

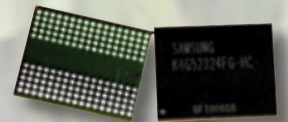
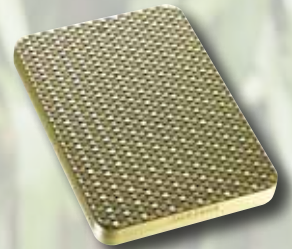


SAMSUNG

# PRODUCT SELECTION GUIDE

Samsung Semiconductor, Inc.

MEMORY & STORAGE



2H 2010



# 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.

## 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/us/business/components](http://www.samsung.com/us/business/components)



## DRAM

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

- DDR3 SDRAM
- DDR2 SDRAM
- DDR SDRAM
- SDRAM
- Mobile SDRAM
- RDRAM

- Graphics DDR SDRAM
- DRAM Ordering Information

DRAM

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- SLC Flash
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- SD and microSD Cards
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FLASH

## HIGH SPEED SRAM

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

- Asynchronous
- Synchronous
- NtRAM™
- Late-Write R-R SRAM
- DDR / II / II+ SRAM
- QDR / II / II+ SRAM

SRAM

## MULTI-CHIP PACKAGE

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

- NAND & DRAM
- OneNAND & DRAM
- Flex-OneNAND & DRAM
- OneNAND & DRAM & OneDRAM
- moviNAND & NAND & DRAM

- NOR & UtRAM
- NOR & DRAM

MCP

## Fusion Memory

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

- moviNAND™
- OneDRAM™

FUSION

## STORAGE

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### SSD

[www.samsungssd.com](http://www.samsungssd.com)

- SATA SSD

### Hard Drive

[www.samsung.com/hdd](http://www.samsung.com/hdd)

### Optical Disc

[www.samsungodd.com](http://www.samsungodd.com)

STORAGE

## DDR3 SDRAM REGISTERED MODULES

| Density | Voltage | Organization | Part Number                      | Composition             | Compliance               | Speed (Mbps) | Ranks | Production |
|---------|---------|--------------|----------------------------------|-------------------------|--------------------------|--------------|-------|------------|
| 1GB     | 1.5V    | 128Mx72      | M393B2873FH0-C(F8/H9/K0*)(04/05) | 1Gb (128M x8) * 9       | Lead Free & Halogen Free | 1066/1333    | 1     | Now        |
| 2GB     | 1.5V    | 256Mx72      | M393B5673FH0-C(F8/H9/K0*)(04/05) | 1Gb (128M x8) * 18      | Lead Free & Halogen Free | 1066/1333    | 2     | Now        |
|         |         |              | M393B5670FH0-C(F8/H9/K0*)(04/05) | 1Gb (256M x4) * 18      | Lead Free & Halogen Free | 1066/1333    | 1     | Now        |
| 4GB     | 1.5V    | 512Mx72      | M393B5173FH0-CF8(04/05)          | 1Gb (128M x8) * 36      | Lead Free & Halogen Free | 1066/1333    | 4     | Now        |
|         |         |              | M393B5170FH0-C(F8/H9/K0*)(04/05) | 1Gb (256M x4) * 36      | Lead Free & Halogen Free | 1066/1333    | 2     | Now        |
|         |         |              | M393B5273CH0-C(F8/H9/K0*)(04/05) | 2Gb (256M x8) * 18      | Lead Free & Halogen Free | 1066/1333    | 2     | Now        |
|         |         |              | M393B5270CH0-C(F8/H9/K0*)(04/05) | 2Gb (512M x4) * 18      | Lead Free & Halogen Free | 1066/1333    | 1     | Now        |
| 8GB     | 1.5V    | 1Gx72        | M393B1K73CH0-CF8(04/05)          | 2Gb (256M x8) * 36      | Lead Free & Halogen Free | 1066/1333    | 4     | Now        |
|         |         |              | M393B1K70CH0-C(F8/H9/K0*)(04/05) | 2Gb (512M x4) * 36      | Lead Free & Halogen Free | 1066/1333    | 2     | Now        |
| 16GB    | 1.5V    | 2Gx72        | M393B2K70CM0-CF8(04/05)          | 4Gb DDP (1024M x4) * 36 | Lead Free & Halogen Free | 1066/1333    | 4     | Now        |
| 32GB    | 1.5V    | 4Gx72        | M393B4G70AM0-CF8(04/05)          | 8Gb DDP (2048M x4) * 36 | Lead Free & Halogen Free | 1066/1333    | 4     | Now        |
| 1GB     | 1.35V   | 128Mx72      | M393B2873FH0-Y(F8/H9/K0*)(04/05) | 1Gb (128M x8) * 9       | Lead Free & Halogen Free | 1066/1333    | 1     | Now        |
| 2GB     | 1.35V   | 256Mx72      | M393B5673FH0-Y(F8/H9/K0*)(04/05) | 1Gb (128M x8) * 18      | Lead Free & Halogen Free | 1066/1333    | 2     | Now        |
|         |         |              | M393B5670FH0-Y(F8/H9/K0*)(04/05) | 1Gb (256M x4) * 18      | Lead Free & Halogen Free | 1066/1333    | 1     | Now        |
| 4GB     | 1.35V   | 512Mx72      | M393B5173FH0-YF8(04/05)          | 1Gb (128M x8) * 36      | Lead Free & Halogen Free | 1066/1333    | 4     | Now        |
|         |         |              | M393B5170FH0-Y(F8/H9/K0*)(04/05) | 1Gb (256M x4) * 36      | Lead Free & Halogen Free | 1066/1333    | 2     | Now        |
|         |         |              | M393B5273CH0-Y(F8/H9/K0*)(04/05) | 2Gb (256M x8) * 18      | Lead Free & Halogen Free | 1066/1333    | 2     | Now        |
|         |         |              | M393B5270CH0-Y(F8/H9/K0*)(04/05) | 2Gb (512M x4) * 18      | Lead Free & Halogen Free | 1066/1333    | 1     | Now        |
| 8GB     | 1.35V   | 1Gx72        | M393B1K73CH0-YF8(04/05)          | 2Gb (256M x8) * 36      | Lead Free & Halogen Free | 1066/1333    | 4     | Now        |
|         |         |              | M393B1K70CH0-Y(F8/H9/K0*)(04/05) | 2Gb (512M x4) * 36      | Lead Free & Halogen Free | 1066/1333    | 2     | Now        |
| 16GB    | 1.35V   | 2Gx72        | M393B2K70CM0-YF8(04/05)          | 4Gb DDP (1024M x4) * 36 | Lead Free & Halogen Free | 1066/1333    | 4     | Now        |
| 32GB    | 1.35V   | 4Gx72        | M393B4G70AM0-YF8(04/05)          | 8Gb DDP (2048M x4) * 36 | Lead Free & Halogen Free | 1066/1333    | 4     | Now        |

NOTES: F7 = DDR3-800 (6-6-6)  
F8 = DDR3-1066 (7-7-7)  
H9 = DDR3-1333 (9-9-9)  
K0 = DDR3-1600 (11-11-11)

O4 = IDT B0 register  
O5 = Inphi C0 register  
\* K0 (1600Mbps) available in ES only

## DDR3 SDRAM VLP REGISTERED MODULES

| Density | Voltage | Organization | Part Number                  | Composition             | Compliance               | Speed (Mbps) | Ranks | Production |
|---------|---------|--------------|------------------------------|-------------------------|--------------------------|--------------|-------|------------|
| 1GB     | 1.5V    | 128Mx72      | M392B2873FH0-C(F8/H9)(04/05) | 1Gb (128M x8) * 9       | Lead Free & Halogen Free | 1066/1333    | 1     | Now        |
| 2GB     | 1.5V    | 256Mx72      | M392B5673FH0-C(F8/H9)(04/05) | 1Gb (128M x8) * 18      | Lead Free & Halogen Free | 1066/1333    | 2     | Now        |
|         |         |              | M392B5670FH0-C(F8/H9)(04/05) | 1Gb (256M x8) * 18      | Lead Free & Halogen Free | 1066/1333    | 1     | Now        |
| 4GB     | 1.5V    | 512Mx72      | M392B5170FM0-C(F8/H9)(04/05) | 2Gb DDP (512M x4) * 18  | Lead Free & Halogen Free | 1066/1333    | 2     | Now        |
|         |         |              | M392B5273CH0-C(F8/H9)(04/05) | 2Gb (256M x8) * 18      | Lead Free & Halogen Free | 1066/1333    | 2     | Now        |
|         |         |              | M392B5270CH0-C(F8/H9)(04/05) | 2Gb (512M x4) * 18      | Lead Free & Halogen Free | 1066/1333    | 1     | Now        |
| 8GB     | 1.5V    | 1Gx72        | M392B1K73CM0-CF8(04/05)      | 4Gb DDP (512M x8) * 18  | Lead Free & Halogen Free | 1066/1333    | 4     | Now        |
|         |         |              | M392B1K70CM0-C(F8/H9)(04/05) | 4Gb DDP (1024M x4) * 18 | Lead Free & Halogen Free | 1066/1333    | 2     | Now        |
| 16GB    | 1.5V    | 2Gx72        | M392B2G70AM0-C(F8/H9)(04/05) | 8Gb DDP (2048M x4) * 18 | Lead Free & Halogen Free | 1066/1333    | 2     | Now        |
| 1GB     | 1.35V   | 128Mx72      | M392B2873FH0-Y(F8/H9)(04/05) | 1Gb (128M x8) * 9       | Lead Free & Halogen Free | 1066/1333    | 1     | Now        |
| 2GB     | 1.35V   | 256Mx72      | M392B5673FH0-Y(F8/H9)(04/05) | 1Gb (128M x8) * 18      | Lead Free & Halogen Free | 1066/1333    | 2     | Now        |
|         |         |              | M392B5670FH0-Y(F8/H9)(04/05) | 1Gb (256M x8) * 18      | Lead Free & Halogen Free | 1066/1333    | 1     | Now        |
| 4GB     | 1.35V   | 512Mx72      | M392B5170FM0-Y(F8/H9)(04/05) | 2Gb DDP (512M x4) * 18  | Lead Free & Halogen Free | 1066/1333    | 2     | Now        |
|         |         |              | M392B5273CH0-Y(F8/H9)(04/05) | 2Gb (256M x8) * 18      | Lead Free & Halogen Free | 1066/1333    | 2     | Now        |
|         |         |              | M392B5270CH0-Y(F8/H9)(04/05) | 2Gb (512M x4) * 18      | Lead Free & Halogen Free | 1066/1333    | 1     | Now        |
| 8GB     | 1.35V   | 1Gx72        | M392B1K73CM0-YF8(04/05)      | 4Gb DDP (512M x8) * 18  | Lead Free & Halogen Free | 1066/1333    | 4     | Now        |
|         |         |              | M392B1K70CM0-Y(F8/H9)(04/05) | 4Gb DDP (1024M x4) * 18 | Lead Free & Halogen Free | 1066/1333    | 2     | Now        |
| 16GB    | 1.35V   | 2Gx72        | M392B2G70AM0-Y(F8/H9)(04/05) | 8Gb DDP (2048M x4) * 18 | Lead Free & Halogen Free | 1066/1333    | 2     | Now        |

