

***RoHS Compliant***

## **USB Flash Drive**

***AH321 Product Specifications***

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***Version 2.5***



**Apacer**  
*Access the best*

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## FEATURES:

- **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
- **NAND Flash Type: MLC & SLC**
- **Performance\***
  - Sustained read: up to 34 MB/s
  - Sustained write: up to 22 MB/s
- **Flash Management**
  - Implements advanced wear-leveling algorithms to substantially increase longevity of flash media
  - BCH (24 bit) Error Detection Code/Error Correction Code (EDC/ECC)
  - S.M.A.R.T.
- **MTBF**
  - SLC: 2,000,000 hours
  - MLC: 2,000,000 hours
- **Temperature Range**
  - Operating:  
Standard: 0°C to 70°C  
Extended: -40°C to 85°C
  - Storage: -40°C to 100°C
- **Power Consumption**
  - Active mode: 185 mA
  - Idle mode: 65 mA
  - Operating voltage: 5V
- **Support Non-Removable Setting**
- **LED Indicators for Drive Behavior**
- **OS Support**
  - Windows: WinXP/7 or later
  - Mac: 10.2.8 or later
  - Linux: 2.4.10 or later
- **Dimensions: 53.60 x 19.00 x 8.00, unit: mm**
- **EMC: FCC, CE**
- **RoHS Compliant**

\*Varies from capacities. The results for performance and power consumption addressed here are typical and may vary in real world platforms.

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## 1. General Description

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 Error Correction Code (ECC)

Apacer's USB FLASH Drive (UFD) uses BCH Error Detection Code (EDC) and Error Correction Code (ECC) algorithms which correct up to 24 random single-bit errors for each 1024-byte block of data.

### 1.3 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.

### 1.4 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)<br>MLC: up to 33 MB/s (read); 16 MB/s (write)                       |
| Temperature  | 0°C to 70°C (Standard); -40°C to 85°C (Extended)   |
| EMC          | FCC, CE  |
| MTBF         | 2,000,000 hours (SLC); 2,000,000 (MLC)   |
| Shock        | Operation: 50G, 11ms<br>Non-operation: 1,500G, 0.5ms   |
| Vibration    | Operation: 7.69 Grms, 20~2000 Hz/random (complies with MIL-STD-810G)<br>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 \ Performance | 256 MB | 512 MB | 1 GB | 2 GB | 4 GB | 8 GB | 16 GB | 32 GB |
|------------------------|--------|--------|------|------|------|------|-------|-------|
| Sustained Read (MB/s)  | 31     | 31     | 32   | 34   | 28   | 32   | 34    | 31    |
| Sustained Write (MB/s) | 10     | 15     | 19   | 19   | 21   | 15   | 22    | 21    |

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

### 2.3 Performance Specifications – MLC

Table 2-3 Performance Specifications (MLC)

| Capacity \ Performance | 4 GB | 8 GB | 16 GB | 32 GB | 64 GB |
|------------------------|------|------|-------|-------|-------|
| Sustained Read (MB/s)  | 32   | 32   | 33    | 33    | 29    |
| Sustained Write (MB/s) | 10   | 10   | 14    | 16    | 10    |

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

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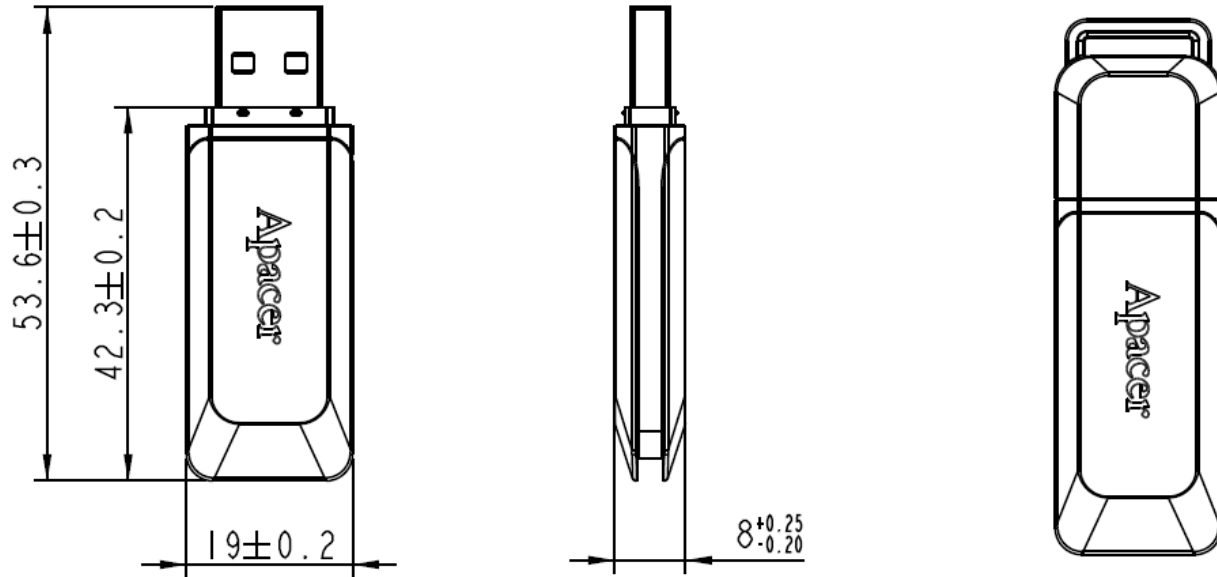
### 3. Electrical Specifications

**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** Absolute Stress Rating

| Parameters  | Conditions                                       |
|---|--|
| Ambient temperature                               | 0°C to 70°C (Standard); -40°C to 85°C (Extended) |
| 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 Dimensions



## 5. Product Ordering Information

### 5.1 Product Code Designations





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## 5.2 Valid Combinations

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### 5.2.1 AH321 (SLC)

| Capacity | Standard Temperature | Extended 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 | Extended Temperature |
|----------|----------------------|----------------------|
| 4 GB     | APHA004GR13CG-2CM    | APHA004GT13EG-2CM    |
| 8 GB     | APHA008GR13CG-2CM    | APHA008GT13EG-2CM    |
| 16 GB    | APHA016GR13CG-2CM    | APHA016GT13EG-2CM    |
| 32 GB    | APHA032GR13CG-2CM    | APHA032GT13EG-2CM    |
| 64 GB    | APHA064GR13CG-2CM    | APHA064GT13EG-2CM    |

## Revision History

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

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## Global Presence

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