UD info Corp.

Industrial USB FLASH DISK

UF2-UA Series

Product DataSheet

UD info CORP.

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Revision History

Revision	Draft Date	History	Author
1.0	2018/06/28	New release	Migo.Huang
1.1	2019/2/26	Modify Block Diagram	

Product Overview

- **Capacity**
  - SLC: 128MB up to 8GB
- **Flash Interface**
  - Flash Type: SLC
- **Performance**
  - Read: up to 30 MB/s
  - Write: up to 25 MB/s
- **Power Consumption**[Note1]
  - Read: 100mA
  - Write: 120mA
  - Idle mode: 30mA
  - Standby: 2.5mA
- **Advanced Flash Management**
  - Wear Leveling
  - Bad Block Management
  - ECC
- **Temperature Range**
  - Operation (Standard): 0°C ~ 70°C
  - Operation (Wide): -40°C ~ 85°C
  - Storage: -40°C ~ 85°C
- **Compliant**
  - RoHS
  - CE & FCC

Notes:

1. Please see Power Consumption" for details.

1. INTRODUCTION

1.1. General Description

The UF2 (USB 2.0 Flash Disk) supports USB 2.0 and 1.1 interfaces to the NAND flash memory. This USB Flash Disk is specially designed for motherboard and built-in to the PC/Notebook/IA system. By using this UF2 solution, it will reduce a lot of efforts which was needed from R/D to production,

1.2. Flash management

1.2.1. Error Correction Code (ECC)

Flash memory cells will deteriorate with use, which might generate random bit errors in the stored data. Thus, applies the BCH ECC algorithm, which can detect and correct errors occurred during read process, ensure data been read correctly, as well as protect data from corruption.

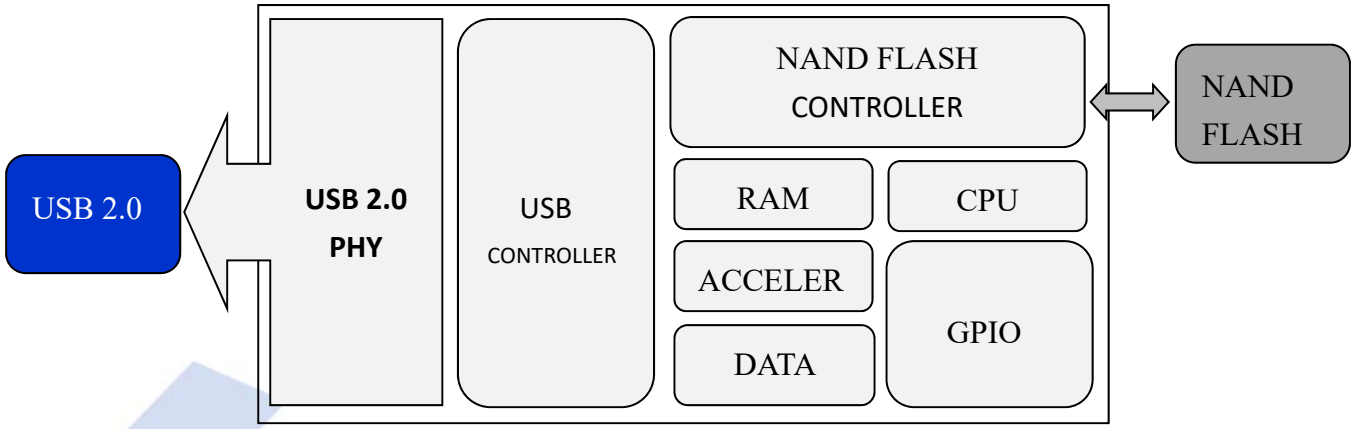
1.2.2. Wear Leveling

NAND flash devices can only undergo a limited number of program/erase cycles, and in most cases, the flash media are not sued evenly. If some area get updated more frequently than others, The lifetime of the device would be reduced significantly. Thus, wear leveling technique is applied to extend the lifespan of NAND flash by evenly distributing write and erase cycles across the media. UDinfo provides advanced wear leveling algorithm, which can efficiently spread out the flash usage through the whole flash media area. Moreover, by implementing both dynamic and static wear leveling algorithms, the life expectancy of the NAND flash is greatly improved.

