

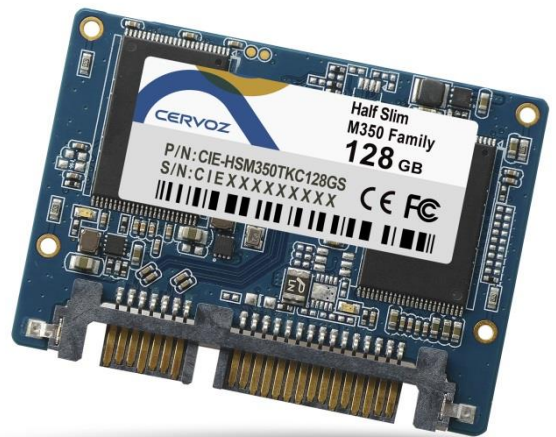
Cervoz Industrial Embedded Module

Half Slim

Momentum Series (MLC)

M350 Family

Product Datasheet





Revision History

| Date | Revision | Description |
|------------|-------------|----------------------------------|
| 2017.03.03 | Preliminary | First Released |
| 2017.03.09 | 1.0 | Product Picture Added |
| 2017.03.27 | 1.1 | 3.1 List of Command Sets Updated |
| 2017.05.26 | 1.2 | 1.3 Ordering Information Added |



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1. Product Overview

1.1 Introduction

Cervoz Industrial Half Slim Embedded Module M350 family is a Solid State Disk product that is in compliance with the SATA III standards. The device design is based on the 7pin for data segment and 15pin for power segment standards. The Half Slim Embedded Module M350 family fits in any 7+15 SATA sockets on a motherboard; it can be used for both booting or storage purposes.

M350 family uses superior quality preselected multi-level cell (MLC) NAND flash memory from the industry leading manufacturer Toshiba. This product includes various capacities to choose from.

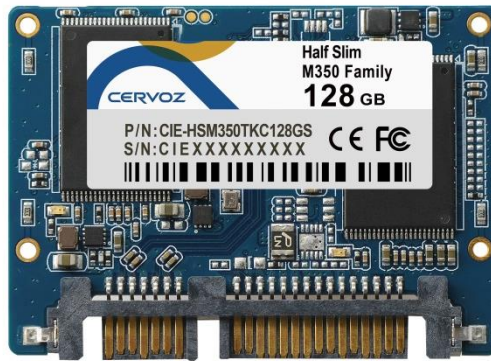
M350 family offers outstanding performance and reliability; the product family is a perfect solution for price sensitive semi-industrial and general industrial applications.

1.2 Feature

- Compliant with SATA III 6.0Gb/s
- MLC NAND flash memory
- Capacity: 32GB ~ 128GB
- 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 Half Slim Module M350



| M350 Family Standard Temp. (0°C ~ 70°C) Model No. | M350 Family Wide Temp. (-40°C ~ 85°C) Model No. | Capacity |
|---|---|----------|
| CIE-HSM350TJC032GS | CIE-HSM350TJC032GW | 32GB |
| CIE-HSM350TJC064GS | CIE-HSM350TJC064GW | 64GB |
| CIE-HSM350TKC128GS | N/A | 128GB |

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

| | |
|-------------------------------|--|
| Form Factor | Half Slim |
| Interface | SATA III 6.0Gb/s (backward compatible to 3.0Gb/s, 1.5Gb/s) |
| Connector | SATA (7+15pin) |
| NAND Flash Type | MLC |
| Capacity | Standard Temp. : 32GB/64GB/128GB Wide Temp. : 32GB/64GB |
| Sequential Read | up to 495MB/s |
| Sequential Write | up to 315MB/s |
| ECC Scheme | Applies the LDPC (Low Density Parity Check) of ECC algorithm |
| MTBF | 2,000,000 hours |
| TeraByte Written (TBW) | 32GB : 31 64GB : 63 128GB : 125 |
| Low Power Management | DIPM/HIPM mode |
| Supply Voltage | +5.0V DC +/-5% |
| Power Consumption | Active mode: < 1600mW Idle mode: < 285mW |
| Dimension (LxWxH) | 54.00*39.00*4.00mm |

2.2 Performance

The performance was measured with below PC configuration:

