Hynix Dreams Good Memory

hynix

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 $15B as of October 2010
| Global presence with 3 manufacturing sites and 30 sales offices worldwide | 21,227 employees worldwide

Recent Accomplishments

2011	03	Developed the world's largest DRAM with TSV technology
2010	12	Developed 40nm class 2Gb DDR3 2133Mbps
	10	Introduced 30nm class based 2.5 inches SSD
	09	Introduced New 2M shellUT Type CSP Image Sensor
	07	Developed 40nm class 2Gb DDR3 1866Mbps
	06	Developed 40nm class DDR3 operating at 1.25V
	04	Developed DDR3 16GB LRDIMM
	03	Developed industry's first stack based on 'Wafer Level Package' technology
	02	Developed 40nm class 64Gb NAND Flash memory
	01	Developed the world's first 2Gb Mobile Low Power DDR2 DRAM
2009	12	Introduced the world's first 40nm class 2Gb GDDR5 DRAM
	11	Acquired Intel validation for 40nm class 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 40nm class 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

Hynix Dreams Good Memory

Hynix Products


Computing Memory


Graphics Memory


Consumer & Network Memory


Mobile Memory


NAND Flash


CMOS Image Sensor

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

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 Disk On Chip 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.

Computing Memory

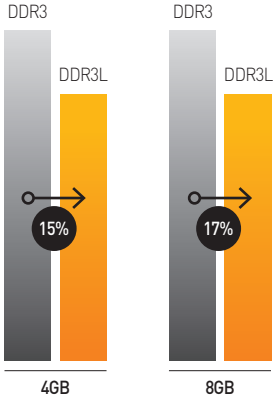
DDR3

Pushing the Limits of Performance

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 2R×4 RDIMM, 1333Mbps)

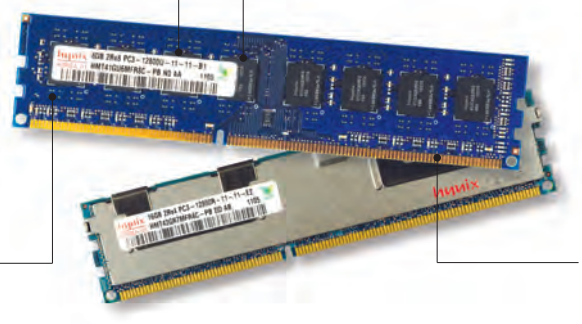
DDR2 VS. DDR3

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

ZQ Calibration
- Reduce variation by Vdd / temp
- Minimize output skew / jitter

Write Levelization
- Minimize tDQSS by de-skewing
- Gain system timing margin



Dynamic ODT
- Changeable termination strength without issuing an MRS command
- Improved Signal Integrity

Fly-by topology
- For higher frequencies
- On-DIMM termination

PC & Server Memory

High Density and Reliability

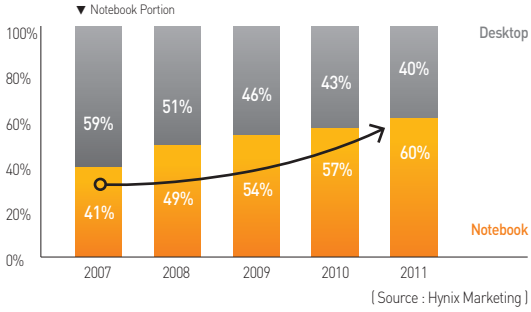
General Description

Environmental protection has become a priority of governments and corporations worldwide. Applications such as highly virtualized data centers, servers and supercomputers that consume a lot of power can take advantage of the low power features of the DDR3 SDRAM to enable cooler, power efficient systems, while lowering costs of utilities.

Hynix is responding to the industry demand for eco-friendly or 'green' products that reduce power consumption, improve system reliability and reduce carbon emissions. The new Hynix 1.5V 1Gb DDR3 features 25% lower power consumption than competing solutions. The 1.35V(DDR3L) product yields an additional 20% power savings and will be attractive solution for applications requiring energy star compliance. This product would also be ideal in mobile applications, such as notebooks, where it markedly extends battery life. The new design philosophy adopted on Hynix's advanced 30nm process, will benefit future high density DRAM components. The new 30nm 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 mobile systems such as 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 the 30nm class product.

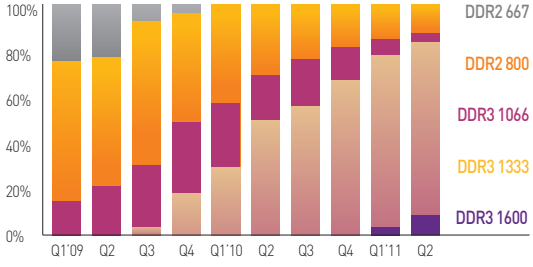
Application Transition to Notebook



(Source : Hynix Marketing)

A crossover to mobile computers from the tradition desktop has already occurred. Declining prices is the primary driving factors, especially in light of the current global economic conditions. Mobility and weight are other features that make mobile computers attractive to consumers.

Memory 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 have widely adopted DDR3 memory. With rapid transition to DDR3, processor vendors are supporting DDR3 platforms at speeds up to 1333Mbps. After the launch of the mobile PC CPU supporting 1600Mbps in January 2011, OEMs will gradually adopt 1600Mbps SODIMM in their mobile platforms.

SODIMM

Density	4GB SODIMM
Organization	512Mx64
Speed	1600Mbps
Number of Rank	2 Ranks
Package	Halogen-Free

RDIMM

Density	16GB RDIMM
Organization	2Gx72
Speed	1333Mbps
Number of Rank	4 Ranks
Package	Halogen-Free

