USB 2.0 Disk Module Specification

(U8)

Version 0.3

Table of Contents

Revision History

Revision	History	Draft Date
0.1	First Release	2014.8.15
0.2	Update photo	2014.10.14
0.3	Update mechanical drawing	2014.11.12

A. General Description

The SQF-UPD is a **removable flash disk drive** with USB connection and can support various storage capacities.

SQF-UPD is compatible with both USB 1.1 and USB 2.0 specification which is a plug and play device, simply plug it into any USB port and it will automatically get detected by the computer as a removable drive. A dedicated write protect function is also supported for making repair drive for system or for other security purpose.

B. System Features

- **Compatible with USB specification revision 1.1 and 2.0.**
- **Capacity available: please check local vendor.**
- **Support Windows 2000 SP4 and later 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 3.0 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)**
- **Hot Plug & Play.**
- **Software write protect function supported**
- **No external power is required - DC 4.5V ~ 5.5V from USB port.**
- **Transfer rate for USB interface :**
  - High speed up to 480Mbits/sec for USB 2.0
  - Full speed up to 12Mbits/sec for USB 1.1
- **Low Power consumption.**
- **Acoustic noise：0 dB (at one meter)**
- **Vibration：15 G peak to peak max**
- **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	34.25
Stand-By	0.26
Sleep	0.27
Read	68.85
Write	90.93

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

E. Electrical Specifications

Absolute Maximum Rating

Item	Symbol	Parameter	MIN	MAX	Unit
1	V_{DD}-V_{SS}	DC Power Supply	-0.3	+5.5	V
2	V_{IN}	Input Voltage	V_{SS}-0.3	V_{DD}+0.3	V
3	Ta	Operating Temperature	0	+70	℃
4	Tst	Storage Temperature	-25	+85	℃

Parameter	Symbol	Min	Typ	MAX	Unit
Operating Temperature	T_a	0	+25	+70	℃
V_{DD} Voltage	V_{DD}	3.0	3.3	3.6	V
		4.5	5.0	5.5	V

F. DC Characters

DC characteristics of 3.3V I/O Cells

Symbol	Parameter	Conditions	MIN	TYP	MAX	Unit
VCCK	Core Power Supply	Core Area	1.16	1.23	1.30	V
VCC3IO	Power Supply	3.3V I/O	3.15	3.30	3.45	V
Temp	Junction Temperature		-40	25	125	℃
Vt	Switching threshold	LVTTL		1.5		V
Vt-	Schmitt Trigger Negative Going threshold voltage	LVTTL	0.8	1.1		V
Vt+	Schmitt Trigger Positive Going threshold voltage			1.6	2.0	V
Vol	Output Low voltage	|Iol| = 2 ~ 16 mA			0.4	V
Voh	Output High voltage	|Ioh| = 2 ~ 16 mA	VCC3IO- 0.4			V
Rpu	Input Pull-Up Resistance	PU=high, PD=low	40	75	190	KΩ
Rpd	Input Pull-Down Resistance	PU=low, PD=high	40	75	190	KΩ
Iin	Input Leakage Current	Vin = VCC3I or 0			10	μA
Ioz	Tri-state Output Leakage Current		-10	±1	10	μA

