Apacer

RoHS Compliant

USB Flash Drive

EH353 Product Specifications

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Version 1.0

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Specifications Overview:

- **USB3.0 Super Speed compatible, and backward compatible with USB2.0 & USB1.1 interfaces**
  - USB3.0 max. transfer rate: 5 Gb/s
  - Backward compatible with 480Mb/s & 12 Mb/s
- **Capacity**
  - 2 GB
- **Performance***
  - Sequential read: up to 65 MB/s
  - Sequential write: up to 40 MB/s
- **Flash Management**
  - Flash bad-block management
  - Built-in hardware ECC
  - Power saving implemented
  - Wear-leveling algorithms
  - S.M.A.R.T.
  - Power Failure Management
- **NAND Flash Type:** SLC
- **MTBF:** >2,000,000 hours
- **Endurance (in Terabytes Written: TBW)**
  - 2 GB: 22 TBW
- **Temperature Range**
  - Operating: 0°C to 70°C
  - Storage: -40°C to 100°C
- **Power Consumption***
  - Operating voltage: 5V
  - Active mode: 225 mA
  - Idle mode: 65 mA
- **OS Support**
  - Windows: WinXP/7 or later
  - Mac: 10.2.8 or later
  - Linux: 2.4.10 or later
- **USB Bus-Powered Capability**
- **Dimensions:** 48.15 x 14.00 x 4.00, unit: mm
- **RoHS Compliant**

*The values for performances and power consumptions presented are typical and may vary depending on flash configurations or platform settings.

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1. General Descriptions

Apacer USB3.0 Handy Flash Drive EH353 is a ultra high-performance flash disk drive designed offering portable storage solutions or external memory expansion. This new generation USB flash drive is compatible with the latest USB specification – USB3.0 Super Speed, with a maximum transfer rate of 5 Gb/s. The connector is backward employable with USB2.0 and USB1.1 interfaces as well. With compliance with USB3.0 specification, this USB drive can deliver up to 65 MB/s outstanding performance. Reliability wise, the USB comes with various implementations including powerful hardware ECC engine, power saving modes, wear leveling and flash block management. This product is well suited for portable flash storage applications while operating at minimal power consumption.

1.1 Performance-optimized USB Controller

1.1.1 Power Saving Implemented

The internal controller of the USB model is designed with power saving implementations, allowing the device to operate at low power consumption.

1.1.2 Program RAM Architect

The internal Program RAM implementation allows the host to upgrade firmware codes anytime when needed.

1.1.3 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 39bit/1K data.

1.1.4 Flash Block Management

Current production technology is unable to guarantee total reliability of NAND flash memory array. When a flash memory device leaves factory, it comes with a minimal number of initial bad blocks during production or out-of-factory as there is no currently known technology that produce flash chips free of bad blocks. In addition, bad blocks may develop during program/erase cycles. When host performs program/erase command on a block, bad block may appear in Status Register. Since bad blocks are inevitable, the solution is to keep them in control. Apacer flash devices are programmed with ECC and block mapping technique to reduce invalidity or error. Once bad blocks are detected, data in those blocks will be transferred to free blocks and error will be corrected by designated algorithms.

1.1.5 Wear-Leveling Algorithms

Flash memory devices differ from Hard Disk Drives (HDDs) in terms of how blocks are utilized. For HDDs, when a change is made to stored data, like erase or update, the controller mechanism on HDDs will perform overwrites on blocks. Unlike HDDs, flash blocks cannot be overwritten and each P/E cycle wears down the lifespan of blocks gradually. Repeatedly program/erase cycles performed on the same memory cells will eventually cause some blocks to age faster than others. This would bring flash storages to their end of service term sooner. Wear leveling is an important mechanism that level out the wearing of blocks so that the wearing-down of blocks can be almost evenly distributed. This will increase the lifespan of flash drives. Commonly used wear leveling types are Static and Dynamic.

1.1.6 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.

1.1.7 Power Failure Management

Power Failure Management plays a crucial role when experiencing unstable power supply. Power disruption may occur when users are storing data into the SSD. In this urgent situation, the controller would run multiple write-to-flash cycles to store the metadata for later block rebuilding. This urgent operation requires about several milliseconds to get it done. At the next power up, the firmware will perform a status tracking to retrieve the mapping table and resume previously programmed NAND blocks to check if there is any incompleteness of transmission.

