Industrial SSD and Memory
SQFlash and SQRAM for AIoT Applications

military grade certified
3 year longevity

security SSD certified
FIPS 140-2

DeviceOn/SQ Manager

MIL-STD 810G

Thermal Solution

Advanced DDR5

Data-Security

Flexible Customization

www.advantech.com
Advantech Industrial SSD & Memory Solutions

Advantech provides SQFlash, SQRAM, and industrial I/O extension module with software integration solutions. These solutions are compatible with Advantech platforms. Advantech’s robust peripheral solutions are key to processing data and empowering industrial manufacturing IoT and AIoT transformations.

**Industry-leading Reliability**
Advantech uses tier 1 chips from original IC vendors. The module assembly also passes in-house vibration and burn-in tests to ensure consistent quality. We leverage strict 100% screen testing and 3-year longevity to guarantee industrial grade stability and reliable 24/7 operation. We offer 3 ~ 5 years of extended longevity support.

**360-Degree Security**
Security is at the heart of our solutions. Our SQFlash series offers a full spectrum of protection. These measures include data encryption (TCG-OPAL Compliant with FIPS Certification), data erase and protection, and built-in security via a user-friendly UI. In addition, our solutions feature McAfee and Acronis integration as security and backup solutions.

**Ruggedized Design**
Advantech’s SQFlash is equipped with advanced multi-stage power failure protection and is capable of operation in broad temperature environments. SQRAM features a conformal coating and underfill to prevent corrosion by acid and/or water. These features remedy problems caused by high humidity or unexpected shock/vibration.

**Self-Management**
Device management is the foundation of industrial and IoT applications. Advantech industrial storage and memory solutions are equipped with DeviceOn/SQ Manager, a real-time self-management software, to enable lifetime prediction, remote device monitoring, and online PMQ.

**Flexible Customization**
To meet different application needs, Advantech provides 30-day design to order services such as conformal coating/underfill, extended longevity, and SPD tuning with full hardware, software, and firmware support.
As industrial and IoT applications require 24/7 data processing and operation, SSD and memory solutions need to accommodate extensive operation and heavy workloads. This is why having a round-the-clock software utility that provides end-to-cloud device monitoring, management, and comprehensive security protection — including comprehensive data encryption, anti-virus protection, and disk back-up — is vital.

DeviceOn/SQ Manager allows users to access information on disk health, lifespan, device power-on time, temperature, power-cycle, and event logs in real-time for diagnostic purposes. Advantech’s solution allows users to execute predictive maintenance and budget for repair and replacement early. The software significantly reduces service times and cost by helping users monitor and diagnose systems remotely, as well as update mass edge devices over the air.

Additionally, through using SQ Manager, users can contact Advantech’s tech support for immediate action upon receiving alerts. Advantech provides customized services such as conformal coating/underfill and SPD tuning with full hardware, software, and firmware aimed at supporting diverse applications.
SQFlash series supports various interfaces such as SATA, PCIe/ NVMe, and PATA/IDE with multiple form factors including 2.5” SSD, mSATA, M.2, DOM, CFast, half-slim SSD and more.

Data logging in autonomous driving applications necessitates processing massive quantities of visual and numerical data. Therefore, reliable storage with stable performance is crucial. Advantech’s SQFlash 840 and 920 series SSD deliver a high capacity of 8TB, stability via complete power failure protection, and wide temperature support. In addition, by using the built-in SQFlash utility protects SSD and valuable data from hacking and unauthorized access.

We used our decades of embedded market experience to developed SQFlash, creating an excellent industrial storage solution with a full range of product support and value-added services. Advantech SQFlash SSDs are designed with industrial operation in mind, and provide highly reliable storage with excellent compatibility, performance, and security. All our products are built with a TCG-OPAL self-encryption disk functionality powered by AES-256 internal encryption, and Advantech’s unique Flash Lock function for disk protection.

