

**i5062-ZD**

**USB Flash Disk Controller**

**Data Sheet**

iCreate Technologies Corporation

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# 1. Introduction

## General description

i5062-ZD is a single-chip USB flash disk controller which can handle up to four NAND-type flash memory chips. It is compatible with USB 1.1 and also compliant with USB 2.0. The features of USB-boot-up and driver-less make the flash disk very convenient for end-users.

i5062-ZD is designed with iCreate flash interface technology to provide wear-leveling and on-the-fly error-correction coding, which enhance the life time of the disk. The flexibility of the interface design also ensures supporting to AND flash by firmware change and MLC NAND flash in the protocol level.

For data security, i5062-ZD supports multi-level protection mechanism. In the non-protection level, data in the disk is fully accessible. In low protection level, disk is read-only to protect from virus and accidental file removal. In high protection level, the disk data cannot be accessed.

User-programmable device name based on USB Mass Storage protocol (SCSI) is also provided. The end-users can change the device name that appears in Windows.

## Features

### System Function

- ◆ USB 1.1 compatible and USB 2.0 compliant
- ◆ USB-ZIP/USB-HDD boot-up
- ◆ Support multi-disk
- ◆ Multi-level security protection
- ◆ Support Read-only privilege
- ◆ Compatible with Windows 98/Me/2K/XP, MacOS 9+, and Linux kernel 2.4+
- ◆ Configurable Removable or Fixed drive type under Windows
- ◆ Support unique serial number for each disk
- ◆ Configurable USB vendor/product ID
- ◆ Support customized disk ID by end-user
- ◆ Read speed > 1000K byte/s
- ◆ Write speed > 800K byte/s
- ◆ Write protect switch
- ◆ Ready/busy LED

### Flash Control

- ◆ Support 128Mb to 8Gb NAND-type flash, AND flash is supported with i5068-Z.
- ◆ Connect up to four flash chips
- ◆ Wear-leveling extends product life time
- ◆ Defect block concealment and dynamic defect block handling
- ◆ On-the-fly ECC enhances reliability

### Chip Hardware

- ◆ On-chip voltage detector for power-on-reset
- ◆ Single 3.3V voltage supply
- ◆ 6MHz external clock for low EMI
- ◆ 32 pin TSOP Type I package

