Good memory

Green Environment

Green Products for
a Greener Tomorrow

hynix

Green Products for a Greener Tomorrow

Corporate Profile

Hynix Semiconductor is a leading supplier of advanced semiconductor memory solutions and Image sensor products. We design, develop, manufacture and market a wide variety of DRAM and NAND Flash memories and CMOS Image Sensors (CIS). These memory components are essential in today's leading-edge computing, consumer and wireless communications applications. Image Sensors are used in a wide range of portable consumer electronics products such as handsets and handheld games.

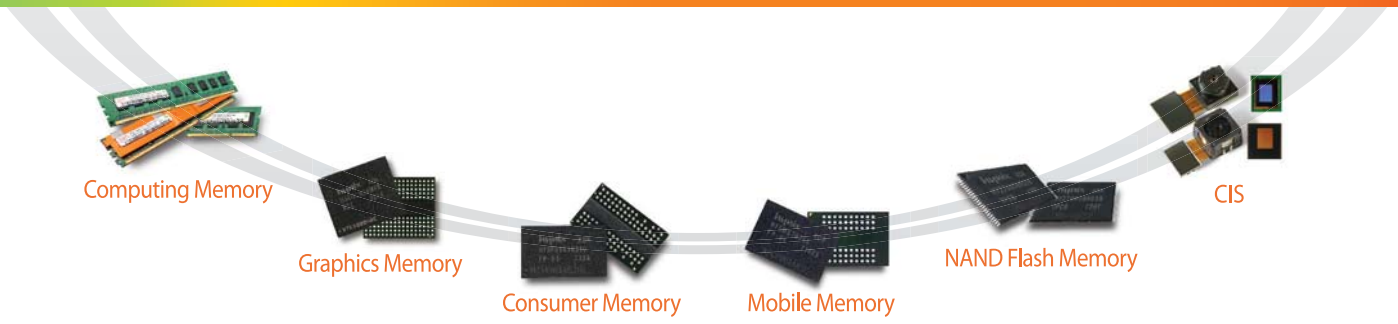
- DRAM and NAND Flash memories are focus products
- CMOS Image Sensors will diversify Hynix product portfolio
- 2009 Revenues of USD $6.2B
- Market capitalization of USD $12B as of July 2010
- Global presence with 3 manufacturing sites and 30 sales offices worldwide
- 17,302 employees worldwide

Good memory hynix

The simply designed symbolic mark of superposition of two circles implies Hynix's will to develop environment-friendly products.
The image of a sprout and green wings representing reborn nature symbolizes Hynix's volitional environmental management initiative. The 'Eco-mark' conveys our passions to contribute to customers and society with ecological practices (Environment Consciousness Outreach), and environmental awareness of each employee (Environment Creates Ourselves).

ECO Eco memory

HYNIX PRODUCTS



Recent Accomplishments

2010
07 Developed 44nm 2Gb DDR3 1866Mbps
06 Developed 44nm DDR3 operating at 1.25V
04 Developed DDR3 16GB LRDIMM
03 Developed industry's first stack based on 'Wafer Level Package' technology
02 Developed 26nm 64Gb NAND Flash memory
01 Developed the world's first 2Gb Mobile Low Power DDR2 DRAM

2009
12 Introduced the world's first 44nm 2Gb GDDR5 DRAM
11 Acquired Intel validation for 44nm 2Gb DDR3 Products
10 Introduced second generation 1Gb DDR3
08 Introduced 4Gb Mobile DDR SDRAM supported on Intel's Moorestown platform
04 Developed the world's first Low Power-High speed Mobile 1Gb DDR2 DRAM
03 Announced the world's first 8GB 2-Rank DDR3 R-DIMM validation
02 Developed the world's first 44nm DDR3 DRAM
01 Acquired Intel validation for the world's first ultra-high speed DDR3 based 4GB ECC UDIMM for servers

2008
12 Developed the world's first 2Gb Mobile DRAM
11 Introduced Industry's fastest 7Gbps, 1Gb GDDR5 Graphics DRAM
04 Developed the world's fastest Mobile LPDDR2
02 Introduced 2-Rank 8GB DDR2 RDIMM
01 Announced 800MHz, 1GB/2GB UDIMM Validation

2007
11 Acquired Intel validation for 1Gb DDR2 DRAM
Developed industry's first 1Gb GDDR5 DRAM
09 Developed the world's first NAND Flash MCP with 24 stacked chips
08 Developed industry's fastest and smallest 1Gb Mobile DRAM
05 Acquired the industry's first validation on DDR3 DRAMs from Intel
03 Developed the world's fastest ECC Mobile DRAM
01 Developed the fastest memory module based on 'Wafer Level Package' technology

2006
12 Announced industry's first 60nm 1Gb DDR2 800MHz based modules
Developed the world's fastest 200MHz 512Mb mobile DRAM
09 Launched 300mm research fab line
03 Acquired the industry's first validation on 80nm 512Mb DDR2 DRAMs from Intel
01 Announced joint development plan of DOC H3 (new generation DiskOnChip embedded flash drive) with M-Systems

2005
12 Developed the world's first 512Mb GDDR4, the industry's fastest and highest density graphics DRAM
11 Launched the industry's first JEDEC standard 8GB DDR2 R-DIMM
04 Launched Hynix-ST joint venture construction in Wuxi City, Jiangsu Province, China

2004
03 Developed the industry's first ultra-high speed DDR 550MHz
Acquired 1Gb DDR2 validation from Intel
02 Developed NAND Flash memory

2003
08 Developed the world's first DRAM 1Gb DDR2
07 Developed the world's first ultra-high speed DDR500
06 Acquired the industry's first Intel validation for 512Mb DDR400
05 Launched production on 0.10-micron process technology
Launched volume production of ultra-low power 256Mb SDRAM
04 Signed agreement with STMicroelectronics to cooperate in NAND Flash memory development
03 Introduced the world's first commercially applicable mega-level FeRAM

2002
10 Developed 0.10-micron 512MB DDR
08 Developed the world's first high-density, wide-bandwidth 256MB DDR
06 Developed the world's first 256MB SDR for high-end consumer application
03 Developed 1G DDR DRAM module

2001
12 Developed the world's first 128Mb DDR for graphics
08 Completed spin-off from Hyundai Group
03 Changed the Company name to "Hynix Semiconductor Inc."

1999
10 Merged with LG Semicon., Ltd.

1983
02 Founded Hyundai Electronics Industries Co., Ltd.

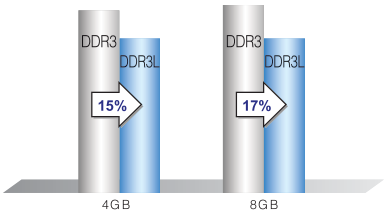
Main Memory

DDR3

General Description

The mainstream, DDR3 SDRAM, can transfer data twice as fast as the current generation DDR2 SDRAM's. DDR3 SDRAM boasts high performance and low power consumption. It supports data transfer rate of up to 1.6Gb/s and operates at a lower power supply voltage of 1.5V, compared to DDR2. The DDR3 SDRAM is eco-friendly for it can operate at even lower power supply voltage of 1.35V contributing to lower power dissipation and extended battery life in mobile systems. The low-power operation of DDR3L, 1.35V DDR3 SDRAM, is also beneficial in high-density memory systems in power constrained applications such as servers and data centers. Using Hynix low-power memory modules can help customers reduce power consumption and utility expenditures, improve reliability and reduce carbon emissions. Hynix plans to offer DDR3 in densities of 1Gb to 4Gb, and is currently in volume production on 2Gb DDR3. Hynix's DDR3 modules exploit functions such as ZQ calibration, fly-by topology, dynamic on-die-termination, and levelization to ensure better signal integrity which guarantees higher performance.

DDR3 vs. DDR3L Power Comparison (Watt)



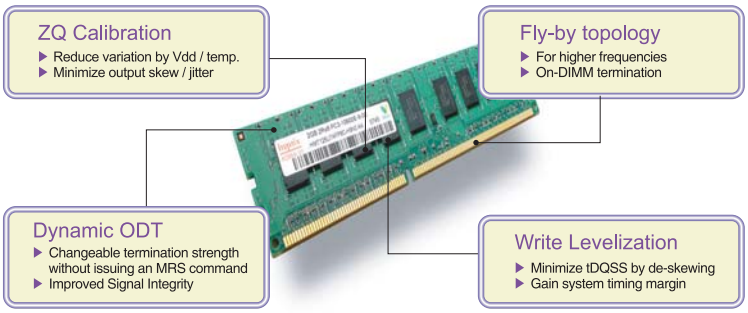
Calculation with 2Rx4 RDIMM, 1333Mbps

Source: Hynix Marketing

DDR2 vs. DDR3

Items	DDR2	DDR3 / DDR3L
Data Rate	400, 533, 667, 800Mbps	800,1066,1333,1600Mbps
VDD / VDDQ	1.8V +0.1V / -0.1V	1.5V ±0.075V (DDR3) 1.35V +0.1V / -0.067V (DDR3L)
Support Density	256Mb ~ 4Gb	1Gb ~ 4Gb
Bank	512Mb : 4 Bank 1Gb : 8 Bank	8 Bank
Data Pre-fetch	4 bit	8 bit
Package Type	60 FBGA for x4 / x8 84 FBGA for x16	78 FBGA for x4 / x8 96 FBGA for x16
Interface	SSTL-18	SSTL -15
DQS Signaling	Single / Differential	Differential Only
Driver Calibration	Off-Chip Driver Calibration	Self Calibration with ZQ pin
DQS-CLK De-Skewing	×	○ (Write Leveling)
On Die Termination	○	○ / Dynamic ODT
Reset pin	×	○ (Soft power-up)

Key Features of High Speed Interface



Main Memory

PC & Server Memory

General Description

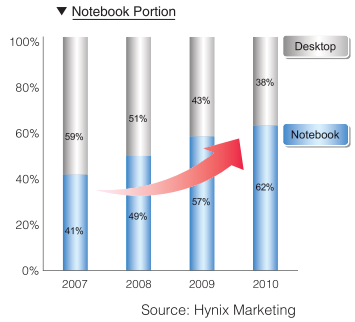
There is a lot of concern about protecting the environment and it is quickly becoming one of the top priorities. Highly virtualized applications such as data centers, servers and supercomputers, could take advantage of the low power features of the DDR3 SDRAM to enable cooler, power efficient systems.

