SQFlash
Product Selection
Advantech design and quality control standard

EMI/ESD Design & Verify
- Industrial material & FW development
- Toshiba original tier 1 Flash IC
- Fixed BOM to keep Quality & Reliability

Industrial Level Material
- According to Advantech product verify process
- Make sure Compatibility & Reliability

Design phase

Through DQA-function & QA-LAB environment test

Verify phase

with different generation chipset and platform to ensure good compatibility.

100% Screening Test
- High temp. Burn-In test
- High-Low temp. cycling test
- Vibration test
- Industrial Quality Assurance
Quality, let the numbers speak!

<table>
<thead>
<tr>
<th></th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Shipping Q’ty</td>
<td>1,143,979</td>
<td>1,233,086</td>
<td>803,610</td>
<td>1,160,211</td>
<td>4,340,886</td>
</tr>
<tr>
<td>RMA Q’ty</td>
<td>1143</td>
<td>1297</td>
<td>1023</td>
<td>699</td>
<td>4,162</td>
</tr>
<tr>
<td>RMA rate (%)</td>
<td>0.10%</td>
<td>0.11%</td>
<td>0.13%</td>
<td>0.06%</td>
<td>0.10%</td>
</tr>
<tr>
<td>Defect Q’ty (NPF excluded)</td>
<td>609</td>
<td>842</td>
<td>593</td>
<td>385</td>
<td>2,429</td>
</tr>
<tr>
<td>Defect rate (%)</td>
<td>0.05%</td>
<td>0.07%</td>
<td>0.07%</td>
<td>0.03%</td>
<td><strong>0.06%</strong></td>
</tr>
</tbody>
</table>

**Mainstream Embedded Series**

<table>
<thead>
<tr>
<th></th>
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<th>2019</th>
<th>2020</th>
<th>2021</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Shipping Q’ty</td>
<td>387,611</td>
<td>333,357</td>
<td>512,194</td>
<td>757,541</td>
<td>1,990,703</td>
</tr>
<tr>
<td>RMA Q’ty</td>
<td>555</td>
<td>647</td>
<td>617</td>
<td>453</td>
<td>2,272</td>
</tr>
<tr>
<td>RMA rate (%)</td>
<td>0.12%</td>
<td>0.19%</td>
<td>0.12%</td>
<td>0.06%</td>
<td><strong>0.11%</strong></td>
</tr>
<tr>
<td>Defect Q’ty (NPF excluded)</td>
<td>325</td>
<td>486</td>
<td>426</td>
<td>262</td>
<td>1,499</td>
</tr>
<tr>
<td>Defect rate (NPF excluded)</td>
<td>0.08%</td>
<td>0.15%</td>
<td>0.08%</td>
<td>0.03%</td>
<td><strong>0.08%</strong></td>
</tr>
</tbody>
</table>

- Defect rate gets lower over years
- Industry leading < 0.06% defect rate

<table>
<thead>
<tr>
<th></th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Shipping Q’ty</td>
<td>680,745</td>
<td>825,726</td>
<td>647,820</td>
<td>898,304</td>
<td>3,052,595</td>
</tr>
<tr>
<td>RMA Q’ty</td>
<td>951</td>
<td>1100</td>
<td>897</td>
<td>596</td>
<td>3,544</td>
</tr>
<tr>
<td>RMA rate (%)</td>
<td>0.14%</td>
<td>0.13%</td>
<td>0.14%</td>
<td>0.07%</td>
<td><strong>0.12%</strong></td>
</tr>
<tr>
<td>Defect Q’ty (NPF excluded)</td>
<td>549</td>
<td>763</td>
<td>541</td>
<td>345</td>
<td>2,198</td>
</tr>
<tr>
<td>Defect rate (NPF excluded)</td>
<td>0.08%</td>
<td>0.09%</td>
<td>0.08%</td>
<td>0.04%</td>
<td><strong>0.07%</strong></td>
</tr>
</tbody>
</table>

- <0.07% defect rate for SATA product

- < 0.1% defect rate for mainstream embedded 600 series!
**SQFlash ER-1 & 930 Series**

Edge Rugged and high Performance PCIe Gen.4/ NVMe solution

- Industrial thermal solution with wide temperature support
  Reduces thermal energy by 10%, support -40~85°C operation