Computing 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	8GB	1Gx64	512Mx8	1600-111111	HMT41GU6MFR8C-PB	FBGA (78ball)	2	30mm	Q3 '11
				1333-999	HMT41GU6MFR8C-H9	FBGA (78ball)	2	30mm	Q3 '11
		1Gx72	512Mx8	1600-111111	HMT41GU7MFR8C-PB	FBGA (78ball)	2	30mm	Q2 '11
				1333-999	HMT41GU7MFR8C-H9	FBGA (78ball)	2	30mm	Q2 '11
	4GB	512Mx64	256Mx8	1600-111111	HMT351U6BFR8C-PB	FBGA (82ball)	2	30mm	Now
					HMT351U6CFR8C-PB	FBGA (78ball)	2	30mm	Now
				1333-999	HMT351U6BFR8C-H9	FBGA (82ball)	2	30mm	Now
					HMT351U6CFR8C-H9	FBGA (78ball)	2	30mm	Now
		512Mx72	256Mx8	1600-111111	HMT351U7BFR8C-PB	FBGA (82ball)	2	30mm	Now
					HMT351U7CFR8C-PB	FBGA (78ball)	2	30mm	Now
				1333-999	HMT351U7BFR8C-H9	FBGA (82ball)	2	30mm	Now
					HMT351U7CFR8C-H9	FBGA (78ball)	2	30mm	Now
	2GB	256Mx64	128Mx8	1333-999	HMT125U6BFR8C-H9	FBGA (78ball)	2	30mm	Now
					HMT125U6TFR8C-H9	FBGA (78ball)	2	30mm	Now
			256Mx8	1600-111111	HMT325U6BFR8C-PB	FBGA (82ball)	1	30mm	Now
					HMT325U6CFR8C-PB	FBGA (78ball)	1	30mm	Now
				1333-999	HMT325U6BFR8C-H9	FBGA (82ball)	1	30mm	Now
					HMT325U6CFR8C-H9	FBGA (78ball)	1	30mm	Now
		256Mx72	128Mx8	1333-999	HMT125U7TFR8C-H9	FBGA (78ball)	2	30mm	Now
			256Mx8	1600-111111	HMT325U7BFR8C-PB	FBGA (82ball)	1	30mm	Now
					HMT325U7CFR8C-PB	FBGA (78ball)	1	30mm	Now
				1333-999	HMT325U7BFR8C-H9	FBGA (82ball)	1	30mm	Now
					HMT325U7CFR8C-H9	FBGA (78ball)	1	30mm	Now
	1GB	128Mx64	128Mx8	1333-999	HMT112U6BFR8C-H9	FBGA (78ball)	1	30mm	Now
					HMT112U6TFR8C-H9	FBGA (78ball)	1	30mm	Now
		128Mx72	128Mx8	1333-999	HMT112U7TFR8C-H9	FBGA (78ball)	1	30mm	Now
1.35V	8GB	1Gx72	512Mx8	1333-999	HMT41GU7MFR8A-H9	FBGA (78ball)	2	30mm	Q2 '11
	4GB	512Mx72	256Mx8	1600-111111	HMT351U7BFR8A-PB	FBGA (82ball)	2	30mm	Now
					HMT351U7CFR8A-PB	FBGA (78ball)	2	30mm	Now
				1333-999	HMT351U7BFR8A-H9	FBGA (82ball)	2	30mm	Now
					HMT351U7CFR8A-H9	FBGA (78ball)	2	30mm	Now
	2GB	256Mx72	256Mx8	1600-111111	HMT325U7BFR8A-PB	FBGA (82ball)	1	30mm	Now
					HMT325U7CFR8A-PB	FBGA (78ball)	1	30mm	Now
				1333-999	HMT325U7BFR8A-H9	FBGA (82ball)	1	30mm	Now
					HMT325U7CFR8A-H9	FBGA (78ball)	1	30mm	Now
		256Mx72	128Mx8	1333-999	HMT125U7TFR8A-H9	FBGA (78ball)	2	30mm	Now
	1GB	128Mx72	128Mx8	1333-999	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	32GB	4Gx72	2Gx4 (DDP)	1333-999	HMT84GR7MMR4C-H9	FBGA (78ball)	4	30mm	Q3 '11
				1066-777	HMT84GR7MMR4C-G7	FBGA (78ball)	4	30mm	Q3 '11
	16GB	2Gx72	1Gx4	1600-111111	HMT42GR7MFR4C-PB	FBGA (78ball)	2	30mm	Q2 '11
				1333-999	HMT42GR7MFR4C-H9	FBGA (78ball)	2	30mm	Q2 '11
			1Gx4 (DDP)	1333-999	HMT42GR7BMR4C-H9	FBGA (82ball)	4	30mm	Now
					HMT42GR7CMR4C-H9	FBGA (78ball)	4	30mm	Q2 '11
				1066-777	HMT42GR7BMR4C-G7	FBGA (82ball)	4	30mm	Now
	8GB	1Gx72	512Mx4	1600-111111	HMT31GR7BFR4C-PB	FBGA (82ball)	2	30mm	Now
					HMT31GR7CFR4C-PB	FBGA (78ball)	2	30mm	Q2 '11
				1333-999	HMT31GR7BFR4C-H9	FBGA (82ball)	2	30mm	Now
					HMT31GR7CFR4C-H9	FBGA (78ball)	2	30mm	Q2 '11
			256Mx8	1333-999	HMT31GR7BFR8C-H9	FBGA (82ball)	4	30mm	Now
					HMT31GR7CFR8C-H9	FBGA (78ball)	4	30mm	Q2 '11
	4GB	512Mx72	256Mx8	1600-111111	HMT351R7BFR8C-PB	FBGA (82ball)	2	30mm	Now
					HMT351R7CFR8C-PB	FBGA (78ball)	2	30mm	Q2 '11
				1333-999	HMT351R7BFR8C-H9	FBGA (82ball)	2	30mm	Now
					HMT351R7CFR8C-H9	FBGA (78ball)	2	30mm	Q2 '11
			512Mx4	1600-111111	HMT351R7BFR4C-PB	FBGA (82ball)	1	30mm	Now
					HMT351R7CFR4C-PB	FBGA (78ball)	1	30mm	Q2 '11
				1333-999	HMT351R7BFR4C-H9	FBGA (82ball)	1	30mm	Now
					HMT351R7CFR4C-H9	FBGA (78ball)	1	30mm	Q2 '11
			128Mx8	1333-999	HMT151R7TFR8C-H9	FBGA (78ball)	4	30mm	Now
			256Mx4	1333-999	HMT151R7TFR4C-H9	FBGA (78ball)	2	30mm	Now
	2GB	256Mx72	256Mx8	1600-111111	HMT325R7BFR8C-PB	FBGA (82ball)	1	30mm	Now
					HMT325R7CFR8C-PB	FBGA (78ball)	1	30mm	Q2 '11
				1333-999	HMT325R7BFR8C-H9	FBGA (82ball)	1	30mm	Now
					HMT325R7CFR8C-H9	FBGA (78ball)	1	30mm	Q2 '11
			256Mx4	1333-999	HMT125R7TFR4C-H9	FBGA (78ball)	1	30mm	Now
			128Mx8	1333-999	HMT125R7TFR8C-H9	FBGA (78ball)	2	30mm	Now
	1GB	128Mx72	128Mx8	1333-999	HMT112R7TFR8C-H9	FBGA (78ball)	1	30mm	Now
1.35V	32GB	4Gx72	2Gx4 (DDP)	1333-999	HMT84GR7MMR4A-H9	FBGA (78ball)	4	30mm	Q3 '11
				1066-777	HMT84GR7MMR4A-G7	FBGA (78ball)	4	30mm	Q3 '11
	16GB	2Gx72	1Gx4	1333-999	HMT42GR7MFR4A-H9	FBGA (78ball)	2	30mm	Q2 '11
			1Gx4 (DDP)	1333-999	HMT42GR7BMR4A-H9	FBGA (82ball)	4	30mm	Now
					HMT42GR7CMR4A-H9	FBGA (78ball)	4	30mm	Q2 '11
				1066-777	HMT42GR7BMR4A-G7	FBGA (82ball)	4	30mm	Now
	8GB	1Gx72	512Mx4	1333-999	HMT31GR7BFR4A-H9	FBGA (82ball)	2	30mm	Now
					HMT31GR7CFR4A-H9	FBGA (78ball)	2	30mm	Q2 '11
			256Mx8	1333-999	HMT31GR7BFR8A-H9	FBGA (82ball)	4	30mm	Now
					HMT31GR7CFR8A-H9	FBGA (78ball)	4	30mm	Q2 '11
	4GB	512Mx72	512Mx4	1333-999	HMT351R7BFR8A-H9	FBGA (82ball)	2	30mm	Now
					HMT351R7CFR8A-H9	FBGA (78ball)	2	30mm	Q2 '11
			256Mx8	1333-999	HMT351R7BFR8A-H9	FBGA (82ball)	2	30mm	Now
					HMT351R7CFR8A-H9	FBGA (78ball)	2	30mm	Q2 '11
			256Mx4	1333-999	HMT151R7TFR4A-H9	FBGA (78ball)	2	30mm	Now
	2GB	256Mx72	256Mx8	1333-999	HMT325R7BFR8A-H9	FBGA (82ball)	1	30mm	Now
					HMT325R7CFR8A-H9	FBGA (78ball)	1	30mm	Q2 '11
			256Mx4	1333-999	HMT125R7TFR4A-H9	FBGA (78ball)	1	30mm	Now
			128Mx8	1333-999	HMT125R7TFR8A-H9	FBGA (78ball)	2	30mm	Now
	1GB	128Mx72	128Mx8	1333-999	HMT112R7TFR8A-H9	FBGA (78ball)	1	30mm	Now

