SanDisk CompactFlash™ and MultiMediaCard

Small Form Factor Solutions

SanDisk, the world's largest supplier of flash data storage products, has the small form factor solutions that today's ever smaller, more functional portable devices demand.

SanDisk offers two industry-standard removable solutions: CompactFlash™ memory cards and MultiMediaCards. Both provide the small size, forward and backward compatibility, high capacities, and low cost necessary to meet your data storage needs. Now and in the future.

Our popular CompactFlash cards are designed to store data, voice, text and music in a portable device. CompactFlash can then be used to bring information back to the computer for further enhancement, printing, or sending over the Internet. SanDisk CompactFlash features high capacities of up to 128 MB, proven compatibility across many platforms, and exceptional ease of handling.

The ultra-small SanDisk MultiMediaCard extends the removable flash memory capabilities to the ultra-small portable device market where ultra-small size and simple, low cost interface are key requirements for success.

SanDisk®

SanDisk CompactFlash
for high capacity

The defacto standard for digital cameras

Shipping in volume since 1995, SanDisk CompactFlash memory cards continue to revolutionize handheld electronics with unprecedented storage capacity. The CompactFlash card's matchbook size and half-ounce weight make it the world's first small, solid-state removable data storage system. Today, the CompactFlash storage specification is the industry standard for next-generation, small form factor consumer applications such as digital cameras, handheld PCs and voice recorders.

CompactFlash is currently available in 8 to 128MB capacities with 192MB capacity available in early 2000. SanDisk also has CompactFlash Type II in 160MB capacity with 300MB capacity available in early 2000.

Actual Size Comparison

SanDisk continues to lead the industry in the development of new flash data storage technology standards. As inventor of the CompactFlash card, SanDisk was a founding member of the CompactFlash Association (CFA), a group of prominent computing, imaging, communications and consumer electronics companies committed to promoting the adoption of the CompactFlash storage specification as an industry standard. Today, the CFA has more than 150 member companies.
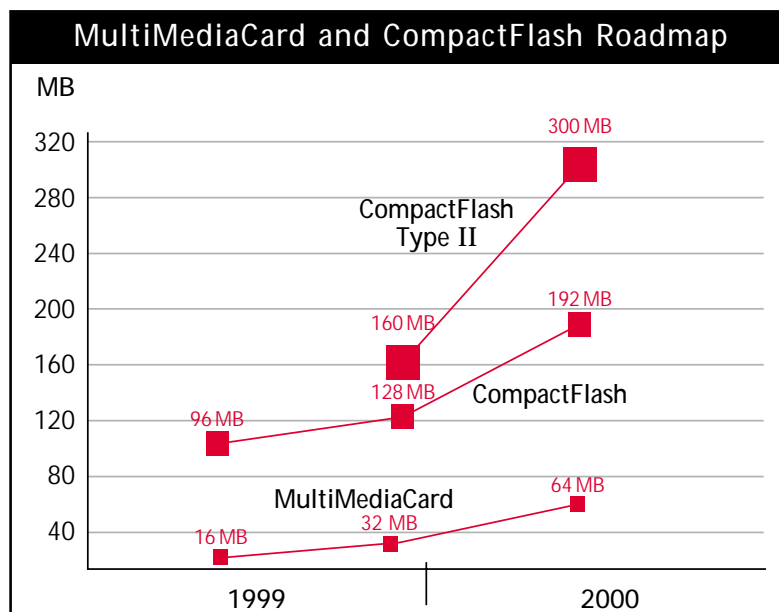
SanDisk CompactFlash gives you a real competitive edge

- World's first small form factor data storage system
- Full compliance with open industry standards
- Forward and backward compatibility
- Built-in ATA interface for easy, plug-and-play interoperability
- Dynamic 3V/5V support
- Low power consumption
- High capacities (up to 128MB)
- Compatibility across many platforms
- Compatible with all major operating systems, including DOS, Windows® 95/98, Windows® NT 4.0, Windows® CE and Apple System 7

Product Comparison			
	MultiMediaCard	**CompactFlash**	**CompactFlash Type II**
Interface	Serial	Parallel	Parallel
Number of Pins	7	50	50
Total Volume of Memory Card	1075 sq mm	5141 sq mm	7789 sq mm
Form Factor			
Thickness	1.4 mm (0.055 in)	3.3 mm (0.13 in)	5.0 mm
Width	24 mm (0.94 in)	42.8 mm (1.685 in)	42.8 mm (1.685 in)
Height	32 mm (1.26 in)	36.4 mm (1.433 in)	36.4 mm (1.433 in)
Weight	1.5 g. max.	11.4 g. max.	13.5 g. max.
Current Capacity	8, 16, 32, 64* MB	8, 16, 32, 48, 64, 80, 96, 128, 160*, 192* MB	160, 300* MB
Op. Voltage	2.7–3.6V	3V/5V Dynamic	3V/5V Dynamic
On Board ECC	Yes	Yes	Yes
Op. Shock	1KG's	2KG's	2KG's
Forward/Backward Compatibility	Yes	Yes	Yes
ROM Version	Yes	N/A	N/A
Other I/O Functions	No	Yes**	Yes**

* Preliminary. Available Q1 2000
** Not available from SanDisk

MultiMediaCard and CompactFlash Roadmap

SanDisk's family of small form factor cards have the right size and capacity to meet your needs.

