2017

swissbit®

EMBEDDED MEMORY AND STORAGE SOLUTIONS

AUTOMOTIVE COMMUNICATIONS INDUSTRIAL NETWORKING SECURITY

made in germany

WHY CHOOSE SWISSBIT

Swissbit, the largest independent embedded memory and storage solutions manufacturer in Europe, was created through a management buyout from Siemens Semiconductor in 2001. With over 20 years of experience in the memory & storage industry Swissbit has become a world class leader in technology, supplying high quality, high reliability memory & storage solutions with all established DRAM and flash interfaces.
Tier 1 customers in the industrial, networking / communication, and automotive segments continue to confirm the outstanding product features and quality and rely on Swissbit's excellent technical and logistics support.

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 2009–2015	Double digit annual growth
Headquarters	Swissbit Group: Zug, 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

Overview of services provided by Swissbit:

PRODUCTS

- Complete line of NAND Flash Solid State Drives with industry standard interfaces and form factors
- Both leading edge technology and legacy product offerings
- Extended and industrial temperature grade products
- Chip-On-Board (COB) and System-in-Package technology
- Small form factor removable NAND Flash cards
- Memory in-Package solutions
- Mobile Security Solutions, like Secure microSD, SD and more
- Security firmware, drivers and SDK

SALES SERVICE AND ENGINEERING SUPPORT

- Fast, effective, and competent sales staff on hand to serve your needs
- Our expert technical staff is available for quick response
- Joint product qualification service
- In-house manufacturing in Germany
- Design-in support

CUSTOMIZATION

- Custom memory and storage solutions
- Security features
- Individual marking
- Conformal coating

OEM SERVICES

- Controlled bill of materials (BOM)
- Serialization and lot code tracking
- Support of long life cycles
- Stringent PCN and ECN process

TEST FOR RELIABILITY

- Final extended and industrial temperature testing with KTI and Tanisys Technology equipment
- World class Swissbit application testing
- System Level Test During Burn-In (TDBI)
- Environmental testing according to industrial and automotive standards

COMPLIANCE TO

- JEDEC, SDA, CFA, USB-IF, SATA-IO
- RoHS, REACH, and WEEE
- UL
- FCC, CE

QUALITY STANDARDS

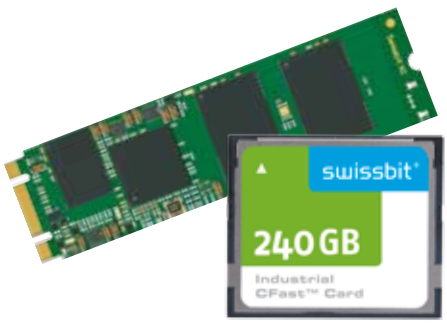
- ISO 9001:2008
- TS 16949
- ISO 14001

ASSOCIATIONS

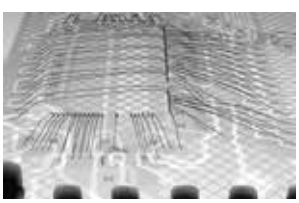
- JEDEC
- CompactFlash Association (CFA)
- SATA-IO
- USB Implementer Forum
- Secure Digital Association (SDA)
- Memory Implementers Forum
- Small Form Factor Special Interest Group SFF-SIG

INTRODUCTION

STORAGE SOLUTIONS



SECURITY SOLUTIONS



TECHNOLOGY

PART NUMBER DECODER

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SWISSBIT TARGET APPLICATIONS

INDUSTRY

Typical applications:

Industrial Automation
- Process- / motion control
- Industrial PC / embedded
- Industrial measurement
- Building technology
- Identification / access systems
- Surveillance

Energy
- Energy distribution
- Energy consumption
- Smart grid

Infotainment
- POS terminals
- Information terminals
- Ticket- / vending terminals
- Digital signage and advertising
- Casino gaming
- VLTs & lottery terminals

Healthcare
- Diagnostics
- Point of care testing
- Mobil systems
- Imaging

Transportation
- Train Control and Monitoring Systems (TCMS)
- Multifunctional terminals
- Data recorders

Aerospace and defense
- In-flight Entertainment & Communication (IFE&C)
- Communications, Command, Control and Intelligence (C4ISR)
- Combat management systems
- Battlefield sensor systems

Memory and non-volatile storage solutions for embedded applications must provide reliable operation even in the most extreme conditions (e.g., temperature, shock, and vibration). As such, both the qualification cycle and the support life cycle needed for these products far exceed those of devices designed for typical consumer applications.
Swissbit's embedded memory and storage solutions are the perfect fit for such demanding applications. They offer the highest reliability and quality with long term availability and controlled BOM. To guarantee such high quality standards, each product undergoes thorough functional testing before being released for shipment.

AUTOMOTIVE

Typical applications:

- Entertainment systems
- Navigation systems
- Head unit / dashboard
- Black box / crash recorder

The increasing varieties of infotainment and dashboard applications in cars today require significantly higher storage capacities than before. 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 independent embedded memory and storage manufacturer with TS16949. Our S-45 SD and microSD memory card lineup caters to the demands of an automotive application, offering the highest reliability and quality at competitive prices.

NETWORKING/COMMUNICATION

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

Telecommunication infrastructure is implemented globally in every possible climate zone; therefore the equipment has to operate under most severe weather conditions such as heat, cold, humidity, or dust. This results in a long, expensive qualification and testing process and the need for products that guarantee long-term availability to minimize the number of requalifications.
Our cards provide features that are particularly suitable for NetCom applications, where high reliability, longer duty cycles, and on-field firmware upgrade are key requirements.
Swissbit's product portfolio is very much focused on products and form factors that will dominate the NetCom sector in the near future, such as small form factors like our newest SATA III devices including M.2, mSATA, and slimSATA.
Among our solutions, we have customized products able to guarantee a high level of random performance meeting or exceeding most NetCom application requirements.
Swissbit's embedded memory and storage solutions are tested specifically for extreme environmental conditions and guarantee industry leading reliability standards. Long-term relationships with our suppliers allow us to maintain a fixed BOM along with the highest possible longevity.

SECURITY

Governments, enterprises, banks, and industry demand high-end security. Swissbit's secure storage solutions offer smart modularization of algorithms and secure storage of encryption keys in one runtime environment. Thus solution providers can concentrate fully on system design while the computation of cryptographic operations is delegated to the trusted execution environment, e.g., a smart card chip in the flash memory device. The Swissbit Security Interface supports all relevant mobile, portable, embedded, and PC platforms.

WIDE TEMPERATURE SUPPORT

Swissbit's embedded memory and storage solutions are designed and approved for reliable operation over a wide temperature range. The products are verified at temperature corners and pre-stressed with a burn-in operating functional test (Test During Burn In-TDBI).

ESD AND EMI SAFE

The product designs are in line with the latest regulations for electrostatic discharge and electromagnetic interference. Swissbit strives to exceed these limits with our own in-house technology and production capabilities, for example with System-in-Package (SiP) competence.