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	16GB	2Gx72	2Gx4 (DDP)	1600-111111	HMT82GV7MMR4C-PB	FBGA (78ball)	2	18.75mm	Q3 '11
				1333-999	HMT82GV7MMR4C-H9	FBGA (78ball)	2	18.75mm	Q3 '11
	8GB	1Gx72	1Gx4 (DDP)	1600-111111	HMT41GV7BMR4C-PB	FBGA (82ball)	2	18.75mm	Now
					HMT41GV7CMR4C-PB	FBGA (78ball)	2	18.75mm	Q2 '11
				1333-999	HMT41GV7BMR4C-H9	FBGA (82ball)	2	18.75mm	Now
					HMT41GV7CMR4C-H9	FBGA (78ball)	2	18.75mm	Q2 '11
			512Mx8 (DDP)	1333-999	HMT41GV7BMR8C-H9	FBGA (82ball)	4	18.75mm	Now
					HMT41GV7CMR8C-H9	FBGA (78ball)	4	18.75mm	Q2 '11
				1066-777	HMT41GV7BMR8C-G7	FBGA (82ball)	4	18.75mm	Now
	4GB	512Mx72	512Mx4	1600-111111	HMT351V7BFR4C-PB	FBGA (82ball)	1	18.75mm	Now
					HMT351V7CFR4C-PB	FBGA (78ball)	1	18.75mm	Q2 '11
				1333-999	HMT351V7BFR4C-H9	FBGA (82ball)	1	18.75mm	Now
					HMT351V7CFR4C-H9	FBGA (78ball)	1	18.75mm	Q2 '11
			512Mx4 (DDP)	1333-999	HMT351V7TMR4C-H9	FBGA (78ball)	2	18.75mm	Now
			256Mx8	1600-111111	HMT351V7BFR8C-PB	FBGA (82ball)	2	18.75mm	Now
					HMT351V7CFR8C-PB	FBGA (78ball)	2	18.75mm	Q2 '11
				1333-999	HMT351V7BFR8C-H9	FBGA (82ball)	2	18.75mm	Now
					HMT351V7CFR8C-H9	FBGA (78ball)	2	18.75mm	Q2 '11
	2GB	256Mx72	256Mx4	1333-999	HMT125V7TFR4C-H9	FBGA (78ball)	1	18.75mm	Now
			128Mx8	1333-999	HMT125V7TFR8C-H9	FBGA (78ball)	2	18.75mm	Now
			256Mx8	1600-111111	HMT325V7BFR8C-PB	FBGA (82ball)	1	18.75mm	Now
					HMT325V7CFR8C-PB	FBGA (78ball)	1	18.75mm	Q2 '11
				1333-999	HMT325V7BFR8C-H9	FBGA (82ball)	1	18.75mm	Now
					HMT325V7CFR8C-H9	FBGA (78ball)	1	18.75mm	Q2 '11
	1GB	128Mx72	128Mx8	1333-999	HMT112V7TFR8C-H9	FBGA (78ball)	1	18.75mm	Now
1.35V	16GB	2Gx72	2Gx4 (DDP)	1333-999	HMT82GV7MMR4A-H9	FBGA (78ball)	2	18.75mm	Q3 '11
				1066-777	HMT82GV7MMR4A-G7	FBGA (78ball)	2	18.75mm	Q3 '11
	8GB	1Gx72	1Gx4 (DDP)	1333-999	HMT41GV7BMR4A-H9	FBGA (82ball)	2	18.75mm	Now
					HMT41GV7CMR4A-H9	FBGA (78ball)	2	18.75mm	Q2 '11
				1066-777	HMT41GV7BMR4A-G7	FBGA (82ball)	2	18.75mm	Now
			512Mx8 (DDP)	1333-999	HMT41GV7BMR8A-H9	FBGA (82ball)	4	18.75mm	Now
					HMT41GV7CMR8A-H9	FBGA (78ball)	4	18.75mm	Q2 '11
				1066-777	HMT41GV7BMR8A-G7	FBGA (82ball)	4	18.75mm	Now
	4GB	512Mx72	512Mx4	1333-999	HMT351V7BFR4C-H9	FBGA (82ball)	1	18.75mm	Now
					HMT351V7CFR4C-H9	FBGA (78ball)	1	18.75mm	Q2 '11
			512Mx4 (DDP)	1333-999	HMT351V7TMR4A-H9	FBGA (78ball)	2	18.75mm	Now
			256Mx8	1333-999	HMT351V7BFR8A-H9	FBGA (82ball)	2	18.75mm	Now
				1333-999	HMT351V7CFR8A-H9	FBGA (78ball)	2	18.75mm	Q2 '11
	2GB	256Mx72	256Mx4	1333-999	HMT125V7TFR4A-H9	FBGA (78ball)	1	18.75mm	Now
			128Mx8	1333-999	HMT125V7TFR8A-H9	FBGA (78ball)	2	18.75mm	Now
			256Mx8	1333-999	HMT325V7BFR8A-H9	FBGA (82ball)	1	18.75mm	Now
					HMT325V7CFR8A-H9	FBGA (78ball)	1	18.75mm	Q2 '11
	1GB	128Mx72	128Mx8	1333-999	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	8GB	1Gx64	512Mx8	1600-111111	HMT41GS6MFR8C-PB	FBGA (78ball)	2	30mm	Q2 '11
				1333-999	HMT41GS6MFR8C-H9	FBGA (78ball)	2	30mm	Q2 '11
	4GB	512Mx64	256Mx8	1600-111111	HMT351S6BFR8C-PB	FBGA (82ball)	2	30mm	Now
					HMT351S6CFR8C-PB	FBGA (89ball)	2	30mm	Now
				1333-999	HMT351S6BFR8C-H9	FBGA (82ball)	2	30mm	Now
					HMT351S6CFR8C-H9	FBGA (78ball)	2	30mm	Now
	2GB	256Mx64	128Mx8	1333-999	HMT125S6BFR8C-H9	FBGA (78ball)	2	30mm	Now
					HMT125S6TFR8C-H9	FBGA (78ball)	2	30mm	Now
			256Mx8	1600-111111	HMT325S6BFR8C-PB	FBGA (82ball)	1	30mm	Now
					HMT325S6CFR8C-PB	FBGA (78ball)	1	30mm	Now
				1333-999	HMT325S6BFR8C-H9	FBGA (82ball)	1	30mm	Now
					HMT325S6CFR8C-H9	FBGA (78ball)	1	30mm	Now
			128Mx16	1333-999	HMT325S6BFR6C-H9	FBGA (96ball)	2	30mm	Now
	1GB	128Mx64	128Mx8	1333-999	HMT112S6TFR8C-H9	FBGA (78ball)	1	30mm	Now
		128Mx64	64Mx16	1333-999	HMT112S6BFR6C-H9	FBGA (96ball)	2	30mm	Now
			128Mx16	1333-999	HMT312S6BFR6C-H9	FBGA (96ball)	1	30mm	Now

