

RoHS Compliant

USB Flash Drive

AH321 Product Specifications



September 18, 2019

Version 2.9



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Specifications Overview:

- **USB2.0 High-Speed and USB1.1 Full-Speed Compatible Interface**
- **Capacity**
 - For SLC: 256, 512 MB
1, 2, 4, 8, 16, 32 GB
 - For MLC: 4, 8, 16, 32, 64 GB
- **Performance***
 - Sequential read: up to 34 MB/s
 - Sequential write: up to 22 MB/s
- **Flash Management**
 - Built-in hardware ECC
 - Wear-leveling algorithms
 - S.M.A.R.T.
- **Support Non-Removable Setting**
- **LED Indicators for Drive Behavior**
- **NAND Flash Type: MLC & SLC**
- **MTBF**
 - SLC: 2,000,000 hours
 - MLC: 1,000,000 hours
- **Temperature Range**
 - Operating:
 - Standard: 0°C to 70°C
 - Wide: -40°C to 85°C
 - Storage: -40°C to 100°C
- **Supply Voltage**
 - 5.0 V
- **Power Consumption***
 - Active mode: 185 mA
 - Idle mode: 65 mA
- **OS Support**
 - Windows: WinXP/7 or later
 - Mac: 10.2.8 or later
 - Linux: 2.4.10 or later
- **Dimensions: 60.59 x 19.00 x 8.00, unit: mm**
- **LED Indicators for Drive Behavior**
- **EMC: FCC, CE**
- **RoHS Compliant**

*Varies from capacities. The values for performances and power consumptions presented are typical and may vary depending on flash configurations or platform settings. The term idle refers to the standby state of the device.

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1. General Descriptions

Apacer’s USB FLASH Drive (UFD) is a high performance flash disk drive designed offering portable storage solutions. UFDs can be plugged into a standard USB 2.0 connector commonly found in desktops, portable computers and even enterprise PC systems. Apacer’s UFDs have an efficient built-in microcontroller and file management firmware that ensures ideal performance, functionality and reliability. This product is well suited for portable flash storage applications while operating at minimal power consumption.

1.1 Functional Block

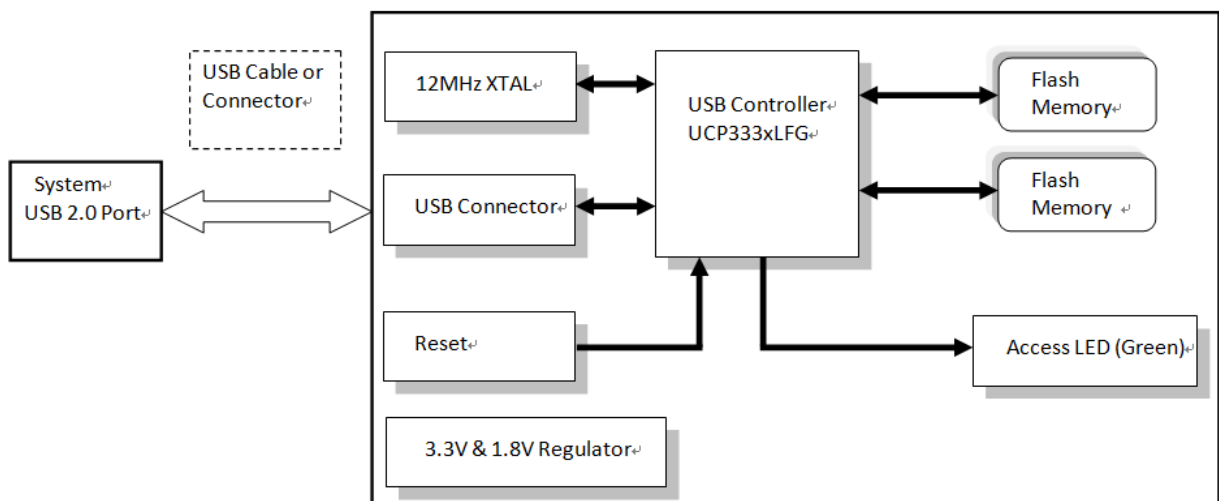


Figure 1-1 Functional Block Diagram

1.2 Performance-Optimized USB Controller

1.2.1 Error Correction Code (ECC)

Flash memory cells can deteriorate with use, which might lead to random bit errors in the stored data. Thus, this USB applies the BCH ECC Algorithm, which can detect and correct errors occurring during Read process, ensure data to be read correctly, as well as protect data from corruption. This device can correct up to 24bit/1K data.