SHOCK AND VIBRATION

Robustness is one of our key specification targets. The design, assembly, and use of selected materials guarantee an extremely solid design, which has been validated by extensive testing.

LIFE TIME MONITORING (LTM)

The Swissbit Life Time Monitoring feature enables users to access the memory device's detailed Life Time Status and allows imminent failure prediction thereby avoiding unexpected data loss. This feature uses an extended S.M.A.R.T. (Self-Monitoring, Analysis, and Reporting Technology) interface or vendor specific commands to retrieve flash product information.

ZONE PROTECTION

The device allows the configuration of multiple zones with either no protection, write protection, or access protected settings. Each zone is secured with a separate password. A Windows tool and a programming library are available.

CONFORMAL COATING

Swissbit offers a special protective coating on selected products. This coating is a thin polyurethane film, which protects against aggressive environmental conditions such as dust, moisture, or corrosive gas.

SECURE ERASE (SANITIZE/PURGE)/ FAST ERASE

This feature uses an uninterruptable sequence of data erase commands. Even a power-off can't stop the process, which will continue upon restoration of power. The optional enhanced feature allows the customer to sanitize the data according to different standards like DoD, NSA, IREC, etc. The purge algorithm can be started by a software command or through a hardware pin.

TEMPERATURE SENSOR

The sensor allows the host hardware or software to monitor memory device temperature to improve data reliability in the target application environment.

HEAT SPREADER

Heat spreader for DRAM modules allow temperature hot spots to be dissipated over a larger surface area and improve the module's reliability.

POWER FAIL PROTECTION AND RECOVERY

Intelligent power fail protection and recovery protects data from unexpected power loss. During an unintentional shutdown, firmware routines and an intelligent hardware architecture ensure that no corruption of user or system data will occur.

WEAR LEVELING

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

READ-ONLY OPTIMIZED

In many industrial applications, content is written to the NAND flash once and is only read afterwards. For such cases, the firmware can be optimized to guarantee the highest possible data retention and less read disturb.

TRIM SUPPORT

The TRIM command allows the operating system to inform the SSD about which blocks of data are no longer considered in use and can be wiped internally, which increases system performance during subsequent write accesses. With TRIM support, data scrap, which would otherwise slow down future write operations to the involved blocks, can be deleted in advance.

LOW POWER CONSUMPTION
Electronic devices with lower power consumption increase the value of the product, because they decrease energy cost, prolong battery life, and reduce heat generation in the device and hence require less cooling.

DATA CARE MANAGEMENT
Various effects like data retention, read disturb limits, or temperature can impact data reliability. The latest generation of Swissbit products uses special methods to maintain and refresh the data for greater data integrity.

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

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

LONGEVITY
The longevity product lines use special components with a long-term supply commitment of up to ten years. These products offer the lowest TCO in demanding applications with high requalification cost.

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.

SECURITY FEATURES

TRUE HARDWARE RNG
True random numbers are generated inside the secure element. True randomness is the key prerequisite for secure systems to prevent brute force attacks.

DIGITAL SIGNATURE AND VERFICATION
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 AND EPURSE
Swissbit Security products for mobile banking and payment offer strong authentication and offline security.

DEVICE PROTECTION BY DUAL FACTOR AUTHENTICATION
The user needs to have the card and know the PIN.

SECURE VOICE
Secure Voice calls are a requirement for confidential communication. Swissbit Security products are optimal for fast, encrypted, and user friendly secure voice solutions.

ELLIPTIC CURVE CRYPTOGRAPHY SUPPORT
Elliptic curves are faster and more efficient than RSA cryptography.

SECURE CD-ROM
The flash memory can be partially or totally switched to read-only. This function ensures that e.g., important data can be modified only after PIN authentication.

DATA PROTECTION AND ENCRYPTION
Various data protection modes ensure privacy of stored data. The card offers a data safe function with strong AES encryption and PIN access protection.

SECURE LOGGING
In large, hidden storage, any system event log, tax data, consumption data, or audit trails can be stored securely in write-once mode, queue mode, or random access mode.

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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.

Swissbit has created a new product family named durabit that features highest endurance and unprecedented random write performance by using a page based FW translation layer in combination with architectural and configuration improvements.
Product development according to stringent design rules and extensive product qualification procedures ensures the electrical and mechanical robustness of Swissbit's embedded storage solutions. All products are offered in commercial (0°C to +70°C) and industrial (-40°C to +85°C) temperature ranges. Available flash handling features include diagnostic information, built-in error correction, bad block management, static and dynamic wear leveling, and power fail protection. Our service team can offer product life time calculations for special use cases with specific workloads. The diagnostic features we provide enable our customers to access device state information and schedule replacements before the system stops working.

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

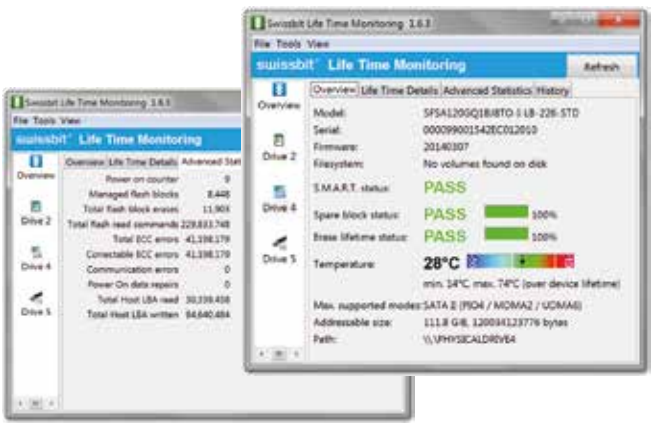
NAND FLASH TECHNOLOGY COMPARISON

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

FLASH LIFE TIME 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 and pSLC at 20,000.
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.

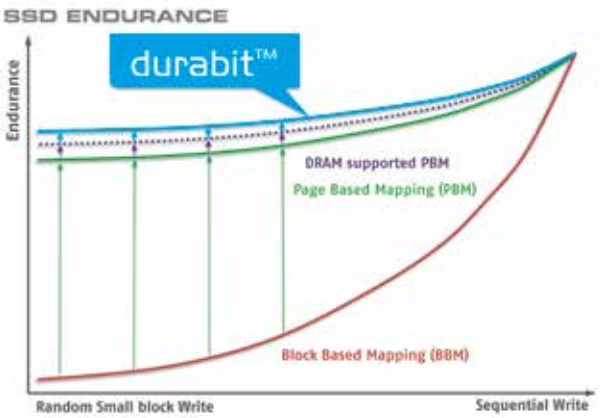
The ratio between internal write data volume and the external request size is called WAF (write amplification factor) and can vary between one (theoretical best case) and several hundred depending on card structure, flash components used, firmware architecture, and user-application write profile.
The WAF directly influences the IOPS rate but the endurance even more. With a WAF of 100, internal PE cycles are 100 times higher than expected from the external data rate, and the endurance limit is reached 100 times faster than anticipated.
Customer application use cases have a huge impact on the WAF. In most cases, how the software's access profile will translate into flash writes can hardly be predicted.



