

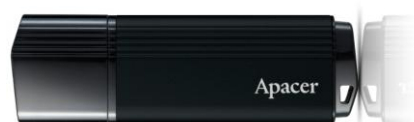
***RoHS Compliant***

# **USB Flash Drive**

***EH353 Product Specifications***

**August 9, 2017**

**Version 2.3**



**Apacer**  
*Access the best*

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## FEATURES:

- **USB3.0 Super Speed compatible, and backward compatible with USB2.0 & USB1.1 interfaces**
  - USB3.0 max. transfer rate: 5.0 Gbps
  - Backward compatible with 480Mbps & 12 Mbps
- **Capacity**
  - SLC: 256, 512 MB  
1, 2, 4, 8, 16, 32 GB
  - MLC: 8, 16, 32, 64, 128 GB
- **Performance\***
  - SLC**
    - Sequential read: up to 80 MB/s
    - Sequential write: up to 70 MB/s
  - MLC**
    - Sequential read: up to 205 MB/s
    - Sequential write: up to 95 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
- **Temperature Range**
  - Operating:
    - Standard: 0°C to 70°C
    - Extended: -40°C to 85°C
  - Storage: -40°C to 100°C
- **Power Consumption\***
  - Operating voltage: 5V
  - SLC**
    - Active mode: 225 mA
    - Idle mode: 65 mA
  - MLC**
    - Active mode: 275 mA
    - Idle mode: 80 mA
- **OS Support**
  - Windows: WinXP/7 or later
  - Mac: 10.2.8 or later
  - Linux: 2.4.10 or later
- **RoHS Compliant**
- **USB Bus-Powered Capability**
- **NAND Flash Type: SLC/MLC**
- **Dimensions: 59.0 x 18.4 x 9.1, unit: mm**

\*Varies from capacities. Performance and power consumption addressed here are typical and may vary from configurations and platforms.

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## 1. General Description

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 5.0 Gbps. 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 205 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

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#### 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)

The UFD utilizes 1-bit Error Detection Code (EDC) and Error Correction Code (ECC).

#### 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 disruption may occur when users are storing data into the SSD. In this urgent situation, the controller would protect firmware table and the data written to flash from data loss in the event of power off. Apacer power failure management maintains data correctness and increases the reliability of the data stored in the NAND Flash memory.

## 2. Product & Environmental Specifications

### 2.1 SLC

Item		Specifications								
Interface		Super-speed USB3.0 compliant; backward compatible with USB2.0 and USB1.1								
Performance* (MB/s)			<b>256MB</b>	<b>512MB</b>	<b>1GB</b>	<b>2GB</b>	<b>4GB</b>	<b>8GB</b>	<b>16GB</b>	<b>32GB</b>
		<b>Read</b>	60	60	65	65	65	80	80	80
		<b>Write</b>	10	21	40	40	50	65	70	70
Power Consumption**		Active: 225 mA Idle: 65 mA								
MTBF		2,000,000 hours								
Temperature	Operating	0°C to 70°C (Standard); -40°C to 85°C (Extended)								
	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.

# USB Disk Module APHAxXXXXXXG-XTX



## 2.2 MLC

Item		Specifications							
Interface		Super-speed USB3.0 compliant; backward compatible with USB2.0 and USB1.1							
Performance*				<b>8GB***</b>	<b>16GB</b>	<b>32GB</b>	<b>64GB</b>	<b>128GB****</b>	
		<b>Read</b>	205	95	190	190	185	190	195
		<b>Write</b>	20	29	55	45	95	95	80
Power consumption**				<b>8GB***</b>	<b>16GB</b>	<b>32GB</b>	<b>64GB</b>	<b>128GB****</b>	
		<b>Active</b>	165	150	270	265	275	265	175
		<b>Idle</b>	75	50	85	80	80	55	35
MTBF		1,000,000 hours							
Temperature	Operating	0°C to 70°C (Standard); -40°C to 85°C (Extended)							
	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.

\*\*\*Values on the left are measured on 32Gb x2 while those on the right are measured on 64Gb x1.

\*\*\*\*Values on the left are measured on 512Gb x2 while those on the right are measured on 1Tb x1.

