



Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

With the principle of “Quality Parts,Customers Priority,Honest Operation,and Considerate Service”,our business mainly focus on the distribution of electronic components. Line cards we deal with include Microchip,ALPS,ROHM,Xilinx,Pulse,ON,Everlight and Freescale. Main products comprise IC,Modules,Potentiometer,IC Socket,Relay,Connector.Our parts cover such applications as commercial,industrial, and automotives areas.

We are looking forward to setting up business relationship with you and hope to provide you with the best service and solution. Let us make a better world for our industry!



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# EMBEDDED MEMORY & STORAGE SOLUTIONS



**AUTOMOTIVE • COMMUNICATIONS  
INDUSTRIAL • NETWORKING • SECURITY**

## WHAT SEPERATES US FROM THE OTHERS

Data is the fuel of the future and is driving global growth and change. As a leader in industrial data storage, Swissbit recognizes the undeniable need for reliable and secure storage solutions as an integral part of the digital transformation age.

More than 5000 customers around the world including Fortune 500 companies and the world's leading OEM's already rely on Swissbit for their safety-critical data-storage requirements. With over 25 years of experience in the development of removable & embedded memory solutions for the most demanding markets coupled with a trusted global distribution & support network, Swissbit is firmly established as a global innovation leader in storage technology for high-reliability solutions.

Swissbit's state-of-the-art centralized and wholly owned manufacturing, testing and packing facility in Berlin ensures supply chain integrity that delivers fail-safe industrial strength flash memory solutions for safety-critical applications including industrial, medical, automotive and communication networking.

Swissbit's devices and proprietary firmware meet the highest technology & safety requirements so that customers can trust that their data is stored, protected and secured even in harsh environments and under the most difficult conditions. Whether flash memory solutions for extreme temperatures or tamper-proof secure data storage, all Swissbit products meet the highest quality criteria and performance benchmarks. When you need a reliable long-term source for your memory solutions, Swissbit is your partner you can trust to deliver.

## CORPORATE PROFILE

### Established

1992 – 2000 as SIEMENS AG  
Swissbit AG was formed in 2001 through a management buyout

### Financial Strength

Privately held company, equity ratio > 60%

### CAGR 2009–2017

Double digit annual growth

### Headquarters

Swissbit Group: Gais, Switzerland  
Swissbit AG: Bronschhofen (St. Gallen, Lake Constance area)

### Subsidiaries

Switzerland, Germany, USA, Japan, Taiwan

### R & D sites

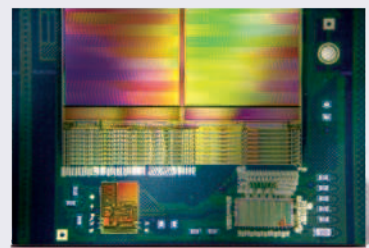
Switzerland, Germany and USA

### Production Site

Berlin, Germany

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## OUR PRODUCTS



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# WHAT IS THE CUSTOMER BENEFIT?

## HIGHEST ROBUSTNESS

### WHAT MATTERS WHEN STORAGE NEEDS TO BE TOUGH

We assure that Swissbit storage products deliver best endurance at maximum performance and for lowest cost of ownership in our customers' applications. We combine reliable design and zero-defect manufacturing with world-class product qualification for highest quality and long service life: key factors that ensure highest productivity and efficiency in the tough applications that Swissbit serves.

01

**Availability of a full portfolio of storage products with best fit to the customer use case**

02

**Fast and easy qualification of a mature product without risk of undetected issues**

03

**Long service life without need of frequent requalification**

04

**Reduced cost of maintenance and RMA handling**

05

**Fast and effective application engineering support**

## SAFE PROCESSES THROUGH RELIABLE DEVELOPMENT

- Product design and development with focus on embedded, NetCom and automotive market requirements
- Optimized for demanding applications
- Stringent hardware and firmware qualification verify design effort

## SAVINGS THROUGH LONG SERVICE LIFE

- Swissbit products use components with long-term availability
- The service life of Swissbit products exceed industry practice by far
- Swissbit commits to frozen BOM and PCN process

## MAXIMUM STABILITY

- Improved signal integrity
- In-house COB process for maximum mechanical robustness
- PCB design and soldering process withstand high thermal stress
- True industrial temperature support
- Firmware for highest endurance

APPLICATIONS

# INDUSTRY



## EMBEDDED PRODUCTS

Swissbit's embedded memory and storage solutions are the perfect fit for demanding embedded applications. They offer the highest reliability and quality. Swissbit's strategic cooperation with suppliers allows for long-term availability of products. To guarantee

high-quality standards, each product undergoes thorough functional testing before being released for shipment. The broad portfolio with different NAND technologies and industry-dedicated features guarantee the right solution for each embedded use case.



swissbit®

6GB

Industrial  
eMMC™ Card

Memory and non-volatile storage solutions for embedded applications must provide reliable operation even in the most extreme conditions: temperature, shock, and vibration. As such, both the qualification cycle and the support life cycle needed for these products by far exceed those of devices designed for typical consumer applications.

