



**Samsung Semiconductor, Inc.**  
Product Selection Guide

**Memory and Storage**  
January 2009

# Samsung Semiconductor, Inc.

Samsung offers the industry's broadest memory portfolio and has maintained its leadership in memory technology for 16 straight years. Its DRAM, flash and SRAM products are found in computers—from ultra-mobile portables to powerful servers—and in a wide range of handheld devices such as smartphones and MP3 players. Samsung also delivers the industry's widest line of storage products. These include optical and hard disk drives as well as flash storage, such as the all-flash Solid State Drive and a range of embedded and removable flash storage products.

## SAMSUNG PRODUCT OFFERINGS

| Markets                   |   | DRAM | SRAM | FLASH | ASIC | LOGIC | TFT/LCD | ODD/HDD |
|---------------------------|---|------|------|-------|------|-------|---------|---------|
| Mobile/Wireless           |   |      |      |       |      |       |         |         |
| Notebook PCs              |  |      |      |       |      |       |         |         |
| Desktop PCs/Workstations  |  |      |      |       |      |       |         |         |
| Servers                   |  |      |      |       |      |       |         |         |
| Networking/Communications |  |      |      |       |      |       |         |         |
| Consumer Electronics      |  |      |      |       |      |       |         |         |

[www.samsung.com/semi/us](http://www.samsung.com/semi/us)



| DRAM   | Pages 4-14  |
|--|---|
| <a href="http://www.samsung.com/semi/dram">www.samsung.com/semi/dram</a> <ul style="list-style-type: none"> <li>• DDR3 SDRAM</li> <li>• DDR2 SDRAM</li> <li>• DDR</li> <li>• SDRAM</li> <li>• Mobile SDRAM</li> <li>• RDRAM</li> </ul> | <ul style="list-style-type: none"> <li>• Graphics DDR SDRAM</li> <li>• DRAM Ordering Information</li> <li>• OneDRAM™: see Fusion</li> </ul> |

DRAM

| FLASH   | Pages 15-19  |
|---|--|
| <a href="http://www.samsung.com/semi/flash">www.samsung.com/semi/flash</a> <ul style="list-style-type: none"> <li>• SLC Flash</li> <li>• MLC Flash</li> <li>• SD and microSD Cards</li> <li>• Flash Product Ordering Information</li> <li>• Solid State Drive: see Storage</li> </ul> | <ul style="list-style-type: none"> <li>• OneNAND™: see Fusion</li> <li>• moviNAND™: see Fusion</li> <li>• Flex-OneNAND™: see Fusion</li> </ul> |

FLASH

| SRAM  | Pages 20 -25  |
|---|---|
| <a href="http://www.samsung.com/semi/sram">www.samsung.com/semi/sram</a> <ul style="list-style-type: none"> <li>• UtRAM</li> <li>• Asynchronous SRAM</li> <li>• NtRAM</li> <li>• Late-write R-R SRAM</li> <li>• DDR / II / II+ SRAM</li> <li>• QDR / II / II+ SRAM</li> </ul> | <ul style="list-style-type: none"> <li>• Synchronous SRAM Ordering Information</li> </ul> |

SRAM

| MULTI-CHIP PACKAGE  | Pages 26-27   |
|---|---|
| <a href="http://www.samsung.com/semi/mcp">www.samsung.com/semi/mcp</a> <ul style="list-style-type: none"> <li>• NAND/DRAM</li> <li>• OneNAND/DRAM</li> <li>• Flex-OneNAND/DRAM</li> <li>• OneNAND/DRAM/OneDRAM</li> <li>• moviNAND/NAND/DRAM</li> </ul> | <ul style="list-style-type: none"> <li>• NOR/UtRAM</li> <li>• NOR/DRAM</li> <li>• OneDRAM/OneNAND/NAND</li> </ul> |

MCP

| FUSION MEMORY   | Page 28 |
|---|---------|
| <b>FUSION MEMORY</b><br><a href="http://www.samsung.com/semi/fusion">www.samsung.com/semi/fusion</a> <ul style="list-style-type: none"> <li>• OneNAND™</li> <li>• Flex-OneNAND™</li> <li>• moviNAND™</li> <li>• OneDRAM™</li> </ul> |         |

FUSION

| STORAGE  | Pages 29-33  |
|--|--|
| <b>Solid State Drives</b><br><a href="http://www.samsungssd.com">www.samsungssd.com</a> <ul style="list-style-type: none"> <li>• Flash Solid State Drives</li> </ul> | <b>Optical Disk Drives</b><br><a href="http://www.samsungodd.com">www.samsungodd.com</a> <ul style="list-style-type: none"> <li>• External DVD</li> <li>• Internal DVD</li> <li>• Internal COMBO</li> <li>• Internal CD</li> </ul> |
| <b>Hard Disk Drives</b><br><a href="http://www.samsung.com/hdd">www.samsung.com/hdd</a> <ul style="list-style-type: none"> <li>• Hard Disk Drives</li> </ul>         |  |

STORAGE

## DDR3 SDRAM REGISTERED MODULES

| Density | Organization | Part Number              | Composition       | Compliance          | Speed (Mbps)  | Banks |
|---------|--------------|--------------------------|-------------------|---------------------|---------------|-------|
| 1GB     | 128Mx72      | M393B2873DZ1-C(F7/F8/H9) | 1Gb (128M x8)*9   | RoHS                | 800/1066/1333 | 1     |
| 2GB     | 256Mx72      | M393B5673DZ1-C(F7/F8/H9) | 1Gb (128M x8)*18  | RoHS                | 800/1066/1333 | 2     |
| 2GB     | 256Mx72      | M393B5670DZ1-C(F7/F8/H9) | 1Gb (256M x4)*18  | RoHS                | 800/1066/1333 | 1     |
| 4GB     | 512Mx72      | M393B5173DZ1-C(F7/F8)    | 1Gb (128M x8)*36  | RoHS                | 800/1066      | 4     |
| 4GB     | 512Mx72      | M393B5170DZ1-C(F7/F8/H9) | 1Gb (256M x4)*36  | RoHS                | 800/1066/1333 | 2     |
| 8GB     | 1Gx72        | M393B1G70DJ1-C(F7/F8)    | 2Gb (512M x4)*36  | RoHS                | 800/1066      | 4     |
| 1GB     | 128Mx72      | M393B2873EH1-C(F7/F8/H9) | 1Gb (128M x8)*9   | RoHS & Halogen Free | 800/1066/1333 | 1     |
| 2GB     | 256Mx72      | M393B5673EH1-C(F7/F8/H9) | 1Gb (128M x8)*18  | RoHS & Halogen Free | 800/1066/1333 | 2     |
| 2GB     | 256Mx72      | M393B5670EH1-C(F7/F8/H9) | 1Gb (256M x8)*18  | RoHS & Halogen Free | 800/1066/1333 | 1     |
| 4GB     | 512Mx72      | M393B5173EH1-C(F7/F8)    | 1Gb (128M x8)*36  | RoHS & Halogen Free | 800/1066      | 4     |
| 4GB     | 512Mx72      | M393B5170EH1-C(F7/F8/H9) | 1Gb (256M x4)*36  | RoHS & Halogen Free | 800/1066/1333 | 2     |
| 8GB     | 1Gx72        | M393B1G70EM1-C(F7/F8)    | 2Gb (512M x4)*36  | RoHS & Halogen Free | 800/1066      | 4     |
| 8GB     | 1Gx72        | M393B1K70BH1-C(F7/F8/H9) | 2Gb (512M x4)*36  | RoHS & Halogen Free | 800/1066/1333 | 2     |
| 16GB    | 2Gx72        | M393B2K70BM1-C(F7/F8)    | 4Gb (1024M x4)*36 | RoHS & Halogen Free | 800/1066      | 4     |
| 1GB     | 128Mx64      | M471B2874DZ1-C(F7/F8/H9) | 1Gb (64M x16)*8   | RoHS                | 800/1066/1333 | 2     |
| 2GB     | 256Mx64      | M471B5673DZ1-C(F7/F8/H9) | 1Gb (128M x8)*16  | RoHS                | 800/1066/1333 | 2     |
| 1GB     | 128Mx64      | M471B2873EH1-C(F8/H9)    | 1Gb (128M x8)*8   | RoHS & Halogen Free | 1066/1333     | 1     |
| 1GB     | 128Mx64      | M471B2874EH1-C(F8/H9)    | 1Gb (64M x16)*8   | RoHS & Halogen Free | 1066/1333     | 2     |
| 2GB     | 256Mx64      | M471B5673EH1-C(F8/H9)    | 1Gb (128M x8)*16  | RoHS & Halogen Free | 1066/1333     | 2     |
| 4GB     | 512Mx64      | M471B5273BH1-C(F8/H9)    | 2Gb (256M x8)*16  | RoHS & Halogen Free | 1066/1333     | 2     |

NOTES:  
 F7= DDR3-800 (6-6-6)  
 F8 = DDR3-1066 (7-7-7)  
 H9 = DDR3-1333 (9-9-9)  
 Voltage = 1.5V

## DDR3 SDRAM UNBUFFERED MODULES

| Density | Organization | Part Number           | Composition      | Compliance          | Speed (Mbps) | Module Ranks |
|---------|--------------|-----------------------|------------------|---------------------|--------------|--------------|
| 1GB     | 128Mx64      | M378B2873DZ1-C(F8/H9) | 1Gb (128M x8)*8  | RoHS                | 1066/1333    | 1            |
| 2GB     | 256Mx64      | M378B5673DZ1-C(F8/H9) | 1Gb (128M x8)*16 | RoHS                | 1066/1333    | 2            |
| 1GB     | 128Mx64      | M378B2873EH1-C(F8/H9) | 1Gb (128M x8)*8  | RoHS & Halogen Free | 1066/1333    | 1            |
| 2GB     | 256Mx64      | M378B5673EH1-C(F8/H9) | 1Gb (128M x8)*16 | RoHS & Halogen Free | 1066/1333    | 2            |
| 4GB     | 512Mx64      | M378B5273BH1-C(F8/H9) | 2Gb (256M x8)*16 | RoHS & Halogen Free | 1066/1333    | 2            |

## DDR3 SDRAM UNBUFFERED MODULES (ECC)

| Density | Organization | Part Number           | Composition      | Compliance          | Speed (Mbps) | Module Ranks |
|---------|--------------|-----------------------|------------------|---------------------|--------------|--------------|
| 1GB     | 128Mx72      | M391B2873DZ1-C(F8/H9) | 1Gb (128M x8)*9  | RoHS                | 1066/1333    | 1            |
| 2GB     | 256Mx72      | M391B5673DZ1-C(F8/H9) | 1Gb (128M x8)*18 | RoHS                | 1066/1333    | 2            |
| 1GB     | 128Mx72      | M391B2873EH1-C(F8/H9) | 1Gb (128M x8)*9  | RoHS & Halogen Free | 1066/1333    | 1            |
| 2GB     | 256Mx72      | M391B5673EH1-C(F8/H9) | 1Gb (128M x8)*18 | RoHS & Halogen Free | 1066/1333    | 2            |
| 4GB     | 512Mx72      | M391B5273BH1-C(F8/H9) | 2Gb (256M x8)*18 | RoHS & Halogen Free | 1066/1333    | 2            |

## DDR3 SDRAM COMPONENTS

| Density | Organization | Part Number             | # Pins - Package | Compliance          | Speed (Mbps)  | Package Dimensions |
|---------|--------------|-------------------------|------------------|---------------------|---------------|--------------------|
| 1Gb     | 256M x4      | K4B1G0446D-HC(F7/F8/H9) | 82 Ball -FBGA    | RoHS & Halogen Free | 800/1066/1333 | 9x11mm             |
| 1Gb     | 128M x8      | K4B1G0846D-HC(F7/F8/H9) | 82 Ball -FBGA    | RoHS & Halogen Free | 800/1066/1333 | 9x11mm             |
| 1Gb     | 64M x16      | K4B1G1646D-HC(F7/F8/H9) | 100 Ball -FBGA   | RoHS & Halogen Free | 800/1066/1333 | 9x13.3mm           |
| 1Gb     | 256M x4      | K4B1G0446E-HC(F7/F8/H9) | 78 Ball -FBGA    | RoHS & Halogen Free | 800/1066/1333 | 7.5x11mm           |
| 1Gb     | 128M x8      | K4B1G0846E-HC(F7/F8/H9) | 78 Ball -FBGA    | RoHS & Halogen Free | 800/1066/1333 | 7.5x11mm           |
| 1Gb     | 64M x16      | K4B1G1646E-HC(F7/F8/H9) | 96 Ball -FBGA    | RoHS & Halogen Free | 800/1066/1333 | 7.5x13.3mm         |
| 2Gb     | 512M x4      | K4B2G0446B-HC(F7/F8/H9) | 78 Ball -FBGA    | RoHS & Halogen Free | 800/1066/1333 | 9x11.5mm           |
| 2Gb     | 256M x8      | K4B2G0846B-HC(F7/F8/H9) | 78 Ball -FBGA    | RoHS & Halogen Free | 800/1066/1333 | 9x11.5mm           |
| 2Gb     | 128M x16     | K4B2G1646B-HC(F7/F8/H9) | 96 Ball -FBGA    | RoHS & Halogen Free | 800/1066/1333 | 9x13.3mm           |

NOTES:  
 F7= DDR3-800 (6-6-6)  
 F8 = DDR3-1066 (7-7-7)  
 H9 = DDR3-1333 (9-9-9)  
 Voltage = 1.5V

## DDR2 SDRAM REGISTERED MODULES

| Density | Organization | Part Number              | Composition      | Compliance               | Speed (Mbps) | Module   |      |            |
|---------|--------------|--------------------------|------------------|--------------------------|--------------|----------|------|------------|
|         |              |                          |                  |                          |              | Register | Rank | Production |
| 512MB   | 64Mx72       | M393T6553GZA-C(E6/F7)    | (64M x8)*9       | Lead free                | 667/800      | Y        | 1    | Now        |
|         |              | M393T6553GZ3-C(CC/D5)    | (64M x8)*9       | Lead free                | 400/533      | N        | 1    | Now        |
| 1GB     | 128Mx72      | M393T2950GZA-C(E6/F7)    | (128M x4)*18     | Lead free                | 667/800      | Y        | 1    | Now        |
|         |              | M393T2950GZ3-C(CC/D5)    | (128M x4)*18     | Lead free                | 400/533      | N        | 1    | Now        |
|         |              | M393T2953GZA-C(E6/F7)    | (64M x8)*18      | Lead free                | 667/800      | Y        | 2    | Now        |
|         |              | M393T2953GZ3-C(CC/D5)    | (64M x8)*18      | Lead free                | 400/533      | N        | 2    | Now        |
|         |              | M393T2863QZA-C(E6/F7)    | (128M x8)*9      | Lead free                | 667/800      | Y        | 1    | Now        |
|         |              | M393T2863EHA-C(E6/F7/E7) | (128M x8)*9      | Lead free & Halogen free | 667/800      | Y        | 1    | Jan'09     |
| 2GB     | 256Mx72      | M393T5750GZA-C(E6/F7)    | (128M x4)*36     | Lead free                | 667/800      | Y        | 2    | Now        |
|         |              | M393T5750GZ3-C(CC/D5)    | (128M x4)*36     | Lead free                | 400/533      | N        | 2    | Now        |
|         |              | M393T5660QZA-C(E6/F7/E7) | (256M x4)*18     | Lead free                | 667/800      | Y        | 1    | Now        |
|         |              | M393T5660EHA-C(E6/F7/E7) | (256M x4)*18     | Lead free & Halogen free | 667/800      | Y        | 1    | Jan'09     |
|         |              | M393T5663QZA-C(E6/F7/E7) | (128M x8)*18     | Lead free                | 667/800      | Y        | 2    | Now        |
|         |              | M393T5663EHA-C(E6/F7/E7) | (128M x8)*18     | Lead free & Halogen free | 667/800      | Y        | 2    | Jan'09     |
| 4GB     | 512Mx72      | M393T5160QZA-C(E6/F7/E7) | (256M x4)*36     | Lead free                | 667/800      | Y        | 2    | Now        |
|         |              | M393T5160EHA-C(E6/F7/E7) | (256M x4)*36     | Lead free & Halogen free | 667/800      | Y        | 2    | Jan'09     |
| 8GB     | 1Gx72        | M393T1G60QJA-C(D5/E6)    | DDP (512M x4)*36 | Lead free                | 533/667      | Y        | 4    | Now        |
|         |              | M393T1G60EMA-C(D5/E6)    | DDP (512M x4)*36 | Lead free & Halogen free | 533/667      | Y        | 4    | Jan'09     |
|         |              | M393T1K66AZA-C(E6/F7)    | st. (1G x4)*18   | Lead free                | 667/800      | Y        | 2    | Now        |

NOTES:  
 CC=PC2-3200 (DDR2-400 @ CL=3)  
 E6=PC2-5300 (DDR2-667 @ CL=5)  
 F7=PC2-6400 (DDR2-800 @ CL=6)  
 E7=PC2-6400 (DDR2-800 @ CL=5)  
 D5=PC2-4200 (DDR2-533 @ CL=4)  
 Voltage = 1.8V  
 Module Height = 1.2"

## DDR2 SDRAM VLP REGISTERED MODULES

| Density | Organization | Part Number           | Composition      | Module                   |              | Parity   |      |            |
|---------|--------------|-----------------------|------------------|--------------------------|--------------|----------|------|------------|
|         |              |                       |                  | Compliance               | Speed (Mbps) | Register | Rank | Production |
| 512MB   | 64Mx72       | M392T6553GZA-C(E6/F7) | (64M x8)*9       | Lead free                | 667/800      | Y        | 1    | Now        |
| 1GB     | 128Mx72      | M392T2953GZA-C(E6/F7) | (64M x8)*18      | Lead free                | 667/800      | Y        | 2    | Now        |
|         |              | M392T2950GZA-C(E6/F7) | (128M x4)*18     | Lead free                | 667/800      | Y        | 1    | Now        |
|         |              | M392T2863QZA-C(E6/F7) | (128M x8)*9      | Lead free                | 667/800      | Y        | 1    | Now        |
|         |              | M392T2863EHA-C(E6/F7) | (128M x8)*9      | Lead free & Halogen free | 667/800      | Y        | 1    | Feb '09    |
| 2GB     | 256Mx72      | M392T5660QZA-C(E6/F7) | (256M x4)*18     | Lead free                | 667/800      | Y        | 1    | Now        |
|         |              | M392T5660EHA-C(E6/F7) | (256M x4)*18     | Lead free & Halogen free | 667/800      | Y        | 1    | Feb '09    |
|         |              | M392T5663QZA-C(E6/F7) | (128M x8)*18     | Lead free                | 667/800      | Y        | 2    | Now        |
|         |              | M392T5663EHA-C(E6/F7) | (128M x8)*18     | Lead free & Halogen free | 667/800      | Y        | 2    | Mar '09    |
| 4GB     | 512Mx72      | M392T5160QJA-C(E6/F7) | DDP (512M x4)*18 | Lead free                | 667/800      | Y        | 2    | Now        |
|         |              | M392T5160EMA-C(E6/F7) | DDP (512M x4)*18 | Lead free & Halogen free | 667/800      | Y        | 2    | Mar '09    |
| 8GB     | 1Gx72        | M392T1G60EEH-C(D5/E6) | QDP (1G x4)*18   | Lead free & Halogen free | 533/667      | Y        | 4    | Q2'09      |

## DDR2 SDRAM FULLY BUFFERED MODULES

| Density            | Organization   | Part Number                        | Composition      | Module                   |              |         |      |            |
|--------------------|----------------|------------------------------------|------------------|--------------------------|--------------|---------|------|------------|
|                    |                |                                    |                  | Compliance               | Speed (Mbps) | Voltage | Rank | Production |
| 512MB              | 64Mx72         | M395T6553GZ4-CE6/F7/E7(50/60)      | (64M x8)*9       | Lead free                | 667/800      | 1.8V    | 1    | Now        |
| 1GB                | 128Mx72        | M395T2953GZ4-CE6/F7/E7(50/60)      | (64M x8)*18      | Lead free                | 667/800      | 1.8V    | 2    | Now        |
|                    |                | M395T2863QZ4-CE6/F7/E7(60/80/90)   | (128M x8)*9      | Lead free                | 667/800      | 1.8V    | 1    | Now        |
|                    |                | M395T2863EH4-CE6/F7/E7(60/80/90)   | (128M x8)*9      | Lead free & Halogen free | 667/800      | 1.8V    | 1    | Jan'09     |
|                    |                | M395T2863QZ4-YE680                 | (128M x8)*9      | Lead free                | 667          | 1.55V   | 1    | Now        |
|                    |                | M395T2863EH4-YE6/F7(80)            | (128M x8)*9      | Lead free & Halogen free | 667/800      | 1.55V   | 1    | Mar'09     |
| 2GB                | 256Mx72        | M395T5750GZ4-CE6/F7/E7(50/60)      | (128M x4)*36     | Lead free                | 667/800      | 1.8V    | 2    | Now        |
|                    |                | M395T5663QZ4-CE6/F7/E7(60/80/90)   | (128M x8)*18     | Lead free                | 667/800      | 1.8V    | 2    | Now        |
|                    |                | M395T5663EH4-C(E6/F7/E7)(60/80/90) | (128M x8)*18     | Lead free & Halogen free | 667/800      | 1.8V    | 2    | Jan'09     |
|                    |                | M395T5663QZ4-YE680                 | (128M x8)*18     | Lead free                | 667          | 1.55V   | 2    | Now        |
|                    |                | M395T5663EH4-YE6/F7(80)            | (128M x8)*18     | Lead free & Halogen free | 667/800      | 1.55V   | 2    | Feb '09    |
| 4GB                | 512Mx72        | M395T5160QZ4-CE6/F7/E7(60/80/90)   | (256M x4)*36     | Lead free                | 667/800      | 1.8V    | 2    | Now        |
|                    |                | M395T5160EH4-C(E6/F7/E7)(60/80/90) | (256M x4)*36     | Lead free & Halogen free | 667/800      | 1.8V    | 2    | Feb '09    |
|                    |                | M395T5160QZ4-YE680                 | (256M x4)*36     | Lead free                | 667          | 1.55V   | 2    | Now        |
|                    |                | M395T5160EH4-YE6/F7(80)            | (256M x4)*36     | Lead free & Halogen free | 667/800      | 1.55V   | 2    | Feb '09    |
|                    |                | M395T5163QZ4-CE6/F7/E7(80)         | (128M x8)*36     | Lead free                | 667/800      | 1.8V    | 4    | Now        |
|                    |                | M395T5163EH4-CE6/F7/E7(80)         | (128M x8)*36     | Lead free & Halogen free | 667/800      | 1.8V    | 4    | Mar'09     |
|                    |                | M395T5163QZ4-YE680                 | (128M x8)*36     | Lead free                | 667          | 1.55V   | 4    | Now        |
|                    |                | M395T5163EH4-YE680                 | (128M x8)*36     | Lead free & Halogen free | 667          | 1.55V   | 4    | Mar'09     |
|                    |                | M395T5263AZ4-CE6/F7(60/80)         | (256M x8)*18     | Lead free                | 667/800      | 1.8V    | 2    | Now        |
| 8GB                | 1Gx72          | M395T5263AZ4-YE680                 | (256M x8)*18     | Lead free                | 667          | 1.55V   | 2    | Now        |
|                    |                | M395T1G60QJ4-CE6/F7(80)            | DDP (512M x4)*36 | Lead free                | 667/800      | 1.8V    | 4    | Now        |
|                    |                | M395T1G60EM4-CE6/F7(80)            | DDP (512M x4)*36 | Lead free & Halogen free | 667/800      | 1.8V    | 4    | Mar'09     |
|                    |                | M395T1G60QJ4-YE680                 | DDP (512M x4)*36 | Lead free                | 667          | 1.55V   | 4    | Now        |
|                    |                | M395T1G60EM4-YE680                 | DDP (512M x4)*36 | Lead free & Halogen free | 667          | 1.55V   | 4    | Mar'09     |
|                    |                | M395T1K66AZ4-CE6/F7(60/80)         | st. (1G x4)*18   | Lead free                | 667/800      | 1.8V    | 2    | Now        |
| M395T1K66AZ4-YE680 | st. (1G x4)*18 | Lead free                          | 667              | 1.55V                    | 2            | Now     |      |            |

