Embedded Storage

# FerriSSD® Module

## SATA Solid-State Drive Bx Series

## Datasheet

(Simplified Edition)

| | |
|---|---|
| **Revision 1.7** | **Dec 2018** |

**Document Confidentiality Statement**

The information contained in these documents is confidential, privileged and only for the information of the intended recipient and should not be disclosed to any other person. It may not be used, published or redistributed in whole, or in part, nor many any of the information contained therein be disclosed without the prior written consent of Silicon Motion, Inc. and its affiliates (collectively "SMI").

The recipient hereby agrees that reading of this datasheet is strictly limited to her/him as authorized by SMI. If any statement, notice, requirement and/or disclaimer set forth hereunder is unacceptable, the recipient shall return this document to SMI's contact window without any delay or it is deemed to be agreed and accepted by the recipient and her/his representing companies, incorporations, or any legal entity of these statements, notices, requirements and/or disclaimers.

**IMPORTANT NOTICE**

INFORMATION IN THIS DOCUMENT IS PROVIDED IN CONNECTION WITH PRODUCTS OF SILICON MOTION, INC. AND ITS AFFILIATES (COLLECTIVELY "SMI"). ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE. NO LICENSE, EXPRESS OR IMPLIED, BY ESTOPPEL OR OTHERWISE, TO ANY INTELLECTUAL PROPERTY RIGHTS IS GRANTED BY THIS DOCUMENT. EXCEPT AS PROVIDED IN SMI'S TERMS AND CONDITIONS OF SALE FOR SUCH PRODUCTS, SMI ASSUMES NO LIABILITY WHATSOEVER, AND SMI DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY, RELATING TO SALE AND/OR USE OF SMI PRODUCTS INCLUDING LIABILITY OR WARRANTIES FOR FITNESS FOR A PARTICULAR PURPOSE, MERCHANTABILITY, OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT.

SMI, its agents, and employees, and all persons acting on its or their behalf, disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Statements regarding the suitability of products for certain types of applications are based on SMI's knowledge of typical requirements that are often placed on SMI's products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is customer's responsibility to validate that a particular product with the properties described in the product specification and/or datasheet is suitable for use in a particular application.

SMI products are not intended for use in medical, life saving, life sustaining, critical control or safety systems, or in nuclear facility applications. SMI may make changes to specifications and product descriptions at any time, without notice. SMI may have patents or pending patent applications, trademarks, copyrights, or other intellectual property rights that relate to the presented subject matter. The furnishing of documents and other materials and information does not constitute any license, express or implied, by estoppel or otherwise, to any such patents, trademarks, copyrights, or other intellectual property rights. The information in this document is furnished for informational use only, is subject to change without notice, and should not be construed as a commitment by SMI. SMI assumes no responsibility or liability for any errors or inaccuracies that may appear in this document or any software that may be provided in association with this document. Except as permitted by the permitted use abovementioned, no part of this document may be reproduced, stored in a retrieval system, or transmitted in any form or by any means without the express written consent of SMI. Contact your local SMI sales office or your distributor to obtain the latest specifications and before placing your product order.

Silicon Motion and Silicon Motion logo are registered trademarks of SMI and/or its affiliates. Other brand names mentioned herein are for identification purposes only and may be trademarks and/or registered trademarks of their respective owners.



**www.siliconmotion.com**

**Revision History**

| Revision | Date | Description |
|---|---|---|
| 0.1 | Mar 21, 2012 | Initial release |
| 1.0 | Sep 17, 2012 | Official release<br>• Updated the FerriSSD trademark logo, document title, and a few descriptions (1)<br>• Updated non-operating and storage temperature (1.2) (5.1)<br>• Added performance values<br>• Updated and added commands, SMART data, and ID table (4)<br>• Updated reliability data (6)<br>• Updated product coding rule (7) |
| 1.1 | Nov 14, 2012 | Removed the wet bulb parameter from Table 12 (5.2) |
| 1.2 | Jul 31, 2013 | • Added FerriSSD Module BB Series<br>• Updated SATA interface rate support and added trim command support(1.2)<br>• Updated FerriSSD M297 mechanical drawing (3.2)<br>• Updated FerriSSD M297 pin assignments/functions: P1, P2, P3 (3.2.1)<br>• Updated FerriSSD M300 pin assignments/functions: P42, P43, P44 (3.3.2)<br>• Updated part number and product coding rule (7)<br>• Moved 3.1 Supply Voltage to (2.2)<br>• Removed FerriSSD M25 and Error Rate definition (1.2) (3) (7.1)<br>• Updated and added commands in the Comment Set Table and the note<br>• Updated the ID table (Table 3) and added the notes: word 77-79, 100-103, 162, 163, 169, 222, and 255 (4.2)<br>• Minor description update of Life Expectancy (6.2) |
| 1.3 | Jul 31, 2014 | • Added FerriSSD M25 (1.2) (2.2) (3.1) (7.1)<br>• Fixed typo of Command Set: RUF Feature Set (4.1)<br>• Fixed typo of Identify Device Data: Word 218-221 (4.2)<br>• Updated the reliability data (6.1) (6.2) |
| 1.4 | Oct 24, 2014 | • Added FerriSSD Module BC series<br>• Updated XtendFerri P/E cycle (6.2)<br>• Updated the Identify Device Data : word 2, word 4 and word 5 (Table 3) |
| 1.5 | Feb 13, 2015 | • Added BD series<br>• Added FerriSSD M.2 form factor (1.2) (2.2) (3.4) (7.1)<br>• Removed the system performance values (2.4)<br>• Updated the dimensions and mechanical drawings of FerriSSD M25, M297, and M300 form factors (3.1.1) (3.2.1) (3.3.1) |
| 1.6 | Jan 15, 2018 | • Updated product descriptions and key features (1.1) (1.2)<br>• Added FerriSSD DOM and correspondent specifications (2.2) (3.5) (7.1) |
| 1.7 | Dec 26, 2018 | • Released the simplified edition<br>• Fixed the function definitions of pin S5 and S6 in FerriSSD M25, M297, and DOM (3.1.2) (3.2.2) (3.5.2) |

# Table of Contents

# 1. Overview

## 1.1 Product Description

Silicon Motion leverages the industry leading technologies and experiences introduce the fully integrated FerriSSD® module in small and light form factors for consumer applications such as tablets, navigation, thin-client, as well as a variety of embedded applications.

The FerriSSD is designed optimally for a wide range of embedded applications that behaves like a SATA hard drive featuring fast access time and enhanced endurance. Without any moving mechanical parts, The FerriSSD provides a shock-protected and quiet-operating environment for mobile storage requirements. The combinations of Silicon Motion advanced technologies such as error correction, bad block management, and IntelligentScan™ monitoring application enable FerriSSD DataRefresh™ to deliver the most robust data integrity and protection in SSD storage.

With high reliability, industry-leading performance and programmable firmware, the FerriSSD is the ultimate non-volatile storage solution for today's fast-moving consumer electronics as well as industrial level applications. The FerriSSD module is available in various form factors and densities for different storage needs.

## 1.2 Key Features

- Host Interface
  - Industrial Standard SATA1.5Gbps / 3.0Gbps interface rate
  - SATA Device Sleep (DevSleep) and Partial/Slumber power saving modes supported
  - Supports trim command with indeterminate pattern [1]
- High Capacity
  - Supports unformatted capacity up to 64GB
- Small Form Factor
  - FerriSSD M25: 2.5" case
  - FerriSSD M297: Slim Lite (MO-297)
  - FerriSSD M300: mSATA (MO-300A)
  - FerriSSD M.2: M.2 SSD (type 2242)
  - FerriSSD DOM: SATA DOM (Disk On Module)
- Easy-to-Use
  - The Plug & Play device only requires format/fdisk prior to use
- Enhanced Data Reliability
  - Advanced Hardware BCH Error Correcting Code (ECC) Engine
  - StaticDataRefresh and EarlyRetirement technologies ensure the data reliability

[1] The trim command is an option.

