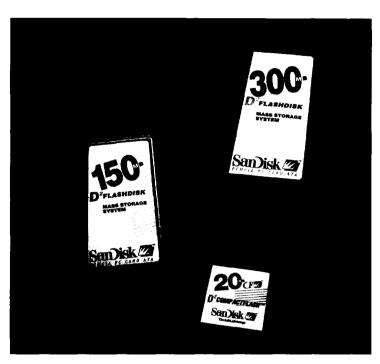# Double Density Flash

SanDisk Double Density Flash Products are ideal for applications requiring high capacity and low cost storage.

The SanDisk Double Density (D2) Flash Series introduces SanDisk's new generation of flash memory technology that provides a lower price per megabyte and higher storage capacities.

D2 technology represents a significant breakthrough in cost reduction of solid state digital storage. By storing two logical bits of information within a single physical Flash cell storage site, D2 offers double the storage density per cell. SanDisk D2 Flash products have much higher storage capacities and significantly faster read performance than SanDisk's

other flash products. The read performance of D2 Flash products is 50 percent faster than SanDisk's 32Mb products. This is due to the concurrent sensing of all four distinct states of the flash memory cell rather than the traditional 0 and 1 states of binary flash memory cells.

Because writing data to Double Density Flash memory requires programming each flash memory cell to one of the four distinct states, write performance is approximately one fourth the write speed of SanDisk's 32 Mb flash products.

Future generations of D2 products will exceed the write rates of non-D2 Flash. D2 Flash products are ideal storage for applications which require low cost and high capacity.

SanDisk Double Density Flash products provide up to 300MB of formatted storage capacity in a Type III form factor, 150MB in a Type II form factor and 20MB in the CompactFlash (CF) form factor.

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SANDD001

	D2 CompactFlash	**D2 Type II**	**D2 Type III**
Interface	PC Card ATA and True IDE Mode	PC Card ATA and True IDE Mode	PC Card ATA and True IDE Mode

System Performance (Notes 1 & 2)

Start-up Time

	D2 CompactFlash	D2 Type II	D2 Type III
Sleep to Write	2.5 msec max.	2.5 msec max.	2.5 msec max.
Sleep to Read	2.0 msec max.	2.0 msec max.	2.0 msec max.
Reset to Ready	50 msec typical, 400 msec max.	50 msec typical, 400 msec max.	50 msec typical, 400 msec max.
Data Transfer Rate to Flash	4.0 MB/sec burst	4.0 MB/sec burst	4.0 MB/sec burst
Data Transfer Rate from Flash	8.0 MB/sec burst	8.0 MB/sec burst	8.0 MB/sec burst
Data Transfer Rate to/from Host	8.0 MB/sec burst	8.0 MB/sec burst	8.0 MB/sec burst
Delay Active to Sleep	Programmable	Programmable	Programmable
Controller Overhead Command to DRQ	<1.25 msec	<1.25 msec	<1.25 msec

Power Requirements (Note1)

DC Input Voltage

	D2 CompactFlash	D2 Type II	D2 Type III
Commercial	5V ± 10%, 3.3V ± 5%	5V ± 10%, 3.3V ± 5%	5V ± 10%, 3.3V ± 5%
Industrial	5V ± 5%	5V ± 5%	5V ± 5%

Typical Power Dissipation (Notes 3 & 4)

	D2 CompactFlash	D2 Type II	D2 Type III
Sleep	200 µA (3.3V) 500 µA (5V)	200 µA (3.3V) 500 µA (5V)	200 µA (3.3V) 500 µA (5V)
Read	32-45 mA (3.3V) 46-75 mA (5V)	32-45 mA (3.3V) 46-75 mA (5V)	32-50mA (3.3V) 46-90mA (5V)
Write	32-60 mA (3.3V) 46-90 mA (5V)	32-60 mA (3.3V) 46-90 mA (5V)	32-60mA (3.3V) 46-110mA (5V)

Environmental Specifications

Temperature

	D2 CompactFlash	D2 Type II	D2 Type III
Operating Commercial	0 - 60°C	0 - 60°C	0 - 60°C
Operating Industrial	–40 - 85°C (5V)	–40 - 85°C (5V)	–40 - 85°C (5V)
Non-Operating Commercial	–25 - 85°C	–25 - 85° C	–25 - 85°C
Non-Operating Industrial	–50 - 100°C (5V)	–50 - 100°C (5V)	–50 - 100°C

Humidity

	D2 CompactFlash	D2 Type II	D2 Type III
Operating	8 - 95%, non-condensing	8 - 95%, non-condensing	8 - 95%, non-condensing
Non-Operating	8 - 95%, non-condensing	8 - 95%, non-condensing	8 - 95%, non-condensing
Acoustic Noise (at 1 meter)	0 dB	0 dB	0 dB

Vibration

	D2 CompactFlash	D2 Type II	D2 Type III
Operating	15 G peak to peak max.	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.	15 G peak to peak max.

Shock

	D2 CompactFlash	D2 Type II	D2 Type III
Operating	2000 G max.	1000 G max.	1000 G max.
Non-Operating	2000 G max.	1000 G max.	1000 G max.

Reliability and Maintenance

	D2 CompactFlash	D2 Type II	D2 Type III
MTBF (Mean Time Between Failures)	> 1,000,000 hours	>1,000,000 hours	>1,000,000 hours
Preventive Maintenance	None	None	None
Data Reliability	<1 non-recoverable error in 10^{14} bits read	<1 non-recoverable error in 10^{14} bits read	<1 non-recoverable error in 10^{14} bits read

Physical Specifications

	CompactFlash	CF Adapter	D2 Type II	D2 Type III
Length	1.433 in (36.4 mm)	3.370 in (85.6 mm)	3.370 ± .008 in (85.6 ± 0.20 mm)	3.370 ± .008 in (85.6 ± 0.20 mm)
Width	1.685 in (42.8 mm)	2.126 in (54.0 mm)	2.126 ± .004 in (54.0 ± 0.10 mm)	2.126 ± .004 in (54.0 ± 0.10 mm)
Thickness (Body)	0.130 in (3.30 mm)	0.1968 in (5.0 mm)	.1968 in (5.0 mm max.)	.413 in (10.5 mm max.)
Thickness (Removable Edge)	0.155 in (3.94 mm)	N/A	N/A	N/A
Weight	0.40 oz (11.4 g)	1.16 oz (33 g)	1.16oz (33g), 1.34oz (38g), 1.52oz (43g) max.	3.2oz (90g) max.

Ordering Information

Order Model #	SDCFCX-YY-ZZZ CompactFlash / SDCF-03 CF Adapter	SDP3CX-YY-ZZZ	SDP3CX-YY-ZZZ

Where X:

	D2 CompactFlash	D2 Type II	D2 Type III
I	Industrial temp. grade	Industrial temp. grade	Industrial temp. grade
	Standard temp. grade	Standard temp. grade	Standard temp. grade

YY:

D2 CompactFlash		D2 Type II				D2 Type III	
7	7.0 MB	7	7.0 MB	40	40.1 MB	300	300.3 MB
10	10.0 MB	10	10.0 MB	85	85.2 MB		
20	10.4 MB	20	20.1 MB	150	150.2 MB		

ZZZ:

	D2 CompactFlash	D2 Type II	D2 Type III
101	Standard	101 Standard	101 Standard

Note 1: All values quoted are typical at ambient temperature and nominal supply voltage 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: The currents specified show the bounds of programmability of the product.