Key Features

- **Comprehensive Security**
  - FIPS certified SQFlash SSD
  - TCG-OPAL compliant
  - Quick Erase and Military Erase
  - McAfee & Acronis software integration

- **High Endurance**
  - 10x more durable SSD with 3D eTLC solution (P/E cycle: 30k)
  - Industrial extended temperature support
  - DeviceOn/SQ Manager delivers endurance and reliable monitoring

- **Power Failure Protection**
  - Comprehensive protection ensures data integrity
  - Built-in voltage stabilizer for internal power supply
  - Reliable startup power sequence

- **Thermal Solution on NVMe SSD**
  - Industrial heatsink cools SSD by up to 30° C
  - Flexible thermal grease prevents physical damage
  - Smart thermal throttling against sudden performance drop
  - Remote health and temperature monitoring

- **Flexible Customization Service**
  - 30-day time to market design-in service
  - Extended longevity: 3 ~ 5 years
  - Early access to the latest Flash technology
  - System integration with FPGA and firmware support

- **30-day time to market design-in service**
- **Extended longevity: 3 ~ 5 years**
- **Early access to the latest Flash technology**
- **System integration with FPGA and firmware support**
SQRAM delivers a wide spectrum product portfolio for AI and industrial applications and all SQRAM memory modules use fixed die ICs to ensure quality and compatibility while providing a 3-year longevity guarantee. The series offers ruggedized wide temperature solutions with an extra sidefill and coating service for harsh environments. Our unique software solution helps you easily monitor SQRAM temperature and status.

Advantech SQRAM series offers a range of product lines including Unbuffered DIMM, ECC DIMM, Server DIMM, and Rugged DIMM with speeds of DDR4, DDR3, DDR2, and DDR1. The superfast DDR5 will arrive in Q2, 2021.

SQRAM Pioneering DDR5 Memory for the Industrial Market

- 800/667
- 512MB/1GB
- DDR3- 1600
- DDR4- 3200
- 8/16/32 GB
- 4800
- 8/16/32 GB

Wide-temperature Support
- Wide temperature support: -40 ~ 85 °C
- Extended temperature support: 30 ~ 85 °C
- Optional industrial heatbank

Robust Solution
- 48hr burn-in test program
- Rugged DIMM with mounting holes resist shock and extreme vibration
- Fixed BOM and 3-year longevity

Customization and Value-added Services
- Conformal coating/sidefill
- Anti-sulfur protection

Key Features
- 48hr burn-in test program
- Rugged DIMM with mounting holes resist shock and extreme vibration
- Fixed BOM and 3-year longevity
- Conformal coating/sidefill
- Anti-sulfur protection

Rugged Reliable DIMM for Aerospace Applications
SQRAM supports Rugged DIMM and is the best solution for military applications. Aerospace customers require solutions capable of withstanding extreme temperature changes and sudden shock/vibration. To meet these needs, SQRAM delivers ruggedized memory solutions that support operation in broad temperature ranges -40 ~ 85 °C. Advantech has mounted the rugged DIMM SQR-YD4I to the motherboard using two secure fasteners; yielding a system that is highly reliable and stable. It also features advanced protection against sudden shock and vibration. In addition, the rugged DIMM series has passed the highest level of military standard mechanical shock test and meets MIL-810G certification standards.

Rugged Mobile Server for Military Applications
Processing large amounts of data accurately in military applications necessitates high-performance registered memory. Analogously, mobile servers must be capable enduring extreme climates with broad temperature ranges (-40 ~ 85 °C). 32GB of DDR4 with ECC is registered DIMM solution capable of meeting these challenges. SQRAM SQR-RD4N is a reliable and flexible high-quality solution for diverse military applications.
Advantech’s embedded extension modules (EXM) are standard full-size Mini PCIe modules equipped with variety of I/O interfaces. EXM users can extend extra interface ports without customization or board modification. This eases EXM modules/adapter integration and delivers high flexibility to a diverse range of embedded, automation, transportation, and networking applications.