DDR3 SDRAM MODULE (240pin-LRDIMM)

VDD	MODULE DENSITY	MODULE ORG.	BASED COM.	SPEED	PART NUMBER	PACKAGE	RANK	HEIGHT	AVAILABILITY
1.5V	32GB	4Gx72	2Gx4 (DDP)	1600-111111	HMT84GL7MMR4C-PB	FBGA (78ball)	4	30.35mm	Q3 '11
				1333-999	HMT84GL7MMR4C-H9	FBGA (78ball)	4	30.35mm	Q3 '11
	16GB	2Gx72	1Gx4 (DDP)	1600-111111	HMT42GL7BMR4C-PB	FBGA (82ball)	4	30.35mm	Q2 '11
				1333-999	HMT42GL7BMR4C-H9	FBGA (82ball)	4	30.35mm	Q2 '11
1.35V	32GB	4Gx72	2Gx4 (DDP)	1333-999	HMT84GL7MMR4A-H9	FBGA (78ball)	4	30.35mm	Q3 '11
	16GB	2Gx72	1Gx4 (DDP)	1333-999	HMT42GL7BMR4A-H9	FBGA (78ball)	4	30.35mm	Q2 '11

Graphics Memory

High Speed and Density

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 40nm class 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 variants, meeting Hynix's goal of developing eco-friendly products.

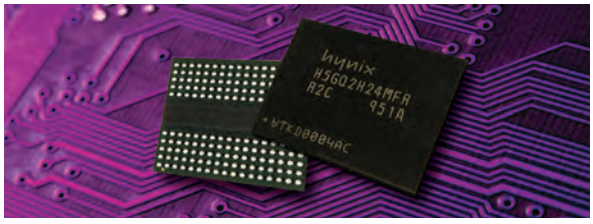
The 2Gb GDDR5 will meet the needs of high-end desktop and notebook graphics applications. It will also be suitable in super computers designed with a General Purpose GPU architecture, where the 2Gb GDDR5 will serve as high bandwidth memory to the GPU.

Hynix has maintained its leadership in graphics memory with the world's first 60nm class 1Gb GDDR5 in 2007, followed by the 50nm class 1Gb GDDR5 in 2008, and 40nm class 2Gb GDDR5 in early 2010.

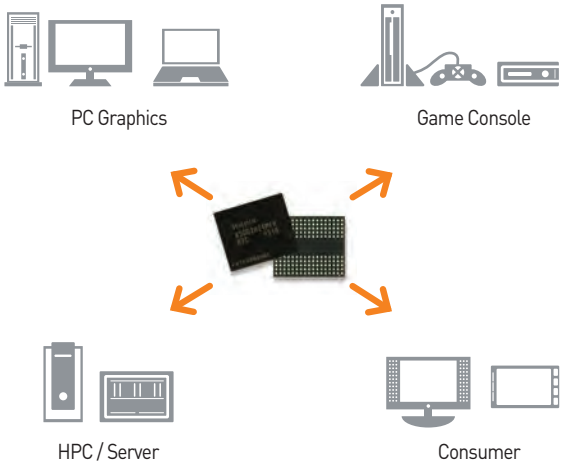
Hynix also supports GDDR3, DDR3 and DDR2 products for performance and mainstream market. Hynix will continue to provide value to customers with leadership products with high performance and quality.

40nm class 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)	×	×	○	○

Product Line-up

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	Now
		900MHz (1.1ns)	H5TQ1G63DFR-11C	FBGA (96ball)	8Bank, 1.5V / 1.5V	Now
		800MHz (1.2ns)	H5TQ1G63DFR-12C	FBGA (96ball)	8Bank, 1.5V / 1.5V	Now
		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)	8bank, 1.9V / 1.9V	Now
		1,200MHz (0.8ns)	H5RS1H23MFR-N2C	FBGA (136ball)	8bank, 1.9V / 1.9V	Now
		1,000MHz (1.0ns)	H5RS1H23MFR-N0C	FBGA (136ball)	8bank, 1.8V / 1.8V	Now
		900MHz (1.1ns)	H5RS1H23MFR-11C	FBGA (136ball)	8bank, 1.8V / 1.8V	Now
		700MHz (1.4ns)	H5RS1H23MFR-14C	FBGA (136ball)	8bank, 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

GDDR5 SDRAM

DENSITY	ORG.	SPEED	PART NUMBER	PACKAGE	FEATURE	AVAILABILITY
2Gb	64Mx32	6.0Gbps	H5GQ2H24MFR-R0C	FBGA (170ball)	16Bank, 1.5V / 1.5V	Now
		4.0Gbps			16Bank, 1.35V / 1.35V	
		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	H5GQ1H24BFR-R0C	FBGA (170ball)	16Bank, 1.5V / 1.5V	Now
		4.0Gbps			16Bank, 1.35V / 1.35V	
		5.0Gbps	H5GQ1H24BFR-T2C	FBGA (170ball)	16Bank, 1.5V / 1.5V	Now
		3.6Gbps			16Bank, 1.35V / 1.35V	
		4.0Gbps	H5GQ1H24BFR-T0C	FBGA (170ball)	16Bank, 1.5V / 1.5V	Now
		6.0Gbps	H5GQ1H24AFR-R0C	FBGA (170ball)	16Bank, 1.6V / 1.6V	Now
		5.0Gbps	H5GQ1H24AFR-T2L	FBGA (170ball)	16Bank, 1.5V / 1.5V	Now
		3.2Gbps			16Bank, 1.35V / 1.35V	
		5.0Gbps	H5GQ1H24AFR-T2C	FBGA (170ball)	16Bank, 1.5V / 1.5V	Now
		4.0Gbps	H5GQ1H24AFR-T0C	FBGA (170ball)	16Bank, 1.5V / 1.5V	Now