1.2.2 Wear-Leveling

Flash memory can be erased a limited number of times. In a typical application, and especially if a file system is used, specific pages are constantly updated (e.g., the page that contains the FAT, registry, etc.). Without any special handling, these pages would wear out more rapidly than other pages, reducing the lifetime of the entire flash. To overcome this inherent deficiency, Apacer's USB FLASH Drive (UFD) uses wear-leveling algorithm. This wear-leveling algorithm ensures that consecutive writes of a specific sector are not written physically to the same page in the flash. This distributes flash media usage evenly across all pages, thereby maximizing flash lifetime. The wear-leveling mechanism provides write/erase cycles for reliable data storage over an extended period.

1.2.3 S.M.A.R.T.

S.M.A.R.T. is an abbreviation for Self-Monitoring, Analysis and Reporting Technology, a self-monitoring system that provides indicators of drive health as well as potential disk problems. It serves as a warning for users from unscheduled downtime by monitoring and displaying critical drive information. Ideally, this should allow taking proactive actions to prevent drive failure and make use of S.M.A.R.T. information for future product development reference.

2. General Specifications

2.1 General Specifications

Table 2-1 General Specifications

Item	Description
Interface	High-speed USB2.0 compliant; backward compatible with USB 1.1
Performance*	SLC: up to 34 MB/s (read); 22 MB/s (write) MLC: up to 33 MB/s (read); 16 MB/s (write)
Temperature	0°C to 70°C (Standard); -40°C to 85°C (Wide)
EMC	FCC, CE
MTBF	2,000,000 hours (SLC); 1,000,000 (MLC)
Shock	Operation: 50G, 11ms Non-operation: 1,500G, 0.5ms
Vibration	Operation: 7.69 Grms, 20~2000 Hz/random (complies with MIL-STD-810G) Non-operation: 15 G, 10 ~ 2000 Hz/sine

Note: Results may vary from flash configurations or host system settings.

2.2 Performance Specifications – SLC

Table 2-2 Performance Specifications (SLC)

Capacity	256 MB	512 MB	1 GB	2 GB	4 GB	8 GB	16 GB	32 GB
Performance								
Sequential Read (MB/s)	31	31	32	34	28	32	34	31
Sequential Write (MB/s)	10	15	19	19	21	15	22	21

Note:

Results may differ from various flash configurations or host system setting.

*Sequential performance is based on CrystalDiskMark 5.2.1 with file size 1,000MB.

**Random performance measured using IOMeter with Queue Depth 32.

2.3 Performance Specifications – MLC

Table 2-3 Performance Specifications (MLC)

Capacity	4 GB	8 GB	16 GB	32 GB	64 GB
Performance					
Sequential Read (MB/s)	32	32	33	33	29
Sequential Write (MB/s)	10	10	14	16	10

Note:

Results may differ from various flash configurations or host system setting.

*Sequential performance is based on CrystalDiskMark 5.2.1 with file size 1,000MB.

**Random performance measured using IOMeter with Queue Depth 32.

2.4 LED Indicator Behavior

The behavior of the AH321 LED indicator is described in Table 2-4.

Table 2-4 LED Behavior

Location	LED Color	Description
As indicated by the red marker below	Yellow green	LED blinks when the drive is being accessed such as power on, read or write. The blink frequency is 65.536ms switch H to L and loop.