**Product Highlights**

- **EXM-CMPF1**
  - A or E key
  - M.2 (NGFF) to mPCIe (PCIe+USB) adapter
  - Supports MiniPCIe thru PCIe and USB
  - Full-size MiniPCIe with -40 ~ 85 °C

- **EXM-520**
  - SATA Port
  - Supports PCIe to 2-Ch SATA III port
  - MiniPCIe thru PCIe interface
  - Full-size MiniPCIe with -10 ~ 70 °C

- **EXM-510**
  - PCIe to 2-Ch Giga LAN port
  - MiniPCIe thru PCIe interface
  - Full-size MiniPCIe with -40 ~ 85 °C

- **EXM-522**
  - PCIe to 1-Ch Giga LAN port
  - MiniPCIe thru PCIe interface
  - Full-size MiniPCIe with 0 ~ 70 °C

- **EXM-523**
  - Supports PCIe to 2-Ch Giga LAN port
  - MiniPCIe thru PCIe interface
  - Full-size MiniPCIe + Extension board with 0 ~ 70 °C

**Applications**

- **Elevator Communication**
  - Quickly extend CANBus interfaces
  - CANBus
  - EXM-320
  - Fanless Box PC
  - ARK-2121

- **Kiosk Applications**
  - Quickly extend USB 3.0 interfaces
  - USB 3.0
  - EXM-521
  - Embedded Box PC
  - AIMB-B2274

- **HMI**
  - Quickly extend high-speed serial COM modules
  - Serial COM
  - EXM-311
  - MIO-Compact SBC
  - MIO-5272

- **Railway NVR Applications**
  - Quickly extend serial ATA ports
  - SATA Port
  - EXM-520
  - Fanless Compact System
  - ITX-5710
Industrial automation applications require memory and storage solutions with excellent stability, longevity and endurance. Automation application high-frequency write functions accentuate the importance of high endurance design, and 3 years of longevity support. Advantech offers SLC flash technology for applications that require the absolute best endurance. Using Ultra MLC delivers 10x the endurance of standard MLC and is significantly more cost effective than comparable SLC.

**Automation**

Industrial automation applications require memory and storage solutions with excellent stability, longevity and endurance. Automation application high-frequency write functions accentuate the importance of high endurance design, and 3 years of longevity support. Advantech offers SLC flash technology for applications that require the absolute best endurance. Using Ultra MLC delivers 10x the endurance of standard MLC and is significantly more cost effective than comparable SLC.

**Storage**

- 24/7 operation
- End-to-end data protection
- Remote life monitoring

**SQF-P10 P8**

- 256MB - 64GB
- 0~70 °C/-40~85 °C

**SQF-SMS 640**

- 16GB - 716GB
- 0~70 °C / -40~85 °C

**SQF SD3N**

- 500MB / 1GB
- 0~85 °C

**SQF SD4N**

- 2400/2666 / 3200 MHz
- 0~85 °C
- up to 32GB

**SQF SD4O**

- 2666 / 3200 MHz
- 0~85 °C
- Up to 32GB

**Transportation**

Due to harsh operating environments and strict certification needs, ruggedized design and extra longevity are frequent requests for transportation applications. Advantech offers SQFlash and SQRAM products with market-leading ruggedness and 3 to 5 year longevity period, which enhance product reliability for applications like surveillance, data logging, and infotainment in the transportation field.

**Storage**

- Advanced thermal solution
- Power failure protection
- Utility and AES-256-bit support

**SQF-S25 840**

- 240GB - 7.6TB
- 0~70 °C / -40~85 °C

**SQF-C25 920**

- 240GB - 7.6TB
- 0~70 °C / -40~85 °C

**SQF-YD4I**

- Rugged DIMM
- 2400/2666 / 3200 MHz
- 0~85 °C
- up to 32 GB

**SQF-YD4O**

- 2666 / 3200 MHz
- 0~85 °C
- Up to 32 GB

**Networking**

Reliable 24/7 operation is mandatory for networking applications. Advantech provides the latest storage and memory solutions such as NVMe SSD and DDR4 memory at 2666/2933/3200 MHz which delivers the highest performance, capacity, and maximum endurance the industry demands.