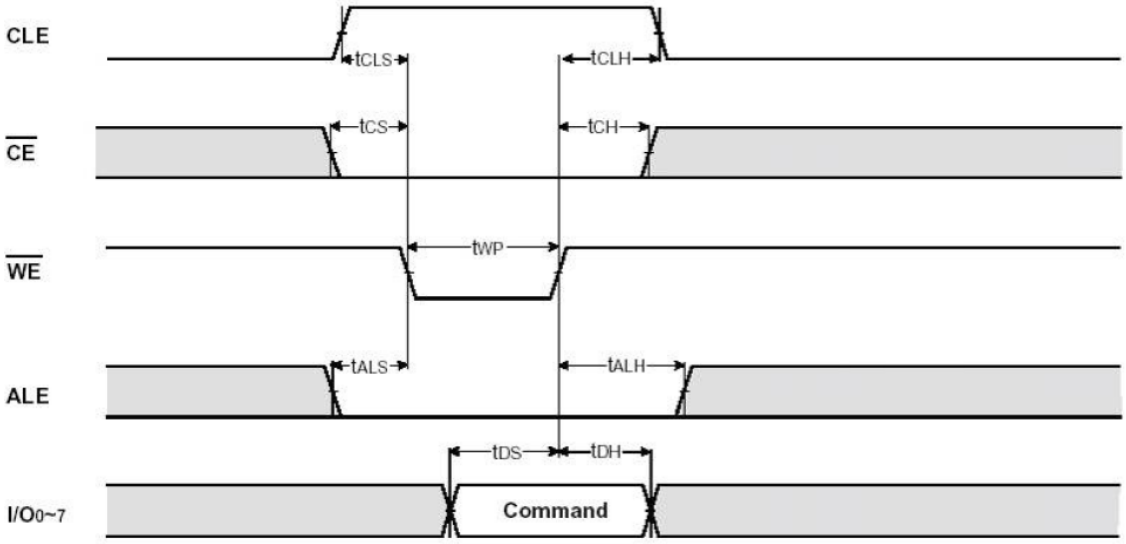
G. AC Characters

NAND Flash Memory Interface Timing

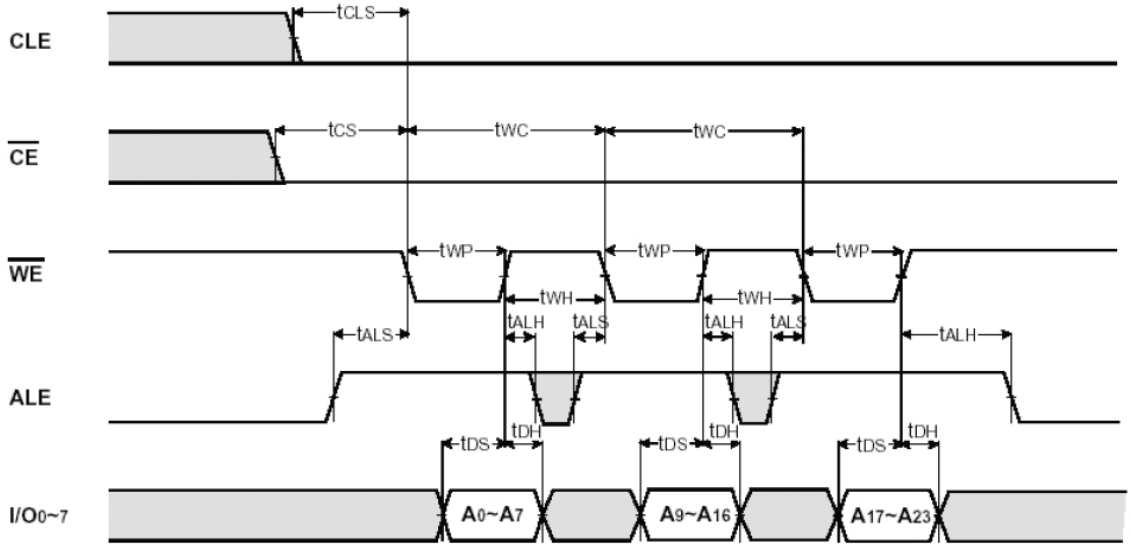
Below information are for reference and example use only. The actual timing, please refer to the related flash spec.

Parameter	Symbol	Min	Max	Unit
CLE Set-up Time	t_{CLS}	0	-	ns
CLE Hold Time	t_{CLH}	10	-	ns
CE Setup Time	t_{CS}	0	-	ns
CE Hold Time	t_{CH}	10	-	ns
WE Pulse Width	t_{WP}	25	-	ns
ALE Setup Time	t_{ALS}	0	-	ns
ALE Hold Time	t_{ALH}	10	-	ns
Data Setup Time	t_{DS}	20	-	ns
Data Hold Time	t_{DH}	10	-	ns
Write Cycle Time	t_{WC}	45	-	ns
WE High Hold Time	t_{WH}	15	-	ns
Read Cycle Time	t_{RC}	50	-	ns
/RE Pulse Width	t_{RP}	25	-	ns
/RE High Hold Time	t_{REH}	15	-	ns
Ready to /RE Low	t_{RR}	60	-	ns