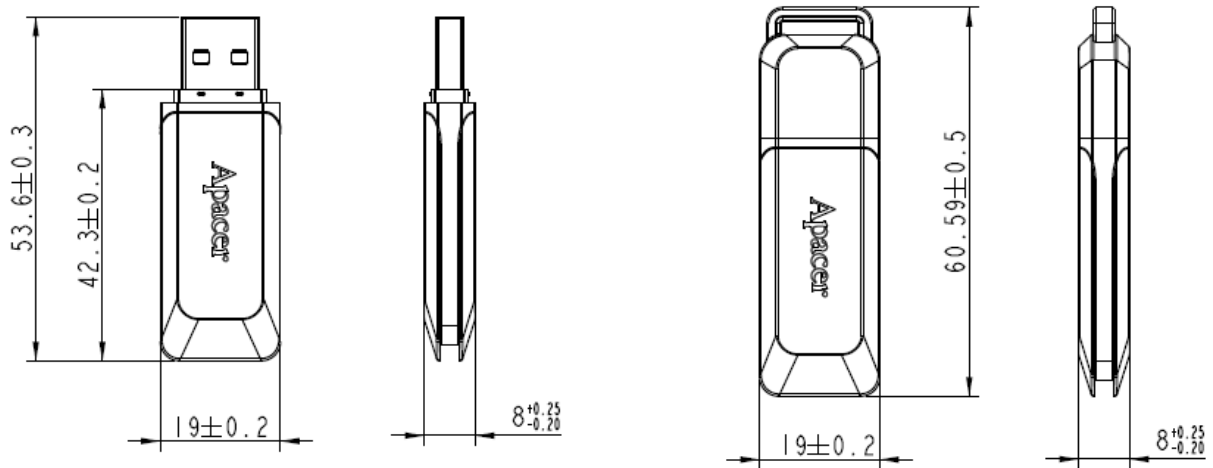
3. Electrical Specifications

Caution: Absolute Maximum Stress Ratings – Applied conditions greater than those listed under “Absolute Maximum Stress Ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these conditions or conditions greater than those defined in the operational sections of this data sheet is not implied. Exposure to absolute maximum stress rating conditions may affect device reliability.

Table 3-1 Operating Range

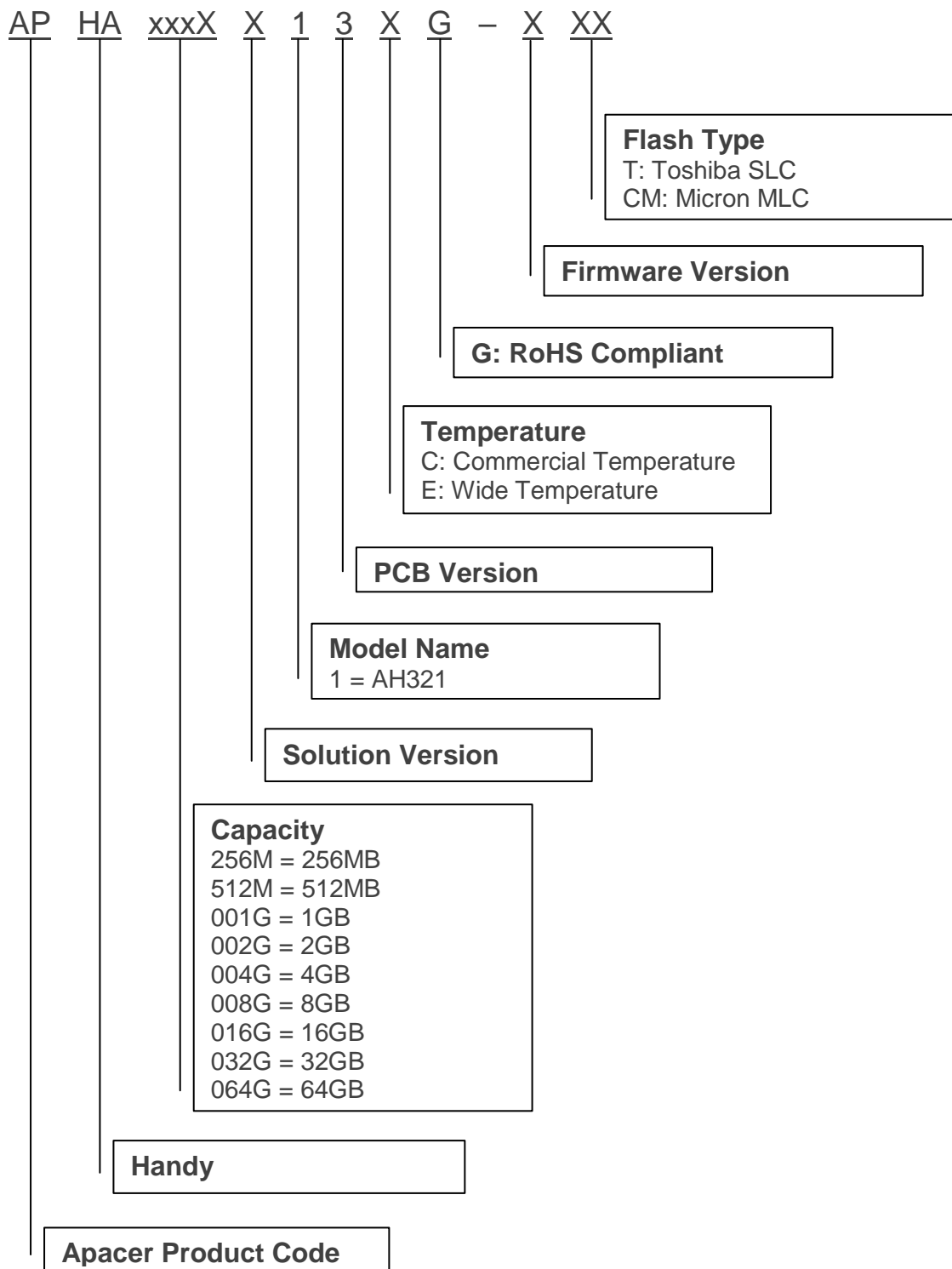
Parameters	Conditions
Ambient temperature	0°C to 70°C (Standard); -40°C to 85°C (Wide)
Storage temperature	-40°C to 100°C
Required power supply	4.5-5.5V
Input power (VDD)	-0.3V (min.) to 5.5V (max.)
Voltage on any pin except VDD with respect to GND	-0.3V (min.) to VDD + 0.3V (max.)

