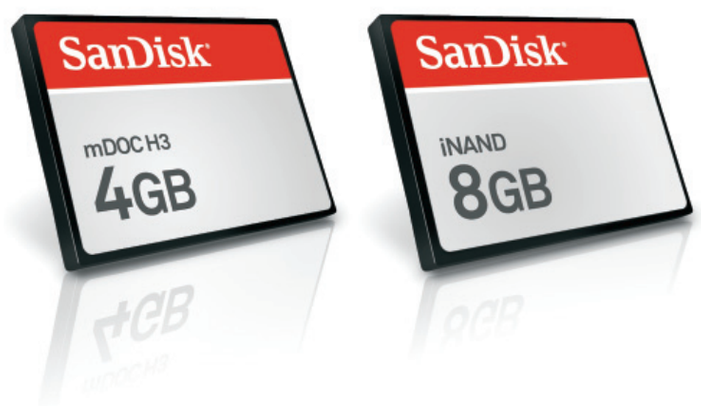
SanDisk® Mobile Handset Embedded Storage Solutions

Embedded Flash Drives



Smart embedded code and data storage for multimedia mobile handsets

A pioneer and leader in the field, SanDisk designs and manufactures NAND flash memory, develops the complete system chip design, state-of-the-art controllers and advanced flash management software. Through these capabilities and by working very closely with customers, partners and the markets served, SanDisk continually sets the standard for quality, reliability and performance.

The SanDisk mDOC H3 and iNAND™ embedded flash drives (EFDs) are designed to smartly address both system design complexity and NAND reliability challenges. Both substantially improve system performance, reduce power consumption and are available in a wide range of capacities.

SanDisk®

SanDisk mDOC H3 and iNAND

Reliable Embedded Storage

Standardized architecture

The SanDisk EFD product line advances embedded flash drive architecture. By building smart flash management software into its controller as firmware and by standardizing the hardware interface, SanDisk EFDs:

- Ensure device reliability
- Maximize device life expectancy
- Mask inherent raw NAND flaws

Access to the latest NAND flash

By integrating our advanced flash management technology internally as firmware, the SanDisk EFD can help OEMs do away with traditional design trade-offs. OEMs can now tap into the latest, most cost-effective NAND flash technologies and minimize integration-associated risks and delays. SanDisk EFDs help OEMs meet aggressive time-to-market schedules, within budget.

Innovation in multimedia handset storage

mDOC H3 and iNAND provide the same package ball-out, power management, hardware and software interface throughout their respective capacity ranges, effectively offering the best handset platform design-in solution. SanDisk EFDs set the standard for embedded storage with:

- **High capacity** – scalable NAND-based solution with capacity ranging from 128MB to 8GB.*
- **Guaranteed reliability** – field-proven, robust on-the-fly error correction and patented embedded flash management technology guaranteeing power-loss immunity and smart wear leveling.
- **High system performance** – meeting multimedia needs, optimized to handle high-resolution photos, video and music download.
- **Smart power management** – supporting multiple power modes, with automatic transitioning to low power in various scenarios, substantially extending battery life.
- **Security** – hardware protection and security-enabling features to protect code, personal data and multimedia digital rights technology.

Enhancing the mobile ecosystem

From technology designers, handset vendors and network operators to content providers and end users, SanDisk EFDs take into consideration the demands of all members of the mobile value chain.

- **Field-proven** – integrated into hundreds of designs for code and data storage in tens of millions of mobile handsets.
- **Wide chipset support** – all major chipsets from TI, Freescale, Qualcomm, Renesas, ARM and Marvell.
- **Patented flash management technology** – compatible with leading OSs, including Symbian, Microsoft Windows Mobile and Windows CE, Linux, Linux/JAVA, Montavista, Nucleus and OSE .
- **Complete mobile offering** – including memory cards microSD™, miniSD™, Memory Stick Pro Duo™, Memory Stick Micro™ M2, SIM cards and TrustedFlash™ technology.
- **Supporting tools** – unique array of programming, testing, and development tools further improving implementation, integration and NPI.

Simplifying and optimizing platform architectures

Low-capacity storage just isn't enough. With the rapidly growing demand for storage-hungry applications, low-capacity flash technologies no longer

** Note: 1 megabyte (MB) = 1 million bytes; 1 gigabyte (GB) = 1 billion bytes. Some of the listed capacity is used for formatting and other functions, and thus is not available for data storage.*

satisfy many of the new consumer requirements. Consequently, OEMs are faced with a challenging mission of adding features, functions and more storage while minimizing form factors and simplifying platform architectures.

SanDisk MLC NAND-based EFDs with bootable code and high-capacity data storage simplify handset design and enhance functionality by utilizing a single, small, cost-effective device. Featuring high reliability and system performance, SanDisk EFDs clearly top the SLC NAND and NOR-based solution value propositions (see figures 1, 2).