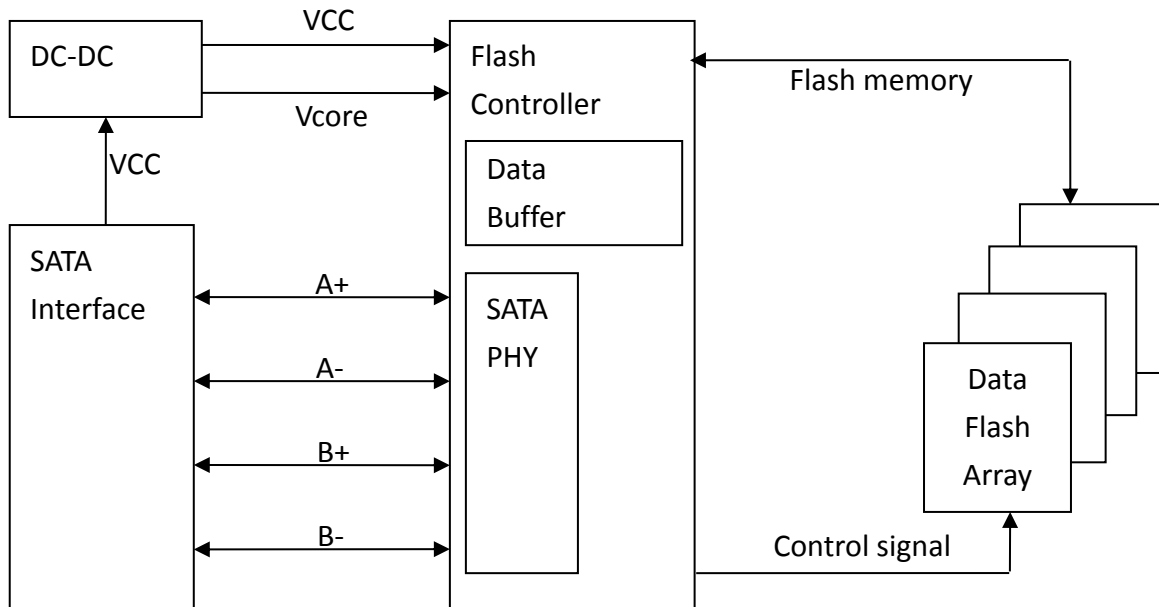
- Platform: ASUS Z97-A (Intel Z97)
- RAM: Cervoz CIR-S3DUSK1604G(DDR3 4G 1600MHz)
- Operation Systems: Windows 7
- Testing Utility: Crystal Disk Mark v5.1.0
- SATAIII port (6.0 Gb/s) performance

| Capacity | 32GB | 64GB | 128GB |
|--------------------------------|---------|---------|---------|
| Sequential Read (max.) | 515MB/s | 505MB/s | 495MB/s |
| Sequential Write (max.) | 160MB/s | 265MB/s | 315MB/s |
| 4KB Random Read (QD32) | 140MB/s | 255MB/s | 355MB/s |
| 4KB Random Write (QD32) | 110MB/s | 145MB/s | 240MB/s |