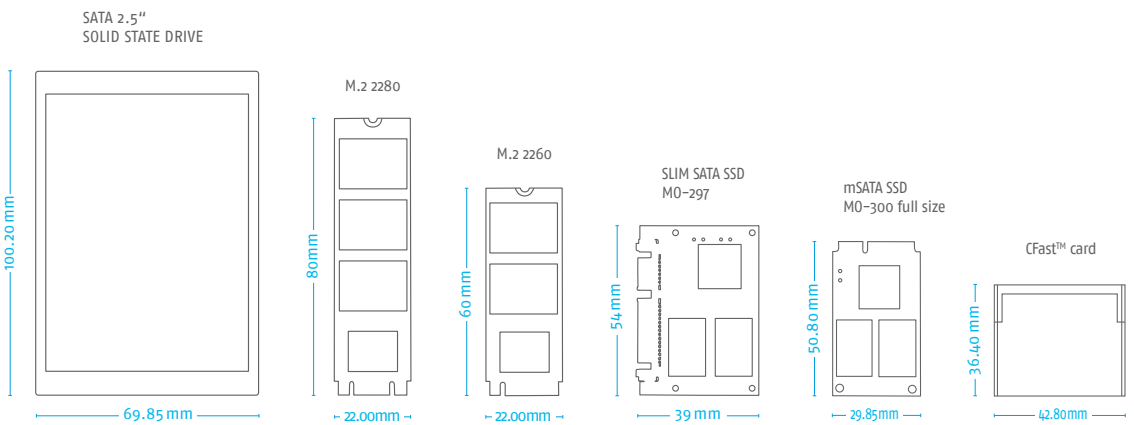
Swissbit supports a realistic forecast of the WAF and the endurance of their SSDs and storage cards with help of the Swissbit Life Time Monitoring Tool and statistical data stored into the flash by the firmware. This tool can read out the real usage data such as number of writes, number of erase cycles, the bad block statistic, the successful ECC correction, and provides all the data necessary to extrapolate the life time of the device.

ENDURANCE OPTIMIZA-

The WAF can be significantly reduced from several hundreds to single digit values by using a page based firmware translation layer (FTL). Especially for MLC flash this means a significant improvement in endurance.
The Swissbit durabit products use MLC flash and page based FTL and offer unprecedented endurance. durabit SSDs even increase this benefit by a DRAM supported FTL and increased overprovisioning which enables the highest available endurance with MLC technology.



Swissbit's 2.5" SSDs as well as the mSATA (M0-300), SLIM SATA (M0-297) and the M.2 SSD modules are ideal solutions for embedded applications requiring reliable and high performing storage in various form factors. Our SATA SSDs offer a long service life combined with controlled BOM and a product change notification process. Each unit undergoes extensive testing over the full temperature range before being released for shipment. The X-60 SATA 6Gb/s series is Swissbit's solution for high performance, cost sensitive, high capacity markets. The SSD modules are available as mSATA (X-60m), SLIM SATA (X-60s), and M.2 (X-60m2). They were designed for all industrial, NetCom, and automotive applications requiring high data transfer rates up to 520 MB/s in sequential access and 75,000 IOPS in 4 KB random access. In addition, they offer a wide range of features such as Swissbit's proven Power Fail Safety, ATA security feature set, Data Care Management tools, a Windows or Linux tool and SDK for detailed S.M.A.R.T.-based Life Time Monitoring, NCQ, TRIM, advanced wear leveling and bad block management and in-field firmware update functionality. The 2.5" SSDs X-60 and X-60P combine the modules attributes with a rugged housing for best shock resistance. The X-60P product features additionally a Power Fail circuitry combined with a bank of high reliable capacitors. In case of a sudden power loss the stored energy allows complete hardening of the cached data into the flash.
The newly introduced SLC-based X-600 series are highly reliable storage solutions with outstanding endurance and are available with the same set of features as the X-60 products. They are built using the most reliable SLC flash on the market and an industrial grade SATA III controller and operate from -40 °C to 85°C.



PRODUCT SIZE COMPARISION

X-600 series	●	●	●	●	●	◐	●	●	●	●	●	★	●	○
X-60 series	●	●	●	●	●	◐	●	●	●	●	●	★	○	●
X-60P	●	●	●	●	●	◐	●	★	●	●	●	★	○	●
X-500	●	●	●	●	●	◐	●	●	●	○	●	○	●	○
X-200 series	●	●	●	●	○	◐	○	●	●	○	○	○	●	○

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

	2.5" SATA III SSD	2.5" SATA SSD	2.5" SATA SSD
Series Name	X-60 / X-60P	X-500	X-200
Interface Data Transfer Mode	SATA III – 6 Gbit/s ATA8	SATA II – 3 Gbit/s up to PIO4, MDMA2, UDMA6	
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	
Flash Type	MLC	SLC	
Density Range	30 GB – 960 GB	16 GB – 512 GB	4 GB – 8 GB
Data Retention	10 years @ life begin 1 year @ life end		
Endurance	485 TBW (960GB, Enterprise workload)	2700 / 370 TBW (64 GB, JESD219 Client / Enterprise workload)	100,000 P/E cycles (Flash cell level)
Operating Temperature	Commercial: 0°C to +70°C Industrial: –40°C to +85°C		
Storage Temperature	–40°C to +85°C	–55°C to +95°C	–50°C to +100°C
Performance			
Burst Rate (MB/s)	up to 600	up to 300	up to 300
Sequential Read (MB/s)	up to 520	up to 240	up to 120
Sequential Write (MB/s)	up to 450	up to 220	up to 95
Random 4KB Read (IOPS)	up to 75,000	up to 14,500	up to 3,100
Random 4KB Write (IOPS)	up to 75,000	up to 5,300	up to 25
MTBF	≥ 2,000,000 hours		≥ 2,500,000 hours
Shock	MIL-STD810; 2,000 G, 0.4 ms; 50 G, 11 ms		1,500 G
Vibration	MIL-STD810; 20 G, 10–2,000 Hz random		20 G
Humidity	85 % RH 85°C, 1,000 hrs		
Voltage	5 V ± 10% / 3.3 V ± 5%	5 V ± 10 % 3.3 V optional	5 V ± 10 %
Power Consumption	typ 300 mA max 1200 mA Idle 60 mA DEVSLP <5 mA	Slumber 140 mA max 700 mA Idle 200 mA	max 320 mA Idle 140 mA
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.	Proven Power Fail Safety ATA security feature set Enhanced Secure Erase, Purge and 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 Security Features available Wear Leveling & Bad Block management SBLTM Tool & SDK for S.M.A.R.T. based Life Time Monitoring
Part Number	SFSAxxxxQvAAxss-t-dd-rrr-ccc	SFSAxxxxQvBJxss-t-dd-rrr-ccc	SFSAxxxxQvBRxss-t-dd-rrr-ccc