- Fully supports AES256 & TCG-OPAL schemes security function

- WISE-DeviceOn/ SQ Manager Compatibility, remote monitoring

- An excellent choice for higher accuracy in AI analytics and enterprise server application

- Triple-CPU and Dual processors
  Compliant with NVMe 1.4, 2x faster with Gen. 3.
**PCIe Gen. 4 solution comparison**

### High Performance Data Acquisition

**SQF 930**
- PCIe/NVMe Gen.4 x4
- M.2 2280 M-Key
- Seq. Read 7,200 MB/s
- Seq. Write 6,500 MB/s
- DWPD 0.6
- BiCS5, 480GB to 3.8TB
- Power consumption 11 W
- 0~70°C/-40~85°C

### Extra Endurance & Performance with Edge Server

**SQF ER-1, Read-Intensive**
- PCIe/NVMe Gen.4 x4
- M.2 2280 M-Key
- DWPD 1
- BiCS5, 400GB to 3.2TB
- 0~70°C/-40~85°C

**SQF ER-1, Mixed-Use**
- PCIe/NVMe Gen.4 x4
- U.2 SSD, SFF-8639
- DWPD 3
- B47R, 400GB to 6.4TB
- 0~70°C

### Key Benefits
- More stable of Read/Write operation, Random Read/Write (IOPS) achieve **750,000**
- Excellent Durability & Endurance - Long term operation achieve on **DWPD 1, DWPD 3**
- Meet different applications on **0 ~ 70°C, -40 ~ 85°C**
- Higher **PWR** into low carbon supply chain (ESG market)
Industrial NVMe Solution – SQFlash 720-D/ 920-D Series

New BiCS5 based PCIe Gen.3 SSD

M.2 2230 (A+E Key)
- SQF-C3A
  - PCIe Gen.3 x2
  - AES256, OPAL
  - Upto 512GB
  - 0~70C/-20~85C/-40~85C

M.2 2242 (M Key)
- SQF-C4M
  - PCIe Gen.3 x4
  - AES256, OPAL
  - Upto 1TB
  - 0~70C/-20~85C/-40~85C

M.2 2280 (B+M/M Key)
- SQF-C8B
  - PCIe Gen.3 x2/x4
  - AES256, OPAL
  - Upto 2TB
  - 0~70C/-20~85C/-40~85C

CF Express (B type)
- SQF-CFX
  - PCIe Gen.3 x2
  - AES256, OPAL
  - Upto 1TB
  - 0~70C/-20~85C/-40~85C

M.2 2280 (M Key)
- SQF-CM8
  - PCIe Gen.3 x4
  - AES256, OPAL
  - Upto 2TB
  - 0~70C/-40~85C

U.2 (SFF-8639)
- SQF-C25
  - PCIe Gen.3 x4
  - AES256, OPAL
  - Upto 8TB
  - 0~70C/-40~85C

Industrial NVMe Solution – SQFlash 720-D/ 920-D Series

Real-time Surveillance

Machine Vision

Gaming Consoles

New BiCS5 based PCIe Gen.3 SSD

M.2 2230 (A+E Key)
- SQF-C3A
  - PCIe Gen.3 x2
  - AES256, OPAL
  - Upto 512GB
  - 0~70C/-20~85C/-40~85C

M.2 2242 (M Key)
- SQF-C4M
  - PCIe Gen.3 x4
  - AES256, OPAL
  - Upto 1TB
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U.2 (SFF-8639)
- SQF-C25
  - PCIe Gen.3 x4
  - AES256, OPAL
  - Upto 8TB
  - 0~70C/-40~85C
# New SQFlash 650 SATA Low Power Series

## New BiCS5 based SATA III SSD

<table>
<thead>
<tr>
<th>SQFlash 650 Series</th>
<th>Y2025</th>
</tr>
</thead>
<tbody>
<tr>
<td>SQF-S25</td>
<td>2.5”</td>
</tr>
<tr>
<td>SQF-S8B</td>
<td>M.2 2280</td>
</tr>
<tr>
<td>SQF-SMS</td>
<td>mSATA</td>
</tr>
<tr>
<td>SQF-S4B</td>
<td>M.2 2242</td>
</tr>
<tr>
<td>SQF-S10</td>
<td>CFast</td>
</tr>
<tr>
<td>SQF-SLM</td>
<td>Half Slim</td>
</tr>
<tr>
<td>SQF-SHM</td>
<td>Half-Size mSATA</td>
</tr>
</tbody>
</table>