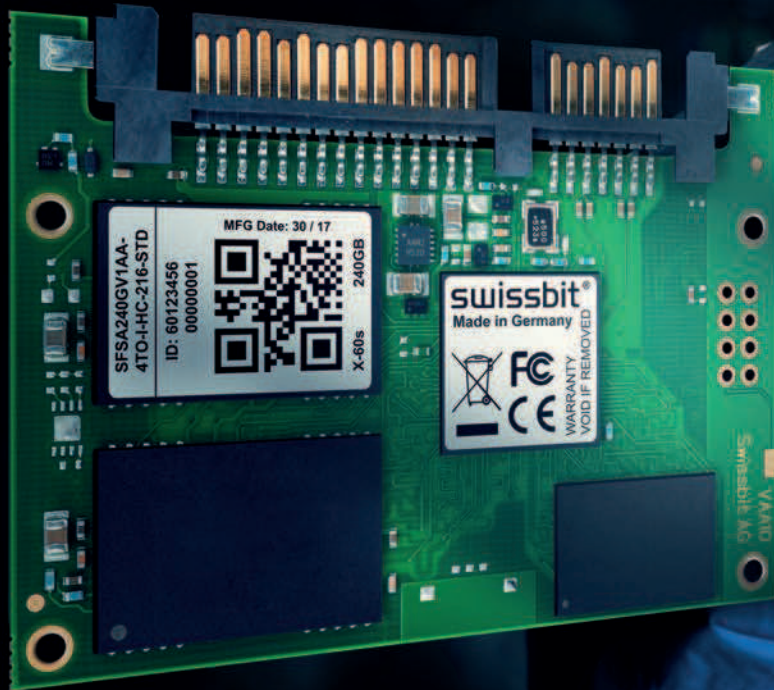
**TYPICAL APPLICATIONS:**

- Industrial automation
- Energy distribution
- Energy consumption
- Smart grid
- Infotainment
- Healthcare
- Transportation
- Aerospace and defense
- Industrial IoT



## APPLICATIONS

# MEDICAL



### MEDICAL PRODUCTS

There is a vast array of medical applications, ranging from diagnostic instruments as MRI and CT scanners, ultrasound systems, to blood testing and dialysis machines and infusion pumps. The amount of data stored can be small, as in heart rate monitoring equipment for example, or large as in X-Ray imaging. Nonetheless there is one common aspect: qualifying and certifying components for medical use is a lengthy, expensive task and the timeline from

the initial testing to volume production may extend over several years. Any requalification needs to be avoided as much as possible. This requires storage products that have a frozen BOM and long availability for many years. The portfolio of products for medical use range from SD memory cards or CF cards for handheld medical appliances, to 2.5" or M.2 SSDs with high bandwidth and capacity for medical imaging.



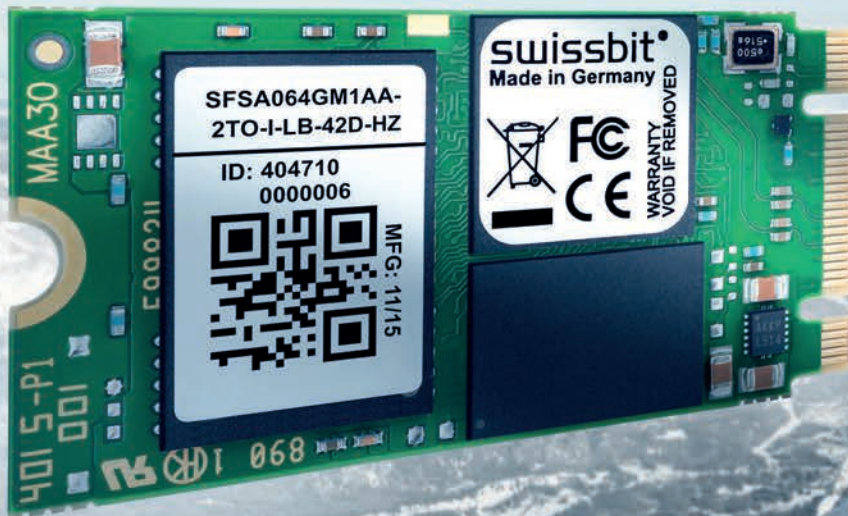
We rely on medical instruments in the most critical conditions of our lives. There is no tolerance for malfunctioning systems. Swissbit understands these requirements and serves the medical industry with storage products that fulfill the highest quality standards. Additionally, Swissbit's secure storage products protect the patients' medical data against unauthorized access. For more details on security products see page 42.

**TYPICAL APPLICATIONS:**

- Diagnostics
- Medical imaging
- Medical treatment
- Point-of-care testing
- Monitoring systems
- Augmented reality
- Medical vision

## APPLICATIONS

# NETWORKING & COMMUNICATION



### NETCOM PRODUCTS

Swissbit supports the demanding field of NetCom applications with products that withstand a wide range of frequent temperature changes and operate between  $-40^{\circ}\text{C}$  and  $+85^{\circ}\text{C}$ . It is mandatory that products perform for an extended life time in the field without the need for replacement or service. Swissbit's durabit™ range of SSDs fulfil this requirement.