Hynix is responding to the industry demand for eco-friendly or 'green' products that reduce power consumption, utility expenditures, improve reliability and reduce carbon emissions. The new Hynix 1.5V 1Gb DDR3 features 25% lower power consumption than legacy or competing solutions. The 1.35V(DDR3L) product will yield an additional 20% power savings. It will be an attractive solution for applications requiring compliance to energy star specifications. This product would also be ideal in mobile applications, such as notebooks, where it markedly extends battery life.

The new design philosophy adopted on the second generation 1Gb DDR3, will also be applied to future high density DRAM components from Hynix. The new 44nm process along with Hynix's design optimization and internal signaling innovations, reduces power consumption and enhances performance. Devices operating at 1.5V and 1.35V(Low Voltage) exhibit similar bandwidth characteristics. The demand for low power consumption in both mobile system like notebooks and server systems such as datacenters, is the emerging trend.

Hynix's strategy is to satisfy customers needs for reduced power consumption and improved performance with technology advancements such as this 40nm class product.

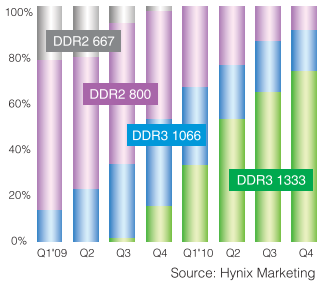
Transition to Notebook Form Factor



Source: Hynix Marketing

A crossover to mobile computers from the traditional desktop has already occurred. Declining prices is the primary driving factor, especially in light of current global economic conditions. Mobility and weight are other features that make mobile computers attractive to consumers, in addition to the computing power that now rivals desktops

Speed Transition in Notebook



Source: Hynix Marketing

The technology leap from DDR2 to DDR3 doubles system performance. As DDR3 offers superior performance and power savings, notebooks are rapidly adopting DDR3 memory.

With rapid transition trend to DDR3, processor makers are also supporting DDR3 platforms at speeds of up to 1600Mbps.

Hynix estimates DDR3 1333Mbps segment in notebooks will be around 70% by the second half of 2010.

SODIMM

Density	4GB SODIMM
Organization	512Mx64
Speed	1600Mbps
Number of Rank	2 Ranks

RDIMM

Density	16GB RDIMM
Organization	2Gx72
Speed	1333Mbps
Number of Rank	4 Ranks

Main Memory
Product Line-up

DDR3 SDRAM MODULE (240pin-UDIMM)

VDD	MODULE DENSITY	MODULE ORG.	BASED COM.	SPEED	PART NUMBER	PACKAGE	RANK	HEIGHT	AVAILABILITY
1.5V	4GB	512Mx64	256Mx8	1600-11-11-11	HMT351U6BFR8C-PB	FBGA (82ball)	2	30mm	Now
					HMT351U6CFR8C-PB	FBGA (78ball)	2	30mm	Q1 '11
				1333-9-9-9	HMT351U6BFR8C-H9	FBGA (82ball)	2	30mm	Now
					HMT351U6CFR8C-H9	FBGA (78ball)	2	30mm	Q1 '11
		512Mx72	256Mx8	1600-11-11-11	HMT351U7CFR8C-H9	FBGA (78ball)	2	30mm	Q1 '11
				1333-9-9-9	HMT351U7BFR8C-H9	FBGA (82ball)	2	30mm	Now
					HMT351U7CFR8C-H9	FBGA (78ball)	2	30mm	Q1 '11
	2GB	256Mx64	128Mx8	1600-11-11-11	HMT125U6DFR8C-PB	FBGA (78ball)	2	30mm	Now
				1333-9-9-9	HMT125U6TFR8C-H9	FBGA (78ball)	2	30mm	Now
					HMT125U6DFR8C-H9	FBGA (78ball)	2	30mm	Now
			256Mx8	1333-9-9-9	HMT325U6BFR8C-H9	FBGA (82ball)	1	30mm	Now
					HMT325U6BFR8C-H9	FBGA (82ball)	1	30mm	Now
		256Mx72	128Mx8	1333-9-9-9	HMT125U7TFR8C-H9	FBGA (78ball)	2	30mm	Now
				1333-9-9-9	HMT325U7BFR8C-H9	FBGA (82ball)	1	30mm	Now
	1GB	128Mx64	128Mx8	1600-11-11-11	HMT112U6DFR8C-PB	FBGA (78ball)	1	30mm	Now
				1333-9-9-9	HMT112U6TFR8C-H9	FBGA (78ball)	1	30mm	Now
					HMT112U6DFR8C-H9	FBGA (78ball)	1	30mm	Now
		128Mx72	128Mx8	1333-9-9-9	HMT112U7TFR8C-H9	FBGA (78ball)	1	30mm	Now
1.35V	4GB	512Mx72	256Mx8	1600-11-11-11	HMT351U7CFR8A-PB	FBGA (78ball)	2	30mm	Q1 '11
				1333-9-9-9	HMT351U7BFR8A-H9	FBGA (82ball)	2	30mm	Now
					HMT351U7CFR8A-H9	FBGA (78ball)	2	30mm	Q1 '11
	2GB	256Mx72	256Mx8	1333-9-9-9	HMT325U7BFR8A-H9	FBGA (82ball)	1	30mm	Now
			128Mx8	1333-9-9-9	HMT125U7TFR8A-H9	FBGA (78ball)	2	30mm	Now
	1GB	128Mx72	128Mx8	1333-9-9-9	HMT112U7TFR8A-H9	FBGA (78ball)	1	30mm	Now

DDR3 SDRAM MODULE (240pin-RDIMM)

VDD	MODULE DENSITY	MODULE ORG.	BASED COM.	SPEED	PART NUMBER	PACKAGE	RANK	HEIGHT	AVAILABILITY
1.5V	16GB	2Gx72	1Gx4 (DDP)	1333-9-9-9	HMT42GR7BMR4C-H9	FBGA (82ball)	4	30mm	Now
	8GB	1Gx72	512Mx4	1600-11-11-11	HMT31GR7BFR4C-PB	FBGA (82ball)	2	30mm	Now
					HMT31GR7CFR4C-PB	FBGA (78ball)	2	30mm	Q1 '11
				1333-9-9-9	HMT31GR7BFR4C-H9	FBGA (82ball)	2	30mm	Now
					HMT31GR7CFR4C-H9	FBGA (78ball)	2	30mm	Q1 '11
			256Mx8	1333-9-9-9	HMT31GR7BFR8C-H9	FBGA (82ball)	4	30mm	Now
					HMT31GR7CFR8C-H9	FBGA (78ball)	4	30mm	Q1 '11
	4GB	512Mx72	256Mx8	1600-11-11-11	HMT351R7BFR8C-PB	FBGA (82ball)	2	30mm	Now
				1333-9-9-9	HMT351R7BFR8C-H9	FBGA (82ball)	2	30mm	Now
			512Mx4	1600-11-11-11	HMT351R7BFR4C-PB	FBGA (82ball)	1	30mm	Now
				1333-9-9-9	HMT351R7BFR4C-H9	FBGA (82ball)	1	30mm	Now
			256Mx4	1333-9-9-9	HMT151R7TFR4C-H9	FBGA (78ball)	2	30mm	Now
	2GB	256Mx72	256Mx8	1600-11-11-11	HMT325R7BFR8C-PB	FBGA (82ball)	1	30mm	Now
				1333-9-9-9	HMT325R7BFR8C-H9	FBGA (82ball)	1	30mm	Now
			256Mx4	1333-9-9-9	HMT125R7TFR4C-H9	FBGA (78ball)	1	30mm	Now
			128Mx8	1333-9-9-9	HMT125R7TFR8C-H9	FBGA (78ball)	2	30mm	Now
	1GB	128Mx72	128Mx8	1333-9-9-9	HMT112R7TFR8C-H9	FBGA (78ball)	1	30mm	Now
1.35V	16GB	2Gx72	1Gx4 (DDP)	1333-9-9-9	HMT42GR7BMR4A-H9	FBGA (82ball)	4	30mm	Now
	8GB	1Gx72	512Mx4	1600-11-11-11	HMT31GR7CFR4A-PB	FBGA (78ball)	2	30mm	Q1 '11
				1333-9-9-9	HMT31GR7BFR4A-H9	FBGA (82ball)	2	30mm	Now
					HMT31GR7CFR4A-H9	FBGA (78ball)	2	30mm	Q1 '11
			256Mx8	1333-9-9-9	HMT31GR7BFR8A-H9	FBGA (82ball)	4	30mm	Now
					HMT31GR7CFR8A-H9	FBGA (78ball)	4	30mm	Q1 '11
	4GB	512Mx72	512Mx4	1333-9-9-9	HMT351R7BFR4A-H9	FBGA (82ball)	2	30mm	Now
				1333-9-9-9	HMT351R7BFR8A-H9	FBGA (82ball)	2	30mm	Now
			128Mx8	1066-7-7-7	HMT151R7TFR8A-G7	FBGA (78ball)	4	30mm	Now
			256Mx4	1333-9-9-9	HMT151R7TFR4A-H9	FBGA (78ball)	2	30mm	Now
	2GB	256Mx72	256Mx8	1333-9-9-9	HMT325R7BFR8A-H9	FBGA (82ball)	1	30mm	Now
			256Mx4	1333-9-9-9	HMT125R7TFR4A-H9	FBGA (78ball)	1	30mm	Now
			128Mx8	1333-9-9-9	HMT125R7TFR8A-H9	FBGA (78ball)	1	30mm	Now
	1GB	128Mx72	128Mx8	1333-9-9-9	HMT112R7TFR8A-H9	FBGA (78ball)	1	30mm	Now

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Main Memory
Product Line-up

DDR3 SDRAM MODULE (240pin-VLP RDIMM)