NOTES: C: AMB Voltage = 1.5V  
 C: DRAM Voltage = 1.8V  
 Y\*: AMB Voltage = 1.5V (Available only with CE6)  
 Y\*: DRAM Voltage = 1.55V (Available only with CE6)

50: Intel C1 AMB  
 60: IDT D1 AMB  
 80 : IDT L4 AMB  
 90: Montage D1 AMB

800 Speed option would be limited along with AMB type.  
 Module Height = 1.2"

## DDR2 SDRAM UNBUFFERED MODULES

| Module  |              |                          |              |                          |              |      |            |
|---------|--------------|--------------------------|--------------|--------------------------|--------------|------|------------|
| Density | Organization | Part Number              | Composition  | Compliance               | Speed (Mbps) | Rank | Production |
| 512MB   | 64Mx64       | M378T6553GZS-C(E6/F7/E7) | (64M x8)*8   | Lead free                | 667/800      | 1    | Now        |
|         |              | M378T6464QZ3-C(E6/F7/E7) | (64M x16)*4  | Lead free                | 667/800      | 1    | Now        |
| 1GB     | 128Mx64      | M378T2953GZ3-C(E6/F7/E7) | (64M x8)*16  | Lead free                | 667/800      | 2    | Now        |
|         |              | M378T2863QZ3-C(E6/F7/E7) | (128M x8)*8  | Lead free                | 667/800      | 1    | Now        |
|         |              | M378T2863EHS-C(E6/F7/E7) | (128M x8)*8  | Lead free & Halogen free | 667/800      | 1    | Now        |
| 2GB     | 256Mx64      | M378T5663QZ3-C(E6/F7/E7) | (128M x8)*16 | Lead free                | 667/800      | 2    | Now        |
|         |              | M378T5663EH3-C(E6/F7/E7) | (128M x8)*16 | Lead free & Halogen free | 667/800      | 2    | Now        |
| 4GB     | 512Mx64      | M378T5263AZ3-C(E6/F7)    | (256M x8)*16 | Lead free                | 667/800      | 2    | Now        |

NOTES: E6=PC2-5300 (DDR2-667 @ CL=5) Voltage = 1.8V  
 E7=PC2-6400 (DDR2-800 @ CL=5) Module Height =1.2"  
 F7=PC2-6400 (DDR2-800 @ CL=6)

## DDR2 SDRAM UNBUFFERED MODULES (ECC)

| Module  |              |                          |              |                          |              |      |            |
|---------|--------------|--------------------------|--------------|--------------------------|--------------|------|------------|
| Density | Organization | Part Number              | Composition  | Compliance               | Speed (Mbps) | Rank | Production |
| 512MB   | 64Mx72       | M391T6553GZ3-C(E6/F7/E7) | (64M x8)*9   | Lead free                | 667/800      | 1    | Now        |
| 1GB     | 128Mx72      | M391T2863QZ3-C(E6/F7/E7) | (128M x8)*9  | Lead free                | 667/800      | 1    | Now        |
|         |              | M391T2863EH3-C(E6/F7/E7) | (128M x8)*9  | Lead free & Halogen free | 667/800      | 1    | Jan '09    |
| 2GB     | 256Mx64      | M391T5663QZ3-C(E6/F7/E7) | (128M x8)*18 | Lead free                | 667/800      | 2    | Now        |
|         |              | M391T5663EH3-C(E6/F7/E7) | (128M x8)*18 | Lead free & Halogen free | 667/800      | 2    | Jan '09    |
| 4GB     | 512Mx64      | M391T5263AZ3-C(E6/F7)    | (256M x8)*18 | Lead free                | 667/800      | 2    | Now        |

NOTES: E6=PC2-5300 (DDR2-667 @ CL=5) Voltage = 1.8V  
 E7=PC2-6400 (DDR2-800 @ CL=5) Module Height =1.2"  
 F7=PC2-6400 (DDR2-800 @ CL=6)

## DDR2 SDRAM SODIMM MODULES

| Module  |              |                          |                |                          |              |      |            |
|---------|--------------|--------------------------|----------------|--------------------------|--------------|------|------------|
| Density | Organization | Part Number              | Composition    | Compliance               | Speed (Mbps) | Rank | Production |
| 512MB   | 64Mx64       | M470T6554GZ3-C(E6/F7/E7) | (32M x16)*8    | Lead free                | 667/800      | 2    | Now        |
|         |              | M470T6464QZ3-C(E6/F7/E7) | (64M x16)*4    | Lead free                | 667/800      | 1    | Now        |
| 1GB     | 128Mx64      | M470T2953GZ3-C(E6/F7/E7) | (64M x8)*16    | Lead free                | 667/800      | 2    | Now        |
|         |              | M470T2864QZ3-C(E6/F7/E7) | (64M x16)*8    | Lead free                | 667/800      | 2    | Now        |
|         |              | M470T2864EH3-C(E6/F7/E7) | (64M x16)*8    | Lead free & Halogen free | 667/800      | 2    | Now        |
| 2GB     | 256Mx64      | M470T5663QZ3-C(E6/F7/E7) | (128M x8)*8    | Lead free                | 667/800      | 2    | Now        |
|         |              | M470T5663EH3-C(E6/F7/E7) | (128M x8)*8    | Lead free & Halogen free | 667/800      | 2    | Now        |
| 4GB     | 512Mx64      | M470T5267AZ3-C(E6/F7)    | st.(512M x8)*8 | Lead free                | 667/800      | 2    | Now        |

NOTES: E6=PC2-5300 (DDR2-667 @ CL=5) Voltage = 1.8V  
 E7=PC2-6400 (DDR2-800 @ CL=5) Module Height =1.2"  
 F7=PC2-6400 (DDR2-800 @ CL=6)

## DDR2 SDRAM COMPONENTS

| Density | Organization | Part Number                | # Pins-Package | Dimensions | Package                  | Speed (Mbps) | Production |
|---------|--------------|----------------------------|----------------|------------|--------------------------|--------------|------------|
| 256Mb   | 16Mx16       | K4T56163QI-ZC(E6/F7/E7)    | 84-FBGA        | 9x13mm     | Lead free                | 667/800      | Now        |
| 512Mb   | 128M x4      | K4T51043QG-HC(E6/F7/E7)    | 60-FBGA        | 10x11mm    | Lead free & Halogen free | 667/800      | Now        |
|         | 64M x8       | K4T51083QG-HC(E6/F7/E7)    | 60-FBGA        | 10x11mm    | Lead free & Halogen free | 667/800      | Now        |
|         | 32M x16      | K4T51163QG-HC(E6/F7/E7/F8) | 84-FBGA        | 11x13mm    | Lead free & Halogen free | 667/800/1066 | Now        |
| 1Gb     | 256M x4      | K4T1G044QQ-HC(E6/F7/E7)    | 68-FBGA        | 11x18mm    | Lead free & Halogen free | 667/800      | Now        |
|         |              | K4T1G044QE-HC(E6/F7/E7)    | 68-FBGA        | 11x18mm    | Lead free & Halogen free | 667/800      | Jan'09     |
|         | 128M x8      | K4T1G084QQ-HC(E6/F7/E7)    | 68-FBGA        | 11x18mm    | Lead free & Halogen free | 667/800      | Now        |
|         |              | K4T1G084QE-HC(E6/F7/E7)    | 68-FBGA        | 11x18mm    | Lead free & Halogen free | 667/800      | Now        |
|         | 64M x16      | K4T1G164QQ-HC(E6/F7/E7)    | 84-FBGA        | 11x18mm    | Lead free & Halogen free | 667/800      | Now        |
|         |              | K4T1G164QE-HC(E6/F7/E7/F8) | 84-FBGA        | 11x18mm    | Lead free & Halogen free | 667/800/1066 | Jan'09     |
| 2Gb     | 512Mx4       | K4T2G044QA-HC(E6/F7/E7)    | 68-FBGA        | 11x18mm    | Lead free & Halogen free | 667/800      | Now        |
|         | 256Mx8       | K4T2G084QA-HC(E6/F7/E7)    | 68-FBGA        | 11x18mm    | Lead free & Halogen free | 667/800      | Now        |

NOTES: E6=DDR2-667 (5-5-5) E7=DDR2-800 (5-5-5) Voltage = 1.8V  
F7=DDR2-800 (6-6-6) F8=DDR2-1066 (7-7-7)

## DDR SDRAM 1U REGISTERED MODULES

| Module  |              |                     |              |            |              |
|---------|--------------|---------------------|--------------|------------|--------------|
| Density | Organization | Part Number         | Composition  | Compliance | Speed (Mbps) |
| 512Mb   | 64Mx72       | M312L6523FH3-CCC/B0 | (64M x8)*9   | Lead-free  | 333/400      |
| 1Gb     | 128Mx72      | M312L2920FLS-CB0    | (128M x4)*18 | Lead-free  | 333/400      |
|         |              | M312L2923FH3-CCC/B0 | (128M x8)*9  | Lead-free  | 333/400      |
|         |              | M312L2920FH3-CB3    | (128M x4)*18 | Lead-free  | 333/400      |
| 2Gb     | 256Mx72      | M312L5720FH3-CB3    | (128M x4)*36 | Lead-free  | 333/400      |

NOTES: B0 = DDR266 (133MHz @ CL=2.5) B3 = DDR333 (166MHz @ CL=2.5) Type: 184-pin  
A2 = DDR266 (133MHz @ CL=2) CC = DDR400 (200MHz @ CL=3)

## DDR SDRAM UNBUFFERED MODULES

| Module  |              |                     |             |                          |              |
|---------|--------------|---------------------|-------------|--------------------------|--------------|
| Density | Organization | Part Number         | Composition | Compliance               | Speed (Mbps) |
| 512Mb   | 64MX64       | M368L6523FLS-CCC/B3 | (64M x8)*8  | Lead-free & Halogen free | 333/400      |
| 1Gb     | 128Mx64      | M368L2923FLN-CCC/B3 | (64M x8)*16 | Lead-free & Halogen free | 333/400      |

NOTES: B0 = DDR266 (133MHz @ CL=2.5) B3 = DDR333 (166MHz @ CL=2.5) Package: 66TSOP lead-free and halogen-free  
A2 = DDR266 (133MHz @ CL=2) CC = DDR400 (200MHz @ CL=3) Voltage: 2.5V

## DDR SDRAM SODIMM MODULES

| Module  |              |                    |             |            |              |
|---------|--------------|--------------------|-------------|------------|--------------|
| Density | Organization | Part Number        | Composition | Compliance | Speed (Mbps) |
| 512Mb   | 64MX64       | M470L6524FLO-CB300 | (32M x16)*8 | Lead-free  | 333          |
| 1Gb     | 128Mx64      | M470L2923F60-CB300 | (64M x8)*16 | Lead-free  | 333          |

NOTES: B0 = DDR266 (133MHz @ CL=2.5) B3 = DDR333 (166MHz @ CL=2.5)  
CC = DDR400 (200MHz @ CL=3) A2 = DDR266 (133MHz @ CL=2)



## DDR SDRAM COMPONENTS

| Density | Organization | Part Number        | # Pins - Package | Speed (Mbps) | Notes         |
|---------|--------------|--------------------|------------------|--------------|---------------|
| 256Mb   | 64Mx4        | K4H560438J-LCB3/B0 | 66-TSOP          | 266/333      | Halogen -free |
|         | 32Mx8        | K4H560838J-LCCC/B3 | 66-TSOP          | 333/400      | Halogen -free |
|         | 16Mx16       | K4H561638J-LCCC/B3 | 66-TSOP          | 333/400      | Halogen -free |
| 512Mb   | 128Mx4       | K4H510438F-LCB3/B0 | 66-TSOP          | 266/333      | Halogen -free |
|         |              | K4H510438F-HCCC/B3 | 60-FBGA          | 333/400      | Halogen -free |
|         | 64Mx8        | K4H510838F-LCCC/B3 | 66-TSOP          | 333/400      | Halogen -free |
|         |              | K4H510838F-HCCC/B3 | 60-FBGA          | 333/400      | Halogen -free |
|         | 32Mx16       | K4H511638F-LCCC/B3 | 66-TSOP          | 333/400      | Halogen -free |
| 128Mb   | 8Mx16        | K4H281638L-LCCC/CD | 66-TSOP          | 400/500      | Halogen -free |

NOTES: B0 = DDR266 (133MHz @ CL=2.5) B3 = DDR333 (166MHz @ CL=2.5)  
A2 = DDR266 (133MHz @ CL=2) CC = DDR400 (200MHz @ CL=3)

## SDRAM COMPONENTS

| Density | Organization | Part Number                | # Pins - Package | Speed (Mbps) | Refresh | Remarks                 |
|---------|--------------|----------------------------|------------------|--------------|---------|-------------------------|
| 64Mb    | 8Mx8         | K4S640832N-UC(75)000       | 54-TSOP          | 133          | 4K      | K-die changing to N-die |
|         | 4Mx16        | K4S641632N-UC(L)(75/60)000 | 54-TSOP          | 133/143/166  | 4K      | K-die changing to N-die |
| 128Mb   | 16Mx8        | K4S280832K-UC(L)(75)000    | 54-TSOP          | 133          | 4K      | I-die changing to K-die |
|         | 8Mx16        | K4S281632K-UC(L)(75/60)000 | 54-TSOP          | 133/166      | 4K      | I-die changing to K-die |
| 256Mb   | 64Mx4        | K4S560432J-UC(L)(75)000    | 54-TSOP          | 133          | 8K      | H-die changing to J-die |
|         | 32Mx8        | K4S560832J-UC(L)(75)000    | 54-TSOP          | 133          | 8K      | H-die changing to J-die |
|         | 16Mx16       | K4S561632J-UC(L)(75/60)000 | 54-TSOP          | 133/166      | 8K      | H-die changing to J-die |
| 512Mb   | 128Mx4       | K4S510432D-UC(L)(75)000    | 54-TSOP          | 133          | 8K      |                         |
|         | 64Mx8        | K4S510832D-UC(L)(75)000    | 54-TSOP          | 133          | 8K      |                         |
|         | 32Mx16       | K4S511632D-UC(L)(75)000    | 54-TSOP          | 133          | 8K      |                         |

NOTES: L = Commercial Temp., Low Power  
For industrial temperature, check with SSI Marketing  
Banks: 4  
All products are lead free  
Voltage: 3.3V  
Speed: PC133 (133MHz CL=3/PC100 CL2)

## RDRAM COMPONENTS

| Density | Organization | Part Number          | Speed (Mbps) | # Pins - Package | Refresh  |
|---------|--------------|----------------------|--------------|------------------|----------|
| 288M    | x18          | K4R881869I-DC(M8/T9) | 800/1066     | 92-FBGA          | 16K/32ms |

NOTES: Voltage: 2.5 V  
All products are lead free

## GRAPHICS DRAM COMPONENTS

| Type  | Density | Organization | Part Number | # Pins - Package | VDD/VDDQ    | Speed Bin (MHz)        | Effective Speed (Mbps) | Status      |
|-------|---------|--------------|-------------|------------------|-------------|------------------------|------------------------|-------------|
| GDDR5 | 512Mb   | 16Mx32       | K4G52324FG  | 170-FBGA         | 1.5/1.5V    | 800/900/1000           | 3200/3600/4000         |             |
|       | 1Gb     | 32Mx32       | K4G10324FE  | 170-FBGA         | 1.5/1.5V    | 900/1000/1250          | 3600/4000/5000         | CS in 1Q'09 |
| GDDR3 | 1Gb     | 32Mx32       | K4J10324QD  | 136-FBGA         | 1.8V/1.8V   | 700/800/900            |                        |             |
|       |         |              | K4J10324QD  | 136-FBGA         | 1.85V/1.85V | 1000                   |                        |             |
|       |         |              | K4J10324QE  | 136-FBGA         | 1.8V/1.8V   | 700/800/1000/1200/1300 |                        | CS in Q2'09 |
|       | 512Mb   | 16Mx32       | K4J52324QH  | 136-FBGA         | 1.8/1.8V    | 700/800                |                        |             |
|       |         |              | K4J52324QH  | 136-FBGA         | 1.9/1.9V    | 1000                   |                        |             |
|       |         |              | K4J52324QH  | 136-FBGA         | 2.05/2.05V  | 1200                   |                        |             |
|       |         |              | K4J52324QH  | 136-FBGA         | 2.05/2.05V  | 1300                   |                        |             |
|       |         |              | K4J52324QI  | 136-FBGA         | 1.8/1.8V    | 700/800                |                        | CS in Q3'09 |
|       |         |              | K4J52324QI  | 136-FBGA         | 1.9/1.9V    | 1000                   |                        | CS in Q3'09 |
| gDDR3 | 1Gb     | 64Mx16       | K4W1G1646D  | 100 FBGA         | 1.5/1.5V    | 667                    |                        |             |
|       |         |              | K4W1G1646D  | 100 FBGA         | 1.8V/1.8V   | 800/900                |                        |             |
|       |         |              | K4W1G1646E  | 100 FBGA         | 1.5V/1.5V   | 800/900/1000           |                        | CS in Q1'09 |
| gDDR2 | 1Gb     | 64Mx16       | K4N1G164QQ  | 84-FBGA          | 1.8/1.8V    | 400/500                |                        |             |
|       |         |              | K4N1G164QE  | 84-FBGA          | 1.8/1.8V    | 400/500                |                        |             |
|       | 512Mb   | 32Mx16       | K4N51163QG  | 84-FBGA          | 1.8/1.8V    | 400/500                |                        |             |
|       |         |              | K4N51163QZ  | 84-FBGA          | 1.8/1.8V    | 400/500                |                        |             |
| GDDR1 | 128Mb   | 4Mx32        | K4D263238K  | 144-FBGA         | 2.5/2.5V    | 200/250                |                        |             |
|       |         |              | K4D263238K  | 100-TQFP         | 2.5/2.5V    | 200/250                |                        |             |
|       |         | 8Mx16        | K4D261638K  | 66-TSOPII        | 2.5/2.5V    | 200/250                |                        |             |

NOTES: (1) Package: Lead Free or Halogen Free (2) Architecture: 4 Banks or 8 Banks (3) Speeds (clock cycle - speed bin):

|                      |                       |                      |
|----------------------|-----------------------|----------------------|
| 04: 0.4ns(5.0Gbps)   | 1A: 1ns (2Gbps)       | 25: 2.5ns (0.8Gbps)  |
| 05: 0.5ns(4Gbps)     | 11: 1.1ns (1.8Gbps)   | 2A: 2.86ns (0.7Gbps) |
| 5C: 0.555(3.6Gbps)   | 12: 1.25ns (1.6Gbps)  | 33: 3.3ns (0.6Gbps)  |
| 06: 0.625(3.2Gbps)   | 14: 1.429ns (1.4Gbps) | 40: 4.0ns (0.5Gbps)  |
| 07: 0.71ns (2.8Gbps) | 16: 1.667ns (1.2Gbps) | 50: 5.0ns (0.4Gbps)  |
| 08: 0.83ns (2.4Gbps) | 20: 2.0ns (1Gbps)     |                      |
| 09: 0.90ns (2.2Gbps) | 22: 2.2ns (0.9Gbps)   |                      |

