UD info Corp.

Industrial USB FLASH DISK
UF2-WHUH Series
Product DataSheet

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Revision History

Revision	Draft Date	History	Author
1.0	2024/3/1	New Release	Migo.Huang
1.1	2024/4/26	Modify Certification Information	Migo.Huang

Product Overview

- **Capacity**
  - BiCS5 TLC: 64GB-256GB
  - BiCS5 pSLC:16GB-64GB
- **USB Interface**
  - High speed up to 480Mbits/sec for USB 2.0
  - Full speed up to 12Mbits/sec for USB 1.1
- **Flash Interface**
  - Flash Type: BiCS5
- **Performance**
  - Read: up to 40 MB/s
  - Write: up to 35 MB/s
- **Power Consumption**[Note1]
  - Read mode: 230 mA
  - Write mode: 220 mA
  - Suspend mode: 1.5 (mA)

Notes:

1. Please see Power Consumption” for details.

- **Advanced Flash Management**
  - Bad Block Management
  - SMART
  - ECC
  - Wear Leveling
- **Low Power Management**
- **Temperature Range**
  - Operation:
    Standard: 0°C ~ 70°C
    Wide: -40°C ~ 85°C
  - Storage: -40°C ~ 85°C
- **Compliant**
  - RoHS

1. INTRODUCTION

1.1. General Description

The UF2 Drive is a ***removable flash disk drive*** with USB connection and can support various storage capacities.

UF2 Drive is compatible with both USB 1.1 and USB 2.0 specification. UF2 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 UF2 Drive or from UF2 Drive to your hard disk drive with the high speed of USB 2.0.

UF2 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, UF2 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 UF2 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, CTL 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

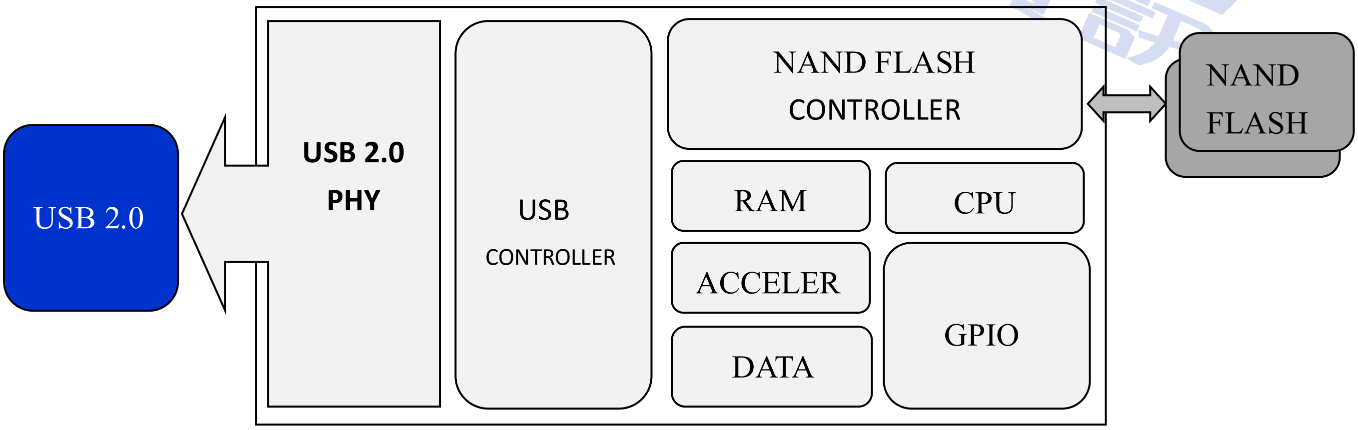
Pseudo SLC pSLC stands for pseudo single-level cell. Pseudo Single-Level Cell (pSLC) is the technology of using multi-Level cell or triple-level cell NAND Flash in a way that reduces the number of bits stored in each cell to one. Pseudo-SLC operates like SLC, but with most cost-effective NAND, such as 3D TLC, which makes it an alternative to SLC.

pSLC is often promoted as a suitable replacement for SLC technology. The cells in pSLC flash are smaller, since they are MLC or TLC cells. It is an advanced variant of MLC/3D TLC that outperforms the latter in speed, program erase cycles, and overall reliability.