Actual performance may vary depending on use conditions and environment

2.3 Electronic Specifications

2.3.1 Block Diagram



2.3.2 Pin Assignment



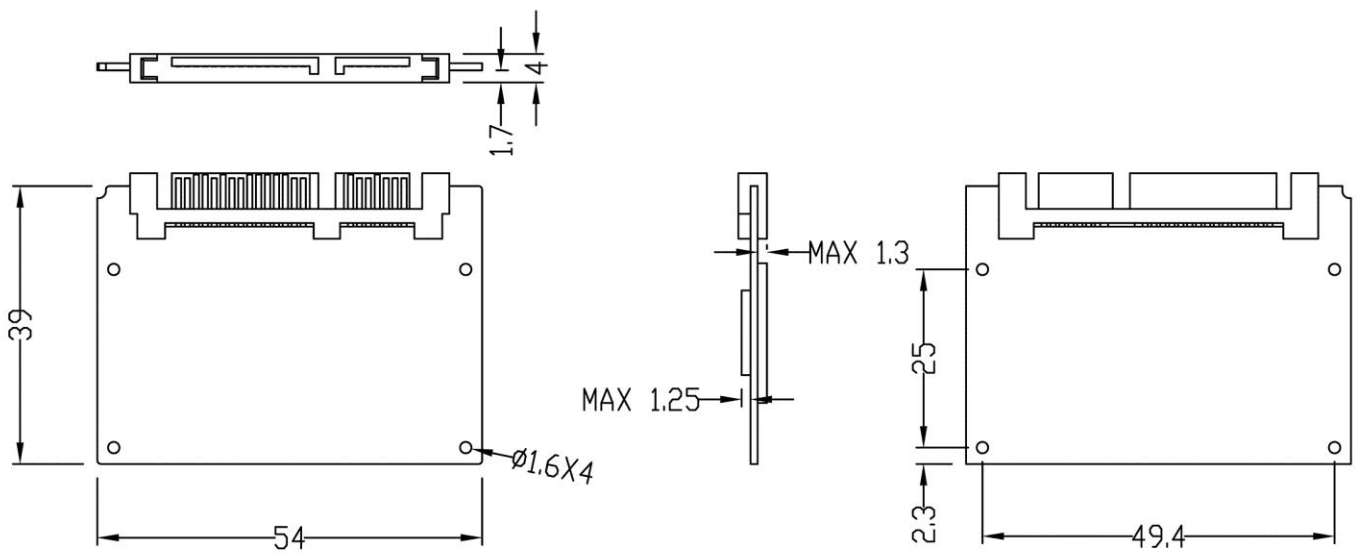
| Group | Pin No. | Function | Description |
|--------------------------|---------|----------|----------------------------|
| Signal Segment | S1 | GND | Ground |
| | S2 | A+ | Differential Signal Pair A |
| | S3 | A – | Differential Signal Pair A |
| | S4 | GND | Ground |
| | S5 | B – | Differential Signal Pair B |
| | S6 | B+ | Differential Signal Pair B |
| | S7 | GND | Ground |
| Key & Spacing | | | |
| Power Segment | P1 | NC | Not Used (3.3V Power) |
| | P2 | NC | Not Used (3.3V Power) |
| | P3 | DEVSLP | Device Sleep Mode |
| | P4 | GND | Ground |
| | P5 | GND | Ground |
| | P6 | GND | Ground |
| | P7 | V5 | 5V Power, Pre-charge |
| | P8 | V5 | 5V Power |
| | P9 | V5 | 5V Power |
| | P10 | GND | Ground |
| | P11 | Reserved | Reserved |
| | P12 | GND | Ground |
| | P13 | NC | Not Used |
| | P14 | NC | Not Used |
| | P15 | NC | Not Used |

2.4 Environmental Specifications

| Type | | Value |
|--------------------|---------------------------------|------------------------|
| Temperature | 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 |
| Humidity | Operating & Storage | 10~95%, Non-Condensing |
| Vibration | Non-Operating | 20G, 10Hz~2000Hz |
| Shock | Non-Operating | 1500G, 0.5ms |

2.5 Mechanical Specifications

| Type | Value |
|-------------|-------------------|
| Form Factor | Half Slim |
| Length | 54.00mm +/-0.15mm |
| Width | 39.00mm +/-0.15mm |
| Thickness | 4.00mm +/-0.15mm |