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

04 = IDT B0 register  
05 = Inphi C0 register

## DDR3 SDRAM UNBUFFERED MODULES

| Density | Voltage | Organization | Part Number               | Composition        | Compliance               | Speed (Mbps)   | Ranks | Production |
|---------|---------|--------------|---------------------------|--------------------|--------------------------|----------------|-------|------------|
| 1GB     | 1.5V    | 128Mx64      | M378B2873FH0-C(F8/H9/K0*) | 1Gb (128M x8) * 8  | Lead Free & Halogen Free | 1066/1333/1600 | 1     | Now        |
| 2GB     | 1.5V    | 256Mx64      | M378B5673FH0-C(F8/H9/K0*) | 1Gb (128M x8) * 16 | Lead Free & Halogen Free | 1066/1333/1600 | 2     | Now        |
|         |         |              | M378B5773FH0-C(F8/H9/K0*) | 2Gb (256M x8) * 8  | Lead Free & Halogen Free | 1066/1333/1600 | 1     | Now        |
| 4GB     | 1.5V    | 512Mx64      | M378B5273CH0-C(F8/H9/K0*) | 2Gb (256M x8) * 16 | Lead Free & Halogen Free | 1066/1333/1600 | 2     | Now        |
| 8GB     | 1.5V    | 1024Mx64     | M378B1G73AH0-C(F8/H9/K0*) | 4Gb (512M x8) * 16 | Lead Free & Halogen Free | 1066/1333/1600 | 2     | Now        |

## DDR3 SDRAM UNBUFFERED MODULES (ECC)

| Density | Voltage | Organization | Part Number               | Composition        | Compliance               | Speed (Mbps)   | Ranks | Production |
|---------|---------|--------------|---------------------------|--------------------|--------------------------|----------------|-------|------------|
| 1GB     | 1.5V    | 128Mx72      | M391B2873FH0-C(F8/H9/K0*) | 1Gb (128M x8) * 9  | Lead Free & Halogen Free | 1066/1333/1600 | 1     | Now        |
| 2GB     | 1.5V    | 256Mx72      | M391B5673FH0-C(F8/H9/K0*) | 1Gb (128M x8) * 18 | Lead Free & Halogen Free | 1066/1333/1600 | 2     | Now        |
|         |         |              | M391B5773FH0-C(F8/H9/K0*) | 2Gb (256M x8) * 9  | Lead Free & Halogen Free | 1066/1333/1600 | 1     | Now        |
| 4GB     | 1.5V    | 512Mx72      | M391B5273CH0-C(F8/H9/K0*) | 2Gb (256M x8) * 18 | Lead Free & Halogen Free | 1066/1333/1600 | 2     | Now        |
| 8GB     | 1.5V    | 1024Mx72     | M391B1G73AH0-C(F8/H9/K0*) | 4Gb (512M x8) * 18 | Lead Free & Halogen Free | 1066/1333/1600 | 2     | Now        |
| 1GB     | 1.35V   | 128Mx72      | M391B2873FH0-Y(F8/H9/K0*) | 1Gb (128M x8) * 9  | Lead Free & Halogen Free | 1066/1333/1600 | 1     | Now        |
| 2GB     | 1.35V   | 256Mx72      | M391B5673FH0-Y(F8/H9/K0*) | 1Gb (128M x8) * 18 | Lead Free & Halogen Free | 1066/1333/1600 | 2     | Now        |
|         |         |              | M391B5773FH0-Y(F8/H9/K0*) | 2Gb (256M x8) * 9  | Lead Free & Halogen Free | 1066/1333/1600 | 1     | Now        |
| 4GB     | 1.35V   | 512Mx72      | M391B5273CH0-Y(F8/H9/K0*) | 2Gb (256M x8) * 18 | Lead Free & Halogen Free | 1066/1333/1600 | 2     | Now        |
| 8GB     | 1.35V   | 1024Mx72     | M391B1G73AH0-Y(F8/H9/K0*) | 4Gb (512M x8) * 18 | Lead Free & Halogen Free | 1066/1333/1600 | 2     | Now        |

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

K0 = DDR3-1600 (11-11-11)  
\* K0 (1600Mbps) available in ES only

## DDR3 SDRAM SODIMM MODULES

| Density | Voltage | Organization | Part Number               | Composition        | Compliance               | Speed (Mbps)   | Ranks | Production |
|---------|---------|--------------|---------------------------|--------------------|--------------------------|----------------|-------|------------|
| 1GB     | 1.5V    | 128Mx64      | M471B2873FHS-C(F8/H9/K0*) | 1Gb (128M x8) * 8  | Lead Free & Halogen Free | 1066/1333/1600 | 1     | Now        |
| 2GB     | 1.5V    | 256Mx64      | M471B5673FH0-C(F8/H9/K0*) | 1Gb (128M x8) * 16 | Lead Free & Halogen Free | 1066/1333/1600 | 2     | Now        |
|         |         |              | M471B5773FHS-C(F8/H9/K0*) | 2Gb (256M x8) * 8  | Lead Free & Halogen Free | 1066/1333/1600 | 1     | Now        |
| 4GB     | 1.5V    | 512Mx64      | M471B5273CH0-C(F8/H9/K0*) | 2Gb (256M x8) * 16 | Lead Free & Halogen Free | 1066/1333/1600 | 2     | Now        |
| 8GB     | 1.5V    | 1024Mx64     | M471B1G73AH0-C(F8/H9/K0*) | 4Gb (512M x8) * 16 | Lead Free & Halogen Free | 1066/1333/1600 | 2     | Now        |
| 1GB     | 1.35V   | 128Mx64      | M471B2873FHS-Y(F8/H9/K0*) | 1Gb (128M x8) * 8  | Lead Free & Halogen Free | 1066/1333/1600 | 1     | Now        |
| 2GB     | 1.35V   | 256Mx64      | M471B5673FH0-Y(F8/H9/K0*) | 1Gb (128M x8) * 16 | Lead Free & Halogen Free | 1066/1333/1600 | 2     | Now        |
|         |         |              | M471B5773FHS-Y(F8/H9/K0*) | 2Gb (256M x8) * 8  | Lead Free & Halogen Free | 1066/1333/1600 | 1     | Now        |
| 4GB     | 1.35V   | 512Mx64      | M471B5273CH0-Y(F8/H9/K0*) | 2Gb (256M x8) * 16 | Lead Free & Halogen Free | 1066/1333/1600 | 2     | Now        |
| 8GB     | 1.35V   | 1024Mx64     | M471B1G73AH0-Y(F8/H9/K0*) | 4Gb (512M x8) * 16 | Lead Free & Halogen Free | 1066/1333/1600 | 2     | Now        |

NOTES: F7 = DDR3-800 (6-6-6)  
F8 = DDR3-1066 (7-7-7)  
H9 = DDR3-1333 (9-9-9)  
K0 = DDR3-1600 (11-11-11)  
\* K0 (1600Mbps) available in ES only

## DDR3 SDRAM COMPONENTS

| Density | Voltage | Organization | Part Number                      | # Pins-Package | Compliance               | Speed (Mbps)   | Dimensions | Production |
|---------|---------|--------------|----------------------------------|----------------|--------------------------|----------------|------------|------------|
| 1Gb     | 1.5V    | 256M x4      | K4B1G0446F-HC(F8/H9)             | 78 Ball -FBGA  | Lead Free & Halogen Free | 1066/1333      | 7.5x11mm   | Now        |
|         |         | 128M x8      | K4B1G0846F-HC(F8/H9/K0*)         | 78 Ball -FBGA  | Lead Free & Halogen Free | 1066/1333/1600 | 7.5x11mm   | Now        |
| 2Gb     | 1.5V    | 512M x4      | K4B2G0446C-HC(F8/H9)             | 78 Ball -FBGA  | Lead Free & Halogen Free | 1066/1333      | 7.5x11mm   | Now        |
|         |         | 256M x8      | K4B2G0846C-HC(F8/H9/K0*)         | 78 Ball -FBGA  | Lead Free & Halogen Free | 1066/1333/1600 | 7.5x11mm   | Now        |
|         |         | 128M x16     | K4B2G1646C-HC(F8/H9/K0*/MA*/NB*) | 96 Ball -FBGA  | Lead Free & Halogen Free | 1066/1333/1600 | 7.5x13.3mm | Now        |
| 1Gb     | 1.35V   | 256M x4      | K4B1G0446F-HC(F8/H9)             | 78 Ball -FBGA  | Lead Free & Halogen Free | 1066/1333      | 7.5x11mm   | Now        |
|         |         | 128M x8      | K4B1G0846F-HC(F8/H9/K0*)         | 78 Ball -FBGA  | Lead Free & Halogen Free | 1066/1333/1600 | 7.5x11mm   | Now        |
| 2Gb     | 1.35V   | 512M x4      | K4B2G0446C-HC(F8/H9)             | 78 Ball -FBGA  | Lead Free & Halogen Free | 1066/1333      | 7.5x11mm   | Now        |
|         |         | 256M x8      | K4B2G0846C-HC(F8/H9/K0*)         | 78 Ball -FBGA  | Lead Free & Halogen Free | 1066/1333/1600 | 7.5x11mm   | Now        |

