

# Cervoz Industrial Embedded Module

SATA Disk 7pin Vertical Tall

Titan Series (TLC)

T350 Family

*Product Datasheet*



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## Revision History

| Date       | Revision | Description          |
|------------|----------|----------------------|
| 2020.10.15 | 1.0      | First Released       |
| 2022.12.30 | 1.1      | MTBF and TBW Updated |



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## Table of Contents

|                                       |           |
|---------------------------------------|-----------|
| <b>1. Product Overview.....</b>       | <b>4</b>  |
| 1.1 Introduction.....                 | 4         |
| 1.2 Feature.....                      | 4         |
| 1.3 Product Appearance & Models.....  | 5         |
| <b>2. Product Specifications.....</b> | <b>6</b>  |
| 2.1 General Specifications.....       | 6         |
| 2.2 Performance.....                  | 6         |
| 2.3 Electronic Specifications.....    | 7         |
| 2.3.1 Block Diagram.....              | 7         |
| 2.3.2 Pin Assignment.....             | 8         |
| 2.4 Environmental Specifications..... | 8         |
| 2.5 Mechanical Specifications.....    | 9         |
| <b>3. Supported Command.....</b>      | <b>10</b> |
| 3.1 List of Command Sets.....         | 10        |
| <b>4. Part No. Decoder.....</b>       | <b>11</b> |
| 4.1 Part No. Decoder.....             | 11~12     |

## 1. Product Overview

### 1.1 Introduction

Cervoz Industrial SATA Disk 7pin Vertical Tall Embedded Module T350 is a Solid State Flash Disk product that is in compliance with the SATA III standards. The SATA Disk 7pin Vertical Tall Embedded Module T350 is in low profile form factor and fits in any SATA sockets internally of a PC or on a motherboard; it can be used for both booting or storage purposes.

T350 family uses SSD grade quality 3D NAND flash memory from the industry leading manufacturer Kioxia (Toshiba). Cervoz's firmware builds in a powerful ECC algorithm call Low-Density Parity Check (LDPC) decoding to improve data reliability. This product includes various capacities to choose from.

T350 family offers outstanding performance and reliability; the product family is a good cost-effective solution for semi-industrial and high-capacity storage applications.

### 1.2 Feature

- Compliant with SATA III 6.0Gb/s
- 3D TLC NAND flash memory
- Capacity: 64GB ~ 256GB
- End-to-End data protection
- SLC write cache technology
- Operating as boot disk
- Product includes Standard Temperature range & Wide Temperature range
- Static and dynamic wear leveling
- Bad block management
- S.M.A.R.T. & TRIM command

### 1.3 Product Appearance & Models

#### Cervoz Industrial SATA Disk 7pin Vertical Tall Module T350



| T350 Family<br>Standard Temp. (0°C ~ 70°C)<br>Model No. | T350 Family<br>Wide Temp. (-40°C ~ 85°C)<br>Model No. | Capacity |
|---|---|----------|
| CIE-7TT350TLF064GS                                      | CIE-7TT350TLF064GW                                    | 64GB     |
| CIE-7TT350TMF128GS                                      | CIE-7TT350TMF128GW                                    | 128GB    |
| CIE-7TT350TNF256GS                                      | CIE-7TT350TNF256GW                                    | 256GB    |

**Please Note:**

Since certain storage capacity has to be reserved for firmware and controller management purposes; the physical capacity of the SATA flash module will be approximately 92.5% of the indicated capacity. If you need to install an image that has the exact (or close to) the indicated size of the flash module, please choose your flash module with a greater capacity.

## 2. Product Specifications

### 2.1 General Specifications

|                               |  |
|-------------------------------|--|
| <b>Form Factor</b>            | SATA Disk 7pin Vertical Tall                                 |
| <b>Interface</b>              | SATA III 6.0Gb/s (backward compatible to 3.0Gb/s, 1.5Gb/s)   |
| <b>Connector</b>              | SATA (7pin)  |
| <b>NAND Flash Type</b>        | 3D TLC   |
| <b>Capacity</b>               | 64GB/128GB/256GB   |
| <b>Sequential Read</b>        | up to 550MB/s  |
| <b>Sequential Write</b>       | up to 450MB/s  |
| <b>ECC Scheme</b>             | Applies the LDPC (Low Density Parity Check) of ECC algorithm |
| <b>MTBF</b>                   | >3,000,000 hours   |
| <b>TeraByte Written (TBW)</b> | 64GB : 94<br>128GB : 188<br>256GB : 375                      |
| <b>Low Power Management</b>   | DIPM/HIPM mode   |
| <b>Supply Voltage</b>         | 5V DC +/-5%  |
| <b>Power Consumption</b>      | Active mode: < 1600mW<br>Idle mode: < 350mW                  |
| <b>Dimension (LxWxH)</b>      | 43.67*22.00*6.30mm   |