Look to SanDisk for the best small
form factor solutions

Whether your newest designs call for high capacity or ultra-small size, SanDisk has the small form factor solutions for today's most advanced portable and handheld devices. For more information on SanDisk CompactFlash and MultiMediaCard products, call 408-542-0595.

SanDisk CompactFlash and MultiMediaCard specifications

SYSTEM PERFORMANCE (see notes 1 and 2)	CompactFlash and CompactFlash Type II	MultiMediaCard
Start-up Time		
Sleep to write	2.5 msec max.	1.0 msec max.
Sleep to read	2.0 msec max.	1.0 msec max.
Reset to ready	50 msec typical, 400 msec max.	50 msec typical, 400 msec max.
Data Transfer Rate to/from Flash	4.0 MB/sec burst	2.0 MB/sec burst
Data Transfer Rate to/from host	6.0 MB/sec burst	2.5 MB/sec burst
Active to Sleep Delay	Programmable	N/A
Controller Overhead Command to DRQ	<1.25 msec	N/A
POWER REQUIREMENTS (see note 1)		
DC Input Voltage Commercial Industrial	3V ± 5%, 5V ± 10% 3V ± 5%, 5V ± 5%	2.7V to 3.6V N/A
Typical Power Dissipation **Read**	200 μA (3.3V) 500 μA (5V)	100 μA
Write	32-45 mA (3.3V) 46-75 mA (5V)	<33 mA
Standby	32-60 mA (3.3) 46-90 mA (5V)	<33 mA

ENVIRONMENTAL SPECIFICATIONS	CompactFlash and CompactFlash Type II	MultiMediaCard
Temperature:		
Operating Commercial	0-60°C	-25-85°C
Operating Industrial	-40-85°C	N/A
Non-Operating Commercial	-25-85°C	-40-85°C
Non-Operating Industrial	-50-100°C	N/A
Humidity:		
Operating	8% to 95%, non-condensing	8% to 95%, non-condensing
Non-Operating	8% to 95%, non-condensing	8% to 95%, non-condensing
Acoustic Noise (at 1 meter)	0dB	0dB
Vibration:		
Operating	15 G peak-to-peak max.	15 G peak-to-peak max.
Non-Operating	15 G peak-to-peak max.	15 G peak-to-peak max.
Shock:		
Operating	2,000 G max.	1,000 G max.
Non-Operating	2,000 G max.	1,000 G max.
RELIABILITY AND MAINTENANCE		
MTBF (Mean Time Between Failures)	>1,000,000 hours	>1,000,000 hours
Preventive Maintenance	None	None
Data Reliability	<1 non-recoverable error in 10^{14} bits read	<1 non-recoverable error in 10^{14} bits read

Note 1: All values quoted are typical at ambient temperature and nominal supply voltages unless otherwise stated.

Note 2: All performance timing assumes the controller is in the default (i.e., fastest) mode.

Note 3: Sleep mode currently is specified under the condition that all card inputs are static CMOS levels and in a "Not Busy" operating state.

Note 4: That currents specified show the bounds of programmability of the product.

Note 5: CF interface surface mount header and ejector may be ordered from 3M Company. To order, call: 1-800-225-5373.

ORDERING INFORMATION		CompactFlash	CompactFlash Type II	MultiMediaCard
Order Model #:		SDCFBX-YY-ZZZ	SDCF2BX-YY-ZZZ	SDMB-YY
Where X:	I	Industrial temp. grade		
		Standard temp. grade		
YY:	8 8.0MB	80 80.2MB	160 160.4MB	8 8.0MB
	16 16.1MB	96 96.2MB	300 300.0MB*	16 16.3MB
	32 32.1MB	128 128.0MB		32 32.1MB
	48 48.4MB	160 160.0MB*		64 64.0MB*
	64 64.2MB	192 192.4MB*		
ZZZ:	101 Standard			

*Preliminary

Actual Size

Actual Size

SanDisk MultiMediaCard for
ultra-small size

The defacto for small and consumer electronic devices

If it's ultra-small size you need, the SanDisk MultiMediaCard is the solution. The MultiMediaCard is the world's smallest solid-state storage device, bringing removable flash memory storage capabilities to the newest portable Internet music players, digital camcorders and smart phones.

Weighing less than two grams and about the size of a postage stamp, the MultiMediaCard meets the unique requirements of the portable communications and computing markets for small size, forward and backward compatibility, low power, low cost, and rugged data storage. The SanDisk MultiMediaCard is available in 8 to 32MB capacities, with 64MB available in early 2000.

Actual Size Comparison

SanDisk MultiMediaCard offers small size and big benefits:

- Smallest removable form factor
- Forward and backward compatibility
- Low cost 7-pin interface
- SPI interface for quick time to market
- Rugged and reliable mechanical construction
- Low power consumption

Co-inventor of the MultiMediaCard with Infineon Technologies AG (formerly Siemens AG), SanDisk was a founding member of the MultiMediaCard Association, formed to promote the MultiMediaCard as an open industry standard, ensuring its wide adoption into many consumer electronics products.

about SanDisk

SanDisk Corporation is the world's largest supplier of flash data storage products. For more than a decade, SanDisk has been designing, manufacturing and marketing industry-standard, solid-state data, digital imaging and audio storage products. Whether you are designing digital cameras, hand-held PCs, voice recorders or the latest internet music players, SanDisk Flash data storage offers you the best in overall compatibility, performance, reliability and cost. Your designs deserve the best flash data storage solutions. Insist on SanDisk Flash technology.

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