UD info Corp.

Industrial USB FLASH DISK

UF3-UA Series

Product DataSheet

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Revision History

Revision	Draft Date	History	Author
1.0	2023/02/13	New release	Migo.Huang

Product Overview

- **Capacity**
  - SLC: 128MB to 64GB
  - MLC: 4GB to 512GB
  - pSLC: 2GB to 256GB
- **SATA Interface**
  - Super Speed up to 5Gbit/sec for USB 3.0
  - High speed up to 480Mbits/sec for USB 2.0
  - Full speed up to 12Mbits/sec for USB 1.1
- **Flash Interface**
  - Flash Type: SLC, MLC and pSLC
- **Performance**
  - SLC R/W up to 170 /120 MB/s
  - pSLC R/W up to 140 /95 MB/s
  - MLC R/W up to 190 /140 MB/s
- **Power Consumption**[Note1]
  - Read mode: 170 mA
  - Write mode: 160 mA
  - Standby mode: 2.5 (mA)
- **Advanced Flash Management**
  - Bad Block Management
  - SMART
  - ECC
  - Wear Leveling
- **Low Power Management**
- **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 UF3 Drive is a ***removable flash disk drive*** with USB connection and can support Various storage capacities.

UF3 Drive is compatible with both USB 1.1 /USB 2.0/USB 3.0 specification. UF3 Drive 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. Now you can read, write, copy, delete and move data from your hard disk drive to UF3 Drive or from UF3 Drive to your Hard disk drive with the high speed of USB 3.0.

UF3 Drive is so compact that you can take it with you anywhere in your pocket. 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, UF3 Drive **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, high Performance and fast data transfer with UF3 Drive.

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, PS2251-03 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.

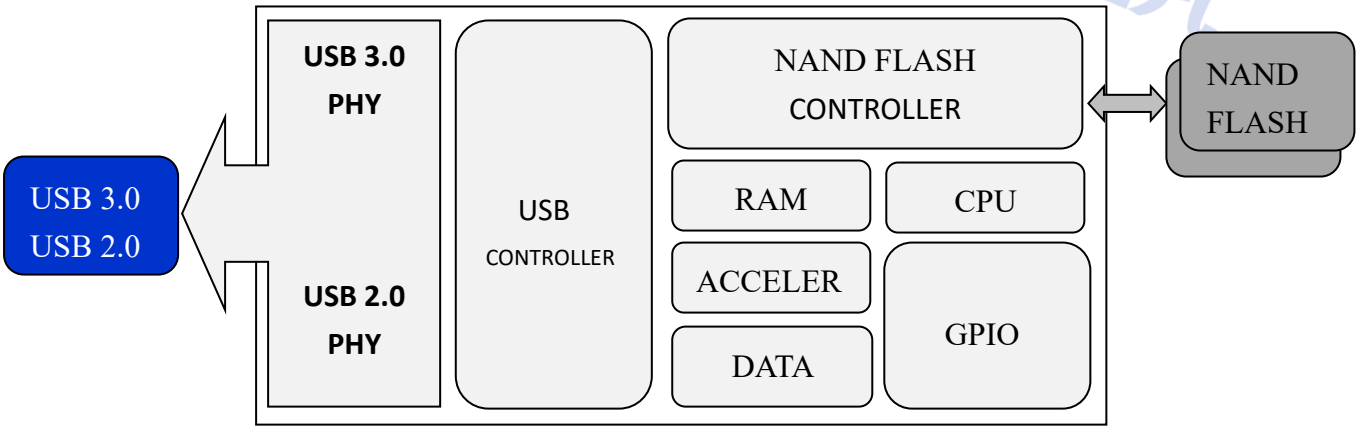
1.2.4 Pseudo SLC

Pseudo SLC can be considered as an extended version of the MLC. While MLC contains both fast and slow pages, pseudo SLC only applies fast pages for programming. The concept of pseudo SLC is demonstrated in the two tables below. The first and second bits of a memory cell represent a fast and slow page respectively, as shown in the left table. Since only fast pages are programmed when applying pseudo SLC, the bits highlighted in red are used, as shown in the right table. Accordingly, because only fast pages are programmed, pseudo SLC provides better performance and endurance than MLC. Moreover, pseudo SLC performs similarly to the SLC, yet more cost effective.