For system boot purposes, a common frequently utilized device is the embedded USB module. With the U-4x and U-5x family, Swissbit offers a broad range of capacities and interface modes. Data care management with retention optimization maintains the boot image data over the complete service life and guarantees a safe and fast restart of the NetCom system.

The latest technologies and life changing developments rely on the Internet. The Internet of Things (IoT), the Industrial Internet of Things (IIoT) or Industry 4.0 (IND4.0) cannot be realized without a strong network of communication channels. Transmitting data to remote areas of the world is quite challenging and involves a high cost. Transceivers, routers and bridges which require uninterrupted, autonomous 24/7 operation, are often under extreme environmental conditions and may be installed in difficult to service areas.

#### TYPICAL APPLICATIONS:

- ATCA Blade
- Cable modem
- Content and video delivery
- Digital Subscriber Line access multiplexer
- Enterprise Media Gateway
- Switches and routers
- Optical network
- Radar / Sonar
- Radio network controller
- Security
- Tetra Base Station
- Wireless Base Station





APPLICATIONS

# AUTOMOTIVE

## AUTOMOTIVE PRODUCTS

All components used in automotive applications need to operate within a wide temperature range and withstand sudden power loss as well as shock and vibration. Additionally, very low failure rates are essential, because replacements of malfunctioning parts can incur high costs. Swissbit is the only indepen-

dent embedded memory and storage manufacturer with an IATF 16949 certified fab. Our S-45 SD and microSD memory card lineup caters to the demands of automotive applications, offering the highest reliability and quality at competitive prices.



The increasing varieties of infotainment and dashboard applications in cars today require significantly higher storage capacities than before. For autonomous driving the demand for fast and high capacity storage drives the development of embedded products. Swissbit participates in this trend with newly developed dedicated storage solutions.

#### TYPICAL APPLICATIONS:

- Entertainment systems
- Navigation systems
- Head unit / dashboard
- Black box / crash recorder
- Instrument cluster
- Dash cam

APPLICATIONS

# SECURITY



## SECURITY PRODUCTS

Governments, enterprises, banks, and industry demand high-end security to protect their assets. The growing number of IoT devices need to be secured against interception of data transfer and hacking of control systems.

But even trusted security solutions like Management Engines, Smartcard chips or secured CPUs prove to be imperfect. An upgradeable security solution based on exchangeable hardware cryptography and standard interfaces is the solution

to update systems to an always state-of-the-art security level. Swissbit's secure memory solutions offer smart card functionality coupled with NAND flash storage. Systems with SD card or USB interface can easily be updated to the protection level of a smart card chip. For efficient data protection of stored information, Swissbit offers SSDs as self-encrypted drives (SED) with TCG OPAL compliance or SD Cards with AES encryption.



Hardware based security offers the highest level of protection but needs a certain effort to be integrated in a system environment. Swissbit's middleware creates the standardized layer to offer security functionality to the system without the need to understand the underlying hardware interfaces. The Swissbit Security Interface supports all relevant mobile, portable, embedded, and PC platforms.

#### TYPICAL APPLICATIONS:

- Surveillance
- Audit trails
- License protection
- Secure update
- Secure voice communication
- Authentication and authorization
- Data encryption and protection



# PRODUCT FEATURES

## ROBUSTNESS FEATURES



### SHOCK AND VIBRATION

The design, assembly, and use of selected materials guarantee extreme mechanical robustness.



### CONFORMAL COATING

A thin polyurethane film protects against aggressive environmental conditions such as dust, moisture, or corrosive gas.



### LONGEVITY

These products offer the lowest TCO in demanding applications with high requalification cost.

## PERFORMANCE FEATURES



### HIGH PERFORMANCE

Optimized for high sequential data rates and IOPS by use of SLC technology.



### WAF REDUCTION

The WAF (write amplification factor) for MLC based products is reduced by combining a paged based FW block management with a powerful card architecture and configuration settings.

## TEMPERATURE FEATURES



### WIDE TEMPERATURE SUPPORT

The products are designed and approved for reliable operation over a wide temperature range.



### TEMPERATURE SENSOR

The sensor allows the host hardware or software to monitor the storage device temperature.

## DATA FEATURES



### DATA CARE MANAGEMENT

Multiple routines inside the controller firmware improve data quality and eliminate degradation effects.



### LIFE TIME MONITORING (LTM)

The Swissbit Life Time Monitoring feature enables users to access the memory device's detailed Life Time Status and allows remaining lifetime prediction thereby avoiding unexpected data loss.



### SECURE ERASE (SANITIZE / PURGE) / FAST ERASE

This feature uses an uninterruptable sequence of data erase commands.



### READ-ONLY OPTIMIZED

For such cases content is written to the NAND flash once, the firmware can be optimized to guarantee the highest possible data retention and read disturb.



### TRIM SUPPORT

Expired data can be released and deleted in the Flash which reduces garbage collection and increases life time.



### ZONE PROTECTION

The device allows the configuration of multiple zones with either no protection, write protection, or access protected settings.

## ELECTRONIC FEATURES



### ESD AND EMI SAFE

The product designs are in line with the latest regulations for electrostatic discharge and electromagnetic interference.



### LOW POWER CONSUMPTION

Electronic devices with lower power consumption decrease energy cost, prolong battery life, and reduce heat generation in the device and hence require less cooling.



