USB 3.2 GEN 1 Disk Module Specification

(U1)

Version 0.1

Table of Contents

Revision History

Revision	History	Draft Date
0.1	First Release	2020/10/13

A. General Description

The SQF-UPD is a super speed USB 3.2 GEN 1 removable flash disk drive with USB 3.2 GEN 1 connection (backward compatible with USB 2.0/1.1) and supports various storage capacities..

SQF-UPD is compatible with all USB specification (USB 1.1 / USB 2.0 / USB 3.2 GEN 1). It is a plug and play device, simply plug it into any USB port and it will automatically get detected by the computer. Now you can read, write, copy, delete and move data from your hard disk drive to SQF-UPD or from SQF-UPD to your hard disk drive with the super speed of USB 3.2 GEN 1.

SQF-UPD is so compact that you can take it with you anywhere in your pocket. With the high capacity of the SQF-UPD, you can use it as an external removable hard drive. Now, you don't have to carry a laptop computer with you to work if you have access to a computer. "Bring your data only." Moreover, SQF-UPD does not require any battery, cables or software drivers. It is compatible with any desktop or notebook computers with USB port. Experience the light weighted, compact design, super performance and fast data transfer with SQF-UPD.

B. System Features

- **Compatible with USB specification revision 3.2 gen 1 and backward compatible with USB 2.0 & USB 1.1**
- **Support Windows Vista and Windows XP without device driver.**
- **Support Windows 7, Windows 8 and Windows 10 without device driver.**
- **Support MAC OS X and later without device driver. (USB 1.1 speed)**
- **Support MAC OS 10.2.8 and later without device driver. (USB 2.0 speed)**
- **Support MAC OS 10.8 and later without device driver. (USB 3.2 GEN 1 speed)**
- **Support Linux Kernel ver 2.4.0 or above without device driver. (USB 1.1 speed)**
- **Support Linux Kernel ver 2.4.10 or above without device driver. (USB 2.0 speed)**
- **Toggle 2.0 / ONFI 3.0 NAND support**
- **LDPC ECC engine embedded**
- **High performance with small form factor PCBA.**
- **Low power consumption.**
- **Hot Plug & Play without driver installation.**
- **Powered by USB port, no external power is required.**
- **Transfer rate for USB interface :**
  - **Super speed up to 5Gbit/sec for USB 3.2 GEN 1**
  - **High speed up to 480Mbits/sec for USB 2.0**
  - **Full speed up to 12Mbits/sec for USB 1.1**
- **Operating temperature : 0℃ to 70℃**
- **Humidity : 20% to 90%**

C. General Description

■ Bad Block Management

Bad blocks are blocks that contain one or more invalid bits of which the reliability is not guaranteed. Bad blocks may be representing when flash is shipped and may developed during life time of the device.

Advantech SQFlash UDM implement an efficient bad block management algorithm to detect the factory produced bad blocks and manages any bad blocks that may develop over the life time of the device. This process is completely transparent to the user, user will not aware of the existence of the bad blocks during operation.

■ Wear Leveling

NAND Type flash have individually erasable blocks, each of which can be put through a finite number of erase cycles before becoming unreliable. It means after certain cycles for any given block, errors can be occurred in a much higher rate compared with typical situation. Unfortunately, in the most of cases, the flash media will not been used evenly. For certain area, like file system, the data gets updated much frequently than other area. Flash media will rapidly wear out in place without any rotation.

Wear leveling attempts to work around these limitations by arranging data so that erasures and re-writes are distributed evenly across the full medium. In this way, no single sector prematurely fails due to a high concentration of program/erase cycles.

Advantech SQFlash UDM provides advanced wear leveling algorithm, which can efficiently spread out the flash usage through the whole flash media area. By implement both dynamic and static wear leveling algorithms, the life expectancy of the flash media can be improved significantly.

■ Error Detection / Correction

Advantech SQFlash UDM utilizes BCH ECC Algorithm which offers one of the most powerful ECC algorithms in the industry. Built-in EDC/ECC up to 12 random bits error per 512 bytes.