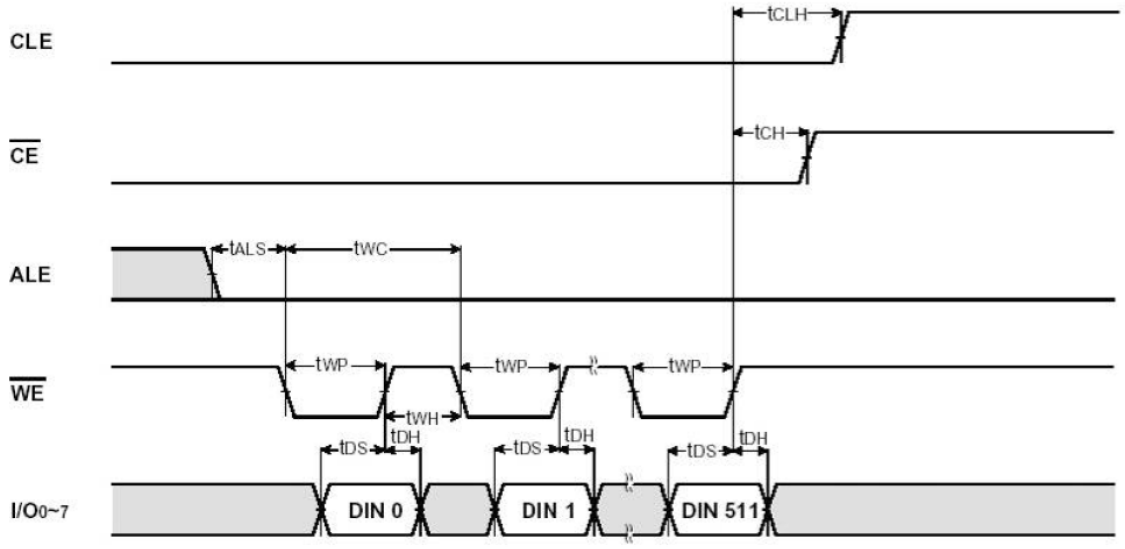
Command Latch Cycle



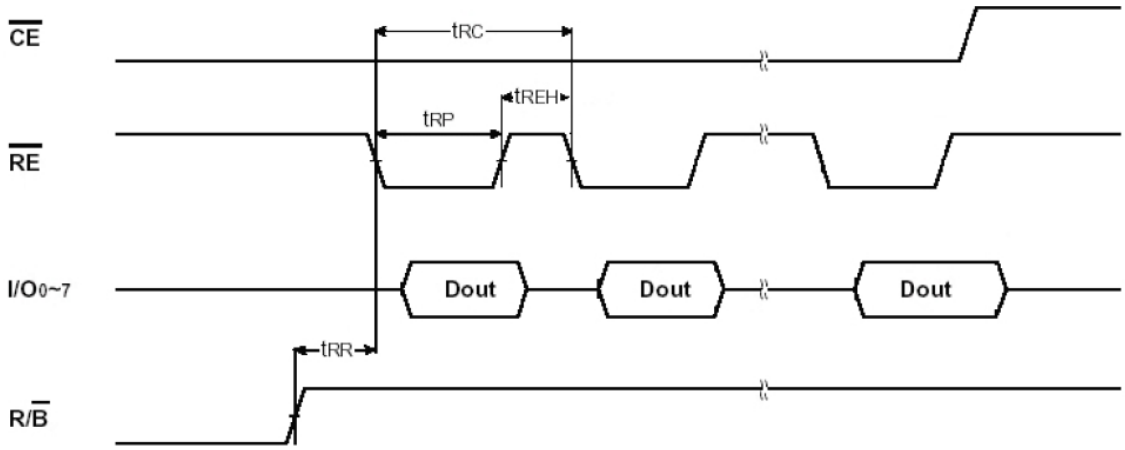
Address Latch Cycle Timing



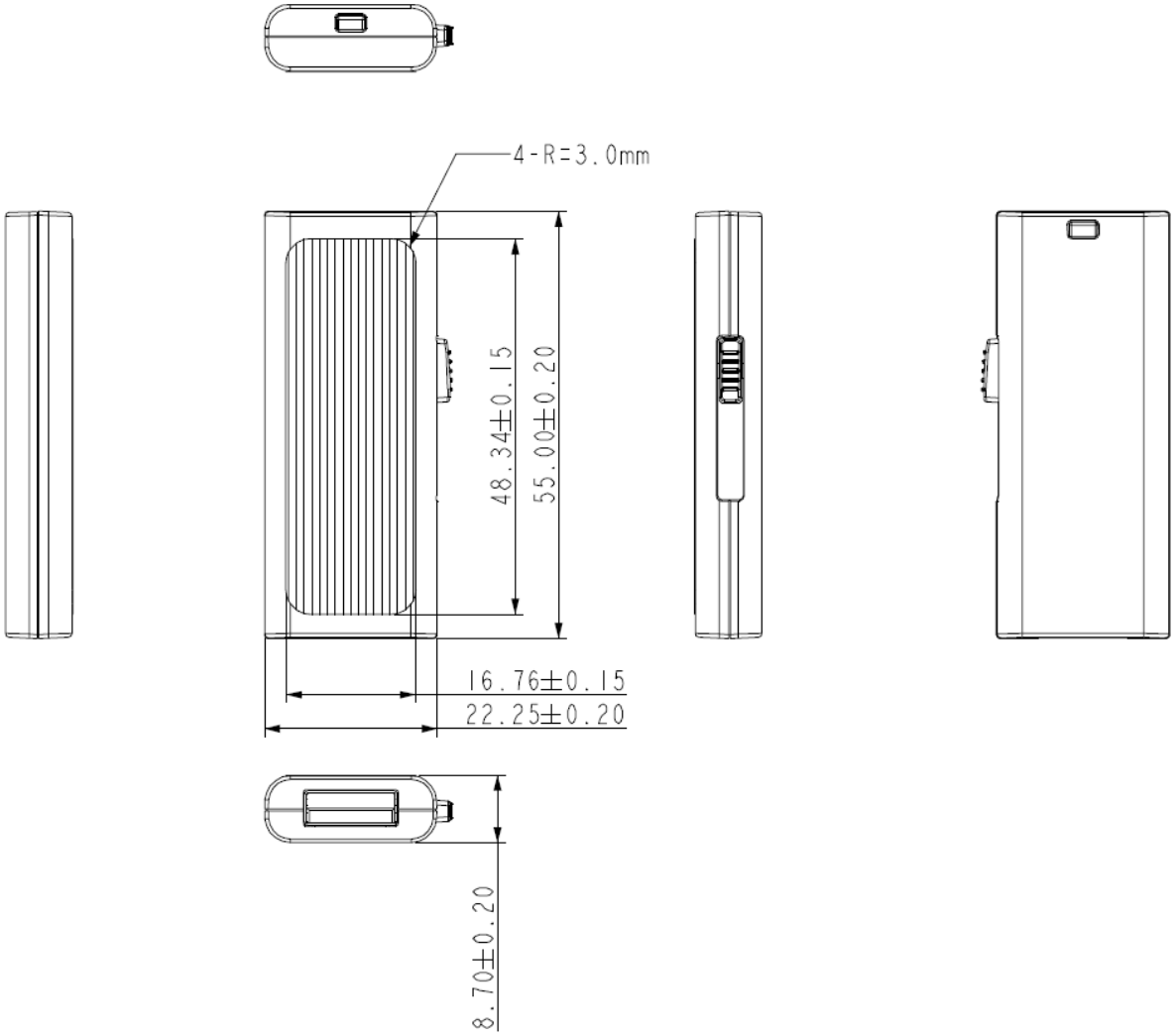
Input Data Latch Cycle



Sequential Out Cycle after Read (CLE=L, /WE=H, ALE=L)



H. Dimension (Unit: mm)



Appendix A: Product Part Number Table

MLC

Product	Advantech PN
SQF USB PEN DRIVE 4G MLC (0~70°C)	SQF-UPDM1-4G-U8C
SQF USB PEN DRIVE 8G MLC (0~70°C)	SQF-UPDM1-8G-U8C
SQF USB PEN DRIVE 16G MLC (0~70°C)	SQF-UPDM1-16G-U8C
SQF USB PEN DRIVE 32G MLC (0~70°C)	SQF-UPDM1-32G-U8C
SQF USB PEN DRIVE 64G MLC (0~70°C)	SQF-UPDM1-64G-U8C