VDD	MODULE DENSITY	MODULE ORG.	BASED COM.	SPEED	PART NUMBER	PACKAGE	RANK	HEIGHT	AVAILABILITY
1.5V	8GB	1Gx72	1Gx4 (DDP)	1600-11-11-11	HMT41GV7BMR4C-PB	FBGA (82ball)	2	18.75mm	Now
				1333-9-9-9	HMT41GV7BMR4C-H9	FBGA (82ball)	2	18.75mm	Now
			512Mx8 (DDP)	1333-9-9-9	HMT41GV7BMR8C-H9	FBGA (82ball)	4	18.75mm	Now
	4GB	512Mx72	512Mx4 (DDP)	1333-9-9-9	HMT351V7BMR4C-H9	FBGA (78ball)	2	18.75mm	Now
			256Mx8	1600-11-11-11	HMT351V7BFR8C-PB	FBGA (82ball)	2	18.75mm	Now
				1333-9-9-9	HMT351V7BFR8C-H9	FBGA (82ball)	2	18.75mm	Now
	2GB	256Mx72	256Mx4	1333-9-9-9	HMT125V7TFR4C-H9	FBGA (78ball)	1	18.75mm	Now
			128Mx8	1333-9-9-9	HMT125V7TFR8C-H9	FBGA (78ball)	2	18.75mm	Now
			256Mx8	1600-11-11-11	HMT325V7BFR8C-PB	FBGA (82ball)	1	18.75mm	Now
				1333-9-9-9	HMT325V7BFR8C-H9	FBGA (82ball)	1	18.75mm	Now
	1GB	128Mx72	128Mx8	1333-9-9-9	HMT112V7TFR8C-H9	FBGA (78ball)	1	18.75mm	Now
1.35V	8GB	1Gx72	1Gx4 (DDP)	1333-9-9-9	HMT41GV7BMR4A-H9	FBGA (82ball)	2	18.75mm	Now
			512Mx8 (DDP)	1333-9-9-9	HMT41GV7BMR8A-H9	FBGA (82ball)	4	18.75mm	Now
	4GB	512Mx72	512Mx4 (DDP)	1333-9-9-9	HMT351V7BMR4A-H9	FBGA (78ball)	2	18.75mm	Now
				1333-9-9-9	HMT351V7BFR8A-H9	FBGA (82ball)	2	18.75mm	Now
	2GB	256Mx72	256Mx4	1333-9-9-9	HMT125V7TFR4A-H9	FBGA (78ball)	1	18.75mm	Now
			128Mx8	1333-9-9-9	HMT125V7TFR8A-H9	FBGA (78ball)	2	18.75mm	Now
				1333-9-9-9	HMT325V7BFR8A-H9	FBGA (82ball)	1	18.75mm	Now
	1GB	128Mx72	128Mx8	1333-9-9-9	HMT112V7TFR8A-H9	FBGA (78ball)	1	18.75mm	Now

DDR3 SDRAM MODULE (204pin-SODIMM)

VDD	MODULE DENSITY	MODULE ORG.	BASED COM.	SPEED	PART NUMBER	PACKAGE	RANK	HEIGHT	AVAILABILITY
1.5V	4GB	512Mx64	256Mx8	1600-11-11-11	HMT351S6BFR8C-PB	FBGA (82ball)	2	30mm	Now
					HMT351S6CFR8C-PB	FBGA (78ball)	2	30mm	Q1 '11
				1333-9-9-9	HMT351S6BFR8C-H9	FBGA (82ball)	2	30mm	Now
					HMT351S6CFR8C-H9	FBGA (78ball)	2	30mm	Q1 '11
	2GB	256Mx64	128Mx8	1600-11-11-11	HMT125S6DFR8C-H9	FBGA (78ball)	2	30mm	Now
					HMT125S6DFR8C-H9	FBGA (78ball)	2	30mm	Now
			256Mx8	1600-11-11-11	HMT325S6BFR8C-PB	FBGA (82ball)	1	30mm	Now
				1333-9-9-9	HMT325S6BFR8C-H9	FBGA (82ball)	1	30mm	Now
			128Mx16	1333-9-9-9	HMT325S6BFR6C-H9	FBGA (96ball)	2	30mm	Now
	1GB	128Mx64	128Mx8	1600-11-11-11	HMT112S6DFR8C-PB	FBGA (78ball)	1	30mm	Now
					HMT112S6DFR8C-H9	FBGA (78ball)	1	30mm	Now
			64Mx16	1333-9-9-9	HMT112S6BFR6C-H9	FBGA (96ball)	2	30mm	Now
1.35V	4GB	512Mx64	256Mx8	1333-9-9-9	HMT351S6AFR8A-H9	FBGA (82ball)	2	30mm	Now
	2GB	256Mx64	256Mx8	1333-9-9-9	HMT325S6AFR8A-H9	FBGA (82ball)	1	30mm	Now

DDR3 SDRAM MODULE (240pin-LRDIMM)

VDD	MODULE DENSITY	MODULE ORG.	BASED COM.	SPEED	PART NUMBER	PACKAGE	RANK	HEIGHT	AVAILABILITY
1.5V	16GB	2Gx72	1Gx4 (DDP)	1333-9-9-9	HMT42GL7BMR4C-H9	FBGA (82ball)	4	30.35mm	Q4 '10
			1Gx4 (DDP)	1600-11-11-11	HMT42GL7BMR4C-PB	FBGA (82ball)	4	30.35mm	Q1 '11
1.35V	16GB	2Gx72	1Gx4 (DDP)	1333-9-9-9	HMT42GL7BMR4A-H9	FBGA (82ball)	4	30.35mm	Q4 '10
			1Gx4 (DDP)	1600-11-11-11	HMT42GL7BMR4A-PB	FBGA (82ball)	4	30.35mm	Q1 '11

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Graphics Memory

General Description

Since the world's first Graphics DDR SDRAM was introduced in 1999, Hynix has played a leadership role in the Graphics memory market by offering cost effective and high performance products.

Hynix's newly introduced 44nm 2Gb GDDR5 offers designers 7Gbps speed (bandwidth of 28GB/sec with 32-bit I/O) required for high end graphics.

In addition to improved speed and higher density, the power consumption on the 2Gb GDDR5 is significantly reduced since it can operate on 1.35V power supply. This results in an estimated 20% reduction in power consumption compared to the 1.5V products, meeting Hynix's goal of developing eco-friendly products.

The 2Gb GDDR5 will meet the needs of high-end desktop and notebook graphics applications. It will also be suitable in super computers designed with a General Purpose GPU architecture, where the 2Gb GDDR5 will serve as high bandwidth memory to the GPU.

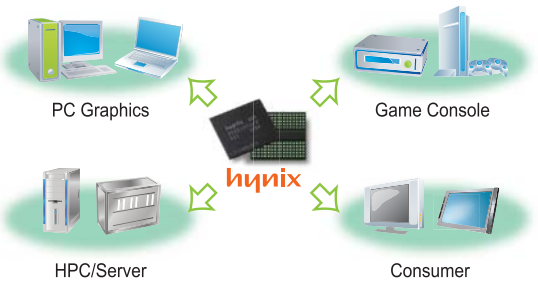
Hynix has maintained its leadership in graphics memory with the world's first 66nm 1Gb GDDR5 in 2007 followed by the 54nm 1Gb GDDR5 in 2008, and 44nm 2Gb GDDR5 in early 2010.

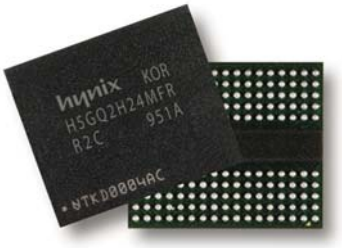
Hynix also supports GDDR3, DDR3 and DDR2 products for performance and mainstream market. Hynix will provide more value to customers with higher performance, quality and technology leadership products.

44nm 2Gb GDDR5 Features

Items	Features
Op. Frequency	Max 7.0Gbps
Power Supply	VDD(Q) = 1.5V & 1.35V
I / O	x32 / x16
Package	170ball FBGA (12mmx14mm)
Banks / Prefetch	16Banks / 8bit
Interface	POD_15

Graphics Applications





Graphics Product Features Comparison

Items	DDR2	DDR3	GDDR3	GDDR5
VDD(Q)	1.8V	1.5V	1.8V	1.35V / 1.5V
Speed	Max 600MHz	Max 1.0GHz	Max 1.3GHz	Max 7.0Gbps
Burst length	4 / 8	4 / 8	4 / 8	8 only
Package	84ball FBGA	96ball FBGA	136ball FBGA	170ball FBGA
Density	512Mb / 1Gb	1Gb / 2Gb	512Mb / 1Gb	1Gb / 2Gb
I / O	x16	x16	x32	x32 / x16
Banks	4(512Mb) / 8(1Gb)	8	8	16
BST (Boundary Scan Test)	No	No	Yes	Yes

Graphics Memory Product Line-up

DDR2 SDRAM

DENSITY	ORG.	SPEED	PART NUMBER	PACKAGE	FEATURE	AVAILABILITY
1Gb	64Mx16	500MHz (2.0ns)	H5PS1G63EFR-20L	FBGA (84ball)	8Bank, 1.8V / 1.8V	EOL : Oct. '10
		400MHz (2.5ns)	H5PS1G63EFR-25C	FBGA (84ball)	8Bank, 1.8V / 1.8V	EOL : Oct. '10
		400MHz (2.5ns)	HY5PS1G1631CFR-25C	FBGA (84ball)	8Bank, 1.8V / 1.8V	EOL : Oct. '10
512Mb	32Mx16	600MHz (1.6ns)	H5PS5162FFR-16C	FBGA (84ball)	4Bank, 2.0V / 2.0V	EOL : Oct. '10
		500MHz (2.0ns)	H5PS5162FFR-20C	FBGA (84ball)	4Bank, 2.0V / 2.0V	EOL : Oct. '10
		500MHz (2.0ns)	H5PS5162FFR-20L	FBGA (84ball)	4Bank, 1.8V / 1.8V	EOL : Oct. '10
		400MHz (2.5ns)	H5PS5162FFR-25C	FBGA (84ball)	4Bank, 1.8V / 1.8V	EOL : Oct. '10
		500MHz (2.0ns)	HY5PS121621CFP-2	FBGA (84ball)	4Bank, 2.0V / 2.0V	EOL : Oct. '10
		450MHz (2.2ns)	HY5PS121621CFP-22	FBGA (84ball)	4Bank, 2.0V / 2.0V	EOL : Oct. '10
		400MHz (2.5ns)	HY5PS121621CFP-25	FBGA (84ball)	4Bank, 1.8V / 1.8V	EOL : Oct. '10
		350MHz (2.8ns)	HY5PS121621CFP-28	FBGA (84ball)	4Bank, 1.8V / 1.8V	EOL : Oct. '10
		300MHz (3.3ns)	HY5PS121621CFP-33	FBGA (84ball)	4Bank, 1.8V / 1.8V	EOL : Oct. '10