■ Sophisticate Product Management Systems

Since industrial application require much more reliable devices compare with consumer product, a more sophisticated product management system become necessary for industrial customer requirement. The key to providing reliable devices is product traceability and failure analysis system. By implement such systems end customer can expect much more reliable product.

D. System Power Consumption

Item	Power Consumption (mA)
Normal	68.3
Suspend	0.9
Read	192.1
Write	187.9

The above values are for reference only; it may change according to the flash memory used.

E. Performance

	Capacity	Performance (CrystalDisk Mark)	
		Read (MB/s)	Write (MB/s)
3D TLC	32 GB	220.0	30.0
	64 GB	220.0	80.0
	128 GB	220.0	100.0
	256 GB	220.0	100.0

F. TBW (Terabytes Written)

	Capacity	TBW (Bases on Sequential data pattern)
3D TLC	32 GB	48
	64 GB	96
	128 GB	192
	256 GB	219

G. Electrical Specifications

Absolute Maximum Rating

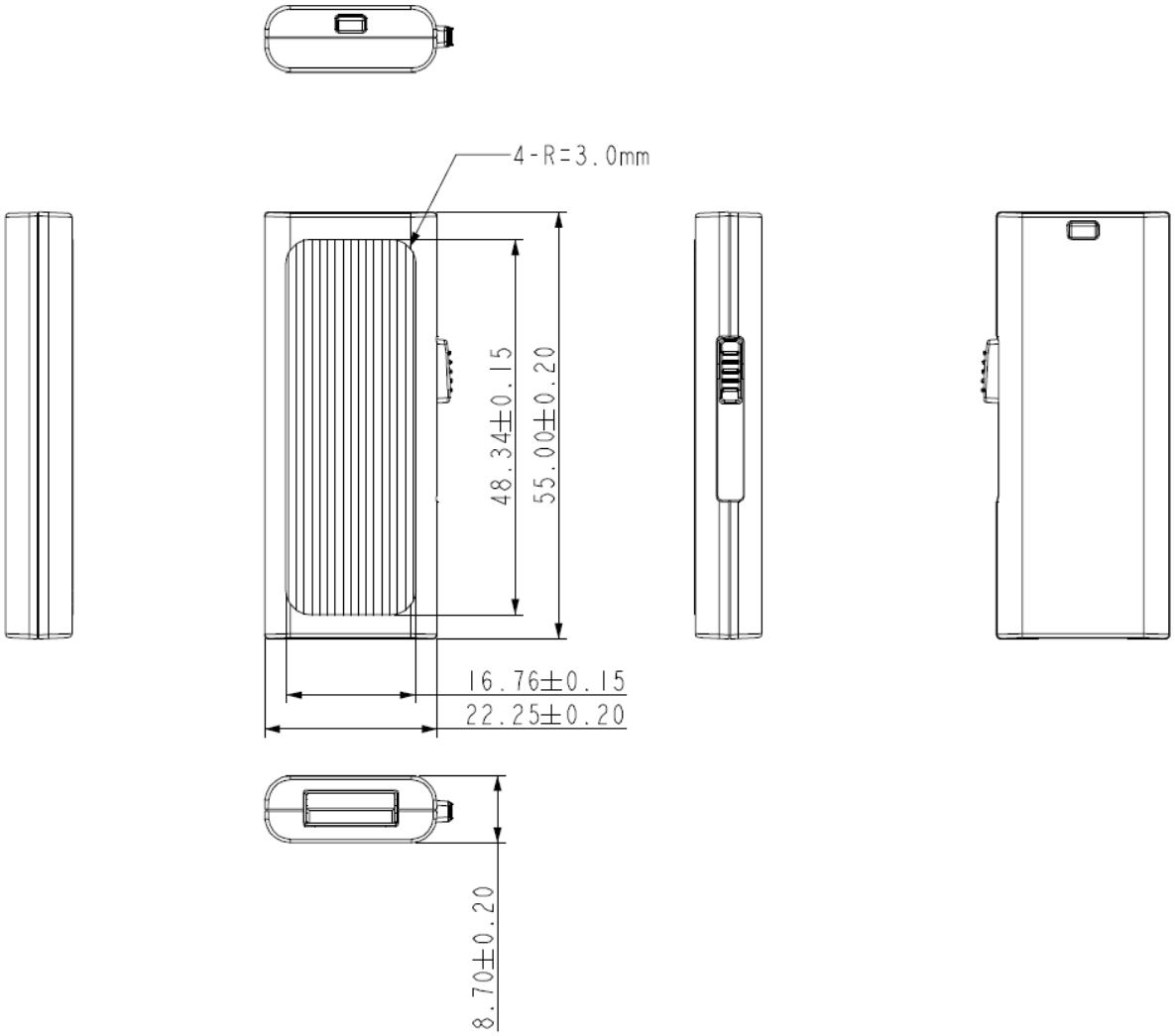
Parameter	Min	Typ	MAX	Unit
Operating Temperature (Commercial)	0	+25	+70	℃
Storage Temperature (Commercial)	-25	+25	+85	℃
Operating Temperature (Industrial)	-40	+25	+85	℃
Storage Temperature (Industrial)	-50	+25	+125	℃
1.1V regulator power supply	1.04	1.12	1.20	V
1.8V regulator power supply	1.76	1.86	2.0	V
3.3V Regulator Power Supply	3.15	3.3	3.45	V
5.0V Regulator Power Supply	3.0	5.0	5.5	V
2.5V regulator power supply	2.35	2.5	2.7	V
1.2V regulator power supply	1.13	1.2	1.3	V