NOTES: F7 = DDR3-800 (6-6-6)  
F8 = DDR3-1066 (7-7-7)  
H9 = DDR3-1333 (9-9-9)  
K0 = DDR3-1600 (11-11-11)  
MA = DDR3-1866 (13-13-13)  
NB = DDR3-2133 (14-14-14)  
\* K0, MA, and NB are available in ES only

## DDR2 SDRAM REGISTERED MODULES

| Density | Organization | Part Number           | Composition  | Compliance | Speed (Mbps) | Register | Rank | Production |
|---------|--------------|-----------------------|--------------|------------|--------------|----------|------|------------|
| 1GB     | 128Mx72      | M393T2863FBA-C(E6/F7) | (128M x8)*9  | Lead free  | 667/800      | Y        | 1    | Now        |
| 2GB     | 256Mx72      | M393T5660FBA-C(E6/F7) | (256M x4)*18 | Lead free  | 667/800      | Y        | 1    | Now        |
|         |              | M393T5663FBA-C(E6/E7) | (128M x8)*18 | Lead free  | 667/800      | Y        | 2    | Now        |
| 4GB     | 512Mx72      | M393T5160FBA-C(E6/F7) | (256M x4)*36 | Lead free  | 667/800      | Y        | 2    | Now        |

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

## DDR2 SDRAM VLP REGISTERED MODULES

| Density | Organization | Part Number      | Composition  | Compliance | Speed (Mbps) | Register | Rank | Production |
|---------|--------------|------------------|--------------|------------|--------------|----------|------|------------|
| 2GB     | 256Mx72      | M392T5660FBA-CE6 | (256M x4)*18 | Lead free  | 667          | 667      | Y    | 1          |

## DDR2 SDRAM FULLY BUFFERED MODULES

| Density | Organization | Part Number       | Composition  | Compliance | Speed (Mbps) | Voltage | Rank | Production |
|---------|--------------|-------------------|--------------|------------|--------------|---------|------|------------|
| 2GB     | 256Mx72      | M395T5663FB4-CE68 | (128M x8)*18 | Lead free  | 667          | 1.8V    | 2    | Now        |
| 4GB     | 512Mx72      | M395T5160FB4-CE68 | (256M x4)*36 | Lead free  | 667          | 1.8V    | 2    | Now        |
|         | 512Mx72      | M395T5163FB4-CE68 | (128M x8)*36 | Lead free  | 667          | 1.8V    | 4    | Now        |

NOTES: E6 = PC2-5300 (DDR2-667 @ CL=5)  
 AMB = IDT L4  
 Voltage = 1.8V (AMB Voltage = 1.5V)

## DDR2 SDRAM UNBUFFERED MODULES

| Density | Organization | Part Number              | Composition  | Compliance | Speed (Mbps) | Rank | Production |
|---------|--------------|--------------------------|--------------|------------|--------------|------|------------|
| 1GB     | 128Mx64      | M378T2863FB3-C(E6/F7/E7) | (128M x8)*8  | Lead free  | 667/800      | 1    | Now        |
| 2GB     | 256Mx64      | M378T5663FB3-C(E6/F7/E7) | (128M x8)*16 | Lead free  | 667/800      | 2    | Now        |

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

## DDR2 SDRAM UNBUFFERED MODULES (ECC)

| Density | Organization | Part Number           | Composition | Compliance | Speed (Mbps) | Rank | Production |
|---------|--------------|-----------------------|-------------|------------|--------------|------|------------|
| 1GB     | 128Mx72      | M391T2863FB3-C(E6/F7) | (128Mx8)*9  | Lead free  | 667/800      | 1    | Now        |
| 2GB     | 256Mx64      | M391T5663FB3-C(E6/F7) | (128Mx8)*18 | Lead free  | 667/800      | 2    | Now        |

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

## DDR2 SDRAM SODIMM MODULES

| Density | Organization | Part Number              | Composition | Compliance | Speed (Mbps) | Rank | Production |
|---------|--------------|--------------------------|-------------|------------|--------------|------|------------|
| 1GB     | 128Mx64      | M470T2863FB3-C(E6/F7/E7) | (64Mx16)*8  | Lead free  | 667/800      | 2    | Now        |
| 2GB     | 256Mx64      | M470T5663FB3-C(E6/F7/E7) | (128M x8)*8 | Lead free  | 667/800      | 2    | Now        |

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

## DDR2 SDRAM COMPONENTS

| Density | Organization | Part Number                | # Pins-Package | Dimensions | Package                  | Speed (Mbps) | Production |
|---------|--------------|----------------------------|----------------|------------|--------------------------|--------------|------------|
| 256Mb   | 16Mx16       | K4T56163QN-HC(E6/F7/E7/F8) | 84-FBGA        | 7.5x12.5mm | Lead free & Halogen free | 667/800/1066 | Now        |
| 512Mb   | 128M x4      | K4T51043QI-HC(E6/F7/E7)    | 60-FBGA        | 7.5x9.5mm  | Lead free & Halogen free | 667/800      | Now        |
|         | 64M x8       | K4T51083QI-HC(E6/F7/E7/F8) | 60-FBGA        | 7.5x9.5mm  | Lead free & Halogen free | 667/800/1066 | Now        |
|         | 32M x16      | K4T51163QI-HC(E6/F7/E7/F8) | 84-FBGA        | 7.5x12.5mm | Lead free & Halogen free | 667/800/1066 | Now        |
|         | 128M x4      | K4T51043QJ-HC(E6/F7/E7)    | 60-FBGA        | 7.5x9.5mm  | Lead free & Halogen free | 667/800      | Q3         |
|         | 64M x8       | K4T51083QJ-HC(E6/F7/E7/F8) | 60-FBGA        | 7.5x9.5mm  | Lead free & Halogen free | 667/800/1066 | Q3         |
|         | 32M x16      | K4T51163QJ-HC(E6/F7/E7/F8) | 84-FBGA        | 7.5x12.5mm | Lead free & Halogen free | 667/800/1066 | Q3         |
| 1Gb     | 256M x4      | K4T1G044QF-BC(E6/F7/E7)    | 68-FBGA        | 7.5x9.5mm  | Lead free & Halogen free | 667/800      | Now        |
|         | 128M x8      | K4T1G084QF-BC(E6/F7/E7/F8) | 68-FBGA        | 7.5x9.5mm  | Lead free & Halogen free | 667/800/1066 | Now        |
|         | 64M x16      | K4T1G164QF-BC(E6/F7/E7/F8) | 84-FBGA        | 7.5x12.5mm | Lead free & Halogen free | 667/800/1066 | Now        |

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

## DDR SDRAM 1U REGISTERED MODULES

| Density | Organization | Part Number      | Composition | Speed (Mbps) |
|---------|--------------|------------------|-------------|--------------|
| 1GB     | 128Mx72      | M312L2920GH3-CB3 | (128Mx4)*18 | 333/400      |
| 2GB     | 256Mx72      | M312L5720GH3-CB3 | (128Mx4)*36 | 333/400      |

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

## DDR DRAM SODIMM MODULES

| Density | Organization | Part Number        | Composition  | Speed (Mbps) |
|---------|--------------|--------------------|--------------|--------------|
| 512MB   | 64Mx64       | M470L6524GL0-CB300 | (32M x 16)*8 | 333          |

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

## DDR SDRAM COMPONENTS

| Density | Organization | Part Number        | # Pins - Package | Speed (Mbps) |
|---------|--------------|--------------------|------------------|--------------|
| 256Mb   | 64Mx4        | K4H560438N-LCB3/B0 | 66-TSOP          | 266/333      |
|         | 32Mx8        | K4H560838N-LCCC/B3 | 66-TSOP          | 333/400      |
|         | 16Mx16       | K4H561638N-LCCC/B3 | 66-TSOP          | 333/400      |
| 512Mb   | 128Mx4       | K4H510438G-LCB3/B0 | 66-TSOP          | 266/333      |
|         |              | K4H510438G-HCCC/B3 | 60-FBGA          | 333/400      |
|         | 64Mx8        | K4H510838G-LCCC/B3 | 66-TSOP          | 333/400      |
|         |              | K4H510838G-HCCC/B3 | 60-FBGA          | 333/400      |
|         | 32Mx16       | K4H511638G-LCCC/B3 | 66-TSOP          | 333/400      |
| 128Mb   | 8Mx16        | K4H2816380-LCCC    | 66-TSOP          | 400          |