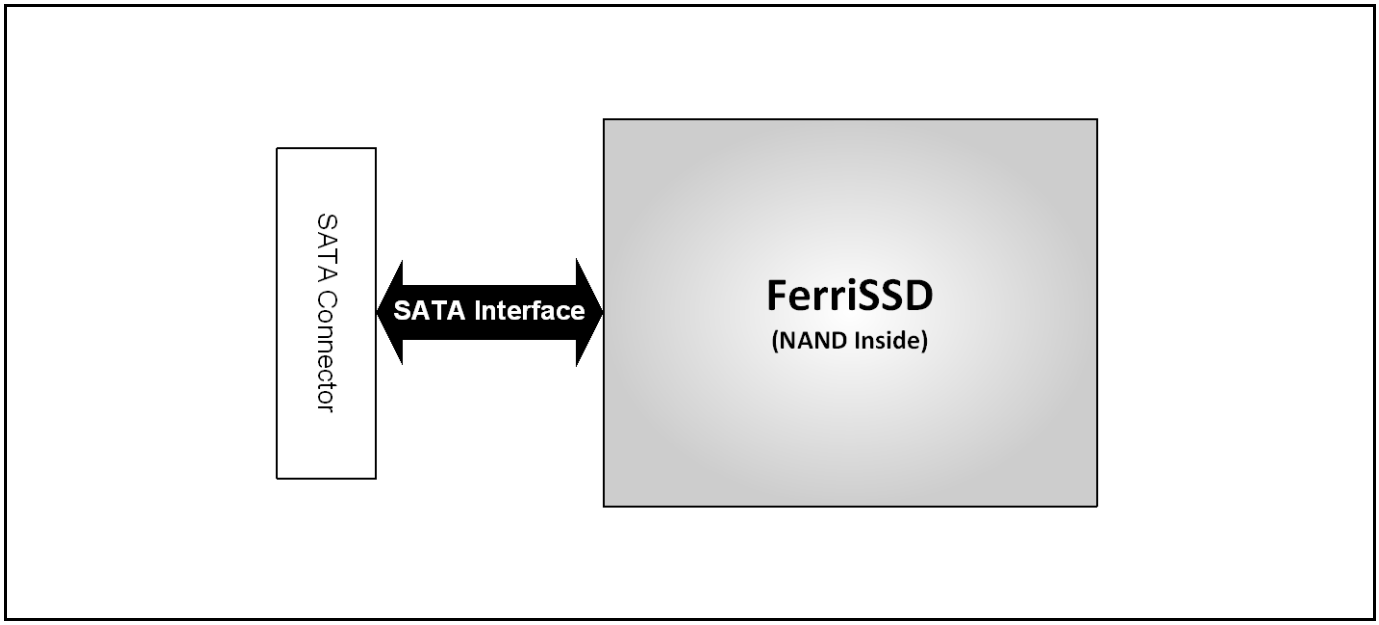
- Robust Data Protection
  - Advanced system level protection against unstable power supply
  - Multiple data security zones
  - PowerShield and DataPhoenix technologies support power-down data protection and recovery
- SSD Status Monitoring
  - Supports Self-Monitoring, Analysis, and Reporting Technology (S.M.A.R.T.) commands
- Advanced Global Wear Leveling
  - Fully utilizes all memory blocks across management units/die(s)
  - Maximizes the SSD lifespan with low Write Amplification Index (WAI)
- Advanced Security
  - Supports ATA8 security feature set
  - Supports real time Full Disk Encryption (FDE) with Advanced Encryption Standard (AES) 128/256-bit strength [2]
  - Supports hardware SHA-256 and True Random Number Generator (TRNG) [2]
- Power Supply: 5V/3.3V [3]
- Temperature Range
  - Operating Temperature - Commercial : 0°C ~ 70°C
  - Operating Temperature - Industrial: -40°C ~ +85°C
  - Non-Operating and Storage Temperature: -55°C ~ +85°C

[2] The encryption function is an option. Refer to 7.1 product coding rule and FerriSSD selection guide for details.

[3] 5V applies to FerriSSD M25, FerriSSD M297 and FerriSSD DOM; 3.3V applies to FerriSSD M300 and FerriSSD M.2.

## 1.3 Block Diagram

**Figure 1: FerriSSD Block Diagram**



# 2. Product Specifications

## 2.1 Host Interface

The FerriSSD complies to the following industrial standards:

- Serial ATA Revision 2.6
- SATA 1.5/3.0Gbps interface rate
- ATA/ATAPI-8

## 2.2 Supply Voltage

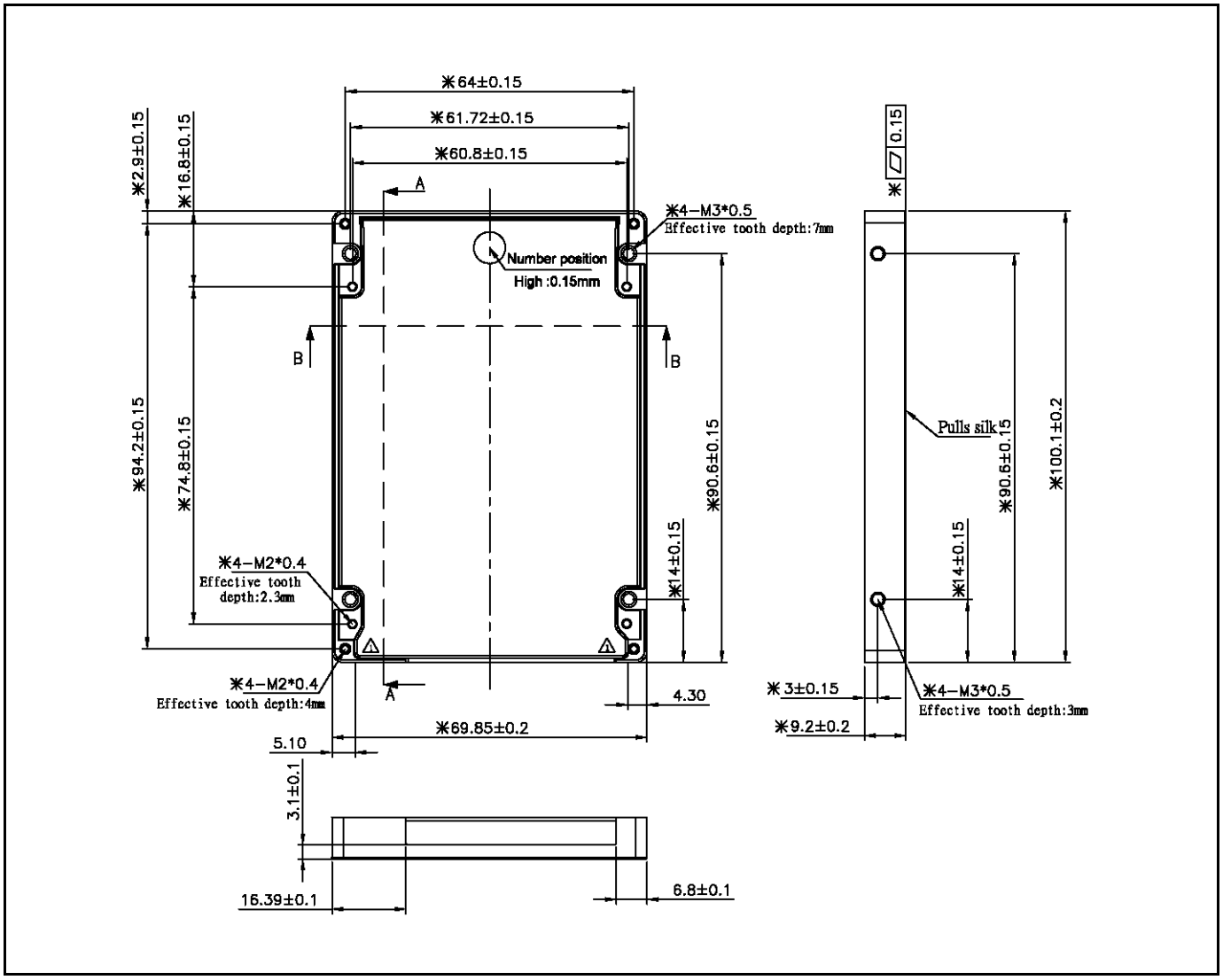
**Table 1: FerriSSD Module Supply Voltage**