MLC Flash	
1st bit (fast)	2nd bit (slow)
1	1
1	0
0	1
0	0

Pseudo SLC	
1st bit (fast)	2nd bit (slow)
1	1
1	0
0	1
0	0

1.3. Block Diagram



Block Diagram

2. PRODUCT SPECIFICATIONS

- Compatible with USB specification revision 1.1, 2.0 and 3.0.
- **Capacity available**
  - SLC: 128MB to 64GB
  - MLC: 4GB to 512GB
  - pSLC: 2GB to 256GB
- **Operation temp.**
  - Standard:0-70℃
  - Wide:-40-85℃
- **Storage temp.**
  - -40-85℃
- Compatible with USB specification revision 1.1, 2.0, and 3.0.
- Support Windows 2000 SP4 and Windows XP ***without*** device driver.
- Support Windows Vista, Windows 7 and Windows 8 ***without*** device driver.
- 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 10 years.
- No external power is required - DC 4.5V ~ 5.5V from USB port.
- **Transfer rate for USB interface**
  - Super Speed up to 5Gbit/sec for USB 3.0
  - High speed up to 480Mbits/sec for USB 2.0
  - Full speed up to 12Mbits/sec for USB 1.1
- Low Power consumption.
- **Performance**
  - SLC R/W up to 170 /120 MB/s
  - pSLC R/W up to 140 /95 MB/s
  - MLC R/W up to 190 /140 MB/s

3. ENVIRONMENTAL SPECIFICATIONS

3.1. Environmental Conditions

3.1.1. Temperature and Humidity

- Temperature:
  - Storage: -40°C to 85°C
  - Operational (Standard grade): 0°C to 70°C
  - Operational (Wide grade): -40°C to 85°C
- Humidity:
  - Standard grade: RH 90% under 40°C (operational)
  - Wide grade: RH 95% under 55°C (operational)

■ **High Temperature Test Condition**

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

Result: No any abnormality is detected.

■ **Low Temperature Test Condition**

	Temperature	Humidity	Test Time
Operation (Standard)	0°C	0% RH	72 hours
Operation (Wide)	-25°C	0% RH	72 hours
Storage (Standard)	-40°C	0% RH	72 hours
Storage (Wide)	-40°C	0% RH	168 hours

Result: No any abnormality is detected.

■ **High Humidity Test Condition**

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

Result: No any abnormality is detected.

■ **Temperature Cycle Test**

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

Result: No any abnormality is detected.

3.1.2. Shock

■ **Shock Specification**

	Acceleration Force	Half Sin Pulse Duration	Number of Shocks
Non-operational	1500G	0.5ms	6 faces, 5 times each
Operational	1500G	0.5ms	6 faces, 5 times each

Result: No any abnormality is detected when power on.

3.1.3. Vibration

■ **Vibration Specification**

	Condition		Vibration Orientation
	Frequency/Displacement	Frequency/Acceleration	
Operational	20Hz~80Hz/1.52mm	80Hz~2000Hz/20G	X, Y, Z axis/60 min for each

Result: No any abnormality is detected when power on.

3.1.4. Drop

■ **Drop Specification**

	Height of Drop	Number of Drop
Non-operational	80cm free fall	6 face of each unit, 2 times

Result: No any abnormality is detected when power on.

3.1.5. Bending

■ **Bending Specification**

	Force	Action
Non-operational	≥ 50N	Hold 1min/5times

Result: No any abnormality is detected when power on.

3.1.6. Torque

■ **Torque Specification**

	Force	Action
Non-operational	0.5 N-m or 10 deg	Hold 5min/5times

Result: No any abnormality is detected when power on.