DDR3 SDRAM

DENSITY	ORG.	SPEED	PART NUMBER	PACKAGE	FEATURE	AVAILABILITY
2Gb	128Mx16	1,000MHz (1.0ns)	H5TQ2G63BFR-N0C	FBGA (96ball)	8Bank, 1.5V / 1.5V	Now
		900MHz (1.1ns)	H5TQ2G63BFR-11C	FBGA (96ball)	8Bank, 1.5V / 1.5V	Now
		800MHz (1.2ns)	H5TQ2G63BFR-12C	FBGA (96ball)	8Bank, 1.5V / 1.5V	Now
1Gb	64Mx16	1,000MHz (1.0ns)	H5TQ1G63DFR-N0C	FBGA (96ball)	8Bank, 1.5V / 1.5V	Q4 '10
		900MHz (1.1ns)	H5TQ1G63DFR-11C	FBGA (96ball)	8Bank, 1.5V / 1.5V	Q4 '10
		800MHz (1.2ns)	H5TQ1G63DFR-12C	FBGA (96ball)	8Bank, 1.5V / 1.5V	Q4 '10
		800MHz (1.2ns)	H5TQ1G63BFR-12C	FBGA (96ball)	8Bank, 1.5V / 1.5V	Now
		700MHz (1.4ns)	H5TQ1G63BFR-14C	FBGA (96ball)	8Bank, 1.5V / 1.5V	Now

GDDR3 SDRAM

DENSITY	ORG.	SPEED	PART NUMBER	PACKAGE	FEATURE	AVAILABILITY
1Gb	32Mx32	1,300MHz (0.77ns)	H5RS1H23MFR-N3C	FBGA (136ball)	8banks, 1.9V / 1.9V	Now
		1,200MHz (0.8ns)	H5RS1H23MFR-N2C	FBGA (136ball)	8banks, 1.9V / 1.9V	Now
		1,000MHz (1.0ns)	H5RS1H23MFR-N0C	FBGA (136ball)	8banks, 1.8V / 1.8V	Now
		900MHz (1.1ns)	H5RS1H23MFR-11C	FBGA (136ball)	8banks, 1.8V / 1.8V	Now
		700MHz (1.4ns)	H5RS1H23MFR-14C	FBGA (136ball)	8banks, 1.8V / 1.8V	Now
512Mb	16Mx32	1,300MHz (0.77ns)	H5RS5223DFR-N3C	FBGA (136ball)	8Bank, 2.05V / 2.05V	Now
		1,200MHz (0.8ns)	H5RS5223DFR-N2C	FBGA (136ball)	8Bank, 2.05V / 2.05V	Now
		1,000MHz (1.0ns)	H5RS5223DFR-N0C	FBGA (136ball)	8Bank, 2.05V / 2.05V	Now
		900MHz (1.1ns)	H5RS5223DFR-11C	FBGA (136ball)	8Bank, 1.8V / 1.8V	Now
		700MHz (1.4ns)	H5RS5223DFR-14C	FBGA (136ball)	8Bank, 1.8V / 1.8V	Now
		500MHz (2.0ns)	H5RS5223DFR-20C	FBGA (136ball)	8Bank, 1.8V / 1.8V	Now
		1,300MHz (0.77ns)	H5RS5223CFR-N3C	FBGA (136ball)	8Bank, 2.05V / 2.05V	EOL : Oct. '10
		1,200MHz (0.8ns)	H5RS5223CFR-N2C	FBGA (136ball)	8Bank, 2.05V / 2.05V	EOL : Oct. '10
		1,000MHz (1.0ns)	H5RS5223CFR-N0C	FBGA (136ball)	8Bank, 2.05V / 2.05V	EOL : Oct. '10
		900MHz (1.1ns)	H5RS5223CFR-11C	FBGA (136ball)	8Bank, 1.8V / 1.8V	EOL : Oct. '10
		700MHz (1.4ns)	H5RS5223CFR-14C	FBGA (136ball)	8Bank, 1.8V / 1.8V	EOL : Oct. '10
		500MHz (2.0ns)	H5RS5223CFR-20C	FBGA (136ball)	8Bank, 1.8V / 1.8V	EOL : Oct. '10
		700MHz (1.4ns)	H5RS5223CFR-14L	FBGA (136ball)	8Bank, 1.5V / 1.5V	EOL : Oct. '10
		550MHz (1.8ns)	H5RS5223CFR-18C	FBGA (136ball)	8Bank, 1.5V / 1.5V	EOL : Oct. '10

GDDR5 SDRAM

DENSITY	ORG.	SPEED	PART NUMBER	PACKAGE	FEATURE	AVAILABILITY
2Gb	64Mx32	6.0Gbps	H5GQ2H24MFR-R0C	FBGA (170ball)	16Bank, 1.6V / 1.6V	Now
		5.0Gbps	H5GQ2H24MFR-T2C	FBGA (170ball)	16Bank, 1.5V / 1.5V	Now
		3.6Gbps			16Bank, 1.35V / 1.35V	
		4.0Gbps	H5GQ2H24MFR-T0C	FBGA (170ball)	16Bank, 1.5V / 1.5V	Now
1Gb	32Mx32	6.0Gbps	H5GQ1H24AFR-R0C	FBGA (170ball)	16Bank, TBD	Now
		5.5Gbps	H5GQ1H24AFR-T3C	FBGA (170ball)	16Bank, 1.5V / 1.5V	Now
		5.0Gbps	H5GQ1H24AFR-T2L	FBGA (170ball)	16Bank, 1.5V / 1.5V	Now
		3.2Gbps			16Bank, 1.35V / 1.35V	
		4.5Gbps	H5GQ1H24AFR-T1C	FBGA (170ball)	16Bank, 1.5V / 1.5V	Now
		4.0Gbps	H5GQ1H24AFR-T0C	FBGA (170ball)	16Bank, 1.5V / 1.5V	Now

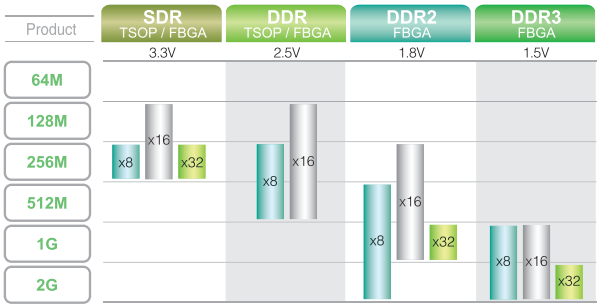
Consumer Memory

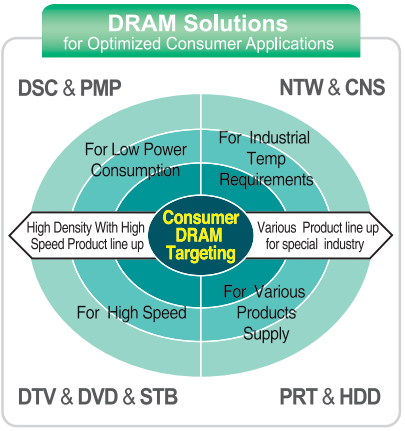
General Description

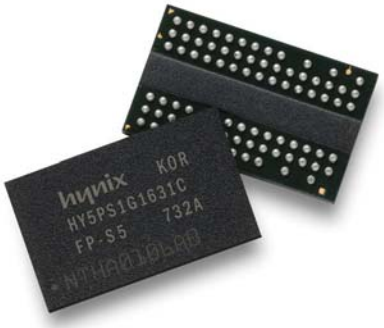
We now live in the Digital Era. Digital televisions, DVD and Set-Top Box give us rich entertainment, while car navigation systems provide comfort and convenience. All of these digital consumer appliances need semiconductor memory for performance improvement, power savings and size reduction. Hynix has full line-up of DRAM (Dynamic RAM) to meet the needs of a wide range of consumer applications. Hynix offers a family of SDRAM (Synchronous DRAM) in 128Mb~256Mb densities, packaged in TSOP-II and FBGA offered at industrial temperature range of -40℃ to 85℃ and featuring very low power consumption. DDR, DDR2 and DDR3 SDRAMs (Double Data Rate 3 SDRAMs) are available for high-end consumer applications requiring higher data transfer rates. In many applications, such as Digital Television and Set-Top-Box, SDR SDRAM has been replaced by DDR, DDR2 and DDR3 SDRAM technologies.

Sometimes, the most important things are not be visible. Although hidden from view, Hynix Consumer memories have been used in a variety of applications offered by a number of companies to realize a multitude of miracles.

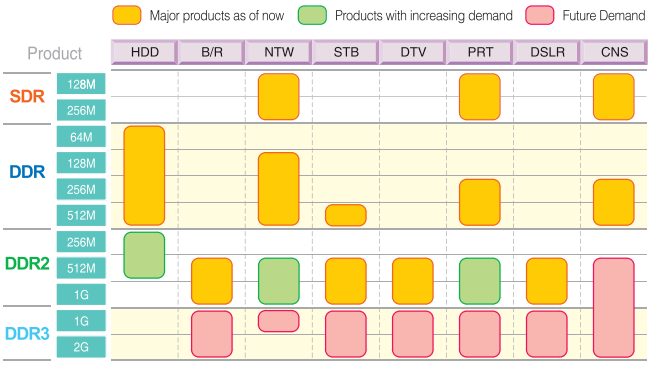
Consumer DRAM Readiness







Consumer DRAM Usage Map



HDD : Hard Disk Drive
DTV : Digital TV
CNS : Car navigation
NTW : Network
PRT : Printer
DPF : Digital Photo Frame
STB : Set Top Box
DSLR : Digital Single Lens Reflex
B/R : Blue-ray player
PMP : Potable Media Player
DVD : Digital Video Disc