2D pSLC technology simulates MLC as an SLC Cell structure, and through the adjustment of SSD firmware and algorithm, the original one Cell unit storing 2-bit MLC NAND Flash, is simulated as the SLC storage model of 1 Cell storing 1 bit. As pSLC reconfigures the MLC Cell layout, it can elevate the SSD read-write performance to the equivalent SLC level with extended usage longevity, which may adversely sacrifice half of the capacity of MLC SSD. The technology delivers a cost-performance balance between MLC and SLC flash types, which makes it an ideal alternative solution for heavy-write applications.

Breaking through the limitations of existing technologies, the current 3D pSLC can offer up to more than 30,000 or higher P/E cycles, more than 10 times the reliability of MLC or industrial 3D TLC. The pSLC simulates the performance and endurance of industrial-grade flash SLC and provides a cost-performance balance solution to customers, making pSLC an ideal alternative solution for embedded or industrial applications.

1.3. Block Diagram



Block Diagram

2. PRODUCT SPECIFICATIONS

- Compatible with USB specification revision 1.1 and 2.0
- **Capacity available**
  - BiCS5 TLC: 64GB-256GB
  - BiCS5 pSLC: 16GB-64GB
- **Operation temp.**
  - Standard: 0°C ~ 70°C
  - Wide: -40°C ~ 85°C
- **Storage temp.**
  - -40-85℃
- 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)
- No external power is required - DC 4.5V ~ 5.5V from USB port.
- Low power consumption
- Hot Plug & Play without driver installation
- **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.

3. ENVIRONMENTAL SPECIFICATIONS

3.1. Environmental Conditions

3.1.1. Temperature and Humidity

- **Temperature:**
  - Storage: -40°C to 85°C
  - Standard grade: 0°C to 70°C
  - 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	
Storage (Standard)	0°C	30 min	10 cycles
	70°C	30 min	
Operation (Wide)	-40°C	30 min	10 cycles
	85°C	30 min	
Storage (Wide)	-40°C	30 min	10 cycles
	85°C	30 min	

Result: No any abnormality is detected.

3.1.2. Electrostatic Discharge (ESD)

- **Contact ESD Specification**

Device	Capacity	Specification	+/- 4KV
UF2	64GB	EN 55035 EN 61000-4-2	Device functions are affected, but EUT will be back to its normal or operational state automatically.

3.1.3. EMI Compliance

- CE: EN55032
- FCC: ANSI C63.4

3.2. Certification & Compliance

- RoHS: 2011/65/EU

4. ELECTRICAL SPECIFICATIONS

4.1. Absolute Maximum Ratings

Parameter	Min	Typ	MAX	Unit
Operating Temperature	0	+25	+70	℃
Storage Temperature	-40	+25	+70	℃
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

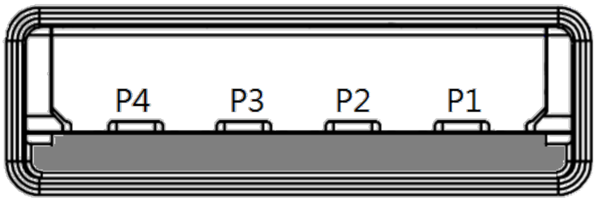
4.2. Power Consumption

Samples are made of Toshiba 3D NAND Flash.