For enhanced smart-phone architectures, SanDisk EFDs utilize a simple LP DRAM POP configuration, reducing design complexity and offering an extremely cost-effective solution (see figure 3).

SanDisk iNAND™

Mass storage

High-capacity embedded flash storage in a small, low-cost JEDEC compatible package ball-out with proven reliability and easy upgradeability to meet the increasingly stringent requirements of today's storage-hungry applications.

Industry-standard interface

SanDisk iNAND uses industry-standard SD and SPI interfaces which offer seamless hardware and software integration — minimizing design risk and ensuring backward compatibility. iNAND offers a high speed 50MHz bus and a low pin-count that fit designs which require tight routing and high system performance (such as multimedia mobile handsets and personal media players).

Capacities: 512MB to 8GB

Packages

- FBGA 11.5mm x 13mm
- FBGA 12mm x 16mm
- FBGA 12mm x 18mm

SanDisk mDOC H3

Bootable code and data storage in one device

mDOC H3 offers handset designers data storage and XIP boot capabilities in one device. Utilizing industry standard NOR-like interface together with patented TrueFFS® flash management technology, mDOC H3 provides a reliable and cost effective solution, eliminating the need for a separate boot device.

Platform design fit solution

mDOC H3 features small FBGA discrete, MCP and POP (with LP DRAM) packages, with a wide range of capacities from 128MB to 4GB, making it a solution for all platform configurations. mDOC products feature the same ball-out, power management, hardware and software interface for all capacities.

Fig. 1

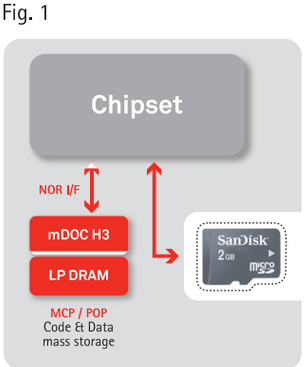


Fig. 2

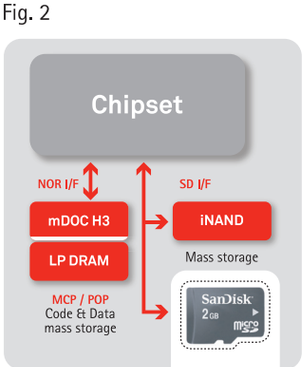
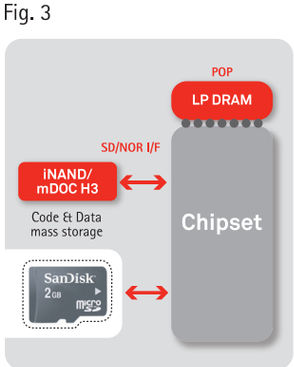


Fig. 3



mDOC H3 in various form factors

Standalone product (Discrete)
Capacities:
128MB to 4GB

Packages:
- FBGA 9mm x 12mm
- FBGA 10mm x 14mm
- FBGA 12mm x 18mm

MCP (mDOC H3 and LP-SDR/DDR in the same package)
Capacities:
mDOC H3:
128MB to 4GB

SDR/DDR SDRAM:
64MB to 128MB

Packages:
- With LP-SDR SDRAM
  - FBGA 9mm x 12mm
  - FBGA 11mm x 14mm
- With LP-DDR SDRAM
  - FBGA 11mm x 14mm
  - FBGA 12mm x 18mm

Specific MCP combinations are available for volume orders.

POP (Package-On-Package)
Capacities:
mDOC H3:
256MB to 1GB

DDR SDRAM:
64MB to 128MB

Packages:
- TI: FBGA 14mm x 14mm
- JEDEC: FBGA 15mm x 15mm

EFD product family

	iNAND	mDOC H3
Capacity	512MB to 8GB	128MB to 4GB
Flash management technology	Embedded in firmware	Embedded in firmware
NAND flash technology	MLC	MLC, SLC
Package	11.5mm x 13mm 12mm x 16mm 12mm x 18mm	9mm x 12mm 10mm x 14mm 12mm x 18mm
XIP boot block	By Chipset ROM code	32Kbytes
Data protection	Yes	Yes
RoHS compliant	Yes	Yes
Performance		
Sustained read**	10MB/sec	10-25MB/sec
Sustained write**	9MB/sec	5-9MB/sec
Power consumption		
Core/IO voltage	3.3V/3.3V, 3.3V/1.8V	3.3V/3.3V, 3.3V/1.8V, 1.8V/1.8V
Deep power-down mode	150uA (typ)	45uA (typ)
Power-save mode	Yes	Yes
Active current	75mA (typ)	30mA (typ)

** Based on SanDisk internal testing

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