- **3-Year Longevity**
- **TCG OPAL**
- **High Endurance sTLC**
- **Various Temp. Option**

* M-temp. (-20~85°C)
* I-temp. (-40~85°C)
New BiCS5 based SATA III SSD

3-Year Longevity
TCG OPAL Compliant
Enterprise 840L Series
High Endurance 840 sTLC Series
True Wide Temp -40~85°C

SQFlash 840 Series

<table>
<thead>
<tr>
<th>Model</th>
<th>Form Factor</th>
<th>Storage Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>SQF-S25</td>
<td>2.5&quot;</td>
<td>Up to 8TB sTLC up to 2TB</td>
</tr>
<tr>
<td>SQF-SM8</td>
<td>M.2 2280</td>
<td>Up to 2TB</td>
</tr>
<tr>
<td>SQF-SMS</td>
<td>mSATA</td>
<td>Up to 2TB</td>
</tr>
</tbody>
</table>

SQFlash 840L Series (5Y DWPD ≥ 1)

<table>
<thead>
<tr>
<th>Model</th>
<th>Form Factor</th>
<th>Storage Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>SQF-S25</td>
<td>2.5&quot;</td>
<td>Up to 8TB</td>
</tr>
</tbody>
</table>
Power Loss Protection – SQFlash 840V SATA Series

New BiCS5 based SATA III SSD

3-Year Longevity
TCG OPAL Compliant
Power Loss Protection & Super Cap
True Wide Temp -40~85°C

SQFlash 840V Series

- SQF-S25: 2.5" Up to 8TB

To Y2025
# Comparison of NAND Flash for Traditional Industrial Application

<table>
<thead>
<tr>
<th></th>
<th>SLC</th>
<th>Ultra MLC</th>
<th>MLC</th>
<th>3D TLC (BiCS 5)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NAND Program Time</strong></td>
<td>200 ~ 300 μs</td>
<td>300 ~ 600 μs</td>
<td>600 ~ 900 μs</td>
<td>900 ~ 1350 μs</td>
</tr>
<tr>
<td><strong>Program / Erase Cycle</strong></td>
<td>100,000+</td>
<td>30,000+</td>
<td>3,000+</td>
<td>3,000+ (w/ LDPC)</td>
</tr>
<tr>
<td><strong>Op. Temp.</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Commercial</strong></td>
<td>0~70°C (T_A)</td>
<td>0~70°C (T_A)</td>
<td>0~70°C (T_A)</td>
<td>0~70°C (T_A)</td>
</tr>
<tr>
<td><strong>Industrial</strong></td>
<td>-40~85°C (T_A)</td>
<td>-40~85°C (T_A)</td>
<td>-40~85°C (T_A)</td>
<td>-40~85°C (T_A)</td>
</tr>
<tr>
<td><strong>Advantages</strong></td>
<td>Best Performance</td>
<td>High Endurance</td>
<td>Stable Performance</td>
<td>Acceptable Performance</td>
</tr>
<tr>
<td></td>
<td>Robust and Longevity</td>
<td>Excellent Performance</td>
<td>Wide-temp. Range</td>
<td>Cost-effective</td>
</tr>
<tr>
<td><strong>Application</strong></td>
<td>Write-Intensive</td>
<td>Write-Intensive</td>
<td>Severe Environment</td>
<td>Read-Intensive</td>
</tr>
<tr>
<td></td>
<td>and Long Life Service</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Automation Machine</td>
<td>Surveillance / Ticket</td>
<td>Fan-less / Embedded</td>
<td>POS Machine / Kiosk</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Machine</td>
<td>System</td>
<td></td>
</tr>
</tbody>
</table>
Find Your SQFlash BiCS5 3D TLC Solutions