| Model | Min | Typ | Max | Unit |
|---|---|---|---|---|
| FerriSSD M25 | 4.5 | 5 | 5.5 | V |
| FerriSSD M297 | 4.5 | 5 | 5.5 | V |
| FerriSSD M300 | 3 | 3.3 | 3.6 | V |
| FerriSSD M.2 | 3.135 | 3.3 | 3.465 | V |
| FerriSSD DOM | 4.5 | 5 | 5.5 | V |

# 3. Physical Specifications

## 3.1 FerriSSD M25 (2.5”)

### *3.1.1 FerriSSD M25 Mechanical Drawing*



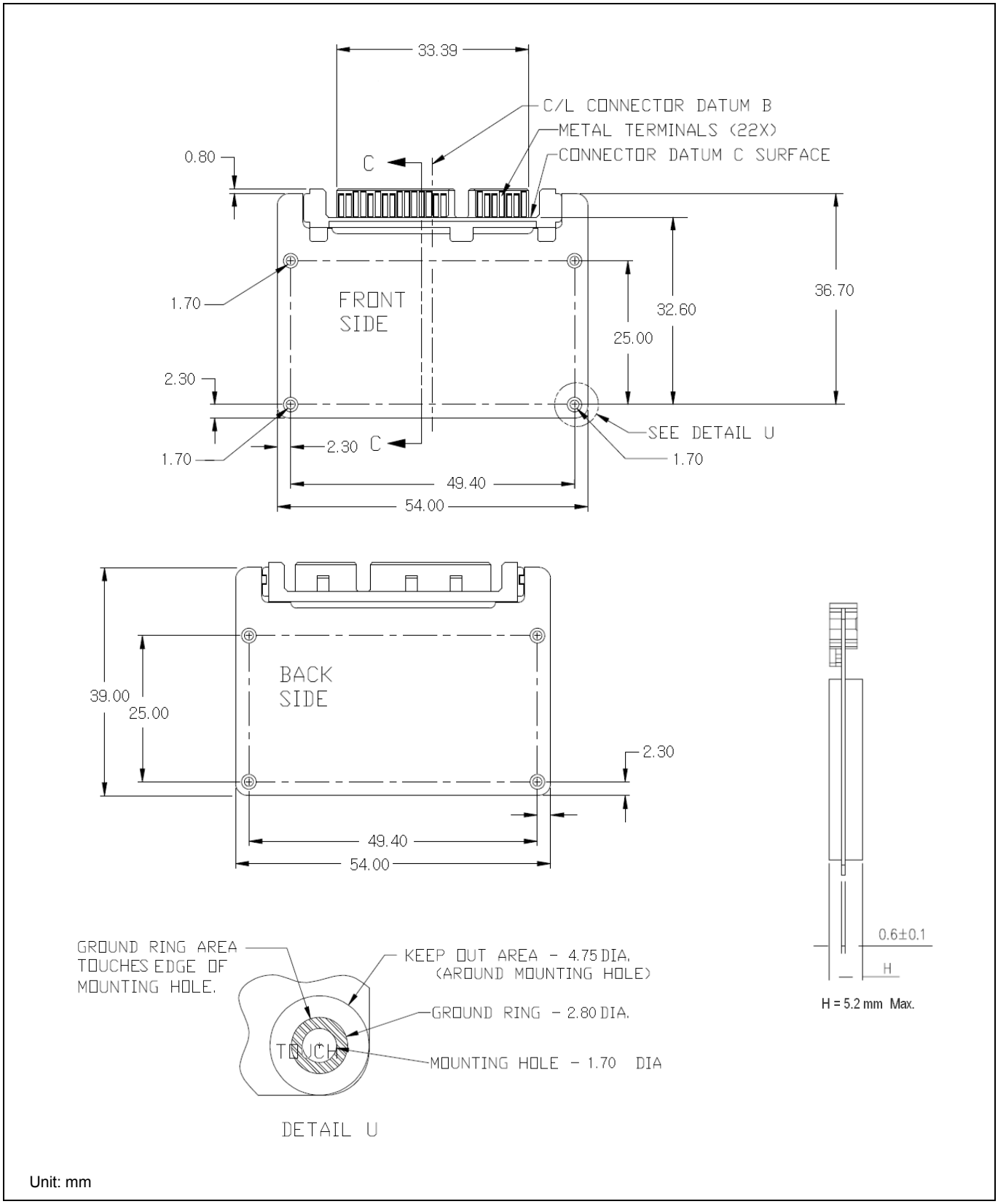

Unit: mm

### *3.1.2 FerriSSD M25 Pin Assignments*

| Segment | Pin | Function | Description |
|---|---|---|---|
| Signal Segment | S1 | GND | |
| | S2 | A+ | RXp |
| | S3 | A- | RXn |
| | S4 | GND | |
| | S5 | B- | TXn |
| | S6 | B+ | TXp |
| | S7 | GND | |
| Power Segment | P1 | V33 | 3.3V Power |
| | P2 | V33 | 3.3V Power |
| | P3 | V33 | 3.3V Power |
| | P4 | GND | |
| | P5 | GND | |
| | P6 | GND | |
| | P7 | 5V | 5V Power |
| | P8 | 5V | 5V Power |
| | P9 | 5V | 5V Power |
| | P10 | GND | |
| | P11 | DAS | Device Activity Signal |
| | P12 | GND | |
| | P13 | V12 | 12V Power |
| | P14 | V12 | 12V Power |
| | P15 | V12 | 12V Power |