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

## SDRAM COMPONENTS

| Density | Organization | Part Number                | # Pins - Package | Speed (Mbps) | Refresh | Remarks                 |
|---------|--------------|----------------------------|------------------|--------------|---------|-------------------------|
| 64Mb    | 8Mx8         | K4S640832N-LC75000         | 54-TSOP          | 133          | 4K      | EOL with no replacement |
|         | 4Mx16        | K4S641632N-LC(L)(75/60)000 | 54-TSOP          | 133/166      | 4K      | EOL with no replacement |
| 128Mb   | 16Mx8        | K4S2808320-LC(L)75000      | 54-TSOP          | 133          | 4K      |                         |
|         | 8Mx16        | K4S2816320-LC(L)(75/60)000 | 54-TSOP          | 133/166      | 4K      |                         |
| 256Mb   | 64Mx4        | K4S560432N-LC(L)75000      | 54-TSOP          | 133          | 8K      |                         |
|         | 32Mx8        | K4S560832N-LC(L)75000      | 54-TSOP          | 133          | 8K      |                         |
|         | 16Mx16       | K4S561632N-LC(L)(75/60)000 | 54-TSOP          | 133/166      | 8K      |                         |
| 512Mb   | 128Mx4       | K4S510432D-UC(L)(75)000    | 54-TSOP          | 133          | 8K      | EOL with no replacement |
|         | 64Mx8        | K4S510832D-UC(L)(75)000    | 54-TSOP          | 133          | 8K      | EOL with no replacement |
|         | 32Mx16       | K4S511632D-UC(L)(75)000    | 54-TSOP          | 133          | 8K      | EOL with no replacement |

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  | Note          |
|---------|--------------|--------------------|--------------|----------------|----------|---------------|
| 288M    | x18          | K4R881869I-DCT9000 | 1066         | 92-FBGA        | 16K/32ms | EOL in Aug'10 |

NOTES: All products are lead free

## GRAPHICS DRAM COMPONENTS

| Type  | Density | Organization | Part Number      | Package   | VDD/VDDQ   | Speed Bin (MHz)   | Status         |
|-------|---------|--------------|------------------|-----------|------------|-------------------|----------------|
| GDDR5 | 1Gb     | 32Mx32       | K4G10325FE-HC(1) | 170-FBGA  | 1.5/1.5V   | 1800/2000/2500    |                |
| GDDR3 | 1Gb     | 32Mx32       | K4J10324KE-HC(1) | 136-FBGA  | 1.8V/1.8V  | 700/800/1000/1200 |                |
|       | 512Mb   | 16Mx32       | K4J52324QH-HC(1) | 136-FBGA  | 1.8/1.8V   | 700/800           | EOL Mar '10    |
|       |         |              | K4J52324QH-HJ(1) | 136-FBGA  | 1.9/1.9V   | 1000              | EOL Mar '10    |
|       |         |              | K4J52324QH-HJ(1) | 136-FBGA  | 2.05/2.05V | 1200              | EOL Mar '10    |
| GDDR2 | 1Gb     | 64Mx16       | K4N1G164QE-HC(1) | 84-FBGA   | 1.8/1.8V   | 400/500           | EOL Mar '10    |
|       | 512Mb   | 32Mx16       | K4N51163QG-HC(1) | 84-FBGA   | 1.8/1.8V   | 400/500           | EOL Mar '10    |
| GDDR1 | 128Mb   | 4Mx32        | K4D263238K-VC(1) | 144-FBGA  | 2.5/2.5V   | 200/250           | CuSmpl Oct '09 |
|       |         |              | K4D263238K-UC(1) | 100-TQFP  | 2.5/2.5V   | 200/250           |                |
|       |         | 8Mx16        | K4D261638K-LC(1) | 66-TSOPII | 2.5/2.5V   | 200/250           | EOL Sep '10    |

NOTES: **Package:**  
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)

**(1) Speeds (clock cycle - speed bin):**  
04: 0.4ns (2500MHz) 1A: 1ns (1000MHz) 22: 2.2ns (450MHz)  
05: 0.5ns (2000MHz) 11: 1.1ns (900MHz) 25: 2.5ns (400MHz)  
5C: 0.555 (1800MHz) 12: 1.25ns (800MHz) 2A: 2.86ns (350MHz)  
07: 0.71ns (1400MHz) 14: 1.429ns (700MHz) 33: 3.3ns (300MHz)  
08: 0.83ns (1200MHz) 16: 1.667ns (600MHz) 40: 4.0ns (240MHz)  
09: 0.90ns (1100MHz) 20: 2.0ns (500MHz) 50: 5.0ns (200MHz)

## MOBILE-SDR/DDR

| Density | Type | Organization    | Part Number      | Package                  | Power | Production |
|---------|------|-----------------|------------------|--------------------------|-------|------------|
| 256Mb   | MSDR | 16Mx16          | K4M56163PN-BG(1) | 54-FBGA                  | 1.8V  | Now        |
|         |      | 8Mx32           | K4M56323PN-HG(1) | 90-FBGA                  | 1.8V  | Now        |
|         | MDDR | 16Mx16          | K4X56163PN-FG(1) | 60-FBGA                  | 1.8V  | Now        |
|         |      | 8Mx32           | K4X56323PN-8G(1) | 90-FBGA                  | 1.8V  | Now        |
| 512Mb   | MSDR | 32Mx16          | K4M51163PI-BG(1) | 54-FBGA                  | 1.8V  | Now        |
|         |      | 16Mx32          | K4M51323PI-HG(1) | 90-FBGA                  | 1.8V  | Now        |
|         | MDDR | 32Mx16          | K4X51163PI-FG(1) | 60-FBGA                  | 1.8V  | Now        |
|         |      | 16Mx32          | K4X51323PI-8G(1) | 90-FBGA                  | 1.8V  | Now        |
| 1Gb     | MDDR | 64Mx16          | K4X1G163PE-FG(1) | 60-FBGA                  | 1.8V  | Now        |
|         |      | 32Mx32          | K4X1G323PE-8G(1) | 90-FBGA                  | 1.8V  | Now        |
|         |      | 64Mx16          | K4X1G163PF-FG(1) | 60-FBGA                  | 1.8V  | MP Q1'11   |
|         |      | 32Mx32          | K4X1G323PF-8G(1) | 90-FBGA                  | 1.8V  | MP Q1'11   |
| 2Gb     | MDDR | 128Mx16         | K4X2G163PC-FG(1) | 60-FBGA                  | 1.8V  | Now        |
|         |      | 64Mx32          | K4X2G323PC-8G(1) | 90-FBGA                  | 1.8V  | Now        |
| 4Gb     | MDDR | x32 (2CS, 2CKE) | K4X4G303PB-AG(1) | 168-FBGA, 12x12 PoP, DDP | 1.8V  | Now        |
|         |      | x32 (2CS, 2CKE) | K4X4G303PB-AG(1) | 168-FBGA, 12x12 PoP, DDP | 1.8V  | Now        |
|         |      | x32 (2CS, 2CKE) | K4X4G303PB-7G(1) | 240-FBGA, 14x14 PoP, DDP | 1.8V  | Now        |

## LPDDR2

| Density | Type   | Organization | Part Number      | Package                  | Power | Production |
|---------|--------|--------------|------------------|--------------------------|-------|------------|
| 512Mb   | LPDDR2 | 1CH x32      | K4P51323EI-AG(1) | 168-FBGA, 12x12 PoP      | 1.8V  | Now        |
| 1Gb     | LPDDR2 | 1CH x32      | K4P1G324EE-AG(1) | 168-FBGA, 12x12 PoP      | 1.2V  | Now        |
| 2Gb     | LPDDR2 | 1CH x32      | K4P2G324EC-AG(1) | 168-FBGA, 12x12 PoP      | 1.2V  | Now        |
|         |        | 2CH x32/ch   | K3PE3E300M-XG(1) | 216-FBGA, 12x12 PoP      | 1.2V  | Now        |
|         |        |              | K3PE3E300A-XG(1) | 240-FBGA, 14x14 PoP      | 1.2V  | Now        |
| 4Gb     | LPDDR2 | 1CH x32      | K4P4G304EC-AG(1) | 168-FBGA, 12x12 PoP, DDP | 1.2V  | Now        |
|         |        | 2CH x32/ch   | K3PE4E400M-XG(1) | 216-FBGA, 12x12 PoP, DDP | 1.2V  | Now        |
|         |        |              | K3PE4E400M-XG(1) | 216-FBGA, 12x12 PoP, DDP | 1.2V  | Now        |
|         |        |              | K3PE4E400A-XG(1) | 240-FBGA, 14x14 PoP, DDP | 1.2V  | Now        |

NOTES: All products offered at Extended, Low, i-TCSR & PASR & DS (Temp, Power)

### (1) Speed:

#### Mobile-SDR

60: 166MHz, CL3

75: 133MHz, CL3

#### Mobile-DDR

D8: 200MHz, CL3

C6: 166MHz, CL3

#### LPDDR2

C0: 667Mbps

C1: 800Mbps

## 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: SDDR2 SDRAM  
S: SDRAM  
T: DDR SDRAM  
U: GDDR4 SDRAM  
V: Mobile DDR SDRAM Power Efficient Address  
W: SDDR3 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: TSOP 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(Hologen Free & Lead Free)  
E: 100 FBGA(Hologen 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. &amp; Interface

- 1: 4K/64mxRef., 4Banks & SSTL-2
- 2 : 8K/ 64ms Ref., 4Banks & SSTL-2
- 2: 4K/ 64ms Ref., 4Banks & LVTTTL (SDR Only)
- 5: 8K/ 64ms Ref., 4Banks & LVTTTL (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 &amp; 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