**Storage**

- Quad-core processor
- Lower power consumption
- SQ management utility

**SQF-C25 920**

- 240GB - 7.6TB
- 0~70 °C / -40~85 °C

**SQF S25 840L**

- 480GB - 3.8TB
- 0~70 °C

**Memory**

- Advanced security features
- Greater longevity

**SQF-CBB 720**

- 126GB - 716GB
- 0~70 °C / -40~85 °C

**SQF-SD4I**

- ECC UDIMM
- 2666 MHz
- 0~85 °C
- Up to 32GB

**SQF-SD4O(ECC)**

- ECC UDIMM
- 2666/3200 MHz
- 0~85 °C / -40~85 °C
- Up to 32GB

**Defense/ Aerospace**

To meet the challenges of wide temperature and high humidity and to ensure 24/7 continuous operation in military and aerospace applications, Advantech provides ruggedized storage and memory modules to address the military needs for non-volatile, high security, high reliability solutions. Our solutions are designed with an integrated suite of security features including data encryption, emergency erase, and McAfee and Acronis security and backup solutions to keep your data safe.

**Storage**

- Ruggedized design
- Advanced security features
- Greater longevity

**SQF-S25 840**

- 240GB - 7.6TB
- 0~70 °C / -40~85 °C

**SQF-CBB 720**

- 126GB - 716GB
- 0~70 °C / -40~85 °C

**SQF-SD4I**

- ECC UDIMM
- 2666 MHz
- 0~85 °C
- Up to 32GB

**SQF-SD4O(ECC)**

- ECC UDIMM
- 2666/3200 MHz
- 0~85 °C / -40~85 °C
- Up to 32GB
**Benefits**

- Outstanding thermal solution from Advantech further enhances NVMe SSD performance in extreme environments
- Advanced power failure protection design to cope with potential unstable power supplies
- Professional IPC system design service seamlessly integrates cutting-edge SSD technology into a ruggedized in-vehicle system
- Comprehensive security functions supported by SQFlash improve the overall system security and ensure data protection
- Smart remote management software monitors SSDs health and performance

**Application Requirements**

Advantech supported the development of an in-vehicle video recording and a data logging system. This project required a very small form factor, high-capacity data collection system that took advantage of PCIe SSDs performance using the NVMe communication protocol. Designed for global deployment, the completed system was expected to operate in temperatures between -20 ~ 70 °C. Integrating 6 to 12 pieces of NVMe SSDs within a system provides excellent throughput and strong performance but also consumes substantial power and generates significant heat. As such, heat dissipation was a major obstacle as the device was bound for integration within compact spaces.

**Project Implementation**

In this case, Advantech’s SQFlash 920 NVMe SSDs provided the perfect solution. The SSDs used KIOXIA’s BICS 3D NAND flash technology, supported capacity of up to 8 TB per drive, and came with built-in power failure protection and advanced security technologies. Developed with Advantech’s significant expertise in thermal management and embedded system design, the SSD adopted an innovative heatsink design that helped reduce internal temperatures by up to 30 °C when compared to NVMe SSDs that rely purely on thermal throttling as the only passive temperature control (which also slows down SSD performance dramatically). To maximize heat dissipation, these heatsinks were used in conjunction with thermal grease; providing outstanding mechanical flexibility to avoid the risk of physical damage to the SSD components from an abrupt temperature change. Due to built-in thermal sensors in the NVMe SSD, it was possible to monitor SSD working temperatures, present SMART data, and control the system fan automatically in order to actively take away the heat from this compact system. The customer easily accessed thermal information through the Advantech WISE-PaaS cloud platform with the SSD PMQ (Predictive Maintenance Quality) function and set thresholds for the system alarm and/or platform with the SSD PMQ (Predictive Maintenance Quality) function and set thresholds for the system alarm and/or state change.