## 2. Pin Configuration and Definition

### Pin configuration

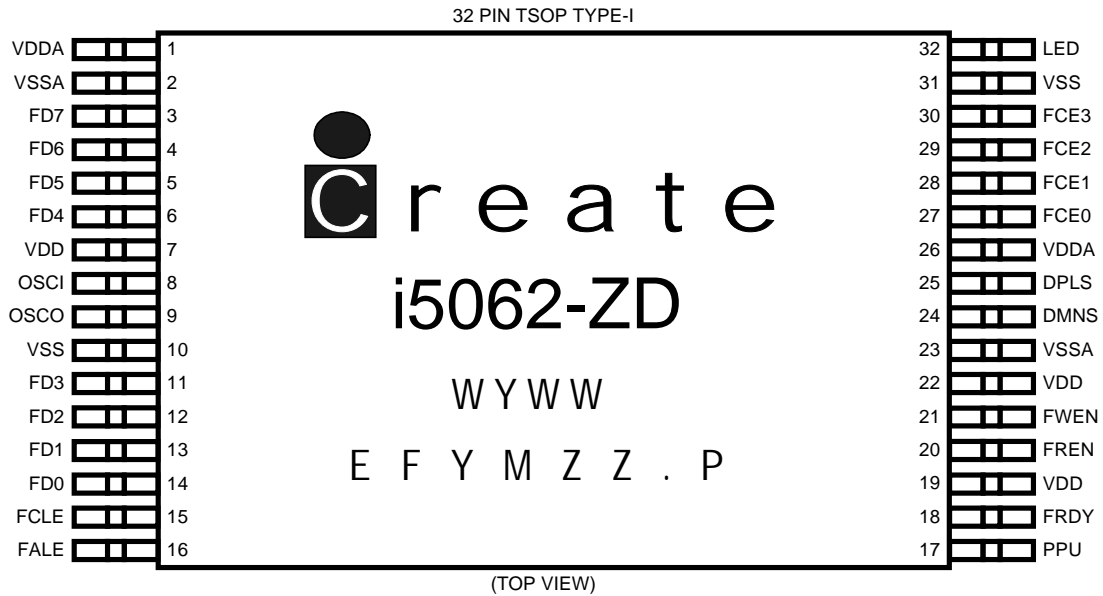


Figure 1. Pin configuration

### Pin definition

| Pin Number                    | Name   | IO Type   | Function                                       |
|-------------------------------|--|-----------|--|
| <b>USB (2 pins)</b>           |  |           |  |
| 25                            | DPLS   | Analog    | USB bus D+.                                    |
| 24                            | DMNS   | Analog    | USB bus D-.                                    |
| <b>Clock (2 pins)</b>         |  |           |  |
| 8                             | OSCI   | Clock In  | 6MHz crystal input.                            |
| 9                             | OSCO   | Clock Out | 6MHz crystal output.                           |
| <b>Flash (17 pins)</b>        |  |           |  |
| 3, 4, 5, 6, 11,<br>12, 13, 14 | FD7, FD6, FD5,<br>FD4, FD3, FD2,<br>FD1, FD0 | IO4       | Bi-directional data bus signals to NAND flash. |
| 30, 29, 28,<br>27             | FCE3, FCE2,<br>FCE1, FCE0                    | O2        | Active-low chip enable signals to NAND flash.  |
| 15                            | FCLE   | O4        | Command latch enable (CLE) of NAND flash.      |
| 16                            | FALE   | O4        | Address latch enable (ALE) of NAND flash.      |
| 20                            | FREN   | O4        | Active-low read enable signal to NAND flash.   |
| 21                            | FWEN   | O4        | Active-low write enable signal to NAND flash.  |
| 18                            | FRDY   | I, ST, PU | Ready/Busy from NAND flash.                    |

| <b>System Control (2 pins)</b>   |      |        |   |
|----------------------------------|------|--------|---|
| 17                               | PPU  | IO4    | This pin controls programmable pull-up of DPLS, and is connected to DPLS through 1.5 K $\Omega$ resistor. |
| 32                               | LED  | O8     | This pin controls LED. LED blinks when operating and dark when idle.                                      |
| <b>Power and Ground (9 pins)</b> |      |        |   |
| 7, 19, 22                        | VDD  | Power  | 3.3V Power  |
| 10, 31                           | VSS  | Ground | Ground  |
| 1, 26                            | VDDA | Power  | 3.3V Analog Power   |
| 2, 23                            | VSSA | Ground | Analog Ground   |

### Function of I/O types

|     |   |
|-----|---|
| I   | Input                                     |
| ST  | Input with Schmitt trigger                |
| PU  | Input with internal pull-up               |
| O2  | Output buffer with 2mA driving capability |
| O4  | Output buffer with 4mA driving capability |
| O8  | Output buffer with 8mA driving capability |
| IO4 | I/O buffer with 4mA driving capability    |

## 3. Electrical Specifications

### Recommended Operating Condition

| Symbol           | Parameter               | Min | Typ | Max | Units |
|------------------|-------------------------|-----|-----|-----|-------|
| V <sub>DD</sub>  | V <sub>DD</sub> Voltage | 3.0 | 3.3 | 3.6 | V     |
| T <sub>OPR</sub> | Operating temperature   | 0   |     | 70  | °C    |

