



# MINIELF USB2.0 Specification

(FxU2 I Series, MLC)

Version 1.4

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**1.1. Introduction**

FLEXXON's MINIELF (FxU2 I series) is a removable flash disk drive with USB connection and can supports various storage capacities, which is fully compatible with both USB 1.1 and USB 2.0 specification. It is a plug and play device, simply plug in into any USB port and it will automatically get detected by the computer as a removable drive. MINIELF does not require any battery, cable 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 MINIELF Drive.

## 1.2. Product Overview

- ❖ **Flash**
  - MLC
- ❖ **Capacity**
  - 4GB up to 64GB
- ❖ **Compatible with USB specification revision 1.1 and 2.0.**
- ❖ **Support Windows 2000 SP4 and Windows XP 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 Linux Kernel ver2.4.0 or above without device driver (USB 1.1 speed).**
- ❖ **Support Linux Kernel ver2.4.10 or above without device driver (USB 2.0 speed).**
- ❖ **No external power is required: DC 4.5V~5.5V from USB port.**
- ❖ **Transfer rate for USB interface:**
  - High speed up to 480Mbps/sec for USB 2.0
  - Full speed up to 12Mbps/sec for USB 1.1
- ❖ **Low Power Consumption**
- ❖ **Dynamic and Static Wear Leveling Algorithm**
- ❖ **Hot Plug & Play**
- ❖ **Temperature Range**
  - Operation: 0°C ~ 70°C
  - Storage: -40°C ~ 85°C
- ❖ **RoHS Compliant**

## 2. PRODUCT SPECIFICATIONS



### 2.1. Power

Table 2-1 Power Consumption of FxU2 I MINIELF

| Item        | Power Consumption (mA) |
|-------------|------------------------|
| Normal      | 34.25                  |
| Stand-By S1 | 0.26                   |
| Sleep       | 0.27                   |
| Read        | 68.85                  |
| Write       | 90.93                  |

**NOTES:**

1. Power Consumption may differ according to flash configuration and platform.

### 2.2. MTBF

MTBF, an acronym for Mean Time Between Failures, is a measure of a device's reliability. Its value represents the average time between a repair and the next failure. The predicted result of FLEXXON's MINIELF (FxU2 I solution) is more than 2 million hours.

### 2.3. Data Retention

- 10 years if > 90% life remaining (@25C)
- 1 year if < 10% life remaining (@25C)

#### 3.1. DC Characteristic

Table 3-1 FxU2 I MINIELF DC characteristic of I/O cells

| Symbol             | Parameter                                        | Conditions                               | MIN                     | TYP  | MAX  | Unit |
|--------------------|--------------------------------------------------|------------------------------------------|-------------------------|------|------|------|
| V <sub>CK</sub>    | Core Power Supply                                | Core Area                                | 1.16                    | 1.23 | 1.30 | V    |
| V <sub>CC3IO</sub> | Power Supply                                     | 3.3V I/O                                 | 3.15                    | 3.30 | 3.45 | V    |
| Temp               | Junction Temperature                             |                                          | -40                     | 25   | 125  | °C   |
| V <sub>t</sub>     | Switching threshold                              | LVTTL                                    | --                      | 1.5  | --   | V    |
| V <sub>t-</sub>    | Schmitt Trigger Negative Going threshold voltage | LVTTL                                    | 0.8                     | 1.1  | --   | V    |
| V <sub>t+</sub>    | Schmitt Trigger Positive Going threshold voltage |                                          | --                      | 1.6  | 2.0  | V    |
| V <sub>OL</sub>    | Output Low Voltage                               | I <sub>ol</sub>   = 2~16 mA              | --                      | --   | 0.4  | V    |
| V <sub>OH</sub>    | Output High Voltage                              | I <sub>oh</sub>   = 2~16 mA              | V <sub>CC3IO</sub> -0.4 | --   | --   | V    |
| R <sub>pu</sub>    | Input Pull-Up Resistance                         | PU=high<br>PD=low                        | 40                      | 75   | 190  | KΩ   |
| R <sub>pd</sub>    | Input Pull-Down Resistance                       | PU=low<br>PD=high                        | 40                      | 75   | 190  | KΩ   |
| I <sub>in</sub>    | Input Leakage Current                            | V <sub>in</sub> = V <sub>CC3I</sub> or 0 | --                      | --   | 10   | μA   |
| I <sub>oz</sub>    | Tri-state Output Leakage Current                 |                                          | -10                     | ±1   | 10   | μA   |