# MOBILE SDRAM COMPONENTS

| Type    | Density | Organization | Part Number             | # Pins-Package | Refresh | Power |
|---------|---------|--------------|-------------------------|----------------|---------|-------|
| MMSDRAM | 512Mb   | 32M x16      | K4M51163PE-(1)(2)(3)(4) | 54-FBGA        | 8K      | 1.8V  |
|         |         |              | K4M51163PG-(1)(2)(3)(4) | 54-FBGA        | 8K      | 1.8V  |
| MMSDDR  | 512Mb   | 32M x16      | K4X51163PE-(1)(2)(3)(4) | 60-FBGA        | 8K      | 1.8V  |
|         |         |              | K4X51163PG-(1)(2)(3)(4) | 60-FBGA        | 8K      | 1.8V  |
| MMSDRAM | 512Mb   | 16M x32      | K4M51323PE-(1)(2)(3)(4) | 54-FBGA        | 8K      | 1.8V  |
|         |         |              | K4M51323PG-(1)(2)(3)(4) | 90-FBGA        | 8K      | 1.8V  |
| MMSDDR  | 512Mb   | 16M x32      | K4X51323PE-(1)(2)(3)(4) | 54-FBGA        | 8K      | 1.8V  |
|         |         |              | K4X51323PG-(1)(2)(3)(4) | 90-FBGA        | 8K      | 1.8V  |
| MMSDRAM | 256Mb   | 16M x16      | K4M56163PI-(1)(2)(3)(4) | 54-FBGA        | 8K      | 1.8V  |
| MMSDDR  | 256Mb   | 16M x16      | K4X56163PI-(1)(2)(3)(4) | 60-FBGA        | 8K      | 1.8V  |
| MMSDRAM | 256Mb   | 8M x32       | K4M56323PI-(1)(2)(3)(4) | 90-FBGA        | 8K      | 1.8V  |
| MMSDDR  | 256Mb   | 8M x32       | K4X56323PI-(1)(2)(3)(4) | 90-FBGA        | 8K      | 1.8V  |
| MMSDRAM | 128Mb   | 8M x16       | K4M28163PN-(1)(2)(3)(4) | 54-FBGA        | 4K      | 1.8V  |
|         | 64Mb    | 4M x16       | K4M641633K-(1)(2)(3)(4) | 54-FBGA        | 4K      | 3.0V  |
|         |         |              | K4M64163LK-(1)(2)(3)(4) | 54-FBGA        | 4K      | 2.5V  |
|         |         |              | K4M64163PK-(1)(2)(3)(4) | 54-FBGA        | 4K      | 1.8V  |
| MMSDDR  | 1Gb     | 64M x16      | K4X1G153PE-(1)(2)(3)(4) | 60-FBGA        | 8K      | 1.8V  |
|         |         |              | K4X1G163PC-(1)(2)(3)(4) | 60-FBGA        | 8K      | 1.8V  |
|         |         |              | K4X1G163PQ-(1)(2)(3)(4) | 60-FBGA        | 8K      | 1.8V  |
|         |         | 32M x32      | K4X1G323PC-(1)(2)(3)(4) | 90-FBGA        | 8K      | 1.8V  |
|         |         |              | K4X1G323PC-(1)(2)(3)(4) | 152-FBGA       | 8K      | 1.8V  |
|         |         |              | K4X1G323PD-(1)(2)(3)(4) | 90-FBGA        | 8K      | 1.8V  |
|         | 2Gb     | 64M x32      | K4X2G303PD-(1)(2)(3)(4) | 90-FBGA        | 8K      | 1.8V  |

NOTES:

(1) Package:

**Mobile SDRAM**

- 1 : POP
- 2 : 90-FBGA(DDP)
- 3 : 90-FBGA(DDP,LF)
- 4 : 96-FBGA
- 5 : 96-FBGA(LF)
- 6 : MCP(LF,HF)
- 9 : 90-FBGA(LF,OSP)
- A : FBGA(LF,TDP)
- B : 54-CSP(LF,HF)

- D : 90-FBGA\_L(LF,HF)
- E : FBGA(LF,MCP)
- F : 90-FBGA\_S
- G : LGA(LF)
- H : 90-FBGA\_S(LF,HF) :
- WBGA
- K : 60-CSP(LF,HF,OSP)
- L : 90-FBGA\_SSD(LF,HF)
- M : FBGA(MCP)

- N : 54-CSP(LF,HF,OSP)
- P : 54-CSP(LF,DDP)
- Q : ISM
- R : 54-FBGA
- S : 90-FBGA\_L
- T : TSOP2-400
- V : WBGA(LF)
- Y : 54-CSP(DDP)

(2) Temp & Power:

- C: Commercial (-25 ~ 70°C), Normal
- L: Commercial, Low, i-TCSR
- F: Commercial, Low, i-TCSR & PASR & DS
- E: Extended (-25~85°C), Normal
- N: Extended, Low, i-TCSR
- G: Extended, Low, i-TCSR & PASR & DS
- I: Industrial (-40~85°C), Normal
- P: Industrial, Low
- H: Industrial, Low, i-TCSR & PASR & DS

(3)-(4) Speed:

- Mobile-SDRAM**
- 60: 166MHz, CL 3
- 75: 133MHz, CL 3
- 80: 125MHz, CL 3
- 1H: 105MHz, CL 2
- 1L: 105MHz, CL 3
- 15: 66MHz, CL 2 & 3
- Mobile-DDR**
- C3: 133MHz, CL 3
- C2: 100MHz, CL 3
- C0: 66MHz, CL 3

- It will be applied from each different generation by density.  
(Halogen Free: 128Mb:14th, 256Mb:13th, 512Mb:8th, 1Gb:5th generation)

**Mobile DDR SDRAM**

- 1 : MCP
- 2 : 90-FBGA(DDP)
- 3 : 90-FBGA(LF,DDP,HF)
- 4 : 96-FBGA
- 5 : 96-FBGA(LF,HF)
- 6 : FBGA(POP,LF,HF)
- 7 : 90-FBGA
- 8 : 90-FBGA(LF,HF)
- 9 : 110-FBGA(LF,HF)
- A : 168-FBGA(LF,HF,DDP)
- F : 60-FBGA(LF,HF)
- G : 60-LGA(LF)
- K : 104-FBGA(LF,HF)
- L : WBGA(0.8MM)
- M : 152-FBGA(POP,HF,LF)
- N : 168-FBGA(LF,POP,HF)
- P : 60-FBGA(LF,DDP,HF)
- Q : ISM
- R : 102-FBGA(HF,LF)
- S : POP(DDP)

- It will be applied from each different generation by density.  
(Halogen Free: 128Mb:14th, 256Mb:13th, 512Mb:8th, 1Gb:5th generation)

**Mobile DDR SDRAM PEA**

- 1 : POP MONO
- 6 : POP MONO(LF,HF)
- 7 : 90-FBGA
- 8 : 90-FBGA(LF)
- A : FBGA(LF,TDP)
- F : 60-FBGA(LF)
- H : ISM
- (10X10mm, 1-side)
- K : 72-FBGA(LF)
- L : 60-FBGA
- M : POP-SAC105(LF,DDP)
- Q : ISM
- S : POP(DDP)
- X : POP(LF,DDP,HF)

- It will be applied from each different generation by density.  
(Halogen Free: 128Mb:14th, 256Mb:13th, 512Mb:8th, 1Gb:5th generation)

# COMPONENT DRAM ORDERING INFORMATION

|                  | 1 | 2 | 3 | 4  | 5  | 6 | 7 | 8 | 9 | 10                       | 11 |
|------------------|---|---|---|----|----|---|---|---|---|--------------------------|----|
|                  | K | 4 | T | XX | XX | X | X | X | X | X                        | XX |
| SAMSUNG Memory   |   |   |   |    |    |   |   |   |   | Speed                    |    |
| DRAM             |   |   |   |    |    |   |   |   |   | Temp & Power             |    |
| DRAM Type        |   |   |   |    |    |   |   |   |   | Package Type             |    |
| Density          |   |   |   |    |    |   |   |   |   | Revision                 |    |
| Bit Organization |   |   |   |    |    |   |   |   |   | Interface (VDD, VDDQ)    |    |
|                  |   |   |   |    |    |   |   |   |   | Number of Internal Banks |    |

## 1. Memory (K)

## 2. DRAM: 4

## 3. DRAM Type

B: DDR3 SDRAM  
 D: GDDR SDRAM  
 G: GDDR5 SDRAM  
 H: DDR SDRAM  
 J: GDDR3 SDRAM  
 M: Mobile SDRAM  
 N: gDDR2 SDRAM  
 S: SDRAM  
 T: DDR SDRAM  
 U: GDDR4 SDRAM  
 V: Mobile DDR SDRAM Power Efficient Address  
 W: gDDR3 SDRAM  
 X: Mobile DDR SDRAM  
 Y: XDR DRAM  
 Z: Value Added DRAM

## 4. Density

10: 1G, 8K/32ms  
 16: 16M, 4K/64ms  
 26: 128M, 4K/32ms  
 28: 128M, 4K/64ms  
 32: 32M, 2K/32ms  
 50: 512M, 32K/16ms  
 51: 512M, 8K/64ms  
 52: 512M, 8K/32ms  
 54: 256M, 16K/16ms  
 55: 256M, 4K/32ms  
 56: 256M, 8K/64ms  
 62: 64M, 2K/16ms  
 64: 64M, 4K/64ms  
 68: 768M, 8K/64ms  
 1G: 1G, 8K/64ms  
 2G: 2G, 8K/64ms  
 4G: 4G, 8K/64ms

## 5. Bit Organization

02: x2  
 04: x4  
 06: x4 Stack (Flexframe)  
 07: x8 Stack (Flexframe)

08: x8  
 15: x16 (2CS)  
 16: x16  
 26: x4 Stack (JEDEC Standard)  
 27: x8 Stack (JEDEC Standard)  
 30: x32 (2CS, 2CKE)  
 31: x32 (2CS)  
 32: x32

## 6. # of Internal Banks

2: 2 Banks  
 3: 4 Banks  
 4: 8 Banks  
 5: 16 Banks

## 7. Interface ( VDD, VDDQ)

2: LVTTTL, 3.3V, 3.3V  
 4: LVTTTL, 2.5V, 2.5V  
 5: SSTL-2 1.8V, 1.8V  
 6: SSTL-15 1.5V, 1.5V  
 8: SSTL-2, 2.5V, 2.5V  
 A: SSTL, 2.5V, 1.8V  
 F: POD-15 (1.5V, 1.5V)  
 H: SSTL\_2 DLL, 3.3V, 2.5V  
 M: LVTTTL, 1.8V, 1.5V  
 N: LVTTTL, 1.5V, 1.5V  
 P: LVTTTL, 1.8V, 1.8V  
 Q: SSTL-2 1.8V, 1.8V  
 R: SSTL-2, 2.8V, 2.8V  
 U: DRSL, 1.8V, 1.2V

## 8. Revision

A: 2nd Generation  
 B: 3rd Generation  
 C: 4th Generation  
 D: 5th Generation  
 E: 6th Generation  
 F: 7th Generation  
 G: 8th Generation  
 H: 9th Generation  
 I: 10th Generation  
 J: 11th Generation  
 K: 12th Generation  
 M: 1st Generation  
 N: 14th Generation  
 Q: 17th Generation

## 9. Package Type

### DDR SDRAM

L: TSOP II (Lead-free & Halogen-free)  
 H: FBGA (Lead-free & Halogen-free)  
 F: FBGA for 64Mb DDR (Lead-free & Halogen-free)  
 6: sTSOP II (Lead-free & Halogen-free)  
 T: TSOP II  
 N: sTSOP II  
 G: FBGA  
 U: TSOP II (Lead-free)  
 V: sTSOP II (Lead-free)  
 Z: FBGA (Lead-free)

### DDR2 SDRAM

Z: FBGA (Lead-free)  
 J: FBGA DDP (Lead-free)  
 Q: FBGA QDP (Lead-free)  
 H: FBGA (Lead-free & Halogen-free)  
 M: FBGA DDP (Lead-free & Halogen-free)  
 E: FBGA QDP (Lead-free & Halogen-free)  
 T: FBGA DSP (Lead-free & Halogen-free, Thin)

### DDR3 SDRAM

Z: FBGA (Lead-free)  
 H: FBGA (Halogen-free & Lead-free)

### Graphics Memory

Q: TQFP  
 U: TQFP (Lead Free)  
 G: 84/144 FBGA  
 V: 144 FBGA (Lead Free)  
 Z: 84 FBGA(Lead Free)  
 T: TSOP  
 L: TSOP (Lead Free)  
 A: 136 FBGA  
 B: 136 FBGA(Lead Free)  
 H: FBGA(Halogen Free & Lead Free)  
 E: 100 FBGA(Halogen Free & Lead Free)

### SDRAM

L TSOP II (Lead-free & Halogen-free)  
 N: STSOP II  
 T: TSOP II  
 U: TSOP II (Lead-free)  
 V: sTSOP II (Lead-free)

# COMPONENT DRAM ORDERING INFORMATION

|                  | 1 | 2 | 3 | 4  | 5  | 6 | 7 | 8 | 9 | 10                       | 11 |
|------------------|---|---|---|----|----|---|---|---|---|--------------------------|----|
|                  | K | 4 | T | XX | XX | X | X | X | X | X                        | XX |
| SAMSUNG Memory   |   |   |   |    |    |   |   |   |   | Speed                    |    |
| DRAM             |   |   |   |    |    |   |   |   |   | Temp & Power             |    |
| DRAM Type        |   |   |   |    |    |   |   |   |   | Package Type             |    |
| Density          |   |   |   |    |    |   |   |   |   | Revision                 |    |
| Bit Organization |   |   |   |    |    |   |   |   |   | Interface (VDD, VDDQ)    |    |
|                  |   |   |   |    |    |   |   |   |   | Number of Internal Banks |    |

### XDR DRAM

J: BOC(LF) P: BOC

### Mobile DRAM

#### Leaded / Lead Free

G/A: 52balls FBGA Mono

R/B: 54balls FBGA Mono

X/Z: 54balls BOC Mono

J/V: 60(72)balls FBGA Mono 0.5pitch

L/F: 60balls FBGA Mono 0.8pitch

S/D: 90balls FBGA

#### Monolithic (11mm x 13mm)

F/H: Smaller 90balls FBGA Mono

Y/P: 54balls CSP DDP

M/E: 90balls FBGA DDP

### DDR2 SDRAM

CC: DDR2-400 (200MHz @ CL=3, tRCD=3, tRP=3)

D5: DDR2-533 (266MHz @ CL=4, tRCD=4, tRP=4)

E6: DDR2-667 (333MHz @ CL=5, tRCD=5, tRP=5)

F7: DDR2-800 (400MHz @ CL=6, tRCD=6, tRP=6)

E7: DDR2-800 (400MHz @ CL=5, tRCD=5, tRP=5)

### DDR3 SDRAM

F7: DDR3-800 (400MHz @ CL=6, tRCD=6, tRP=6)

F8: DDR3-1066 (533MHz @ CL=7, tRCD=7, tRP=7)

G8: DDR3-1066 (533MHz @ CL=8, tRCD=8, tRP=8)

H9: DDR3-1333 (667MHz @ CL=9, tRCD=9, tRP=9)

K0: DDR3-1600 (800MHz @ CL=11, tRCD=11, tRP=11)

### Graphics Memory

18: 1.8ns (550MHz)

04: 0.4ns (2500MHz)

20: 2.0ns (500MHz)

05: 0.5ns (2000MHz)

22: 2.2ns (450MHz)

5C: 0.56ns (1800MHz)

25: 2.5ns (400MHz)

06: 0.62ns (1600MHz)

2C: 2.66ns (375MHz)

6A: 0.66ns (1500MHz)

2A: 2.86ns (350MHz)

07: 0.71ns (1400MHz)

33: 3.3ns (300MHz)

7A: 0.77ns (1300MHz)

36: 3.6ns (275MHz)

08: 0.8ns (1200MHz)

40: 4.0ns (250MHz)

09: 0.9ns (1100MHz)

45: 4.5ns (222MHz)

1 : 1.0ns (1000MHz)

50/5A: 5.0ns (200MHz)

1 : 1.1ns (900MHz)

55: 5.5ns (183MHz)

12: 1.25ns (800MHz)

60: 6.0ns (166MHz)

14: 1.4ns (700MHz)

16: 1.6ns (600MHz)

### SDRAM (Default CL=3)

50: 5.0ns (200MHz CL=3)

60: 6.0ns (166MHz CL=3)

67: 6.7ns

75: 7.5ns PC133 (133MHz CL=3)

### XDR DRAM

A2: 2.4Gbps, 36ns, 16Cycles

B3: 3.2Gbps, 35ns, 20Cycles

C3: 3.2Gbps, 35ns, 24Cycles

C4: 4.0Gbps, 28ns, 24Cycles

DS: Daisychain Sample

### Mobile-SDRAM

60: 166MHz, CL 3

75: 133MHz, CL 3

80: 125MHz, CL 3

1H: 105MHz, CL 2

1L: 105MHz, CL 3

15: 66MHz, CL 2 & 3

### Mobile-DDR

C3: 133MHz, CL 3

C2: 100MHz, CL 3

C0: 66MHz, CL 3

Note: All of Lead-free or Halogen-free product are in compliance with RoHS

## 10. Temp & Power - COMMON (Temp, Power)

C: Commercial, Normal (0°C – 95°C) & Normal Power

C: (Mobile Only) Commercial (-25 ~ 70°C), Normal Power

J: Commercial, Medium

L: Commercial, Low (0°C – 95°C) & Low Power

L: (Mobile Only) Commercial, Low, i-TCSR

F: Commercial, Low, i-TCSR & PASR & DS

E: Extended (-25~85°C), Normal

N: Extended, Low, i-TCSR

G: Extended, Low, i-TCSR & PASR & DS

I: Industrial, Normal (-40°C – 85°C) & Normal Power

P: Industrial, Low (-40°C – 85°C) & Low Power

H: Industrial, Low, i-TCSR & PASR & DS

## 11. Speed (Wafer/Chip Biz/BGD: 00)

### DDR SDRAM

CC: DDR400 (200MHz @ CL=3, tRCD=3, tRP=3)

B3: DDR333 (166MHz @ CL=2.5, tRCD=3, tRP=3) \*1

A2: DDR266 (133MHz @ CL=2, tRCD=3, tRP=3)

B0: DDR266 (133MHz @ CL=2.5, tRCD=3, tRP=3)

Note 1: "B3" has compatibility with "A2" and "B0"

# MODULE DRAM ORDERING INFORMATION

|                     | 1 | 2 | 3  | 4 | 5  | 6 | 7 | 8 | 9 | 10 | 11 | 12                 | 13 |
|---------------------|---|---|----|---|----|---|---|---|---|----|----|--------------------|----|
|                     | M | X | XX | T | XX | X | X | X | X | X  | X  | XX                 | X  |
| SAMSUNG Memory      |   |   |    |   |    |   |   |   |   |    |    | AMB Vendor         |    |
| DIMM                |   |   |    |   |    |   |   |   |   |    |    | Speed              |    |
| Data bits           |   |   |    |   |    |   |   |   |   |    |    | Temp & Power       |    |
| DRAM Component Type |   |   |    |   |    |   |   |   |   |    |    | PCB Revision       |    |
| Depth               |   |   |    |   |    |   |   |   |   |    |    | Package            |    |
| Number of Banks     |   |   |    |   |    |   |   |   |   |    |    | Component Revision |    |
| Bit Organization    |   |   |    |   |    |   |   |   |   |    |    |                    |    |

## 1. Memory Module: M

### 2. DIMM Type

- 3: DIMM
- 4: SODIMM

### 3. Data bits

- 12: x72 184pin Low Profile Registered DIMM
- 63: x63 PC100 / PC133 μSODIMM with SPD for 144pin
- 64: x64 PC100 / PC133 SODIMM with SPD for 144pin (Intel/JEDEC)
- 66: x64 Unbuffered DIMM with SPD for 144pin/168pin (Intel/JEDEC)
- 68: x64 184pin Unbuffered DIMM
- 70: x64 200pin Unbuffered SODIMM
- 71: x64 204pin Unbuffered SODIMM
- 74: x72 /ECC Unbuffered DIMM with SPD for 168pin (Intel/JEDEC)
- 77: x72 /ECC PLL + Register DIMM with SPD for 168pin (Intel PC100)
- 78: x64 240pin Unbuffered DIMM
- 81: x72 184pin ECC unbuffered DIMM
- 83: x72 184pin Registered DIMM
- 90: x72 /ECC PLL + Register DIMM
- 91: x72 240pin ECC unbuffered DIMM
- 92: x72 240pin VLP Registered DIMM
- 93: x72 240pin Registered DIMM
- 95: x72 240pin Fully Buffered DIMM with SPD for 168pin (JEDEC PC133)

### 4. DRAM Component Type

- B: DDR3 SDRAM (1.5V VDD)
- L: DDR SDRAM (2.5V VDD)
- S: SDRAM
- T: DDR2 SDRAM (1.8V VDD)

## 5. Depth

- 09: 8M (for 128Mb/512Mb)
- 17: 16M (for 128Mb/512Mb)
- 16: 16M
- 28: 128M
- 29: 128M (for 128Mb/512Mb)
- 32: 32M
- 33: 32M (for 128Mb/512Mb)
- 51: 512M
- 52: 512M (for 512Mb/2Gb)
- 56: 256M
- 57: 256M (for 512Mb/2Gb)
- 59: 256M (for 128Mb/512Mb)
- 64: 64M
- 65: 64M (for 128Mb/512Mb)
- 1G: 1G
- 1K: 1G (for 2Gb)

## 6. # of Banks in Comp. & Interface

- 1: 4K/64mxRef., 4Banks & SSTL-2
- 2: 8K/ 64ms Ref., 4Banks & SSTL-2
- 2: 4K/ 64ms Ref., 4Banks & LVTTL (SDR Only)
- 5: 8K/ 64ms Ref., 4Banks & LVTTL (SDR Only)
- 5: 4Banks & SSTL-1.8V
- 6: 8Banks & SSTL-1.8V

## 7. Bit Organization

- 0: x 4
- 3: x 8
- 4: x16
- 6: x 4 Stack (JEDEC Standard)
- 7: x 8 Stack (JEDEC Standard)
- 8: x 4 Stack
- 9: x 8 Stack

## 8. Component Revision

- A: 2nd Gen.
- B: 3rd Gen.
- C: 4th Gen.
- D: 5th Gen.
- E: 6th Gen.
- F: 7th Gen.
- G: 8th Gen.
- M: 1st Gen.
- Q: 17th Gen.