### WEAR LEVELING

Sophisticated wear leveling and bad block management ensure that flash cells are sparingly and equally used to prolong the device's life.



### IN FIELD FW UPDATE

The storage product can be upgraded with new FW in the field. The upgrade process is protected against power loss.



### POWER FAIL PROTECTION & RECOVERY

During an unintentional shutdown, firmware routines and intelligent hardware architecture ensure that no corruption of user or system data will occur.

## SECURITY FEATURES



### TRUE HARDWARE RNG

True random numbers are generated inside the secure element to prevent brute force attacks.



### DIGITAL SIGNATURE & VERIFICATION

Digital signatures are very popular and inevitable to protect against data or code manipulation.



### HARDWARE BASED DATA ENCRYPTION

Hardware based security is key when it comes to replaceability, simple workflows, and trusted runtime environments.



### MOBILE BANKING & EPURSE

Strong authentication and offline security for mobile banking and payment.



### DEVICE PROTECTION BY DUAL FACTOR AUTHENTICATION

The user needs to have the card and know the PIN.



### SECURE VOICE

The product is optimal for fast, encrypted, and user friendly secure voice solutions.



### ELLIPTIC CURVE CRYPTOGRAPHY SUPPORT

Elliptic curves are faster and more efficient than RSA cryptography.



### DATA PROTECTION & ENCRYPTION

The card offers a data safe function with strong AES encryption and PIN access protection.



### SECURE LOGGING

Any data can be stored securely in write-once mode, queue mode, or random-access mode.



### SECURE CD-ROM

Important data can be modified only after PIN authentication.



## **PRESALES**

### **YOUR FUTURE WITH OUR SOLUTION**

Our experienced BDM and FAE teams in Europe, North America, and Asia support you in the selection and qualification of the most suitable memory and storage solution for your applications.

This includes TCO analysis with the Swissbit Lifetime Monitor, hardware or firmware customization, middleware development, the provision of evaluation units and ultimately a joint qualification.

## **SALES**

### **YOUR TRUSTWORTHY PARTNER**

We understand the importance of providing local support in your language and time zone. For that reason, Swissbit has established sales offices in all major regions plus a strong network of partners that reaches even farther. Our experienced sales teams manage forecasting and order fulfillment, if desired also through third-party logistics or distribution networks.

## **AFTERSALES**

### **LOCAL SUPPORT – GLOBALLY**

Our engagement stretches far beyond the delivery of our products. Through sophisticated lifecycle management, we can ensure maximum longevity and smooth transitions in the event of product changes. And while we are proud of our best-in-class quality, we are still prepared to provide fast and solution-oriented RMA support at any time, including 4D and 8D reports whenever required.

# SWISSBIT'S UNIQUE 360° CUSTOMER SERVICE



# NAND FLASH PRODUCTS

## SWISSBIT'S EMBEDDED STORAGE SOLUTIONS

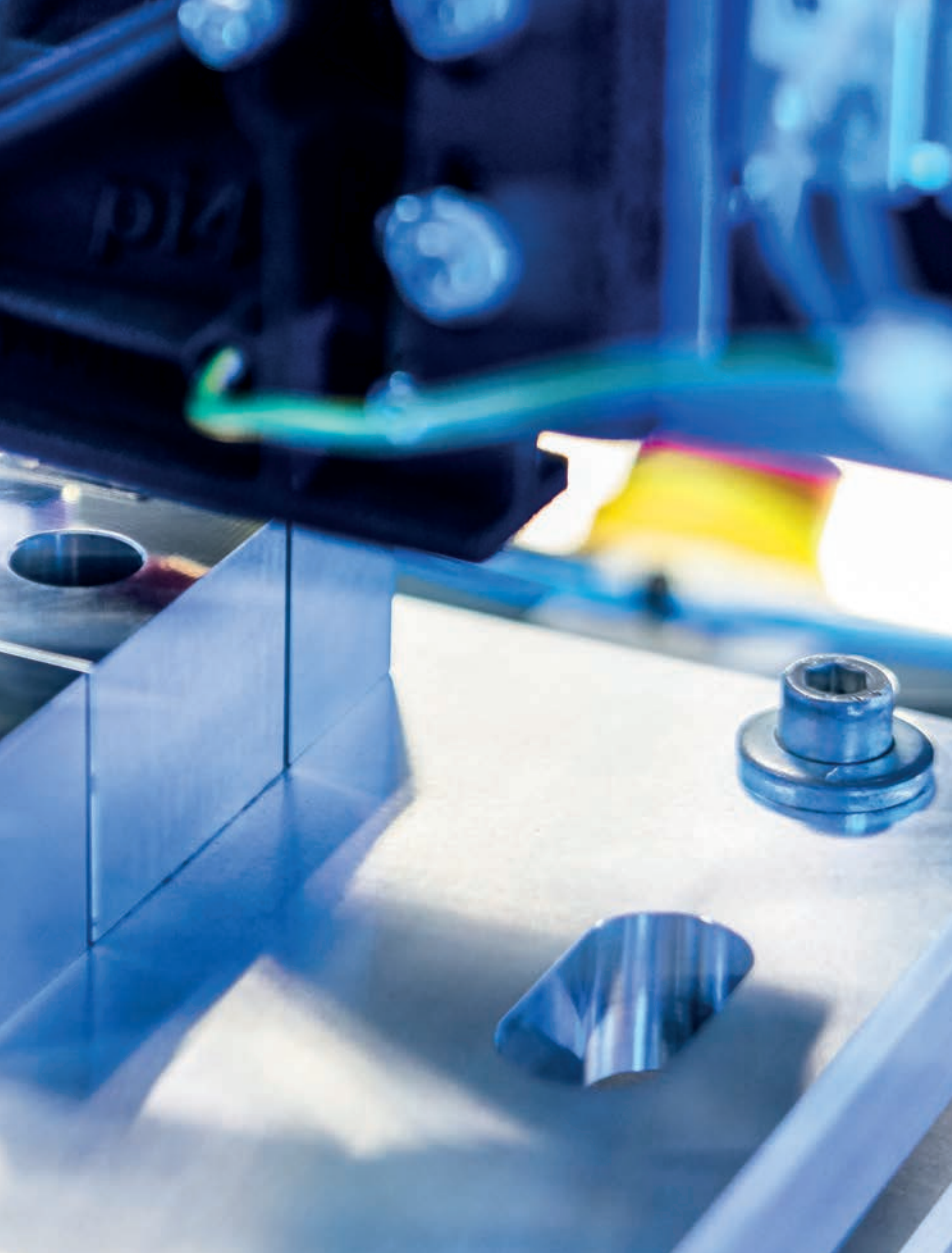
Our sophisticated flash handling algorithms optimize performance and life of the Single Level Cell (SLC) and Multi Level Cell (MLC) NAND flash used in our products.