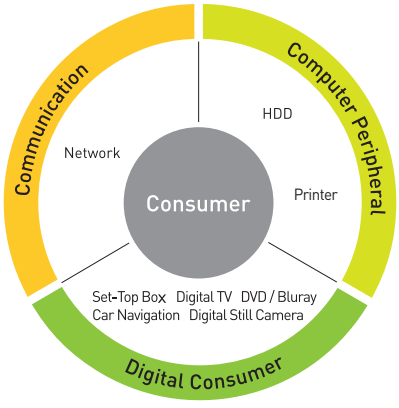
Consumer & Network Memory

New and Diverse

General Description

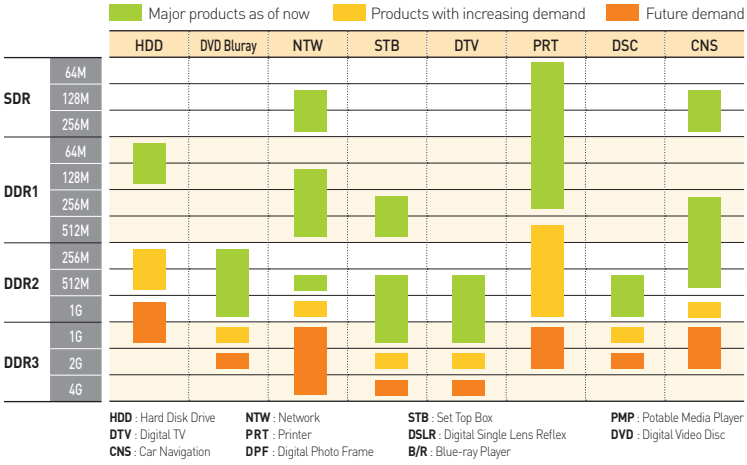
We now live in the Digital Era. Digital televisions, DVD and Set-Top Box give us rich entertainment, while car navigation systems provide comfort and convenience. All of these digital consumer appliances need semiconductor memory for performance improvement, power savings and size reduction. Hynix has 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~512Mb 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 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 Solutions



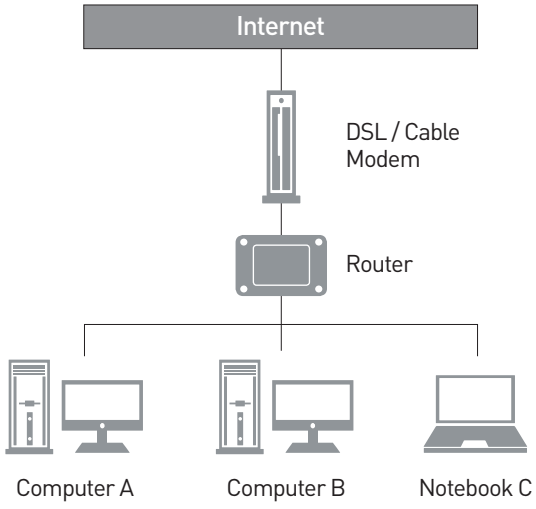
| DRAM Solutions for Optimized Consumer Applications |

Consumer DRAM Usage Map



Network Memory

Hynix is offering a family of network-centric memory products that meet the special requirements of telecommunications and network switching applications. DRAM components offered include SDRAM, DDR, DDR2 and DDR3 in a wide range of densities, configurations and modular form factors. Hynix offers Extended Temperature and Industrial Temperature ranges and high speed to ensure optimum performance in extreme environments.



Product Line-up

SDR SDRAM

DENSITY	ORG.	PART NUMBER	SPEED	POWER	OPERATION TEMP.	PACKAGE	VOLTAGE	AVAILABILITY
128Mb	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
	x8	H57V2582GTR	50 / 60 / 70 / 75	Normal / Low	0~70 / -40~85 (℃)	TSOP	3.3V	Now
256Mb	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	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	H5DU2562GTR	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	E3 / C4 / Y4 / Y5 / S6 / S5 / G7	Normal / Low	0~95 / -40~95 (℃) Note	FBGA	1.8V	Now
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
	x8	H5PS1G83JFR	E3 / C4 / Y5 / S6 / S5	Normal / Low	0~95 / -40~95 (℃) Note	FBGA	1.8V	Q3' 11
	x16	H5PS1G63JFR	E3 / C4 / Y5 / S6 / S5	Normal / Low	0~95 / -40~95 (℃) Note	FBGA	1.8V	Q3' 11
	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

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	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

| The information in this product brochure is subject to change. Up to date information on
| our products and technologies may be obtained from our website. **www.hynix.com**

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

Mobile Memory

Smart and Mobile

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, Tablet PCs, 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, 1Gb/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, Tablets PCs, 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

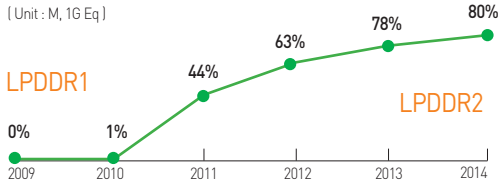
[Bandwidth Comparison]

(Source : Hynix Marketing)

PRODUCT	VOLTAGE	BIT RATE	BANDWITH
LPDDR1	1.8V	400Mbps	1.6Gbps
LPDDR2	1.2V	800Mbps	3.2Gbps

[Transition to LPDDR2]

(Source : Hynix Marketing)



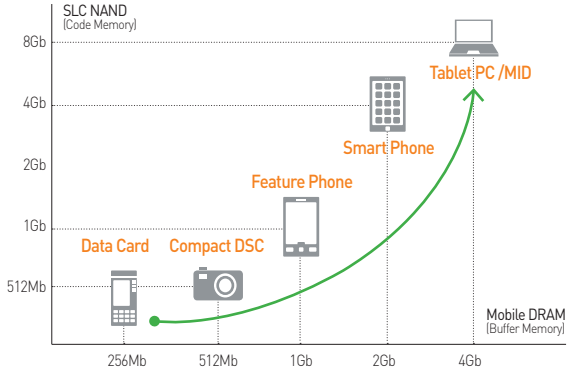
MCP

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

[MCPs in Mobile Application]

MCP	= NAND (SLC) (Code / Storage)	+ Mobile DRAM (Data Execution)		
PoP (PKG on PKG)	= NAND (SLC) (Code / Storage)	+ Mobile DRAM (Data Execution)	* SLC NAND can be removed → DRAMPoP	
NAND (SLC)	512 / 1Gb / 2Gb / 4Gb / 8Gb(DDP)	→ Page Size : LB (2K) / SB (512) → Vol : 1.8V / 2.7V 3.3V → I/O : ×16 / ×8		
+ Mobile DRAM	128M / 256Mb / 512Mb / 1Gb / 2Gb / 4Gb (DDP)	→ SDR / DDR → I/O : ×16 / ×32		
PKG & Ball Out	8×9 (130ball) / 10.5×13 (107/137ball) / 10×14(149ball)	→ SDR / DDR		
	14×14 (152ball) / 15×15 (160ball) / 12×12(168ball)	→ I/O : ×16 / ×32		

[MCPs in Mobile Applications]