Consumer Memory Product Line-up

SDR SDRAM

DENSITY	ORG.	PART NUMBER	SPEED	POWER	OPERATION TEMP.	PACKAGE	VOLTAGE	AVAILABILITY
128Mb	x16	HY57V281620FTP	5 / 6 / 7 / H	Normal / Low	0~70 / -40~85 [℃]	TSOP	3.3V	Now
	x16	HY5V26FFP	5 / 6 / 7 / H	Normal / Low	0~70 / -40~85 [℃]	FBGA	3.3V	Now
	x16	H57V1262GTR	50 / 60 / 70 / 75	Normal / Low	0~70 / -40~85 [℃]	TSOP	3.3V	Now
	x16	H57V1262GFR	50 / 60 / 70 / 75	Normal / Low	0~70 / -40~85 [℃]	FBGA	3.3V	Now
256Mb	x8	HY57V56820FTP	6 / H	Normal / Low	0~70 / -40~85 [℃]	TSOP	3.3V	Now
	x16	HY57V561620FTP	6 / H	Normal / Low	0~70 / -40~85 [℃]	TSOP	3.3V	Now
	x16	HY5V56FFP	6 / H	Normal / Low	0~70 / -40~85 [℃]	FBGA	3.3V	Now
	x32	HY5V52AFP	6 / H	Normal / Low	0~70 / -40~85 [℃]	FBGA	3.3V	Now
	x8	H57V2582GTR	50 / 60 / 70 / 75	Normal / Low	0~70 / -40~85 [℃]	TSOP	3.3V	Now
	x16	H57V2562GTR	50 / 60 / 70 / 75	Normal / Low	0~70 / -40~85 [℃]	TSOP	3.3V	Now
	x16	H57V2562GFR	50 / 60 / 70 / 75	Normal / Low	0~70 / -40~85 [℃]	FBGA	3.3V	Now
	x32	H57V2622GMR	60 / 70 / 75	Normal / Low	0~70 / -40~85 [℃]	FBGA	3.3V	Now

DDR SDRAM

DENSITY	ORG.	PART NUMBER	SPEED	POWER	OPERATION TEMP.	PACKAGE	VOLTAGE	AVAILABILITY
128Mb	x16	HY5DU281622FTP	4 / 5 / D43 / D4 / J / H	Normal / Low	0~70 / -40~85 [℃]	TSOP	2.5V	Now
	x16	H5DU1262GTR	FA / FB / E3 / E4 / J3 / K2 / K3	Normal / Low	0~70 / -40~85 [℃]	TSOP	2.5V	Now
256Mb	x8	H5DU2582GTR	FA / E3 / E4 / J3 / K2 / K3	Normal / Low	0~70 / -40~85 [℃]	TSOP	2.5V	Now
	x16	H5DU2562GFR	FA / E3 / E4 / J3 / K2 / K3	Normal / Low	0~70 / -40~85 [℃]	FBGA	2.5V	Now
	x8	H5DU2582GTR	FA / E3 / E4 / J3 / K2 / K3	Normal / Low	0~70 / -40~85 [℃]	TSOP	2.5V	Now
	x16	H5DU2562GFR	FA / E3 / E4 / J3 / K2 / K3	Normal / Low	0~70 / -40~85 [℃]	FBGA	2.5V	Now
512Mb	x8	H5DU5182ETR	FA / E3 / E4 / J3 / K2 / K3	Normal / Low	0~70 / -40~85 [℃]	TSOP	2.5V	Now
	x8	H5DU5182EFR	FA / E3 / E4 / J3 / K2 / K3	Normal / Low	0~70 / -40~85 [℃]	FBGA	2.5V	Now
	x16	H5DU5162ETR	FA / E3 / E4 / J3 / K2 / K3	Normal / Low	0~70 / -40~85 [℃]	TSOP	2.5V	Now
	x16	H5DU5162EFR	FA / E3 / E4 / J3 / K2 / K3	Normal / Low	0~70 / -40~85 [℃]	FBGA	2.5V	Now

DDR2 SDRAM

DENSITY	ORG.	PART NUMBER	SPEED	POWER	OPERATION TEMP.	PACKAGE	VOLTAGE	AVAILABILITY
256Mb	x16	H5PS2562GFR	S6 / S5	Normal / Low	0~95 / -40~95 [℃]Note	FBGA	1.8V	Q4 '10
512Mb	x8	H5PS5182GFR	E3 / C4 / Y4 / Y5 / S6 / S5	Normal / Low	0~95 / -40~95 [℃]Note	FBGA	1.8V	Now
	x16	H5PS5162FFR	E3 / C4 / Y4 / Y5 / S6 / S5 / G7	Normal / Low	0~95 / -40~95 [℃]Note	FBGA	1.8V	Now
		H5PS5162GFR	E3 / C4 / Y4 / Y5 / S6 / S5 / G7	Normal / Low	0~95 / -40~95 [℃]Note	FBGA	1.8V	Now
1Gb	x8	HY5PS1G831CFP	E3 / C4 / Y5 / S6 / S5	Normal / Low	0~95 / -40~95 [℃]Note	FBGA	1.8V	Now
	x8	H5PS1G83EFR	E3 / C4 / Y5 / S6 / S5	Normal / Low	0~95 / -40~95 [℃]Note	FBGA	1.8V	Now
	x16	HY5PS1G1631CFP	E3 / C4 / Y5 / S6 / S5	Normal / Low	0~95 / -40~95 [℃]Note	FBGA	1.8V	Now
	x16	H5PS1G63EFR	E3 / C4 / Y5 / S6 / S5 / G7	Normal / Low	0~95 / -40~95 [℃]Note	FBGA	1.8V	Now
	x32	H5PS1GC2FMR	E3 / C4 / Y5	Normal / Low	0~95 / -40~95 [℃]Note	FBGA	1.8V	Now

Note : At tOPER 85~95 ℃, Double refresh rate is required.

DDR3 SDRAM

DENSITY	ORG.	PART NUMBER	SPEED	POWER	OPERATION TEMP.	PACKAGE	VOLTAGE	AVAILABILITY
1Gb	x8	H5TQ1G83BFR	S5 / S6 / G7 / G8 / H9 / PB	Normal / Low	0~95 / -40~95 [℃]Note	FBGA	1.5V	Now
		H5TQ1G83DFR	S6 / G7 / H9 / PA / PB / RD	Normal / Low	0~95 / -40~95 [℃]Note	FBGA	1.5V	Now
	x16	H5TQ1G63BFR	S5 / S6 / G7 / G8 / H9 / PB	Normal / Low	0~95 / -40~95 [℃]Note	FBGA	1.5V	Now
		H5TQ1G63DFR	S6 / G7 / H9 / PA / PB / RD	Normal / Low	0~95 / -40~95 [℃]Note	FBGA	1.5V	Now
2Gb	x8	H5TQ2G83AFR	S5 / S6 / G7 / G8 / H9	Normal / Low	0~95 / -40~95 [℃]Note	FBGA	1.5V	Now
	x8	H5TQ2G83BFR	S5 / S6 / G7 / G8 / H9 / PB	Normal / Low	0~95 / -40~95 [℃]Note	FBGA	1.5V	Now
	x16	H5TQ2G63BFR	S5 / S6 / G7 / G8 / H9 / PB	Normal / Low	0~95 / -40~95 [℃]Note	FBGA	1.5V	Now
	x32	H5TQ2GC3DMR	S5 / S6 / G7 / G8 / H9	Normal / Low	0~95 / -40~95 [℃]Note	FBGA	1.5V	Now

Note : At tOPER 85~95 ℃, Double refresh rate is required.

Mobile Memory

General Description

Hynix Mobile Memory technology unleashes the best mobile experience on the go. As mobile devices get smaller, sleeker, and lighter than ever, consumers will be able to choose from a wide range of mobile devices to keep them connected, entertained, informed, and productive. As consumer life styles become more mobile, there is ever increasing demand for connectivity. Mobile devices will require high performance memories, with very low power consumption for extended battery life. Devices that use Hynix Mobile Memory enables everything you love on-the-go. Hynix Mobile Memory products offered in small footprint packages have superior power saving features useful in all handheld devices such as cellular phones, PDAs, MP3 players, etc. Hynix Mobile Memories are ideal for portable applications which require very low power consumption. Hynix's Mobile Business Group offers a broad variety of products enabling our customers to deliver next-generation devices in time to market

Mobile DRAM

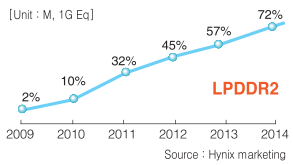
- **Broad Product Line**: LPSDR / LPDDR, x16 / x32 organizations, 256Mb~2Gb densities
  LPDDR2, x32 organization, 2Gb density
- **Diverse Packaging Options**: Discrete, KGD (Known Good Die), MCP (Multi Chip Package), PoP (Package on Package)
- **Small Form Factor Packages**: For use in the most space-constrained handheld applications
- **Low Power Features**: Programmable Drive strength, Partial Array Self Refresh, Temperature Compensated Self Refresh
- **Major Applications**: Mobile Phone, PDA, MP3 Player, Digital Still Camera, MID (Mobile Internet Device), PND (Portable Navigation Device), Personal Media Player (PMP), Handheld Game Console, e-book
- LPDDR2 will be the next generation mainstream. Hynix set the standard for LPDDR2 technology along with LPDDR

Bandwidth Comparison

Product	Voltage	Bit Rate	Bandwidth
LPDDR1	1.8V	400Mbps	1.6GBps
LPDDR2	1.2V	800Mbps	3.2GBps

Source : Hynix marketing

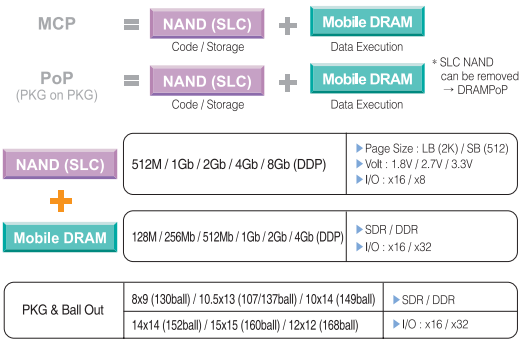
Transition to LPDDR2



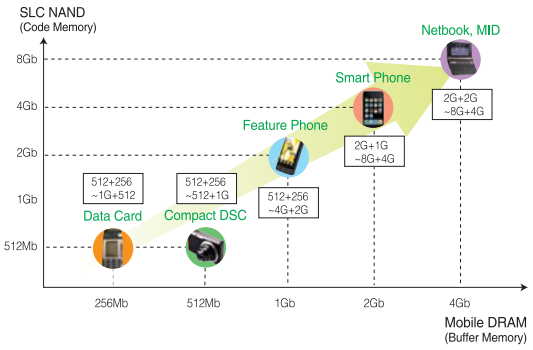
Source : Hynix marketing

MCP

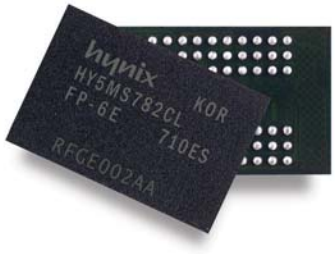
- Small Form Factor package saves space in Handheld Devices
- High Capacity Data Storage, High Speed, with Low Power Consumption
- In-house manufacturing provides cost efficient solutions in a timely manner
- Major Application - Mobile Phone, Smartphone, PDA Phone, Digital Still Camera, MID (Mobile Internet Device), Wireless LAN Card, Handheld Game Console, Netbook