## 9. Package

- E: FBGA QDP (Lead-free & Halogen-free)
- G: FBGA
- H: FBGA (Lead-free & Halogen-free)
- J: FBGA DDP (Lead-free)
- M: FBGA DDP (Lead-free & Halogen-free)
- N: sTSOP
- Q: FBGA QDP (Lead-free)
- T: TSOP II (400mil)
- U: TSOP II (Lead-Free)
- V: sTSOP II (Lead-Free)
- Z: FBGA(Lead-free)

## 10. PCB Revision

- 0: Mother PCB
- 1: 1st Rev
- 2: 2nd Rev.
- 3: 3rd Rev.
- 4: 4th Rev.
- A: Parity DIMM
- S: Reduced PCB
- U: Low Profile DIMM

## 11. Temp & Power

- C: Commercial Temp. (0°C ~ 95°C) & Normal Power
- L: Commercial Temp. (0°C ~ 95°C) & Low Power

## 12. Speed

- CC: (200MHz @ CL=3, tRCD=3, tRP=3)
- D5: (266MHz @ CL=4, tRCD=4, tRP=4)
- E6: (333MHz @ CL=5, tRCD=5, tRP=5)
- F7: (400MHz @ CL=6, tRCD=6, tRP=6)
- E7: (400MHz @ CL=5, tRCD=5, tRP=5)
- F8: (533MHz @ CL=7, tRCD=7, tRP=7)
- G8: (533MHz @ CL=8, tRCD=8, tRP=8)
- H9: (667MHz @ CL=9, tRCD=9, tRP=9)
- K0: (800MHz @ CL=10, tRCD=10, tRP=10)
- 7A: (133MHz CL=3/PC100 CL2)

## 13. AMB Vendor for FBDIMM

- 0, 5: Intel
- 1, 6, 8: IDT
- 9: Montage

Note: All of Lead-free or Halogen-free product are in compliance with RoHS

# MLC NAND FLASH

| Family                                | Density   | Technology | Part Number     | Package Type | Org. | Vol(V) | MOQ             |                 | Remarks                                  |
|---------------------------------------|-----------|------------|-----------------|--------------|------|--------|-----------------|-----------------|--|
|                                       |           |            |                 |              |      |        | Tray<br>-xxx0xx | T/R<br>-xxx0Txx |  |
| 16Gb based<br>4KByte/Page<br>Cache    | 128Gb DSP | 51nm       | K9MDG08U5M-PCB0 | TSOP1        | x8   | 3.3    | 960             | 1,000           |  |
|                                       |           |            | K9MDG08U5M-ZCB0 | WELP         | x8   | 3.3    | 960             | 1,000           |  |
|                                       | 64Gb QDP  |            | K9HCG08U1M-PCB0 | TSOP1        | x8   | 3.3    | 960             | 1,000           |  |
|                                       |           |            | K9HCG08U1M-IIB0 | ULGA         | x8   | 3.3    | 960             | 1,000           |  |
|                                       | 32Gb DDP  |            | K9LBG08U0M-PCB0 | TSOP1        | x8   | 3.3    | 960             | 1,000           |  |
|                                       |           |            | K9LBG08U1M-IIB0 | ULGA         | x8   | 3.3    | 720             | 2,000           | 2CE                                      |
|                                       | 16Gb mono |            | K9GAG08U0M-PCB0 | TSOP1        | x8   | 3.3    | 960             | 1,000           |  |
| K9GAG08U0M-IIB0                       |           | ULGA       | x8              | 3.3          | 720  | 2,000  |                 |                 |  |
| 8Gb Based<br>2KByte/Page<br>W/O Cache | 32Gb QDP  | 59nm       | K9HBG08U1B-PCB0 | TSOP1        | x8   | 3.3    | 960             | 1,000           |  |
|                                       | 16Gb DDP  | 51nm       | K9LAG08U0A-PCB0 | TSOP1        | x8   | 3.3    | 960             | 1,000           | qualify B-die part # K9LAG08U0B-PCB0000  |
|                                       |           | 59nm       | K9LAG08U0B-PCB0 | TSOP1        | x8   | 3.3    | 960             | 1,000           |  |
|                                       | 8Gb mono  | 51nm       | K9G8G08U0A-PCB0 | TSOP1        | x8   | 3.3    | 960             | 1,000           | qualify B-die, part # K9G8G08U0B-PCB0000 |
|                                       |           |            | K9G8G08U0A-IIB0 | ULGA         | x8   | 3.3    | 960             | 2,000           |  |
|                                       |           | 59nm       | K9G8G08U0B-PCB0 | TSOP1        | x8   | 3.3    | 960             | 1,000           |  |
| 4Gb based                             | 4Gb mono  | 63nm       | K9G4G08U0A-PCB0 | TSOP1        | x8   | 3.3    | 960             | 1,000           | qualify B-die, part # K9G4G08U0B-PCB0000 |
|                                       |           | 51nm       | K9G4G08U0B-PCB0 | TSOP1        | x8   | 3.3    | 960             | 1,000           |  |

Please contact your local Samsung sales representative for latest product offerings.

Note: All parts are lead free

FLASH

# SLC NAND FLASH

| Family                | Density  | Tech | Part Number     | Package Type    | Org. | Vol(V) | MOQ      |          | Remarks   |
|-----------------------|----------|------|-----------------|-----------------|------|--------|----------|----------|---|
|                       |          |      |                 |                 |      |        | Tray     | T/R      |   |
|                       |          |      |                 |                 |      |        | -xxxx0xx | -xxx0Txx |   |
| 8Gb Based<br>4KB/page | 64Gb DSP | 51nm | K9NCG08U5M-PCB0 | TSOP1           | x8   | 3.3    | 960      | 1,000    |   |
|                       | 32Gb QDP |      | K9WBG08U1M-PCB0 | TSOP1           | x8   | 3.3    | 960      | 1,000    |   |
|                       |          |      | K9WBG08U1M-PIB0 | TSOP1           | x8   | 3.3    | 960      | 1,000    |   |
|                       |          |      | K9KAG08U0M-PCB0 | TSOP1           | x8   | 3.3    | 960      | 1,000    |   |
|                       | 16Gb DDP |      | K9KAG08U0M-PIB0 | TSOP1           | x8   | 3.3    | 960      | 1,000    |   |
|                       |          |      | K9F8G08U0M-PCB0 | TSOP1           | x8   | 3.3    | 960      | 1,000    |   |
|                       |          |      | K9F8G08U0M-PIB0 | TSOP1           | x8   | 3.3    | 960      | 1,000    |   |
| 8G mono               |          |      |                 |                 |      |        |          |          |   |
| 4Gb Based<br>2KB/page | 16Gb QDP | 63nm | K9WAG08U1A-PCB0 | TSOP1           | x8   | 3.3    | 960      | 1,000    | qualify 59nm B-die: K9WAG08U1B-PCB0000;<br>A-die EOL:LTBO due Dec'08            |
|                       |          |      | K9WAG08U1A-PIB0 | TSOP1           | x8   | 3.3    | 960      | 1,000    | qualify 59nm B-die: K9WAG08U1B-PIB0000;<br>A-die EOL: LTBO due Dec'08           |
|                       |          |      | K9WAG08U1A-IIB0 | ULGA            | x8   | 3.3    | 960      | 2,000    | A-die EOL: LTBO due Dec'08  |
|                       |          | 59nm | K9WAG08U1B-PCB0 | TSOP1           | x8   | 3.3    | 960      | 1,000    |   |
|                       |          |      | K9WAG08U1B-PIB0 | TSOP1           | x8   | 3.3    | 960      | 1,000    |   |
|                       |          |      | K9WAG08U1B-KIB0 | ULGA HF & LF    | x8   | 3.3    | 960      | 2,000    |   |
|                       | 8Gb DDP  | 63nm | K9K8G08U0A-PCB0 | TSOP1           | x8   | 3.3    | 960      | 1,000    | qualify 59nm B-die: K9K8G08U0B-PCB0000;<br>A-die EOL: LTBO due Dec'08           |
|                       |          |      | K9K8G08U0A-PIB0 | TSOP1           | x8   | 3.3    | 960      | 1,000    | qualify 59nm B-die: K9K8G08U0B-PIB0000;<br>A-die EOL: LTBO due Dec'08           |
|                       |          |      | K9K8G08U1A-IIB0 | ULGA            | x8   | 3.3    | 960      | 2,000    | A-die EOL/LTBO due Dec'08   |
|                       |          | 59nm | K9K8G08U0B-PCB0 | TSOP1           | x8   | 3.3    | 960      | 1,000    |   |
|                       |          |      | K9K8G08U0B-PIB0 | TSOP1           | x8   | 3.3    | 960      | 1,000    |   |
|                       |          |      | K9K8G08U1B-KIB0 | ULGA HF & LF    | x8   | 3.3    | 960      | 2,000    |   |
|                       | 4Gb      | 63nm | K9F4G08U0A-PCB0 | TSOP1           | x8   | 3.3    | 960      | 1,000    | qualify 59nm B-die: K9F4G08U0B-PCB0000;<br>A-die EOL: LTBO due Dec'08           |
|                       |          |      | K9F4G08U0A-PIB0 | TSOP1           | x8   | 3.3    | 960      | 1,000    | qualify 59nm B-die: K9F4G08U0B-PIB0000;<br>A-die EOL: LTBO due Dec'08           |
|                       |          |      | K9F4G08U0A-IIB0 | ULGA            | x8   | 3.3    | 960      | 2,000    | A-die EOL: LTBO due Dec'08  |
|                       |          | 59nm | K9F4G08U0B-PCB0 | TSOP1           | x8   | 3.3    | 960      | 1,000    |   |
|                       |          |      | K9F4G08U0B-PIB0 | TSOP1           | x8   | 3.3    | 960      | 1,000    |   |
|                       |          |      | K9F4G08U0B-KIB0 | ULGA HF & LF    | x8   | 3.3    | 960      | 2,000    |   |
| 2Gb                   | 2Gb      | 63nm | K9F2G08U0A-PCB0 | TSOP1           | x8   | 3.3    | 960      | 1,000    | qualify 59nm B-die: K9F2G08U0B-PCB0000;<br>A-die EOL: LTBO due Dec'08           |
|                       |          |      | K9F2G08U0A-PIB0 | TSOP1           | x8   | 3.3    | 960      | 1,000    | qualify 59nm B-die: K9F2G08U0B-PIB0000;<br>A-die EOL: LTBO due Dec'08           |
|                       |          | 59nm | K9F2G08U0B-PCB0 | TSOP1           | x8   | 3.3    | 960      | 1,000    |   |
|                       |          |      | K9F2G08U0B-PIB0 | TSOP1           | x8   | 3.3    | 960      | 1,000    |   |
| 1Gb                   | 1Gb      | 63nm | K9F1G08U0B-PCB0 | TSOP1           | x8   | 3.3    | 960      | 1,000    | 59nm C-die coming Oct'08: K9F1G08U0C-<br>PCB0000; B-die EOL: LTBO due Mar'09    |
|                       |          |      | K9F1G08U0B-PIB0 | TSOP1           | x8   | 3.3    | 960      | 1,000    | 59nm C-die coming Oct'08: K9F1G08U0C-<br>PIB0000;<br>B-die EOL: LTBO due Mar'09 |
|                       |          |      | K9F1G08R0B-JIB0 | 63 FBGA(9.5x12) | x8   | 1.8    | 1,120    | 2,000    | 1.8v B-die supported through 2009   |
|                       |          | 59nm | K9F1G08U0C-PCB0 | TSOP1           | x8   | 3.3    | 960      | 1,000    |   |
|                       |          |      | K9F1G08U0C-PIB0 | TSOP1           | x8   | 3.3    | 960      | 1,000    |   |
|                       |          |      |                 |                 |      |        |          |          |   |
| 512Mb                 | 512Mb    | 63nm | K9F1208U0C-PCB0 | TSOP1           | x8   | 3.3    | 960      | 1,000    |   |
|                       |          |      | K9F1208U0C-PIB0 | TSOP1           | x8   | 3.3    | 960      | 1,000    |   |
|                       |          |      | K9F1208R0C-JIB0 | 63 FBGA(8.5x13) | x8   | 1.8    | 1,120    | 2,000    |   |
|                       |          |      | K9F1208U0C-JIB0 | 63 FBGA(8.5x13) | x8   | 3.3    | 1,120    | 2,000    |   |
| 256Mb                 | 256Mb    | 90nm | K9F5608U0D-PCB0 | TSOP1           | x8   | 3.3    | 960      | 1,000    |   |
|                       |          |      | K9F5608U0D-PIB0 | TSOP1           | x8   | 3.3    | 1,000    | 1,000    |   |
|                       |          |      | K9F5608R0D-JIB0 | 63 FBGA(9x11)   | x8   | 1.8    | 1,280    | 2,000    |   |
|                       |          |      | K9F5608U0D-JIB0 | 63 FBGA(9x11)   |      | 3.3    | 1,280    | 2,000    |   |

Please contact your local Samsung sales representative for latest product offerings.

Note: All parts are lead free



## Solid State Drives (SSD)\*

| Application        | Interface                   | Size               | Connector         | Den.       | Comp.             | Part Number        |                    |
|--------------------|-----------------------------|--------------------|-------------------|------------|-------------------|--------------------|--------------------|
| PC/Notebook        | SATA II<br>SLC<br>3.0Gb/sec | 1.8"               | Thin uSATA        | 32GB       | 8Gb               | MCBQE32G8MPP-0VA00 |                    |
|                    |                             |                    |                   | 64GB       |                   | MCCOE64G8MPP-0VA00 |                    |
|                    |                             | 2.5"               | Thin SATA         | 32GB       | 8Gb               | MCBQE32G5MPP-0VA00 |                    |
|                    |                             |                    |                   | 64GB       |                   | MCCOE64G5MPP-0VA00 |                    |
|                    |                             | SLIM<br>(caseless) | uSATA             | 32GB       | 8Gb               | MCBQE32GFMP-0VA00  |                    |
|                    |                             |                    |                   | 64GB       |                   | MCBQE64GFMP-0VA00  |                    |
|                    | SATA II<br>MLC<br>3.0Gb/sec | PM410              | 1.8"              | Thin uSATA | 64GB              | 16Gb               | MMCRE64G8MPP-0VA00 |
|                    |                             |                    |                   |            | 128GB             |                    | MMCQE28G8MUP-0VA00 |
|                    |                             |                    | 2.5"              | Thin SATA  | 64GB              | 16Gb               | MMCRE64G5MPP-0VA00 |
|                    |                             |                    |                   |            | 128GB             |                    | MMDOE28G5MPP-0VA00 |
|                    |                             | SLIM<br>(caseless) | uSATA             | 64GB       | 16Gb              | MMCRE64GFMP-0VA00  |                    |
|                    |                             |                    |                   | 128GB      |                   | MMCQE28GFMP-0VA00  |                    |
|                    |                             | PM800              | 2.5"              | Thin SATA  | 64GB              | 16Gb               | MMCRE64G5MXP-0VB00 |
|                    |                             |                    |                   |            | 128GB             |                    | MMCRE28G5MXP-0VB00 |
| 256GB              | MMDOE56G5MXP-0VB00          |                    |                   |            |                   |                    |                    |
| SLIM<br>(caseless) | uSATA                       |                    | 64GB              | 16Gb       | MMCRE64GFMP-0VB00 |                    |                    |
|                    |                             | 128GB              | MMCRE28GFMP-0VB00 |            |                   |                    |                    |
| Server/Storage     | SATA II<br>3.0Gb/sec<br>SLC | SS410              | 2.5"              | Thin SATA  | 8Gb               | MCBQE25G5MPQ-0VA03 |                    |
|                    |                             |                    |                   |            |                   | 50GB               | MCCOE50G5MPQ-0VA03 |
|                    |                             | SS415              | 2.5"              | Thin SATA  | 50GB              | 8Gb                | MCBQE32G5MPQ-0VA03 |
|                    |                             |                    |                   |            | 64GB              |                    | MCCOE64G5MPQ-0VA03 |
|                    |                             | SS800              | 2.5"              | Thin SATA  | 50GB              | 8Gb                | MCBQE50G5MXP-0VB03 |
|                    |                             |                    |                   |            | 100GB             |                    | MCCOE00G5MXP-0VB03 |
| UMPC/Low-Cost PC   | SATA II MLC                 | UM410              | HALF SLIM         | Thin SATA  | 16Gb              | MMAGE08GSMPP-MVA00 |                    |
|                    |                             |                    |                   |            |                   | 16GB               | MMBRE16GSMPP-MVA00 |
|                    |                             |                    |                   |            |                   | 32GB               | MMCRE32GSMPP-MVA00 |

\*Please contact Marketing for the latest offerings.

## SD and MicroSD FLASH CARDS

| Flash Cards                  |         |           |       |            |             |                    |     |      |                    |
|------------------------------|---------|-----------|-------|------------|-------------|--------------------|-----|------|--------------------|
| Type                         | Density | Component |       | Controller | Manuf. Site | Part Number        | MOQ |      |                    |
|                              |         | Family    | Ver.  |            |             |                    |     |      |                    |
| SD                           | 1GB     | 8Gb MLC   | B-die | SKYMEDI    | STS         | MM8GF01GWBCA-2MA00 | 135 |      |                    |
|                              | 2GB     | 16G MLC   | M-die | SKYMEDI    | STS         | MMAGF02GWMCA-2NA00 |     |      |                    |
|                              | 4GB     |           |       | SKYMEDI    | STS         | MMAGF04GWMCA-2NA00 |     |      |                    |
|                              | 8GB     |           |       | SKYMEDI    | STS         | MMAGF08GWMCA-2NA00 |     |      |                    |
| MicroSD<br>(without adapter) | 512MB   | 4Gb MLC   | A-die | SMI        | STS         | MM4GR512UACA-2PA00 | 600 |      |                    |
|                              |         |           |       | SMI        | ATP         | MM4GR512UACU-2PA00 |     |      |                    |
|                              |         |           |       | SMI        | SPIL        | MM4GR512UACY-2PA00 |     |      |                    |
|                              | 1GB     | 8Gb MLC   | B-die | SKYMEDI    | SPIL        | MM8GR01GUBCY-2MA00 |     |      |                    |
|                              |         |           |       | SKYMEDI    | STS         | MM8GR01GUBCA-2MA00 |     |      |                    |
|                              | 2GB     | 8Gb MLC   | B-die | SKYMEDI    | SPIL        | MM8GR02GUBCY-2MA00 |     |      |                    |
|                              |         |           |       | SKYMEDI    | STS         | MM8GR02GUBCA-2MA00 |     |      |                    |
|                              | 4GB     | 16G MLC   | M-die | SKYMEDI    | STS         | MMAGR02GUDCA-2MA00 |     |      |                    |
|                              |         |           |       | 8Gb MLC    | B-die       | SKYMEDI            |     | SPIL | MM8GR04GUBCY-2MA00 |
|                              |         |           |       |            |             | SKYMEDI            |     | STS  | MMAGR04GUDCA-2MA00 |
|                              | 8GB     | 16G MLC   | M-die | SKYMEDI    | STS         | MMAGR08GUDCA-2MA00 |     |      |                    |

Please contact your local Samsung sales representative for latest product offerings.

Note: All parts are lead free.