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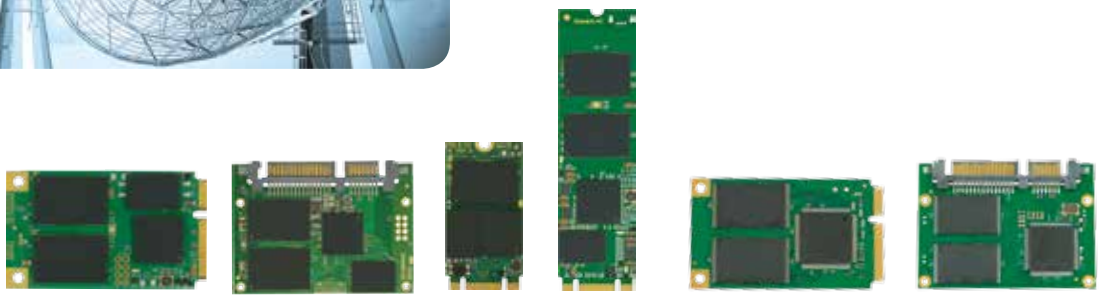
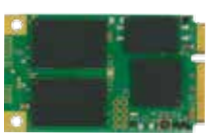


	MO-300 mSATA	MO-297 SLIM SATA	M.2 2242	M.2 2260/ 2280	MO-300 mSATA	MO-297 SLIM SATA
Series Name	X-600m	X-600s	X-600m2		X-200m	X-200s
Interface Data Transfer Mode	SATA III – 6 Gbit/s ATA8				SATA II – 3 Gbit/s up to PIO4, MDMA2, UDMA6	
Connector	52 pos. Edge Connector PCI Express (PCIe) mini	15 + 7 pin Serial ATA Connector	75 pos. Edge Connector B & M key		52 pos. PCI Express (PCIe) mini	15 + 7 pin Serial ATA Connector
Outline Dimensions	50.8 x 29.85 mm	54 x 39 mm	22 x 42 mm	22 x 60/80 mm	50.8 x 29.85 mm	54 x 39 mm
Thickness	3.3 mm	4.0 mm	3.6 mm	DS: 3.6 mm SS: 2.0 mm	3.3 mm	4.0 mm
Flash Type	SLC					
Density Range	8 GB – 128 GB	16 GB – 128 GB	8 GB – 64 GB	16 GB – 128 GB	2 GB – 64 GB	
Data Retention	10 years @ life begin 1 year @ life end					
Endurance	max. 4.5 TBW per GB drive capacity (JEDEC Enterprise WL)				100,000 P/E cycles (Flash cell level)	
Operating Temperature	Commercial: 0°C to +70°C Industrial: -40°C to +85°C					
Storage Temperature	-40°C to +85°C					
Performance						
Burst Rate (MB/s)	up to 600		up to 600	up to 600	up to 300	
Sequential Read (MB/s)	up to 520		up to 520	up to 520	up to 120	
Sequential Write (MB/s)	up to 405		up to 245	up to 405	up to 95	
Random 4KB Read (IOPS)	up to 76,000		up to 76,000	up to 76,000	up to 3,100	
Random 4KB Write (IOPS)	up to 73,000		up to 54,000	up to 73,000	up to 25	
Voltage	3.3 V ± 5 %	5 V ± 10 %	3.3 V ± 5 %		3.3 V ± 5 %	5 V ± 10 %
Power Consumption	typ 450 mA max 750 mA Idle 115 mA DEVSLP 35 mA	typ 450 mA max 750 mA Idle 110 mA DEVSLP 55 mA	typ 450 mA max 520 mA Idle 115 mA DEVSLP 35 mA	typ 450 mA max 750 mA Idle 115 mA DEVSLP 35 mA	typ 300 mA max 490 mA Idle 180 mA	typ 260 mA max 320 mA Idle 140 mA
Features & Tools	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				Proven Power Fail Safety Advanced Wear Leveling & Bad Block management SBLTM Tool & SDK for S.M.A.R.T. based Life Time Monitoring	
Part Number	SFSAxxxxUvAAxss-t-dd-rrr-ccc	SFSAxxxxVvAAxss-t-dd-rrr-ccc	SFSAxxxxMvAAxss-t-dd-rrr-ccc		SFSAxxxxUvBRxss-t-dd-rrr-ccc	SFSAxxxxVvBRxss-t-dd-rrr-ccc



	MO-300 mSATA	MO-297 SLIM SATA	M.2 2242	M.2 2260/ 2280
Series Name	X-60m	X-60s	X-60m2	
Interface Data Transfer Mode		SATA III – 6 Gbit/s ATA8		
Connector	52 pos. Edge Connector PCI Express (PCIe) mini	15 + 7 pin Serial ATA Connector	75 pos. Edge Connector B & M key	
Outline Dimensions	50.8 x 29.85 mm	54 x 39 mm	22 x 42 mm	22 x 60/80 mm
Thickness	3.3 mm	4.0 mm	3.6 mm	DS: 3.6 mm SS: 2.0 mm
Flash Type	MLC durabit			
Density Range	8 GB – 480 GB	30 GB – 480 GB	30 GB – 240 GB	30 GB – 960 GB
Data Retention	10 years @ life begin 1 year @ life end			
Endurance	max. 0.5 TBW per GB drive capacity ((JEDEC Enterprise WL) max 1.9 TBW per GB drive capacity (JEDEC Client WL)			
Operating Temperature	Commercial: 0°C to +70°C Industrial: –40°C to +85°C			
Storage Temperature	–40°C to +85°C			
Performance				
Burst Rate (MB/s)	up to 600		up to 600	up to 600
Sequential Read (MB/s)	up to 520		up to 520	up to 520
Sequential Write (MB/s)	up to 450		up to 340	up to 450
Random 4KB Read (IOPS)	up to 75,000		up to 72,000	up to 72,000
Random 4KB Write (IOPS)	up to 75,000		up to 78,000	up to 75,000
Voltage	3.3 V ± 5 %	5 V ± 10 %	3.3 V ± 5 %	
Power Consumption	typ 500 mA max 960 mA Idle 115 mA DEVSLP 35 mA	typ 450 mA max 750 mA Idle 110 mA DEVSLP 55 mA	typ 420 mA max 480 mA Idle 110 mA DEVSLP 35 mA	typ 500 mA max 960 mA Idle 115 mA DEVSLP 35 mA
Features & Tools	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			
Part Number	SFSAxxxxUvAAxss-t-dd-rrr-ccc	SFSAxxxxVvAAxss-t-dd-rrr-ccc	SFSAxxxxMvAAxss-t-dd-rrr-ccc	

CFast™ CARDS

CFast™ cards combine two existing industry standards into a single product: the CompactFlash™ (CF) card form factor and the Serial ATA (SATA) interface commonly used in hard disks. CFast™ cards can replace both HDDs and CompactFlash™ cards in applications requiring small form factors, high endurance and the ability to withstand shock, vibration, extreme temperatures (-40°C to +85°C), high altitude and rough environmental conditions. Swissbit's CFast™ cards provide rugged storage for embedded and industrial systems where performance, data and system reliability, power fail protection and flexibility are important design considerations.
Swissbit CFast™ cards operate with a 3.3 Volt low power source and support three SATA power management states: Active, Partial, and Slumber. This standard is a perfect choice for both boot devices and as removable media for applications requiring low to medium storage densities with a small footprint. Additionally, the Swissbit CFast™ cards come with full engineering and customization support, S.M.A.R.T. based Life Time Monitoring features, our intelligent flash Management algorithms and Error Correction, guaranteeing the highest level of reliability even in rough application environments.