MCPs in Mobile Application



MCP Line-up



Mobile Memory Product Line-up

LPSDR

DENSITY	ORG.	SPEED	PART NUMBER	PACKAGE	FEATURE	AVAILABILITY
2Gb	64M x 16	166MHz	H55S1G62MFP-60M	FBGA (54ball)	4Bank, 1.8V / 1.8V	Now
		133MHz	H55S1G62MFP-75M	FBGA (54ball)	4Bank, 1.8V / 1.8V	Now
	32M x 32	166MHz	H55S1G22MFP-60M	FBGA (90ball)	4Bank, 1.8V / 1.8V	Now
		133MHz	H55S1G22MFP-75M	FBGA (90ball)	4Bank, 1.8V / 1.8V	Now
	32M x 32 (reduced page size)	166MHz	H55S1G32MFP-60M	FBGA (90ball)	4Bank, 1.8V / 1.8V	Now
		133MHz	H55S1G32MFP-75M	FBGA (90ball)	4Bank, 1.8V / 1.8V	Now
1Gb	64M x 16	166MHz	H55S1G62MFP-60M	FBGA (54ball)	4Bank, 1.8V / 1.8V	Now
		133MHz	H55S1G62MFP-75M	FBGA (54ball)	4Bank, 1.8V / 1.8V	Now
		166MHz	H55S1G62AFR-60M	FBGA (54ball)	4Bank, 1.8V / 1.8V	Now
		133MHz	H55S1G62AFR-75M	FBGA (54ball)	4Bank, 1.8V / 1.8V	Now
	32M x 32	166MHz	H55S1G22MFP-60M	FBGA (90ball)	4Bank, 1.8V / 1.8V	Now
		133MHz	H55S1G22MFP-75M	FBGA (90ball)	4Bank, 1.8V / 1.8V	Now
		166MHz	H55S1G22AFR-60M	FBGA (90ball)	4Bank, 1.8V / 1.8V	Now
		133MHz	H55S1G22AFR-75M	FBGA (90ball)	4Bank, 1.8V / 1.8V	Now
	32M x 32 (reduced page size)	166MHz	H55S1G32MFP-60M	FBGA (90ball)	4Bank, 1.8V / 1.8V	Now
		133MHz	H55S1G32MFP-75M	FBGA (90ball)	4Bank, 1.8V / 1.8V	Now
		166MHz	H55S1G32AFR-60M	FBGA (90ball)	4Bank, 1.8V / 1.8V	Now
		133MHz	H55S1G32AFR-60M	FBGA (90ball)	4Bank, 1.8V / 1.8V	Now
512Mb	32M x 16	166MHz	H55S5162DFR-60M	FBGA (54ball)	4Bank, 1.8V / 1.8V	Now
		133MHz	H55S5162DFR-75M	FBGA (54ball)	4Bank, 1.8V / 1.8V	Now
		166MHz	H55S5162EFR-60M	FBGA (54ball)	4Bank, 1.8V / 1.8V	Now
		133MHz	H55S5162EFR-75M	FBGA (54ball)	4Bank, 1.8V / 1.8V	Now
	16M x 32	166MHz	H55S5122DFR-60M	FBGA (90ball)	4Bank, 1.8V / 1.8V	Now
		133MHz	H55S5122DFR-75M	FBGA (90ball)	4Bank, 1.8V / 1.8V	Now
		166MHz	H55S5122EFR-60M	FBGA (90ball)	4Bank, 1.8V / 1.8V	Now
		133MHz	H55S5122EFR-75M	FBGA (90ball)	4Bank, 1.8V / 1.8V	Now
256Mb	16M x 16	166MHz	H55S2562JFR-60M	FBGA (54ball)	4Bank, 1.8V / 1.8V	Now
		133MHz	H55S2562JFR-75M	FBGA (54ball)	4Bank, 1.8V / 1.8V	Now
	8M x 32	166MHz	H55S2622JFR-60M	FBGA (90ball)	4Bank, 1.8V / 1.8V	Now
		133MHz	H55S2622JFR-75M	FBGA (90ball)	4Bank, 1.8V / 1.8V	Now

* All SDRAM is Available For Lead Free or Lead & Halogen Free

LPDDR

DENSITY	ORG.	SPEED	PART NUMBER	PACKAGE	FEATURE	AVAILABILITY
2Gb	64M x 16	DDR400	H5MS2G62MFR-EBM	FBGA (60ball)	4Bank, 1.8V / 1.8V	Now
		DDR333	H5MS2G62MFR-J3M	FBGA (60ball)	4Bank, 1.8V / 1.8V	Now
	32M x 32	DDR400	H5MS2G22MFR-EBM	FBGA (90ball)	4Bank, 1.8V / 1.8V	Now
		DDR333	H5MS2G22MFR-J3M	FBGA (90ball)	4Bank, 1.8V / 1.8V	Now
	32M x 32 (reduced page size)	DDR400	H5MS2G32MFR-EBM	FBGA (90ball)	4Bank, 1.8V / 1.8V	Now
		DDR333	H5MS2G32MFR-J3M	FBGA (90ball)	4Bank, 1.8V / 1.8V	Now
1Gb	64M x 16	DDR400	H5MS1G62MFP-E3M	FBGA (60ball)	4Bank, 1.8V / 1.8V	Now
		DDR333	H5MS1G62MFP-J3M	FBGA (60ball)	4Bank, 1.8V / 1.8V	Now
		DDR266	H5MS1G62MFP-K3M	FBGA (60ball)	4Bank, 1.8V / 1.8V	Now
		DDR400	H5MS1G62AFR-E3M	FBGA (60ball)	4Bank, 1.8V / 1.8V	Now
		DDR333	H5MS1G62AFR-J3M	FBGA (60ball)	4Bank, 1.8V / 1.8V	Now
	32M x 32	DDR400	H5MS1G22MFP-E3M	FBGA (90ball)	4Bank, 1.8V / 1.8V	Now
		DDR333	H5MS1G22MFP-J3M	FBGA (90ball)	4Bank, 1.8V / 1.8V	Now
		DDR266	H5MS1G22MFP-K3M	FBGA (90ball)	4Bank, 1.8V / 1.8V	Now
		DDR400	H5MS1G22AFR-E3M	FBGA (90ball)	4Bank, 1.8V / 1.8V	Now
		DDR333	H5MS1G22AFR-J3M	FBGA (90ball)	4Bank, 1.8V / 1.8V	Now
	32M x 32 (reduced page size)	DDR400	H5MS1G32MFP-E3M	FBGA (90ball)	4Bank, 1.8V / 1.8V	Now
		DDR333	H5MS1G32MFP-J3M	FBGA (90ball)	4Bank, 1.8V / 1.8V	Now
		DDR266	H5MS1G32MFP-K3M	FBGA (90ball)	4Bank, 1.8V / 1.8V	Now
		DDR400	H5MS1G32AFR-E3M	FBGA (90ball)	4Bank, 1.8V / 1.8V	Now
		DDR333	H5MS1G32AFR-J3M	FBGA (90ball)	4Bank, 1.8V / 1.8V	Now
512Mb	32M x 16	DDR400	H5MS5162DFR-E3M	FBGA (60ball)	4Bank, 1.8V / 1.8V	Now
		DDR333	H5MS5162DFR-J3M	FBGA (60ball)	4Bank, 1.8V / 1.8V	Now
		DDR266	H5MS5162DFR-K3M	FBGA (60ball)	4Bank, 1.8V / 1.8V	Now
		DDR400	H5MS5162EFR-E3M	FBGA (60ball)	4Bank, 1.8V / 1.8V	Now
		DDR333	H5MS5162EFR-J3M	FBGA (60ball)	4Bank, 1.8V / 1.8V	Now
	16M x 32	DDR400	H5MS5122DFR-E3M	FBGA (90ball)	4Bank, 1.8V / 1.8V	Now
		DDR333	H5MS5122DFR-J3M	FBGA (90ball)	4Bank, 1.8V / 1.8V	Now
		DDR266	H5MS5122DFR-K3M	FBGA (90ball)	4Bank, 1.8V / 1.8V	Now
		DDR400	H5MS5122EFR-E3M	FBGA (90ball)	4Bank, 1.8V / 1.8V	Now
		DDR333	H5MS5122EFR-J3M	FBGA (90ball)	4Bank, 1.8V / 1.8V	Now
256Mb	16M x 16	DDR400	H5MS2562JFR-E3M	FBGA (60ball)	4Bank, 1.8V / 1.8V	Now
		DDR333	H5MS2562JFR-J3M	FBGA (60ball)	4Bank, 1.8V / 1.8V	Now
		DDR266	H5MS2562JFR-K3M	FBGA (60ball)	4Bank, 1.8V / 1.8V	Now
	8M x 32	DDR400	H5MS2622JFR-E3M	FBGA (90ball)	4Bank, 1.8V / 1.8V	Now
		DDR333	H5MS2622JFR-J3M	FBGA (90ball)	4Bank, 1.8V / 1.8V	Now
		DDR266	H5MS2622JFR-K3M	FBGA (90ball)	4Bank, 1.8V / 1.8V	Now

* All SDRAM is Available For Lead Free or Lead & Halogen Free

LPDDR2

DENSITY	ORG.	SPEED	PART NUMBER	PACKAGE	FEATURE	AVAILABILITY
2Gb	64M x 32	DDR2-800	H9TKNNN2GDMPLR-NDM	FBGA (168ball)	8Bank, 1.8V / 1.2V / 1.2V	Now
		DDR2-667	H9TKNNN2GDMPLR-NYM	FBGA (168ball)	8Bank, 1.8V / 1.2V / 1.2V	Now

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NAND Flash Memory

General Description

Hynix provides a broad range of NAND Flash products density from 128Mb to 256Gb with various types of packaging (TSOP, VLGA and FBGA). Due to the proliferation of digital content, NAND Flash memory products are used in a wide variety of applications such as MP3, PMP, Digital camera, Camcorder, Memory card, USB flash drive and other consumer electronics such as game console, Navigation. Currently, Hynix NAND Flash Memory is being widely adopted in the mobile handset applications and we are also developing PC storage solutions based on the NAND Flash chips. To meet the growing demand for high capacity and improved performance in mobile applications, Hynix is offering HiFFS (Flash File System) software with eHiFFS system that enhances NAND chip performance and reliability.