3.1.7. Electrostatic Discharge (ESD)

■ **Contact ESD Specification**

Device	Capacity	Temperature	Relative Humidity	+/- 15KV	Result
UF3	256GB	24.0°C	49% (RH)	No degradation of performance or loss of function.	PASS

3.2. Certification

- RoHS
- CE / FCC

4. ELECTRICAL SPECIFICATIONS

4.1. Absolute Maximum Ratings

Item	Symbol	Parameter	MIN	MAX	Unit
1	VCC5A	5V Power	-0.6	+9.0	V
2	VCC3IO	IO Power	-0.6	+7.5	V
3	AVCC33	Phy 3.3V Power	0.6	+7.5	V
4	VCCK	AON Core Power	-0.6	+5.5	V
5	Ta	Operating Temperature (Commercial)	-0.6	+70	℃
6	Tst	Storage Temperature	-25	+85	℃

4.2. Power Consumption

Samples are made of Toshiba SLC NAND Flash.

Capacity	Power Consumption (mA)			
	Read	Write	Idle	Standby
128MB	80	90	25	2.5
256MB	85	95	25	2.5
512MB	85	95	25	2.5
1GB	85	95	25	2.5
2GB	90	100	25	2.5
4GB	90	100	30	2.5
8GB	100	120	30	2.5
16GB	100	120	30	2.5
32GB	100	120	30	2.5
64GB	110	120	35	2.5

Unit: mA

Samples are made of Toshiba MLC NAND Flash.

Capacity	Power Consumption (mA)			
	Read	Write	Idle	Standby
4GB	80	75	30	2.5
8GB	80	75	30	2.5
16GB	130	150	35	2.5
32GB	130	150	35	2.5
64GB	150	160	35	2.5
128GB	170	160	35	2.5
256GB	170	160	40	2.5
512GB	170	170	40	2.5

Unit: mA

Samples are made of Toshiba pSLC NAND Flash.

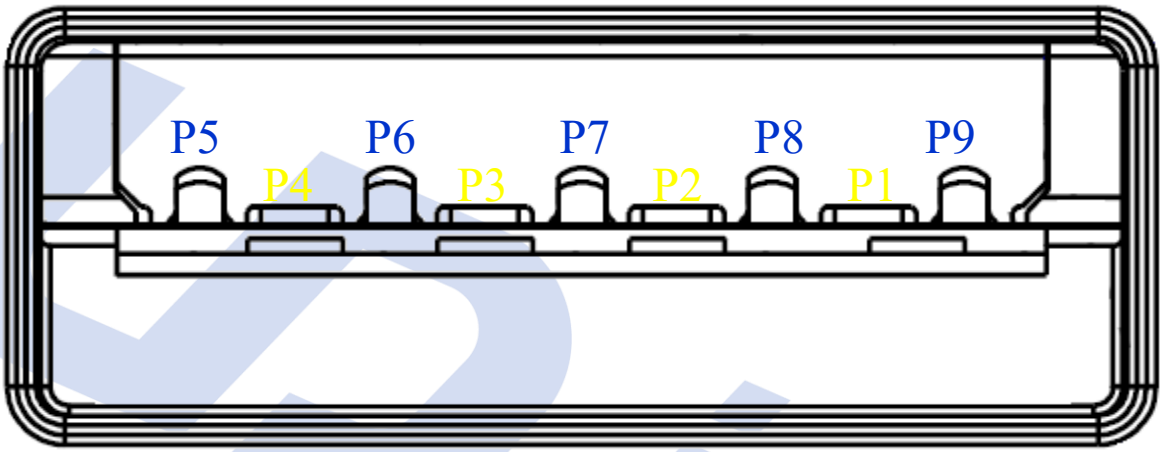
Capacity	Power Consumption (mA)			
	Read	Write	Idle	Standby
2GB	90	95	35	2.5
4GB	90	120	35	2.5
8GB	130	150	35	2.5
16GB	130	150	35	2.5
32GB	130	150	35	2.5