## SLC FLASH

| Family      | Density    | Part Number     | Package Type    | Org. | Vol(V) | MOQ             |                 | Status |
|-------------|------------|-----------------|-----------------|------|--------|-----------------|-----------------|--------|
|             |            |                 |                 |      |        | Tray<br>-xxx0xx | T/R<br>-xxx0Txx |        |
| 16Gb Based  | 16Gb Mono  | K9FAG08U0M-HCB0 | BGA             | X8   | 3.3    | 960             | 1000            | E/S    |
|             |            | K9FAG08S0M-HCB0 | BGA             | X8   | 1.8    | 960             | 1000            | E/S    |
|             | 32Gb DDP   | K9KBG08U1M-HCB0 | BGA             | X8   | 3.3    | 960             | 1000            | E/S    |
|             |            | K9KBG08S1M-HCB0 | BGA             | X8   | 1.8    | 960             | 1000            | E/S    |
|             | 64Gb QDP   | K9WCG08U5M-HCB0 | BGA             | X8   | 3.3    | 960             | 1000            | E/S    |
|             |            | K9WCG08S5M-HCB0 | BGA             | X8   | 1.8    | 960             | 1000            | E/S    |
|             | 128Gb ODP  | K9QDG08U5M-HCB0 | BGA             | X8   | 3.3    | 960             | 1000            | E/S    |
|             |            | K9QDG08S5M-HCB0 | BGA             | X8   | 1.8    | 960             | 1000            | E/S    |
| 8Gb Based   | 64Gb DSP   | K9NCG08U5M-PCK0 | TSOP1           | x8   | 3.3    | 960             | 1000            | M/P    |
|             | 32Gb QDP   | K9WBG08U1M-PCB0 | TSOP1           | x8   | 3.3    | 960             | 1000            | M/P    |
|             |            | K9WBG08U1M-PIB0 | TSOP1           | x8   | 3.3    | 960             | 1000            | M/P    |
|             |            | K9KAG08U0M-PCB0 | TSOP1           | x8   | 3.3    | 960             | 1000            | M/P    |
|             | 16Gb DDP   | K9KAG08U0M-PIB0 | TSOP1           | x8   | 3.3    | 960             | 1000            | M/P    |
|             |            | K9F8G08U0M-PCB0 | TSOP1           | x8   | 3.3    | 960             | 1000            | M/P    |
| 4Gb Based   | 16Gb QDP   | K9F8G08U0M-PIB0 | TSOP1           | x8   | 3.3    | 960             | 1000            | M/P    |
|             |            | K9WAG08U1D-SCB0 | TSOP1 HF&LF     | x8   | 3.3    | 960             | 1000            | C/S    |
|             |            | K9WAG08U1D-SIB0 | TSOP1 HF&LF     | x8   | 3.3    | 960             | 1000            | C/S    |
|             |            | K9WAG08U1B-PCB0 | TSOP1           | x8   | 3.3    | 960             | 1000            | M/P    |
|             |            | K9WAG08U1B-PIB0 | TSOP1           | x8   | 3.3    | 960             | 1000            | M/P    |
|             | 8Gb DDP    | K9WAG08U1B-KIB0 | ULGA HF & LF    | x8   | 3.3    | 960             | 2000            | M/P    |
|             |            | K9K8G08U0D-SCB0 | TSOP1 HF&LF     | X8   | 3.3    | 960             | 1000            | C/S    |
|             |            | K9K8G08U0D-SIB0 | TSOP1 HF&LF     | x8   | 3.3    | 960             | 1000            | C/S    |
|             |            | K9K8G08U0B-PCB0 | TSOP1           | x8   | 3.3    | 960             | 1000            | M/P    |
|             |            | K9K8G08U0B-PIB0 | TSOP1           | x8   | 3.3    | 960             | 1000            | M/P    |
|             | 4Gb Mono   | K9K8G08U1B-KIB0 | ULGA HF & LF    | x8   | 3.3    | 960             | 2000            | M/P    |
|             |            | K9F4G08U0D-SCB0 | TSOP1 HF & LF   | x8   | 3.3    | 960             | 1000            | C/S    |
|             |            | K9F4G08U0D-SIB0 | TSOP1 HF& LF    | X8   | 3.3    | 960             | 1000            | C/S    |
|             |            | K9F4G08U0B-PCB0 | TSOP1           | x8   | 3.3    | 960             | 1000            | M/P    |
|             |            | K9F4G08U0B-PIB0 | TSOP1           | x8   | 3.3    | 960             | 1000            | M/P    |
|             |            | K9F4G08U0B-KIB0 | ULGA HF & LF    | x8   | 3.3    | 960             | 2000            | M/P    |
|             |            | K9F2G08U0C-SCB0 | TSOP-LF/HF      | x8   | 3.3    | 960             | 1000            | C/S    |
| 2Gb Based   | 2Gb Mono   | K9F2G08U0C-SIB0 | TSOP-LF/HF      | x8   | 3.3    | 960             | 1000            | C/S    |
|             |            | K9F2G08U0B-PCB0 | TSOP1           | x8   | 3.3    | 960             | 1000            | M/P    |
|             |            | K9F2G08U0B-PIB0 | TSOP1           | x8   | 3.3    | 960             | 1000            | M/P    |
|             |            | K9F1G08U0D-SCB0 | TSOP-LF/HF      | x8   | 3.3    | 960             | 1000            | C/S    |
| 1Gb Based   | 1Gb Mono   | K9F1G08U0D-SIB0 | TSOP-LF/HF      | x8   | 3.3    | 960             | 1000            | C/S    |
|             |            | K9F1G08U0C-PCB0 | TSOP1           | x8   | 3.3    | 960             | 1000            | M/P    |
|             |            | K9F1G08U0C-PIB0 | TSOP1           | x8   | 3.3    | 960             | 1000            | M/P    |
|             |            | K9F1208U0C-PCB0 | TSOP1           | x8   | 3.3    | 960             | 1000            | M/P    |
| 512Mb Based | 512Mb Mono | K9F1208U0C-PIB0 | TSOP1           | x8   | 3.3    | 960             | 1000            | M/P    |
|             |            | K9F1208R0C-JIB0 | 63 FBGA(8.5x13) | x8   | 1.8    | 1120            | -               | M/P    |
|             |            | K9F1208U0C-JIB0 | 63 FBGA(8.5x13) | x8   | 3.3    | 1120            | -               | M/P    |
|             |            | K9F5608U0D-PCB0 | TSOP1           | x8   | 3.3    | 960             | 1000            | M/P    |
| 256Mb Based | 256Mb Mono | K9F5608U0D-PIB0 | TSOP1           | x8   | 3.3    | 1000            | 1000            | M/P    |
|             |            | K9F5608R0D-JIB0 | 63 FBGA(9x11)   | x8   | 1.8    | 1280            | 2000            | M/P    |
|             |            | K9F5608U0D-JIB0 | 63 FBGA(9x11)   | x8   | 3.3    | 1280            | 2000            | M/P    |
|             |            |                 |                 |      |        |                 |                 |        |

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

Note: All parts are lead free

## MLC FLASH

| Type | Family     | Density   | Technology | Part Number        | Package Type                    | Org. | Vol(V) | MOQ              |                 | Comments             |
|------|------------|-----------|------------|--------------------|---------------------------------|------|--------|------------------|-----------------|----------------------|
|      |            |           |            |                    |                                 |      |        | Tray<br>-xxxx0xx | T/R<br>-xxx0Txx |                      |
| 2bit | 32Gb Based | 32Gb Mono | 27nm       | K9HDG08U1A-SCB0    | TSOP - Lead free & Halogen free | x8   | 3.3    | 960              | 1000            |                      |
|      |            | 64Gb DDP  | 27nm       | K9LCG08U0A-SCB0    | TSOP - Lead free & Halogen free | x8   | 3.3    | 960              | 1000            |                      |
|      |            | 128Gb QDP | 27nm       | K9GBG08U0A-SCB0    | TSOP - Lead free & Halogen free | x8   | 3.3    | 960              | 1000            |                      |
|      | 16Gb Based | 16Gb Mono | 32nm       | K9GAG08U0E-SCB0    | TSOP - Lead free & Halogen free | x8   | 3.3    | 960              | 1000            |                      |
|      |            | 32Gb DDP  | 32nm       | K9LBG08U0E-SCB0    | TSOP - Lead free & Halogen free | x8   | 3.3    | 960              | 1000            |                      |
|      |            | 64Gb QDP  | 32nm       | K9HCG08U1E-SCB0    | TSOP - Lead free & Halogen free | x8   | 3.3    | 960              | 1000            |                      |
|      | 8Gb Based  | 8Gb Mono  | 32nm       | K9G8G08U0C-SCB0    | TSOP - Lead free & Halogen free | x8   | 3.3    | 960              | 1000            |                      |
| 3bit | 32Gb Based | 32Gb mono | 32nm       | K9CDG08U5A-MCB0001 | LGA - Lead free & Halogen free  | x8   | 3.3    | 840              | -               | Moving to 2xnm Q3'10 |
|      |            | 64Gb DDP  | 32nm       | K9BCG08U1A-MCB0001 | LGA - Lead free & Halogen free  | x8   | 3.3    | 840              | -               | Moving to 2xnm Q3'10 |
|      |            | 128Gb QDP | 32nm       | K9ABG08U0A-MCB0001 | LGA - Lead free & Halogen free  | x8   | 3.3    | 840              | -               | Moving to 2xnm Q3'10 |

Please contact your local Samsung sales representative for latest product offerings.  
Note: All parts are lead free

## SD and MicroSD FLASH CARDS

| Application  | Density | Controller                                                               |
|--------------|---------|--------------------------------------------------------------------------|
| SD Card      | 2GB     | Contact your local Samsung rep for availability and ordering information |
|              | 4GB     |                                                                          |
|              | 8GB     |                                                                          |
|              | 16GB    |                                                                          |
| MicroSD Card | 2GB     | Contact your local Samsung rep for availability and ordering information |
|              | 4GB     |                                                                          |
|              | 8GB     |                                                                          |
|              | 16GB    |                                                                          |
|              | 32GB    |                                                                          |

Please contact your local Samsung sales representative for latest product offerings.  
Note: All parts are lead free

