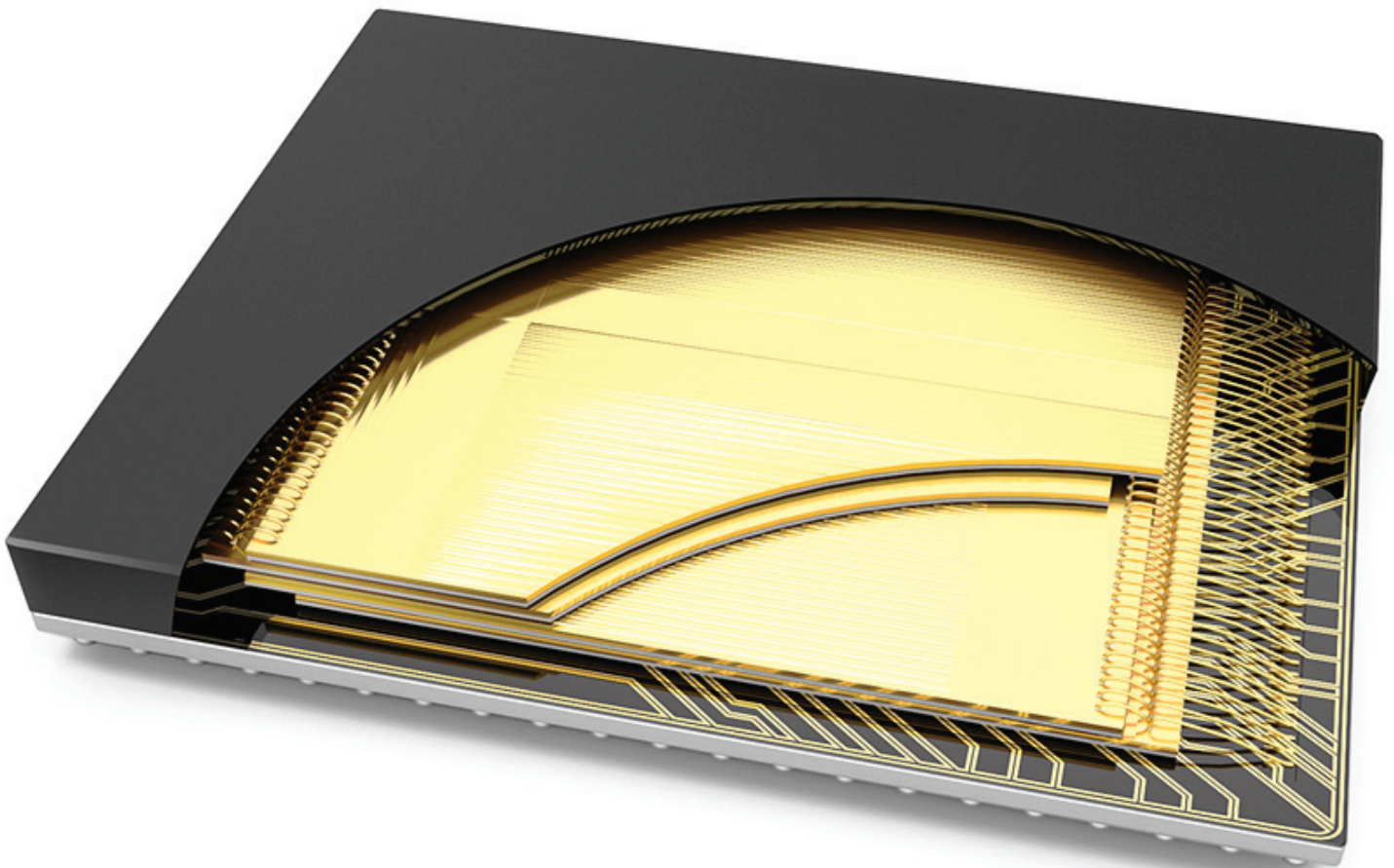
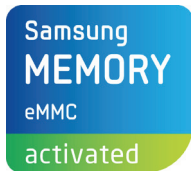