64GB	150	160	40	2.5
128GB	170	160	40	2.5
256GB	170	170	40	2.5

Unit: mA

5. INTERFACE

5.1. Pin Assignment and Descriptions



Pin Number	Type	Function
P1	V_{BUS}	Power
P2	D-	USB 2.0 differential pair
P3	D+	USB 2.0 differential pair
P4	GND	Ground
P5	StdA_SSRX-	SuperSpeed receiver differential pair
P6	StdA_SSRX+	SuperSpeed receiver differential pair
P7	GND_DRAIN	Ground
P8	StdA_SSTX-	SuperSpeed receiver differential pair
P9	StdA_SSTX+	SuperSpeed receiver differential pair
Shell	Shield	Connector Shell

6. DC CHARACTERS

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
		3.3V I/O	3.0	3.3	3.6	V
Temp	Junction Temperature		0	25	115	℃
V_{IL}	Schmitt Trigger	VCC3IO = 3.3V	0.35 * VCC3IO			V
	CMOS Trigger		0.5 * VCC3IO			
	Two Trigger		0.45 * VCC3IO			
V_{IH}	Schmitt Trigger		0.65 * VCC3IO			V
	CMOS Trigger		0.5 * VCC3IO			
	Two Trigger		0.55 * VCC3IO			
V_{IL}	Schmitt Trigger	VCC3IO = 1.8V	0.41 * VCC3IO			V
	CMOS Trigger		0.53 * VCC3IO			
	Two Trigger		0.5 * VCC3IO			
V_{IH}	Schmitt Trigger		0.69 * VCC3IO			V
	CMOS Trigger		0.53 * VCC3IO			
	Two Trigger		0.56 * VCC3IO			
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
Rpu	Input Pull-Up Resistance	PU=high, PD=low	40	50	190	KΩ
Rpd	Input Pull-Down Resistance	PU=high, PD=low	40		190	KΩ
Iin	Input Leakage Current	Vin = VCC3I or 0			10	μA
Ioz	Tri-state Output Leakage Current		-10	±1	10	μA