# FLASH PRODUCT ORDERING INFORMATION

|                      | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |                     |
|----------------------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|---------------------|
|                      | K | 9 | X | X | X | X | X | X | X | X  | -  | X  | X  | X  | X  |                     |
| SAMSUNG Memory       |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    | Pre-Program Version |
| NAND Flash           |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    | Customer Bad Block  |
| Small Classification |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    | Temp                |
| Density              |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    | Package             |
| Density              |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    | ---                 |
| Organization         |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    | Generation          |
| Organization         |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    | Mode                |
| Vcc                  |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |                     |

## 1. Memory (K)

## 2. NAND Flash : 9

## 3. Small Classification

(SLC : Single Level Cell, MLC : Multi Level Cell)

- 7 : SLC moviNAND
- 8 : MLC moviNAND
- F : SLC Normal
- G : MLC Normal
- H : MLC QDP
- K : SLC DDP
- L : MLC DDP
- M : MLC DSP
- N : SLC DSP
- P : MLC 8 Die Stack
- Q : SLC 8 Die Stack
- S : SLC Single SM
- T : SLC SINGLE (S/B)
- U : 2 Stack MSP
- W : SLC 4 Die Stack

## 4~5. Density

- 12 : 512M
- 56 : 256M
- 1G : 1G
- 2G : 2G
- 4G : 4G
- 8G : 8G
- AG : 16G BG :
- 32G CG : 64G
- DG : 128G
- EG : 256G
- LG : 24G
- NG : 96G
- ZG : 48G
- 00 : NONE

## 6~7. Organization

- 00 : NONE
- 08 : x8
- 16 : x16

## 8. Vcc

- A : 1.65V~3.6V
- B : 2.7V (2.5V~2.9V)
- C : 5.0V (4.5V~5.5V)
- D : 2.65V (2.4V~2.9V)
- E : 2.3V~3.6V
- R : 1.8V (1.65V~1.95V)
- Q : 1.8V (1.7V~1.95V)
- T : 2.4V~3.0V
- U : 2.7V~3.6V
- V : 3.3V (3.0V~3.6V)
- W : 2.7V~5.5V, 3.0V~5.5V
- 0 : NONE

## 9. Mode

- 0 : Normal
- 1 : Dual nCE & Dual R/nB
- 3 : Tri /CE & Tri R/B
- 4 : Quad nCE & Single R/nB
- 5 : Quad nCE & Quad R/nB
- 9 : 1st block OTP
- A : Mask Option 1
- L : Low grade

## 10. Generation

- M : 1st Generation
- A : 2nd Generation
- B : 3rd Generation
- C : 4th Generation
- D : 5th Generation

## 11. " ----"

## 12. Package

- A : COB
- B : FBGA (Halogen-Free, Lead-Free)
- C : CHIP BIZ D : 63-TBGA
- F : WSOP (Lead-Free) G : FBGA
- H : TBGA (Lead-Free)
- I : ULGA (Lead-Free) (12\*17)
- J : FBGA (Lead-Free)
- L : ULGA (Lead-Free) (14\*18)
- M : TLGA N : TLGA2
- P : TSOP1 (Lead-Free)
- Q : TSOP2 (Lead-Free)
- S : TSOP1 (Halogen-Free, Lead-Free)
- T : TSOP2 U : COB (MMC)
- V : WSOP W : Wafer
- Y : TSOP1 Z : WELP (Lead-Free)

## 13. Temp

- C : Commercial I : Industrial
- 0 : NONE (Containing Wafer, CHIP, BIZ, Exception handling code)

## 14. Customer Bad Block

- B : Include Bad Block
- D : Daisychain Sample
- L : 1~5 Bad Block
- N : ini. 0 blk, add. 10 blk
- S : All Good Block
- 0 : NONE (Containing Wafer, CHIP, BIZ, Exception handling code)

## 15. Pre-Program Version

- 0 : None
- Serial (1~9, A~Z)

## LOW POWER ASYNCHRONOUS SRAM

| Type   | Density | Organization | Part Number | # Pins-Package | Vcc (V) | Speed (ns) | Temp | Current (mA) | Current (uA) | Production Status |
|--------|---------|--------------|-------------|----------------|---------|------------|------|--------------|--------------|-------------------|
| UtRAM  | 64Mb    | 4Mx16        | K1S6416BCE  | 48-FBGA        | 1.8     | 70         | I    | 40           | 180          | 2Q'09             |
|        |         | 4Mx16        | K1S64161CE  | 48-FBGA        | 3.0     | 70         | I    | 40           | 180          | 2Q'09             |
|        |         | 4Mx16        | K1B6416B2E  | 54-FBGA        | 1.8     | 104Mhz     | I    | 40           | 180          | 2Q'09             |
| UtRAM2 | 64Mb    | 4Mx16        | K1C6416B2E  | 54-FBGA        | 1.8     | 104Mhz     | I    | 40           | 180          | 2Q'09             |
|        |         | 4Mx16        | K1C6416B8E  | 54-FBGA        | 1.8     | 104Mhz     | I    | 40           | 180          | 2Q'09             |
| UtRAM  | 32Mb    | 2Mx16        | K1S3216BCF  | 48-FBGA        | 1.8     | 70         | I    | 35           | 120          | 3Q'09             |
|        |         | 2Mx16        | K1S32161CF  | 48-FBGA        | 3.0     | 70         | I    | 35           | 100          | 3Q'09             |
|        |         | 2Mx16        | K1B3216B2F  | 54-FBGA        | 1.8     | 104Mhz     | I    | 35           | 100          | 3Q'09             |
| UtRAM2 | 32Mb    | 2Mx16        | K1C3216B2F  | 54-FBGA        | 1.8     | 104Mhz     | I    | 35           | 100          | 3Q'09             |
|        |         | 2Mx16        | K1C3216B8F  | 54-FBGA        | 1.8     | 104Mhz     | I    | 35           | 100          | 3Q'09             |
| UtRAM  | 16Mb    | 1Mx16        | K1S1616B1C  | 48-FBGA        | 1.8     | 70         | I    | 35           | 80           | 3Q'09             |
|        |         | 1Mx16        | K1S161611C  | 48-FBGA        | 3.0     | 70         | I    | 35           | 95           | 3Q'09             |
| UtRAM2 | 16Mb    | 1Mx16        | K1C1616B2C  | 54-FBGA        | 1.8     | 104Mhz     | I    | 35           | 100          | 3Q'09             |
|        |         | 1Mx16        | K1C1616B8C  | 54-FBGA        | 1.8     | 104Mhz     | I    | 35           | 100          | 3Q'09             |

## HIGH-SPEED ASYNCHRONOUS SRAM

| Density | Organization | Part Number | # Pins-Package   | Vcc (V) | Speed (ns) | Operaring Temp | Operating Current (mA) | Operating Current (mA) | Production Status |
|---------|--------------|-------------|------------------|---------|------------|----------------|------------------------|------------------------|-------------------|
| 4Mb     | 256Kx16      | K6R4016C1D  | 44-SOJ, 44-TSOP2 | 5       | 10         | I              | 65, 55                 | 20, 5                  | Mass Production   |
|         |              | K6R4016V1D  | 44-SOJ, 44-TSOP2 | 3.3     | 10         | I              | 80, 65                 | 20, 5 (1.2)            | Mass Production   |
|         | 1Mx4         | K6R4004C1D  | 32-SOJ           | 5       | 10, 12     | I              | 65, 55                 | 20, 5                  | EOL               |
|         |              | K6R4004V1D  | 32-SOJ           | 3.3     | 8, 10      | I              | 80, 65                 | 20, 5                  | EOL               |
|         | 512Kx8       | K6R4008C1D  | 36-SOJ, 44-TSOP2 | 5       | 10         | I              | 65, 55                 | 20, 5                  | Mass Production   |
|         |              | K6R4008V1D  | 36-SOJ, 44-TSOP2 | 3.3     | 10         | I              | 80, 65                 | 20, 5                  | Mass Production   |

## SYNCHRONOUS PIPELINED BURST AND FLOW-THRU

| Density | Organization | Part Number | # Pins-<br>Package | Operating<br>Mode | Vdd (V)  | Access<br>Time<br>tCD (ns) | Speed<br>tCYC<br>(MHz) | I/O<br>Voltage<br>(V) | Production<br>Status | Comments      |
|---------|--------------|-------------|--------------------|-------------------|----------|----------------------------|------------------------|-----------------------|----------------------|---------------|
| 36Mb    | 2Mx18        | K7A321830C  | 100-TQFP           | SPB               | 3.3, 2.5 | 3.1                        | 200                    | 3.3, 2.5              | Mass Production      | 2E1D          |
|         |              | K7B321835C  | 100-TQFP           | SB                | 3.3, 2.5 | 7.5                        | 118                    | 3.3, 2.5              | Mass Production      | Ind Temp only |
|         | 1Mx36        | K7A323630C  | 100-TQFP           | SPB               | 3.3, 2.5 | 3.1                        | 200                    | 3.3, 2.5              | Mass Production      | 2E1D          |
|         |              | K7B323635C  | 100-TQFP           | SB                | 3.3, 2.5 | 7.5                        | 118                    | 3.3, 2.5              | Mass Production      | Ind Temp only |
| 18Mb    | 512Kx36      | K7A163630B  | 100-TQFP           | SPB               | 3.3, 2.5 | 2.6, 3.5                   | 250, 167               | 3.3, 2.5              | Mass Production      | 2E1D          |
|         |              | K7A163631B  | 100-TQFP           | SPB               | 3.3, 2.5 | 3.1                        | 200                    | 3.3, 2.5              | Mass Production      | 2E2D          |
|         |              | K7B163635B  | 100-TQFP           | SB                | 3.3, 2.5 | 7.5                        | 117                    | 3.3, 2.5              | Mass Production      |               |
|         | 1Mx18        | K7A161830B  | 100-TQFP           | SPB               | 3.3, 2.5 | 2.6, 3.5                   | 250, 167               | 3.3, 2.5              | Mass Production      | 2E1D          |
|         |              | K7A161831B  | 100-TQFP           | SPB               | 3.3, 2.5 | 3.1                        | 200                    | 3.3, 2.5              | Mass Production      | 2E2D          |
|         |              | K7B161835B  | 100-TQFP           | SB                | 3.3, 2.5 | 7.5                        | 117                    | 3.3, 2.5              | Mass Production      |               |
| 8Mb     | 256x36       | K7A803609B  | 100-TQFP           | SPB               | 3.3      | 2.6                        | 250                    | 3.3,2.5               | Not for new designs  | 2E1D          |
|         |              | K7A803600B  | 100-TQFP           | SPB               | 3.3      | 3.5                        | 167                    | 3.3,2.5               | Not for new designs  | 2E1D          |
|         |              | K7B803625B  | 100-TQFP           | SB                | 3.3      | 6.5                        | 133                    | 3.3,2.5               | Not for new designs  |               |
|         | 512x18       | K7A801809B  | 100-TQFP           | SPB               | 3.3      | 2.6                        | 250                    | 3.3,2.5               | Not for new designs  | 2E1D          |
|         |              | K7A801800B  | 100-TQFP           | SPB               | 3.3      | 3.5                        | 167                    | 3.3,2.5               | Not for new designs  | 2E1D          |
|         |              | K7B801825B  | 100-TQFP           | SB                | 3.3      | 6.5                        | 133                    | 3.3,2.5               | Not for new designs  |               |
| 4Mb     | 128Kx32      | K7A403609B  | 100-TQFP           | SPB               | 3.3      | 2.4                        | 250                    | 3.3, 2.5              | Not for new designs  | 2E1D          |
|         |              | K7A403600B  | 100-TQFP           | SPB               | 3.3      | 3.5                        | 167                    | 3.3, 2.5              | Not for new designs  | 2E1D          |
|         |              | K7B403625B  | 100-TQFP           | SB                | 3.3      | 6.5                        | 133                    | 3.3, 2.5              | Not for new designs  |               |
|         | 256Kx18      | K7A403200B  | 100-TQFP           | SPB               | 3.3      | 3.5                        | 167                    | 3.3, 2.5              | Not for new designs  | 2E1D          |
|         |              | K7A401809B  | 100-TQFP           | SPB               | 3.3      | 2.4                        | 250                    | 3.3, 2.5              | Not for new designs  | 2E1D          |
|         |              | K7A401800B  | 100-TQFP           | SPB               | 3.3      | 3.5                        | 167                    | 3.3, 2.5              | Not for new designs  | 2E1D          |
|         |              | K7B401825B  | 100-TQFP           | SB                | 3.3      | 6.5                        | 133                    | 3.3, 2.5              | Not for new designs  |               |

NOTES: All TQFP products are Lead Free  
 2E1D = 2-cycle Enable and 1-cycle Disable  
 2E2D = 2-cycle Enable and 2-cycle Disable  
 SPB speed recommendations: For 200MHz use 250MHz; For 133MHz use 167MHz  
 SB speed recommendation: Use 7.5ns Access Time use 6.5ns Access Time

## NtRAM

| Density | Organization | Part Number | # Pins-<br>Package | Operating<br>Mode | Vdd (V)  | Access<br>Time<br>tCD (ns) | Speed<br>tCYC<br>(MHz) | I/O<br>Voltage<br>(V) | Production<br>Status |
|---------|--------------|-------------|--------------------|-------------------|----------|----------------------------|------------------------|-----------------------|----------------------|
| 72Mb    | 2Mx36        | K7N643645M  | 100-TQFP, 165FBGA  | SPB               | 2.5      | 2.6, 3.5                   | 250, 167               | 2.5                   | Mass Production      |
|         | 4Mx18        | K7N641845M  | 100-TQFP, 165FBGA  | SPB               | 2.5      | 2.6, 3.5                   | 250, 167               | 2.5                   | Mass Production      |
| 36Mb    | 1Mx36        | K7N323635C  | 100-TQFP, 165FBGA  | SPB               | 3.3, 2.5 | 2.6, 3.5                   | 250, 167               | 3.3, 2.5              | Mass Production      |
|         | 2Mx18        | K7N321835C  | 100-TQFP, 165FBGA  | SPB               | 3.3, 2.5 | 2.6, 3.5                   | 250, 167               | 3.3, 2.5              | Mass Production      |
|         | 1Mx36        | K7M323631C  | 100-TQFP           | FT                | 3.3, 2.5 | 7.5                        | 118                    | 3.3, 2.5              | Mass Production      |
|         | 2Mx18        | K7M321831C  | 100-TQFP           | FT                | 3.3, 2.5 | 7.5                        | 118                    | 3.3, 2.5              | Mass Production      |
| 18Mb    | 1Mx18        | K7N161831B  | 100-TQFP, 165FBGA  | SPB               | 3.3, 2.5 | 2.6, 3.5                   | 250, 167               | 3.3, 2.5              | Mass Production      |
|         | 512Kx36      | K7N163631B  | 100-TQFP, 165FBGA  | SPB               | 3.3, 2.5 | 2.6, 3.5                   | 250, 167               | 3.3, 2.5              | Mass Production      |
|         | 1Mx18        | K7M161835B  | 100-TQFP           | FT (SB)           | 3.3      | 6.5                        | 133                    | 3.3, 2.5              | Mass Production      |
|         | 512Kx36      | K7M163635B  | 100-TQFP           | FT (SB)           | 3.3      | 6.5                        | 133                    | 3.3, 2.5              | Mass Production      |
| 8Mb     | 256Kx36      | K7N803601B  | 100-TQFP           | SPB               | 3.3      | 3.5                        | 167                    | 3.3,2.5               | Not for new designs  |
|         | 512Kx18      | K7N801801B  | 100-TQFP           | SPB               | 3.3      | 3.5                        | 167                    | 3.3,2.5               | Not for new designs  |
|         | 256Kx36      | K7N803609B  | 100-TQFP           | SPB               | 3.3      | 2.6                        | 250                    | 3.3,2.5               | Not for new designs  |
|         | 512Kx18      | K7N801809B  | 100-TQFP           | SPB               | 3.3      | 2.6                        | 250                    | 3.3,2.5               | Not for new designs  |
|         | 256Kx36      | K7N803645B  | 100-TQFP           | SPB               | 2.5      | 3.5                        | 167                    | 2.5                   | Not for new designs  |
|         | 512Kx18      | K7N801845B  | 100-TQFP           | SPB               | 2.5      | 3.5                        | 167                    | 2.5                   | Not for new designs  |
|         | 256Kx36      | K7N803649B  | 100-TQFP           | SPB               | 2.5      | 2.6                        | 250                    | 2.5                   | Not for new designs  |
|         | 512Kx18      | K7N801849B  | 100-TQFP           | SPB               | 2.5      | 2.6                        | 250                    | 2.5                   | Not for new designs  |
|         | 512Kx18      | K7M801825B  | 100-TQFP           | FT                | 3.3      | 6.5                        | 133                    | 3.3, 2.5              | Not for new designs  |
|         | 256Kx36      | K7M803625B  | 100-TQFP           | FT                | 3.3      | 6.5                        | 133                    | 3.3, 2.5              | Not for new designs  |
| 4Mb     | 128Kx36      | K7N403609B  | 100-TQFP           | SPB               | 3.3      | 3.0                        | 200                    | 3.3,2.5               | Not for new designs  |
|         | 256Kx18      | K7N401809B  | 100-TQFP           | SPB               | 3.3      | 3.0                        | 200                    | 3.3,2.5               | Not for new designs  |

NOTES: All TQFP products are Lead Free  
 NtRAM speed recommendations: For 200MHz use 250MHz; For 133MHz use 167MHz  
 NtRAM speed recommendation: Use 7.5ns Access Time use 6.5ns Access Time  
 Recommended SPB speeds are 250MHz and 167MHz  
 Recommended SB Access Speed is 7.5ns

## LATE-WRITE RR AND R-L

| Type                             | Density    | Organization | Part Number | # Pins-<br>Package | Operating<br>Mode | Vdd (V)    | Access<br>Time<br>tCD (ns) | Speed<br>tCYC<br>(MHz) | I/O<br>Voltage<br>(V) | Production<br>Status |
|----------------------------------|------------|--------------|-------------|--------------------|-------------------|------------|----------------------------|------------------------|-----------------------|----------------------|
| Late-<br>Write<br>R-R            | 32Mb       | 1Mx36        | K7P323674C  | 119-BGA            | SP                | 1.8 / 2.5V | 1.6, 2.0                   | 300,250                | 1.5 (Max 1.8)         | C/S                  |
|                                  |            | 2Mx18        | K7P321874C  | 119-BGA            | SP                | 1.8 / 2.5V | 1.6, 2.0                   | 300,250                | 1.5 (Max 1.8)         | C/S                  |
|                                  | 8Mb        | 256Kx36      | K7P803611B  | 119-BGA            | SP                | 3.3        | 1.6                        | 300                    | 1.5 (Max.2.0)         | Not for new designs  |
|                                  |            | 512Kx18      | K7P801811B  | 119-BGA            | SP                | 3.3        | 1.6                        | 300                    | 1.5 (Max.2.0)         | Not for new designs  |
|                                  |            | 256Kx36      | K7P803666B  | 119-BGA            | SP                | 2.5        | 2.0                        | 250                    | 1.5 (Max.2.0)         | Not for new designs  |
| 512Kx18                          | K7P801866B | 119-BGA      | SP          | 2.5                | 2.0               | 250        | 1.5 (Max.2.0)              | Not for new designs    |                       |                      |
| Late-<br>Write<br>R-R and<br>R-L | 4Mb        | 128Kx36      | K7P403622B  | 119-BGA            | SP                | 3.3        | 2.5,2.7,3.0                | 250,200,167            | 2.5/3.3               | Not for new designs  |
|                                  |            | 256Kx18      | K7P401822B  | 119-BGA            | SP                | 3.3        | 2.5,2.7,3.0                | 250,200,167            | 2.5/3.3               | Not for new designs  |
|                                  |            | 256Kx18      | K7P401823B  | 119-BGA            | SP                | 3.3        | 6.5                        | 167                    | 2.5/3.3               | Not for new designs  |

## DDR SYNCHRONOUS SRAM

| Type           | Density     | Organization | Part Number | # Pins-Package | Vdd (V)  | Access Time tCD (ns) | Cycle Time (MHz) | I/O Voltage (V) | Production Status   | Comments        |                 |
|----------------|-------------|--------------|-------------|----------------|----------|----------------------|------------------|-----------------|---------------------|-----------------|-----------------|
| DDR            | 16Mb        | 512K x36     | K7D163674B  | 153-BGA        | 1.8~2.5  | 2.3                  | 330, 300         | 1.5~1.9         | Mass Production     |                 |                 |
|                |             | 1M x18       | K7D161874B  | 153-BGA        | 1.8~2.5  | 2.3                  | 330, 300         | 1.5~1.9         | Mass Production     |                 |                 |
|                | 8Mb         | 256K x36     | K7D803671B  | 153-BGA        | 2.5      | 1.7/1.9/2.1          | 333, 330, 250    | 1.5(Max 2.0)    | Not for new designs |                 |                 |
|                |             | 512K x18     | K7D801871B  | 153-BGA        | 2.5      | 1.7/1.9/2.1          | 333, 330, 250    | 1.5(Max 2.0)    | Not for new designs |                 |                 |
| DDR II CIO/SIO | 72Mb        | 4M x18       | K7I641882M  | 165-FBGA       | 1.8      | 0.45,0.45,0.45,0.50  | 300,250,200,167  | 1.5,1.8         | Mass Production     | CIO-2B          |                 |
|                |             |              | K7I641884M  | 165-FBGA       | 1.8      | 0.45,0.45,0.45,0.50  | 300,250,200,167  | 1.5,1.8         | Mass Production     | CIO-4B          |                 |
|                |             |              | K7J641882M  | 165-FBGA       | 1.8      | 0.45,0.45,0.45,0.50  | 300,250,200,167  | 1.5,1.8         | Mass Production     | SIO-2B          |                 |
|                |             | 2M x36       | K7I643682M  | 165-FBGA       | 1.8      | 0.45,0.45,0.45,0.50  | 300,250,200,167  | 1.5,1.8         | Mass Production     | CIO-2B          |                 |
|                |             |              | K7I643684M  | 165-FBGA       | 1.8      | 0.45,0.45,0.45,0.50  | 300,250,200,167  | 1.5,1.8         | Mass Production     | CIO-4B          |                 |
|                |             |              | K7J643682M  | 165-FBGA       | 1.8      | 0.45,0.45,0.45,0.50  | 300,250,200,167  | 1.5,1.8         | Mass Production     | SIO-2B          |                 |
|                | 36Mb        | 2M x18       | K7I321882C  | 165-FBGA       | 1.8      | 0.45                 | 333,300,250      | 1.5,1.8         | Mass Production     | CIO-2B          |                 |
|                |             |              | K7I321884C  | 165-FBGA       | 1.8      | 0.45                 | 333,300,250      | 1.5,1.8         | Mass Production     | CIO-4B          |                 |
|                |             |              | K7J321882C  | 165-FBGA       | 1.8      | 0.45                 | 333,300,250      | 1.5,1.8         | Mass Production     | SIO-2B          |                 |
|                |             | 1M x36       | K7I323682C  | 165-FBGA       | 1.8      | 0.45                 | 333,300,250      | 1.5,1.8         | Mass Production     | CIO-2B          |                 |
|                |             |              | K7I323684C  | 165-FBGA       | 1.8      | 0.45                 | 333,300,250      | 1.5,1.8         | Mass Production     | CIO-4B          |                 |
|                |             |              | K7J323682C  | 165-FBGA       | 1.8      | 0.45                 | 333,300,250      | 1.5,1.8         | Mass Production     | SIO-2B          |                 |
|                | 18Mb        | 1M x18       | K7I161882B  | 165-FBGA       | 1.8      | 0.45,0.45,0.45,0.50  | 300,250,200,167  | 1.5,1.8         | Mass Production     | CIO-2B          |                 |
|                |             |              | K7I161884B  | 165-FBGA       | 1.8      | 0.45,0.45,0.45,0.50  | 300,250,200,167  | 1.5,1.8         | Mass Production     | CIO-4B          |                 |
|                |             |              | K7J161882B  | 165-FBGA       | 1.8      | 0.45,0.45,0.45,0.50  | 300,250,200,167  | 1.5,1.8         | Mass Production     | SIO-2B          |                 |
|                |             | 512K x36     | K7I163682B  | 165-FBGA       | 1.8      | 0.45,0.45,0.45,0.50  | 300,250,200,167  | 1.5,1.8         | Mass Production     | SIO-2B          |                 |
|                |             |              | K7I163682B  | 165-FBGA       | 1.8      | 0.45,0.45,0.45,0.50  | 300,250,200,167  | 1.5,1.8         | Mass Production     | CIO-2B          |                 |
|                |             |              | K7I163684B  | 165-FBGA       | 1.8      | 0.45,0.45,0.45,0.50  | 300,250,200,167  | 1.5,1.8         | Mass Production     | CIO-4B          |                 |
|                | DDR II+ CIO | 36Mb         | 2M x18      | K7K3218T2C     | 165-FBGA | 1.8                  | 0.45             | 450, 400, 333   | 1.5                 | Mass Production | DDR II + CIO-2B |
|                |             |              | 1M x36      | K7K3236T2C     | 165-FBGA | 1.8                  | 0.45             | 450, 400, 333   | 1.5                 | Mass Production | DDR II + CIO-2B |
|                |             | 18Mb         | 1M x18      | K7K1618T2C     | 165-FBGA | 1.8                  | 0.45             | 450, 400, 333   | 1.5                 | Mass Production | DDR II + CIO-2B |
|                |             |              | 512K x36    | K7K1636T2C     | 165-FBGA | 1.8                  | 0.45             | 450, 400, 333   | 1.5                 | Mass Production | DDR II + CIO-2B |