## 3.2. AC Characteristic

### 3.2.1. Flash Memory Interface Timing

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

**Table 3-2 FxU2 I MINIELF Flash Memory Interface Timing**

| Parameter          | Symbol | Min | MAX | Unit |
|--------------------|--------|-----|-----|------|
| CLE Set-up Time    | tCLS   | 0   | --  | ns   |
| CLE Hold Time      | tCLH   | 10  | --  | ns   |
| CE Setup Time      | tCS    | 0   | --  | ns   |
| CE Hold Time       | tCH    | 10  | --  | ns   |
| WE Pulse Width     | tWP    | 25  | --  | ns   |
| ALE Setup Time     | tALS   | 0   | --  | ns   |
| ALE Hold Time      | tALH   | 10  | --  | ns   |
| Data Setup Time    | tDS    | 20  | --  | ns   |
| Data Hold Time     | tDH    | 10  | --  | ns   |
| Write Cycle Time   | tWC    | 45  | --  | ns   |
| WE High Hold Time  | tWH    | 15  | --  | ns   |
| Read Cycle Time    | tRC    | 50  | --  | ns   |
| /RE Pulse Width    | tRP    | 25  | --  | ns   |
| /RE High Hold Time | tREH   | 15  | --  | ns   |
| Ready to /RE Low   | tRR    | 60  | --  | ns   |

