

DiskOnChip® Millennium Plus

16/32/64MByte



Flash Disk with Protection and Security-Enabling Features

Highlights

DiskOnChip Millennium Plus is an award-winning member of M-Systems' family of DiskOnChip flash disk products. To meet the needs of a growing application base, M-Systems offers it in two form factors, TSOP-I and BGA, in capacities of 16MByte (128Mbit), 32MByte (256Mbit) and 64MByte¹ (512Mbit).

DiskOnChip Millennium Plus, based on Toshiba's state-of-the-art 0.16 μ NAND flash technology, features:

- Advanced protection and security-enabling features for data and code
- Proprietary TrueFFS® technology for full hard-disk emulation, high data reliability and maximum flash lifetime
- Device cascade options for up to 128MByte (1Gbit) capacity
- Small form factors: 48-pin TSOP-I and 69-ball BGA
- NAND-based flash technology that enables high density and small die size
- Single-die chip: 16MByte and 32MByte, dual-die chip: 64MByte
- Exceptional read, write and erase performance
- Configurable for 8/16/32-bit bus interface
- Programmable eExecute In Place (XIP) Boot Block
- Data integrity with Reed-Solomon-based Error Detection Code/Error Correction Code (EDC/ECC)
- Deep Power-Down mode for reduced power consumption
- Low voltage:
 - Core – 3V,
 - I/O – 1.8V/3V auto-detect (16MByte device)
- Software tools for programming, duplicating, testing and debugging
- Support for all major OSs, including: Symbian OS, VxWorks, Windows CE, Linux, pSOS and QNX



Performance

	32/64MByte (256/512Mbit)	16MByte (128Mbit)
Burst read/write	20 MB/sec	13.3 MB/sec
Sustained read	3.1 MB/sec	1.7 MB/sec
Sustained write	1.3 MB/sec	0.86 MB/sec

Protection and Security-Enabling Features

- 16-byte Unique Identification (UID) number
- 6KB user-configurable One Time Programmable (OTP) area
- Two configurable write and read-protected partitions for data and boot code
- Hardware data and code protection:
 - Protection key and LOCK# signal
 - Sticky Lock option for boot partition lock
 - Protected Bad-Block Table

Boot Capability

- Programmable Boot Block with XIP capability to replace boot ROM
 - 1KByte for 16/32MByte devices
 - 2KByte for 64MByte devices
- Download Engine (DE) for automatic download of boot code from Programmable Boot Block
- Boot capabilities:
 - CPU initialization
 - Platform initialization
 - OS boot
- Asynchronous Boot mode to boot CPUs that wake up in burst mode

The following abbreviations are used in this document: MB for MByte, Mb for Mbit.

¹ 64MByte devices available in BGA 9x12 form factor only.

Reliability

- On-the-fly Reed-Solomon Error Detection Code/Error Correction Code (EDC/ECC)
- Guaranteed data integrity, even after power failure
- Transparent bad-block management
- Dynamic and static wear-leveling

Hardware Compatibility

- Configurable interface: simple SRAM-like or multiplexed A/D interface
- Compatible with all major CPUs, including:
 - X86
 - StrongARM
 - XScale
 - Geode[®] SCxxxx
 - PowerPC[™] MPC8xx
 - Dragonball MX1
 - MediaGX
 - 68K
 - MIPS
 - SuperH[™] SH-x
- All capacities are pinout compatible, in TSOP-I and BGA form factors
- 8-bit, 16-bit and 32-bit bus architecture support

TrueFFS Software

- Full hard-disk read/write emulation for transparent file system management
- Identical software for all DiskOnChip capacities
- Patented methods to extend flash lifetime, including:
 - Dynamic virtual mapping
 - Dynamic and static wear-leveling
- Support for all major OS environments, including:
 - Windows CE
 - Linux
 - VxWorks
 - Symbian OS
 - Windows NT
 - PSOS
 - QNX
 - ATI Nucleus
 - DOS
- Support for OS-less environments
- 8KB memory window

Applications

- Internet set-top boxes, interactive TVs, web browsers
- WBT, thin clients, network computers
- PDAs and smart handsets
- Embedded systems
- Routers, switches, networking equipment
- Car PCs, automotive computing
- Point of sale (POS) terminals, industrial PCs
- Medical equipment

Power Requirements

- Operating voltage
 - Core: 2.7V to 3.6V
 - I/O (auto-detect):
 - 1.65 - 1.95V or 2.7V - 3.6V (16MB)
 - 2.7V - 3.6V (32/64MB)
- Current (Typical)
 - Active: 25 mA
 - Deep Power-Down:
 - 10 μ A (16/32MB)
 - 20 μ A (64MB)

Capacities

- 16MB (128Mb) with device cascading option for up to 64MB (512Mb)
- 32MB (256Mb) with device cascading option for up to 128MB (1Gb)
- 64MB (512Mb) with device cascading option for up to 128MB (1Gb)

Packaging

- 48-pin TSOP-I: 20 x 12 x 1.2 mm
- 69-ball BGA: 9 x 12 x 1.4 mm (max)