Product Line-up

Mobile SDR

DENSITY	ORG.	SPEED	PART NUMBER	PACKAGE	FEATURE	AVAILABILITY
2Gb	128M x 16	166MHz	H55S2G62MFP-60M	FBGA (54ball)	4Bank, 1.8V / 1.8V	Now
	64M x 32	166MHz	H55S2G22MFP-60M	FBGA (90ball)	4Bank, 1.8V / 1.8V	Now
	64M x 32	166MHz	H55S2G32MFP-60M	FBGA (90ball)	4Bank, 1.8V / 1.8V	Now
1Gb	64M x 16	166MHz	H55S1G62MFP-60M	FBGA (54ball)	4Bank, 1.8V / 1.8V	Now
		166MHz	H55S1G62AFR-60M	FBGA (54ball)	4Bank, 1.8V / 1.8V	Now
	32M x 32	166MHz	H55S1G22MFP-60M	FBGA (90ball)	4Bank, 1.8V / 1.8V	Now
		166MHz	H55S1G22AFR-60M	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
		166MHz	H55S1G32AFR-60M	FBGA (90ball)	4Bank, 1.8V / 1.8 V	Now
512Mb	32M x 16	166MHz	H55S5162DFR-60M	FBGA (54ball)	4Bank, 1.8V / 1.8V	Now
		166MHz	H55S5162EFR-60M	FBGA (54ball)	4Bank, 1.8V / 1.8V	Now
	16M x 32	166MHz	H55S5122DFR-60M	FBGA (90ball)	4Bank, 1.8V / 1.8V	Now
		166MHz	H55S5122EFR-60M	FBGA (90ball)	4Bank, 1.8V / 1.8V	Now
256Mb	16M x 16	166MHz	H55S2562JFR-60M	FBGA (54ball)	4Bank, 1.8V / 1.8V	Now
	8M x 32	166MHz	H55S2622JFR-60M	FBGA (90ball)	4Bank, 1.8V / 1.8V	Now

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

Mobile DDR

DENSITY	ORG.	SPEED	PART NUMBER	PACKAGE	FEATURE	AVAILABILITY
2Gb	128M x 16	DDR400	H5MS2G62MFR-EBM	FBGA (60ball)	4Bank, 1.8V / 1.8V	Now
		DDR333	H5MS2G62MFR-J3M	FBGA (60ball)	4Bank, 1.8V / 1.8V	Now
		DDR400	H5MS2G62AFR-EBM	FBGA (60ball)	4Bank, 1.8V / 1.8V	Now
		DDR333	H5MS2G62AFR-J3M	FBGA (60ball)	4Bank, 1.8V / 1.8V	Now
	64M x 32	DDR400	H5MS2G22MFR-EBM	FBGA (90ball)	4Bank, 1.8V / 1.8V	Now
		DDR333	H5MS2G22MFR-J3M	FBGA (90ball)	4Bank, 1.8V / 1.8V	Now
		DDR400	H5MS2G22AFR-EBM	FBGA (90ball)	4Bank, 1.8V / 1.8V	Now
		DDR333	H5MS2G22AFR-J3M	FBGA (90ball)	4Bank, 1.8V / 1.8V	Now
	64M 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
		DDR400	H5MS2G32AFR-EBM	FBGA (90ball)	4Bank, 1.8V / 1.8V	Now
		DDR333	H5MS2G32AFR-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
		DDR400	H5MS1G62AFR-E3M	FBGA (60ball)	4Bank, 1.8V / 1.8V	Now
		DDR333	H5MS1G62AFR-J3M	FBGA (60ball)	4Bank, 1.8V / 1.8V	Now
		DDR400	H5MS1G62BFR-E3M	FBGA (60ball)	4Bank, 1.8V / 1.8V	Now
		DDR333	H5MS1G62BFR-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
		DDR400	H5MS1G22AFR-E3M	FBGA (90ball)	4Bank, 1.8V / 1.8V	Now
		DDR333	H5MS1G22AFR-J3M	FBGA (90ball)	4Bank, 1.8V / 1.8V	Now
		DDR400	H5MS1G22BFR-E3M	FBGA (90ball)	4Bank, 1.8V / 1.8V	Now
		DDR333	H5MS1G22BFR-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
		DDR400	H5MS1G32AFR-E3M	FBGA (90ball)	4Bank, 1.8V / 1.8V	Now
		DDR333	H5MS1G32AFR-J3M	FBGA (90ball)	4Bank, 1.8V / 1.8V	Now
		DDR400	H5MS1G32BFR-E3M	FBGA (90ball)	4Bank, 1.8V / 1.8V	Now
		DDR333	H5MS1G32BFR-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
		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
		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
	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

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

LPDDR2

DENSITY	ORG.	SPEED	PART NUMBER	PACKAGE	FEATURE	AVAILABILITY
2Gb	64Mx32	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
1Gb	32M x32	DDR2-800	H9TKNNN1GDAPLR-NDM	FBGA (168ball)	8Bank, 1.8V / 1.2V / 1.2V	Now
		DDR2-667	H9TKNNN1GDAPLR-NYM	FBGA (168ball)	8Bank, 1.8V / 1.2V / 1.2V	Now

NAND Flash

High Density in Small Packages

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 mobile handsets and Tablet PCs. Hynix is also developing NAND based storage solutions for PCs and Servers. 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.

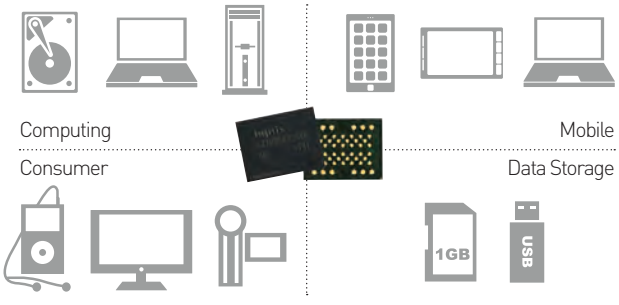
NAND Flash Key Features

Items		40nm class 32G MLC	30nm class 32G MLC	20nm class 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	○ with Data out	○ with Data out	○ with Data out
	Cache Program	○	○	○
	Cache Read	○	○	○
	2 Plane Op.	Write, Read & Erase	Write, Read & Erase	Write, Read & Erase
Special / Function	Enhanced Data Out	○	○	○
	OTP	○	○	○
	Unique ID	○	○	○

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

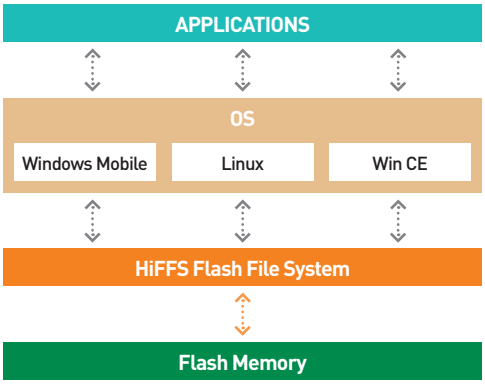
Software Support

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 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 : 0.75W / Stand-by : 0.2W
Temperature Range	0℃ to 70℃ for Operating / -55℃ to 95℃ for Storage
MTBF	2,000,000 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.
- Mainly adopted on Smart phone, Tablet PC, eBook. Emerging of Tablet PC application leads e-NAND market growth.