Swissbit's latest innovations are the F-60 / F-600 SATA III CFast™ card series. Using state of the art controllers and MLC / SLC flash technology, the F-60 / F-600 achieve data transfer rates up to 520 MB/s in sequential access and 76,000 IOPS in 4 KB random access. In addition, the F-60 / F-600 series feature Swissbit's proven Power Fail Safety, ATA security feature set, enhanced Secure Erase tools, a Windows or Linux tool and SDK for detailed S.M.A.R.T.-based Life Time Monitoring, NCQ, TRIM, advanced wear leveling and bad block management or in-field firmware update functionality.

F-600	●	●	●	★	●	◐	●	★	●	●	●	★	○	○
F-60	●	●	●	★	●	◐	●	★	●	●	●	★	○	●
F-50	●	●	●	★	●	◐	●	★	●	●	●	★	○	○
F-240	●	●	●	★	○	◐	○	★	●	★	●	○	●	○

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

	CFAST™ CARD	CFAST™ CARD	CFAST™ CARD	CFAST™ CARD
Series Name	F-600	F-60	F-50	F-240
Interface Data Transfer Mode	CFast™ 2.0 – SATA III – 6 Gbit/s ATA8			CFast™ 1.0 – SATA II – 3 Gbit/s ATA7
Connector	CFast™ Type I			
Outline Dimensions	36.4 x 42.8 x 3.6 mm			
Flash Type	SLC	MLC durabit	MLC	SLC
Density Range	8 GB – 64 GB	8 GB – 240 GB	8 GB – 256 GB	2 GB – 64 GB
Data Retention	10 years @ life begin 1 year @ life end			
Endurance	7.6 TBW per GB drive capacity	0.5 TBW per GB drive capacity	0.05 TBW per GB drive capacity	100,000 P/E cycles (Flash cell level)
Operating Temperature	Commercial: 0°C to +70°C Industrial: –40°C to +85°C			
Storage Temperature	–40°C to +85°C			
Performance				
Burst Rate (MB/s)	up to 600	up to 600	up to 600	up to 300
Sequential Read (MB/s)	up to 520	up to 520	up to 500	up to 120
Sequential Write (MB/s)	up to 245	up to 180	up to 330	up to 120
Random 4KB Read (IOPS)	up to 76,000	up to 72,000	up to 53,000	up to 3,200
Random 4KB Write (IOPS)	up to 54,000	up to 43,000	up to 74,000	up to 75
MTBF	≥ 2,000,000 hours			≥ 2,500,000 hours
Shock	MIL-STD810; 2,000 G, 0.4 ms; 50 G, 11 ms			1,500 G
Vibration	MIL-STD810; 20 G, 10–2,000 Hz random			20 G
Humidity	85 % RH 85°C, 1,000 hrs			
Voltage	3.3 V ± 5 %			
Power Consumption	typ 450 mA max 715 mA Idle 105 mA DEVSLP 35 mA	typ 400 mA max 495 mA Idle 110 mA DEVSLP 35 mA	typ 290 mA max 420 mA Idle 75 mA DEVSLP 35 mA	typ 140 mA max 250 mA Idle 55 mA PHYSLP <20 mA
Features & Tools	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			Proven Power Fail Safety Sophisticated Wear Leveling & Bad Block management Read Disturb Management TRIM Low Power Consumption Security & SBZoneProtection features available SBLTM Tool & SDK for S.M.A.R.T. based Life Time Monitoring Evaluation kit with 2.5" SATA adapter board available
Part Number	SFCAxxxxHvAAxss-t-dd-rrr-ccc			SFCAxxxxHvBVxss-t-dd-rrr-ccc

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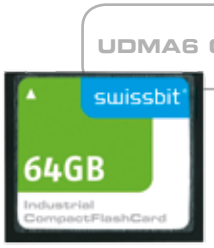
CompactFlash™ CARDS

To this day, CompactFlash™ (CF) cards remain the most popular flash-based storage solution used in the embedded and industrial markets and the CompactFlash™ card form factor and connector are well established. Swissbit's CF cards were developed with strong focus on quality, reliability, robustness, and longevity. We select only high-quality components and apply design rules fitting the stringent requirements of our customers. Hardware and firmware were tested and qualified by our experienced technical team and features and functionality have been proven in many challenging customer applications. Swissbit's CF Series C-3x0 and C-4x0 are offered in both commercial (0°C to +70°C) and industrial (-40°C to +85°C) temperature ranges, providing rugged, reliable memory for a wide range of demanding use cases. They are designed to address a broad range of concerns from compatibility, booting, and power fail safety to long-term supply, controlled BOM, and outstanding flash protocol-handling techniques to ensure highest possible data integrity. In contrast to commonly promoted sequential performance values, Swissbit is especially focused on optimized random-access speed, one of the key requirements in legacy embedded CompactFlash applications.

Swissbit's most recent CF card product family is the C-300 Longevity series, which offers maximum long-term availability (until at least 2021). In addition, the C-300 Longevity CF card ensures optimized backward compatibility with legacy systems, high random access speed, and a wide range of capacities from 32 MB to 8 GB using highly reliable SLC flash with 100,000 program / erase cycles.

C-300	●	●	●	●	○	◐	★	●	○	○	●
C-300 LONGEVITY	●	●	●	★	○	◐	★	●	●	○	★
C-320	●	●	●	●	◐	◐	★	●	◐	○	●
C-440	●	●	●	★	◐	◐	★	●	★	●	●

