

Industrial SD Card 6.1

CH120-SD Product Specifications

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Version 1.2



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Specifications Overview:

- Compliant with SD Memory Card Specifications
 - Part 1 Physical Layer Specification Ver6.1
 - Part 2 File System Specification Ver3.0
 - Part 3 Security Specification Ver4.0
- Capacity: 16 GB
- NAND flash type: Kioxia TLC BiCS5 112 Layers
- Firmware Version: SLC-liteX
- Operating voltage range: 2.7V~3.6V
- SD card form factor: 32mm (L) x 24mm (W) x 2.1mm (H)
- Temperature range
 - Operating: -25°C to 85°C (Standard) / -40°C to 85°C (Wide)
 - Storage: -40°C to 85°C
- Speed class: Class 10, A2, U3, V30
- SD Card protocol compatible
- Supports SD and SPI modes
- Bus Speed Mode¹ (using 4 parallel data lines)
 - SDR12: SDR up to 25MHz 1.8V signaling
 - SDR25: SDR up to 50MHz 1.8V signaling
 - SDR50: 1.8V signaling, frequency up to 100MHz, up to 50 MB/sec
 - SDR104: 1.8V signaling, frequency up to 208MHz, up to 104 MB/sec
 - DDR50: 1.8V signaling, frequency up to 50MHz, sampled on both clock edges, up to 50 MB/sec
- Flash management
 - Built-in advanced ECC algorithm, Global Wear Leveling, Bad Block Management, Power Failure Management, Flash Translation Layer: Page Mapping, S.M.A.R.T., Smart Read Refresh™
- Enhanced security
 - Mechanical Write Protect Switch
 - Built-in write protection features (permanent and temporary)
 - Copyrights Protection Mechanism (Compliant with Part 1 Physical Layer Specification Ver6.1)
- High reliability
 - Specifically designed for the industrial market, ideal for read-intensive applications such as navigation, infotainment, POS/POI systems, medical devices, and general boot media use cases
 - Supports MTBF of more than 3,000,000 hours
 - Supports up to 10,000 card insertions and removals
- RoHS Compliant

Note 1: Timing in 1.8V signaling is different from that of 3.3V signaling.

4. Product Specifications

4.1 Capacity

Table 4-1 Capacity Specifications

Capacity	Total bytes
16 GB	16,007,561,216

Note: Total bytes are viewed under Windows operating system and were measured by SD format too.

4.2 Performance

Table 4-2 Performance Specifications

Capacity	Speed Class	Sequential (MB/s)		4K Random (IOPS)	
		Read	Write	Read	Write
16 GB		90	80	1,900	1,300

Notes:

- Results may differ from various flash configurations or host system setting.
- Sequential read/write is based on CrystalDiskMark 8.0.4 with file size 1,000MB.
- Random read/write is measured using IOMeter with Queue Depth 32.
- Performance results are measured based on USB 3.0 card reader.

4.3 Mean Time Between Failures (MTBF)

Mean Time Between Failures (MTBF) indicates a device's reliability by representing the average time between one repair and the next failure. This metric is usually expressed in hours. A higher MTBF value signifies greater device reliability.

Table 4-3 Mean Time Between Failures

Analysis Method	MTBF (Hours)
Telcordia Technologies Special Report, SR-332, Issue 3 method	>3,000,000

4.4 Endurance

The endurance of a storage device is predicted by TeraBytes Written based on several factors related to usage, such as the amount of data written into the drive, block management conditions, and daily workload for the drive. Thus, key factors, such as Write Amplifications and the number of P/E cycles, can influence the lifespan of the drive.

Table 4-4 Endurance Specifications

Capacity	TeraBytes Written
16 GB	292

Notes:

- This estimation complies with Apacer internal workload.
- Flash vendor guaranteed 3D SLC-liteX P/E cycles: 30K
- WAF may vary from capacity, flash configurations and writing behavior on each platform.
- 1 Terabyte = 1,024GB

4.5 Reliability and Durability

Table 4-5 Reliability and Durability

Parameter		Specification
Temperature	Operating	-25°C to 85°C (Standard); -40°C to 85°C (Wide)
	Storage	-40°C to 85°C
Shock		1,500G, 0.5ms
Vibration		20Hz~80Hz/1.52mm (frequency/displacement) 80Hz~2000Hz/20G (frequency/displacement) X, Y, Z axis/60mins each
Drop		150cm free fall, 6 face of each
Bending		≥ 10N, hold 1min/5times
Torque		0.1N-m or 2.5deg, hold 5min/5times
Salt Spray		Concentration: 3% NaCl at 35°C (storage for 24 hours)
Waterproof		JIS IPX7 compliance. Water temperature: 25°C Water depth: the lowest point of unit is locating 1000mm below surface (storage for 30 mins)
X-Ray Exposure		0.1 Gy of medium-energy radiation (70 KeV to 140 KeV, cumulative dose per year) to both sides of the card (storage for 30 mins)
Durability		10,000 times mating cycle
ESD		Pass