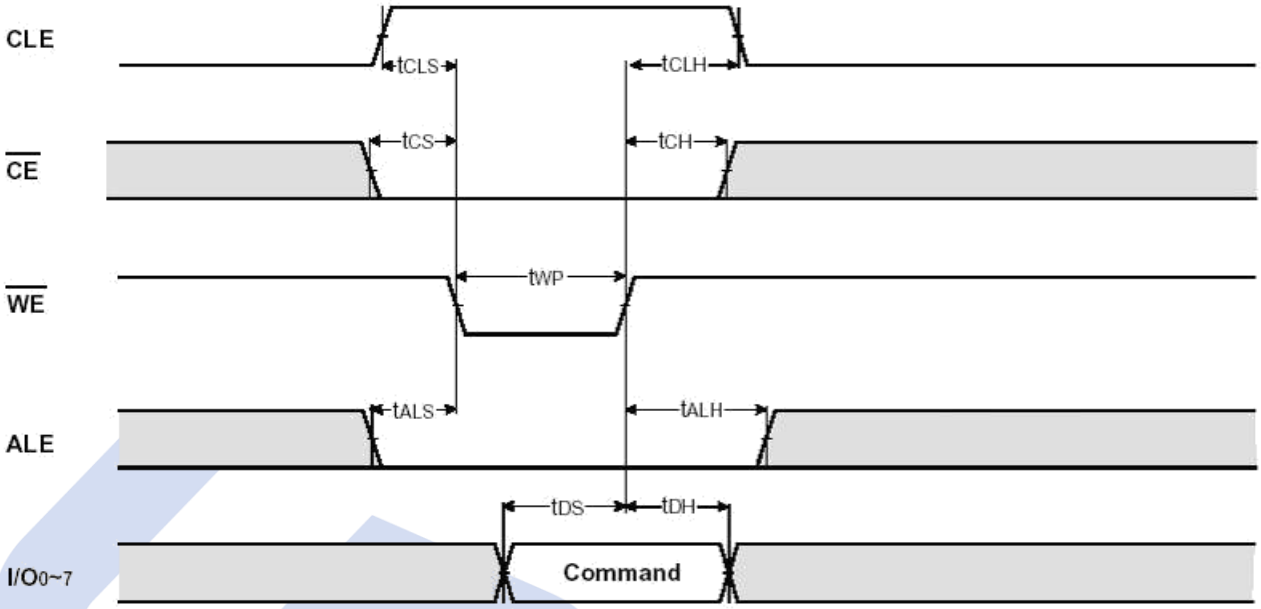
7. AC CHARACTERS

F1.Flash Memory Interface Timing

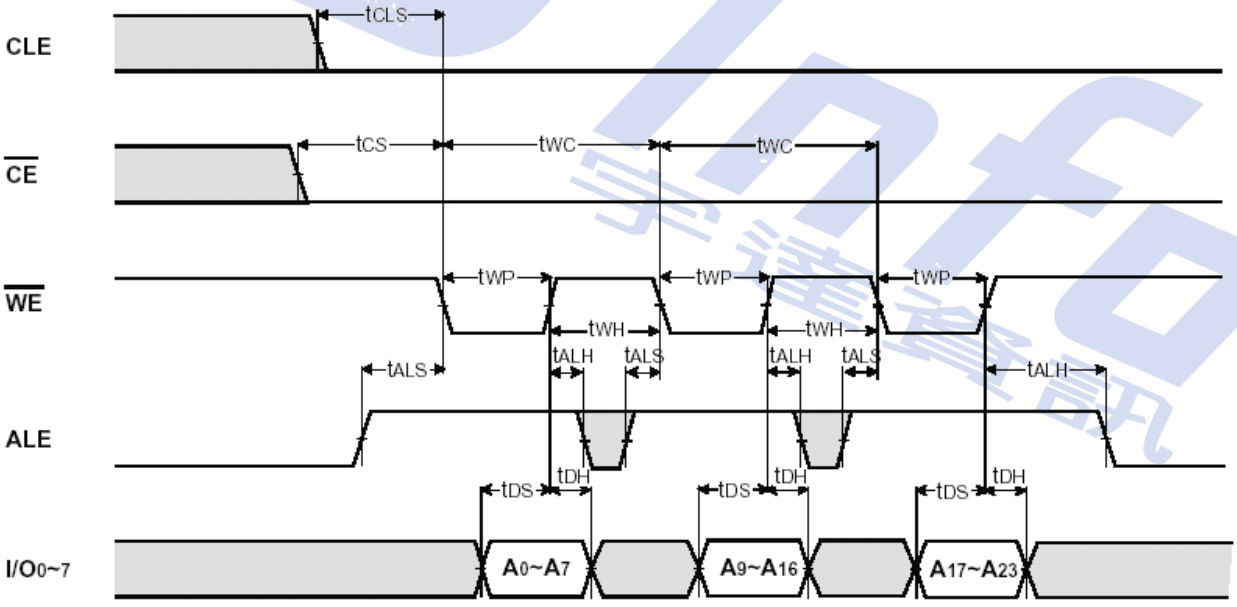
Below information are for reference and example use only.

The actual timing, please refer to the related flash spec.