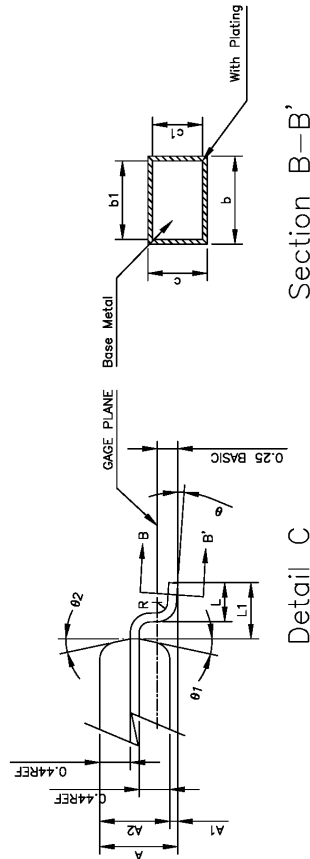
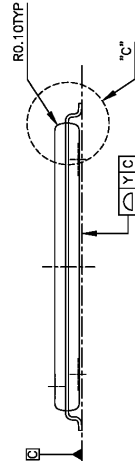
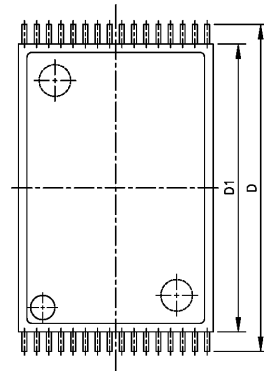
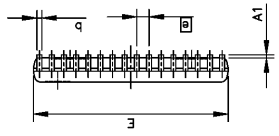
### DC Characteristics

| Symbol          | Parameter           | Min | Typ | Max                 | Units |
|-----------------|---------------------|-----|-----|---------------------|-------|
| V <sub>IL</sub> | Input LOW voltage   |     |     | 0.3*V <sub>DD</sub> | V     |
| V <sub>IH</sub> | Input HIGH voltage  | 2.0 |     |                     | V     |
| V <sub>OL</sub> | Output LOW voltage  |     |     | 0.4                 | V     |
| V <sub>OH</sub> | Output HIGH voltage | 2.4 |     |                     | V     |

### 4. Package Dimensions

| SYM.       | DIMENSION (MM) |       |       | DIMENSION (MIL) |      |      |
|------------|----------------|-------|-------|-----------------|------|------|
|            | MIN.           | NOM.  | MAX.  | MIN.            | NOM. | MAX. |
| A          | -              | -     | 1.20  | -               | -    | 47   |
| A1         | 0.05           | -     | 0.15  | 2               | -    | 6    |
| A2         | 0.95           | 1.00  | 1.05  | 37              | 39   | 41   |
| b          | 0.17           | 0.22  | 0.27  | 7               | 9    | 11   |
| b1         | 0.17           | 0.20  | 0.23  | 7               | 8    | 9    |
| c          | 0.10           | -     | 0.21  | 4               | -    | 8    |
| c1         | 0.10           | -     | 0.16  | 4               | -    | 6    |
| D          | 13.20          | 13.40 | 13.60 | 520             | 528  | 535  |
| $\bar{e}$  | 0.5 BSC        |       |       | 20 BSC          |      |      |
| D1         | 11.60          | 11.80 | 12.00 | 457             | 465  | 472  |
| E          | 7.80           | 8.00  | 8.20  | 307             | 315  | 323  |
| L          | 0.50           | 0.60  | 0.70  | 20              | 24   | 28   |
| L1         | 0.80 REF       |       |       | 31 REF          |      |      |
| R          | -              | -     | 0.08  | -               | -    | 3    |
| $\theta$   | 0              | 3°    | 5°    | 0               | 3°   | 5°   |
| $\theta 1$ | 15° REF        |       |       | 15° REF         |      |      |
| $\theta 2$ | 15° REF        |       |       | 15° REF         |      |      |

1. REFER TO JEDEC STD. MO-142
2. DIMENSION D1 AND E DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE PROTRUSION IS 0.25mm PER SIDE. D1 AND E ARE MAXIMUM PLASTIC BODY SIZE DIMENSIONS WHICH INCLUDE MOLD MIS-MATCH.
3. DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL NOT CAUSE THE LEAD WIDTH TO EXCEED THE MAXIMUM b DIMENSION BY MORE THAN 0.06mm
4. ALL DIMENSIONS ARE IN MILLIMETERS.



