The FerriSSD® is designed optimally for a wide range of embedded applications requiring faster access speed, small flexible form factor and reliable SATA/PATA storage. By combining industry proven controller technology, NAND flash and passive components into a small single BGA package, FerriSSD® simplifies design efforts, reduces time-to-market while protecting from NAND technology migration concerns.

The FerriSSD® family consists of the SATA and legacy PATA series featuring high throughput transfer rate with optional embedded DRAM to enhance data storage efficiency and high random read/write IOPS. The 4th generation FerriSSD leveraging Silicon Motion's most advanced technologies, including IntelligentScan, DataRefresh, high bandwidth LDPC ECC engine with SMI group RAID, and End-to-end data path protection to provide unsurpassed data integrity in a non-volatile storage device. All FerriSSD® series support 3D SLCmode, MLCmode, and TLCmode NAND flash options.

### Key Features

#### End to End Data Path Protection

SMI's FerriSSDs incorporate full data error detection with recovery engines to provide enhanced data integrity throughout the entire Host-to-NAND-to-Host data path. The FerriSSD® data recovery algorithm can effectively detect any error in the SSD data path, including hardware (i.e. ASIC) errors, firmware errors and memory errors arising in SRAM, DRAM or NAND.

![Diagram of End to End Data Path Protection](image)

**Write flow w / encode**

1. Host
2. Write
3. CRC
4. Encode
5. DRAM
6. Decode
7. ECC
8. SRAM
9. Decode
10. NAND

**Read flow w / decode**

1. Host
2. Read
3. CRC
4. Decode
5. ECC
6. SRAM
7. Decode
8. ECC
9. DRAM
10. Decode
11. NAND

**NANDXtend™ ECC Engine**

Conventional SSDs employ standard BCH and RS ECC (error correction coding) engines for initiate first-level correction using NAND shift-read-retries. In addition to this first-level error correction, FerriSSDs also implement a highly efficient second-level correction scheme using an LDPC (low-density parity check) code and a Group page RAID algorithm (a highly efficient redundant backup) to reduce potential dPPM at customer site while extending the service life of SSD.

![Diagram of NANDXtend™ ECC Engine](image)
IntelligentScan and DataRefresh to Enhance Data Integrity

SMI's proprietary IntelligentScan function will activate automatically to scan recharge, repair or retire the cell block (DataRefresh) according to the host behavior and working environment (e.g. ambient temperature). As a result of the combination of IntelligentScan and DataRefresh, FerriSSD® can effectively prolong its service life much beyond typical NAND specifications.

Thermo impact on NAND Data Retention

<table>
<thead>
<tr>
<th>Temp</th>
<th>SLC @ max PE</th>
<th>MLC @ max PE</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>75.58 Mo</td>
<td>12 Mo</td>
</tr>
<tr>
<td>55</td>
<td>12 Mo</td>
<td>1.88 Mo</td>
</tr>
<tr>
<td>70</td>
<td>2.14 Mo</td>
<td>0.34 Mo</td>
</tr>
<tr>
<td>85</td>
<td>0.45 Mo</td>
<td>0.07 Mo</td>
</tr>
</tbody>
</table>

Based on Arrhenius Equation

Higher ambient temp to increase Scan frequency

Why FerriSSD®

- Easy to use
  - Plug & Play only requires format/fdisk prior to use
  - Small footprint for space-limited design

- Lower total cost of ownership
  - Rugged & Reliable (no moving parts)
  - Eliminate requalification cost from NAND generation change
  - Cost saving with low density FerriSSD, HDD are typically > 160GB capacity

- Eliminate down time
  - Support S.M.A.R.T. and advanced SSD Telemetry logging features
  - IntelligentScan with DataRefresh for Data integrity enhancement
  - Full End-to-End data path protection with recovery algorithms
  - SMI’s 4th generation LDPC ECC engine with Group Page RAID
  - Remote firmware update available via secured digital signature

Specifications

- **Host Interface**
  - SM619: SATA 6Gb/s
  - SM631: SATA 3Gb/s
  - SM651: SATA 3Gb/s
  - SM611: PATA
  - SM621: PATA
  - SM641: PATA
  - SM601: PATA

- **NAND**
  - 3D SLCmode
  - 3D MLCmode
  - 3D TLCmode

- **Density**
  - 4-480GB*
  - 1-32GB
  - 2-64GB
  - 1-32GB
  - 1-32GB
  - 4-64GB

- **Embedded DRAM**
  - Yes
  - DRAM-Less

- **Form Factor**
  - 20mm x 16mm BGA

- **Green Product**
  - Compliant to RoHS (Restriction to Hazardous Substances Directive) 2.0 / Halogen free

- **Temperature Support**
  - Commercial Temp (0°C to +70°C)
  - Industrial Temp (-40°C to +85°C)

For more information about FerriSSD®, please go to www.siliconmotion.com or send e-mail to ferri@siliconmotion.com

*1TB in Q3’2022