NAND Flash
Product Line-up

NAND Flash SLC COMPONENT

PRODUCT	DENSITY	BLOCK SIZE	STACK	VCC/ORG	PACKAGE	AVAILABILITY	REMARK
HY27US08281A	128Mb	16KB (512B Page)	SDP	3.3V / x8	TSOP / USOP	Now	
HY27US08561A	256Mb	16KB (512B Page)	SDP	3.3V / x8	TSOP / USOP / FBGA	Now	
HY27US08121B	512Mb	16KB (512B Page)	SDP	3.3V / x8	TSOP / USOP / FBGA	Now	
H27U518S2C	512Mb	16KB (512B Page)	SDP	3.3V / x8	TSOP	Now	
HY27UF081G2A	1Gb	128KB (2KB Page)	SDP	3.3V / x8	TSOP / USOP / FBGA	Now	
HY27SF081G2A	1Gb	128KB (2KB Page)	SDP	1.8V / x8	FBGA	Now	
H27U1G8F2B	1Gb	128KB (2KB Page)	SDP	3.3V / x8	TSOP / FBGA	Now	
H27S1G6F2B	1Gb	128KB (2KB Page)	SDP	1.8V / x8	FBGA	Now	
HY27UF082G2B	2Gb	128KB (2KB Page)	SDP	3.3V / x8	TSOP / LGA / FBGA	Now	
H27U2G8F2C	2Gb	128KB (2KB Page)	SDP	3.3V / x8	TSOP	Now	
HY27UF084G2B	4Gb	128KB (2KB Page)	SDP	3.3V / x8	TSOP	Now	
H27U4G8F2D	4Gb	128KB (2KB Page)	SDP	3.3V / x8	TSOP	Now	
H27QAG8F2ATR	16Gb	512KB (4KB Page)	SDP	3.3V / x8	TSOP	Now	
H27QBG8GDAIR	32Gb	512KB (4KB Page)	DDP	3.3V / x8	FBGA	Now	Vccq 1.8V

NAND Flash MLC COMPONENT

PRODUCT	DENSITY	BLOCK SIZE	STACK	VCC/ORG	PACKAGE	AVAILABILITY	REMARK
H27U4G8T2B	4Gb	512KB (4KB Page)	SDP	3.3V / x8	TSOP	Now	
H27U8G8T2B	8Gb	512KB (4KB Page)	SDP	3.3V / x8	TSOP	Now	
H27UAG8T2A	16Gb	512KB (4KB Page)	SDP	3.3V / x8	TSOP	Now	
H27UAG8T2B	16Gb	2MB (8KB Page)	SDP	3.3V / x8	TSOP	Now	
H27UBG8T2M	32Gb	512KB (4KB Page)	SDP	3.3V / x8	TSOP / LGA	Now	
H27UBG8T2A	32Gb	2MB (8KB Page)	SDP	3.3V / x8	TSOP / LGA	Now	
H27UBG8T2B	32Gb	2MB (8KB Page)	SDP	3.3V / x8	TSOP	Now	
H27UCG8U5B	64Gb	2MB (8KB Page)	DDP	3.3V / x8	TSOP	Now	
H27UCG8T2M	64Gb	2MB (8KB Page)	SDP	3.3V / x8	LGA	Now	
H27UDG8V5A	128Gb	2MB (8KB Page)	QDP	3.3V / x8	TSOP / LGA	Now	
H27UEG8YEA	256Gb	2MB (8KB Page)	ODP	3.3V / x8	LGA	Now	

e-NAND (eMMC)

PRODUCT	DENSITY	BASE COMPONENT		VCC/ORG	VERSION	AVAILABILITY	REMARK
		DENSITY	STACK				
H26M3A001MMR	512MB	4Gb (SLC)	1	1.8V / x8 / x4	MMC4.41	Now	
H26M21001DAR	2GB	16Gb	1	3.3V / x8 / x4	MMC4.3	Now	
H26M21001ECR	2GB	16Gb	1	3.3V / x8 / x4	MMC4.41	Now	
H26M32001DAR	4GB	16Gb	2	3.3V / x8 / x4	MMC4.3	Now	
H26M31001EFR	4GB	32Gb	1	3.3V / x8 / x4	MMC4.41	Now	
H26M31001FPR	4GB	32Gb	1	3.3V / x8 / x4	MMC4.41	2Q '11	
H26M44001CAR	8GB	16Gb	4	3.3V / x8 / x4	MMC4.3	Now	
H26M42001EFR	8GB	32Gb	2	3.3V / x8 / x4	MMC4.41	Now	
H26M42001FMR	8GB	32Gb	2	3.3V / x8 / x4	MMC4.41	2Q '11	
H26M54001AJR	16GB	32Gb	4	3.3V / x8 / x4	MMC4.3	Now	
H26M54001BKR	16GB	32Gb	4	3.3V / x8 / x4	MMC4.41	Now	
H26M54001BFR	16GB	32Gb	4	3.3V / x8 / x4	MMC4.41	Now	
H26M52002CKR	16GB	64Gb	2	3.3V / x8 / x4	MMC4.41	1Q '11	
H26M68001MNR	32GB	32Gb	8	3.3V / x8 / x4	MMC4.3	Now	
H26M68001ANR	32GB	32Gb	8	3.3V / x8 / x4	MMC4.41	Now	
H26M64002BNR	32GB	64Gb	4	3.3V / x8 / x4	MMC4.41	1Q '11	
H26M78002ANR	64GB	64Gb	8	3.3V / x8 / x4	MMC4.41	1Q '11	

E2NAND2.0

PRODUCT	DENSITY	BLOCK SIZE	STACK	VCC/ORG	PACKAGE	AVAILABILITY	REMARK
H2DTDG8VD1MYR	128Gb	2MB(8KB Page)	4	3.3V / X8	VLGA	Now	VccQ=3.3V
H2DTEG8VD1MYR	256Gb	2MB(8KB Page)	8	3.3V / X8	VLGA	Now	VccQ=3.3V
H2DTDG8UD1MYR	128Gb	2MB(8KB Page)	2	3.3V / X8	VLGA	Now	
H2DTEG8VD1MYR	256Gb	2MB(8KB Page)	4	3.3V / X8	VLGA	Now	
H2DTFG8YD1MYR	512Gb	2MB(8KB Page)	8	3.3V / X8	VLGA	Now	

CIS

CMOS Image Sensor

High Resolution and Clarity

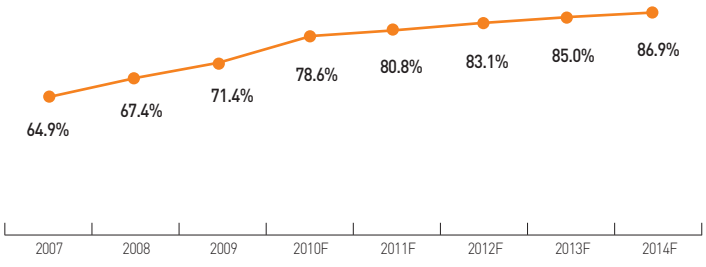
General Description

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 more than 15 percent annually through 2014.
Its main applications are camera phones, video conferencing systems for NotePC and digital still cameras, The market for CMOS Image Sensor is rapidly diversifying into applications such as surveillance systems, automotive cameras, medical equipment and various home appliances such as Smart TV.