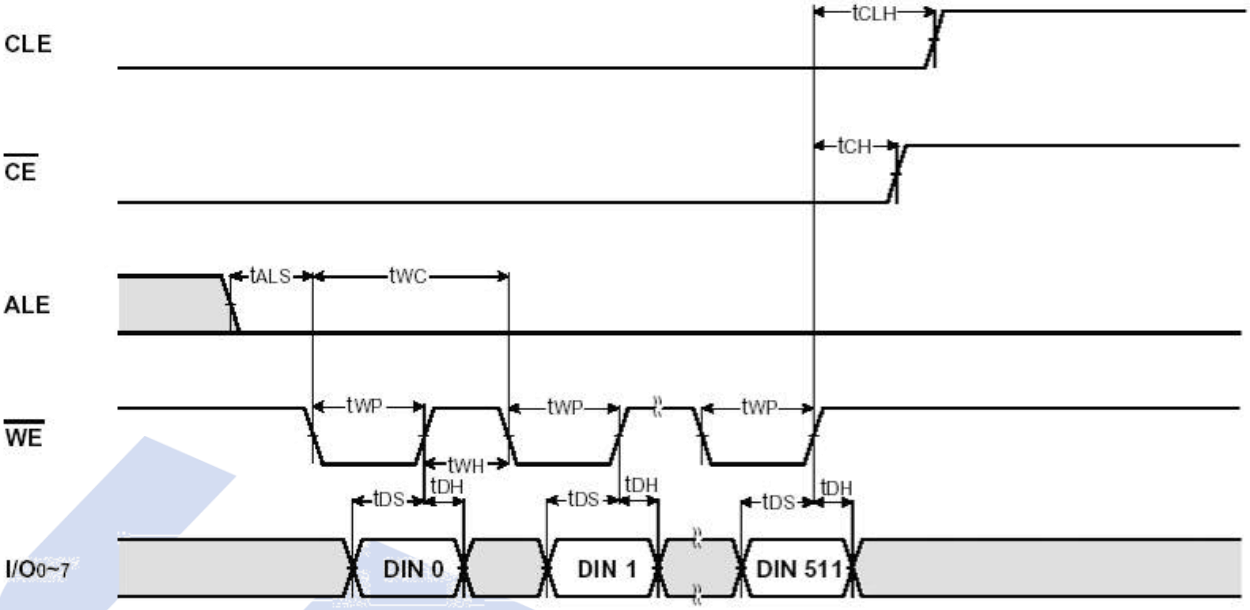
Parameter	Symbol	Min	Max	Unit
CLE Set-up Time	t_{CLS}	0	-	ns
CLE Hold Time	t_{CLH}	10	-	ns
CE Setup Time	t_{CS}	0	-	ns
CE Hold Time	t_{CH}	10	-	ns
WE Pulse Width	t_{WP}	25	-	ns
ALE Setup Time	t_{ALS}	0	-	ns
ALE Hold Time	t_{ALH}	10	-	ns
Data Setup Time	t_{DS}	20	-	ns
Data Hold Time	t_{DH}	10	-	ns
Write 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