## 3.2 FerriSSD M297 (Slim Lite)

### *3.2.1 FerriSSD M297 Mechanical Drawing*

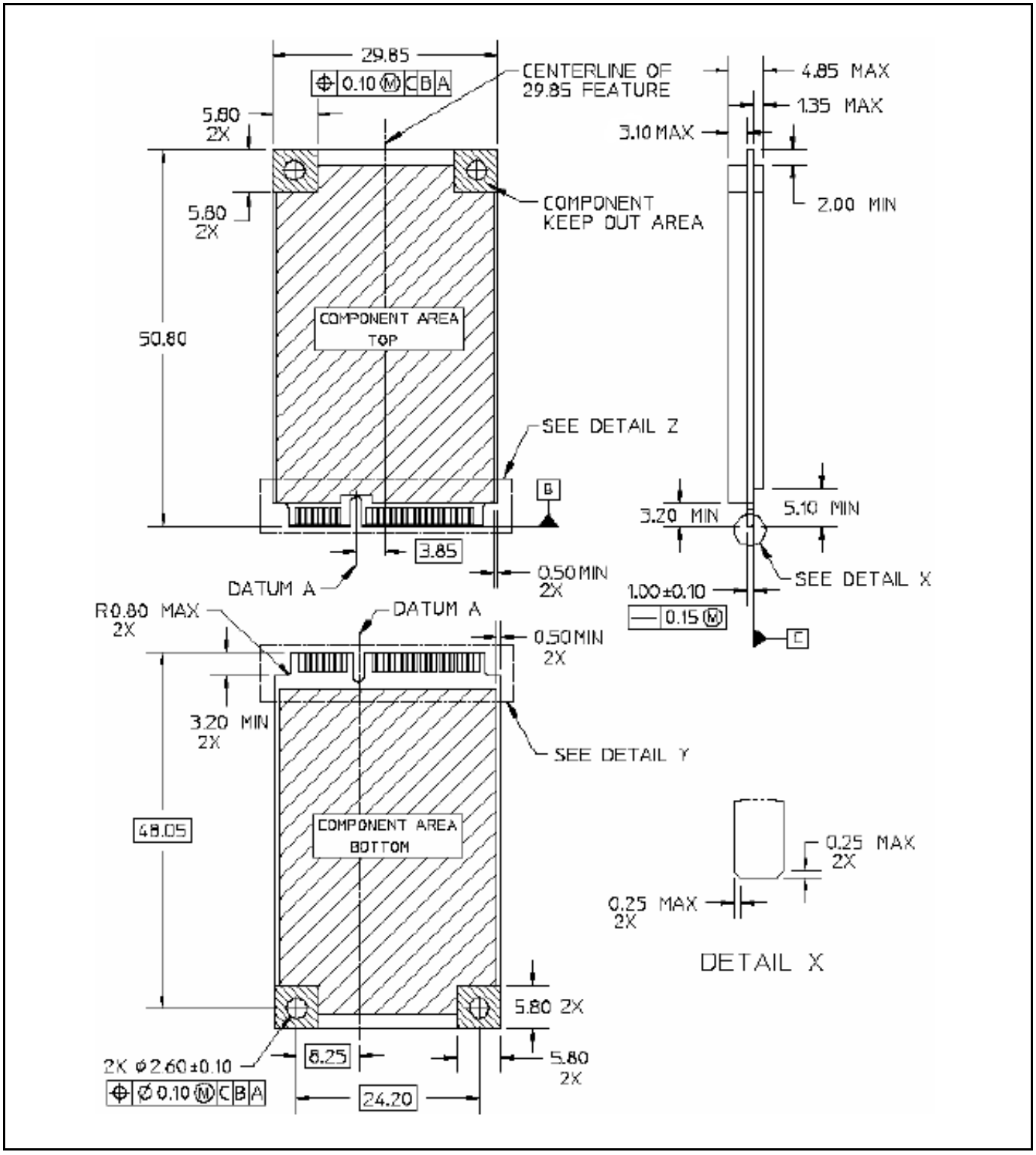


### 3.2.2 *FerriSSD M297 Pin Assignments*

| Segment | Pin | Function | Description |
|---|---|---|---|
| Signal Segment | S1 | GND | |
| | S2 | A+ | RXp |
| | S3 | A- | RXn |
| | S4 | GND | |
| | S5 | B- | TXn |
| | S6 | B+ | TXp |
| | S7 | GND | |
| Power Segment | P1 | Retired | |
| | P2 | Retired | |
| | P3 | DEVSLP | SATA DEVSLP (Device Sleep) Signal |
| | P4 | GND | |
| | P5 | GND | |
| | P6 | GND | |
| | P7 | 5V | 5V Power |
| | P8 | 5V | 5V Power |
| | P9 | 5V | 5V Power |
| | P10 | GND | |
| | P11 | DAS | Device Activity Signal |
| | P12 | GND | |
| | P13 | V12 | 12V Power |
| | P14 | V12 | 12V Power |
| | P15 | V12 | 12V Power |

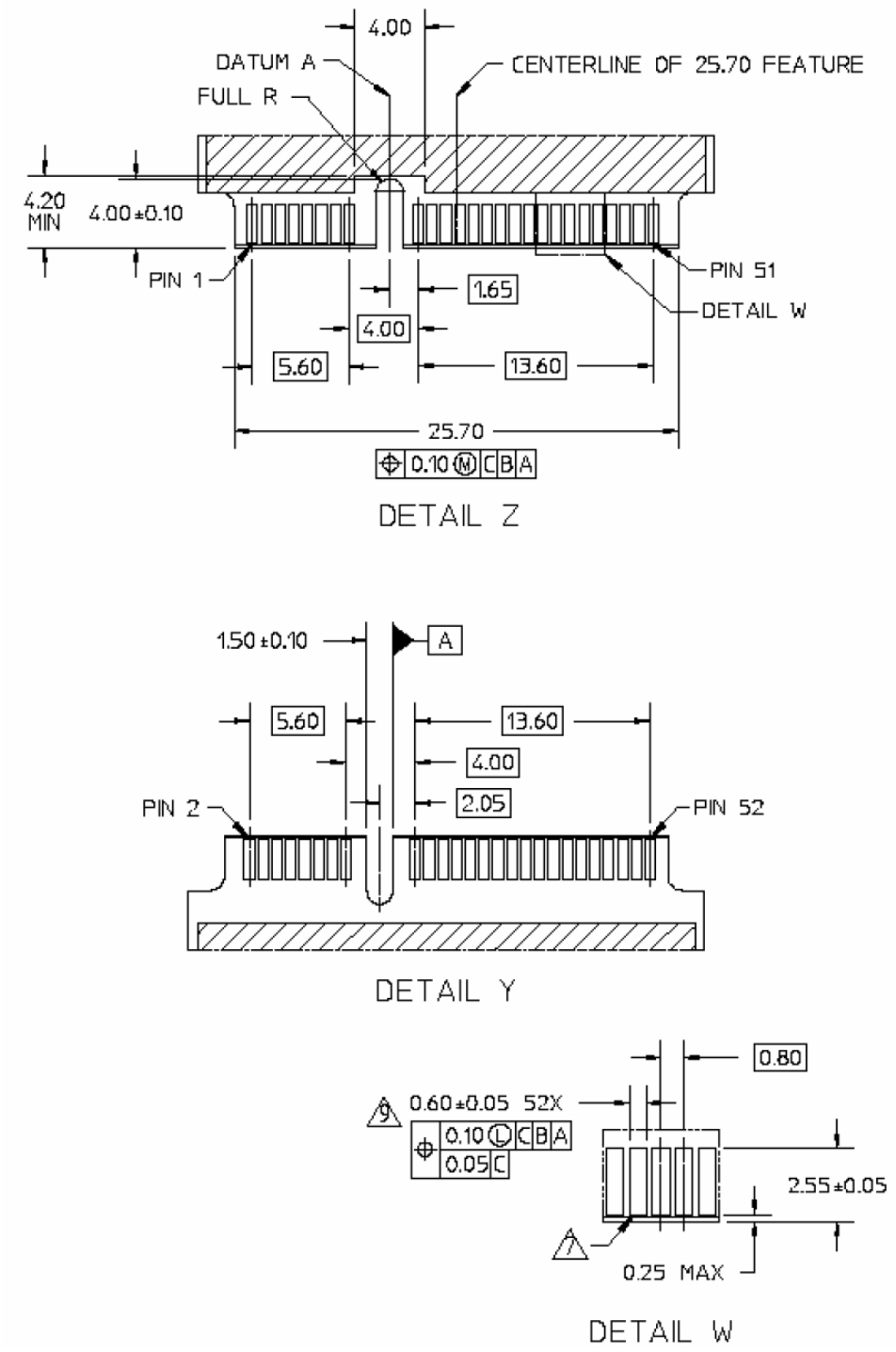
## 3.3 FerriSSD M300 (mSATA)