NOTES:  
 2B = Burst of 2  
 4B = Burst of 4  
 SIO = Separate I/O  
 CIO = Common I/O

For DDR II CIO/SIO: C-die use 330, 300, or 250MHz instead of 200MHz or 167MHz using a stable DLL circuit  
 For DDR II+ CIO: 2-clock latency is available. A 2.5-clock latency can be supported on 18Mb at 500MHz and 36Mb at 450MHz

SRAM

## QDR SYNCHRONOUS SRAM

| Type          | Density    | Organization | Part Number | # Pins- Package | Vdd (V)     | Access Time tCD (ns) | Cycle Time (MHz) | I/O Voltage (V) | Production Status | Comments        |
|---------------|------------|--------------|-------------|-----------------|-------------|----------------------|------------------|-----------------|-------------------|-----------------|
| QDR II        | 72Mb       | 8M x9        | K7R640982M  | 165-FBGA        | 1.8         | 0.45,0.45,0.50       | 250,200,167      | 1.5,1.8         | Mass Production   | QDR II-2B       |
|               |            |              | K7R641882M  | 165-FBGA        | 1.8         | 0.45,0.45,0.50       | 250,200,167      | 1.5,1.8         | Mass Production   | QDR II-2B       |
|               |            | 4M x18       | K7R641884M  | 165-FBGA        | 1.8         | 0.45,0.45,0.45,0.50  | 300,250,200,167  | 1.5,1.8         | Mass Production   | QDR II-4B       |
|               |            |              | K7R643682M  | 165-FBGA        | 1.8         | 0.45,0.45,0.50       | 250,200,167      | 1.5,1.8         | Mass Production   | QDR II-2B       |
|               |            |              | K7R643684M  | 165-FBGA        | 1.8         | 0.45,0.45,0.45,0.50  | 300,250,200,167  | 1.5,1.8         | Mass Production   | QDR II-4B       |
|               | 36Mb       | 4M x9        | K7R320982C  | 165-FBGA        | 1.8         | 0.45                 | 300, 250, 200    | 1.5,1.8         | Mass Production   | QDR II-2B       |
|               |            |              | K7R321882C  | 165-FBGA        | 1.8         | 0.45                 | 300, 250, 200    | 1.5,1.8         | Mass Production   | QDR II-2B       |
|               |            | 2M x18       | K7R321884C  | 165-FBGA        | 1.8         | 0.45                 | 333, 300, 250    | 1.5,1.8         | Mass Production   | QDR II-4B       |
|               |            |              | K7R323682C  | 165-FBGA        | 1.8         | 0.45                 | 300, 250, 200    | 1.5,1.8         | Mass Production   | QDR II-2B       |
|               |            |              | K7R323684C  | 165-FBGA        | 1.8         | 0.45                 | 333, 300, 250    | 1.5,1.8         | Mass Production   | QDR II-4B       |
| QDR I, QDR II | 18Mb       | 2M x9        | K7R160982B  | 165-FBGA        | 1.8         | 0.45,0.45,0.50       | 250,200,167      | 1.5,1.8         | Mass Production   | QDR II - 2B     |
|               |            |              | 1M x18      | K7R161882B      | 165-FBGA    | 1.8                  | 0.45,0.45,0.50   | 250,200,167     | 1.5,1.8           | Mass Production |
|               |            | K7R161884B   |             | 165-FBGA        | 1.8         | 0.45,0.45,0.45,0.50  | 300,250,200,167  | 1.5,1.8         | Mass Production   | QDR II - 4B     |
|               |            | K7Q161862B   |             | 165-FBGA        | 1.8v / 2.5v | 2.5                  | 167              | 1.5,1.8         | Mass Production   | QDR I - 2B      |
|               |            | K7Q161864B   |             | 165-FBGA        | 1.8v / 2.5v | 2.5                  | 167              | 1.5,1.8         | Mass Production   | QDR I - 4B      |
|               |            | 512K x36     | K7R163682B  | 165-FBGA        | 1.8         | 0.45,0.45,0.50       | 250,200,167      | 1.5,1.8         | Mass Production   | QDR II - 2B     |
|               |            |              | K7R163684B  | 165-FBGA        | 1.8         | 0.45,0.45,0.45,0.50  | 300,250,200,167  | 1.5,1.8         | Mass Production   | QDR II - 4B     |
|               |            |              | K7Q163662B  | 165-FBGA        | 1.8v / 2.5v | 2.5                  | 167              | 1.5,1.8         | Mass Production   | QDR I - 2B      |
|               |            |              | K7Q163664B  | 165-FBGA        | 1.8v / 2.5v | 2.5                  | 167              | 1.5,1.8         | Mass Production   | QDR I - 4B      |
|               |            | QDR II+      | 36Mb        | 1M x36          | K7S3218T4C  | 165-FBGA             | 1.8              | 0.45            | 450, 400, 333     | 1.5             |
| 2M x18        | K7S3236T4C |              |             |                 | 165-FBGA    | 1.8                  | 0.45             | 450, 400, 333   | 1.5               | Mass Production |
|               | 18Mb       |              | 1M x18      | K7S1618T4C      | 165-FBGA    | 1.8                  | 0.45             | 450, 400, 333   | 1.5               | Mass Production |
| 512K x36      |            |              |             | K7S1636T4C      | 165-FBGA    | 1.8                  | 0.45             | 450, 400, 333   | 1.5               | Mass Production |

NOTES: For QDR I, QDR II: 2B = Burst of 2, 4B = Burst of 4  
 For QDR II (36Mb): C-die use 300, 250MHz or 200MHz instead of 167MHz using a stable DLL circuit  
 For QDR II (72Mb): 2B = Burst of 2 and 250MHz or 200MHz is recommended, 4B = Burst of 4 and 300MHz or 250MHz is recommended  
 For QDR II+: 2-clock latency supported. 2.5-clock latency can be supported with 450MHz speed



# SYNCHRONOUS SRAM ORDERING INFORMATION

|                      | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16             |                      |
|----------------------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----------------|----------------------|
|                      | K | 7 | X | X | X | X | X | X | X | X  | -  | X  | X  | X  | X  | X              |                      |
| SAMSUNG Memory       |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    | Packaging Type |                      |
| Sync SRAM            |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |                | Speed                |
| Small Classification |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |                | Speed                |
| Density              |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |                | Temp, Power          |
| Density              |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |                | Package              |
| Organization         |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |                | ---                  |
| Organization         |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |                | Generation           |
| Vcc, Interface, Mode |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |                | Vcc, Interface, Mode |

## 1. Memory (K)

## 2. Sync SRAM: 7

## 3. Small Classification

- A: Sync Pipelined Burst
- B: Sync Burst
- D: Double Data Rate
- I: Double Data Rate II, Common I/O
- J: Double Data Rate, Separate I/O
- K: Double Data II+, Common I/O
- M: Sync Burst + NtRAM
- N: Sync Pipelined Burst + NtRAM
- P: Sync Pipe
- Q: Quad Data Rate I
- R: Quad Data Rate II
- S: Quad Data Rate II+

## 4~5. Density

|         |         |
|---------|---------|
| 80: 8M  | 16: 18M |
| 40: 4M  | 32: 36M |
| 64: 72M |         |

## 6~7. Organization

|         |         |
|---------|---------|
| 08: x8  | 09: x9  |
| 18: x18 | 32: x32 |
| 36: x36 |         |

## 8~9. Vcc, Interface, Mode

- 00: 3.3V, LVTTTL, 2E1D WIDE
- 01: 3.3V, LVTTTL, 2E2D WIDE
- 08: 3.3V, LVTTTL, 2E2D Hi SPEED
- 09: 3.3V, LVTTTL, Hi SPEED
- 11: 3.3V, HSTL, R-R
- 12: 3.3V, HSTL, R-L
- 14: 3.3V, HSTL, R-R Fixed ZQ
- 22: 3.3V, LVTTTL, R-R
- 23: 3.3V, LVTTTL, R-L
- 25: 3.3V, LVTTTL, SB-FT WIDE
- 30: 1.8/2.5/3.3V, LVTTTL, 2E1D
- 31: 1.8/2.5/3.3V, LVTTTL, 2E2D
- 35: 1.8/2.5/3.3V, LVTTTL, SB-FT
- 44: 2.5V, LVTTTL, 2E1D
- 45: 2.5V, LVTTTL, 2E2D

- 49: 2.5V, LVTTTL, Hi SPEED
- 52: 2.5V, 1.5/1.8V, HSTL, Burst2
- 54: 2.5V, 1.5/1.8V, HSTL, Burst4
- 62: 2.5V/1.8V, HSTL, Burst2
- 64: 2.5V/1.8V, HSTL, Burst4
- 66: 2.5V, HSTL, R-R
- 74: 1.8V, 2.5V, HSTL, All
- 82: 1.8V, HSTL, Burst2
- 84: 1.8V, HSTL, Burst4
- 88: 1.8V, HSTL, R-R
- T2: 1.8V, 2Clock Latency, Burst2
- T4: 1.8V, 2Clock Latency, Burst4
- U2: 1.8V, 2.5Clock Latency, Burst2
- U4: 1.8V, 2.5Clock Latency, Burst4

## 10. Generation

- M: 1st Generation
- A: 2nd Generation
- B: 3rd Generation
- C: 4th Generation
- D: 5th Generation

## 11. "--"

## 12. Package

- H: BGA, FCBGA, PBGA
- G: BGA, FCBGA, FBGA (LF)
- F: FBGA
- E: FBGA (LF)
- Q: (L)QFP
- P: (L)QFP(LF)
- C: CHIP BIZ
- W: WAFER

## 13. Temp, Power

- COMMON (Temp, Power)**
- 0: NONE, NONE (Containing of error handling code)
- C: Commercial, Normal
- E: Extended, Normal
- I: Industrial, Normal

## WAFER, CHIP BIZ Level Division

- 0: NONE, NONE
- 1: Hot DC sort
- 2: Hot DC, selected AC sort

## 14~15. Speed

### Sync Burst, Sync Burst + NtRAM

| < Mode is R-L > (Clock Access Time) |         |
|-------------------------------------|---------|
| 65: 6.5ns                           | 70: 7ns |
| 75: 7.5ns                           | 80: 8ns |
| 85: 8.5ns                           |         |

### Other Small Classification (Clock Cycle Time)

|                               |            |
|-------------------------------|------------|
| 10: 100MHz                    | 11: 117MHz |
| 13: 133MHz                    | 14: 138MHz |
| 16: 166MHz                    | 20: 200MHz |
| 25: 250MHz                    |            |
| 26: 250MHz(1.75ns)            | 27: 275MHz |
| 30: 300MHz                    | 33: 333MHz |
| 35: 350MHz                    | 37: 375MHz |
| 40: 400MHz(t-CYCLE)           | 42: 425MHz |
| 45: 450MHz                    |            |
| 50: 500MHz (except Sync Pipe) |            |

## 16. Packing Type (16 digit)

- Common to all products, except of Mask ROM
- Divided into TAPE & REEL (In Mask ROM, divided into TRAY, AMMO packing separately)

| Type       | Packing Type            | New Marking |
|------------|-------------------------|-------------|
| Component  | TAPE & REEL             | T           |
|            | Other (Tray, Tube, Jar) | 0 (Number)  |
|            | Stack                   | S           |
| Component  | TRAY                    | Y           |
| (Mask ROM) | AMMO PACKING            | A           |
| Module     | MODULE TAPE & REEL      | P           |
|            | MODULE Other Packing    | M           |

## MCP: NAND/DRAM

| NAND Density | DRAM Density/Organization | Voltage (NAND-DRAM) | MCP Package | PoP Package     |
|--------------|---------------------------|---------------------|-------------|-----------------|
| 512Mb        | 256Mb (x16,x32)           | 2.7V/1.8V - 1.8V    | 107/137FBGA | 120FBGA         |
|              | 512Mb (x16,x32)           | 2.7V/1.8V - 1.8V    | 107/137FBGA | 120/136FBGA     |
| 1Gb          | 256Mb (x16,x32)           | *3.0V/1.8V - 1.8V   | 107/137FBGA | 152FBGA         |
|              | 512Mb (x16,x32)           | *2.7V/1.8V - 1.8V   | 107/137FBGA | 119/152FBGA     |
|              | 1Gb (x32)                 | 1.8V - 1.8V         | 137FBGA     |                 |
| 2Gb          | 512Mb (x16,x32)           | 1.8V - 1.8V         | 107/137FBGA | 119/152FBGA     |
|              | 1Gb (x16,x32)             | 1.8V - 1.8V         | 107/137FBGA | 152/160/168FBGA |
| 4Gb          | 1Gb (x32)                 | 2.7V - 1.8V         | 137FBGA     | 137FBGA         |

## MCP: OneNAND/DRAM

| OneNAND Density | DRAM Density/Organization | Voltage (NAND-DRAM) | MCP Package | PoP Package     |
|-----------------|---------------------------|---------------------|-------------|-----------------|
| 512Mb           | 256Mb (x32)               | 3.3V/1.8V - 1.8V    | 188FBGA     | 152FBGA         |
|                 | 512Mb (x16,x32)           | 1.8V - 1.8V         | 167/202FBGA | 152FBGA         |
|                 | 768Mb (x32)               | 1.8V - 1.8V         | -           | 152FBGA         |
| 1Gb             | 512Mb (x16,x32)           | 1.8V - 1.8V         | 167/202FBGA | 168FBGA         |
|                 | 1Gb (x32)                 | 1.8V - 1.8V         | -           | 168FBGA         |
| 2Gb             | 512Mb (x16,x32)           | 1.8V - 1.8V         | -           | 152/160/168FBGA |
|                 | 1Gb (x16,x32)             | 1.8V - 1.8V         | 167/202FBGA | 152/160/168FBGA |
|                 | 2Gb (x32)                 | 1.8V - 1.8V         |             | 152/168FBGA     |
| 4Gb             | 1Gb (x16)                 | 1.8V - 1.8V         | 202FBGA     | -               |

## MCP: FlexOneNAND/DRAM

| (Flex)OneNAND Density | DRAM Density/Organization | Voltage (NAND-DRAM) | MCP Package | PoP Package |
|-----------------------|---------------------------|---------------------|-------------|-------------|
| 8Gb                   | 2Gb (x32)                 | 1.8V - 1.8V         | 202FBGA     |             |

## MCP: OneNAND/DRAM/OneDRAM

| (Flex)OneNAND Density | DRAM Density/Organization | Voltage (NAND-DRAM) | MCP Package | PoP Package |
|-----------------------|---------------------------|---------------------|-------------|-------------|
| 2Gb                   | 1Gb (x16)                 | 1.8V - 1.8V         |             | 216FBGA     |

## MCP: moviNAND/NAND/DRAM

| OneNAND Density | DRAM Density/Organization | Voltage (MoviNAND/NAND-DRAM) | MCP Package |
|-----------------|---------------------------|------------------------------|-------------|
| 1GB & 1Gb       | 1Gb (x32)                 | 3.3V/1.8V - 1.8V             | 199FBGA     |
| 1GB & 2Gb       | 1Gb (x32)                 | 3.3V/1.8V - 1.8V             | 199FBGA     |
|                 | 2Gb (x32)                 | 2.8V/1.8V - 1.8V             | 199FBGA     |
| 2GB & 2Gb       | 1Gb (x32)                 | 3.3V/1.8V - 1.8V             | 199FBGA     |
|                 | 2Gb (x32)                 | 3.3V/1.8V - 1.8V             | 199FBGA     |
| 4GB & 2Gb       | 1Gb (x32)                 | 3.3V/1.8V - 1.8V             | 199FBGA     |
|                 | 2Gb (x32)                 | 3.3V/1.8V - 1.8V             | 199FBGA     |
| 8GB & 2Gb       | 1Gb (x32)                 | 3.3V/1.8V - 1.8V             | 199FBGA     |
|                 | 2Gb (x32)                 | 3.3V/1.8V - 1.8V             | 199FBGA     |

## MCP: NOR/UtRAM

| NOR Density | UtRAM or DRAM Density/ Organization | Voltage (NOR-DRAM) | Package   |
|-------------|-------------------------------------|--------------------|-----------|
| 512Mb       | 128Mb                               | 1.8V - 1.8V        | 107FBGA   |
| 256Mb       | 128Mb                               | 1.8V - 1.8V        | 107FBGA   |
|             |                                     | 3.0V - 3.0V        | 84FBGA    |
|             | 64Mb                                | 3.0V - 3.0V        | 84FBGA    |
|             |                                     | 1.8V - 1.8V        | 56FBGA    |
| 128Mb       | 64Mb                                | 1.8V - 1.8V        | 84/88FBGA |
|             | 32Mb                                | 1.8V - 1.8V        | 84/88FBGA |
|             |                                     | 3.0V - 3.0V        | 64FBGA    |
| 64Mb        | 32Mb                                | 3.0V - 3.0V        | 56FBGA    |

## MCP: NOR/DRAM

| NOR Density | UtRAM or DRAM Density/ Organization | Voltage (NOR-DRAM) | Package |
|-------------|-------------------------------------|--------------------|---------|
| 512Mb       | 128Mb (x16)                         | 1.8V - 1.8V        | 103FBGA |
|             | 256Mb (x16)                         | 1.8V - 1.8V        | 103FBGA |

## MCP: OneDRAM/OneNAND/NAND

| OneDRAM                      |      |             |                              | OneNAND/NAND |      |       |      | Version | Part No.           | PKG Information |         |
|------------------------------|------|-------------|------------------------------|--------------|------|-------|------|---------|--------------------|-----------------|---------|
| Org                          | Vcc  | Speed       | Opr.                         | Org          | Vcc  | Speed | Type |         |                    | Size            | Type    |
| A-port : x32<br>B-port : x32 | 1.8V | 166MHz@CL=3 | A-port : SDR<br>B-port : DDR | x16          | 1.8V | 83Mhz | Mux  | AQD     | KAC00F008M-AE77000 | 14*14*1.15      | 240FBGA |
| A-port : x16<br>B-port : x32 | 1.8V | 166MHz@CL=3 | A-port : DDR<br>B-port : DDR | x16          | 1.8V | 83Mhz | Mux  | AQD     | KAC00F00XM-AE77000 | 14*14*1.15      | 240FBGA |
| A-port : x16<br>B-port : x32 | 1.8V | 166MHz@CL=3 | A-port : SDR<br>B-port : DDR | x16          | 1.8V | 83Mhz | Mux  | AQD     | TBD                | 14*14*1.15      | 240FBGA |
| A-port : x32<br>B-port : x32 | 1.8V |             | A-port : SDR<br>B-port : DDR | x16          | 1.8V | 83Mhz | Mux  | AAQD    | KBZ00900PM-A439000 | 14*14*1.25      | 240FBGA |

\* OneDRAM 512Mb now EOL

\* Based on demand, OneDRAM is in MCP only, not in discrete package

## OneNAND

OneNAND is a monolithic IC that combines a NAND flash array with a NOR flash interface plus an SRAM buffer. It's ideal for high-performance, high-density applications.

| Density | Part Number        | Package          | Org. | Voltage (V) | Temp.      | Speed | MOQ (Tray) | Remarks |
|---------|--------------------|------------------|------|-------------|------------|-------|------------|---------|
| 512Mb   | KFG1216Q2B-DEB8000 | 63FBGA (9.5x12)  | X16  | 1.8         | extended   | 83Mhz | 1,120      |         |
|         | KFG1216U2B-DIB6000 | 63FBGA (9.5x12)  | X16  | 3.3         | industrial | 66Mhz | 1,120      |         |
|         | KFG1216Q2B-SEB8000 | 67FBGA (7x9)     | X16  | 1.8         | extended   | 83Mhz | 1,120      |         |
|         | KFG1216U2B-SIB6000 | 67FBGA (7x9)     | X16  | 3.3         | industrial | 66Mhz | 1,120      |         |
|         | KFM1216Q2B-DEB8000 | 63 FBGA (9.5x12) | X16  | 1.8v        | extended   | 83Mhz | 1,120      | Muxed   |
| 1Gb     | KFG1G16U2C-AIB6000 | 63 FBGA (10x13)  | X16  | 3.3v        | industrial | 66Mhz | 1,120      |         |
|         | KFG1G16Q2C-AEB8000 | 63 FBGA (10x13)  | X16  | 1.8v        | extended   | 83Mhz | 1,120      |         |
|         | KFM1G16Q2C-DEB8000 | 63 FBGA (10x13)  | X16  | 1.8v        | extended   | 83Mhz | 1,120      | Muxed   |
| 2Gb     | KFG2G16Q2A-DEB8000 | 63 FBGA (10x13)  | X16  | 1.8v        | extended   | 83Mhz | 1,120      |         |
|         | KFM2G16Q2A-DEB8000 | 63 FBGA (10x13)  | X16  | 1.8v        | extended   | 83Mhz | 1,120      | Muxed   |
| 4Gb DDP | KFH4G16Q2A-DEB8000 | 63 FBGA (10x13)  | X16  | 1.8v        | extended   | 83Mhz | 1,120      |         |

\*T&R MOQ 2Kpcs

\*\*Please contact your local Samsung sales representative for latest product offerings & information on support & availability.