4.6 Certification and Compliance

Apacer CH120-SD complies with the following standards:

- CE
- UKCA
- FCC
- BSMI
- RoHS
- EMI
- ESD

6. SD Card Comparison

Table 6-1 Comparing SDSC, SDHC, and SDXC

Item	SDSC	SDHC	SDXC
File System	FAT 12/16	FAT32	exFAT
Addressing Mode	Byte (1 byte unit)	Block (512 byte unit)	Block (512 byte unit)
HCS/CCS bits of ACMD41	Support	Support	Support
CMD8 (SEND_IF_COND)	Support	Support	Support
CMD16 (SET_BLOCKLEN)	Support	Support (Only CMD42)	Support (Only CMD42)
Partial Read	Support	Not Support	Not Support
Lock/Unlock Function	Mandatory	Mandatory	Mandatory
Write Protect Groups	Optional	Not Support	Not Support
Supply Voltage 2.7v – 3.6v (for operation)	Support	Support	Support
Total Bus Capacitance for each signal line	40pF	40pF	40pF
CSD Version (CSD_STRUCTURE Value)	1.0 (0x0)	2.0 (0x1)	2.0 (0x1)
Speed Class	Optional	Mandatory (Class 2 / 4 / 6 / 10)	Mandatory (Class 2 / 4 / 6 / 10)

Table 6-2 Comparing Speed Class Symbols

Item	C2 (Class 2)	C4 (Class 4)	C6 (Class 6)	C10 (Class 10)
Bus Mode	UHS-I/UHS-II			
SD Memory Card	SDSC, SDHC, SDXC			
Mark				
Min. Sequential Write Speed	2 MB/s	4 MB/s	6 MB/s	10 MB/s

Table 6-3 Comparing UHS Speed Grade Symbols

Item	U1 (UHS Speed Grade 1)	U3 (UHS Speed Grade 3)
Bus Mode	UHS-I/UHS-II	
SD Memory Card	SDHC, SDXC	
Mark		
Performance	10 MB/s minimum write speed	30 MB/s minimum write speed
Applications	Full higher potential of recording real-time broadcasts and capturing large-size HD videos.	Capable of recording 4K2K video.

Table 6-4 Comparing Video Speed Class Symbols

Item	V6 (Video Speed Class 6)	V10 (Video Speed Class 10)	V30 (Video Speed Class 30)	V60 (Video Speed Class 60)	V90 (Video Speed Class 90)
Bus Mode	High Speed/UHS-I/UHS-II		UHS-I/UHS-II	UHS-II	
SD Memory Card	SDHC, SDXC				
Mark	V6	V10	V30	V60	V90
Performance	6 MB/s minimum write speed	10 MB/s minimum write speed	30 MB/s minimum write speed	60 MB/s minimum write speed	90 MB/s minimum write speed
Applications	HD/FHD Video Recording	FHD Video Recording, HD Still Image, Continuous Shooting.		4K/2K Video Recording	8K/3D/360° Video Recording

Table 6-4 Comparing Application Performance Class Symbols

Item	A1 (Application Performance Class 1)	A2 (Application Performance Class 2)
Mark	A1	A2
Min. Random Read	1500 IOPS	4000 IOPS
Min. Random Write	500 IOPS	2000 IOPS
Min. Sustained Sequential Write	10 MB/s	10 MB/s
Applications	Main target is uSD for Android mobile handset	

10. Product Ordering Information

10.1 Product Code Designations

Code	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	A	J	6	.	1	4	8	G	X	A	.	0	0	1	0	9

Code 1-3 (Product Line & Form Factor)	CH120-SD
Code 5-6 (Model/Solution)	CH120
Code 7-8 (Product Capacity)	16GB
Code 9 (Flash Type & Product Temp)	S: 3D TLC Standard Temperature T: 3D TLC Wide Temperature
Code 10 (Product Spec)	SD Card
Code 12-14 (Version Number)	Random number generated by system
Code 15-16 (Firmware Version)	Firmware page mode

10.2 Valid Combinations

Capacity	Standard Temperature	Wide Temperature
16GB	AJ6.148GSA.00109	AJ6.148GTA.00109

Global Presence

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