Applications

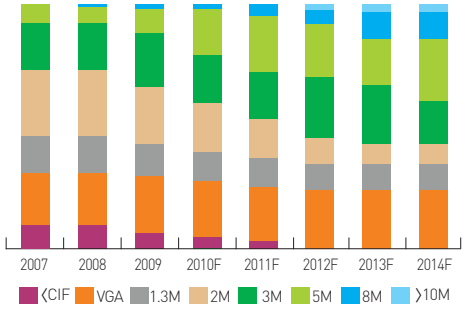
- Camera Phone
- NotePC
- Stand alone Web Cam
- Other Mobile Gadgets

Camera attachment ratio on Mobile Phone



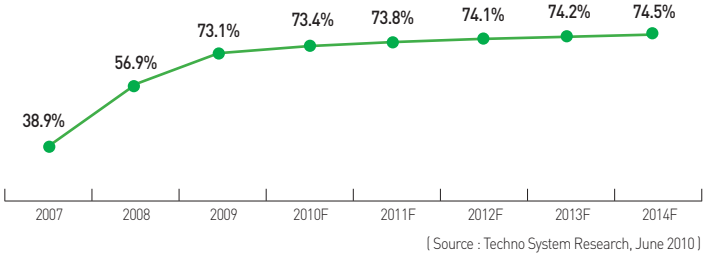
(Source : Techno System Research, June 2010)

Resolution Trend for Mobile phone & NotePC

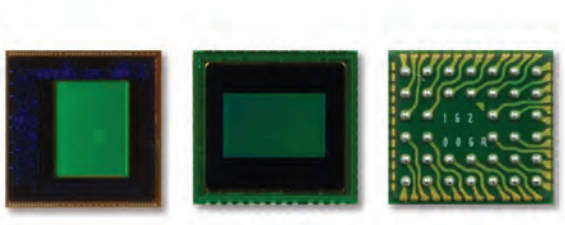


(Source : Techno System Research, June 2010)

Camera attachment ratio on NotePC



(Source : Techno System Research, June 2010)



CIS

Product Line-up and Key Features

VGA (YACBA21S)

Optical Format	1/10-inch
Pixel Size	2.25um × 2.25um
Active Array Format	640H × 480V
Imaging Area	1.44mm × 1.08mm
Color Filter Array	RGB Bayer color filters
Frame Rate	30-fps @ full resolution
Shutter	Electronic Rolling Shutter
Features	Automatic Exposure, Automatic White Balance, Automatic Black Level Calibration, On-Chip Dead Pixel Correction, Windowing, Sub-Sampling, X-Y Image Flip, Anti-flicker, Noise Reduction, Edge Enhancement, Brightness, Color Saturation, Gamma Correction, Color Correction, Lens shading Correction

Sensitivity		1280mV / lux-sec
SNR		39dB
Dynamic Range		60dB
ADC		On-chip, 10-bit
Output Format		YUV4:2:2 RGB5:6:5 RGB4:4:4
Supply Voltage	Digital I/O	1.7V—3.0V (1.8V / 2.8V)
	Digital Core	2.7V—3.0V (2.8V) with Single Regulator
	Analog & Pixel	
Power Consumption		123mW @ 30fps (Typ.) for Single Power
		107mW @ 30fps (Typ.) for dual power
Operating Temp.		-20℃ to 60℃
Status		Mass Production
Packaging		ShellUT CSP

VGA (YACBA31S)

Optical Format	1/10-inch
Pixel Size	2.125um × 2.125um
Active Array Format	640H × 480H
Imaging Area	1.36mm × 1.02mm
Color Filter Array	RGB Bayer color filters
Frame Rate	30-fps @ full resolution
Shutter	Electronic Rolling Shutter
Features	Automatic Exposure, Automatic White Balance, Automatic Black Level Calibration, On-Chip Dead Pixel Correction, Windowing, Sub-Sampling, X-Y Image Flip, Anti-flicker, Noise Reduction, Edge Enhancement, Brightness, Color Saturation, Gamma Correction, Color Correction, Lens shading Correction

Sensitivity		TBD
SNR		
Dynamic Range		
ADC		On-chip, 10-bit
Output Format		YUV4:2:2 RGB5:6:5 RGB4:4:4
Supply Voltage	Digital I/O	1.7V—3.0V (1.8V / 2.8V)
	Digital Core	2.7V—3.0V (2.8V) with Single Regulator
	Analog & Pixel	
Power Consumption		TBD
Operating Temp.		-20℃ to 60℃
Status		Q3' 11 (MP)
Packaging		ShellUT CSP

1.0M (YACC611C)

Optical Format	1/5.5-inch
Pixel Size	2.0um × 2.0um
Active Array Format	1280H × 800V
Imaging Area	2.56mm × 1.6mm
Color Filter Array	RGB Bayer color filters
Frame Rate	30fps @ 720P
Shutter	Electronic Rolling Shutter
Features	Exposure Control, White Balance, BLC, DPC, LSC, Windowing, Sub-sampling, X-Y Flip (Sensor Only)

Sensitivity		TBD
SNR		
Dynamic Range		
ADC		On-chip, 10-bit
Output Format		RAW 8bit, 10bit
Supply Voltage	Digital I/O	1.7V—3.0V (1.8V / 2.8V)
	Digital Core	1.7V—1.9V (1.8V)
	Analog & Pixel	2.7V—3.0V (2.8V)
Power Consumption		TBD
Operating Temp.		-20℃ to 60℃
Status		Q2' 11 (MP)
Packaging		ShellUT CSP

2M (YACD511S)

Optical Format	1/5-inch
Pixel Size	1.75um × 1.75um
Active Array Format	1600H × 1200V
Imaging Area	2.80mm × 2.10mm
Color Filter Array	RGB Bayer color filters
Frame Rate	15-fps @ full resolution
Shutter	Electronic Rolling Shutter
Features	Automatic Exposure, Automatic White Balance, Automatic Black Level Calibration, On-Chip Dead Pixel Correction, Edge Data for Auto Focus, Motion Data for Anti-Shaking, Windowing, Sub-Sampling, Image Scaling, X-Y Image Flip, Anti-flicker, Noise Reduction, Edeg Enhancement

Sensitivity		700mV / lux-sec
SNR		38dB
Dynamic Range		60dB
ADC		On-chip, 10-bit
Output Format		YUV4:2:2 RGB5:6:5 ITU656-like
Supply Voltage	Digital I/O	1.7V—3.0V
	Digital Core	1.7V—1.9V
	Analog & Pixel	2.7V—3.0V
Power Consumption		TBD
Operating Temp.		-20℃ to 60℃
Status		Mass Production
Packaging		ShellUT CSP

3M (YACE5A1S)

Optical Format	1/5-inch
Pixel Size	1.4um × 1.4um
Active Array Format	2048H × 1536V
Imaging Area	2.87mm × 2.15mm
Color Filter Array	RGB Bayer color filters
Frame Rate	15-fps @ full resolution
Shutter	Electronic Rolling Shutter
Features	MCU Embedded, JPEG Encoder, Automatic Exposure, Automatic White Balance, Auto Flicker Cancellation, Automatic Focus Data, Anti Shaking Function, Automatic Black Level Calibration, Image Scaling, Dead Pixel Cancealment, Edge Enhancement, Bright Control, Contrast Control, False Color Reduction, Image X-Y Flip, OTP

Sensitivity		TBD
SNR		
Dynamic Range		
ADC		On-chip, 10-bit
Output Format		YUV422, RGB565, RGB666, ITU656-like, Bayer 8bit/10bit, JPEG compressed data
Supply Voltage	Digital I/O	1.7V—3.0V
	Digital Core	1.2V
	Analog & Pixel	2.7V—3.0V
Power Consumption		TBD
Operating Temp.		-20℃ to 60℃
Status		Q2' 11 (MP)
Packaging		Bare die (COB) / Recon. Wafer

Global Sales Network

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