NOTE: All parts are lead free

## Flex-OneNAND

A monolithic IC with a NAND flash array using a NOR flash interface, Flex-OneNAND enables partitioning into SLC and MLC areas so the chip can be configured for storage or high-speed access.

| Density              | Part Number        | Package         | Org. | Voltage (V) | Temp.      | Speed | MOQ (Tray) | Remarks               |
|----------------------|--------------------|-----------------|------|-------------|------------|-------|------------|-----------------------|
| 4Gb Flex-OneNAND     | KFG4GH6Q4M-DEB8000 | 63 FBGA (10x13) | X16  | 1.8v        | extended   | 83Mhz | 1,120      | FSR software required |
|                      | KFG4GH6U4M-DIB6000 | 63 FBGA (10x13) | X16  | 3.3V        | Industrial | 66Mhz | 1,120      | FSR software required |
|                      | KFM4GH6Q4M-DEB8000 | 63 FBGA (10x13) | X16  | 1.8v        | extended   | 83Mhz | 1,120      | Muxed. FSR SW req.    |
| 8Gb DDP Flex-OneNAND | KFH8GH6U4M-DIB6000 | 63 FBGA (10x13) | X16  | 3.3V        | Industrial | 66Mhz | 1,120      | FSR software required |

\*T&R MOQ 2Kpcs

\*\*Please contact your local Samsung sales representative for latest product offerings & information on support & availability.

NOTE: All parts are lead free

## moviNAND

Combining high-density MLC NAND flash with an MMC controller in a single chip that has an MMC interface, moviNAND delivers dense, cost-effective storage for embedded applications.

| moviNAND Densities | Vol(V)  | Package | Package Size | Org. |
|--------------------|---------|---------|--------------|------|
| 1GB                | 1.8/3.3 | FBGA    | 12.0x18x1.2t | x8   |
| 2GB                | 1.8/3.3 | FBGA    | 12.0x18x1.2t | x8   |
| 4GB                | 1.8/3.3 | FBGA    | 12.0x18x1.2t | x8   |
| 8GB                | 1.8/3.3 | FBGA    | 12.0x18x1.3t | x8   |
| 16GB               | 1.8/3.3 | FBGA    | 14.0x18.0    | x8   |

Please contact your local Samsung sales representative for latest product offerings.

NOTE: All parts are lead free

## OneDRAM

OneDRAM is a dual-port, low-power DRAM with an SRAM buffer interface and is optimal for high-performance, high-density mobile applications.

| Density | Part Number    | Package         | Org.                                       | Voltage (V) | Temp.    | Speed  | MOQ (Tray) | Remarks   |
|---------|----------------|-----------------|--|-------------|----------|--------|------------|---|
| 512Mb   | KJA51Z23PC-AAO | 216FBGA (14x14) | A-port:x16(SDR/DDR)<br>B-port:x16(SDR/DDR) | 1.8V        | extended | 133MHz |            | PKG Combination: 2G OneNAND + 512Mb MDDR + 512Mb OneDRAM<br>MCP P/N: KAC00F00JM |
|         | KJA51Y23PC-AAO | 152FBGA (14x14) | A-port:x16(SDR/DDR)<br>B-port:x16(SDR/DDR) | 1.8V        | extended | 133MHz |            | PKG Combination: 2G NAND + 512Mb MDDR + 512Mb OneDRAM<br>MCP P/N: KAR00900GM    |

## 3.5" Hard Disk Drives

| Family | Capacity (GB) | RPM  | Interface | Buffer | Model   |
|--------|---------------|------|-----------|--------|---------|
| F1     | 1TB           | 7200 | SATA-2    | 32MB   | HD103UJ |
|        | 750           | 7200 | SATA-2    | 32MB   | HD753LJ |
|        | 750           | 7200 | SATA-2    | 16MB   | HD752LJ |
|        | 640           | 7200 | SATA-2    | 16MB   | HD642JJ |
|        | 500           | 7200 | SATA-2    | 16MB   | HD502IJ |
|        | 500           | 7200 | SATA-2    | 8MB    | HD501IJ |
|        | 320           | 7200 | SATA-2    | 16MB   | HD322HJ |
|        | 250           | 7200 | SATA-2    | 16MB   | HD252HJ |
|        | 250           | 7200 | SATA-2    | 8MB    | HD251HJ |
|        | 160           | 7200 | SATA-2    | 16MB   | HD162GJ |
|        | 160           | 7200 | SATA-2    | 8MB    | HD161GJ |
| T166S  | 500           | 7200 | SATA-2    | 8      | HD500LJ |
|        | 500           | 7200 | SATA-2    | 16     | HD501LJ |
|        | 320           | 7200 | SATA-2    | 8      | HD320KJ |
|        | 320           | 7200 | SATA-2    | 16     | HD321KJ |
| T133S  | 400           | 7200 | SATA-2    | 8      | HD400LI |
|        | 400           | 7200 | SATA-2    | 16     | HD401LI |
|        | 300           | 7200 | SATA-2    | 8      | HD300LI |
| T133   | 400           | 7200 | PATA      | 8      | HD400LD |
|        | 300           | 7200 | PATA      | 8      | HD300LD |
| S250   | 250           | 7200 | SATA-2    | 8      | HD250HJ |
| S166S  | 160           | 7200 | SATA-2    | 8      | HD161HJ |
|        | 120           | 7200 | SATA-2    | 8      | HD120HJ |
|        | 80            | 7200 | SATA-2    | 2      | HD081GJ |
|        | 80            | 7200 | SATA-2    | 8      | HD082GJ |
|        | 40            | 7200 | SATA-2    | 2      | HD041GJ |
|        | 40            | 7200 | SATA-2    | 8      | HD042GJ |
| P120S  | 250           | 7200 | SATA-2    | 8      | SP2504C |
|        | 250           | 7200 | SATA-2    | 8      | SP2004C |
| P120   | 250           | 7200 | PATA      | 8      | SP2514N |
|        | 200           | 7200 | PATA      | 8      | SP2014N |
| P80SD  | 160           | 7200 | SATA-2    | 8      | HD160JJ |
|        | 120           | 7200 | SATA-2    | 8      | HD120IJ |
|        | 80            | 7200 | SATA-2    | 8      | HD080HJ |
| P80SD  | 160           | 7200 | PATA      | 2      | SP1644N |
|        | 160           | 7200 | PATA      | 8      | SP1654N |
|        | 120           | 7200 | PATA      | 2      | SP1243N |
|        | 120           | 7200 | PATA      | 8      | SP1253N |
|        | 80            | 7200 | PATA      | 2      | SP0842N |

## 3.5" Enterprise RAID Drives

| Family | Capacity (GB) | RPM  | Interface | Buffer | Model   |
|--------|---------------|------|-----------|--------|---------|
| F1R    | 1TB           | 7200 | SATA-2    | 32     | HE103UJ |
|        | 750           | 7200 | SATA-2    | 32     | HE753LJ |
|        | 500           | 7200 | SATA-2    | 16     | HE502IJ |
|        | 320           | 7200 | SATA-2    | 16     | HE322HJ |
|        | 250           | 7200 | SATA-2    | 16     | HE252HJ |

## 2.5" Hard Disk Drives

| Family | Capacity (GB) | RPM  | Interface | Buffer | Model   |
|--------|---------------|------|-----------|--------|---------|
| M6     | 320           | 5400 | SATA      | 8      | HM320JI |
|        | 250           | 5400 | SATA      | 8      | HM251JI |
| M5S    | 250           | 5400 | SATA      | 8      | HM250JI |
|        | 160           | 5400 | SATA      | 8      | HM160HI |
|        | 120           | 5400 | SATA      | 8      | HM121HI |
|        | 80            | 5400 | SATA      | 8      | HM080GI |
|        | 60            | 5400 | SATA      | 8      | HM061GI |
| M5P    | 160           | 5400 | PATA      | 8      | HM160HC |
|        | 120           | 5400 | PATA      | 8      | HM121HC |
|        | 80            | 5400 | PATA      | 8      | HM080GC |
| M80S   | 160           | 5400 | SATA      | 8      | HM160JI |
|        | 120           | 5400 | SATA      | 8      | HM120II |
|        | 80            | 5400 | SATA      | 8      | HM080HI |
| M80    | 160           | 5400 | PATA      | 8      | HM160JC |
|        | 120           | 5400 | PATA      | 8      | HM120IC |
|        | 80            | 5400 | PATA      | 8      | HM080HC |
| M60S   | 120           | 5400 | SATA      | 8      | HM120JI |
|        | 100           | 5400 | SATA      | 8      | HM100JI |
|        | 60            | 5400 | SATA      | 8      | HM060HI |
| M60    | 120           | 5400 | PATA      | 8      | HM120JC |
|        | 100           | 5400 | PATA      | 8      | HM100JC |
|        | 60            | 5400 | PATA      | 8      | HM060HC |

## 1.8" Hard Disk Drives

| Family       | Capacity (GB) | RPM  | Interface | Buffer | Model   |
|--------------|---------------|------|-----------|--------|---------|
| N1 (3600rpm) | 60            | 3600 | PATA      | 2      | HS061HA |
|              |               |      | CEATA     | 2      | HS061HP |
|              | 40            |      | PATA      | 2      | HS041HA |
|              |               |      | CEATA     | 2      | HS041HP |
|              | 30            |      | PATA      | 2      | HS031GA |
|              |               |      | CEATA     | 2      | HS031GP |
|              | 20            |      | PATA      | 2      | HS021GA |
|              |               |      | CEATA     | 2      | HS021GP |
| N1 (4200rpm) | 60            | 4200 | PATA      | 2      | HS060HB |
|              |               |      | CEATA     | 2      | HS060HQ |
|              | 40            |      | PATA      | 2      | HS040HB |
|              |               |      | CEATA     | 2      | HS040HQ |
|              | 30            |      | PATA      | 2      | HS030GB |
|              |               |      | CEATA     | 2      | HS030GQ |
|              | 20            |      | PATA      | 2      | HS020GB |
|              |               |      | CEATA     | 2      | HS020GQ |

## External Hard Disk Drives

| Family      | Size | Capacity (GB) | Model #   | Interface | Operating System                                    | Dimensions  |
|-------------|------|---------------|-----------|-----------|---|-------------|
| S1 Mini     | 1.8" | 120           | HXSU012BA | USB 2.0   | Windows 2000 Pro/Vista/XP; Mac OS X 10.4.8 or later | 15x87x62mm  |
| S2 Portable | 2.5" | 160           | HXSU016BA | USB 2.0   | Windows 2000 Pro/Vista/XP; Mac OS X 10.4.8 or later | 17x111x82mm |
|             |      | 160           | HXMU016DA |           |   |             |
|             |      | 250           | HXMU025DA |           |   |             |
|             |      | 320           | HXMU032DA |           |   |             |
|             |      | 400           | HXMU040DA |           |   |             |
|             |      | 500           | HXMU050DA |           |   |             |

## SH-S222L Optical Storage

| DISK FORMAT   | GENERAL SPECIFICATIONS                        |   |                  |
|---|---|---|------------------|
| <b>1. DISC TYPE</b> <ul style="list-style-type: none"> <li>- READ: MASTERED DISC, CD-R, CD-RW, DVD-ROM, DVD-R 3.95GB, DVD-R 4.7GB Authoring, DVD-R 4.7GB General, DVD-RW 4.7GB, DVD+R 4.7GB, DVD+R 8.5GB(Double-layer), DVD+RW 4.7GB, DVD-RAM 4.7GB/2.6GB</li> <li>- WRITE: DVD 4.7GB(DVD±R, DVD±RW, DVD-RAM), Double Layer±R, CD-R, CD-RW</li> <li>- Print: CD-R, DVD+/-R LS Media</li> </ul> <b>2. DATA FORMAT:</b> <ul style="list-style-type: none"> <li>- CD: CD-DA, CD-ROM, MIXED-CD, CD-ROM XA, ENHANCED-CD, CD-EXTRA/CD+, Photo-CD, VIDEO-CD, CD-TEXT, CD-G, Multi-Session</li> <li>- DVD: DVD-RAM, DVD-ROM, DVD-VIDEO, Multi-Session(Read/Write), Multi-Border(Read)</li> </ul> <b>3. Recording:</b> <ul style="list-style-type: none"> <li>- CD-R/RW: DAO, TAO, SAO, Packet Write(RW)</li> <li>- DVD+R/RW: Sequential, Random(RW)</li> <li>- DVD-R/RW: Incremental, DAO, Restricted Overwrite(RW)</li> <li>- DVD-RAM: Random</li> </ul> | Data Transfer Rate MAX                        |   |                  |
|   | Media Type                                    | Write   | Read             |
|   | DVD+R   | 22X (29.7 MB/sec)   | 16X (21.6MB/sec) |
|   | DVD+RW  | 8X (10.8MB/sec)   | 12X (16.2MB/sec) |
|   | DVD+R DUAL                                    | 16X (21.6MB/sec)  | 12X (16.2MB/sec) |
|   | DVD-R DUAL                                    | 12X (16.2MB/sec)  | 12X (16.2MB/sec) |
|   | DVD-R   | 22X (29.7 MB/sec)   | 16X (21.6MB/sec) |
|   | DVD-RW  | 6X (8.1MB/sec)  | 12X (16.2MB/sec) |
|   | DVD-ROM (Single)                              | -   | 16X (21.6MB/sec) |
|   | DVD-ROM (Dual)                                | -   | 12X (16.2MB/sec) |
|   | CD-ROM  | -   | 48X (7.2MB/sec)  |
|   | CD-R  | 48X (7.2MB/sec)   | 40X (6.0MB/sec)  |
|   | US-RW   | 32X (4.8MB/sec)   | 40X (6.0MB/sec)  |
|   | HS-RW   | 10X (1.5MB/sec)   | 40X (6.0MB/sec)  |
|   | CD-RW   | 4X (0.6MB/sec)  | 40X (6.0MB/sec)  |
|   | DVD-RAM                                       | 12X (16.2MB/sec)  | 12X (16.2MB/sec) |
|   | Data transfer mode                            | Ultra DMA Mode 2: 33.3MB/sec, Multiword DMA mode2: 16.6MB/sec, PIO Mode 4: 16.7MB/sec |                  |
|   | Interface                                     | ATA/ATAPI (E-IDE)   |                  |
|   | Buffer Memory                                 | 2M  |                  |
|   | Drive Install Form                            | Horizontal / Vertical   |                  |
| Size (W * H * L)  | 148.2mm (W) x 42mm (H) X 170mm (D) with Bezel |   |                  |
| Buffer Protection   | yes   |   |                  |
| Lead Free   | yes   |   |                  |
| Light Scribe  | yes   |   |                  |

## SH-S222A Optical Storage

| DISK FORMAT   | GENERAL SPECIFICATIONS                        |   |                  |
|---|---|---|------------------|
| <b>1. DISC TYPE</b> <ul style="list-style-type: none"> <li>- READ: MASTERED DISC, CD-R, CD-RW, DVD-ROM, DVD-R 3.95GB, DVD-R 4.7GB Authoring, DVD-R 4.7GB General, DVD-RW 4.7GB, DVD+R 4.7GB, DVD+R 8.5GB(Double-layer), DVD+RW 4.7GB, DVD-RAM 4.7GB/2.6GB</li> <li>- WRITE: DVD 4.7GB(DVD±R, DVD±RW, DVD-RAM), Double Layer±R, CD-R, CD-RW</li> </ul> <b>2. DATA FORMAT:</b> <ul style="list-style-type: none"> <li>- CD: CD-DA, CD-ROM, MIXED-CD, CD-ROM XA, ENHANCED-CD, CD-EXTRA/CD+, Photo-CD, VIDEO-CD, CD-TEXT, CD-G, Multi-Session</li> <li>- DVD: DVD-RAM, DVD-ROM, DVD-VIDEO, Multi-Session (Read/Write), Multi-Border(Read)</li> </ul> <b>3. Recording:</b> <ul style="list-style-type: none"> <li>- CD-R/RW: DAO, TAO, SAO, Packet Write(RW)</li> <li>- DVD+R/RW: Sequential, Random(RW)</li> <li>- DVD-R/RW: Incremental, DAO, Restricted Overwrite(RW)</li> <li>- DVD-RAM: Random</li> </ul> | Data Transfer Rate MAX                        |   |                  |
|   | Media Type                                    | Write   | Read             |
|   | DVD+R   | 22X (29.7 MB/sec)   | 16X (21.6MB/sec) |
|   | DVD+RW  | 8X (10.8MB/sec)   | 12X (16.2MB/sec) |
|   | DVD+R DUAL                                    | 16X (21.6MB/sec)  | 12X (16.2MB/sec) |
|   | DVD-R DUAL                                    | 12X (16.2MB/sec)  | 12X (16.2MB/sec) |
|   | DVD-R   | 22X (29.7 MB/sec)   | 16X (21.6MB/sec) |
|   | DVD-RW  | 6X (8.1MB/sec)  | 12X (16.2MB/sec) |
|   | DVD-ROM (Single)                              | -   | 16X (21.6MB/sec) |
|   | DVD-ROM (Dual)                                | -   | 12X (16.2MB/sec) |
|   | CD-ROM  | -   | 48X (7.2MB/sec)  |
|   | CD-R  | 48X (7.2MB/sec)   | 40X (6.0MB/sec)  |
|   | US-RW   | 32X (4.8MB/sec)   | 40X (6.0MB/sec)  |
|   | HS-RW   | 10X (1.5MB/sec)   | 40X (6.0MB/sec)  |
|   | CD-RW   | 4X (5.4MB/sec)  | 40X (6.0MB/sec)  |
|   | DVD-RAM                                       | 12X (16.2MB/sec)  | 12X (16.2MB/sec) |
|   | Data transfer mode                            | Ultra DMA Mode 2: 33.3MB/sec, Multiword DMA mode2: 16.6MB/sec, PIO Mode 4: 16.7MB/sec |                  |
|   | Interface                                     | ATA/ATAPI (E-IDE)   |                  |
|   | Buffer Memory                                 | 2M  |                  |
|   | Drive Install Form                            | Horizontal / Vertical   |                  |
| Size (W * H * L)  | 148.2mm (W) x 42mm (H) X 170mm (D) with bezel |   |                  |
| Buffer Protection   | yes   |   |                  |
| Lead Free   | yes   |   |                  |
| Light Scribe  | no  |   |                  |

## SH-S223Q Optical Storage

| DISK FORMAT  | GENERAL SPECIFICATIONS |   |                  |
|--|------------------------|---|------------------|
| <b>1. DISC SUPPORT</b><br>- READ: MASTERED DISC, CD-R, CD-RW, DVD-ROM, DVD-R 3.95GB, DVD-R 4.7GB Authoring, DVD-R 4.7GB General, DVD-RW 4.7GB, DVD-RW 8.5 GB(Double-layer), DVD+R 4.7GB, DVD+R 8.5GB(Double-layer), DVD+RW 4.7GB, DVD-RAM 4.7GB/2.6GB<br>- WRITE: DVD 4.7GB(DVD±R, DVD±RW, DVD-RAM), Double Layer±R, Double Layer-RW, CD-R, CD-RW<br>- Print: DVD+/-R ( LF Media [Label/Data Side] / Non LF Media [Data Side] ) - (Optional)<br><br><b>2. DATA FORMAT:</b><br>- CD: CD-DA, CD-ROM, MIXED-CD, CD-ROM XA, ENHANCED-CD, CD-EXTRA/CD+, Photo-CD, VIDEO-CD, CD-TEXT, CD-G, Multi-Session<br>- DVD: DVD-RAM, DVD-ROM, DVD-VIDEO, Multi-Session(Read/Write), Multi-Border(Read) | Data Transfer Rate MAX |   |                  |
|  | Media Type             | Write   | Read             |
|  | DVD+R                  | 22X(29.7 MB/sec)                              | 16X (21.6MB/sec) |
|  | DVD+RW                 | 8X (10.8MB/sec)                               | 12X (16.2MB/sec) |
|  | DVD+R DUAL             | 16X (21.6MB/sec)                              | 12X (16.2MB/sec) |
|  | DVD-R DUAL             | 12X (16.2MB/sec)                              | 12X (16.2MB/sec) |
|  | DVD-R                  | 22X(29.7 MB/sec)                              | 16X (21.6MB/sec) |
|  | DVD-RW                 | 6X (8.1MB/sec)                                | 12X (16.2MB/sec) |
|  | DVD-ROM (Single)       | -   | 16X (21.6MB/sec) |
|  | DVD-ROM (Dual)         | -   | 12X (16.2MB/sec) |
|  | CD-ROM                 | -   | 48X (7.2MB/sec)  |
|  | CD-R                   | 48X (7.2MB/sec)                               | 40X (6.0MB/sec)  |
|  | US-RW                  | 32X (4.8MB/sec)                               | 40X (6.0MB/sec)  |
|  | HS-RW                  | 10X (1.5MB/sec)                               | 40X (6.0MB/sec)  |
|  | CD-RW                  | 4X (0.6MB/sec)                                | 40X (6.0MB/sec)  |
|  | DVD-RAM                | 12X (16.2MB/sec)                              | 12X (16.2MB/sec) |
|  | Access Time            | CD 110ms (Random), DVD 130ms (Random)         |                  |
|  | Data transfer mode     | SATA 1.5Gbps                                  |                  |
|  | Interface              | Serial-ATA                                    |                  |
|  | Buffer Memory          | 2M  |                  |
|  | Drive Install Form     | Horizontal / Vertical                         |                  |
|  | Size (W * H * L)       | 148.2mm (W) X 170mm (D) X 42mm (H) with bezel |                  |
|  | Buffer Protection      | Applied                                       |                  |
|  | Lead Free              | Applied                                       |                  |
|  | Light Scribe           | Applied                                       |                  |