### *3.3.1 FerriSSD M300 Mechanical Drawing*




Unit: mm

**Detailed Z, Y, W**




Unit: mm

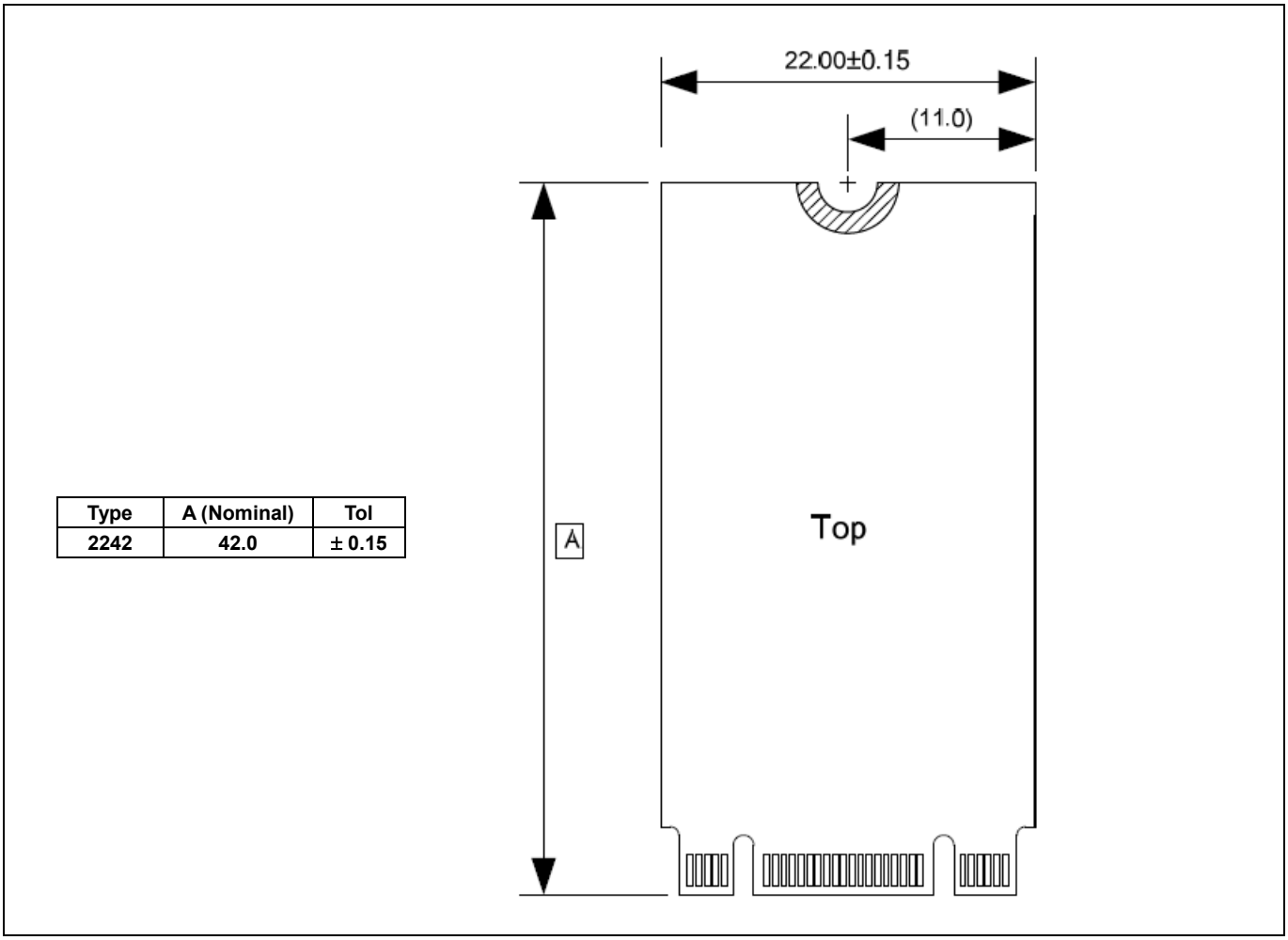
### 3.3.2 FerriSSD M300 Pin Assignments

| Pin | Type | Description |
|---|---|---|
| P1 | Reserved | No Connect |
| P2 | +3.3V | 3.3V Source |
| P3 | Reserved | No Connect |
| P4 | GND | Return Current Path |
| P5 | Reserved | No Connect |
| P6 | +1.5V | 1.5V Source |
| P7 | Reserved | No Connect |
| P8 | Reserved | No Connect |
| P9 | GND | Return Current Path |
| P10 | Reserved | No Connect |
| P11 | Reserved | No Connect |
| P12 | Reserved | No Connect |
| P13 | Reserved | No Connect |
| P14 | Reserved | No Connect |
| P15 | GND | Return Current Path |
| P16 | Reserved | No Connect |
| P17 | Reserved | No Connect |
| P18 | GND | Return Current Path |
| P19 | Reserved | No Connect |
| P20 | Reserved | No Connect |
| P21 | GND | Return Current Path |
| P22 | Reserved | No Connect |
| P23 | +B | Host Receiver Differential Signal Pair |
| P24 | +3.3V | 3.3V Source |
| P25 | -B | Host Receiver Differential Signal Pair |
| P26 | GND | Return Current Path |
| P27 | GND | Return Current Path |
| P28 | +1.5V | 1.5V Source |
| P29 | GND | Return Current Path |
| P30 | Two Wire Interface | Two Wire Interface Clock<br>Pin 30 is intended for use as a two wire interface to read a memory device to determine device information (an example of this would be for use as SMB bus pins). This pin is not designed to be active in conjunction with the SATA signal differential pairs. |
| P31 | -A | Host Transmitter Differential Signal Pair |

| Pin | Type | Description |
|---|---|---|
| P32 | Two Wire Interface | Two Wire Interface Data<br>Pin 32 is intended for use as a two wire interface to read a memory device to determine device information (an example of this would be for use as SMB bus pins). This pin is not designed to be active in conjunction with the SATA signal differential pairs. |
| P33 | +A | Host Transmitter Differential Signal Pair |
| P34 | GND | Return Current Path |
| P35 | GND | Return Current Path |
| P36 | Reserved | No Connect |
| P37 | GND | Return Current Path |
| P38 | Reserved | No Connect |
| P39 | +3.3V | 3.3V Source |
| P40 | GND | Return Current Path |
| P41 | +3.3V | 3.3V Source |
| P42 | Reserved | No Connect |
| P43 | Device Type | Shall be a No Connect on mSATA Devices |
| P44 | DEVSLP | Enter/Exit DevSleep |
| P45 | Vendor | Vendor Specific / Manufacturing Pin<br>(No connect on the host side) |
| P46 | Reserved | No Connect |
| P47 | Vendor | Vendor Specific / Manufacturing Pin<br>(No connect on the host side) |
| P48 | +1.5V | 1.5V Source |
| P49 | DA/DSS | Device Activity Signal / Disable Staggered Spin-up |
| P50 | GND | Return Current Path |
| P51 | Presence Detection | Shall be pulled to GND by device<br>(Presence detection pin provided for tamper proof functionality) |
| P52 | +3.3V | 3.3V Source |