## 5. Flash Support List

|                              |  |
|------------------------------|--|
| <b>Actrans</b>               |  |
| 512Mbit (64MByte)            | AC79LV512B                                   |
| <b>Fujitsu</b>               |  |
| 128Mbit (16MByte)            | MBM30LV0128                                  |
| <b>Hynix</b>                 |  |
| 256Mbit (32MByte)            | HY27US08561M                                 |
| 512Mbit (64MByte)            | HY27US08121M                                 |
| 1Gbit (128MByte)             | HY27UA081G1M, HY27UA081G4M                   |
| 2Gbit (256MByte)             | HY27UB082G4M                                 |
| 1Gbit (128MByte) Large Block | HY27UF081G2M                                 |
| <b>Infineon</b>              |  |
| 256Mbit (32MByte)            | HYF33DS256800ATC                             |
| 512Mbit (64MByte)            | HYF33DS512800ATC                             |
| 1Gbit (128MByte)             | HYF33DS1G800ATC                              |
| <b>Micron</b>                |  |
| 2Gbit (256MByte) Large Block | MT29F2G08AAA                                 |
| <b>Samsung</b>               |  |
| 128Mbit (16MByte)            | KM29U128, K9K2808U0, K9F2808U0               |
| 256Mbit (32MByte)            | K9K5608U0, K9F5608U                          |
| 512Mbit (64MByte)            | K9K1208U0, K9F1208U                          |
| 1Gbit (128MByte)             | K9K1G08U0, K9T1G08U0                         |
| 2Gbit (256MByte)             | K9E2G08U0                                    |
| 1Gbit (128MByte) Large Block | K9F1G08U0                                    |
| 2Gbit (256MByte) Large Block | K9K2G08U0, K9F2G08U0                         |
| 4Gbit (512MByte) Large Block | K9K4G08U0, K9W4G08U0                         |
| 8Gbit (1GByte) Large Block   | K9W8G08U0                                    |
| <b>Sandisk</b>               |  |
| 128Mbit (16MByte)            | SDTNFAH-128, SDTNGAHE0-128                   |
| 256Mbit (32MByte)            | SDTNFAH-256, SDTNGAHE0-256                   |
| 512Mbit (64MByte)            | SDTNFAH-512, SDTNGAHE0-512                   |
| 1Gbit (128MByte)             | SDTNFBH-1024, SDTNGBHE0-1024                 |
| 2Gbit (256MByte)             | SDTNGBHE0-2048                               |
| 512Mbit (64MByte) 4LC        | SDTNFCH-512, SDTNGCHE0-512                   |
| 1Gbit (128MByte) 4LC         | SDTNFCH-1024, SDTNGCHE0-1024                 |
| 2Gbit (256MByte) 4LC         | SDTNFDH-2048, SDTNGDHE0-2048, SDTNGCHE0-2048 |
| 1Gbit (128MByte) Big Block   | SDTNGEHE0-1024                               |
| 2Gbit (256MByte) Big Block   | SDTNGFHE0-2048                               |
| <b>ST</b>                    |  |
| 128Mbit (16MByte)            | NAND128W3A                                   |
| 256Mbit (32MByte)            | NAND256W3A                                   |
| 512Mbit (64MByte)            | NAND512W3A                                   |
| 1Gbit (128MByte)             | NAND1GW3A                                    |

| 1Gbit (128MByte) Big Block | NAND1GW3B                                      |
|----------------------------|--|
| <b>Toshiba</b>             |  |
| 128Mbit (16MByte)          | TC58128FT, TC58DVAM72AF1FT                     |
| 256Mbit (32MByte)          | TC58256FT, TC58DVAM82AF1FT                     |
| 512Mbit (64MByte)          | TH58512FT, TC58512FT, TC58512TG, TC58DVM92A1FT |
| 1Gbit (128MByte)           | TH58100FT, TC58DVG02A1FT                       |
| 2Gbit (256MByte)           | TH58DVG12A1TGK0                                |
| 512Mbit (64MByte) 4LC      | TC58005FT, TC58DVM94B1FT                       |
| 1Gbit (128MByte) 4LC       | TC58010FT, TC58DVG04B1FT                       |
| 2Gbit (256MByte) 4LC       | TH58020FT, TC58DVG14B1FT , TH58DVG14B1FT       |
| 1Gbit (128MByte) Big Block | TC58NVG0S3AFT                                  |
| 2Gbit (256MByte) Big Block | TH58NVG1S3AFT                                  |