2. Product Specifications

2.1 Performance and Environmental Specifications

Table 2-1 Performance & Environmental Specifications

Item		Specifications	
Interface		Super-speed USB3.0 compliant; backward compatible with USB2.0 and USB1.1	
Performance* (MB/s)		**2GB**	
		Read	65
		Write	40
Power Consumption** (mA)		**2GB**	
		Active	225
		Idle	65
MTBF		>2,000,000 hours	
Temperature	Operating	0°C to 70°C	
	Storage	-40°C to 100°C	
Humidity		30°C to 60°C , 95% RH; 244hrs (compliant with MIL-STD-810G)	
Shock	Operating	50(G)/11(ms)/half sine (compliant with MIL-STD-202G)	
	Non-operating	1,500(G)/0.5(ms)/half sine (compliant with MIL-STD-202G)	
Vibration	Operating	7.69(Grms), 20~2000(Hz)/random (compliant with MIL-STD-810G)	
	Non-operating	4.02(Grms), 15~2000(Hz)/random (compliant with MIL-STD-810G)	
ESD		CE compliance (Criteria B)	

Note:
Results may vary from flash configurations or host system settings.
*Sequential performance is based on CrystalDiskMark 5.2.1 with file size 1,000MB.
**Active power is an average power measurement performed using CrystalDiskMark with 128KB sequential read/write transfers.

2.2 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 2-3 Endurance Specifications

Capacity	TeraBytes Written
2 GB	22

Note:

- The estimated values are based on sequential write behavior. (Apacer EDTest Tool, test mode – sequential data pattern – 100.00% of disk space)
- Flash vendor guaranteed SLC P/E cycle: Kioxia - 60K.
- The WLE/WAF values may vary with the real application on user platform.
- 1 Terabyte = 1,000 GB.

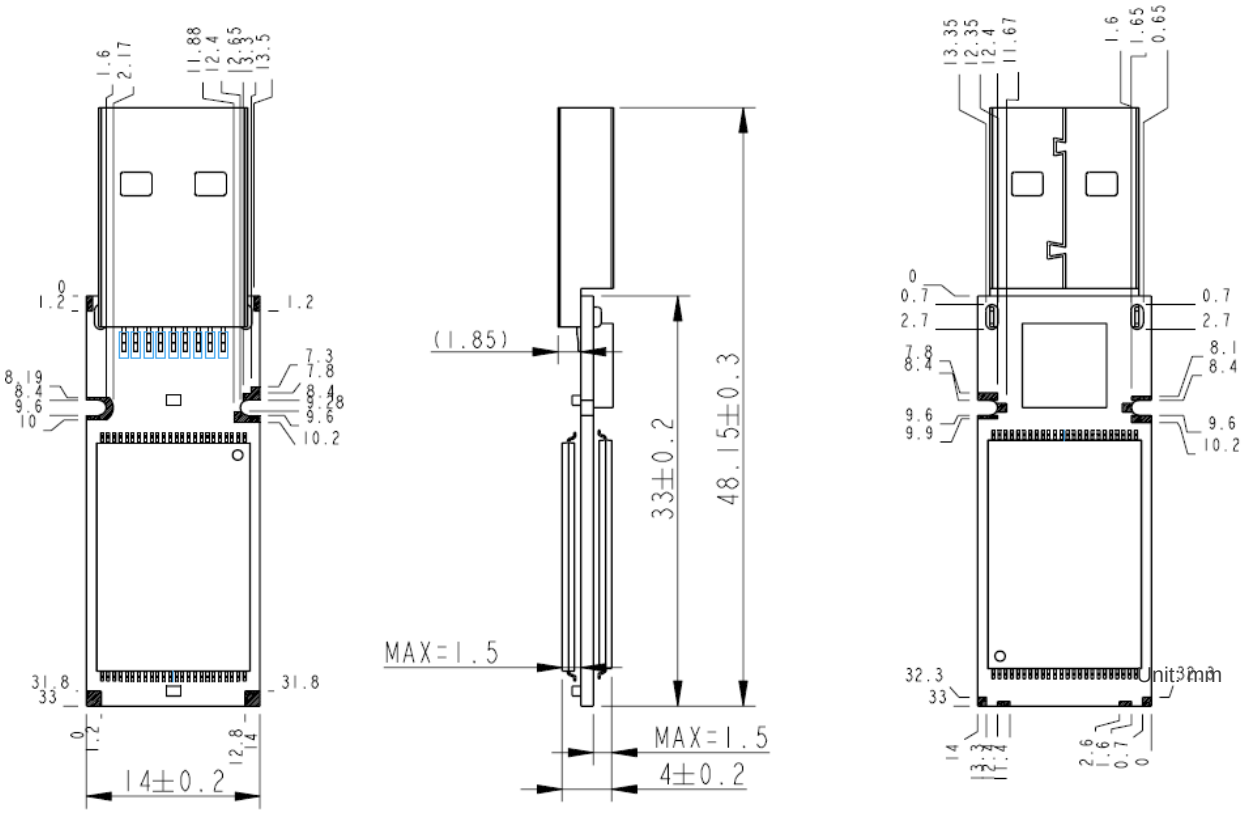
3. Absolute Maximum Rating

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

Item	Range
Required power supply	4.5-5.5V
Operating temperature	0°C to 70°C
Storage temperature	-40℃ to 100℃

4. Physical Dimensions



5. Product Ordering Information

Capacity	Part Number
2GB	APHA002GA50CS-2T-FTNT

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	Initial release	3/6/2020

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