

RoHS Recast Compliant

USB Turbo Charge

UV210-UFD3 Product Specifications



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Version 1.2



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Specifications Overview:

- **USB 3.1 Gen1 Super Speed compatible, and backward compatible with USB 2.0 & USB 1.1 interfaces**
 - USB 3.1 Gen1 max. transfer rate: 5 Gb/s
 - Backward compatible with 480Mb/s for USB 2.0 & 12 Mb/s for USB 1.1
- **Capacity**
 - 128, 256 GB
- **Performance***
 - Sequential read: Up to 435 MB/sec
 - Sequential write: Up to 250 MB/sec
 - Random read (4K): Up to 27,000 IOPS
 - Random write (4K): Up to 6,800 IOPS
- **Flash Management**
 - Built-in hardware Low Density Parity-Check (LDPC) ECC
 - Global Wear Leveling
 - Flash bad-block management
 - Flash Translation Layer: Page Mapping
 - S.M.A.R.T.
 - Power Saving Implemented
- **Supports Non-Removable Setting**
- **NAND Flash Type: UFS**
- **MTBF: >3,000,000 hours**
- **Endurance (in Terabytes Written: TBW)**
 - 128 GB: 255 TBW
 - 256 GB: 483 TBW
- **Temperature Range**
 - Operating: 0°C to 70°C
 - Storage: -55°C to 100°C
- **Power Consumption***
 - Operating voltage: 5V
 - Active mode: 275 mA
 - Idle mode: 130 mA
- **OS Support**
 - Windows: 10 later
 - Linux: 2.4.0/2.4.10 or later
- **Dimensions**
 - 52.7 x 17.03 x 8.21, unit: mm
- **RoHS Recast Compliant**
 - Complies with 2011/65/EU Standard

*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 UV210-UFD3 is a turbocharged USB designed with the latest USB 3.1 Gen1 as the hardware transmission interface and embedded high-speed multi-channel UFS interface as a storage. With exquisite size and robust metal housing, UV210-UFD3 prevents mechanical interference and enhances environment and ESD protection.

Turbocharged USB supports UFS 2.1 and UHS-I, and UFS transmission protocol is designed with low power and high transmission and solves the transmission bottleneck of the storage component. The overall performance is twice that of a typical USB storage disk, and the transfer rate is more than 435MB/sec. The number of readings per second is around 27,000 IOPS, and the random write speed is 30 times faster than the general USB.

Reliability wise, UV210-UFD3 is implemented with LDPC (Low Density Parity Check) ECC engine to extend SSD endurance and increase data reliability. In addition, the drive comes with various implementations including powerful hardware ECC engine, wear leveling, flash block management, S.M.A.R.T., page mapping etc. This product is well suited for portable flash storage applications while operating at minimal power consumption.

2. Functional Block

UV210-UFD3 contains a controller, embedded firmware, and Flash Media with a female connector. It interfaces with the host system allowing data to be written to and read from the Flash Media.