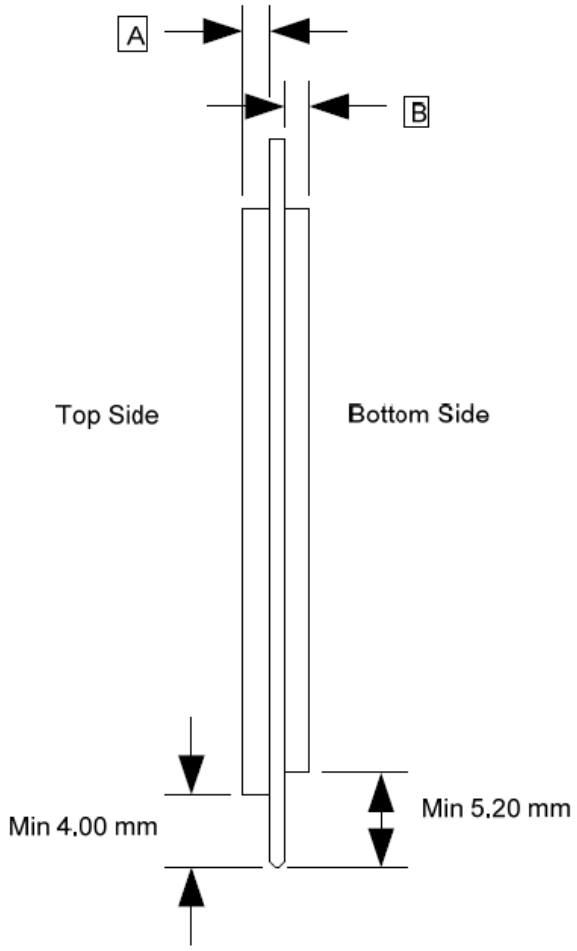
## 3.4 FerriSSD M.2

### *3.4.1 FerriSSD M.2 Mechanical Drawing*




| Type | A (Nominal) | Tol |
|---|---|---|
| 2242 | 42.0 | ± 0.15 |

All dimensions in mm




| Profile | A (max) | B (max) |
|---|---|---|
| D5 | 3.1 | 1.50 |

### *3.4.2 FerriSSD M.2 Pin Assignments*

| Pin | Type | Description |
|---|---|---|
| 1 | CONFIG_3 | Shall be a No connect on SATA M.2 devices |
| 2 | 3.3V | Supply pin, 3.3V |
| 3 | GND | Ground |
| 4 | 3.3V | Supply pin, 3.3V |
| 5 | No connect | No connect |
| 6 | Not Available | No connect (used for other purposes) |
| 7 | Not Available | No connect (used for other purposes) |
| 8 | Not Available | No connect (used for other purposes) |
| 9 | No connect | No connect |
| 10 | DAS/DSS | Device Activity Signal / Disable Staggered Spinup |
| 11 | No connect | No connect (used for other purposes) |
| 12 | (removed for key) | Mechanical notch B |
| 13 | (removed for key) | Mechanical notch B |
| 14 | (removed for key) | Mechanical notch B |
| 15 | (removed for key) | Mechanical notch B |
| 16 | (removed for key) | Mechanical notch B |
| 17 | (removed for key) | Mechanical notch B |
| 18 | (removed for key) | Mechanical notch B |
| 19 | (removed for key) | Mechanical notch B |
| 20 | Not Available | No connect (used for other purposes) |
| 21 | CONFIG_0 | Shall be a No connect on SATA M.2 devices |
| 22 | Not available | No connect (used for other purposes) |
| 23 | Not available | No connect (used for other purposes) |
| 24 | Not available | No connect (used for other purposes) |
| 25 | Not available | No connect (used for other purposes) |
| 26 | Not available | No connect (used for other purposes) |
| 27 | GND | Ground |
| 28 | Not available | No connect (used for other purposes) |
| 29 | Not available | No connect (used for other purposes) |
| 30 | Not available | No connect (used for other purposes) |
| 31 | Not available | No connect (used for other purposes) |
| 32 | Not available | No connect (used for other purposes) |
| 33 | GND | Ground |
| 34 | Not available | No connect (used for other purposes) |
| 35 | Not available | No connect (used for other purposes) |

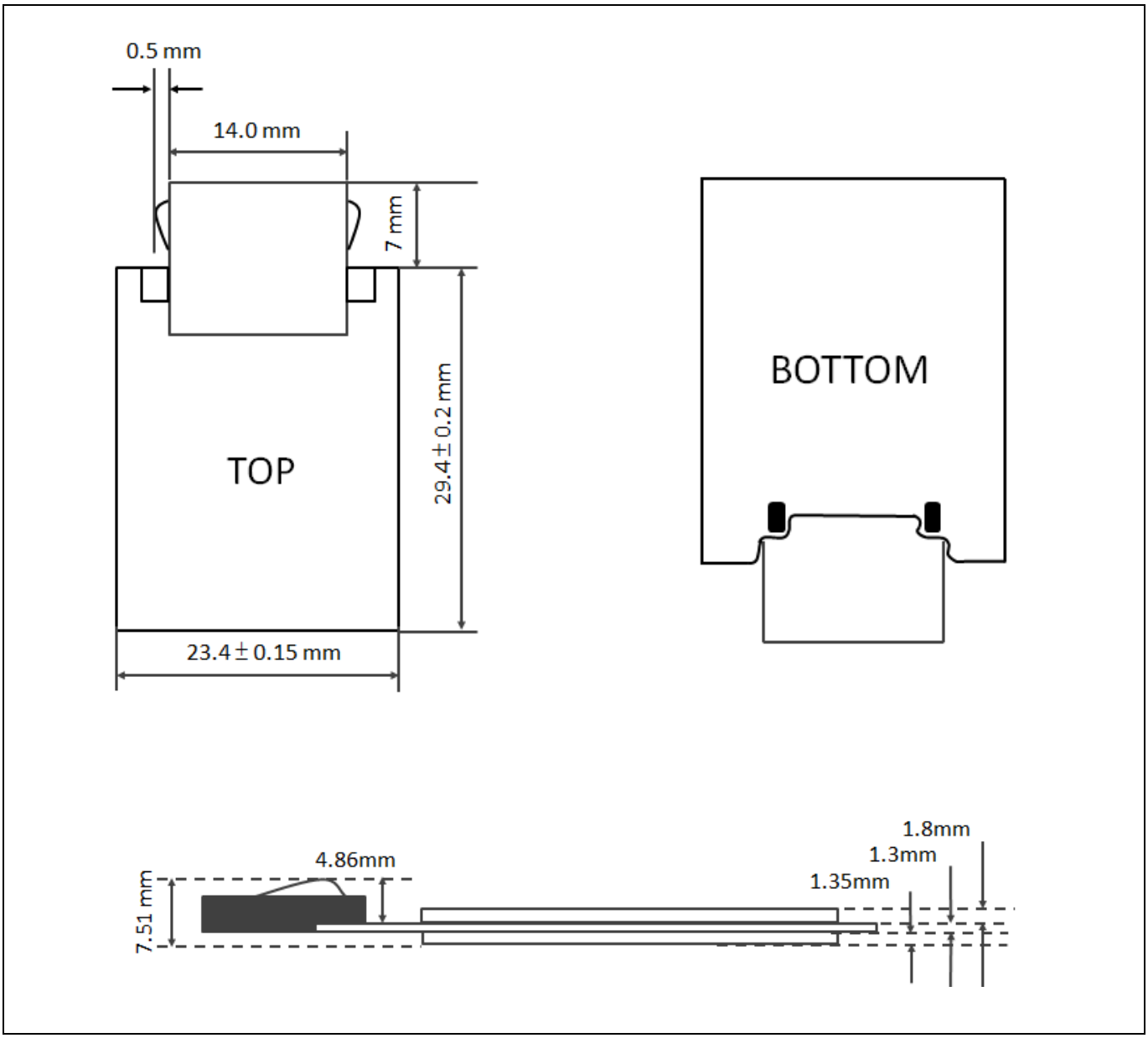
| Pin | Type | Description |
|---|---|---|
| 36 | Not available | No connect (used for other purposes) |
| 37 | Not available | No connect (used for other purposes) |
| 38 | DEVSLP | Device Sleep, input. If driven high the host is informing the SSD to enter a low power state. |
| 39 | GND | Ground |
| 40 | Not available | No connect (used for other purposes) |
| 41 | SATA-B+ | Host receiver differential signal pair |
| 42 | na | No connect (used for other purposes) |
| 43 | SATA-B- | Host receiver differential signal pair |
| 44 | Not available | No connect (used for other purposes) |
| 45 | GND | Ground |
| 46 | Not available | No connect (used for other purposes) |
| 47 | SATA-A- | Host transmitter differential signal pair |
| 48 | Not available | No connect (used for other purposes) |
| 49 | SATA-A+ | Host transmitter differential signal pair |
| 50 | Not available | No connect (used for other purposes) |
| 51 | GND | Ground |
| 52 | Not available | No connect (used for other purposes) |
| 53 | Not available | No connect (used for other purposes) |
| 54 | Not available | No connect (used for other purposes) |
| 55 | Not available | No connect (used for other purposes) |
| 56 | MFG1 | Manufacturing pin. Use determined by vendor. [1] |
| 57 | GND | Ground |
| 58 | MFG2 | Manufacturing pin. Use determined by vendor. [1] |
| 59 | (removed for key) | Mechanical notch M |
| 60 | (removed for key) | Mechanical notch M |
| 61 | (removed for key) | Mechanical notch M |
| 62 | (removed for key) | Mechanical notch M |
| 63 | (removed for key) | Mechanical notch M |
| 64 | (removed for key) | Mechanical notch M |
| 65 | (removed for key) | Mechanical notch M |
| 66 | (removed for key) | Mechanical notch M |
| 67 | Not available | No connect (used for other purposes) |
| 68 | Not available | No connect (used for other purposes) |
| 69 | CONFIG_1 | Shall be a No connect on SATA M.2 devices |
| 70 | 3.3V | Supply pin, 3.3V |