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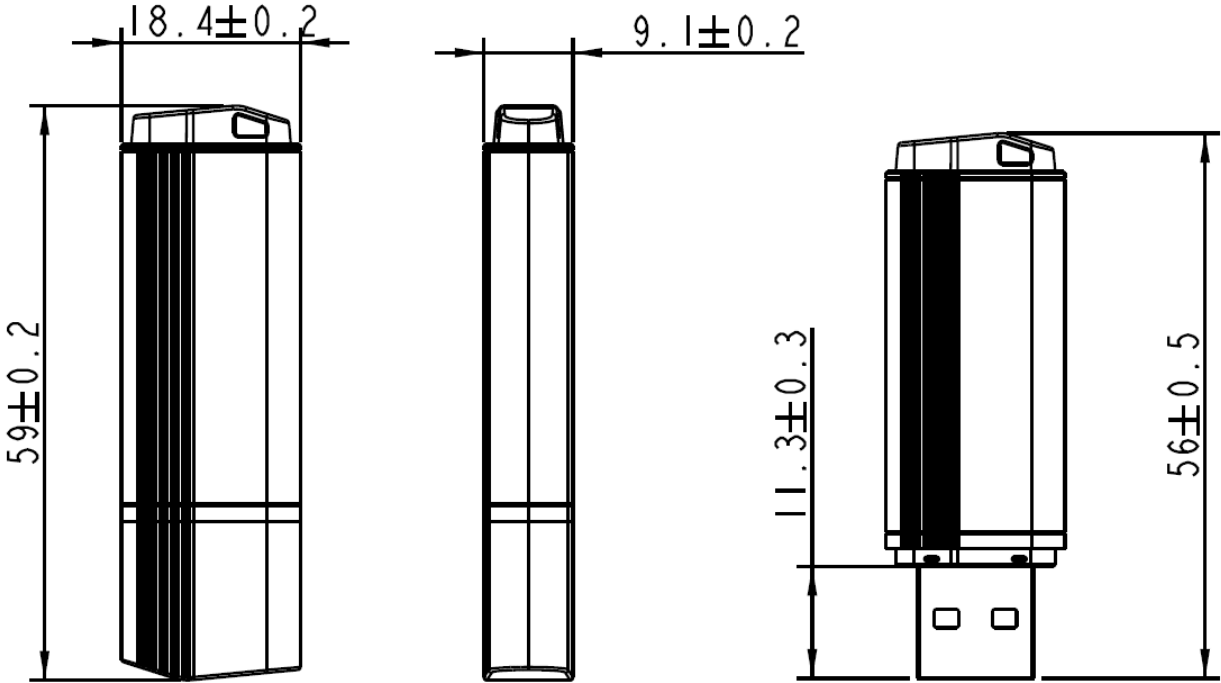
### 3. Absolute Maximum Rating

**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

Parameters	Conditions
Required power supply	4.5-5.5V
Operating temperature	0°C to 70°C (Standard); -40°C to 85°C (Extended)
Storage temperature	-40°C to 100°C