4. Physical Characteristics



5. Product Ordering Information

5.1 Product Code Designations



5.2 Valid Combinations

5.2.1 AH321 (SLC)

Capacity	Standard Temperature	Wide Temperature
256 MB	APHA256MR13CG-6T	APHA256MT13EG-6T
512 MB	APHA512MR13CG-6T	APHA512MT13EG-6T
1 GB	APHA001GR13CG-6T	APHA001GT13EG-6T
2 GB	APHA002GR13CG-6T	APHA002GT13EG-6T
4 GB	APHA004GR13CG-6T	APHA004GT13EG-6T
8 GB	APHA008GR13CG-6T	APHA008GT13EG-6T
16 GB	APHA016GR13CG-6T	APHA016GT13EG-6T
32 GB	APHA032GR13CG-6T	APHA032GT13EG-6T

5.2.2 AH321 (MLC)

Capacity	Standard Temperature	Wide Temperature
256 MB	APHA004GR13CG-2CM	APHA004GT13EG-2CM
512 MB	APHA008GR13CG-2CM	APHA008GT13EG-2CM
1 GB	APHA016GR13CG-2CM	APHA016GT13EG-2CM
2 GB	APHA032GR13CG-2CM	APHA032GT13EG-2CM
4 GB	APHA064GR13CG-2CM	APHA064GT13EG-2CM

Note: Valid combinations are those products in mass production or will be in mass production. Consult your Apacer sales representative to confirm availability of valid combinations and to determine availability of new combinations.

Revision History

Revision	Description	Date
1.0	Official Release	8/11/2011
1.1	Updated Product Ordering Information	6/20/2012
1.2	Updated Product Ordering Information - contents relating to extended temperature are removed	7/2/2012
1.3	Updated read/write performance due to change in NAND flash use Updated addresses of Taiwan headquarter and the office in India	7/30/2013
1.4	Added performance tables	6/4/2014
1.5	Added SLC extended temperature models	10/17/2014
1.6	Updated Product Ordering Information	11/17/2014
1.7	Updated Product Ordering Information	2/17/2015
1.8	Added storage temperature	11/11/2015
1.9	Added 64GB support	11/26/2015
2.0	- Revised mechanical specifications - Added non-removable setting and OS support on Features page - Added block diagram - Added shock and vibration specifications - Revised product ordering information	6/7/2016
2.1	Added SLC&MLC to file name	10/3/2016
2.2	Revised storage temperature	12/13/2016
2.3	- Updated MTBF hours for MLC and shock specifications - Updated product ordering information	2/16/2017
2.4	- Updated mechanical specifications - Added S.M.A.R.T to Flash Management and LED Indicators for Drive Behavior on Features page - Added 1.4 S.M.A.R.T. - Updated product ordering information for SLC except 128MB	3/20/2017
2.5	- Removed 128GB support - Updated ECC description on Features page - Removed flash types including Samsung SLC and Micron SLC from product code designations	3/23/2017

Revision	Description	Date
2.6	- Updated the description of 1.2.1 Error Correction Code (ECC) - Renamed extended temperature to wide temperature	12/13/2018
2.7	- Updated Dimensions on Specifications Overview page - Updated 4. Physical Characteristics	4/24/2019
2.8	Updated MTBF hours for MLC to 1,000,000 hours at MTBF on Specifications Overview page and Table 2-1 General Specifications	7/16/2019
2.9	Added 2.4 LED Indicator Behavior section	9/18/2019

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