H. DC Characters

DC characteristics of I/O cells

Symbol	Parameter	Conditions	MIN	TYP	MAX	Unit
VCCK	Core Power Supply	Core Area	0.99	1.1	1.21	V
VCC3IO	Power Supply	1.8V I/O	1.62	1.8	1.98	V
		1.2V I/O	1.13	1.2	1.3	V
		3.3V I/O	3.0	3.3	3.6	V
		2.5V I/O	2.35	2.5	2.7	V
Temp	Junction Temperature	0	25	115	℃	Temp
V_{IL}	Schmitt Trigger	VCC3IO=3.3V	0.35 * VCC3IO			V
	CMOS Trigger		0.5 * VCC3IO			
	Differential		PAD_VREF			
V_{IH}	Schmitt Trigger		0.65 * VCC3IO			V
	CMOS Trigger		0.5 * VCC3IO			
	Differential		PAD_VREF			
V_{IL}	Schmitt Trigger	VCC3IO=1.8V	0.41 * VCC3IO			V
	CMOS Trigger		053 * VCC3IO			
	Differential		PAD_VREF			
V_{IH}	Schmitt Trigger		0.69 * VCC3IO			V
	CMOS Trigger		0.53 * VCC3IO			
	Differential		PAD_VREF			
V_{OL}	Output Low voltage	|Iol| = 2 ~ 16 mA			0.4	V
V_{OH}	Output High voltage	|Ioh| = 2 ~ 16 mA	VCC3IO-0.4			V
R_{pu}	Input Pull-Up Resistance	PU=high, PD=low		75		KΩ
R_{pd}	Input Pull-Down Resistance	PU=high, PD=low		75		KΩ
I_{in}	Input Leakage Current	Vin = VCC3I or 0			10	μA
I_{oz}	Tri-state Output Leakage Current		-10	±1	10	μA

I. Dimension (Unit: mm)



Appendix A: Product Part Number Table

Product	Advantech PN
SQF USB 3.2 GEN 1 PEN DRIVE 32G 3D TLC, (0~70°C)	SQF-UPDV1-32G-U1C
SQF USB 3.2 GEN 1 PEN DRIVE 64G 3D TLC, (0~70°C)	SQF-UPDV1-64G-U1C
SQF USB 3.2 GEN 1 PEN DRIVE 128G 3D TLC, (0~70°C)	SQF-UPDV1-128G-U1C
SQF USB 3.2 GEN 1 PEN DRIVE 256G 3D TLC, (0~70°C)	SQF-UPDV1-256G-U1C