**Benefits**

- Comprehensive security functions supported by SQFlash improve the overall system security and ensure data protection
- Smart remote management software monitors SSDs health and performance
- Professional IPC system design service seamlessly integrates cutting-edge SSD technology into a ruggedized in-vehicle system
- Extremely small form factor, high-capacity data collection system that takes advantage of PCIe SSDs performance using the NVMe communication protocol
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**SQFlash Presents Wide-temperature 8TB NVMe SSDs for Autonomous Driving**

For transport applications like surveillance, in-vehicle data logging, and autonomous driving there is a significant demand for reliable, high-capacity, high-performance storage to efficiently store high volumes of vision-based data. In many cases, such systems also need to operate in challenging environments with wide temperature ranges, strong vibration levels, and/or unstable power supplies. While SSDs built on nonvolatile NAND flash memory are the technology of choice, there can be issues related to heat dissipation and decreased reliability when deploying them in industrial applications.

**Benefits**

- Comprehensive security functions supported by SQFlash improve the overall system security and ensure data protection
- Smart remote management software monitors SSDs health and performance
- Professional IPC system design service seamlessly integrates cutting-edge SSD technology into a ruggedized in-vehicle system
- Extremely small form factor, high-capacity data collection system that takes advantage of PCIe SSDs performance using the NVMe communication protocol
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**Application Requirements**

Our customer was involved in a project making flight instrument panels for AirBus and required a ruggedized memory solution to cope with mission-critical environments. A major concern was that memory modules would be affected by humidity and AirBus needed their systems to be highly resistant to moisture and humidity. They needed a ruggedized memory solution with the promise that key components could operate continuously 24/7 in AirBus aircraft under extreme conditions with total safety.

**Project Implementation**

The AirBus flight instrument panels included Advantech’s industrial grade SQ-RDIMM 1.35V low voltage DRAM DDR3 memory. To operate in extreme conditions, each DDR3 DRAM module is designed with reliable and wide temperature IC chip and 30μ” PCB and is verified for severe thermal shock in wide temperature ranges of -40 ~ 85 °C for 12 hours in our burn-in test program. In addition to humidity tests in our special chambers, we apply a conformal coating on the PCB module for base resistance against corrosion, acid, and water problems. Moreover, SQ-RDIMM also has under fill epoxy applied on the PCB substrate and IC chip to protect solder connections against vibration or shock. This outstanding protection extends durability and protects against drops and vibration. Finally, all key information is stored in EEPROM. In order to ensure the DRAM works without impact from system noise, we lock the read only EEPROM function to protect against accidental write overs. This highly reliable and durable SQRAM memory solution perfectly fulfilled the customer’s request and our severe test program and extra ruggedizing service perfectly fitted their mission critical requirements.

**Benefits**

- Advanced EEPROM protected design ensures DRAM operates without impact from M/B data interference
- 100% reliability burn-in and vibration testing program
- Conformal coating and IC sideways services
- Reliable, ruggedized industrial grade DRAM with -40 ~ 85 °C wide operating temperature testing to withstand extreme operating environments

**SQRAM Provides Extreme Ruggedized Solution for Aircraft**

Aerospace and defense systems require rugged and reliable platforms that can operate in challenging environments. Conditions in these fields are characterized by extreme heat, cold, dust, shock, and vibration. When it comes to DRAM memory modules inside these systems, individual bit errors are common as they operate under extreme conditions, meaning their DRAM modules are repeatedly tested to their specification limits.
# Product Selection

## SATA SSD

<table>
<thead>
<tr>
<th>Model Name</th>
<th>SQF-S25 640 series</th>
<th>SQF-SMS 640 series</th>
<th>SQF-SMS 320 series</th>
<th>SQF-S25 320 series</th>
<th>SQF-SMS 320 series</th>
<th>SQF-S2S 640 series</th>
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<tbody>
<tr>
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## NVMe SSD

