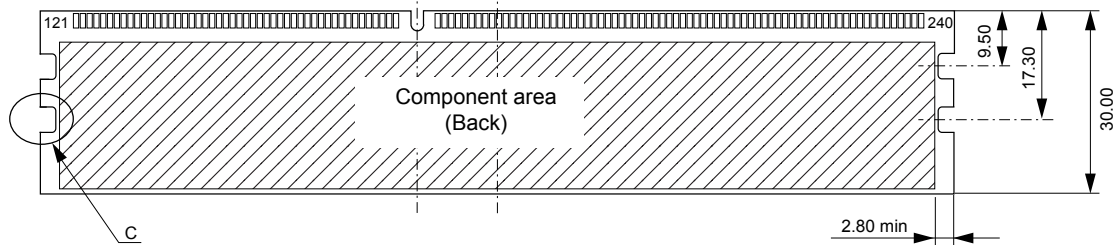
## Physical Outline

Unit: mm

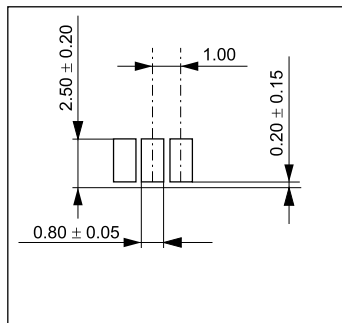
Front side



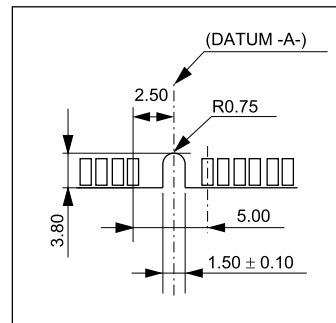
Back side



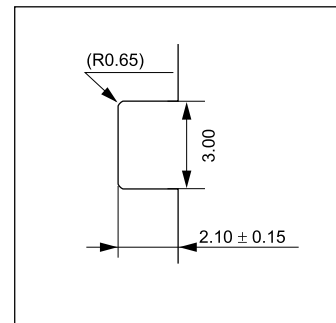
Detail A



Detail B



Detail C



(All dimensions are in millimeters with ±0.15mm tolerance unless specified otherwise.)

## Данный компонент на территории Российской Федерации

### Вы можете приобрести в компании MosChip.

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Нашей специализацией является поставка электронной компонентной базы двойного назначения, продукции таких производителей как XILINX, Intel (ex.ALTERA), Vicor, Microchip, Texas Instruments, Analog Devices, Mini-Circuits, Amphenol, Glenair.

Сотрудничество с глобальными дистрибьюторами электронных компонентов, предоставляет возможность заказывать и получать с международных складов практически любой перечень компонентов в оптимальные для Вас сроки.

На всех этапах разработки и производства наши партнеры могут получить квалифицированную поддержку опытных инженеров.

Система менеджмента качества компании отвечает требованиям в соответствии с ГОСТ Р ИСО 9001, ГОСТ РВ 0015-002 и ЭС РД 009

### Офис по работе с юридическими лицами:

105318, г.Москва, ул.Щербаковская д.3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: [info@moschip.ru](mailto:info@moschip.ru)

Skype отдела продаж:

moschip.ru

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