### 3.2.2. Command Latch Cycle

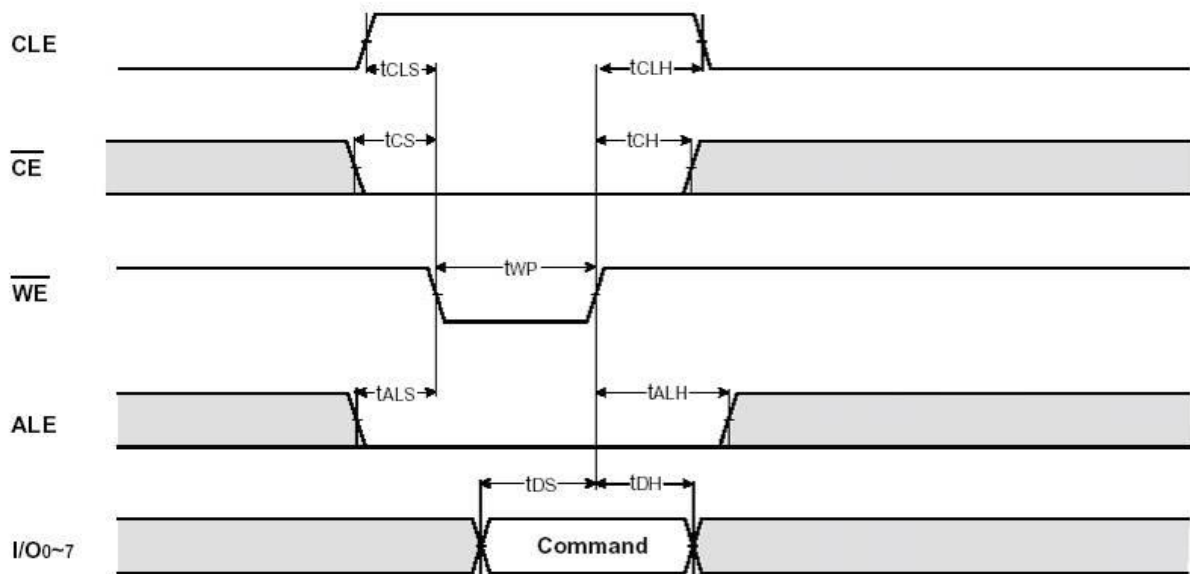


Figure 3-1 FxU2 I Command Latch Cycle

### 3.2.3. Address Latch Cycle

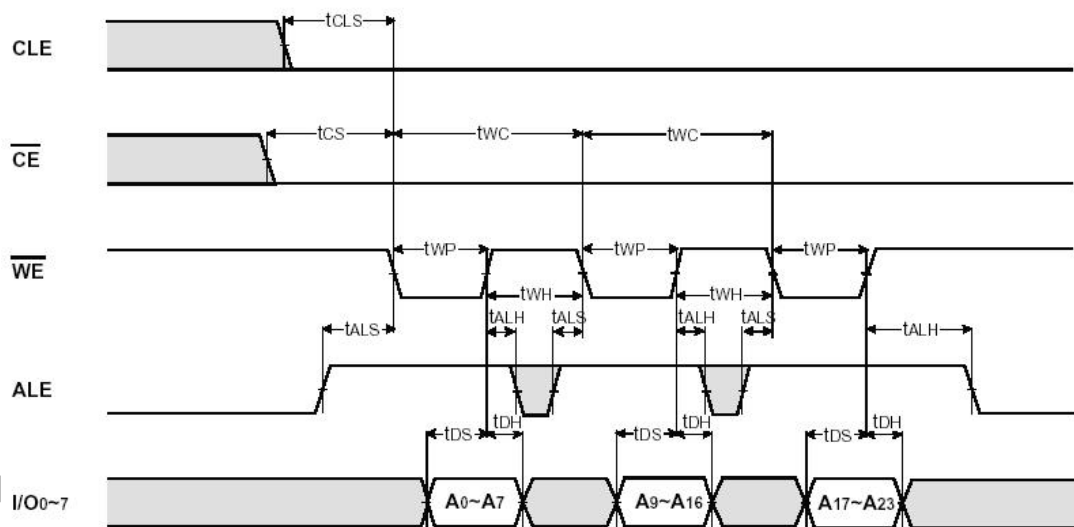


Figure 3-2 FxU2 I Address Latch Cycle

### 3.2.4. Input Data Latch Cycle

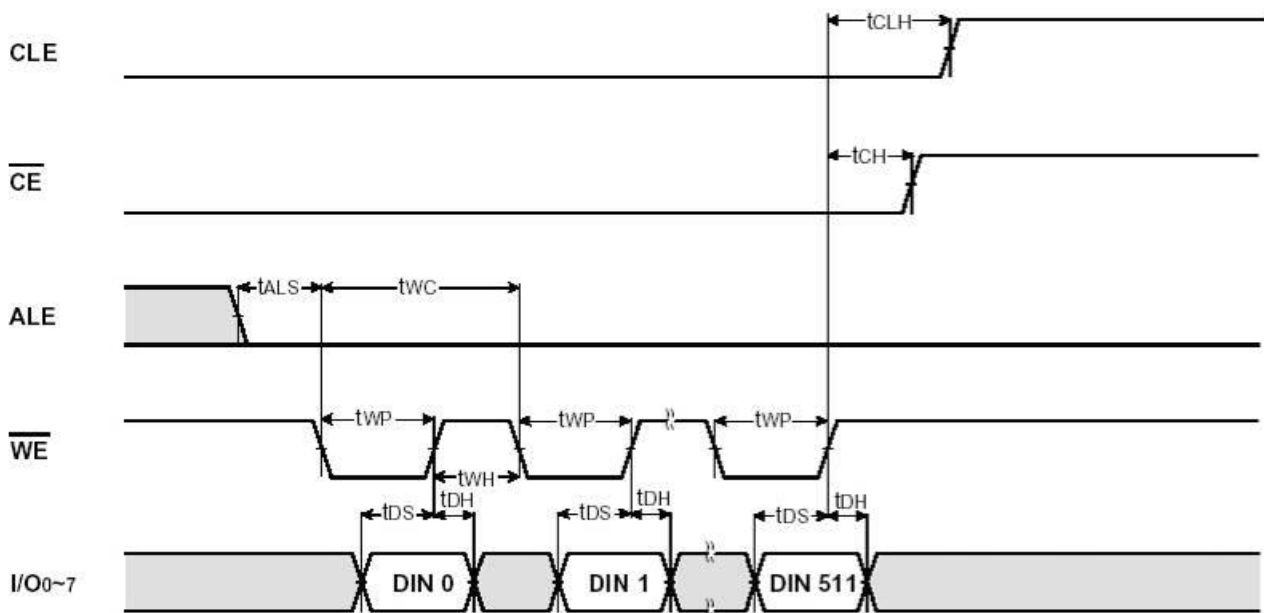


Figure 3-3 FxU2 I Input Data Latch Cycle

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

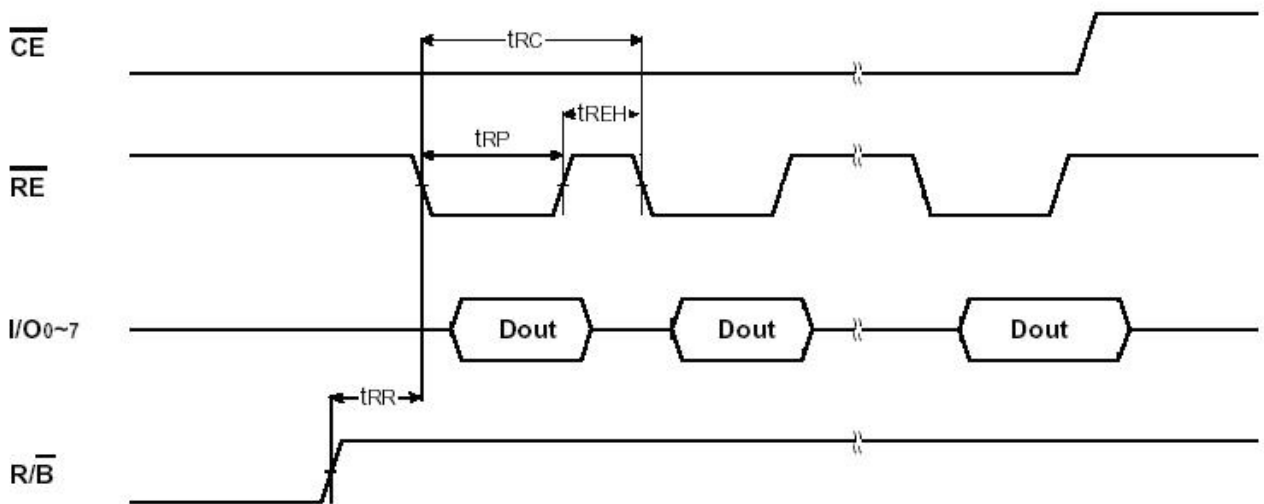
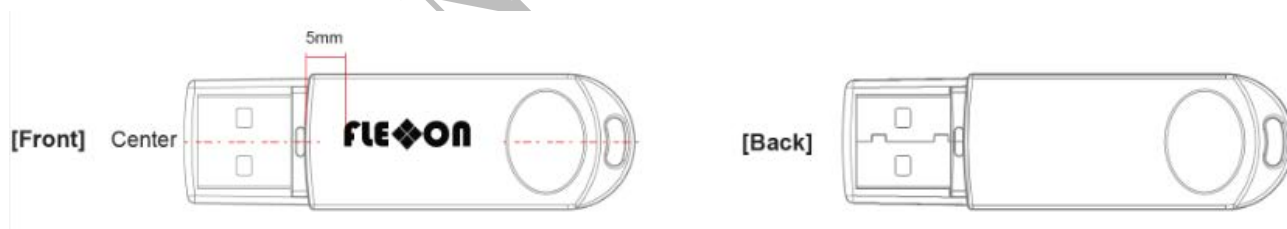
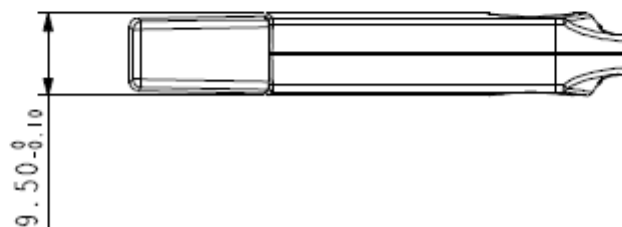
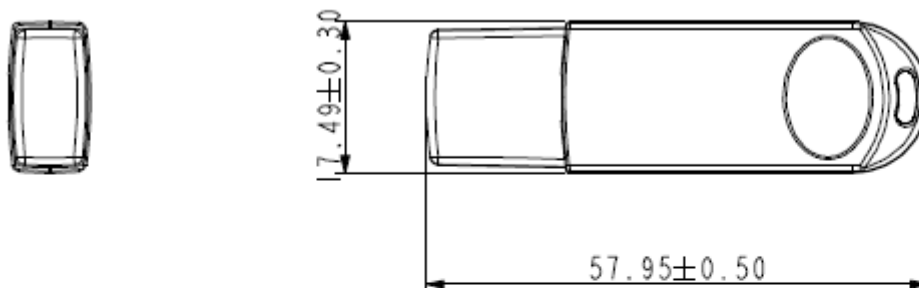


Figure 3-4 FxU2 I Sequential Out Cycle

## 4. PHYSICAL DIMENSION



Dimension: 58.0 (L) x 17.5 (W) x 9.5 (H) mm



## 5. ORDERING INFORMATION



| Capacity | MPN             |
|----------|-----------------|
| 4GB      | FUUP004GMC-6800 |
| 8GB      | FUUP008GMC-6800 |
| 16GB     | FUUP016GMC-6800 |
| 32GB     | FUUP032GMC-6800 |
| 64GB     | FUUP064GMC-6800 |

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## Revision History

| Revision | Release Date | History                     |
|----------|--------------|-----------------------------|
| 1.0      | 2014/11      | First release               |
| 1.1      | 2015/01      | Update housing              |
| 1.2      | 2016/11      | Update Ordering information |
| 1.3      | 2018/09      | Update Ordering information |
| 1.4      | 2019/02      | Update Template             |