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



	COMPACTFLASH™ CARD	COMPACTFLASH™ CARD	COMPACTFLASH™ CARD	COMPACTFLASH™ CARD
Series Name	C-300	C-300 Longevity	C-320	C-440
Interface Data Transfer Mode	CFA4.1 True IDE/PC card – Up to UDMA4, MDMA4 & PIO6			CFA5.0 True IDE/PC card – Up to UDMA6, MDMA4 & PIO6
Connector	CFC Type I			
Outline Dimensions	36.4 x 42.8 x 3.3 mm			
Flash Type	SLC			
Density Range	128 MB – 8 GB	32 MB – 8 GB	2 GB – 32 GB	2 GB – 64 GB
Data Retention	10 years @ life begin 1 year @ life end			
Endurance	100,000 P/E Cycles (Flash Cell Level)			
Operating Temperature	Commercial: 0°C to +70°C Industrial: -40°C to +85°C			
Storage Temperature	-50°C to +100°C			
Performance				
Burst Rate (MB/s)	up to 66	up to 66	up to 66	up to 133
Sequential Read (MB/s)	up to 37	up to 37	up to 45	up to 65
Sequential Write (MB/s)	up to 20	up to 20	up to 35	up to 40
Random 4KB Read (IOPS)	up to 3,300	up to 3,300	up to 2,800	up to 2,400
Random 4KB Write (IOPS)	up to 40	up to 50	up to 44	up to 300 (with TRIM)
MTBF	≥ 3,000,000 hours			
Shock	1,500 G			
Vibration	20 G			
Humidity	85 % RH 85°C, 1,000 hrs			
Voltage	3.3 V ± 5 % 5 V ± 10 %			
Power Consumption	PIO typ 50 mA @ 3.3 V DMA typ 70 mA @ 3.3 V DMA typ 110 mA @ 5 V		PIO typ 60 mA @ 3.3 V DMA typ 90 mA @ 3.3 V DMA typ 130 mA @ 5 V	PIO typ 60 mA @ 3.3 V DMA typ 80 mA @ 3.3 V DMA typ 90 mA @ 5 V
Features & Tools	Proven Power Fail Safety Sophisticated Wear Leveling & Bad Block management Security & SBZoneProtection features available SBLTM Tool & SDK for S.M.A.R.T. based Life Time Monitoring		Proven Power Fail Safety Sophisticated Wear Leveling & Bad Block management Read Disturb Management TRIM Security & SBZoneProtection features available SBLTM Tool & SDK for S.M.A.R.T. based Life Time Monitoring	
Part Number	SFCFxxxxHxBKxss-t-xx-rrr-ccc	SFCFxxxxHxBKxss-t-xx-rrr-ccc	SFCFxxxxHxB0xss-t-dd-rrr-ccc	SFCFxxxxHvBUxss-t-dd-rrr-ccc

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FLASH MANAGEMENT MECHANISM

- Optimized error correction code
- Efficient algorithms for bad block management
- Real life time monitoring
- Sophisticated wear leveling and bad block management
- Power fail protection

Swissbit's Industrial microSD Memory Cards are designed, manufactured and tested to withstand extreme environmental conditions. Each of our product series is designed for a broad, embedded use case with its unique requirements for longevity, service life, endurance, temperature, data retention, and cost.

The durabit S-45u series combines latest MLC technology with an innovative controller and a sub-page based firmware that enables unprecedented random write performance and an up to 100 times higher endurance compared to standard microSD card solutions. The special firmware features in the S-45u include powerful built-in error correction, read retry, autonomous data care management, randomizer, wear leveling and bad block management algorithms, and intelligent power fail protection. The Swissbit microSD memory cards are supported by the Swissbit life time monitoring for real time status information. Applications that demand highest endurance and performance benefit from the equally featured but SLC flash technology based S-450u. This series supports data transfer rates of up to 80 MB/s. Both S-450u and S-45u fulfill UHS-I, class 10 speed grade.
By only using the strong bit of an MLC cell the S-46u pSLC version increases the endurance by a factor of 6.7 against MLC and offers all the features of the S-45u.

All Swissbit microSD Cards can withstand extreme environmental conditions. They provide the highest level of mechanical stability and enhanced ESD protection. Furthermore, the hard gold SD connectors endure a minimum of 20,000 insertion cycles.

S-300u	●	●	●	○	●	●	●	●	○	●	○
S-200u	●	●	●	●	●	★	●	○	○	●	○
S-45u	●	●	●	★	●	●	●	★	★	○	★
S-46u	●	●	●	★	●	★	●	★	★	○	★
S-450u	●	●	●	★	●	★	●	★	★	●	○

★ Industry Leading; ● default implemented; ○ not available

	microSD MEMORY CARD (SD / SDHC)	microSD MEMORY CARD (SD)	microSD MEMORY CARD (SD / SDHC)	microSD MEMORY CARD (SDHC / SDXC)	microSD MEMORY CARD (SD / SDHC)
Series Name	S-300u	S-200u	S-450u	S-45u	S-46u
Interface Data Transfer Mode	SD 2.0, Class 6 / 10	SD 2.0, Class 6	SD 3.0, Class 10, UHS-I		
Connector	microSD				
Outline Dimensions	15 x 11 x 0.7 / 1 mm				
Flash Type	SLC			MLC durabit	pSLC
Density Range	1 GB – 2 GB (SD) 4 GB – 8 GB (SDHC)	512 MB – 2 GB (SD)	512 MB – 2 GB (SD) 4 GB – 8 GB (SDHC)	4 GB – 32 GB (SDHC) 64 GB (SDXC)	2 GB (SD) 4 GB – 16 GB (SDHC)
Data Retention	10 years @ life begin 1 year @ life end				
Endurance	100,000 P/E Cycles (Flash Cell Level)			3,000 P/E Cycles (Flash Cell Level)	20,000 P/E Cycles (Flash Cell Level)
Operating Temperature	Extended: -25°C to +85°C Industrial: -40°C to +85°C				
Storage Temperature	-40°C to +85°C	-40°C to +100°C			
Performance Burst Rate (MB/s) Sequential Read (MB/s) Sequential Write (MB/s) Random 4KB Read (IOPS) Random 4KB Write (IOPS)	 up to 25 up to 24 up to 22	 up to 25 up to 21 up to 18	 up to 104 up to 80 up to 75 up to 1200 up to 30	 up to 50 up to 40 up to 12 up to 750 up to 650	 up to 104 up to 48 up to 48 up to 1350 up to 1400
MTBF	≥ 3,000,000 hours				
Shock	1,500 G				
Vibration	50 G				
Humidity	93 % RH 40°C, 500 hrs	85 % RH 85°C, 1,000 hrs			
Voltage	2.7 – 3.6 V				
Power Consumption	Read typ 50 mA Write typ 50 mA	Read typ 30 mA Write typ 40 mA	Read typ 100 mA Write typ 100 mA		
Features & Tools	Proven Power Fail Safety Advanced Wear Leveling & Bad Block management	Proven Power Fail Safety Sophisticated Wear Leveling & Bad Block Management Diagnostic features Life Time Monitoring	Proven Power Fail Safety Sophisticated Wear Leveling & Bad Block management Autonomous Data Care Management SBLTM Tool & SDK for detailed Life Time Monitoring		
Part Number	SFSDxxxxNxBWxss-t-dd-rrr-ccc	SFSDxxxxNxBNxss-t-dd-rrr-ccc	SFSDxxxxNxBMxss-t-dd-rrr-ccc		

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FLASH MANAGEMENT MECHANISM

- Optimized error correction code
- Efficient algorithms for bad block management
- Diagnostic with real life time monitoring
- Sophisticated wear leveling and bad block management resistance
- Power fail protection

SD MEMORY CARDS

Secure Digital (SD) memory cards have a wide spread use in industrial and automotive application, ranging from read only applications as in navigation systems to utilization as boot media, for video recording or data logging. Swissbit's Industrial Secure Digital (SD) card series are designed for high sustained performance and endurance over the entire lifetime and are manufactured and tested to withstand extreme environmental conditions. They provide the highest level of mechanical stability and enhanced ESD protection.
Each of our product series meets the stringent industry requirements for longevity, service life, endurance, temperature, data retention, and overall cost.