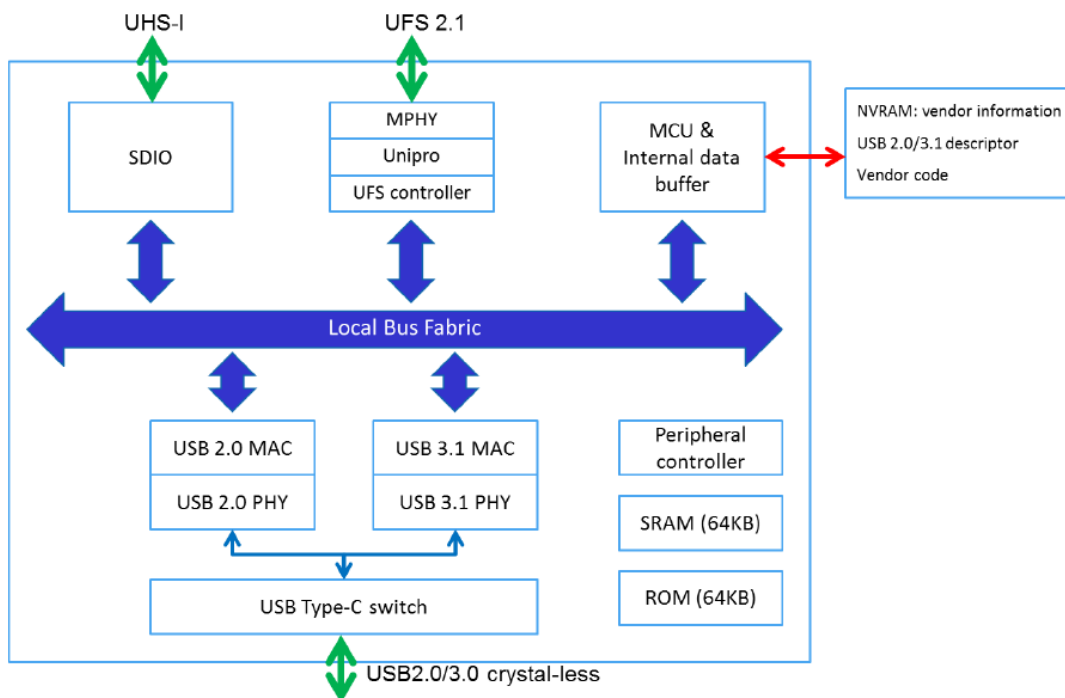


Figure 2-1 Functional Block Diagram

3. Product Specifications

3.1 Capacity

Capacity specifications of UV210-UFD3 are available as shown in Table 3-1.

Table 3-1 Capacity Specifications

Capacity	Total bytes*	Total LBA
128 GB	127,984,992,256	249,970,688
256 GB	255,944,818,688	499,892,224

*Display of total bytes varies from file systems, which means not all of the bytes can be used for storage.

**Notes: 1 GB = 1,000,000,000 bytes; 1 sector = 512 bytes.

LBA count addressed in the table above indicates total user storage capacity and will remain the same throughout the lifespan of the device. However, the total usable capacity of the SSD is most likely to be less than the total physical capacity because a small portion of the capacity is reserved for device maintenance usages.

3.2 Performance

Performance of UV210-UFD3 is listed below in Table 3-2.

Table 3-2 Performance Specifications

Performance	Capacity	128 GB	256 GB
	Sequential Read* (MB/s)		435
Sequential Write* (MB/s)		195	250
Random Read IOPS** (4K)		25,000	27,000
Random Write IOPS** (4K)		6,100	6,800

Note:

Results may differ from various flash configurations or host system setting, and the above test results are based on the default file structure with FAT 32 file system.

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

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

3.3 Environmental Specifications

Environmental specifications of UV210-UFD3 product are shown in Table 3-3.

Table 3-3 Environmental Specifications

Item	Specifications
Operating temp.	0°C to 70°C
Non-operating temp.	-55°C to 100°C
Operating vibration	7.69 GRMS, 20~2000 Hz/random (compliant with MIL-STD-810G)
Non-operating vibration	4.02 GRMS, 15~2000 Hz/sine (compliant with MIL-STD-810G)
Operating shock	50G, 11ms/half sine (compliant with MIL-STD-202G)
Non-operating shock	1500G, 0.5ms/half sine (compliant with MIL-STD-883K)

3.4 Mean Time Between Failures (MTBF)

Mean Time Between Failures (MTBF) is predicted based on reliability data for the individual components in Apacer’s USB flash drive. Serving as statistical reference, the prediction result for Apacer’s UV210-UFD3 is more than 3,000,000 hours.

Note: The MTBF is predicated and calculated based on “Telcordia Technologies Special Report, SR-332, Issue 3” method.

3.5 Certification and Compliance

UV210-UFD3 complies with the following standards:

- CE
- FCC
- RoHS Recast Compliant
- MIL-STD-810

3.6 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 3-4 Endurance Specifications

Capacity	TeraBytes Written
128 GB	255
256 GB	483

Note:

- This estimation values are based on sequential write behavior.
(Apacer EDTestTool, test mode – sequential data pattern - 100.00% of disk space with 128K)
- Flash vendor guaranteed 3D NAND TLC P/E cycle: 3K
- WAF may vary from capacity, flash configurations and writing behavior on each platform.
- 1 Terabyte = 1,024GB

4. Flash Management

4.1 Performance-optimized USB Controller

The heart of UV210-UFD3 is the USB controller, which translates standard USB signals into the data and controls of the flash media. This proprietary USB controller is specifically designed to attain high data throughput from host to flash.

4.2 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.

4.3 Error Correction/Detection (ECC)

UV210-UFD3 implements a hardware ECC scheme, based on the Low Density Parity Check (LDPC). LDPC is a class of linear block error correcting code which has apparent coding gain over BCH code because LDPC code includes both hard decoding and soft decoding algorithms. With the error rate decreasing, LDPC can extend SSD endurance and increase data reliability while reading raw data inside a flash chip.

4.4 Global Wear Leveling

Flash memory can be erased a limited number of times, This number is called the erase cycle limit, or write endurance limit, The erase cycle limit applies to each individual erase block in the flash device.

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 UV210-UFD3 uses Global Wear Leveling algorithm. This algorithm ensures that consecutive writes of a specific sector are not written physically to the same page in the flash. This spreads flash media usage evenly across all pages, thereby maximizing flash lifetime.

The Global Wear Leveling mechanism provides write/erase cycles for reliable data storage over an extended period.

4.5 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.

4.6 Bad 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. Since bad blocks are inevitable, the solution is to keep them in control. Apacer flash devices are programmed with ECC, page mapping technique and S.M.A.R.T 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.