### 2.2 Performance

The performance was measured with below PC configuration:

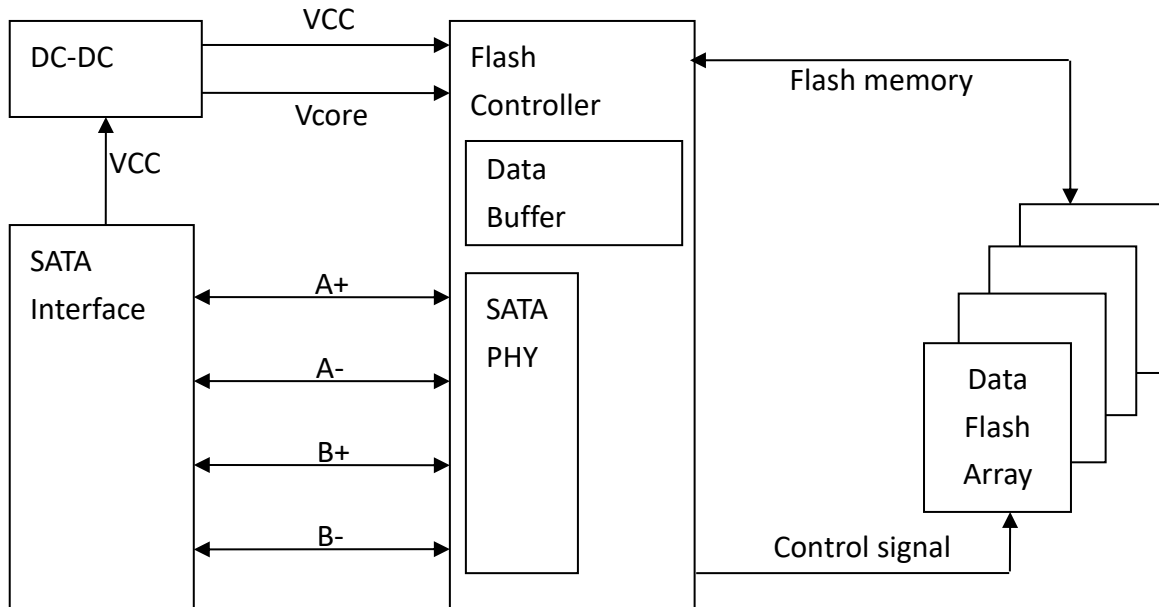
- Platform: ASUS Z97-A (Intel Z97)
- RAM: Cervoz CIR-S3DUSK1604G(DDR3 4G 1600MHz)
- Operation Systems: Windows 7
- Testing Utility: Crystal Disk Mark v5.1.0
- SATAIII port (6.0 Gb/s) performance

| Capacity                       | 64GB    | 128GB   | 256GB   |
|--------------------------------|---------|---------|---------|
| <b>Sequential Read (max.)</b>  | 540MB/s | 550MB/s | 550MB/s |
| <b>Sequential Write (max.)</b> | 255MB/s | 450MB/s | 450MB/s |
| <b>4KB Random Read (QD32)</b>  | 120MB/s | 195MB/s | 285MB/s |
| <b>4KB Random Write (QD32)</b> | 240MB/s | 225MB/s | 320MB/s |

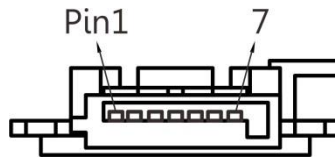
Actual performance may vary depending on use conditions and environment

## 2.3 Electronic Specifications

### 2.3.1 Block Diagram



### 2.2.2 Pin Assignment



| Pin No. | Function | Description                |
|---------|----------|----------------------------|
| S1      | GND      | Ground                     |
| S2      | RX+      | Differential signal pair A |
| S3      | RX-      |                            |
| S4      | GND      | Ground                     |
| S5      | TX-      | Differential signal pair B |
| S6      | TX+      |                            |
| S7      | GND      | Ground                     |