## SOLID STATE DRIVES (SSD)

| Interface        | Size  | Connector | Controller       | Comp.                     | Capacity | Part Number        |
|------------------|-------|-----------|------------------|---------------------------|----------|--------------------|
| SATA II (Native) | 2.5"  | Thin SATA | MAX              | 16Gb                      | 64GB     | MZ5PA064HMCD-0A000 |
|                  |       |           |                  |                           | 128GB    | MZ5PA128HMCD-0A000 |
|                  |       |           |                  |                           | 256GB    | MZ5PA256HMDR-0A000 |
|                  |       |           | TMDDR Controller | 32Gb Toggle-Mode DDR NAND | 512GB    | Contact Sales      |
| SATA II (Native) | mSATA | mSATA     | MAX              | 16Gb                      | 32GB     | MZMPA032HMCD-00000 |
|                  |       |           |                  |                           | 64GB     | MZMPA064HMDR-00000 |
|                  |       |           |                  |                           | 128GB    | MZMPA128HMFU-00000 |

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)

## NtRAM

| Type       | Density | Organization | Part Number | Package           | Operating Mode | Vdd (V)  | Access Time tCD (ns) | Speed tCYC (MHz) | I/O Voltage (V) | Production Status   |
|------------|---------|--------------|-------------|-------------------|----------------|----------|----------------------|------------------|-----------------|---------------------|
| NtRAM      | 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        | K7M323635C  | 100-TQFP          | FT             | 3.3, 2.5 | 7.5                  | 118              | 3.3, 2.5        | Mass Production     |
|            |         | 2Mx18        | K7M321835C  | 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                    | 200              | 3.3, 2.5        | Not for new designs |
|            |         | 256Kx18      | K7N401809B  | 100-TQFP          | SPB            | 3.3      | 3                    | 200              | 3.3, 2.5        | Not for new designs |
| SPB and FT | 4Mb     | 256Kx18      | K7B401825B  | 100-TQFP          | SB             | 3.3      | 6.5                  | 133              | 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 SRAM

| Density | Organization | Part Number | Package | Operating Mode | Vdd (V)    | Access Time tCD (ns) | Speed tCYC (MHz) | I/O Voltage (V) | Production Status |
|---------|--------------|-------------|---------|----------------|------------|----------------------|------------------|-----------------|-------------------|
| 32Mb    | 1Mx36        | K7P323674C  | 119-BGA | SP             | 1.8 / 2.5V | 1.6, 2.0             | 300,250          | 1.5 (Max 1.8)   | Mass Production   |
|         | 2Mx18        | K7P321874C  | 119-BGA | SP             | 1.8 / 2.5V | 1.6, 2.0             | 300,250          | 1.5 (Max 1.8)   | Mass Production   |
| 8Mb     | 256Kx36      | K7P803611B  | 119-BGA | SP             | 3.3        | 1.6                  | 300              | 1.5 (Max.2.0)   | Mass Production   |
|         | 512Kx18      | K7P801811B  | 119-BGA | SP             | 3.3        | 1.6                  | 300              | 1.5 (Max.2.0)   | Mass Production   |
|         | 256Kx36      | K7P803666B  | 119-BGA | SP             | 2.5        | 2                    | 250              | 1.5 (Max.2.0)   | Mass Production   |
|         | 512Kx18      | K7P801866B  | 119-BGA | SP             | 2.5        | 2                    | 250              | 1.5 (Max.2.0)   | Mass Production   |

## DDR SYNCHRONOUS SRAM

| Type            | Density | Organization | Part Number | Package  | Vdd (V) | Access Time tCD (ns) | Cycle Time (MHz) | I/O Voltage (V) | Production Status   | Comments                           |
|-----------------|---------|--------------|-------------|----------|---------|----------------------|------------------|-----------------|---------------------|------------------------------------|
| DDR             | 16Mb    | 512Kx36      | K7D163674B  | 153-BGA  | 1.8~2.5 | 2.3                  | 330, 300         | 1.5~1.9         | Mass Production     |                                    |
|                 |         | 1Mx18        | K7D161874B  | 153-BGA  | 1.8~2.5 | 2.3                  | 330, 300         | 1.5~1.9         | Mass Production     |                                    |
|                 | 8Mb     | 256Kx36      | K7D803671B  | 153-BGA  | 2.5     | 1.7/1.9/2.1          | 333, 330, 250    | 1.5 (Max 2.0)   | Not for new designs |                                    |
|                 |         | 512Kx18      | 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    | 4Mx18        | 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                             |
|                 |         | 2Mx36        | 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    | 2Mx18        | K7I321882C  | 165-FBGA | 1.8     | 0.45                 | 300,250          | 1.5,1.8         | Mass Production     | CIO-2B                             |
|                 |         |              | K7I321884C  | 165-FBGA | 1.8     | 0.45                 | 300,250          | 1.5,1.8         | Mass Production     | CIO-4B                             |
|                 |         |              | K7J321882C  | 165-FBGA | 1.8     | 0.45                 | 300,250          | 1.5,1.8         | Mass Production     | SIO-2B                             |
|                 |         | 1Mx36        | K7I323682C  | 165-FBGA | 1.8     | 0.45                 | 300,250          | 1.5,1.8         | Mass Production     | CIO-2B                             |
|                 |         |              | K7I323684C  | 165-FBGA | 1.8     | 0.45                 | 300,250          | 1.5,1.8         | Mass Production     | CIO-4B                             |
|                 |         |              | K7J323682C  | 165-FBGA | 1.8     | 0.45                 | 300,250          | 1.5,1.8         | Mass Production     | SIO-2B                             |
|                 | 18Mb    | 1Mx18        | 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                             |
|                 |         | 512Kx36      | K7J163682B  | 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    | 2Mx18        | K7K3218T2C  | 165-FBGA | 1.8     | 0.45                 | 400, 333         | 1.5             | Mass Production     | DDRII + CIO-2B, 2 clocks latency   |
|                 |         |              | K7K3218U2C  | 165-FBGA | 1.8     | 0.45                 | 400, 334         | 2.5             | Mass Production     | DDRII + CIO-2B, 2.5 clocks latency |
|                 |         | 1Mx36        | K7K3236T2C  | 165-FBGA | 1.8     | 0.45                 | 400, 333         | 1.5             | Mass Production     | DDRII + CIO-2B, 2 clocks latency   |
|                 |         |              | K7K3236U2C  | 165-FBGA | 1.8     | 0.45                 | 400, 334         | 2.5             | Mass Production     | DDRII + CIO-2B, 2.5 clocks latency |
|                 | 18Mb    | 1Mx18        | K7K1618T2C  | 165-FBGA | 1.8     | 0.45                 | 400, 333         | 1.5             | Mass Production     | DDRII + CIO-2B, 2 clocks latency   |
|                 |         |              | K7K1618U2C  | 165-FBGA | 1.8     | 0.45                 | 400, 334         | 2.5             | Mass Production     | DDRII + CIO-2B, 2.5 clocks latency |
|                 |         | 512Kx36      | K7K1636T2C  | 165-FBGA | 1.8     | 0.45                 | 400, 333         | 1.5             | Mass Production     | DDRII + CIO-2B, 2 clocks latency   |
|                 |         |              | K7K1636U2C  | 165-FBGA | 1.8     | 0.45                 | 400, 334         | 2.5             | Mass Production     | DDRII + CIO-2B, 2.5 clocks latency |

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 instad 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

## QDR SYNCHRONOUS SRAM

| Type    | Density | Organization | Part Number | Package  | Vdd (V)     | Access Time tCD (ns) | Cycle Time      | I/O Voltage (V) | Production Status | Comments                        |
|---------|---------|--------------|-------------|----------|-------------|----------------------|-----------------|-----------------|-------------------|---------------------------------|
| QDR I   | 18Mb    | 1Mx18        | 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                      |
|         |         | 512Kx36      | 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  | 72Mb    | 8Mx9         | 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                       |
|         |         | 4Mx18        | 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                       |
|         |         | 2Mx36        | 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                       |
|         |         |              | K7R320982C  | 165-FBGA | 1.8         | 0.45                 | 167, 250, 200   | 1.5,1.8         | Mass Production   | QDR II-2B                       |
|         | 36Mb    | 2Mx18        | K7R321882C  | 165-FBGA | 1.8         | 0.45                 | 167, 250, 200   | 1.5,1.8         | Mass Production   | QDR II-2B                       |
|         |         |              | K7R321884C  | 165-FBGA | 1.8         | 0.45                 | 200, 300, 250   | 1.5,1.8         | Mass Production   | QDR II-4B                       |
|         |         | 1Mx36        | 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                 | 200, 300, 250   | 1.5,1.8         | Mass Production   | QDR II-4B                       |
|         | 18Mb    | 2Mx9         | K7R160982B  | 165-FBGA | 1.8         | 0.45,0.45,0.50       | 250,200,167     | 1.5,1.8         | Mass Production   | QDR II - 2B                     |
|         |         |              | K7R161882B  | 165-FBGA | 1.8         | 0.45,0.45,0.50       | 250,200,167     | 1.5,1.8         | Mass Production   | QDR II - 2B                     |
|         |         | 1Mx18        | 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                     |
|         |         |              | K7R163682B  | 165-FBGA | 1.8         | 0.45,0.45,0.50       | 250,200,167     | 1.5,1.8         | Mass Production   | QDR II - 2B                     |
|         |         | 512Kx36      | 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                     |
|         |         |              | K7S3236T4C  | 165-FBGA | 1.8         | 0.45                 | 400, 333        | 1.5             | Mass Production   | QDR II + 4B, 2 clocks latency   |
| QDR II+ | 36Mb    | 1Mx36        | K7S3236U4C  | 165-FBGA | 1.8         | 0.45                 | 400, 334        | 2.5             | Mass Production   | QDR II + 4B, 2.5 clocks latency |
|         |         |              | K7S3218T4C  | 165-FBGA | 1.8         | 0.45                 | 400, 333        | 1.5             | Mass Production   | QDR II + 4B, 2 clocks latency   |
|         |         | 2Mx18        | K7S3218U4C  | 165-FBGA | 1.8         | 0.45                 | 400, 333        | 1.5             | Mass Production   | QDR II + 4B, 2.5 clocks latency |
|         |         |              | K7S1618T4C  | 165-FBGA | 1.8         | 0.45                 | 400, 333        | 1.5             | Mass Production   | QDR II + 4B, 2 clocks latency   |
|         | 18Mb    | 1Mx18        | K7S1618U4C  | 165-FBGA | 1.8         | 0.45                 | 400, 333        | 1.5             | Mass Production   | QDR II + 4B, 2.5 clocks latency |
|         |         | 512Kx36      | K7S1636U4C  | 165-FBGA | 1.8         | 0.45                 | 400, 333        | 1.5             | Mass Production   | QDR II + 4B, 2.5 clocks latency |