OEM's of various industries require a variety of memory and storage solutions. In contrast to typical consumer devices, Swissbit's embedded memory and storage solutions are designed for highest reliability under extreme environmental conditions. They come with a large feature set tailored to the demands of the industrial, automotive, and NetCom markets and with our commitment to long-term availability. Swissbit's embedded

memory and storage solutions portfolio covers all relevant interfaces and form factors including SD and microSD memory cards, CompactFlash™ and CFast™ cards, 2.5" SATA SSDs, SLIM SATA and mSATA SSDs, M.2, USB Flash Drives (UFD) and modules. Our sophisticated flash handling algorithms optimize performance and life of the Single Level Cell (SLC) and Multi Level Cell (MLC) NAND flash used in our products.

	SLC	everbit™ pSLC	durabit™ The better MLC	MLC	TLC
Chip Capacity	•	••	•••	•••	••••
Cost per Bit	••••	•••	••	••	•
Reliability & Endurance	••••	••••	•••	••	•
Industrial Temperature	••••	•••	•••	•••	•
Write Performance	••••	••••	••••	•••	•
ECC Requirement	•	••	••	••	••••
Data Retention	••••	•••	•••	•••	•
Longevity	••••	••	••	••	•

•••• highest; ••• high; •• medium; • low



## FLASH LIFETIME PREDICTION

The endurance of flash-based products is primarily defined by the maximum number of program / erase cycles of the flash components. SLC components normally allow 100,000 PE cycles per block while MLC is typically specified as 3,000 PE cycles.

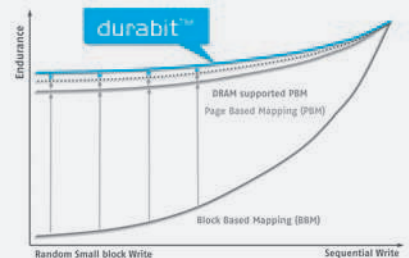
This transparency of NAND component endurance is no longer provided for integrated flash cards with controllers and firmware. For each write that the host initiates, the flash controller has to perform internal management steps and may need to erase and write multiple blocks even at the smallest external write transfer size. The ratio between internal write data volume and the external request size is called WAF (write amplification factor) and can vary between one (theoretical best case) and several hundred depending on card structure, flash components used, firmware architecture, and user-application write profile.

As explained in the box to the right, the endurance and performance of a FLASH product is massively defined by the internal write amplification (WAF). The way in which customer applications write to the storage device has a high impact on the WAF but is difficult to calculate analytically. Swissbit supports a realistic evaluation of the WAF and the endurance of their SSDs and storage cards with help of the Swissbit Life Time Monitoring Tool and statistical data stored into the flash by the firmware. This tool can read out the real usage

data such as number of writes and erase cycles, the bad block statistic, the successful ECC correction, and provides all the data necessary to extrapolate the lifetime of the device.

Swissbit durabit™ products use architectural improvements such as page based FTL, increased overprovisioning and DRAM supported flash management to significantly decrease the WAF for small writes. This enables unprecedented endurance and write performance in these critical use cases.