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<th>SQF-C2S 920 series</th>
<th>SQF-CMB 920 series</th>
<th>SQF-CA 720 series</th>
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## PATA/SD/eMMC/USB Storage

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<th>SQF-P2P P/P/S</th>
<th>SQF-P3P P/P/S</th>
<th>SQF-P4P P/P/S</th>
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</tr>
<tr>
<td>Temperature</td>
<td>0 ~ 70 °C / -40 ~ 85 °C</td>
<td>0 ~ 70 °C / -40 ~ 85 °C</td>
<td>0 ~ 70 °C / -40 ~ 85 °C</td>
<td>0 ~ 70 °C / -40 ~ 85 °C</td>
<td>0 ~ 70 °C / -40 ~ 85 °C</td>
<td>0 ~ 70 °C / -40 ~ 85 °C</td>
<td>0 ~ 70 °C / -40 ~ 85 °C</td>
</tr>
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---

**New**

**Embedded**

**Enterprise**

**PATA/SD/eMMC/USB Storage**
## Product Selection

### SRAM Industrial Memory Modules

**Embedded DRAM Modules**

<table>
<thead>
<tr>
<th>Model</th>
<th>SODIMM</th>
<th>UDIMM</th>
</tr>
</thead>
<tbody>
<tr>
<td>DDR</td>
<td>SQR-SD2N</td>
<td>SQR-SD2N</td>
</tr>
<tr>
<td>DDR Type</td>
<td>SQR-SD2N</td>
<td>SQR-SD2N</td>
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<tr>
<td>PCIe Rating</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Frequency (MHz)</td>
<td>2400</td>
<td>2666</td>
</tr>
<tr>
<td>Capacity</td>
<td>8/16/32GB</td>
<td>8/16/32GB</td>
</tr>
<tr>
<td>Voltage</td>
<td>1.2V</td>
<td>1.2V</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>0 ~ 85 °C</td>
<td>0 ~ 85 °C</td>
</tr>
<tr>
<td>DeviceOn/ SQ Manager</td>
<td>Supported</td>
<td>Supported</td>
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</tbody>
</table>

### Ruggedized DRAM Modules

<table>
<thead>
<tr>
<th>Model</th>
<th>SODIMM</th>
<th>UDIMM</th>
</tr>
</thead>
<tbody>
<tr>
<td>DDR</td>
<td>SQR-YD4</td>
<td>SQR-YD4</td>
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<tr>
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<tr>
<td>PCIe Rating</td>
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<td>Yes</td>
</tr>
<tr>
<td>Frequency (MHz)</td>
<td>2400</td>
<td>2666</td>
</tr>
<tr>
<td>Capacity</td>
<td>8/16/32GB</td>
<td>8/16/32GB</td>
</tr>
<tr>
<td>Voltage</td>
<td>1.2V</td>
<td>1.2V</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>0 ~ 85 °C</td>
<td>0 ~ 85 °C</td>
</tr>
<tr>
<td>DeviceOn/ SQ Manager</td>
<td>Supported</td>
<td>Supported</td>
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### High Performance & Server DRAM Modules

<table>
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<tr>
<th>Model</th>
<th>LRDIMM</th>
<th>RDIMM</th>
<th>UDIMM ECC</th>
<th>SODIMM ECC</th>
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<tbody>
<tr>
<td>DDR</td>
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<td>SQR-2D4N</td>
<td>SQR-2D4N</td>
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<tr>
<td>DDR Type</td>
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<td>SQR-2D4N</td>
<td>SQR-2D4N</td>
<td>SQR-2D4N</td>
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<tr>
<td>PCIe Rating</td>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<td>Frequency (MHz)</td>
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<tr>
<td>Capacity</td>
<td>8/16/32GB</td>
<td>8/16/32GB</td>
<td>8/16/32GB</td>
<td>8/16/32GB</td>
</tr>
<tr>
<td>Voltage</td>
<td>1.2V</td>
<td>1.2V</td>
<td>1.2V</td>
<td>1.2V</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>0 ~ 85 °C</td>
<td>0 ~ 85 °C</td>
<td>0 ~ 85 °C</td>
<td>0 ~ 85 °C</td>
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<tr>
<td>DeviceOn/ SQ Manager</td>
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## EXM Embedded Extension Modules

