RoHS Compliant

USB *Flash Drive*

EH353 Product Specifications (Toshiba 15nm)

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Version 1.6





Apacer
Access the best

Apacer Technology Inc.
1F, No.32, Zhongcheng Rd., Tucheng Dist., New Taipei City, Taiwan, R.O.C
Tel: +886-2-2267-8000 Fax: +886-2-2267-2261
www.apacer.com

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
  - Sustained read: up to 80 MB/s
  - Sustained write: up to 70 MB/s

  MLC
  - Sustained read: up to 205 MB/s
  - Sustained write: up to 95 MB/s
- **Flash Management**
  - Flash bad-block management
  - Built-in hardware ECC
  - Power saving implemented
  - Wear-leveling algorithms
- **Temperature Range**
  - Operating:
    Standard: 0°C to 70°C
    Extended: -40°C to 85°C
  - Storage: -40°C to 85°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

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.

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2. General Specifications

2.1 SLC

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

*Results may vary from flash configurations or host system settings.

2.2 MLC

Interface	Super-speed USB3.0 compliant; backward compatible with USB2.0 and USB1.1					
Performance*		**8GB**	**16GB**	**32GB**	**64GB**	**128GB**
	Read	205	190	190	185	190
	Write	20	55	45	95	95
Temperature	-40°C to 85°C					
Power consumption*		**8GB**	**16GB**	**32GB**	**64GB**	**128GB**
	Active	165	270	265	275	265
	Idle	75	85	80	80	55
MTBF	1,000,000 hours					

*Results may vary from flash configurations or host system settings.

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3. Absolute Maximum Rating

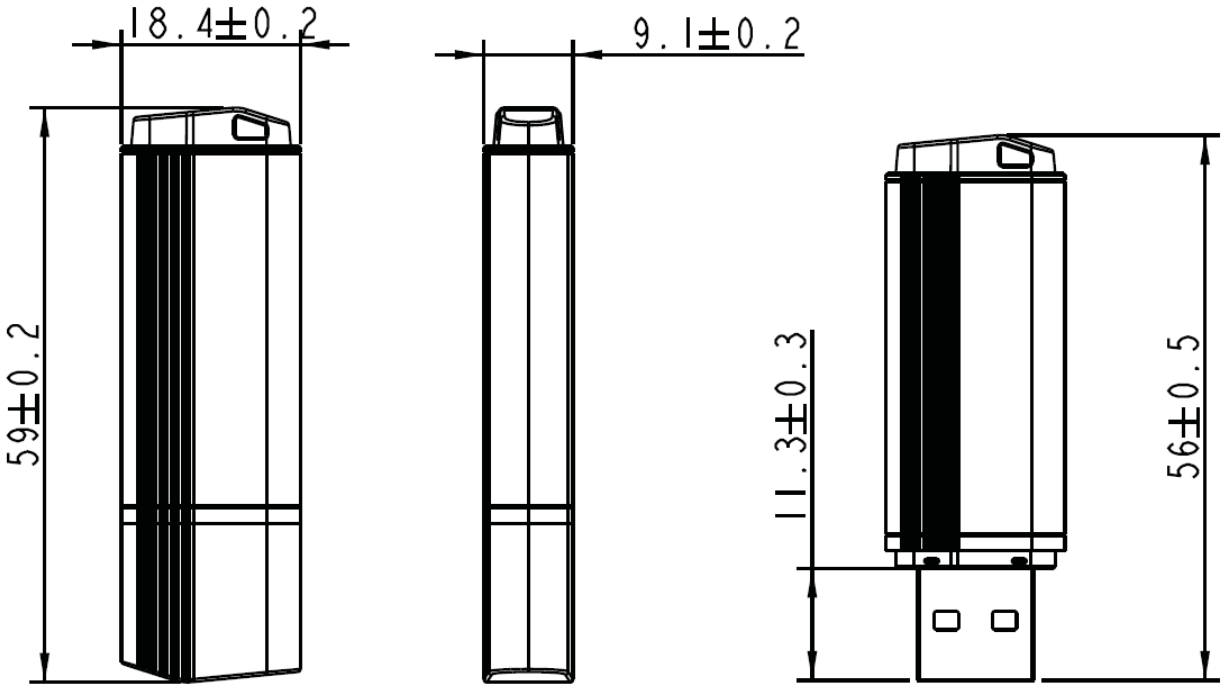
Caution: Absolute Maximum Stress Ratings – Applied conditions greater than those listed under "Absolute Maximum Stress Ratings" may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these conditions or conditions greater than those defined in 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℃ to 70℃ (Standard) -40°C to 85°C (Extended)
Storage temperature	-40℃ to 85℃