Samsung eMMC

Managed NAND Flash memory solution supports mobile applications



FBGA QDP Package

Efficiency, reduced costs and quicker time to market

Expand device development with capable memory solutions

To meet current trends for advanced mobile device designs, manufacturers require memory that is increasingly dense, robust and small:

- **Dense.** Sophisticated mobile devices require high-density content storage that supports high-definition video playback and other high-end multimedia features. As a result, memory densities are advancing at rapid rates.
- **Robust.** Today's fastest and most demanding embedded uses require strong memory management solutions. Embedded uses include multifunctional smartphones, portable media players and tablet computers.
- **Small.** The Joint Electron Device Engineering Council (JEDEC) requires memory to be produced in extremely compact sizes to allow space for other components.

To focus on these demands, developers need an efficient way to control software development by simplifying mass storage designs and improving device production. Developers also require the ability to create efficient mobile device designs with minimal costs and brief time to market. Finally, they need superior storage capabilities to augment device production.

Samsung has a wide range of eMMC solutions based on performance requirements.

Samsung embedded multimedia card (eMMC) addresses these needs with advanced embedded NAND Flash. It helps simplify mass storage designs for the latest consumer electronics. Samsung eMMC is produced in very compact sizes (typically smaller than a postage stamp) to create room within devices for additional parts. Key application areas that can leverage Samsung eMMC include advanced mobile devices and handsets. These products use eMMC to expand computing power and content storage. They also use eMMC to provide booting functionality.

Simplify mass storage designs

Conventional NAND Flash memory can be challenging to adopt. Developers may notice difficulty controlling software development, particularly when implementing wear leveling, bad block management, device mapping and error handling. Developers may also experience issues related to die shrinkage, including page size and error correcting code (ECC) management.

Conversely, Samsung eMMC is designed to be easy to adopt. It is suitable for the latest consumer electronics, including tablets, smartphones, GPS systems and e-readers. Chipset validation means that eMMC is a thoroughly tested solution. Samsung eMMC incorporates a standard, mature interface by JEDEC, and key functionality yields strong power management and performance optimization.

Samsung eMMC provides enhanced storage capabilities, a reduced controller footprint and streamlined data reads and writes. Standardized packaging and device specifications plus intelligent firmware ease design work and provide a common footprint for the use of embedded and removable NAND. Samsung offers a single footprint combining boot, embedded storage and external mass storage in one device.

In addition, Samsung offers a wide range of eMMC solutions based on low (4 GB or 8 GB) to high (16 GB, 32 GB, 64 GB or 128 GB) density requirements.

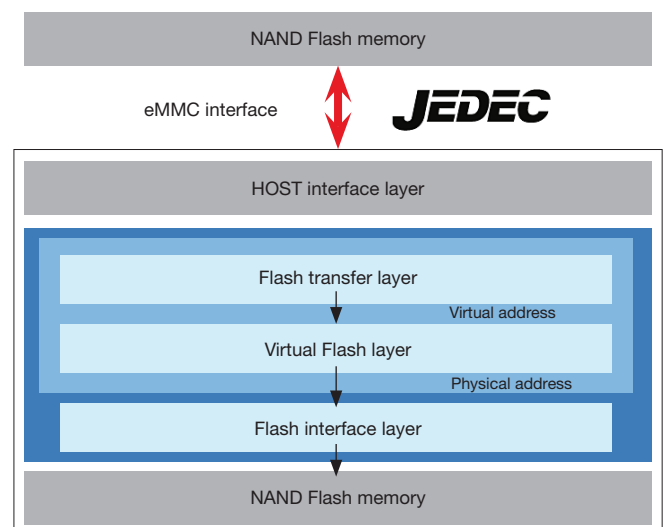


Figure 1. MMC user

Enhanced ability to proceed directly from concept to testing

Reduce development time and control costs

In the past, a product using NAND memory required changes in the chipset or the OS. At times, the NAND memory also required changes to be made in the Flash translation layer (FTL). The changes then needed to be tested at the NAND level, which could lead to significant delays for product-level testing. In contrast, developers using Samsung eMMC can move forward directly from product concept to product testing. Samsung eMMC isolates the host from changes in NAND memory technology and bypasses the FTL, which reduces design, development and testing time, and helps control costs.