1.2.3. Bad Block Management

Bad blocks are blocks that include one or more invalid bits, and their reliability is not guaranteed. Blocks that are identified and marked as bad by the manufacturer are referred to as “initial bad blocks”. Bad blocks that are developed during the lifespan of the flash are named “later bad blocks”. UDinfo implements an efficient bad block management algorithm to detect the factory-produced bad blocks and manages any bad blocks that appear with use. The practice further prevents data being stored into bad blocks and improves the data reliability.

1.2.4. Block Diagram



2. PRODUCT SPECIFICATIONS

- **Capacity**
  - SLC: 128MB up to 8GB
- **Compatible with USB specification revision 1.1 and 2.0.**
- **Support Windows 2000 SP4 and Windows XP without device driver.**
- **Support Windows Vista and Windows 7 without device driver.**
- **Support MAC OS X and later without device driver (USB 1.1 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).**
- **Durable solid-state storage – data retention up to ten years.**
- **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.**
- **Performance (MB/s):**

Capacity	Flash Structure	Sequential Read	Sequential Write
128MB	TSB TSOP SLC 24nm 1Gb*1	30 MB/s	5 MB/s
256MB	TSB TSOP SLC 24nm 2Gb*1	30 MB/s	10 MB/s

512MB	TSB TSOP SLC 24nm 4Gb*1	30 MB/s	20 MB/s
1GB	TSB TSOP SLC 24nm 8Gb*1	30 MB/s	20 MB/s
2GB	TSB TSOP SLC 24nm 16Gb*1	30 MB/s	20 MB/s
4GB	TSB TSOP SLC 24nm 32Gb*1	30 MB/s	25 MB/s
8GB	TSB TSOP SLC 24nm 64Gb*1	30 MB/s	27 MB/s

NOTES:

1. The performance is obtained from CrystalDiskMark.
2. Samples are made of Toshiba SLC NAND Flash.
3. Performance may vary from flash configuration, DDR configuration, and platform.
4. The table above is for your reference only. The criteria for MP (mass production) and for accepting goods shall be discussed based on different flash configuration.

3. ENVIRONMENTAL SPECIFICATIONS

3.1. Environmental Conditions

Temperature and Humidity

- Storage Temperature Range
  - -40°C ~ 85°C
- Operation Temperature Range
  - Standard: 0°C ~ 70°C
  - Wide: -40°C ~ 85°C
- Humidity:
  - Standard: RH 93% under 40°C (in operation)
  - Wide: RH 95% under 55°C (in operation)

	Temperature	Humidity	Test Time
Operation (Standard)	70°C	0% RH	72 hours
Storage (Standard)	85°C	0% RH	72 hours
Operation (Wide)	85°C	0% RH	72 hours
Storage (Wide)	85°C	0% RH	168 hours

Result: No any abnormality is detected.

	Temperature	Humidity	Test Time
Operation (Standard)	0°C	0% RH	72 hours
Storage (Standard)	-40°C	0% RH	72 hours
Operation (Wide)	-40°C	0% RH	72 hours
Storage (Wide)	-40°C	0% RH	168 hours

Result: No any abnormality is detected.

	Temperature	Humidity	Test Time
Operation (Standard)	40°C	93% RH	24 hours
Storage (Standard)	40°C	95% RH	72 hours
Operation (Wide)	55°C	95% RH	72 hours
Storage (Wide)	55°C	95% RH	96 hours

Result: No any abnormality is detected.

	Temperature	Test Time	Cycle
Operation (Standard)	0°C	30 min	10 Cycles
	70°C	30 min	
Storage (Standard)	-40°C	30 min	10 Cycles
	85°C	30 min	
Operation (Wide)	-40°C	30 min	20 Cycles
	85°C	30 min	
Storage (Wide)	-40°C	30 min	50 Cycles
	85°C	30 min	

Result: No any abnormality is detected.