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4. Physical Dimensions

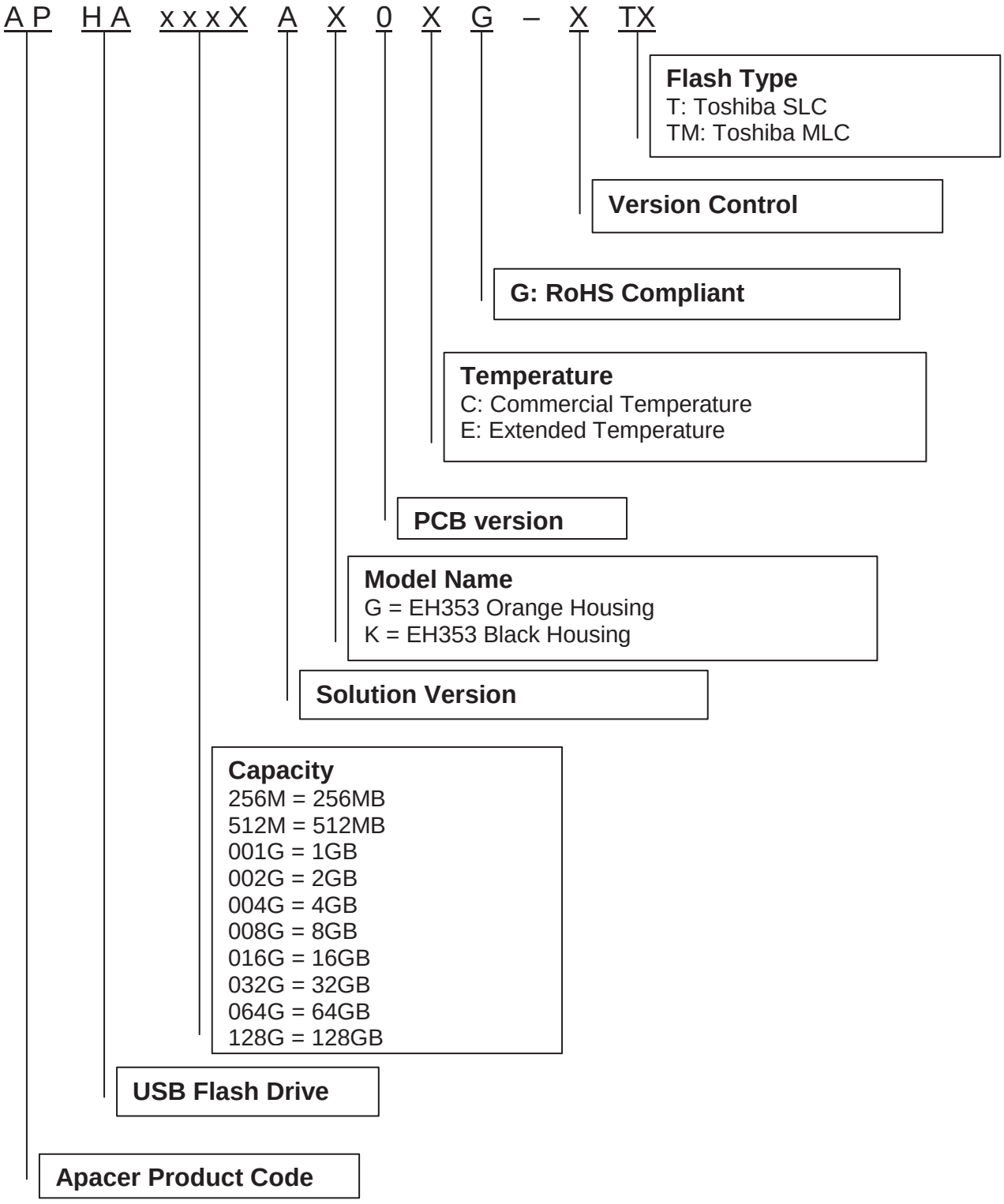


Unit: mm

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5. Product Ordering Information

5.1 Product Code Designations



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5.2 Valid Combinations

5.2.1 EH353 (SLC)

- **Orange Housing**

Capacity	Standard	Extended
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	Extended
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

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5.2.2 EH353 (MLC)

- **Orange Housing**

Capacity	Standard	Extended
8GB	APHA008GAG0CG-3TM	APHA008GAG0EG-3TM
16GB	APHA016GAG0CG-3TM	APHA016GAG0EG-3TM
32GB	APHA032GAG0CG-3TM	APHA032GAG0EG-3TM
64GB	APHA064GAG0CG-3TM	APHA064GAG0EG-3TM
128GB	APHA128GAG0CG-3TM	APHA128GAG0EG-3TM

- **Black Housing**

Capacity	Standard	Extended
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

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Revision History

Revision	Description	Date
1.0	Official release	07/24/2015
1.1	● Modified performance and power consumption data for MLC models. ● Updated valid combinations for SLC and MLC models.	09/17/2015
1.2	Revised product ordering information.	10/14/2015
1.3	Revised mechanical specifications	12/21/2015
1.4	● Added 128GB support ● Added OS support and flash management implementations on Features page	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

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Global Presence

Taiwan (Headquarters)

Apacer Technology Inc.
1F., No.32, Zhongcheng Rd., Tucheng Dist.,
New Taipei City 236, Taiwan R.O.C.
Tel: 886-2-2267-8000
Fax: 886-2-2267-2261
amtsales@apacer.com

U.S.A.

Apacer Memory America, Inc.
46732 Lakeview Blvd., Fremont, CA 94538
Tel: 1-408-518-8699
Fax: 1-510-249-9568
sa@apacerus.com

Japan

Apacer Technology Corp.
5F, Matsura Bldg., Shiba, Minato-Ku
Tokyo, 105-0014, Japan
Tel: 81-3-5419-2668
Fax: 81-3-5419-0018
jpservices@apacer.com

Europe

Apacer Technology B.V.
Science Park Eindhoven 5051 5692 EB Son,
The Netherlands
Tel: 31-40-267-0000
Fax: 31-40-267-0000#6199
sales@apacer.nl

China

Apacer Electronic (Shanghai) Co., Ltd
Room D, 22/FL, No.2, Lane 600, JieyunPlaza,
Tianshan RD, Shanghai, 200051, China
Tel: 86-21-6228-9939
Fax: 86-21-6228-9936
sales@apacer.com.cn

India

Apacer Technologies Pvt Ltd,
Unit No.201, “Brigade Corner”, 7th Block Jayanagar,
Yediyur Circle, Bangalore – 560082, India
Tel: 91-80-4152-9061
Fax: 91-80-4170-0215
sales_india@apacer.com

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