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  
 40: 4M  
 64: 72M

### 6~7. Organization

08: x8  
 18: x18  
 36: x36

### 8~9. Vcc, Interface, Mode

00: 3.3V,LVTTL,2E1D WIDE  
 01: 3.3V,LVTTL,2E2D WIDE  
 08: 3.3V,LVTTL,2E2D Hi SPEED  
 09: 3.3V,LVTTL,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,LVTTL,R-R  
 23: 3.3V,LVTTL,R-L  
 25: 3.3V,LVTTL,SB-FT WIDE  
 30: 1.8/2.5/3.3V,LVTTL,2E1D  
 31: 1.8/2.5/3.3V,LVTTL,2E2D  
 35: 1.8/2.5/3.3V,LVTTL,SB-FT  
 44: 2.5V,LVTTL,2E1D  
 45: 2.5V,LVTTL,2E2D

49: 2.5V,LVTTL,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)QPF  
 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

| Memory      | NAND Density | DRAM Density (Org.) | Voltages (NAND-DRAM) | MCP Package | PoP Package     |
|-------------|--------------|---------------------|----------------------|-------------|-----------------|
| NAND & DRAM | 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     | -               |

## MCP: OneNAND/DRAM

| Memory         | OneNAND Density | DRAM Density (Org.) | Voltages (NAND-DRAM) | MCP Package | PoP Package     |
|----------------|-----------------|---------------------|----------------------|-------------|-----------------|
| OneNAND & DRAM | 512Mb           | 256Mb (x32)         | 3.3V/1.8V - 1.8V     | 188FBGA     | 152FBGA         |
|                |                 | 512Mb (x16,x32)     | 1.8V - 1.8V          | 167/202FBGA | 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: Flex-OneNAND/DRAM

| Memory              | Flex-OneNAND Density | DRAM Density (Org.) | Voltages (NAND-DRAM) | MCP Package | PoP Package |
|---------------------|----------------------|---------------------|----------------------|-------------|-------------|
| Flex-OneNAND & DRAM | 8Gb                  | 2Gb (x32)           | 1.8V - 1.8V          | 202FBGA     | -           |

## MCP: OneNAND/DRAM/OneNAND

| Memory                   | Flex-OneNAND Density | DRAM Density (Org.) | Voltages (NAND-DRAM) | MCP Package | PoP Package |
|--------------------------|----------------------|---------------------|----------------------|-------------|-------------|
| OneNAND & DRAM & OneDRAM | 2Gb                  | 1Gb (x16)           | 1.8V - 1.8V          |             | 216FBGA     |

## MCP: moviNAND/NAND/DRAM

| Memory                 | movi & NAND Density | DRAM Density (Org.) | Voltages (NAND-DRAM) | MCP Package | Remark |
|------------------------|---------------------|---------------------|----------------------|-------------|--------|
| moviNAND & NAND & DRAM | 512Mb               | 256Mb(x16,x32)      | 2.7V/1.8V - 1.8V     | 107/137FBGA |        |
|                        |                     | 512Mb (x16,x32)     | 2.7V/1.8V - 1.8V     | 107/137FBGA |        |
|                        | 1Gb                 | 256Mb (x16,x32)     | 3.0V/1.8V - 1.8V     | 107/137FBGA |        |
|                        |                     | 512Mb (x16,x32)     | 2.7V/1.8V - 1.8V     | 107/137FBGA |        |
|                        |                     | 1Gb (x32)           | 1.8V - 1.8V          | 137FBGA     |        |
|                        | 2Gb                 | 512Mb (x16,x32)     | 1.8V - 1.8V          | 107/137FBGA |        |
|                        |                     | 1Gb (x16,x32)       | 1.8V - 1.8V          | 107/137FBGA |        |
|                        | 4Gb                 | 1Gb (x32)           | 2.7V - 1.8V          | 137FBGA     |        |

## MCP: NOR/UtRAM

| Memory      | NOR Density | UtRAM Density (Org.) | Voltages (NOR-UtRAM) | MCP Package | Remark |
|-------------|-------------|----------------------|----------------------|-------------|--------|
| NOR & UtRAM | 512Mb       | 128Mb                | 1.8V - 1.8V          | 107FBGA     |        |
|             | 256Mb       | 128Mb                | 1.8V - 1.8V          | 107FBGA     |        |
|             |             |                      | 1.8V - 1.8V          | 56FBGA      |        |
|             | 128Mb       | 64Mb                 | 1.8V - 1.8V          | 84/88FBGA   |        |
|             |             | 32Mb                 | 1.8V - 1.8V          | 84/88FBGA   |        |
|             |             |                      |                      |             |        |

## MCP: NOR/DRAM

| Memory     | NOR Density | DRAM Density (Org.) | Voltages (NOR-DRAM) | Package | Remark |
|------------|-------------|---------------------|---------------------|---------|--------|
| NOR & DRAM | 512Mb       | 128Mb (x16)         | 1.8V - 1.8V         | 103FBGA |        |
|            |             | 256Mb (x16)         | 1.8V - 1.8V         | 103FBGA |        |

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

Note: All parts are lead free

## moviNAND™

moviNAND combines 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.

| Density | Package Type | Org. | Vol (V) | Remarks                                                                                            |
|---------|--------------|------|---------|----------------------------------------------------------------------------------------------------|
| 2GB     | FBGA         | x8   | 1.8/3.3 | MMC 4.3 & MMC 4.4<br><br>Contact your local Samsung rep for availability and ordering information. |
| 4GB     | FBGA         | x8   | 1.8/3.3 |                                                                                                    |
| 8GB     | FBGA         | x8   | 1.8/3.3 |                                                                                                    |
| 16GB    | FBGA         | x8   | 1.8/3.3 |                                                                                                    |
| 32GB    | FBGA         | x8   | 1.8/3.3 |                                                                                                    |
| 64GB    | FBGA         | x8   | 1.8/3.3 |                                                                                                    |

Please contact your local Samsung sales representative for the 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 Type    | Org.                  | Vol (V) | Temp.    | Speed  |
|---------|----------------|-----------------|-----------------------|---------|----------|--------|
| 512Mb   | KJA51Z23PC-AAO | 216FBGA (14x14) | A-port: x16 (SDR/DDR) | 1.8V    | extended | 133MHz |
|         |                |                 | B-port: x16 (SDR/DDR) |         |          |        |
|         | KJA51Y23PC-AAO | 152FBGA (14x14) | A-port: x16 (SDR/DDR) |         |          |        |
|         |                |                 | B-port: x16 (SDR/DDR) |         |          |        |
| 1Gb     | KJA1GW25PD-EAO | 240FBGA (14x14) | A-port: x32SDR        | 1.8V    | extended | 166MHz |
|         |                |                 | B-port: x32DDR"       |         |          |        |
|         | KJA1GZ45PD-EAO |                 | A-port: x16DDR        |         |          |        |
|         |                |                 | B-port: x32DDR"       |         |          |        |
|         | KJA1GZ45PD-EAO |                 | A-port: x16DDR        |         |          |        |
|         |                |                 | B-port: x16DDR"       |         |          |        |
|         | KJA1GY25PD-EAO |                 | A-port: x16SDR        |         |          |        |
|         |                |                 | B-port: x32DDR"       |         |          |        |