3. Supported Command

3.1 List of Command Sets

| Code | Description | Code | Description |
|----------|-----------------------------------|----------|---|
| 00h | NOP | B0h, D1h | SMART READ DATA ATTRIBUTE THRESHOLD |
| 06h | Data Set Management | B0h, D2h | SMART ENABLE/DISABLE ATTRIBUTE AUTOSAVE |
| 10h | Recalibrate | B0h, D3h | SMART SAVE ATTRIBUTE VALUES |
| 20h | Read Sectors | B0h, D4h | SMART EXECUTE OFF-LINE IMMEDIATE |
| 21h | Read Sectors without Retry | B0h, D5h | SMART READ LOG |
| 24h | Read Sectors EXT | B0h, D6h | SMART WRITE LOG |
| 25h | Read DMA EXT | B0h, D8h | SMART ENABLE OPERATIONS |
| 27h | Read Native Max Address EXT | B0h, D9h | SMART DISABLE OPERATIONS |
| 29h | Read Multiple EXT | B0h, DAh | SMART RETURN STATUS |
| 2Fh | Read Log EXT | B0h, DBh | SMART ENABLE/DISABLE AUTOMATIC OFF-LINE |
| 30h | Write Sectors | B1h | DEVICE CONFIGURATION OVERLAY |
| 31h | Write Sectors without Retry | B1h, C0h | DEVICE CONFIGURATION RESTORE |
| 34h | Write Sectors EXT | B1h, C1h | DEVICE CONFIGURATION FREEZE LOCK |
| 35h | Write DMA EXT | B1h, C2h | DEVICE CONFIGURATION IDENTIFY |
| 37h | Set Native Max Address EXT | B1h, C3h | DEVICE CONFIGURATION SET |
| 39h | Write Multiple EXT | B1h, C4h | DEVICE CONFIGURATION IDENTIFY DMA |
| 3Dh | Write DMA FUA EXT | B1h, C5h | DEVICE CONFIGURATION SET DMA |
| 3Fh | Write Long EXT | C4h | Read Multiple |
| 40h | Read Verify Sectors | C5h | Write Multiple |
| 41h | Read Verify Sectors without Retry | C6h | Set Multiple Mode |
| 42h | Read Verify Sectors EXT | C8h | Read DMA |
| 45h | Write Uncorrectable EXT | C9h | Read DMA without Retry |
| 47h | Read Log DMA EXT | CAh | Write DMA |
| 57h | Write Log DMA EXT | CBh | Write DMA without Retry |
| 60h | Read FPDMA Queued | CEh | Write Multiple FUA EXT |
| 61h | Write FPDMA Queued | E0h | Standby Immediate |
| 70h | Seek | E1h | Idle Immediate |
| 90h | Execute Device Diagnostic | E2h | Standby |
| 91h | Initialize Device Parameters | E3h | Idle |
| 92h | Download Microcode | E4h | Read Buffer |
| 93h | Download Microcode DMA | E5h | Check Power Mode |
| B0h | SMART | E6h | Sleep |
| B0h, D0h | SMART READ DATA | E7h | Flush Cache |

| Code | Description | Code | Description |
|---------------|--|------------------|---|
| E8h | Write Buffer | Efh, 82h | Disable write cache |
| E9h | Read Buffer DMA | Efh, 85h | Disable advanced power management |
| EAh | Flush Cache EXT | Efh, 90h | Disable use of Serial ATA feature set |
| EBh | Write Buffer DMA | Efh, 90h, 02h | Disable DMA Setup FIS Auto-Activate optimization |
| ECh | Identify Device | Efh, 90h, 03h | Disable Device-initiated interface power state (DIPM) transitions |
| EFh | Set Features | Efh, 90h, 06h | Disable Software Settings Preservation (SSP) |
| Efh, 02h | Enable 8-bit PIO transfer mode | Efh, 90h, 07h | Disable Device Automatic Partial to Slumber transitions |
| Efh, 03h | Set transfer mode based on value in Count field | Efh, 90h, 09h | Disable Device Sleep |
| Efh, 05h | Enable advanced power management | Efh, AAh | Enable read look-ahead feature |
| Efh, 10h | Enable use of Serial ATA feature | Efh, CCh | Enable reverting to power-on defaults |
| Efh, 10h, 02h | Enable DMA Setup FIS Auto-Activate optimization | F1h | Security Set Password |
| Efh, 10h, 03h | Enable Device-initiated interface power state (DIPM) transitions | F2h | Security Unlock |
| Efh, 10h, 06h | Enable Software Settings Preservation (SSP) | F3h | Security Erase Prepare |
| Efh, 10h, 07h | Enable Device Automatic Partial to Slumber transitions | F4h | Security Erase Unit |
| Efh, 10h, 09h | Enable Device Sleep | F5h | Security Freeze Lock |
| Efh, 55h | Disable read look-ahead feature | F6h | Security Disable Password |
| Efh, 66h | Disable reverting to power-on defaults | F8h | Read Native 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) | Flash Brand | 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) |

4. Cervoz Family Code

Bus and Internal Control for Cervoz Product Families

5. Flash Brand

| | |
|---|---------|
| M | Micron |
| T | Toshiba |

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 |

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 |

9. Operating Temperature

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