Samsung eMMC incorporates simplified system design and integration of multi-level cell (MLC)-type NAND and triple-level cell (TLC) memory, leading to faster overall time to market. This approach makes Samsung eMMC memory an excellent choice for deployment across a variety of segments, including low-cost legacy chipsets. Samsung eMMC operates at standard 4.41 and 4.5 voltage levels, so there is no need to develop or use separate firmware. This interface turns memory accesses into straightforward read-write operations with advanced security and reliability features.

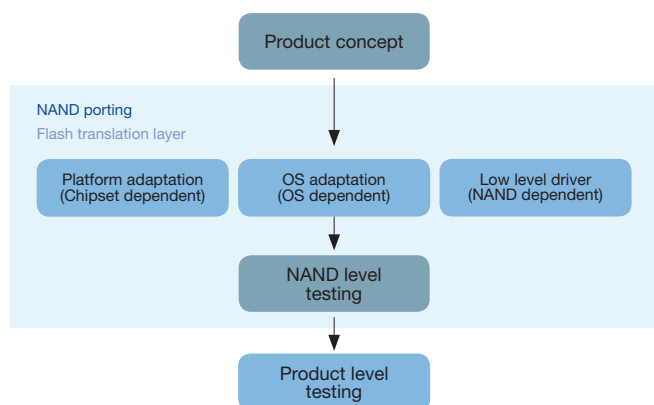


Figure 2. Samsung eMMC memory enables users to proceed from product concept directly to product testing.

Increase storage capabilities for diverse applications

Advanced mobile devices and handsets can use Samsung eMMC to expand computing power and content storage. Enhanced storage solutions for mobile devices that provide high-density solid state memory can be integrated into system designs. Traditional storage media, as a result of the high storage capacity of eMMC, can be replaced by lower-power solid-state drives (SSDs). Including SSDs enables increased storage densities, reduced costs and low power consumption. Content storage supports high-definition video playback and other complex multimedia features. Computing power provides booting functionality.

Samsung eMMC comprises high-density MLC and TLC NAND, and an MMC controller in a Ball Grid Array (BGA) package. It supports x1, x4 or x8 bus widths and interface voltages of 1.8 V or 3.3 V.

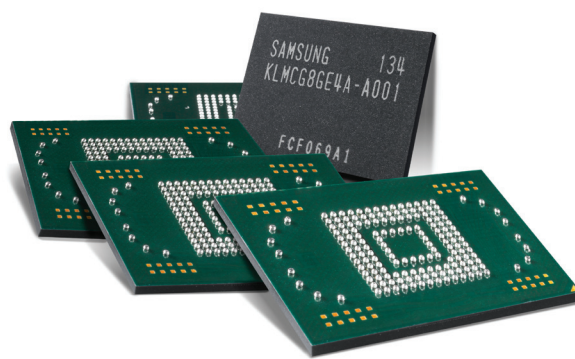


Figure 3. 20 nm class eMMC

Intelligent mobile device development

Create an efficient way to develop well-designed mobile devices

To maintain the required data rates and throughput for high-density chips, the eMMC standard was developed to enhance storage capabilities, reduce controller footprint and streamline data reads and writes. Advanced Samsung technology helps reduce the cost of application development and increase work efficiency, enabling developers to stay competitive by building better and faster.

Samsung eMMC contributes to successful mobile device development. The intelligent interface is designed for ease of use, and enhanced storage solutions improve device designs. Samsung eMMC also helps developers go straight from concept to testing, reducing time to market.