Shock

	Acceleration Force	Half Sin Pulse Duration
Non-operational	1500G	0.5ms

Result: No any abnormality is detected when power on.

Vibration

	Condition		Vibration Orientation
	Frequency/Displacement	Frequency/Acceleration	
Non-operational	20Hz~80Hz/1.52mm	80Hz~2000Hz/20G	X, Y, Z axis/30 min for each

Result: No any abnormality is detected when power on.

Drop

	Height of Drop	Number of Drop
Non-operational	110cm free fall	6 face of each unit

Result: No any abnormality is detected when power on.

Bending

	Force	Action
Non-operational	≥ 10N	Hold 1min/5times

Result: No any abnormality is detected when power on.

Torque

	Force	Action
Non-operational	0.5N-m or 5 deg	Hold 5min/5times

Result: No any abnormality is detected when power on.

Electrostatic Discharge (ESD)

Device	Capacity	Temperature	Relative Humidity	+/- 8KV	Result
UF2-UA	1GB	24.0°C	49% (RH)	Device functions are affected, but EUT will be back to its normal or operational state automatically.	PASS

4. ELECTRICAL SPECIFICATIONS

4.1. Absolute Maximum Rating

Symbol	Parameter	MIN	MAX	Unit
V_{DD}, V_{SS}	DC Power Supply	-0.3	+5.5	V
V_{in}	Input Voltage	V_{SS} -0.3	V_{DD} +0.3	V
T_a	Operating Temperature	0	+70	℃
T_{st}	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

4.2. Power Consumption

Capacity	Flash Structure	Power Consumption (mA)			
		Read	Write	Idle	Standby
128MB	TSB TSOP SLC 24nm 1Gb*1	80	90	25	2.5
256MB	TSB TSOP SLC 24nm 2Gb*1	85	95	25	2.5
512MB	TSB TSOP SLC 24nm 4Gb*1	85	95	25	2.5
1GB	TSB TSOP SLC 24nm 8Gb*1	85	95	25	2.5
2GB	TSB TSOP SLC 24nm 16Gb*1	90	100	25	2.5
4GB	TSB TSOP SLC 24nm 32Gb*1	90	100	30	2.5
8GB	TSB TSOP SLC 24nm 64Gb*1	100	120	30	2.5

Unit: mA

NOTES:

1. Samples are made of Toshiba NAND Flash.
2. Power Consumption may vary from flash configuration, DDR configuration, or platform.