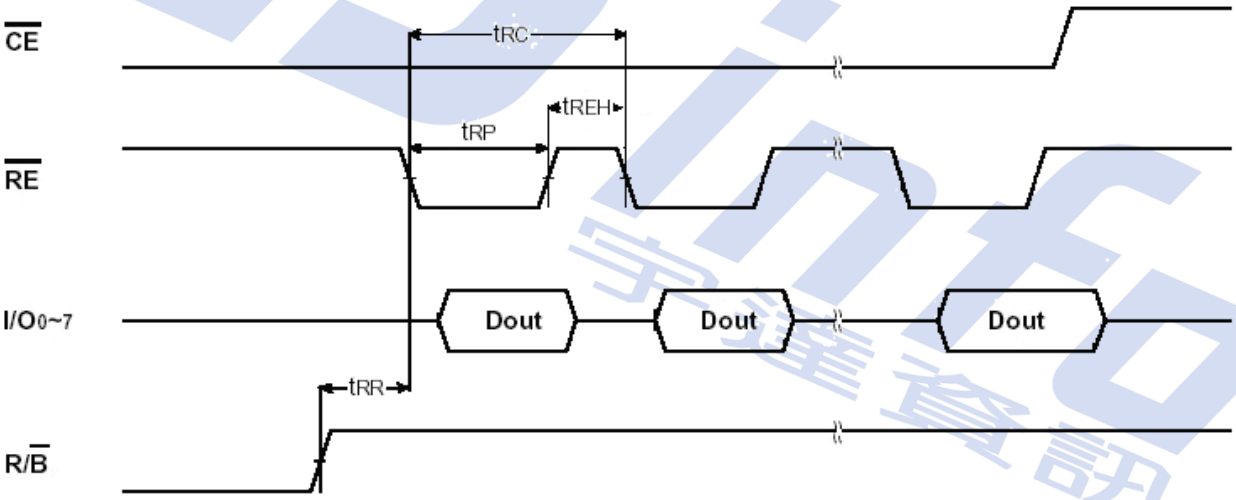
Command Latch Cycle



Address Latch Cycle



Input Data Latch Cycle

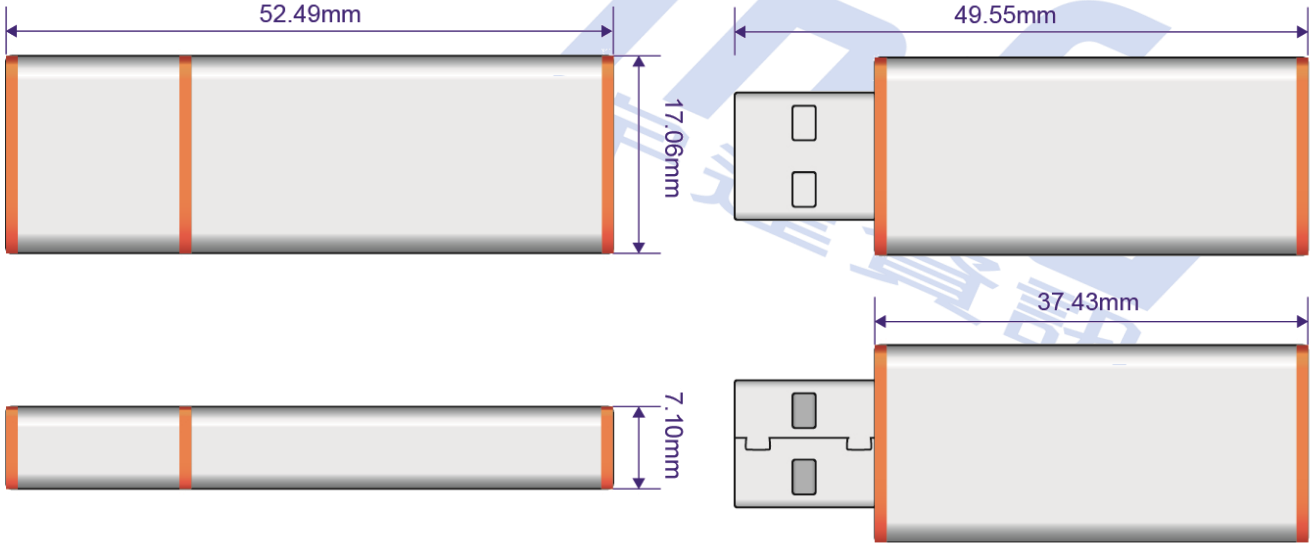


Sequential Out Cycle after Read (CLE=L, /WE=H, ALE=L)

8. PHYSICAL DIMENSION

Dimension:

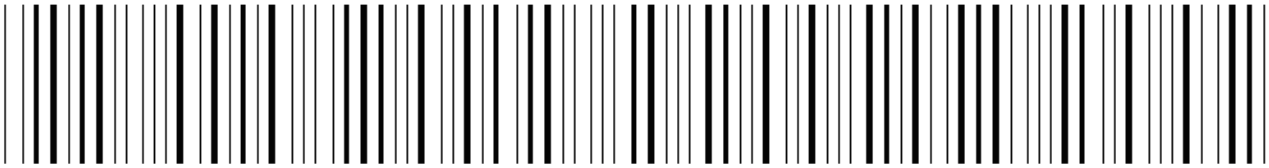
Type1:UF3-AL



Type2:UF3-V2

Unit:mm

9. BARCODE DESCRIPTION



U F 3 x x U A 1 2 8 G B P R U

XXXXXXXXXX-YYMMDDXX

Part Number

Manufacturing

10. PARTNUMBER DECODER

UF3- X^4X^5 UA$X^8X^9X^{10}X^{11}X^{12}$ 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}
UF3	xx AL V2	UA	128MB 256MB 512MB 001GB 002GB 004GB 008GB 016GB 032GB 064GB 128GB 256GB 512GB	C: SLC Standard (0ºC ~ +70ºC) I: SLC Industrial (-40ºC ~ +85ºC) K: MLC Standard (0ºC ~ +70ºC) M: MLC Industrial (-40ºC ~ +85ºC) P: pSLC Standard (0ºC ~ +70ºC) F: pSLC Industrial (-40ºC ~ +85ºC)	F: Fixed R: Removable	U