**Note** [1] **:** No connect on a host.

| Pin | Type | Description |
|---|---|---|
| 71 | GND | Ground |
| 72 | 3.3V | Supply pin, 3.3V |
| 73 | GND | Ground |
| 74 | 3.3V | Supply pin, 3.3V |
| 75 | CONFIG_2 | Shall be a No connect on SATA M.2 devices |

## 3.5 FerriSSD SATA DOM

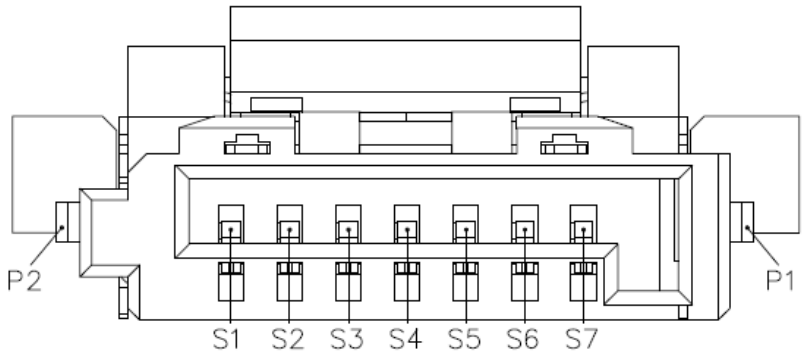
### *3.5.1 FerriSSD DOM Mechanical Drawing*



### *3.5.2 FerriSSD DOM Pin Assignments*

| Segment | Pin | Function | Description |
|---|---|---|---|
| Signal Segment | S1 | GND | |
| | S2 | A+ | RXp |
| | S3 | A- | RXn |
| | S4 | GND | |
| | S5 | B- | TXn |
| | S6 | B+ | TXp |
| | S7 | GND | |
| Power Segment | P1 | 5V | 5V Power |
| | P2 | GND | |

**Pin-Out on FerriSSD SATA DOM**



# 4. Command Sets

## 4.1 Command Set

**Table 2: Command Set**

| Command Set | Command | Command Code | Protocol |
|---|---|---|---|
| General Feature Set | Execute Drive Diagnostic | 90h | Device diagnostic |
| | Flush Cache | E7h | Non-data |
| | Identify Device | ECh | PIO data-in |
| | Initial Drive Parameters | 91h | Non-data |
| | NOP | 00h | Non-data |
| | Read Buffer | E4h | PIO data-in |
| | Read DMA | C8h | DMA |
| | Read Multiple | C4h | PIO data-in |
| | Read Sector(s) | 20h | PIO data-in |
| | Read Verify Sector(s) | 40h or 41h | Non-data |
| | Set Feature | EFh | Non-data |
| | Set Multiple Mode | C6h | Non-data |
| | Write Buffer | E8h | PIO data-out |
| | Write DMA | CAh | DMA |
| | Write Multiple | C5h | PIO data-out |
| | Write Sector(s) | 30h | PIO data-out |
| Power Management Feature Set | Check Power Mode | E5h or 98h | Non-data |
| | Idle | E3h or 97h | Non-data |
| | Idle Immediate | E1h or 95h | Non-data |
| | Sleep | E6h or 99h | Non-data |
| | Standby | E2h or 96h | Non-data |
| | Standby Immediate | E0h or 94h | Non-data |
| Security Mode Feature Set | Security Set Password | F1h | PIO data-out |
| | Security Unlock | F2h | PIO data-out |
| | Security Erase Prepare | F3h | Non-data |
| | Security Erase Unit | F4h | PIO data-out |
| | Security Freeze Lock | F5h | Non-data |
| | Security Disable Password | F6h | PIO data-out |

| Command Set | Command | Command Code | Protocol |
|---|---|---|---|
| Host Protected Area Feature Set | Read Native Max Address | F8h | Non-data |
| | Set Max Address | F9h | Non-data |
| | Set Max Set Password | F9h | PIO data-out |
| | Set Max Lock | F9h | Non-data |
| | Set Max Freeze Lock | F9h | Non-data |
| | Set Max Unlock | F9h | PIO data-out |
| 48-bit Address Feature Set [1] | Flush Cache Ext | EAh | Non-data |
| | Read Sector(s) Ext | 24h | PIO data-in |
| | Read DMA Ext | 25h | DMA |
| | Read Multiple Ext | 29h | PIO data-in |
| | Read Native Max Address Ext | 27h | Non-data |
| | Read Verify Sector(s) Ext | 42h | Non-data |
| | Set Max Address Ext | 37h | Non-data |
| | Write DMA Ext | 35h | DMA |
| | Write DMA FUA Ext | 3Dh | DMA |
| | Write Multiple Ext | 39h | PIO data-out |
| | Write Multiple FUA Ext | CEh | PIO data-out |
| | Write Sector(s) Ext | 34h | PIO data-out |
| CFA Feature Set | Erase Sectors | C0h | Non-data |
| | Request Sense | 03h | Non-data |
| | Set Features Enable/Disable 8-bit Transfer | EFh | Non-data |
| | Translate Sector | 87h | PIO data-in |
| | Write Multiple Without Erase | CDh | PIO data-out |
| | Write Sectors Without Erase | 38h | PIO data-out |
| Others | Data Set Management | 06h | DMA |
| | Seek | 70h | Non-data |
| | Wear Level | F5h | Non-data |

**Note[1]:** By default the 48-bit Address feature set is supported only in the models of 16GB storage capacity and above. This feature can be an option for small capacities if customers have the need.

## 4.2 Identify Device Data

The Identify Device command enables the host to receive parameter information from the FerriSSD. This command has the same protocol as the Read Sector(s) command. The parameter words in the buffer have the arrangement and meanings defined in the following table.