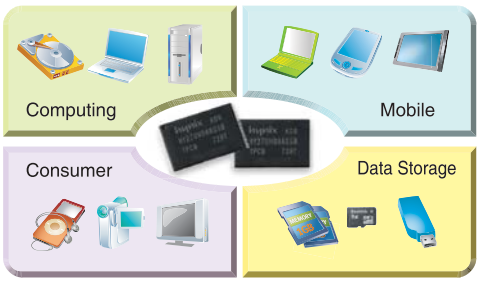
NAND Flash Key Features

Items		41nm 32G MLC	32nm 32G MLC	26nm 64G MLC
Voltage		3.3V	3.3V	3.3V
Organization		x8	x8	x8
Page & Block size (P/B)		4KB+224B / 512KB	8KB+448B / 2MB	8KB+448B / 2MB
tRC(min) / tWC (min)		25ns	25ns	20ns
tR (max)		60us	200us	200us
Program time (typ.)		1000us	1600us	1700us
Erase time (typ.)		3ms	2.5ms	3.5ms
Operating current	MONO / DDP	30mA(typ.) ~ 50mA(max)	30mA(typ.) ~ 50mA(max)	30mA(typ.) ~ 50mA(max)
	QDP / DSP	30mA(typ.) ~ 50mA(max)	30mA(typ.) ~ 60mA(max)	30mA(typ.) ~ 60mA(max)
Function	Copyback	O with Data out	O with Data out	O with Data out
	Cache Program	O	O	O
	Cache Read	O	O	O
	2 Plane Op.	Write, Read & Erase	Write, Read & Erase	Write, Read & Erase
Special / Function	Enhanced Data Out	O	O	O
	OTP	O	O	O
	Unique ID	O	O	O

Endurance / Package

E/W Cycles / Retention	5K / 10 years	3K / 10 years	TBD
NOP	1	1	1
Package	VLGA	VLGA / TSOP	VLGA

NAND Flash Applications



Hynix NAND Flash

Cell Type	SLC	MLC	TLC
Specification	High Performance / Low Density	Middle Performance / Middle Density	Low Performance / High Density
Package	TSOP LGA FBGA	TSOP LGA	LGA
Max Density	TSOP 8GB LGA 16GB	TSOP 16GB LGA 32GB	LGA 32GB

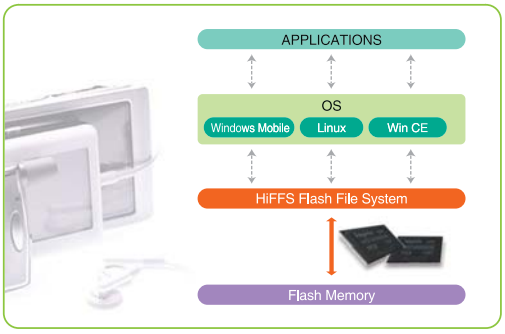
Software Support

HiFFS Software

HiFFS is a flash file system solution for mobile applications. HiFFS is the essential system software for electronic devices which has Flash memory storage such as mobile phones, PDAs, MP3 players, PMPs, digital TVs, and digital camcorders.

Features

- Flash memory file system solution for mobile embedded system
- Higher performance and reliability
- Fully compatible with FAT 12 / 16 / 32 file system standards
- Journaling error recovery mechanism
- Support various NAND Flash memory types such as small block, large block, MLC and SLC and TLC.
- Efficient bad block management and wear-leveling
- Support UMS(USB Mass Storage) and external flash memory cards
- Higher read / write performance
- Fast booting
- Support various operating systems such as WinCE, Linux, Non-OS, Windows Mobile



Hynix SSD & e-NAND

SSD (Solid State Drive)

SSD is one of the fastest growing NAND applications in the world. Because of its strengths - Speed, Performance, Reliability, and Power Consumption - many computing devices such as MID, Net Book, Notebook, Servers, etc have replaced conventional hard drives with SSD. Hynix offers SSM (Solid State Module) and SSD for mobile and personal computing devices.

SSD Key Features

Items	Features
Bus Interface	SATA 3.0Gbps
Capacities	128GB, 256GB, 512GB
Form Factor	Standard 2.5″
Dimension	69.9 x 100 x 7mm
Sustained Performance - 128KB, MAX	Read 260MB/s / Write 260MB/s
Random Performance - 4KB, MAX	Read 30K IOPS / Write 10K IOPS
Power Consumption	Active : 2.0W / Stand-by : 240mW
Temperature Range	0'c to 70'c for Operating / -55'c to 95'c for Storage
MTBF	1,000,000 Hrs
BER	1 error in 10^{14} bits transferred

e-NAND

- Combination of NAND Flash and the Flash Controller with MMC interface, in a single package
- Simple read / write memory using standard MMC 4.3 / 4.4 protocol interface.
- No additional firmware for NAND management required
- Controller includes NAND software such as FTL, ECC, FAT-16/32

NAND Flash
Product Line-up

NAND Flash SLC COMPONENT

PRODUCT	TECH.	DENSITY	BLOCK SIZE	STACK	VCC/ORG	PACKAGE	AVAILABILITY	REMARK
HY27US08281A	90nm	128Mb	16KB	Mono	3.3V / x8	TSOP / USOP	Now	
HY27US08561A	90nm	256Mb	16KB	Mono	3.3V / x8	TSOP / USOP / FBGA	Now	
HY27US08121B	70nm	512Mb	16KB	Mono	3.3V / x8	TSOP / USOP / FBGA	Now	
H27U518S2C	57nm	512Mb	16KB	Mono	3.3V / x8	TSOP	Now	
HY27US081G1M	70nm	1Gb	16KB	Mono	3.3V / x8	USOP	Now	
HY27US081G1A	57nm	1Gb	16KB	Mono	3.3V / x8	TSOP	Now	
HY27UF081G2A	70nm	1Gb	128KB	Mono	3.3V / x8	TSOP / USOP / FBGA	Now	
HY27US081G2A	70nm	1Gb	128KB	Mono	1.8V / x8	FBGA	Now	
H27U1G8F2B	48nm	1Gb	128KB	Mono	3.3V / x8	TSOP / FBGA	Now	
H27U1G8F2B	48nm	1Gb	128KB	Mono	1.8V / x8	FBGA	Now	
HY27UF082G2A	70nm	2Gb	128KB	Mono	3.3V / x8	TSOP / LGA	Now	
HY27UF082G2B	57nm	2Gb	128KB	Mono	3.3V / x8	TSOP / FBGA	Now	
HY27UF084G2B	57nm	4Gb	128KB	Mono	3.3V / x8	TSOP	Now	
H27U4G8F2D	41nm	4Gb	128KB	Mono	3.3V / x8	TSOP	Now	
HY27UG088G5(D)B	57nm	8Gb	128KB	DDP	3.3V / x8	TSOP / LGA	Now	2CE / Dual CH.
HY27UH08AG5B	57nm	16Gb	128KB	QDP	3.3V / x8	TSOP	Now	2CE

NAND Flash MLC COMPONENT

PRODUCT	TECH.	DENSITY	BLOCK SIZE	STACK	VCC/ORG	PACKAGE	AVAILABILITY	REMARK
H27U8G8T2B	48nm	8Gb	512KB	Mono	3.3V / x8	TSOP	Now	
H27UAG8T2BTR	32nm	16Gb	2MB (8KB Page)	SDP	3.3V / x8	TSOP	Now	
H27UAG8T2A	41nm	16Gb	512KB (4KB Page)	Mono	3.3V / x8	TSOP	Now	
H27UBG8U5A	41nm	32Gb	512KB (4KB Page)	DDP	3.3V / x8	TSOP	Now	
H27UBG8T2M	41nm	32Gb	512KB (4KB Page)	Mono	3.3V / x8	VLGA	Now	
H27UBG8T2A	32nm	32Gb	2MB (8KB Page)	SDP	3.3V / x8	TSOP / VLGA	Now	
H27UCG8VFA	41nm	64Gb	512KB (4KB Page)	QDP	3.3V / x8	TSOP	Now	
H27UCG8UDM	41nm	64Gb	512KB (4KB Page)	DDP	3.3V / x8	VLGA	Now	Dual CH.
H27UCG8U5(D)A	32nm	64Gb	2MB (8KB Page)	DDP	3.3V / x8	TSOP / VLGA	Now	Dual CH. LGA
H27UCG8T2M	26nm	64Gb	2MB (8KB Page)	SDP	3.3V / x8	VLGA	Now	
H27UDG8VEM	41nm	128Gb	512KB (4KB Page)	QDP	3.3V / x8	VLGA	Now	4CE, Dual CH.
H27UDG8V5(E)A	32nm	128Gb	2MB (8KB Page)	QDP	3.3V / x8	TSOP / VLGA	Now	4CE, Dual CH.
H27UEG8YEA	32nm	256Gb	2MB (8KB Page)	ODP	3.3V / x8	VLGA	Now	4CE, Dual CH.