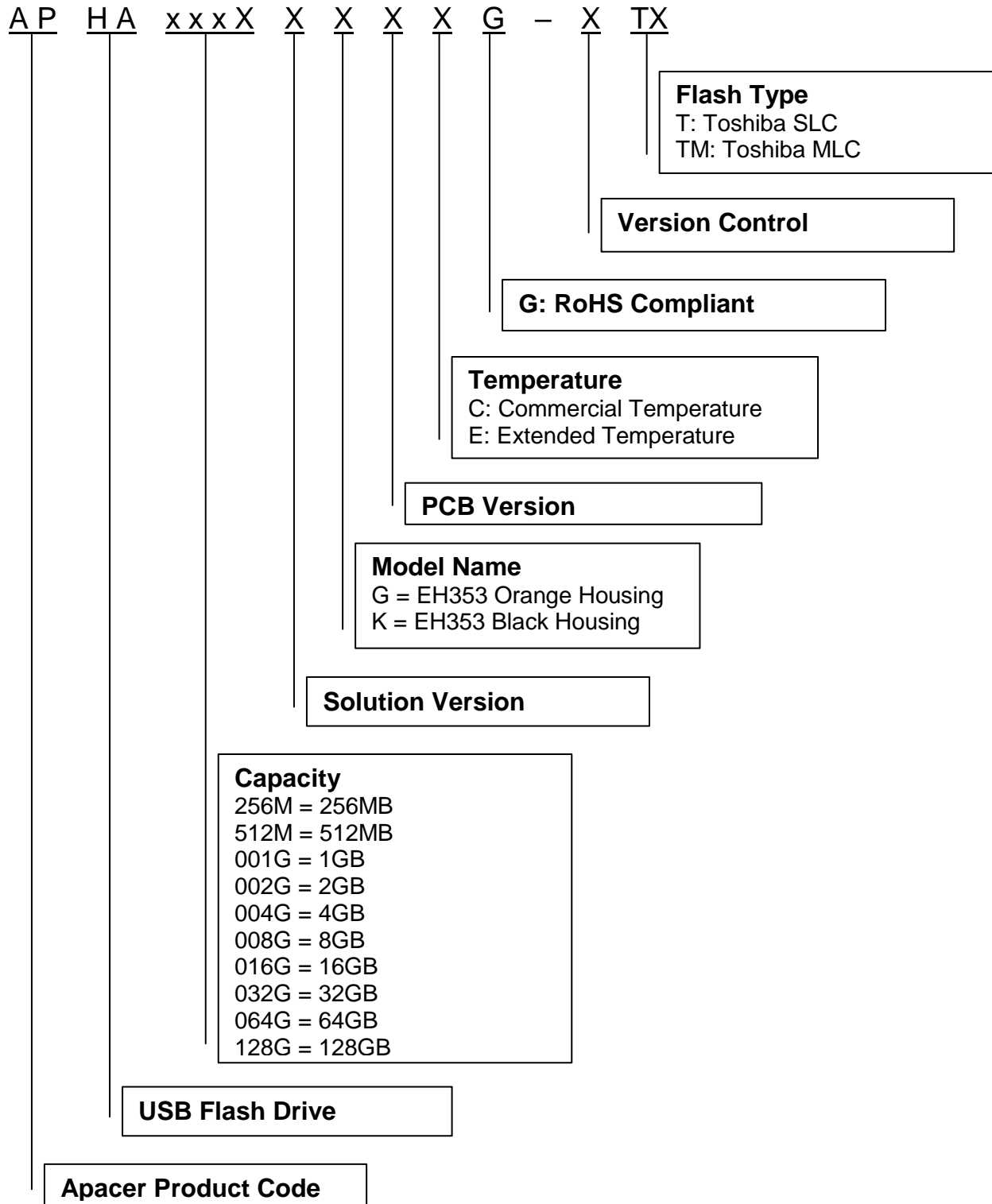
### 4. Physical Dimensions



Unit: mm

## 5. Product Ordering Information

### 5.1 Product Code Designations



## 5.2 Valid Combinations

### 5.2.1 EH353 (SLC)

- **Orange Housing**

Capacity	Standard Temp.	Extended Temp.
256MB	APHA256MAG0CG-2T	APHA256MAG0EG-2T
512MB	APHA512MAG0CG-2T	APHA512MAG0EG-2T
1GB	APHA001GAG0CG-2T	APHA001GAG0EG-2T
2GB	APHA002GAG0CG-2T	APHA002GAG0EG-2T
4GB	APHA004GAG0CG-2T	APHA004GAG0EG-2T
8GB	APHA008GAG0CG-2T	APHA008GAG0EG-2T
16GB	APHA016GAG0CG-2T	APHA016GAG0EG-2T
32GB	APHA032GAG0CG-2T	APHA032GAG0EG-2T

- **Black Housing**

Capacity	Standard Temp.	Extended Temp.
256MB	APHA256MAK0CG-2T	APHA256MAK0EG-2T
512MB	APHA512MAK0CG-2T	APHA512MAK0EG-2T
1GB	APHA001GAK0CG-2T	APHA001GAK0EG-2T
2GB	APHA002GAK0CG-2T	APHA002GAK0EG-2T
4GB	APHA004GAK0CG-2T	APHA004GAK0EG-2T
8GB	APHA008GAK0CG-2T	APHA008GAK0EG-2T
16GB	APHA016GAK0CG-2T	APHA016GAK0EG-2T
32GB	APHA032GAK0CG-2T	APHA032GAK0EG-2T

### 5.2.2 EH353 (MLC)

- **Orange Housing**

Capacity	Standard Temp.	Extended Temp.
8GB	APHA008GAG0CG-3TM	APHA008GAG0EG-3TM
16GB	APHA016GAG0CG-3TM	APHA016GAG0EG-3TM
32GB	APHA032GAG0CG-3TM	APHA032GAG0EG-3TM
64GB	APHA064GAG0CG-3TM	APHA064GAG0EG-3TM
128GB	APHA128GAK0CG-3TM	APHA128GAG0EG-3TM*
		APHA128G4MCEG-3TM**

- **Black Housing**

Capacity	Standard Temp.	Extended Temp.
8GB	APHA008GAK0CG-3TM	APHA008GAK0EG-3TM
16GB	APHA016GAK0CG-3TM	APHA016GAK0EG-3TM
32GB	APHA032GAK0CG-3TM	APHA032GAK0EG-3TM
64GB	APHA064GAK0CG-3TM	APHA064GAK0EG-3TM
128GB	APHA128GAK0CG-3TM	APHA128GAK0EG-3TM*
		APHA128G4KCEG-3TM**

**Note:** The part number with one asterisk represents the SSD manufactured based on 512Gb x2 while that with two asterisks based on 1Tb x1.

## Revision History

Revision	Description	Date
1.0	Official release	07/24/2015
1.1	<ul style="list-style-type: none"> <li>● Modified performance and power consumption data for MLC models.</li> <li>● Updated valid combinations for SLC and MLC models.</li> </ul>	09/17/2015
1.2	Revised product ordering information.	10/14/2015
1.3	Revised mechanical specifications	12/21/2015
1.4	<ul style="list-style-type: none"> <li>● Added 128GB support</li> <li>● Added OS support and flash management implementations on Features page</li> </ul>	2/19/2016
1.5	Revised performance for MLC series (8GB-64GB)	2/26/2016
1.6	Revised read performance for MLC 16GB	3/31/2016
1.7	Added S.M.A.R.T. and Power Failure Management to Features	10/3/2016
1.8	Added environmental specifications	10/18/2016
1.9	<ul style="list-style-type: none"> <li>- Added extended temperature</li> <li>- Revised storage temperature</li> </ul>	12/13/2016
2.0	Added 64Gbx1 on 8G performance and power consumption for MLC	4/18/2017
2.1	Added 1Tbx1 on 128G performance and power consumption for MLC	7/11/2017
2.2	Updated product ordering information for 128GB	7/24/2017
2.3	Updated product ordering information for 128GB manufactured based on 512Gb x2	8/9/2017

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## Global Presence

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