4.3. DC Characteristic

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

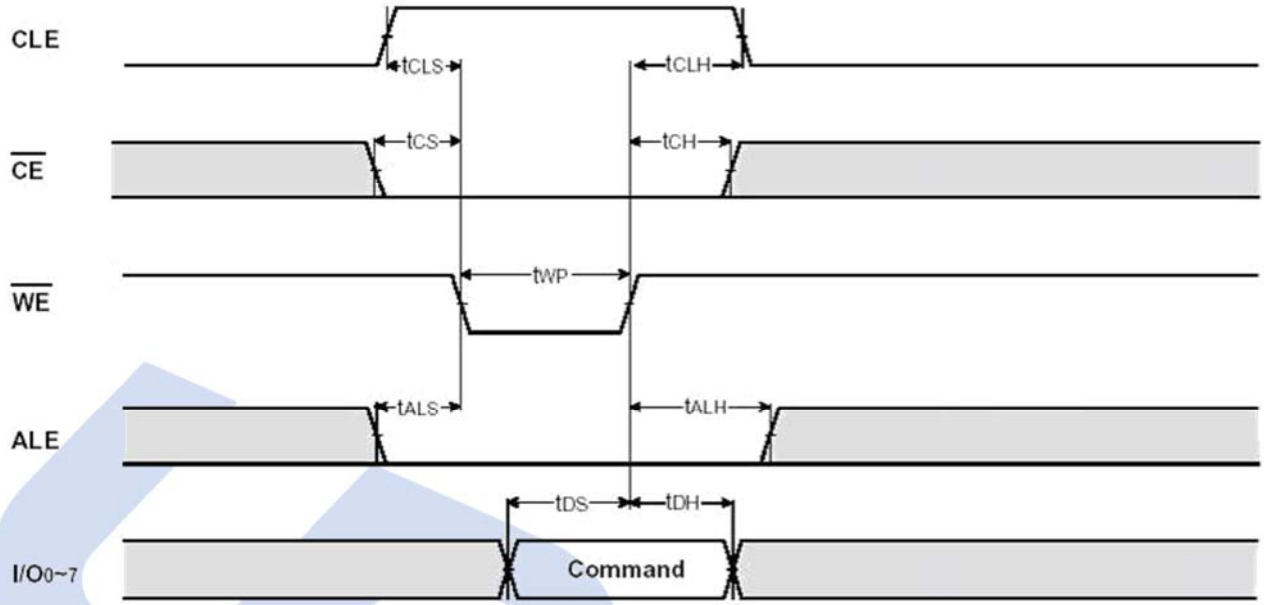
4.4. AC Characteristic

4.4.1. Flash Memory Interface Timing

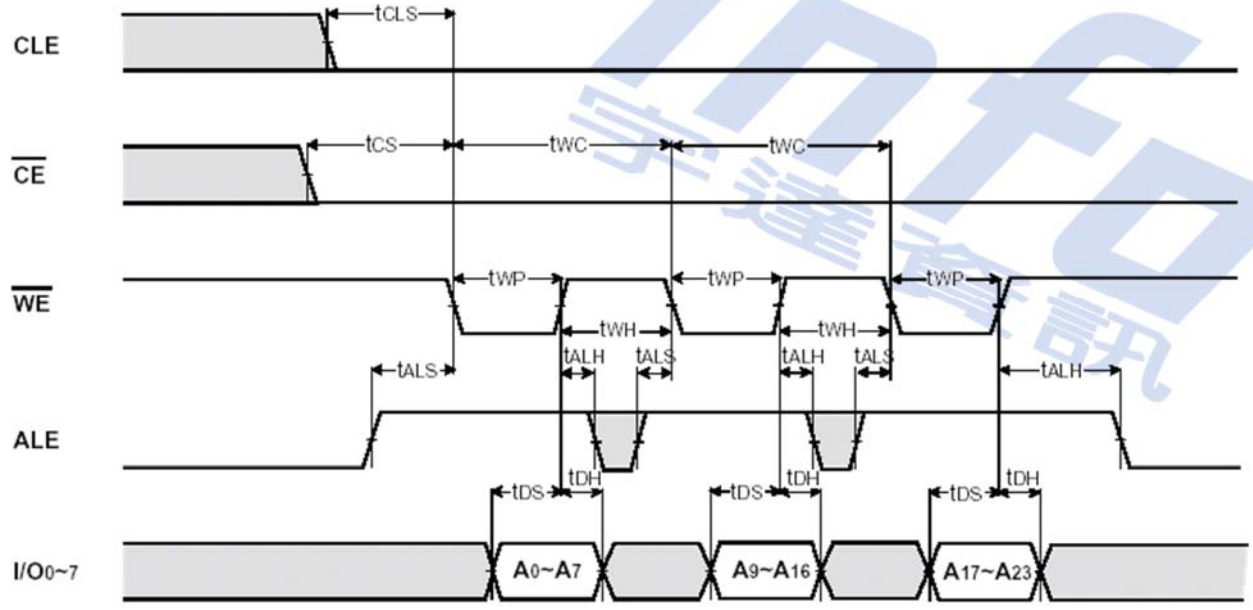
Below information are for reference and example use only. The actual timing, please refer to the related flash spec.