### Adapter

<table>
<thead>
<tr>
<th>Model Name</th>
<th>EXM-CMP01 (A key)</th>
<th>EXM-CMP01 (B key)</th>
<th>EXM-C110 (EMI-2071L)</th>
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</thead>
<tbody>
<tr>
<td>Type</td>
<td>PCIe to 2-Ch Giga LAN port</td>
<td>PCIe to 2-Ch Giga LAN port</td>
<td>PCIe to 2-Ch Giga LAN port</td>
</tr>
<tr>
<td>Communication Interface</td>
<td>PCIe</td>
<td>PCIe</td>
<td>PCIe</td>
</tr>
<tr>
<td>Interface Connector</td>
<td>MiniPCIe to PCIe</td>
<td>MiniPCIe to PCIe</td>
<td>Internal USB port, PCIe</td>
</tr>
<tr>
<td>Channel Connector</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>-40 ~ 85 °C</td>
<td>-40 ~ 85 °C</td>
<td>-40 ~ 85 °C</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>-40 ~ 85 °C</td>
<td>-40 ~ 85 °C</td>
<td>-40 ~ 85 °C</td>
</tr>
<tr>
<td>LED Status</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Dimensions (L x W x H)</td>
<td>35.5 x 30.1 x 15 mm (1.39 x 1.18 x 0.59 in)</td>
<td>35.5 x 30.1 x 15 mm (1.39 x 1.18 x 0.59 in)</td>
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</tr>
</tbody>
</table>

### PCIe Signal

<table>
<thead>
<tr>
<th>Model Name</th>
<th>EXM-101 (EMI-206A)</th>
<th>EXM-521 (EMI-2050U)</th>
<th>EXM-522 (EMI-2050U)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>PCIe to 2-Ch High Speed RS-232 port</td>
<td>PCIe to 2-Ch High Speed RS-232 port</td>
<td>PCIe to 2-Ch High Speed RS-232 port</td>
</tr>
<tr>
<td>Communication Interface</td>
<td>PCIe</td>
<td>PCIe</td>
<td>PCIe</td>
</tr>
<tr>
<td>Interface Connector</td>
<td>MiniPCIe to PCIe</td>
<td>MiniPCIe to PCIe</td>
<td>Internal USB port, PCIe</td>
</tr>
<tr>
<td>Channel Connector</td>
<td>1</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>-40 ~ 85 °C</td>
<td>-40 ~ 85 °C</td>
<td>-40 ~ 85 °C</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>-40 ~ 85 °C</td>
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</tr>
<tr>
<td>LED Status</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Dimensions (L x W x H)</td>
<td>50.5 x 30 x 15 mm (1.98 x 1.18 x .78 in)</td>
<td>50.5 x 30 x 15 mm (1.98 x 1.18 x .78 in)</td>
<td>50.5 x 30 x 15 mm (1.98 x 1.18 x .78 in)</td>
</tr>
</tbody>
</table>

### USB Signal

<table>
<thead>
<tr>
<th>Model Name</th>
<th>EXM-311 (EMI-2080P)</th>
<th>EXM-322 (EMI-2080U)</th>
<th>EXM-320 (EMI-3080U)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>USB to 2-Ch High Speed RS-232 port</td>
<td>USB to 2-Ch High Speed RS-232 port</td>
<td>USB to 2-Ch High Speed RS-232 port</td>
</tr>
<tr>
<td>Communication Interface</td>
<td>USB to 2-Ch High Speed RS-232 port</td>
<td>USB to 2-Ch High Speed RS-232 port</td>
<td>USB to 2-Ch High Speed RS-232 port</td>
</tr>
<tr>
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<td>MiniPCIe to PCIe</td>
<td>MiniPCIe to PCIe</td>
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