Features and benefits

Features	Benefits
Density of 4 GB to 64 GB	Contributes to a variety of mobile designs
Small size	Helps meet today's mobile design requirements Frees up space for other components
Enhanced storage capabilities	Enhances robust mobile devices Enables traditional storage media to be replaced by lower-power SSDs
Advanced embedded NAND Flash	Helps simplify mass storage designs Aids in expanding computing power and content storage Is designed for easier adoption
Standard, mature interface by JEDEC	Provides strong power management and performance optimization
Intelligent firmware	Facilitates easier design work Provides a common footprint for the use of embedded and removable NAND
Single footprint	Combines boot, embedded storage and external mass storage in one device
Isolation of the host from changes in NAND memory technology	Enables developers to move directly from product concept to product testing
FTL bypass	Reduces design, development and testing time
Simplified system design and integration of SLC-type and MLC-type NAND memory	Contributes to faster overall time to market
Operation at standard 4.41 and 4.5 voltage levels	Eliminates the need to develop or use separate firmware Turns memory access into straightforward read-write operations

Specifications

Part number	Density	Organization	Voltage	Package	Package type	Production status
KLM4G1YE4C	4 GB	x 8	1.7 - 1.95 2.7 - 3.6	153 FBGA*	1 chip (mono)	Mass production
KLM8G1WE4A	8 GB	x 8	1.7 - 1.95 2.7 - 3.6	169 FBGA	1 chip (mono)	Customer sample
KLMAG2GE2A	16 GB	x 8	1.7 - 1.95 2.7 - 3.6	169 FBGA	2 chip (DDP)	Customer sample
KLMAG2WE4A	16 GB	x 8	1.7 - 1.95 2.7 - 3.6	169 FBGA	2 chip (DDP)	Customer sample
KLMBG4GE2A	32 GB	x 8	1.7 - 1.95 2.7 - 3.6	169 FBGA	4 chip (QDP)	Customer sample
KLMBG4WE4A	32 GB	x 8	1.7 - 1.95 2.7 - 3.6	169 FBGA	4 chip (QDP)	Customer sample
KLMCG8GE2A	64 GB	x 8	1.7 - 1.95 2.7 - 3.6	169 FBGA	8 chip (ODP)	Customer sample
KLMCG8WE4A	64 GB	x 8	1.7 - 1.95 2.7 - 3.6	169 FBGA	8 chip (ODP)	Customer sample
KLMDGAGE2A	128 GB	x 8	1.7 - 1.95 2.7 - 3.6	169 FBGA	16 chip (HDP)	Customer sample
KLM2G1HE3F	2 GB	x 8	1.7 - 1.95 2.7 - 3.6	153 FBGA	1 chip (mono)	Mass production
KLM4G1FE3B	4 GB	x 8	1.7 - 1.95 2.7 - 3.6	153 FBGA	1 chip (mono)	Mass production
KLM8G2FE3B	8 GB	x 8	1.7 - 1.95 2.7 - 3.6	153 FBGA	2 chip (DDP)	Mass production
KLMAG2GE4A	16 GB	x 8	1.7 - 1.95 2.7 - 3.6	169 FBGA	2 chip (DDP)	Mass production
KLMAG4FE3B	16 GB	x 8	1.7 - 1.95 2.7 - 3.6	169 FBGA	4 chip (QDP)	Mass production
KLMBG4GE4A	32 GB	x 8	1.7 - 1.95 2.7 - 3.6	169 FBGA	4 chip (QDP)	Mass production
KLMBG8FE3B	32 GB	x 8	1.7 - 1.95 2.7 - 3.6	169 FBGA	8 chip (ODP)	Mass production
KLMCG8GE4A	64 GB	x 8	1.7 - 1.95 2.7 - 3.6	169 FBGA	8 chip (ODP)	Mass production

* FBGA: Fine-Pitch Ball Grid Array

Legal and additional information

About Samsung Electronics Co., Ltd.

Samsung Electronics Co., Ltd. is a global leader in semiconductor, telecommunication, digital media and digital convergence technologies with 2011 consolidated sales of US\$143.1 billion. Employing approximately 222,000 people in 205 offices across 71 countries, the company operates two separate organizations to coordinate its nine independent business units: Digital Media & Communications, comprising Visual Display, Mobile Communications, Telecommunication Systems, Digital Appliances, IT Solutions, and Digital Imaging; and Device Solutions, consisting of Memory, System LSI and LCD. Recognized for its industry-leading performance across a range of economic, environmental and social criteria, Samsung Electronics was named the world's most sustainable technology company in the 2011 Dow Jones Sustainability Index. For more information, please visit www.samsung.com.



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For more information

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