NAND Flash TLC COMPONENT

PRODUCT	TECH.	DENSITY	BLOCK SIZE	STACK	VCC/ORG	PACKAGE	AVAILABILITY	REMARK
H27UAG8M2M	41nm	16Gb	768KB (4KB page)	SDP	3.3V / x8	VLGA	Now	
H27UBG8M2A	32nm	32Gb	1MB (4KB page)	SDP	3.3V / x8	VLGA	Now	
H27UCG8N5A	32nm	64Gb	1MB (4KB page)	DDP	3.3V / x8	VLGA	Now	

e-NAND COMPONENT

PRODUCT	DENSITY	BASE COMPONENT			VCC/ORG	VERSION	AVAILABILITY	REMARK
		TECH.	DENSITY	STACK				
H26M11001BAR	1GB	48nm	8Gb	1	3.3V / x8 / x4	MMC4.3	Now	
H26M21001CAR	2GB	41nm	16Gb	1	3.3V / x8 / x4	MMC4.3	Now	
H26M32001CAR	4GB	41nm	16Gb	2	3.3V / x8 / x4	MMC4.3	Now	
H26M32001DAR	4GB	32nm	32Gb	1	3.3V / x8 / x4	MMC4.4	Now	
H26M42001DAR	8GB	41nm	16Gb	2	3.3V / x8 / x4	MMC4.3	Now	
H26M42001EFR	8GB	32nm	32Gb	2	3.3V / x8 / x4	MMC4.4	Now	
H26M54001AJR	16GB	41nm	32Gb	4	3.3V / x8 / x4	MMC4.3	Now	
H26M54001BKR	16GB	32nm	32Gb	4	3.3V / x8 / x4	MMC4.4	Now	
H26M68001MJR	32GB	41nm	32Gb	8	3.3V / x8 / x4	MMC4.3	Now	
H26M68001ANR	32GB	32nm	32Gb	8	3.3V / x8 / x4	MMC4.4	Now	

uSD COMPONENT

PRODUCT	DENSITY	BASE COMPONENT			VCC/ORG	VERSION	AVAILABILITY	REMARK
		TECH.	DENSITY	STACK				
H24U1GTM3ARH	1GB	48nm	8Gb	1	3.3V / x4	Class-4	Now	
H24U2GTM1BRH	2GB	41nm	16Gb	1	3.3V / x4	Class-4	Now	
H24U4GUM1ARH	4GB	41nm	16Gb	2	3.3V / x4	Class-6	Now	
H24U8GVM1MRH	8GB	41nm	16Gb	4	3.3V / x4	Class-6	Now	
H24UAGYM1MRH	16GB	41nm	16Gb	8	3.3V / x4	Class-6	Now	
H24U2GTM1DRH	2GB	32nm	16Gb	1	3.3V / x4	Class-6	Oct' 10	

E2NAND2.0

PRODUCT	TECH.	DENSITY	BLOCK SIZE	STACK	VCC/ORG	PACKAGE	AVAILABILITY	REMARK
H2DQDG8VD1MYR	32nm	128Gb	256KB	4	3.3V / x8	VLGA	Now	VccQ=1.8V
H2DUDG8VD1MYR	32nm	128Gb	256KB	4	3.3V / x8	VLGA	Now	VccQ=3.3V
H2DQEG8VD1MYR	32nm	256Gb	256KB	8	3.3V / x8	VLGA	Now	VccQ=1.8V
H2DUEG8VD1MYR	32nm	256Gb	256KB	8	3.3V / x8	VLGA	Now	VccQ=3.3V

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CIS
CMOS Image Sensor

General Description

Cameras are now embedded in every consumer application. From cell phones to Laptops, taking pictures or streaming self video images to friends are part of everyday life. Through Hynix CIS, these images can be realized with improved clarity and more lively ways. Delivering an important moment of one's life is a pleasure one can never part with.
The year 2010 will be a milestone for Hynix CIS product line as it gears up toward being the market leader. Hynix is enhancing its technical excellence in accelerating technology development to provide advanced quality products and meet the next level of customer needs

Applications

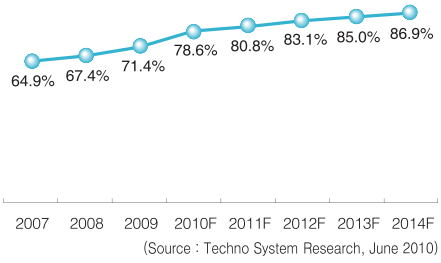
- Camera Phone
- Dual-camera products
- Web cams
- Other mobile gadgets

CMOS Image Sensor

CMOS image sensor is a device that converts an optical image to an electrical signal using a CMOS technology. CMOS technology enables integration of image sensing and digital signal processing on the same chip, resulting in faster, smaller, less expensive, and lower power image sensing devices.

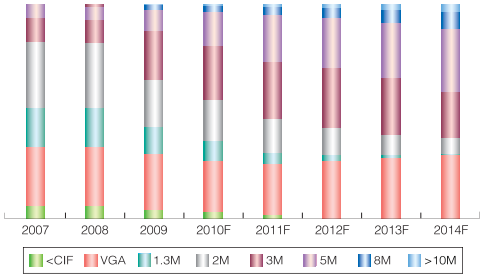
CMOS image sensor market has a high growth potential, with demand expected to rise by 10 percent annually through 2012.
Its main applications are camera phones, digital still cameras and video conferencing systems, but the market for CMOS image sensor is rapidly diversifying into applications such as surveillance systems, automotive cameras, and medical equipment.

Camera Attachment Ratio of Mobile Phones



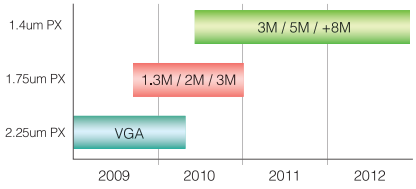
(Source : Techno System Research, June 2010)

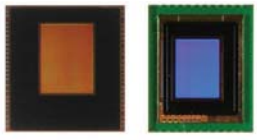
Camera Phone Resolution Trend (Main Camera)



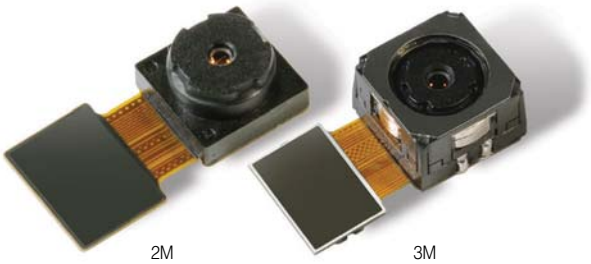
(Source : Techno System Research, June 2010)

Hynix CMOS Image Sensor Technology Migration





VGA 1.3M



2M 3M

CMOS Image Sensor
Product Line-up and Key Features

VGA (YACBA21S)

Pixel Size	2.25um × 2.25um
Array Format (Active)	640H × 480V
Optical Format	1/10-inch
Imaging Area	1.44mm × 1.08mm
Color Filter Array	RGB Bayer color filters
Scan Mode	Progressive
Frame Rate	30-fps @ 24MHz
Shutter	Electronic rolling Shutter (ERS)
Supply Voltage	Digital I/O: 1.7V ×3.0V Digital Core: 1.7V — 1.9V Analog & Pixel: 2.6V —3.0V
Window size	Programmable (including VGA, QVGA, CIF, QCIF)
Flash Support	Xenon and LED
Sensitivity	1280mV / LuxSec

SNR	39dB
Dynamic Range	60dB
ADC	On-chip, 10-bit
Data Rate	12 megapixels per second (master clock, 24MHz)
Features	Auto Exposure, Auto White Balance, Black Level Calibration, Dead pixel Correction, Windowing, Sub-Sampling, Image Flip, Anti-Flicker, Noise Reduction, Edge Enhancement, Brightness, Color Saturation, Gamma Correction, Color Correction, Lens Shading Correction
Packaging	ShellUT CSP
Operating Temp. Range	-20 ℃ to 60 ℃

1.3M (YACC6A1S)

Pixel Size	1.75um
Optical Format	1/6-inch
Array Format (Active)	1280H × 1024V
Imaging Area	2.296mm × 1.848mm
Color Filter Array	RGB Bayer color filters
Scan Mode	Progressive
Frame Rate	20fps @ SXGA, 30fps @ 720P, 40fps @ VGA
Shutter	Electronic rolling Shutter (ERS)
Supply Voltage	Digital I/O: 1.7V —3.0V Digital Core: 1.7V — 1.9V Analog & Pixel: 2.6V —3.0V
Window size	Programmable
Flash Support	Xenon and LED
Sensitivity	700mV / LuxSec

SNR	38dB
Dynamic Range	60dB
ADC	On-chip, 10-bit
Features	Auto Exposure, Auto White Balance, Black Level Calibration, Dead pixel Correction, Windowing, Sub-Sampling, Image Scaling, Image Flip, Anti-Flicker, Noise Reduction, Edge Enhancement, Brightness, Color Saturation, Gamma Correction, Color Correction, Lens Shading Correction
Packaging	Bare die (COB) , Recon. Wafer, NeoPAC CSP
Operating Temp. Range	-20 ℃ to 60 ℃

2M (YACD5B1S / YACD511S)

Pixel Size	1.75um × 1.75um
Optical Format	1/5-inch
Array Format (Active)	1600H × 1200V
Imaging Area	2.80mm × 2.10mm
Color Filter Array	RGB Bayer color filters
Scan Mode	Progressive
Frame Rate	Max 15-fps @ full resolution
Shutter	Electronic rolling Shutter (ERS)
Supply Voltage	Digital I/O: 1.7V —3.0V Digital Core: 1.7V — 1.9V Analog & Pixel: 2.6V —3.0V
Window size	Programmable (including UXGA, SVGA, QSVGA)
Flash Support	Xenon and LED
Sensitivity	700mV / lux.sec
SNR	38dB
Dynamic Range	60dB

ADC	On-chip, 10-bit
Data Rate	36 megapixels per second (Internal PLL clock = 72MHz)
Features	Auto Exposure, Auto White Balance, Black Level Calibration, Dead pixel Correction, Edge Data for Auto Focus, Motion Data for Anti-shaking, Windowing, Sub-Sampling, Image Scaling, Image Flip, Anti-Flicker, Noise Reduction, Strobe Control, Edge Enhancement, Brightness , Color Saturation, Gamma Correction, Color Correction, Lens Shading Correction
Packaging	Bare die (COB) , Recon. Wafer, NeoPAC CSP
Operating Temp. Range	-20 ℃ to 60 ℃

3M (YACE4A1S)

Pixel Size	1.75um × 1.75um
Optical Format	1/4-inch
Array Format (Active)	2048H × 1356V
Imaging Area	3.640mm × 2.744mm
Color Filter Array	RGB Bayer color filters
Scan Mode	Progressive
Frame Rate	15-fps @ QXGA, 30-fps @ XGA
Shutter	Electronic rolling Shutter (ERS)
Supply Voltage	Digital I/O: 1.7V —3.0V Digital Core: 1.7V — 1.9V Analog & Pixel: 2.6V —3.0V
Window size	Programmable
Sensitivity	700mV / lux-sec @ 550nm (est.)
SNR	32dB (est.)

Dynamic Range	60dB
ADC	On-chip, 10-bit
Features	Auto Exposure, Auto white balance, Black level calibration, Dead pixel Correction, Auto Focus Control, Anti-Shaking, Windowing, Sub-Sampling, Image Scaling, Image Flip, Anti-flicker, Noise Reduction, Strobe Control, Edge Enhancement , Brightness, Color Saturation Gamma Correction, Color Correction Lens Shading Correction, MCU Embeded, JPEG Encoder with thumbnail support
Packaging	Bare die (COB) , Recon. Wafer, NeoPAC CSP
Operating Temp. Range	-20 ℃ to 60 ℃

*. YACE4B1S is available with smaller size but JPEG is not embedded.

Global Sales Network

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