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

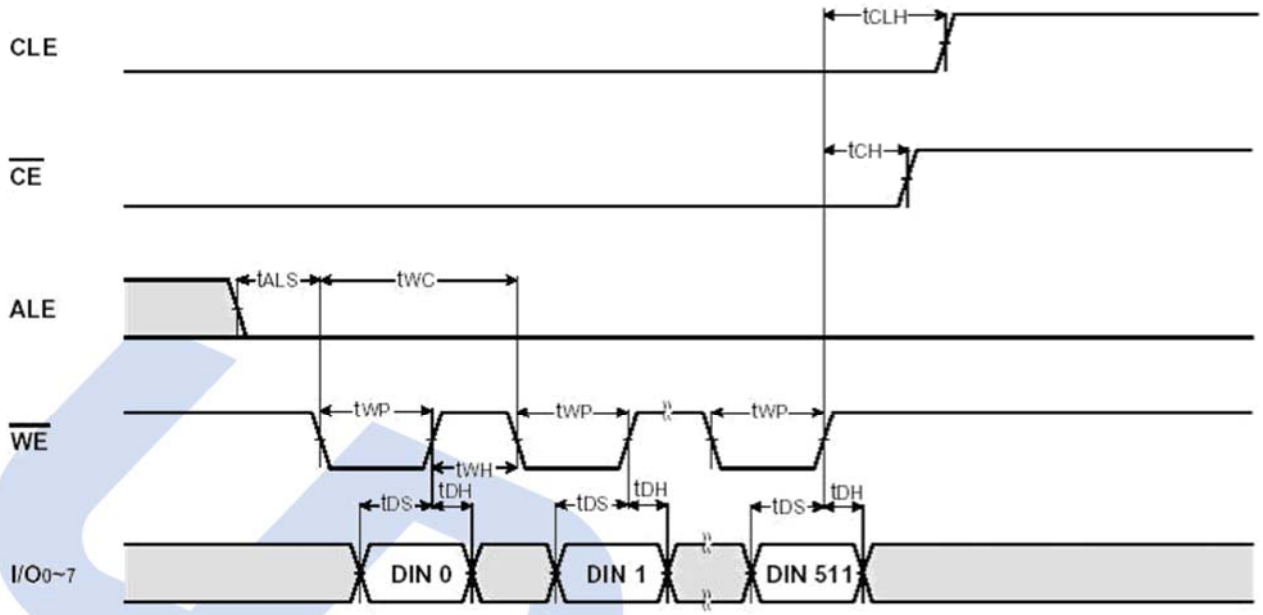
4.4.2. Command Latch Cycle



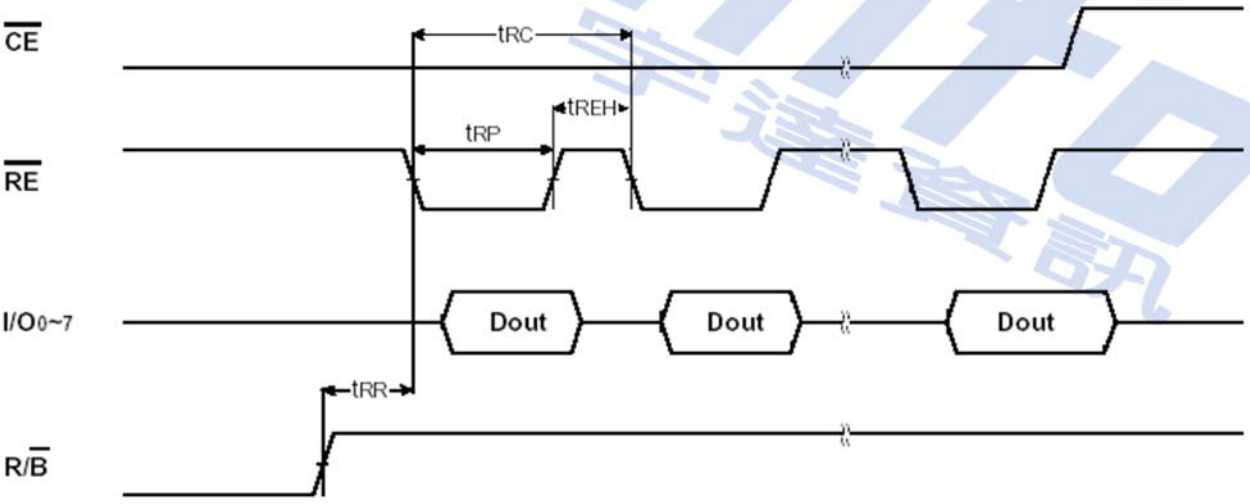
4.4.3. Address Latch Cycle



4.4.4. Input Data Latch Cycle

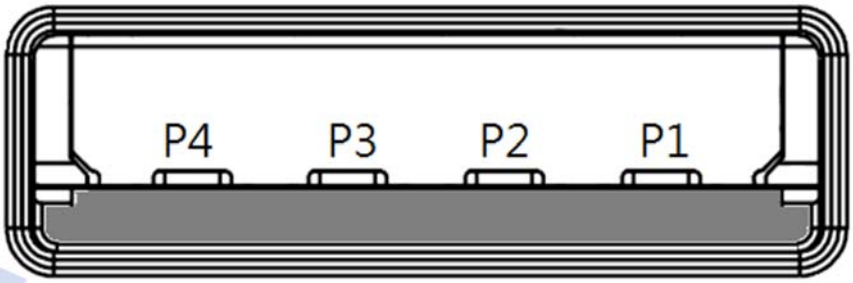


4.4.5. Sequential Out Cycle after Read (CLE=L, /WE=H, ALE=L)



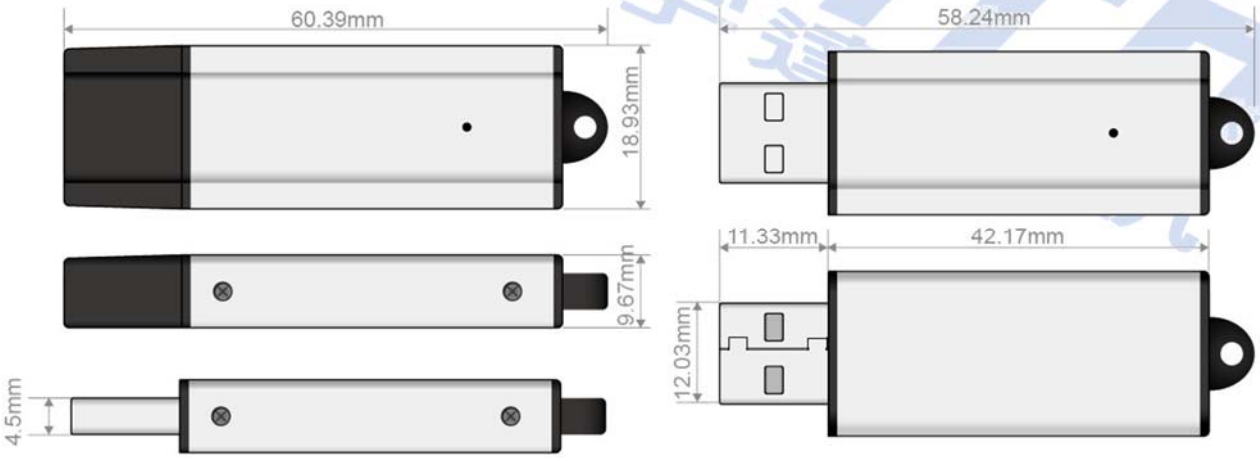
5. INTERFACE

5.1. Pin Assignment and Descriptions



Pin Number	Type	Function
P1	V_{BUS}	5.0V USB Bus Power Input
P2	D-	USB 2.0 data in negative pin terminal.
P3	D+	USB 2.0 data in positive pin terminal.
P4	GND	Ground

6. PHYSICAL DIMENSION



7. BARCODE DESCRIPTION

U F 2 - X X U A 0 0 1 G B - I R U

yymmdd

Part Number

Manufacturing

Data: YYMMDD

8. PARTNUMBER DECODER

UF2- X^4X^5UA$X^8X^9X^{10}X^{11}X^{12}$ X^{13} X^{14} X^{15}

$X^1X^2X^3$	X^4X^5	X^6X^7	X^8 X^9 X^{10} X^{11} X^{12}		X^{13}	X^{14}	X^{15}
UF2	AL	UA	128MB 256MB 512MB	001GB 002GB 004GB 008GB	C: SLC (0℃~+70℃) I: SLC (-40℃~+85℃)	F: Fixed R: Removable	U