PCIe / NVMe

**SQF ER-1 Series**
- SQF-C8M ER-1
- SQF-CU2 ER-1

**SQF 930 Series**
- SQF-C8M 930

**SQF 720 Series**
- SQF-C3A 720
- SQF-C4M 720
- SQF-C8M 720

**SQF 920 Series**
- SQF-C25 920
- SQF-CM8 920
- SQF-CM8 920F

---

**Ruggedized**
- High Durable & Endurance
- Ultimate Speed
- High Power Efficiency

**Embedded**

**Performance**
Find Your SQFlash BiCS5 3D TLC Solutions

**SATA**

SQF 650 Series
- SQF-S25 650
- SQF-SMS 650
- SQF-S10 650
- SQF-SHM 650
- SQF-S2B 650
- SQF-S4B 650
- SQF-SLM 650

SQF 840 Series
- SQF-S25 840
- SQF-S25 840F
- SQF-S25 840L
- SQF-S25 840V
- SQF-SM8 840
- SQF-SM8 840F
- SQF-S8B 840
- SQF-SM8 840

**Card / Onboard Storage**

SD Card / Micro SD Card / USB
- SQF-ISD
- SQF-MSD
- SQF-UPD

**BGA SSD / eMMC**

- SQF-SUS 640 (SATA BGA SSD)
- SQF-CUS 730 (PCIe Gen4 BGA SSD)
- SQF-MMC (100 ball eMMC)
- SQF-MM5 (153 ball eMMC)
### Naming Rule – SQFlash

**Model Name:** SQFlash

#### Flash type:
- S → SLC
- M → MLC
- U → UltraMLC
- T → 2D TLC
- V → 3D TLC
- E → 3D eTLC
- Z → 3D sTLC (1-bit)
- W → 3D TLC (2-bit)

#### Flash Source:
- → Kioxia
- A → Intel
- B → Sandisk
- C → Micron
- D → Hynix
- E → YMTC JGS
- F → WD
- H → Samsung

#### Channel type:
(After S11, E8: Flash IC Q’ty)
- 1 → Single Channel
- 2 → Dual Channel
- 4 → Quad Channel
- 5 → 5 Channel
- 8 → 8 Channel
- 9 → 9 Channel
- A → 10 Channel
- F → 16 Channel

#### Capacity:
256M~8T

#### Others support:
- → Normal (BiCS3, B16)
- w/ OPAL (E8 only)
- Retail package
- C, D, E → New Flash gen. After (BiCS4, B27) of 3D TLC

### Form Factor:
- P10 → CF
- P25 → 2.5” PATA SSD
- PDM → PATA DOM
- ISD → Industrial SD
- MSD → MicroSD
- UPD → USB PenDrive
- UDM → USB DOM
- C25 → 2.5” PCIe/U.2 (SFF-8639)
- C3A → M.2 2230 (AE Key)
- C4M → M.2 2242 (M Key)
- C8M → M.2 2280 (M Key)
- CBM → M.2 22110 (M Key)
- CMS → Full-size MiniPCIe
- CFX → CFexpress
- SMS → mSATA
- SHM → Half-size mSATA
- SDM → SATA DOM
- SLM → Half Slim
- S4B → M.2 2242 (BM Key)
- S6B → M.2 2260 (BM Key)
- S8B → M.2 2280 (BM Key)
- SUS → uSATA SSD
- MMC → eMMC,100B
- MM5 → eMMC,153B

#### Temperature:
- C → Commercial Temp (0~70°C)
- E → Extended (or Auto Grade3) Temp (-40~85°C)
- I → Industrial Temp (-40~105°C)

If Form Factor is ‘MMC’ or ‘MM5’, please follow as below
- I → Industrial Temp (-40~85°C)
- E → Auto Grade3 Temp (-40~85°C)
- A → Auto Grade2 Temp (-40~105°C)

### Controller type:
- M5 → PS8225
- P8 → PS3016-P8
- P9 → PS3016-P9
- S8 → PS3108-S8
- S9 → PS3109-S9
- SA → PS3110-S10
- SB → PS3111-S11
- SC → PS3112-S12
- D1 → PS8131
- E7 → PS5007-E7
- E8 → PS5008-E8/E8T
- EC → PS5012-E12
- ED → PS5013-E13T
- EI → PS5018-E18

Note. After E13, S17 (since 2021/1/1) project, the definition of M.2 form factor will be changed.
Co-Creating the Future of the IoT World