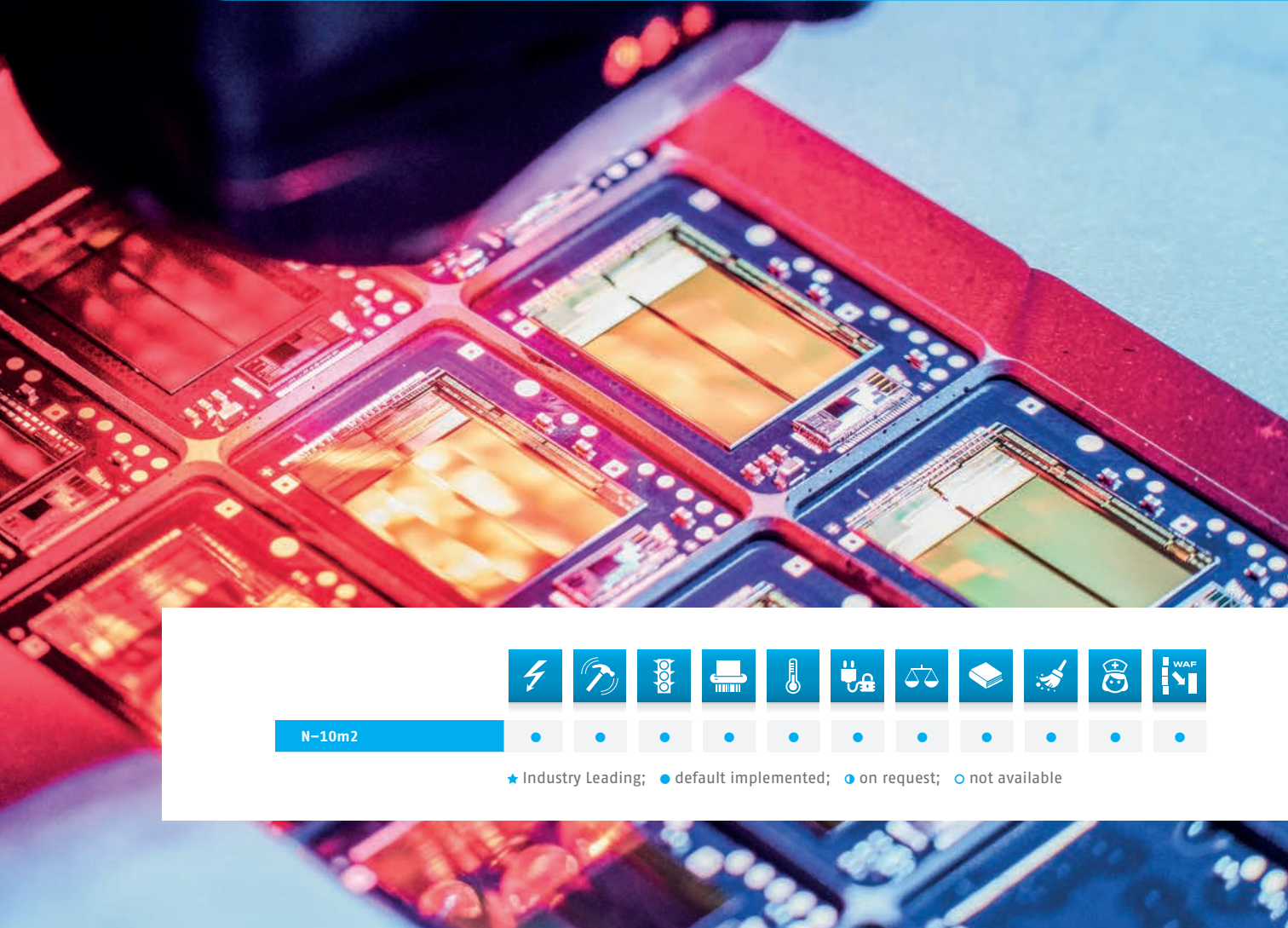
## SSD ENDURANCE



# PCIe SSD Modules

Although SATA is still a dominant interface in embedded and NetCom systems, the future belongs to PCIe. PCIe breaks the bandwidth limitations of SATA and offers flexible solutions with multiple lanes that can be combined. The second innovation to increase the performance is the new protocol NVMe, which has been designed specifically for Non Volatile Memory. The protocol significantly reduces the latency of read and

write requests. The higher performance also requires higher power consumption, especially with the common 4-lane configuration. The Swissbit N-10m2 module, a PCIe Gen3 / NVMe 1.2 module only uses 2 PCIe lanes and reduces the power consumption without sacrificing performance. Even if only operated with one PCIe lane, the performance still exceeds the SATA limits.



N-10m2	⚡	🔧	🚦	🖨️	🌡️	🔌	⚖️	📄	👉	🛡️	WAF
●	●	●	●	●	●	●	●	●	●	●	●
	★ Industry Leading;	● default implemented;	● on request;	○ not available							

# N-10m2



## GENERAL INFORMATION

TYPE	m.2 PCIe / NVMe
STANDARD & INTERFACE	PCI Express (PCIe) Specification Revision 3.1 / NVMe 1.2
PACKAGE	PCI Express® M.2 (2280)
OUTLINE DIMENSIONS	80 x 22 x 3,6 mm
FLASH TYPE	3D NAND
DENSITY RANGE	120 GB – 960 GB
DATA RETENTION	10 years @ life begin 1 year @ life end
ENDURANCE	3,000 P/E cycles (Flash Cell Level)