### 2.4 Environmental Specifications

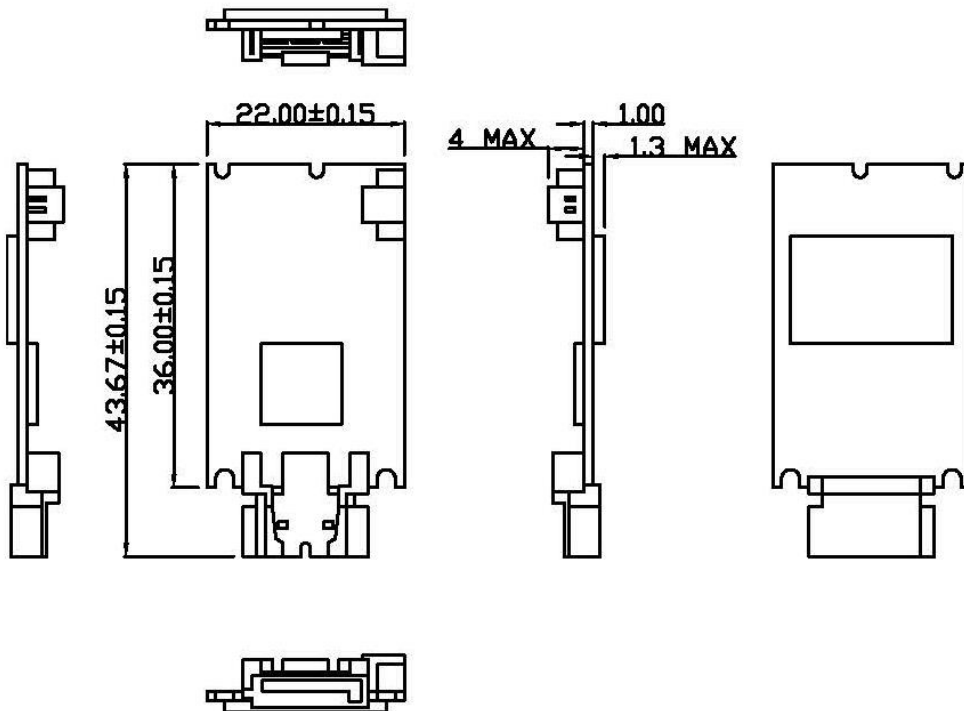
| Type               |                                 | Value                  |
|--------------------|---------------------------------|------------------------|
| <b>Temperature</b> | Standard Temperature Operating: | 0°C~70°C               |
|                    | Standard Temperature Storage:   | -40°C~85°C             |
|                    | Wide Temperature Operating:     | -40°C~85°C             |
|                    | Wide Temperature Storage:       | -50°C~95°C             |
| <b>Humidity</b>    | Operating & Storage             | 10~95%, Non-Condensing |
| <b>Vibration</b>   | Non-Operating                   | 20G, 10Hz~2000Hz       |
| <b>Shock</b>       | Non-Operating                   | 1500G, 0.5ms           |





### 2.5 Mechanical Specifications

| Type        | Value             |
|-------------|-------------------|
| Form Factor | SATA Disk         |
| Length      | 43.67mm +/-0.15mm |
| Width       | 22.00mm +/-0.15mm |
| Thickness   | 6.30mm +/-0.30mm  |



### 3. Supported Command

#### 3.1 List of Command Sets

| Code    | Description                       | Code | Description               |
|---------|-----------------------------------|------|---------------------------|
| 00h     | NOP                               | 97h  | IDLE                      |
| 06h     | Data Set Management               | 98h  | CHECK POWER MODE          |
| 10h-1Fh | Recalibrate                       | 99h  | SLEEP                     |
| 20h     | Read Sectors                      | B0h  | SMART                     |
| 21h     | Read Sectors without Retry        | B1h  | DEVICE CONFIGURATION      |
| 24h     | Read Sectors EXT                  | C4h  | Read Multiple             |
| 25h     | Read DMA EXT                      | C5h  | Write Multiple            |
| 27h     | Read Native Max Address EXT       | C6h  | Set Multiple Mode         |
| 29h     | Read Multiple EXT                 | C8h  | Read DMA                  |
| 2Fh     | Read Log EXT                      | C9h  | Read DMA without Retry    |
| 30h     | Write Sectors                     | CAh  | Write DMA                 |
| 31h     | Write Sectors without Retry       | CBh  | Write DMA without Retry   |
| 34h     | Write Sectors EXT                 | CEh  | Write Multiple FUA EXT    |
| 35h     | Write DMA EXT                     | E0h  | Standby Immediate         |
| 37h     | Set Native Max Address EXT        | E1h  | Idle Immediate            |
| 38h     | CFA WRITE SECTORS WITHOUT ERASE   | E2h  | Standby                   |
| 39h     | Write Multiple EXT                | E3h  | Idle                      |
| 3Dh     | Write DMA FUA EXT                 | E4h  | Read Buffer               |
| 3Fh     | Write Long EXT                    | E5h  | Check Power Mode          |
| 40h     | Read Verify Sectors               | E6h  | Sleep                     |
| 41h     | Read Verify Sectors without Retry | E7h  | Flush Cache               |
| 42h     | Read Verify Sectors EXT           | E8h  | Write Buffer              |
| 45h     | WRITE UNCORRECTABLE EXT           | EAh  | Flush Cache EXT           |
| 60h     | Read FPDMA Queued                 | ECh  | Identify Device           |
| 61h     | Write FPDMA Queued                | EFh  | Set Features              |
| 70h-7Fh | Seek                              | F1h  | Security Set Password     |
| 90h     | Execute Device Diagnostic         | F2h  | Security Unlock           |
| 91h     | Initialize Device Parameters      | F3h  | Security Erase Prepare    |
| 92h     | Download Microcode                | F4h  | Security Erase Unit       |
| 93h     | DOWNLOAD MICROCODE DMA            | F5h  | Security Freeze Lock      |
| 94h     | STANDBY IMMEDIATE                 | F6h  | Security Disable Password |
| 95h     | IDLE IMMEDIATE                    | F8h  | Read Native Max Address   |
| 96h     | STANDBY                           | F9h  | Set Max Address           |