## SH-S223F Optical Storage

| DISK FORMAT  | GENERAL SPECIFICATIONS |   |                  |
|--|------------------------|---|------------------|
| <b>1. DISC SUPPORT</b><br>- READ: MASTERED DISC, CD-R, CD-RW, DVD-ROM, DVD-R 3.95GB, DVD-R 4.7GB Authoring, DVD-R 4.7GB General, DVD-RW 4.7GB, DVD-RW 8.5 GB(Double-layer), DVD+R 4.7GB, DVD+R 8.5GB(Double-layer), DVD+RW 4.7GB, DVD-RAM 4.7GB/2.6GB<br>- WRITE: DVD 4.7GB(DVD±R, DVD±RW, DVD-RAM), Double Layer±R, Double Layer-RW, CD-R, CD-RW<br>- Print: DVD+/-R ( LF Media [Label/Data Side] / Non LF Media [Data Side] ) - (Optional)<br><br><b>2. DATA FORMAT:</b><br>- CD: CD-DA, CD-ROM, MIXED-CD, CD-ROM XA, ENHANCED-CD, CD-EXTRA/CD+, Photo-CD, VIDEO-CD, CD-TEXT, CD-G, Multi-Session<br>- DVD: DVD-RAM, DVD-ROM, DVD-VIDEO, Multi-Session(Read/Write), Multi-Border(Read) | Data Transfer Rate MAX |   |                  |
|  | Media Type             | Write   | Read             |
|  | DVD+R                  | 22X(29.7 MB/sec)                              | 16X (21.6MB/sec) |
|  | DVD+RW                 | 8X (10.8MB/sec)                               | 12X (16.2MB/sec) |
|  | DVD+R DUAL             | 16X (21.6MB/sec)                              | 12X (16.2MB/sec) |
|  | DVD-R DUAL             | 12X (16.2MB/sec)                              | 12X (16.2MB/sec) |
|  | DVD-R                  | 22X(29.7 MB/sec)                              | 16X (21.6MB/sec) |
|  | DVD-RW                 | 6X (8.1MB/sec)                                | 12X (16.2MB/sec) |
|  | DVD-ROM (Single)       | -   | 16X (21.6MB/sec) |
|  | DVD-ROM (Dual)         | -   | 12X (16.2MB/sec) |
|  | CD-ROM                 | -   | 48X (7.2MB/sec)  |
|  | CD-R                   | 48X (7.2MB/sec)                               | 40X (6.0MB/sec)  |
|  | US-RW                  | 32X (4.8MB/sec)                               | 40X (6.0MB/sec)  |
|  | HS-RW                  | 10X (1.5MB/sec)                               | 40X (6.0MB/sec)  |
|  | CD-RW                  | 4X (0.6MB/sec)                                | 40X (6.0MB/sec)  |
|  | DVD-RAM                | 12X (16.2MB/sec)                              | 12X (16.2MB/sec) |
|  | Access Time            | CD 110ms (Random), DVD 130ms (Random)         |                  |
|  | Data transfer mode     | SATA 1.5Gbps                                  |                  |
|  | Interface              | Serial-ATA                                    |                  |
|  | Buffer Memory          | 2M  |                  |
|  | Drive Install Form     | Horizontal / Vertical                         |                  |
|  | Size (W * H * L)       | 148.2mm (W) x 42mm (H) X 170mm (D) with Bezel |                  |
|  | Buffer Protection      | yes   |                  |
|  | Lead Free              | yes   |                  |
|  | Light Scribe           | no  |                  |



## SN-T083A [Slot-in Type] Optical Storage

| DISK FORMAT  | GENERAL SPECIFICATIONS                     |   |                 |
|--|--|---|-----------------|
| <ul style="list-style-type: none"> <li>READ: MASTERED DISC, CD-R, CD-RW, DVD-ROM, DVD-R 3.95GB, DVD-R 4.7GB Authoring, DVD-R 4.7GB General, DVD-RW, DVD+R 4.7GB, DVD+R 8.5GB(Double-layer), DVD+RW 4.7GB, DVD-RAM 4.7GB</li> <li>WRITE: DVD 4.7GB(DVD±R, DVD±RW, DVD-RAM), Double Layer±R,CD-R, CD-RW</li> </ul> | <b>Data Transfer Rate MAX</b>              |   |                 |
|  | <b>Media Type</b>                          | <b>Write</b>  | <b>Read</b>     |
|  | DVD+R                                      | 8X (10.8MB/sec)   | 8X (10.8MB/sec) |
|  | DVD+RW                                     | 8X (10.8MB/sec)   | 8X (10.8MB/sec) |
|  | DVD+R DUAL                                 | 6X (8.1MB/sec)  | 6X (8.1MB/sec)  |
|  | DVD-R DUAL                                 | 6X (8.1MB/sec)  | 6X (8.1MB/sec)  |
|  | DVD-R                                      | 6X (8.1MB/sec)  | 8X (10.8MB/sec) |
|  | DVD-RW                                     | 6X (8.1MB/sec)  | 8X (10.8MB/sec) |
|  | DVD-ROM (Single)                           | -   | 8X (10.8MB/sec) |
|  | DVD-ROM (Dual)                             | -   | 8X (10.8MB/sec) |
|  | CD-ROM                                     | -   | 24X (3.6MB/sec) |
|  | CD-R                                       | 24X (3.6MB/sec)   | 24X (3.6MB/sec) |
|  | US-RW                                      | 24X (3.6MB/sec)   | 24X (3.6MB/sec) |
|  | HS-RW                                      | 10X (1.5MB/sec)   | 24X (3.6MB/sec) |
|  | CD-RW                                      | 4X (0.6MB/sec)  | 24X (3.6MB/sec) |
|  | DVD-RAM                                    | 5X (6.75MB/sec)   | 5X (6.75MB/sec) |
|  | Data transfer mode                         | Ultra DMA Mode 2: 33.3MB/sec, Multiword DMA mode2: 16.6MB/sec, PIO Mode 4: 16.7MB/sec |                 |
|  | Interface                                  | Serial-ATA  |                 |
|  | Buffer Memory                              | 2M  |                 |
|  | Drive Install Form                         | Horizontal  |                 |
| Size (W * H * L)   | 128 (W) x 12.7 (H) x 127 (D) without Bezel |   |                 |
| Buffer Protection  | yes  |   |                 |
| Lead Free  | yes  |   |                 |
| Light Scribe   | no   |   |                 |

## SN-S083B Optical Storage

| DISK FORMAT   | GENERAL SPECIFICATIONS                     |   |                 |
|---|--|---|-----------------|
| <p><b>1. DISC TYPE</b></p> <ul style="list-style-type: none"> <li>READ: MASTERED DISC, CD-R, CD-RW, DVD-ROM, DVD+R 4.7GB, DVD+R DL 8.5GB, DVD+RW 4.7GB, DVD-R 3.95GB, DVD-R 4.7GB Authoring, DVD-R 4.7GB General, DVD-R DL 8.5GB, DVD-RW, DVD-RAM 4.7GB</li> <li>WRITE: DVD4.7GB(DVD±R/RW, DVD-RAM), DVD±R DL(8.5GB), CD-R/RW</li> </ul> <p><b>2. DATA FORMAT:</b></p> <ul style="list-style-type: none"> <li>CD: CD-DA, CD-ROM, MIXED-CD, CD-ROM XA, ENHANCED-CD, CD-EXTRA/CD+, Photo-CD, VIDEO-CD, CD-TEXT, CD-G, Multi-Session</li> <li>DVD: DVD-RAM, DVD-ROM, DVD-VIDEO, Multi-Session(Read/Write), Multi-Border(Read/Write)</li> </ul> <p><b>3. Recording mode</b></p> <ul style="list-style-type: none"> <li>CD-R/RW: DAO, TAO, SAO, Packet Write(RW)</li> <li>DVD+R/RW: Sequential, Random(RW)</li> <li>DVD-R/RW: Incremental, DAO, Restricted Overwrite(RW)</li> <li>DVD-RAM: Random</li> </ul> | <b>Data Transfer Rate MAX</b>              |   |                 |
|   | <b>Media Type</b>                          | <b>Write</b>  | <b>Read</b>     |
|   | DVD+R                                      | 8X (10.8MB/sec)   | 8X (10.8MB/sec) |
|   | DVD+RW                                     | 8X (10.8MB/sec)   | 8X (10.8MB/sec) |
|   | DVD+R DUAL                                 | 6X (8.1MB/sec)  | 6X (8.1MB/sec)  |
|   | DVD-R DUAL                                 | 6X (8.1MB/sec)  | 6X (8.1MB/sec)  |
|   | DVD-R                                      | 8X (10.8MB/sec)   | 8X (10.8MB/sec) |
|   | DVD-RW                                     | 6X (8.1MB/sec)  | 8X (10.8MB/sec) |
|   | DVD-ROM (Single)                           | -   | 8X (10.8MB/sec) |
|   | DVD-ROM (Dual)                             | -   | 8X (10.8MB/sec) |
|   | CD-ROM                                     | -   | 24X (3.6MB/sec) |
|   | CD-R                                       | 24X (3.6MB/sec)   | 24X (3.6MB/sec) |
|   | US-RW                                      | 24X (3.6MB/sec)   | 24X (3.6MB/sec) |
|   | HS-RW                                      | 10X (1.5MB/sec)   | 24X (3.6MB/sec) |
|   | CD-RW                                      | 4X (0.6MB/sec)  | 24X (3.6MB/sec) |
|   | DVD-RAM                                    | 5X (6.75MB/sec)   | 5X (6.75MB/sec) |
|   | Access Time                                | CD 150ms (Random), DVD 160ms (Random)   |                 |
|   | Data transfer mode                         | Ultra DMA Mode 2: 33.3MB/sec, Multiword DMA mode2: 16.6MB/sec, PIO Mode 4: 16.7MB/sec |                 |
|   | Interface                                  | Serial-ATA  |                 |
|   | Buffer Memory                              | 2M  |                 |
| Drive Install Form  | Horizontal / Vertical                      |   |                 |
| Size (W * H * L)  | 128 (W) x 12.7 (H) x 127 (D) without Bezel |   |                 |
| Buffer Protection   | yes  |   |                 |
| Lead Free   | yes  |   |                 |
| Light Scribe  | no   |   |                 |

## SN-S083M Optical Storage

| DISK FORMAT   | GENERAL SPECIFICATIONS                     |   |                 |
|---|--|---|-----------------|
| <b>1. DISC TYPE</b><br>- READ: MASTERED DISC, CD-R, CD-RW, DVD-ROM, DVD+R 4.7GB, DVD+R DL 8.5GB, DVD+RW 4.7GB, DVD-R 3.95GB, DVD-R 4.7GB Authoring, DVD-R 4.7GB General, DVD-R DL 8.5GB, DVD-RW, DVD-RAM 4.7GB<br>- WRITE: DVD4.7GB(DVD±R/RW, DVD-RAM), DVD±R DL(8.5GB), CD-R/RW<br><br><b>2. DATA FORMAT:</b><br>- CD: CD-DA, CD-ROM, MIXED-CD, CD-ROM XA, ENHANCED-CD, CD-EXTRA/CD+, Photo-CD, VIDEO-CD, CD-TEXT, CD-G, Multi-Session<br>- DVD: DVD-RAM, DVD-ROM, DVD-VIDEO, Multi-Session(Read/Write), Multi-Border(Read/Write)<br><br><b>3. Recording mode</b><br>- CD-R/RW: DAO, TAO, SAO, Packet Write(RW)<br>- DVD+R/RW: Sequential, Random(RW)<br>- DVD-R/RW: Incremental, DAO, Restricted Overwrite(RW)<br>- DVD-RAM: Random | <b>Data Transfer Rate MAX</b>              |   |                 |
|   | <b>Media Type</b>                          | <b>Write</b>  | <b>Read</b>     |
|   | DVD+R                                      | 8X (10.8MB/sec)   | 8X (10.8MB/sec) |
|   | DVD+RW                                     | 8X (10.8MB/sec)   | 8X (10.8MB/sec) |
|   | DVD+R DUAL                                 | 6X (8.1MB/sec)  | 6X (8.1MB/sec)  |
|   | DVD-R DUAL                                 | 6X (8.1MB/sec)  | 6X (8.1MB/sec)  |
|   | DVD-R                                      | 8X (10.8MB/sec)   | 8X (10.8MB/sec) |
|   | DVD-RW                                     | 6X (8.1MB/sec)  | 8X (10.8MB/sec) |
|   | DVD-ROM (Single)                           | -   | 8X (10.8MB/sec) |
|   | DVD-ROM (Dual)                             | -   | 8X (10.8MB/sec) |
|   | CD-ROM                                     | -   | 24X (3.6MB/sec) |
|   | CD-R                                       | 24X (3.6MB/sec)   | 24X (3.6MB/sec) |
|   | US-RW                                      | 24X (3.6MB/sec)   | 24X (3.6MB/sec) |
|   | HS-RW                                      | 10X (1.5MB/sec)   | 24X (3.6MB/sec) |
|   | CD-RW                                      | 4X (0.6MB/sec)  | 24X (3.6MB/sec) |
|   | DVD-RAM                                    | 5X (6.75MB/sec)   | 5X (6.75MB/sec) |
|   | Access Time                                | CD 150ms (Random), DVD 160ms (Random)   |                 |
|   | Data transfer mode                         | Ultra DMA Mode 2: 33.3MB/sec, Multiword DMA mode2: 16.6MB/sec, PIO Mode 4: 16.7MB/sec |                 |
|   | Interface                                  | Serial-ATA  |                 |
|   | Buffer Memory                              | 2M  |                 |
| Drive Install Form  | Horizontal / Vertical                      |   |                 |
| Size (W * H * L)  | 128 (W) x 12.7 (H) x 127 (D) without Bezel |   |                 |
| Buffer Protection   | yes  |   |                 |
| Lead Free   | yes  |   |                 |
| Light Scribe  | yes  |   |                 |

## SN-S082H Optical Storage

| DISK FORMAT  | GENERAL SPECIFICATIONS                     |   |                 |
|--|--|---|-----------------|
| - CD: CD-DA, CD-ROM, MIXED-CD, CD-ROM XA, ENHANCED-CD, CD-EXTRA/CD+, Photo-CD, VIDEO-CD, CD-TEXT, CD-G, Multi-Session<br>- DVD: DVD-RAM, DVD-ROM, DVD-VIDEO, Multi-Session(Read/Write), Multi-Border(Read/Write) | <b>Data Transfer Rate MAX</b>              |   |                 |
|  | <b>Media Type</b>                          | <b>Write</b>  | <b>Read</b>     |
|  | DVD+R                                      | 8X (10.8MB/sec)   | 8X (10.8MB/sec) |
|  | DVD+RW                                     | 8X (10.8MB/sec)   | 8X (10.8MB/sec) |
|  | DVD+R DUAL                                 | 6X (8.1MB/sec)  | 8X (10.8MB/sec) |
|  | DVD-R DUAL                                 | 6X (8.1MB/sec)  | 8X (10.8MB/sec) |
|  | DVD-R                                      | 8X (10.8MB/sec)   | 8X (10.8MB/sec) |
|  | DVD-RW                                     | 6X (8.1MB/sec)  | 8X (10.8MB/sec) |
|  | DVD-ROM (Single)                           | -   | 8X (10.8MB/sec) |
|  | DVD-ROM (Dual)                             | -   | 8X (10.8MB/sec) |
|  | CD-ROM                                     | -   | 24X (3.6MB/sec) |
|  | CD-R                                       | 24X (3.6MB/sec)   | 24X (3.6MB/sec) |
|  | US-RW                                      | 24X (3.6MB/sec)   | 24X (3.6MB/sec) |
|  | HS-RW                                      | 10X (1.5MB/sec)   | 24X (3.6MB/sec) |
|  | CD-RW                                      | 4X (0.6MB/sec)  | 24X (3.6MB/sec) |
|  | DVD-RAM                                    | 5X (6.75MB/sec)   | 5X (6.75MB/sec) |
|  | Data transfer mode                         | Ultra DMA Mode 2: 33.3MB/sec, Multiword DMA mode2: 16.6MB/sec, PIO Mode 4: 16.7MB/sec |                 |
|  | Interface                                  | ATA/ATAPI(E-IDE)  |                 |
|  | Buffer Memory                              | 2M  |                 |
|  | Drive Install Form                         | Horizontal  |                 |
| Size (W * H * L)   | 128 (W) x 12.7 (H) x 127 (D) without Bezel |   |                 |
| Buffer Protection  | yes  |   |                 |
| Lead Free  | yes  |   |                 |
| Light Scribe   | no   |   |                 |

## SN-M242D Optical Storage

| DISK FORMAT   | GENERAL SPECIFICATIONS |   |                 |
|---|------------------------|---|-----------------|
| CD-DA, CD-ROM, Video CD, CD-I/FMV, CD-ROM XA, Multi-Session Disc, DVD-ROM, DVD-VIDEO, DVD±R, DVD±RW, CD-R, CD-RW, DVD-RAM | Data Transfer Rate MAX |   |                 |
|   | Media Type             | Write   | Read            |
|   | DVD+R                  | -   | 8X (10.8MB/sec) |
|   | DVD+RW                 | -   | 8X (10.8MB/sec) |
|   | DVD+R DUAL             | -   | 6X (8.1MB/sec)  |
|   | DVD-R DUAL             | -   | 6X (8.1MB/sec)  |
|   | DVD-R                  | -   | 8X (10.8MB/sec) |
|   | DVD-RW                 | -   | 8X (10.8MB/sec) |
|   | DVD-ROM (Single)       | -   | 8X (10.8MB/sec) |
|   | DVD-ROM (Dual)         | -   | 6X (8.1MB/sec)  |
|   | CD-ROM                 | -   | 24X (3.6MB/sec) |
|   | CD-R                   | 24X (3.6MB/sec)   | 24X (3.6MB/sec) |
|   | US-RW                  | 24X (3.6MB/sec)   | 24X (3.6MB/sec) |
|   | HS-RW                  | 10X (1.5MB/sec)   | 24X (3.6MB/sec) |
|   | CD-RW                  | 4X (0.6MB/sec)  | 24X (3.6MB/sec) |
|   | DVD-RAM                | -   | 5X (6.75MB/sec) |
|   | Data transfer mode     | Ultra DMA Mode 2: 33.3MB/sec, Multiword DMA mode2: 16.6MB/sec, PIO Mode 4: 16.7MB/sec |                 |
|   | Interface              | ATA/ATAPI (E-IDE)   |                 |
|   | Buffer Memory          | 2M  |                 |
|   | Drive Install Form     | Horizontal / Vertical   |                 |
| Size (W * H * L)  | 128 X 12.7 X 129.0     |   |                 |
| Buffer Protection   | yes                    |   |                 |
| Lead Free   | yes                    |   |                 |
| Light Scribe  | no                     |   |                 |

## [USB 2.0] SE-S084B Optical Storage

| DISK FORMAT   | GENERAL SPECIFICATIONS           |                                       |                 |
|---|----------------------------------|---------------------------------------|-----------------|
| <p>1. DISC TYPE</p> <ul style="list-style-type: none"> <li>- READ: MASTERED DISC, CD-R, CD-RW, DVD-ROM, DVD+R 4.7GB, DVD+R DL 8.5GB, DVD+RW 4.7GB, DVD-R 3.95GB, DVD-R 4.7GB Authoring, DVD-R 4.7GB General, DVD-R DL 8.5GB, DVD-RW, DVD-RAM 4.7GB</li> <li>- WRITE: DVD4.7GB(DVD±R/RW, DVD-RAM), DVD±R DL(8.5GB), CD-R/RW</li> <li>- Print: CD-R, DVD+/-R Light Scribe Media</li> </ul> <p>2. DATA FORMAT:</p> <ul style="list-style-type: none"> <li>- CD: CD-DA, CD-ROM, MIXED-CD, CD-ROM XA, ENHANCED-CD, CD-EXTRA/CD+, Photo-CD, VIDEO-CD, CD-TEXT, CD-G, Multi-Session</li> <li>- DVD: DDVD-RAM, DVD-ROM, DVD-VIDEO, Multi-Session (Read/Write), Multi-Border(Read/Write)</li> </ul> <p>3. Recording mode</p> <ul style="list-style-type: none"> <li>- CD-R/RW: DAO, TAO, SAO, Packet Write(RW)</li> <li>- DVD+R/RW: Sequential, Random(RW)</li> <li>- DVD-R/RW: Incremental, DAO, Restricted Overwrite(RW)</li> <li>- DVD-RAM: Random</li> </ul> | Data Transfer Rate MAX           |                                       |                 |
|   | Media Type                       | Write                                 | Read            |
|   | DVD+R                            | 8X (10.8MB/sec)                       | 8X (10.8MB/sec) |
|   | DVD+RW                           | 8X (10.8MB/sec)                       | 8X (10.8MB/sec) |
|   | DVD+R DUAL                       | 6X (8.1MB/sec)                        | 8X (10.8MB/sec) |
|   | DVD-R DUAL                       | 6X (8.1MB/sec)                        | 8X (10.8MB/sec) |
|   | DVD-R                            | 6X (8.1MB/sec)                        | 8X (10.8MB/sec) |
|   | DVD-RW                           | 6X (8.1MB/sec)                        | 8X (10.8MB/sec) |
|   | DVD-ROM (Single)                 | -                                     | 8X (10.8MB/sec) |
|   | DVD-ROM (Dual)                   | -                                     | 8X (10.8MB/sec) |
|   | CD-ROM                           | -                                     | 24X (3.6MB/sec) |
|   | CD-R                             | 24X (3.6MB/sec)                       | 24X (3.6MB/sec) |
|   | US-RW                            | 24X (3.6MB/sec)                       | 24X (3.6MB/sec) |
|   | HS-RW                            | 10X (1.5MB/sec)                       | 24X (3.6MB/sec) |
|   | CD-RW                            | 4X (0.6MB/sec)                        | 24X (3.6MB/sec) |
|   | DVD-RAM                          | 5X (6.75MB/sec)                       | 5X (6.75MB/sec) |
|   | Access Time                      | CD 130ms (Random), DVD 160ms (Random) |                 |
|   | Interface                        | USB 2.0                               |                 |
|   | Buffer Memory                    | 2M                                    |                 |
|   | Drive Install Form               | Horizontal / Vertical                 |                 |
| Size (W * H * L)  | 141mm (W) x 19mm (H) X 157mm (D) |                                       |                 |
| Buffer Protection   | yes                              |                                       |                 |
| Lead Free   | yes                              |                                       |                 |
| Light Scribe  | no                               |                                       |                 |



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