## TEMPERATURE

OPERATING TEMPERATURE	Commercial: 0°C to +70°C
STORAGE TEMPERATURE	-40°C to +85°C

## PERFORMANCE

SEQUENTIAL READ (MB/S)	up to 1,600
SEQUENTIAL WRITE (MB/S)	up to 1,100
RANDOM 4KB READ (IOPS)	up to 197,000
RANDOM 4KB WRITE (IOPS)	up to 199,000

## ELECTRICAL DATA

VOLTAGE	2.70–3.60 V
POWER CONSUMPTION	Typ. Read Active: 3.1 W Typ. Write Active: 3.3 W Power State 3: < 50 mW

## FEATURE LIST

FEATURES & TOOLS	<ul style="list-style-type: none"> <li>Best-in-Class Performance and Endurance with durabit™ Technology</li> <li>Dynamic and Static Wear Leveling, Dynamic Bad Block Remapping</li> <li>Active and Passive Data Care Management</li> <li>On-Board Power Fail Protection</li> <li>Active State Power Management (ASPM) Support</li> <li>NVMe Security Command Support</li> <li>In-Field Firmware Update</li> <li>Self-Monitoring, Analysis, and Reporting Technology (S.M.A.R.T.)</li> <li>AES256 Encryption (on request)</li> <li>Swissbit Life Time Monitoring (SBLTM) Tool and SDK for SBLTM (on request)</li> </ul>
PART NUMBER	SFPCxxxGMxAGxss-C-dd-rrrr-ccc

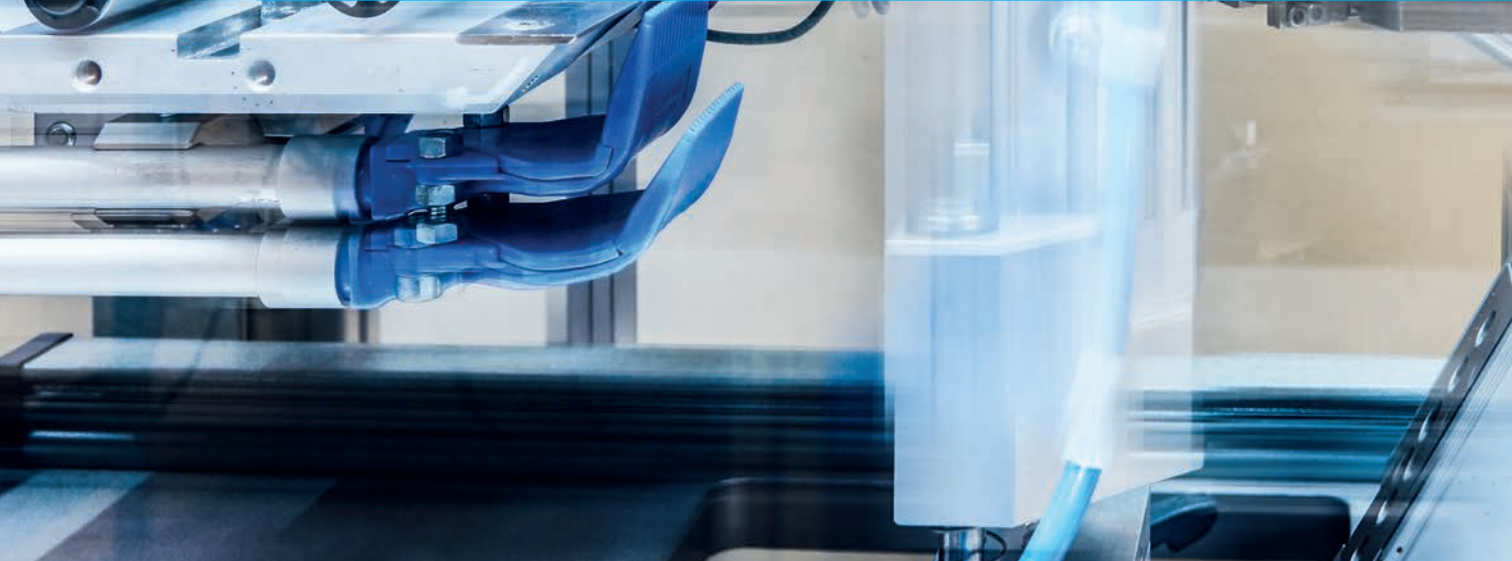


# 2.5" SATA SSDs

Swissbit's 2.5" SSDs are ideal solutions for embedded applications requiring reliable and long service life storage. The X-60 SATA 6Gb/s series is Swissbit's MLC based solution for high performance, cost sensitive, high capacity markets.

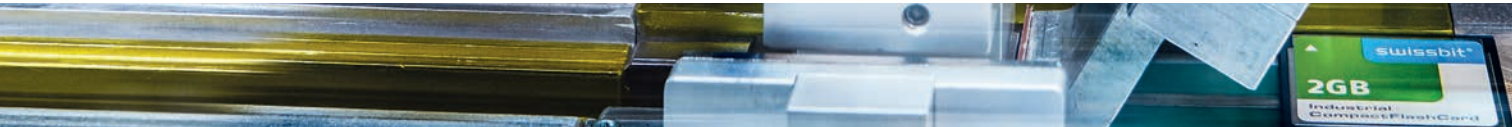
X-600 has best-in-class endurance, using SLC technology while X-66 is the perfect compromise with MLC NAND in pSLC mode.