Power Consumption Max. (mA)			
Read	**Write**	**Normal**	**Suspend**
230	216	75	1.20

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

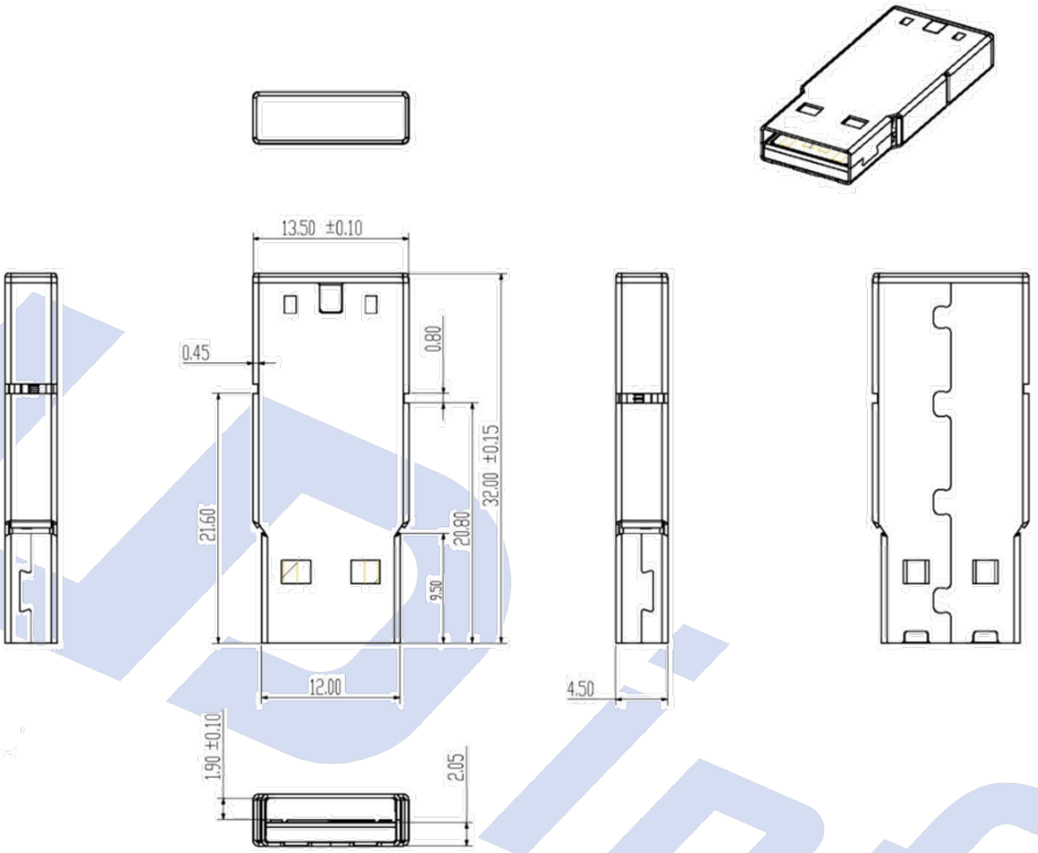
6. DC CHARACTERS

6.1. 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
		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			
	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		0.53 * 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
Rpu	Input Pull-Up Resistance	PU=high, PD=low		75		KΩ
Rpd	Input Pull-Down Resistance	PU=high, PD=low		75		KΩ
Iin	Input Leakage Current	Vin = VCC3I or 0			10	µA
Ioz	Tri-state Output Leakage Current		-10	±1	10	µA

7. PHYSICAL DIMENSION

Dimension:



8. BARCODE DESCRIPTION

U F 2 W H U H 1 2 8 G B P R U

XXXXXXXXXX-YYMMDDXX

Part Number

Manufacturing

9. PARTNUMBER DECODER

UF2- WHUH$X^8X^9X^{10}X^{11}X^{12}$ 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	WH	UH	16GB 32GB 64GB	128GB 256GB	A: 3D TLC Standard (0ºC ~ +70ºC) B: 3D TLC Industrial (-40ºC ~ +85ºC) V: 3D pSLC Standard (0ºC ~ +70ºC) W: 3D pSLC Industrial (-40ºC ~ +85ºC)	F: Fixed R: Removable	U