#### 4. Part No. Decoder

##### 4.1 Part No. Decoder

| 1            | - | 2           | 3              | 4   | 5          | 6              | 7          | 8               | 9               |
|--------------|---|-------------|----------------|---|------------|----------------|------------|-----------------|-----------------|
| Product Line | - | Form Factor | Product Series | Cervoz Family Code (Bus / Internal Control) | NAND Flash | Flash Capacity | Flash Mode | Module Capacity | Operating Temp. |
| XXX          | - | XX          | X              | XXX   | X          | X              | X          | XXXX            | X               |

##### 1. Product Line

|     |                                   |
|-----|-----------------------------------|
| CIS | Cervoz Industrial SSD             |
| CIM | Cervoz Industrial Memory Card     |
| CIE | Cervoz Industrial Embedded Module |

##### 2. Form Factor

|    |                                 |
|----|---------------------------------|
| 2S | 2.5" SATA                       |
| 2P | 2.5" PATA                       |
| CF | CompactFlash                    |
| CA | CFast                           |
| MS | mSATA                           |
| HM | Half Size mSATA                 |
| HS | Half Slim                       |
| M4 | M.2 2242                        |
| M6 | M.2 2260                        |
| M8 | M.2 2280                        |
| 0V | PATA Disk 40pin Vertical        |
| 4V | PATA Disk 44pin Vertical        |
| 4L | PATA Disk 44pin Horizontal Left |
| 7T | SATA Disk 7pin Vertical Tall    |
| 7L | SATA Disk 7pin Horizontal Left  |
| 7R | SATA Disk 7pin Horizontal Right |

##### 3. Product Series

|   |                          |
|---|--------------------------|
| S | Supreme Series (SLC)     |
| R | Reliance Series (RO-MLC) |
| M | Momentum Series (MLC)    |
| T | Titan Series (TLC)       |

#### 4. Cervoz Family Code

Bus and Internal Control for Cervoz Product Families

##### 5. NAND Flash

|   |         |
|---|---------|
| M | Micron  |
| T | Toshiba |
| K | Kioxia  |

## 6. Flash Capacity

|   |       |
|---|-------|
| A | 256Mb |
| B | 512Mb |
| C | 1Gb   |
| D | 2Gb   |
| E | 4Gb   |
| F | 8Gb   |
| G | 16Gb  |
| H | 32Gb  |
| I | 64Gb  |
| J | 128Gb |
| K | 256Gb |
| L | 512Gb |
| M | 1Tb   |
| N | 2Tb   |
| O | 4Tb   |

## 7. Flash Mode

Internal Control for Flash Mode

## 8. Module Capacity

|      |       |
|------|-------|
| 128M | 128MB |
| 256M | 256MB |
| 512M | 512MB |
| 001G | 1GB   |
| 002G | 2GB   |
| 004G | 4GB   |
| 008G | 8GB   |
| 016G | 16GB  |
| 032G | 32GB  |
| 064G | 64GB  |
| 128G | 128GB |
| 256G | 256GB |
| 512G | 512GB |
| 001T | 1TB   |
| 002T | 2TB   |

## 9. Operating Temperature

|   |                                      |
|---|--------------------------------------|
| S | Standard Grade (0~ +70°C)            |
| W | Wide Temperature Grade (-40 ~ +85°C) |