4.7 Flash Translation Layer – Page Mapping

Page mapping is an advanced flash management technology whose essence lies in the ability to gather data, distribute the data into flash pages automatically, and then schedule the data to be evenly written. Page-level mapping uses one page as the unit of mapping. The most important characteristic is that each logical page can be mapped to any physical page on the flash memory device. This mapping algorithm allows different sizes of data to be written to a block as if the data is written to a data pool and it does not need to take extra operations to process a write command. Thus, page mapping is adopted to increase random access speed and improve SSD lifespan, reduce block erase frequency, and achieve optimized performance and lifespan.

5. Electrical Specifications

5.1 Absolute Stress Rating

Table 5-1 lists the absolute stress rating for UV210-UFD3.

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 5-1 Absolute Stress Rating

Item	Range
Required power supply	4.5-5.5V
Operating temperature	0°C to 70°C
Storage temperature	-55°C to 100°C

5.2 Absolute Maximum Rating

Table 5-2 lists the absolute maximum power ratings for UV210-UFD3.

Table 5-2 Absolute Maximum Power Ratings

Parameter	Symbol	Condition	Min	Max	Unit
Digital 3.3V	VCC33 _(ABS)		-0.5	VCC33+0.5	V
Digital 1.8V	VCC18 _(ABS)		-0.5	VCC18+0.5	V
Digital 1.2V	VCCK _(ABS)		-0.5	VCCK+0.5	V
Switching regulator 18	AVDDREG18 _(ABS)		-0.5	AVDDREG18+0.5	V
Switching regulator 12	AVDDREG12 _(ABS)		-0.5	AVDDREG12+0.5	V
Analog 1.2V	AVDDL _(ABS)		-0.5	AVDDL+0.5	V
Analog 3.3V	AVDD33 _(ABS)		-0.5	AVDDL+0.5	V
Digital I/O Input voltage	VI(D)		-0.5	VCC33+0.5	V
USB V _{BUS}	V _{BUS}			V _{BUS} +0.5	V
Storage temperature	T _{STORAGE}		-40	150	°C

5.3 Power Consumption

Table 5-3 lists the power consumption for UV210-UFD3.

Table 5-3 Power Consumption

Mode \ Capacity	128 GB	256 GB
Active (mA)	235	275
Idle (mA)	130	130

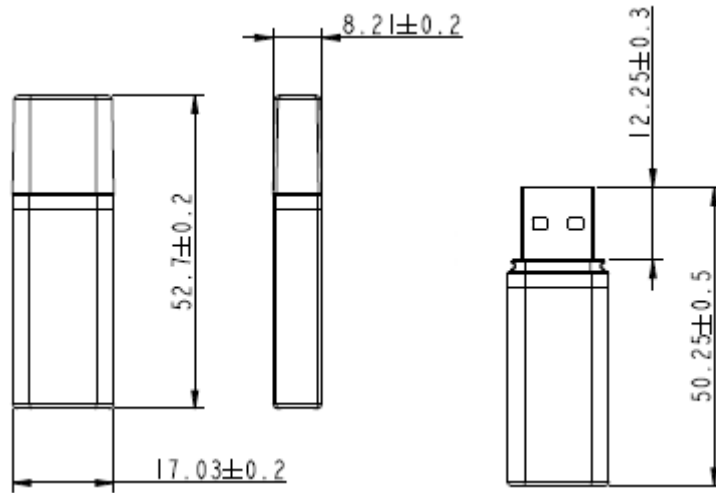
Note:

*All values are typical and may vary depending on flash configurations or host system settings.

**Active power is an average power measurement performed using CrystalDiskMark with 128KB sequential read/write transfers.

6. Physical Characteristics

Length	Width	Height
52.7mm	17.03mm	8.21mm



7. Product Ordering Information

7.1 Product Code Designations

Code	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	A	N	2	.	2	1	2	X	G	N	.	0	0	2	0	1

Code 1-3 (Product Line & form factor)	USB+UFD3
Code 5-6 (Model/Solution)	21: JM901
Code 7-8 (Product Capacity)	2H: 128GB 2J: 256GB
Code 9 (Flash Type & Product Temp)	G: 3D TLC Standard temperature
Code 10 (Product Spec)	N: UV210-UFD3 silver-gray housing
Code 12-14 (Version Number)	Random numbers generated by system
Code 15-16 (Firmware Version)	01: UFJA000A

7.2 Valid Combinations

Capacity	Part Number
128GB	AN2.212HGN.00201
256GB	AN2.212JGN.00201

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	7/21/2020
1.1	Modified the wrong model name at 4.4 Global Wear Leveling	8/27/2020
1.2	Updated storage temperature from 0°C to 70°C to -55°C to 100°C	9/14/2020

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