**Table 3: ID Table**

| Word | F / V | Default Value | Description |
|---|---|---|---|
| 0 | F | 044Ah | General configuration |
| 1 | X | XXXXh | Default number of cylinders |
| 2 | V | C837h | Specific configuration |
| 3 | X | 00XXh | Default number of heads |
| 4 | X | 0000h | Retired |
| 5 | X | 0000h | Retired |
| 6 | F | XXXXh | Default number of sectors per track |
| 7 - 8 | V | XXXXh | Number of sectors per card<br>(Word 7 = MSW, Word 8 = LSW) |
| 9 | X | 0000h | Obsolete |
| 10 - 19 | F | XXXXh | Serial number in ASCII (Right justified) |
| 20 | X | 0002h | Obsolete |
| 21 | X | 0002h | Obsolete |
| 22 | X | 0000h | Obsolete |
| 23 - 26 | F | XXXXh | Firmware revision in ASCII.<br>Big Endian Byte Order in Word. |
| 27 - 46 | F | XXXXh | Model number in ASCII (Left justified).<br>Big Endian Byte Order in Word. |
| 47 | F | 8001h | Maximum number of sectors on Read/Write Multiple command |
| 48 | F | 0000h | Reserved |
| 49 | F | 0F00h | Capabilities |
| 50 | F | 4000h | Capabilities |
| 51 | F | 0200h | PIO data transfer cycle timing mode |
| 52 | X | 0000h | Obsolete |
| 53 | F | 0007h | Field validity |
| 54 | X | XXXXh | Current numbers of cylinders |
| 55 | X | XXXXh | Current numbers of heads |
| 56 | X | XXXXh | Current sectors per track |
| 57 - 58 | X | XXXXh | Current capacity in sectors (LBAs)<br>(Word 57 = LSW, Word 58 = MSW) |
| 59 | F | 0100h | Multiple sector setting |
| 60 - 61 | F | XXXXh | Total number of sectors addressable in LBA Mode |

| Word | F / V | Default Value | Description |
|---|---|---|---|
| 62 | X | 0000h | Reserved |
| 63 | F | 0007h | Multiword DMA transfer<br>Supports MDMA Mode 0, 1 and 2 |
| 64 | F | 0003h | Advanced PIO modes supported |
| 65 | F | 0078h | Minimum Multiword DMA transfer cycle time per word |
| 66 | F | 0078h | Recommended Multiword DMA transfer cycle time |
| 67 | F | 0078h | Minimum PIO transfer cycle time without flow control |
| 68 | F | 0078h | Minimum PIO transfer cycle time with IORDY flow control |
| 69 - 75 | F | 0000h | Reserved |
| 76 | F | 0006h | Serial ATA capabilities<br>Supports Serial ATA Gen1 and Gen2 |
| 77 | F | 0000h | Serial ATA Additional capabilities |
| 78 | F | 0148h | Serial ATA features supported<br>• Supports Device Sleep (option)<br>• Supports software settings preservation (option)<br>• Device supports initiating power management |
| 79 | V | XXXXh | Serial ATA features enabled |
| 80 | F | 03FCh | Major version number (ATA8-ACS2) |
| 81 | F | 0000h | Minor version number |
| 82 | F | 742Bh | Command sets supported 0 |
| 83 | F | 7500h | Command sets supported 1 |
| 84 | F | 4002h | Command sets supported 2 |
| 85 - 87 | V | XXXXh | Command set/feature enabled |
| 88 | V | 007Fh | Ultra DMA mode supported and selected |
| 89 | F | 0003h | Time required for Security erase unit completion |
| 90 | F | 0000h | Time required for Enhanced security erase unit completion |
| 91 | V | 0000h | Current Advanced power management value |
| 92 | V | FFFEh | Master Password Revision Code |
| 93 - 99 | V | 0000h | Reserved |
| 100 - 103 | V | XXXXh | Maximum user LBA for 48-bit Address feature set |
| 104 - 127 | V | 0000h | Reserved |
| 128 | V | 0001h | Security status |
| 129 - 159 | X | 0000h | Vendor unique bytes |
| 160 | F | 0000h | Power requirement description |
| 161 - 168 | X | 0000h | Reserved |
| 169 | F | 0001h | Data Set Management supported (option) |
| 170 - 216 | V | 0000h | Reserved |
| 217 | F | 0100h | Non-rotating media (SSD) |

| Word | F / V | Default Value | Description |
|---|---|---|---|
| 218 - 221 | X | 0000h | Reserved |
| 222 | F | 101Fh | Transport major revision (SATA Rev 2.6) |
| 223 - 254 | X | 0000h | Reserved |
| 255 | X | XXXXh | Integrity word |

**Notes:**
1. F = content (byte) is fixed and does not change.
2. V = content (byte) is variable and may change depending on the state of the device or the commands executed by the device.
3. X = content (byte) is vendor specific and may be fixed or variable.

# 5. Environmental Conditions

## 5.1 Temperature

**Table 4: FerriSSD Module Temperature Support**

| Parameter | Specifications |
|---|---|
| Operating Temperature | 0°C ~ 70°C for the commercial version<br>-40°C ~ +85°C for the industrial version |
| Non-Operating Temperature | -55°C to +85°C |
| Storage Temperature | -55°C to +85°C |

## 5.2 Humidity

**Table 5: FerriSSD Module Humidity Support**

| Parameter | Specifications |
|---|---|
| **Operating Humidity** | |
| Humidity | 5% to 95% (Non condensation) |
| **Non-Operating Humidity** | |
| Humidity (Non condensation) | 5% to 95% |
| Maximum Relative Humidity Gradient | 20% per hour |

## 5.3 RoHS

Directive of the European Parliament and of the Council on the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment, 2002/95/EC, January 2003. (RoHS Directive).

# 6. Reliability

## 6.1 Reliability Specifications

**Table 6: Reliability Specifications**

| Type | UBER | MTBF |
|---|---|---|
| CommercialFerri | 1 sector in $10^{16}$ bits read, max | 1,200,000 hours |
| XtendFerri | 1 sector in $10^{16}$ bits read, max | 2,000,000 hours |
| EnterpriseFerri | 1 sector in $10^{16}$ bits read, max | 2,000,000 hours |

**Notes:**

1. UBER: Uncorrectable bit error rate will not exceed one sector in the specified number of bits read. Refer to the JEDEC SSD specifications for detailed definition.
2. Mean Time Between Failure is estimated based on FIT value. FIT (Failure in Time) test is conducted at SMI internal test lab with SMI RDT (Reliability Demonstration Test).

## 6.2 Endurance

- CommercialFerri: 2,500 P/E cycles
- XtendFerri: 20,000 P/E cycles
- EnterpriseFerri: 50,000 P/E cycles

## 6.3 Preventive Maintenance

No preventive maintenance is required.

# 7. Ordering Information

## 7.1 Product Coding Rule

**Table 7: Product Code Definitions**

| **Example: M B 6 3 1 G X 8 □ BA □** | |
|---|---|
| M | Module |
| B | Form Factor<br>• A = FerriSSD M25 (2.5” case)<br>• B = FerriSSD M297 (half-slim)<br>• C = FerriSSD M300 (mSATA)<br>• D = FerriSSD M.2 (22 x 42 mm)<br>• S = FerriSSD DOM (Type S) |
| 6 | Ferri Family |
| 3 | Type / Interface<br>• 1 = CommercialFerri / SATA<br>• 3 = EnterpriseFerri / SATA<br>• 5 = XtendFerri / SATA |
| 1 | Encryption Function<br>• 1 = Standard<br>• 2 = Encryption Enabled |
| G | Package: MCM TFBGA |
| X | Operating Temperature<br>• X = 0°C ~ 70°C (C-temp)<br>• E = -40°C ~ +85°C (I-temp) |
| 8 | Capacity<br>• 1 = 1GB<br>• 2 = 2GB<br>• 4 = 4GB<br>• 8 = 8GB<br>• A = 16GB<br>• B = 32GB<br>• C = 64GB |
| □ | PCB Revision |
| BA/BB/BC/BD | Product Revision |
| □ | BOM Version |

Note: Refer to the FerriSSD Product Selection Guide for valid ordering numbers.