The durabit S-45 / S-46 series combine latest MLC technology with an innovative controller and a sub-page based firmware that enables unprecedented random write performance and an up to 100 times higher endurance compared to standard SD card solutions. The S-45/S-46 firmware features include powerful built-in error correction, read retry, autonomous data care management, randomizer, wear leveling and bad block management algorithms, and intelligent power fail protection. The Swissbit SD memory cards are supported by the Swissbit life time monitoring for real time status information.
Applications that demand highest endurance and performance benefit from the SLC based S-450. This series supports data transfer rates of up to 80 MB/s and offers the same data care features as the S-45. Both S-450 and S-45 fulfill UHS-I, class 10 speed grade. By only using the strong bit of an MLC cell the S-46 pSLC version increases the endurance by a factor of 6.7 against MLC and offers all the features of the S-45.

S-200 / 220	●	●	●	●	○	★	●	○	○	●	○
S-45	●	●	●	★	●	●	●	★	★	○	★
S-46	●	●	●	★	●	★	●	★	★	○	★
S-450	●	●	●	★	●	★	●	★	★	●	○

★ Industry Leading; ● default implemented; ○ not available

	SD MEMORY CARD (SD / SDHC)	SD MEMORY CARD (SD / SDHC)	SD MEMORY CARD (SDHC / SDXC)	SD MEMORY CARD (SD / SDHC / SDXC)
Series Name	S-200 / 220	S-450	S-45	S-46
Interface Data Transfer Mode	SD 2.0, Class 6 / 10	SD 3.0, Class 10, UHS-I		
Connector	SD			
Outline Dimensions	32 x 24 x 2.1 mm			
Flash Type	SLC		MLC durabit	pSLC
Density Range	512 MB – 2 GB (SD) 4 GB – 8 GB (SDHC)	512 MB – 2 GB (SD) 4 GB – 32 GB (SDHC)	4 GB – 32 GB (SDHC) 64 GB – 128 GB (SDXC)	2 GB (SD) 4 GB – 32 GB (SDHC) 64 GB (SDXC)
Data Retention	10 years @ life begin 1 year @ life end			
Endurance	100,000 P/E Cycles (Flash Cell Level)		3,000 P/E Cycles (Flash Cell Level)	20,000 P/E Cycles (Flash Cell Level)
Operating Temperature	Extended: -25°C to +85°C Industrial: -40°C to +85°C			
Storage Temperature	-40°C to +100°C			
Performance				
Burst Rate (MB/s)	up to 25	up to 104	up to 104	up to 104
Sequential Read (MB/s)	up to 24	up to 90	up to 40	up to 50
Sequential Write (MB/s)	up to 19	up to 75	up to 12	up to 55
Random 4KB Read (IOPS)	up to 1400	up to 1200	up to 750	up to 1350
Random 4KB Write (IOPS)	up to 90	up to 30	up to 650	up to 1400
MTBF	≥ 3,000,000 hours			
Shock	1,000 G	1,500 G		
Vibration	15 G	50 G		
Humidity	85 % RH 85°C, 1,000 hrs			
Voltage	2.7 -3.6 V Normal			
Power Consumption	Read typ 40 mA Write typ 65 mA	Read typ 75 mA Write typ 75 mA		
Features & Tools	Proven Power Fail Safety Sophisticated Wear Leveling & Bad Block management Diagnostic features & Life Time Monitoring through SD / SPI command set	Proven Power Fail Safety Sophisticated Wear Leveling & Bad Block management Autonomous Data Care Management SBLTM Tool & SDK for detailed Life Time Monitoring		
Part Number	SFSDxxxxLvBNxss-t-dd-rrr-ccc	SFSDxxxxLxBMxss-t-dd-rrr-ccc		

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USB FLASH DRIVES / MODULES

The Universal Serial Bus (USB) interface is very well established and has almost entirely replaced any other forms of serial or parallel interfaces for computer peripherals and memory storage devices. Advantages of USB are its flexibility, fast sequential data transfer rate, and the ability to obtain power through the connector. Most computer and embedded systems support these devices either via the standard USB connector or internal, on-board terminal headers. Swissbit offers both options in different form factors and in commercial and industrial operating temperature ranges. State of the art NAND flash handling algorithms, stringent component selection, product change control, and a 100% in-process final system test at full temperature range (-40°C to +85°C) qualify Swissbit's USB Flash Drive (UFDs) for embedded and industrial markets.

Swissbit's U-110 and U-4x Series (USB Flash Module) offers a no compromise flash based storage solution for:

- embedded PCs that need a rugged reliable storage solution,
- servers with backup or recovery functionality, and
- general industrial computers needing easy-to-use boot media.

All Swissbit USB solutions combine security features and Life Time Monitoring tools for product life control.

U-45/U-46	●	○	●	●	●	●	◐
U-400	●	○	●	●	●	●	●
U-110	●	○	●	●	●	●	●
unitedCONTRAST II	●	●	●	●	●	●	●

● default implemented; ◐ on request; ○ not available




	eUSB FLASH MODULE	eUSB FLASH MODULE	eUSB FLASH MODULE	USB FLASH DRIVE
Series Name	U-400	U-45 / U-46	U-110	unitedCONTRAST II
Interface Data Transfer Mode	USB 2.0 High / Full Speed			
Connector	Standard: 2.54 mm - 10 Pin (key option) Low Profile: 2.00 mm - 10 Pin (key option)			USB A-Plug
Outline Dimensions	Standard: 36.8 mm x 26.65 mm x 9.6 mm Low Profile: 36.8 mm x 26.65 mm x 5.7 mm			68.0 mm x 18.0 mm x 8.0 mm
Flash Type	SLC	MLC durabit / pSLC	SLC	SLC
Density Range	1 GB - 16 GB (32 GB opt.)	4 GB - 32 GB / 2GB - 16GB	1 GB - 16 GB	512 MB - 16 GB
Data Retention	10 years @ life begin 1 year @ life end			
Endurance	100,000 P/E Cycles (Flash Cell Level)	3,000 / 20,000 P/E Cycles (Flash Cell Level)	100,000 P/E Cycles (Flash Cell Level)	
Operating Temperature	Commercial: 0°C to +70°C Industrial: -40°C to +85°C			
Storage Temperature	-50°C to +100°C			
Performance				
Burst Rate (MB/s)	up to 60	up to 60	up to 60	up to 60
Sequential Read (MB/s)	up to 37	up to 32	up to 32	up to 32
Sequential Write (MB/s)	up to 26	up to 23	up to 23	up to 23
Random 4KB Read (IOPS)	up to 1,600	up to 650	up to 1,600	up to 1,600
Random 4KB Write (IOPS	up to 30	up to 650	up to 30	up to 30
MTBF	≥ 3,000,000 hours			
Shock	50 G			
Vibration	15 G			
Humidity	85 % RH 85°C, 500 hrs			
Voltage	3.3 V ± 5 % / 5 V ± 10 %		5 V ± 10 % (3.3 V ± 5 % optional)	5 V ± 10 %
Power Consumption	Full Speed typ 70 mA High Speed typ 80 mA		Full Speed typ 80 mA High Speed typ 100 mA	
Features & Tools	Proven Power Fail Safety Windows/Linux – Spare block read out Bootable USB Drive Supports latest OS as Fixed Drive Connector pitch & key variations available Shock & vibration resistant			Proven Power Fail Safety Windows/Linux – Spare block read out Hot Pluggable / Plug & Play Optimized Wear Leveling Security features Password manager available
Part Number	2.54 mm: SFUIxxxxJvABxss-t-dd-rrr-ccc 2.00 mm: SFUIxxxxKvABxss-t-dd-rrr-ccc		2.54 mm: SFUIxxxxJvBPxss-t-dd-rrr-ccc 2.00 mm: SFUIxxxxKvBPxss-t-dd-rrr-ccc	SFU2xxxxEvBPxss-t-dd-rrr-ccc