ALL products feature Swissbit's proven Power Fail Safety, Data Care Management, a detailed S.M.A.R.T.-based Life Time Monitoring, NCQ, TRIM, advanced wear leveling, bad block management, and in-field firmware update functionality. The X-60P provides highest level of PFail protection by adding special circuitry and energy storing capacitors. The X-60 supports AES security and can be used as a self-encrypted drive (SED).



X-600	●	●	●	●	●	○	●	●	●	●	★	●	●
X-60 / X-66	●	●	●	●	●	○	●	●	●	●	★	○	●
X-60P	●	●	●	●	●	○	★	●	●	●	★	○	●
X-500	●	●	●	●	●	●	●	●	○	●	○	●	○
X-70	●	●	●	●	●	●	●	●	●	●	★	○	●

★ Industry Leading; ● default implemented; ○ on request; ○ not available



# X-600 / X-66 / X-60 / X-60P

# X-500

# X-70



## GENERAL INFORMATION

TYPE	2.5" SATA III SSD	2.5" SATA SSD	2.5" SATA IIISSD
INTERFACE DATA TRANSFER MODE	SATA III – 6 Gbit/s ATA8	SATA II – 3 Gbit/s up to PIO4, MDMA2, UDMA6	SATA III – 6 Gbit/s ATA8
CONNECTOR	15 + 7 pin Serial ATA	15 + 7 pin Serial ATA with latch protection / special feature connector	15 + 7 pin Serial ATA
OUTLINE DIMENSIONS	100.2 x 69.85 x 7.0 mm	100.2 x 69.85 x 9.3 mm	100.2 x 69.85 x 7.0 mm
FLASH TYPE	SLC / pSLC / MLC	SLC	3D NAND
DENSITY RANGE	SLC: X-600: 8 GB – 256 GB pSLC: X-66: 16 GB – 240 GB MLC: X-60: 30 GB – 960 GB	16 GB – 512 GB	240 GB – 2 TB
DATA RETENTION	10 years @ life begin   1 year @ life end		
ENDURANCE ENTERPRISE WL	8.7 / 3.8 / 0.6 TBW per GB drive capacity	5.8 TBW per GB drive capacity	tbd / 3,000 P/E cycles (Flash cell level)

## TEMPERATURE

OPERATING TEMPERATURE	Commercial: 0°C to +70°C Industrial: -40°C to +85°C		Commercial: 0°C to +70°C
STORAGE TEMPERATURE	-40°C to +85°C	-55°C to +95°C	-40°C to +85°C

## PERFORMANCE

BURST RATE (MB/S)	up to 600	up to 300	up to 600
SEQUENTIAL READ (MB/S)	up to 520 / 520 / 520	up to 240	up to 560
SEQUENTIAL WRITE (MB/S)	up to 425 / 450 / 450	up to 220	up to 530
RANDOM 4KB READ (IOPS)	up to 79,000 / 80,000 / 74,000	up to 14,500	up to 81,000
RANDOM 4KB WRITE (IOPS)	up to 76,000 / 75,000 / 75,000	up to 5,300	up to 81,000

## ROBUSTNESS

MTBF	≥2,000,000 hours
SHOCK	1,500 G, 0.5 ms
VIBRATION	50 G, 131–2,000 Hz
HUMIDITY	X-60/X-70: 85 % RH 85 °C, 1,000 hrs / X-60P: 65 % RH 85 °C, 1,000 hrs

## ELECTRICAL DATA

VOLTAGE	5 V ± 10% / 3.3 V ± 5%	5 V ± 10% / 3.3 V optional	5 V ± 10%
POWER CONSUMPTION	typ 300 mA max 1,200 mA Idle 60 mA DEVSLEP <5 mA	Slumber 140 mA max 700 mA Idle 200 mA	max 650 mA Idle 100 mA DEVSLEP <1 mA

## FEATURE LIST

FEATURES & TOOLS	X-60P: with Pfail Circuitry Proven Power Fail Safety NCQ, TRIM Advanced Wear Leveling & Bad Block management In-field firmware update SBLTM Tool & SDK for S.M.A.R.T. based Life Time Monitoring Self encrypted drive (SED) / TCG OPAL optional	Proven Power Fail Safety ATA security feature set Enhanced Secure Erase, Purge & Sanitize features (MIL STD) NCQ, TRIM Advanced Wear Leveling & Bad Block management In-field firmware update SBLTM Tool & SDK for S.M.A.R.T. based Life Time Monitoring	Proven Power Fail Safety NCQ, TRIM Advanced Wear Leveling & Bad Block management In-field firmware update SBLTM Tool & SDK for S.M.A.R.T. based Life Time Monitoring Self encrypted drive (SED) / TCG OPAL optional
PART NUMBER	SFSAxxxxQvAAxss-t-dd-rrr-ccc	SFSAxxxxQvBJxss-t-dd-rrr-ccc	SFSAxxxxQvAHxss-t-dd-rrr-ccc