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

Note: All parts are lead free

## 3.5" Hard Disk Drives

| Family | Capacity (GB) | RPM  | Interface     | Buffer | Sector | Model   |
|--------|---------------|------|---------------|--------|--------|---------|
| F1DT   | 80            | 7200 | SATA 3.0 Gbps | 8      | 512    | HD083GJ |
|        | 80            | 7200 | SATA 3.0 Gbps | 16     | 512    | HD084GJ |
|        | 160           | 7200 | SATA 3.0 Gbps | 8      | 512    | HD161GJ |
|        | 160           | 7200 | SATA 3.0 Gbps | 16     | 512    | HD162GJ |
|        | 250           | 7200 | SATA 3.0 Gbps | 8      | 512    | HD251HJ |
|        | 250           | 7200 | SATA 3.0 Gbps | 16     | 512    | HD252HJ |
|        | 320           | 7200 | SATA 3.0 Gbps | 8      | 512    | HD321HJ |
|        | 320           | 7200 | SATA 3.0 Gbps | 16     | 512    | HD322HJ |
|        | 500           | 7200 | SATA 3.0 Gbps | 8      | 512    | HD501IJ |
|        | 500           | 7200 | SATA 3.0 Gbps | 16     | 512    | HD502IJ |
|        | 640           | 7200 | SATA 3.0 Gbps | 16     | 512    | HD642JJ |
|        | 750           | 7200 | SATA-2        | 16     | 512    | HD752LJ |
|        | 750           | 7200 | SATA 3.0 Gbps | 32     | 512    | HD753LJ |
|        | 1 TB          | 7200 | SATA 3.0 Gbps | 16     | 512    | HD102UJ |
|        | 1 TB          | 7200 | SATA 3.0 Gbps | 32     | 512    | HD103UJ |
| F2EG   | 500           | 5400 | SATA 3.0 Gbps | 16     | 512    | HD502HI |
|        | 1 TB          | 5400 | SATA 3.0 Gbps | 32     | 512    | HD103SI |
|        | 1.5 TB        | 5400 | SATA 3.0 Gbps | 32     | 512    | HD154UI |
| F3     | 160           | 7200 | SATA 3.0 Gbps | 8      | 512    | HD164GJ |
|        | 250           | 7200 | SATA 3.0 Gbps | 8      | 512    | HD254GJ |
|        | 320           | 7200 | SATA 3.0 Gbps | 8      | 512    | HD324HJ |
|        | 160           | 7200 | SATA 3.0 Gbps | 16     | 512    | HD163GJ |
|        | 250           | 7200 | SATA 3.0 Gbps | 16     | 512    | HD253GJ |
|        | 320           | 7200 | SATA 3.0 Gbps | 16     | 512    | HD323HJ |
|        | 500           | 7200 | SATA 3.0 Gbps | 16     | 512    | HD502HJ |
|        | 750           | 7200 | SATA 3.0 Gbps | 32     | 512    | HD754JJ |
|        | 1TB           | 7200 | SATA 3.0 Gbps | 32     | 512    | HD103SJ |
| F3EG   | 250           | -    | SATA 3.0 Gbps | 16     | 512    | HD253GI |
|        | 320           | -    | SATA 3.0 Gbps | 16     | 512    | HD324HI |
|        | 500           | -    | SATA 3.0 Gbps | 16     | 512    | HD503HI |
|        | 750           | -    | SATA 3.0 Gbps | 32     | 512    | HD754JI |
|        | 1TB           | -    | SATA 3.0 Gbps | 32     | 512    | HD105SI |
|        | 1.5 TB        | -    | SATA 3.0 Gbps | 32     | 512    | HD153WI |
|        | 2 TB          | -    | SATA 3.0 Gbps | 32     | 512    | HD203WI |
| F4     | 160           | 7200 | SATA 3.0 Gbps | 8      | 512    | HD165GJ |
|        | 160           | 7200 | SATA 3.0 Gbps | 16     | 512    | HD166GJ |
|        | 250           | 7200 | SATA 3.0 Gbps | 8      | 512    | HD255GJ |
|        | 250           | 7200 | SATA 3.0 Gbps | 16     | 512    | HD255GJ |
|        | 320           | 7200 | SATA 3.0 Gbps | 16     | 512    | HD323HJ |

## 3.5" Enterprise RAID Drives

| Family | Capacity (GB) | RPM  | Interface     | Buffer | Sector | Model   |
|--------|---------------|------|---------------|--------|--------|---------|
| F1R    | 250           | 7200 | SATA 3.0 Gbps | 16     | 512    | HE252HJ |
|        | 320           | 7200 | SATA 3.0 Gbps | 16     | 512    | HE322HJ |
|        | 500           | 7200 | SATA 3.0 Gbps | 16     | 512    | HE502IJ |
|        | 640           | 7200 | SATA 3.0 Gbps | 16     | 512    | HE642JJ |
|        | 750           | 7200 | SATA 3.0 Gbps | 32     | 512    | HE753LJ |
|        | 1 TB          | 7200 | SATA 3.0 Gbps | 32     | 512    | HE103UJ |
| F3R    | 250           | 7200 | SATA 3.0 Gbps | 16     | 512    | HE253GJ |
|        | 500           | 7200 | SATA 3.0 Gbps | 16     | 512    | HE502HJ |
|        | 750           | 7200 | SATA 3.0 Gbps | 32     | 512    | HE754JJ |
|        | 1 TB          | 7200 | SATA 3.0 Gbps | 32     | 512    | HE103SJ |

## 2.5" Hard Disk Drives

| Family | Capacity (GB) | RPM  | Interface     | Buffer | Sector | Model   |
|--------|---------------|------|---------------|--------|--------|---------|
| M7E    | 160           | 5400 | SATA 3.0 Gbps | 8      | 512    | HM161GI |
|        | 250           | 5400 | SATA 3.0 Gbps | 8      | 512    | HM251HI |
|        | 320           | 5400 | SATA 3.0 Gbps | 8      | 512    | HM321HI |
|        | 500           | 5400 | SATA 3.0 Gbps | 8      | 512    | HM501JI |
|        | 640           | 5400 | SATA 3.0 Gbps | 8      | 512    | HM641JI |
| M7     | 120           | 5400 | SATA 3.0 Gbps | 8      | 512    | HM120JI |
|        | 160           | 5400 | SATA 3.0 Gbps | 8      | 512    | HM161JI |
|        | 250           | 5400 | SATA 3.0 Gbps | 8      | 512    | HM250II |
|        | 320           | 5400 | SATA 3.0 Gbps | 8      | 512    | HM320HI |
|        | 400           | 5400 | SATA 3.0 Gbps | 8      | 512    | HM400HI |
|        | 500           | 5400 | SATA 3.0 Gbps | 8      | 512    | HM500GI |
| MP4    | 250           | 7200 | SATA 3.0 Gbps | 16     | 512    | HM250HJ |
|        | 320           | 7200 | SATA 3.0 Gbps | 16     | 512    | HM320HJ |
|        | 500           | 7200 | SATA 3.0 Gbps | 16     | 512    | HM500JJ |
|        | 640           | 7200 | SATA 3.0 Gbps | 16     | 512    | HM640JJ |
| MT2    | 750           | 5400 | SATA 3.0 Gbps | 8      | 512    | HM750LI |
|        | 1 TB          | 5400 | SATA 3.0 Gbps | 8      | 512    | HM100UI |

## BD-COMBO

| Interface | Speed           | Type | Loading | Lightscribe | Model               |
|-----------|-----------------|------|---------|-------------|---------------------|
| SATA      | BD ROM READ 8X  | H/H  | Tray    | X           | TS-HB33A / SH-B083A |
|           |                 |      |         | 0           | TS-HB33L / SH-B083L |
|           | BD ROM READ 12X | H/H  | Tray    | X           | TS-HB43A / SH-B123A |
|           |                 |      |         | 0           | TS-HB43L / SH-B123L |
|           | BD-ROM READ 4X  | Slim | Tray    | X           | TS-LB23A / SN-B043A |
|           |                 |      |         |             | TS-LB23B            |
|           |                 |      |         |             | TS-LB23D            |
|           |                 |      | Slot    | 0           | TS-LB23L / SN-B043L |
|           |                 |      |         | 0           | TS-LB23P            |
|           |                 |      | Slot    | 0           | TS-TB23L            |

## DVD-W

| Interface | Speed         | Type       | Loading | Lightscribe | Model               |
|-----------|---------------|------------|---------|-------------|---------------------|
| SATA      | DVD Write 22X | H/H        | Tray    | X           | TS-H653G            |
|           | DVD Write 20X | H/H        | Tray    | X           | TS-H653H            |
|           | DVD Write 20X | H/H        | Tray    | X           | TS-H653J            |
| PATA      | DVD Write 22X | H/H        | Tray    | X           | TS-H662A / SH-S222A |
| SATA      | DVD Write 22X | H/H        | Tray    | X           | TS-H663C / SH-S223C |
|           | DVD Write 24X | H/H        | Tray    | X           | TS-H663D / SH-S243D |
|           | DVD Write 22X | H/H        | Tray    | 0           | TS-H653R            |
|           | DVD Write 16X | H/H        | Tray    | 0           | TS-H653T            |
| PATA      | DVD Write 22X | H/H        | Tray    | 0           | TS-H662L / SH-S222L |
| SATA      | DVD Write 22X | H/H        | Tray    | 0           | TS-H663L / SH-S223L |
|           | DVD Write 24X | H/H        | Tray    | 0           | TS-H663N / SH-S243N |
| SATA      | DVD Write 8X  | Slim       | Tray    | X           | TS-L633B / SN-S083B |
|           |               |            |         |             | TS-L633C / SH-S083C |
|           |               |            |         |             | TS-L633F / SN-S083F |
|           |               |            |         |             | TS-L633J            |
|           |               |            | Slot    | 0           | TS-L633N / SN-S083N |
|           |               |            |         |             | TS-L633R / SN-S083R |
|           |               |            |         |             | TS-L633Y            |
|           |               |            |         |             | TS-T633C / SN-T083C |
|           |               |            |         |             | TS-T633P            |
|           |               | Ultra Slim | Tray    | X           | TS-U633F            |
|           |               |            | Slot    | X           | TS-U633J / SU-S083J |
|           |               |            |         |             | TS-D633A            |
|           |               |            | Slot    | X           | TS-D633C            |

## DVD-W Slim External

| Interface | Speed        | Type       | Loading | Lightscribe | Model    |
|-----------|--------------|------------|---------|-------------|----------|
| USB 2.0   | DVD Write 8X | Slim       | Tray    | X           | SE-S084C |
|           |              | Ultra Slim | Tray    | X           | SE-S084D |
|           |              | Slim       | Tray    | X           | SE-S084F |
|           |              |            | Slot    | 0           | SE-T084P |

## DVD-ROM

| Interface | Speed   | Type       | Loading | Lightscribe | Model               |
|-----------|---------|------------|---------|-------------|---------------------|
| SATA      | DVD 16X | H/H        | Tray    | X           | TS-H353C / SH-D163J |
|           | DVD 8X  | Slim       | Tray    | X           | TS-L333B            |
|           |         |            |         |             | TS-L333D            |
|           | DVD 8X  | Ultra Slim | Tray    | X           | TS-U333A            |

## DVD-W Loader

| Interface | Speed  | Type | Loading | Lightscribe | Model    |
|-----------|--------|------|---------|-------------|----------|
| PATA      | DVD 8X | H/H  | Tray    | X           | TS-P632F |



#### Memory

DRAM  
Flash  
SRAM  
MCP  
Fusion

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