Security is becoming mandatory in diverse markets. Data breaches and compromised IT environments are becoming a reality. In the meantime legal requirements force solution providers to use state of the art security concepts. If critical systems fail or sensitive data leak, severe fines and penalties are imminent. Customers and solution providers are rightly concerned about risks, creating a necessity to improve security in a reliable and flexible fashion.

That GSM calls can easily be tapped has been widely publicized in the telecommunications market. Reports about the mass interception of Internet data on a global scale compromise trust in the privacy of communications. Sophisticated attacks on industrial facilities raise questions about liability and reliability. A new class of threats and risks needs consideration. Consumers, governments, enterprises, and industry are affected by security breaches directly or indirectly, visible or invisible.

Swissbit is the partner to support customers in industrial, medical, government, telecommunications, and the banking sector in delivering secure systems.

Each and every system requires storage to operate. While globally recognized as a leader in highly reliable flash memory solutions, Swissbit also designs, develops, and manufactures security products that provide additional security functions and features. Swissbit demonstrates a continuous, uninterrupted migration path towards secure systems while maintaining the reliability and flexibility of existing memory form factors.

Swissbit offers product related services:

- Security firmware and drivers
- Logo printing
- Optical and electronic personalization
- Design-in of consigned smart card chips

As well as extended services:

- Security consulting
- Security training
- Customer support
- Design-in support
- Connection with eco-system partner network for turn key solutions and quick time to market

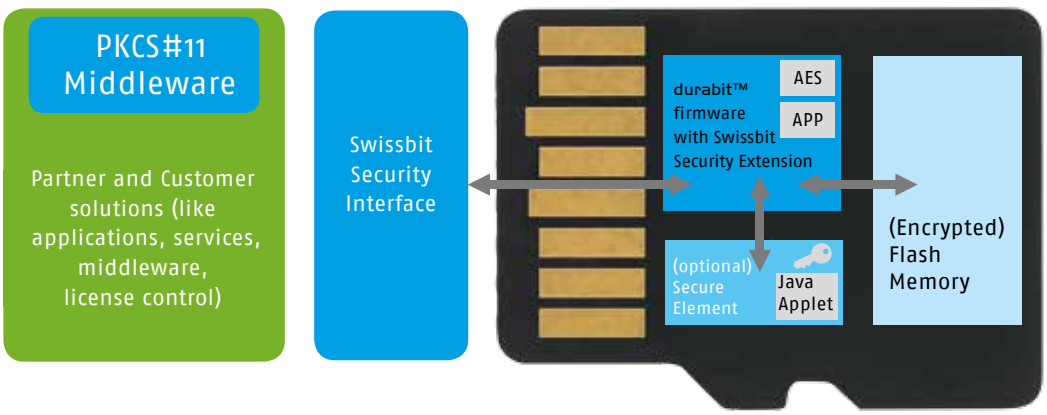
SECURITY PRODUCTS

The security product series in the microSD and SD form factor addresses the growing demand for mobile, portable and industrial security. The products offer tangible hardware security in the same manner as the plug and play approach.
For various markets, Swissbit offers a broad set of security use cases.
The flash memory can be used by any host to store data on the cards at high speed.
Additional security functions of the card can be activated to protect any data.

Valuable data such as sensitive files, emails, photos, OS images, FW updates, log files and audit trails can be protected by encryption, access protection, or made resistant to tampering by digital signature. Voice and video calls as well as data streams for M2M communication can be protected by the card in high speed. The best fitting product can be chosen depending on the use case.

Our security product series provides a smart card chip or a security extension to the Swissbit durabit™ firmware or a combination of both. The block diagram below illustrates the architecture of the Swissbit Security Interface, the flash controller, and the Encrypted flash chips.

The Swissbit Security Interface empowers solution providers to build applications on various platforms. An SDK is available to develop applications on Windows™ and Linux™ PC platforms and on mobile phones and tablets like Android™ and BlackBerry™.



SE	●	●	●	●	●	○	○	○	○	○
VE	●	●	●	●	●	●	●	○	○	○
FE	●	●	●	●	●	●	●	○	○	○
PE	●	●	●	●	●	●	●	●	●	●
DP	○	○	○	○	○	○	○	●	●	●

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

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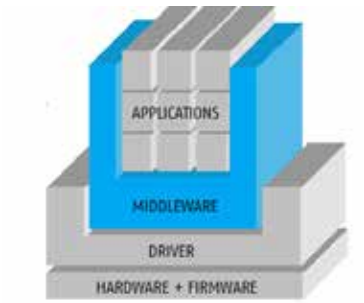
AVAILABLE SMART CARDS CHIPS

	SE/VE/PE	FE
Security	Infineon SLE 78 smart card chip CC EAL 5+ HW and OS Java card 3.0.4 Global Platform 2.2.1 Smart card OS jTop ID RSA up to 2048 bit optional ECC up to 512 / 521 bit AES up to 256 bit SHA2 up to 512 bit RNG AIS31, FIPS-140 Compatible Middleware: • AET SafeSign • Charismathics • Cryptovision	Infineon SLE 78 smart card chip FIPS 140-2 level 3 Java card V2.2.x (ext. of V3.0) Global Platform 2.2.1 Gemalto ID Core 30 RSA up to 2048 bit ECC up to 512 / 521 bit AES up to 256 bit SHA2 up to 512 bit Compatible Middleware: • Gemalto
	80 k EEPROM secure storage	160 k EEPROM secure storage
Drivers / API	Windows, Mac, Linux, BlackBerry, Android SDK available PKCS#11 Middleware	Windows, Mac, Linux, BlackBerry, Android SDK available

		PS-100u	PS-45	PS-45u	PS-450	PS-450u
Compliance		SD 3.0 SD, ASSD V1.1				
Data transfer / Compatible to		SPI mode supported Speed class 10	S-45	S-45u	S-450	S-450u
Temperature / Compatible to		-25°C to 85°C	S-45 (E-grade only)	S-45u (E-grade only)	S-450 (E-grade only)	S-450u (E-grade only)
Flash Type		MLC			SLC	
Density	SE / VE / FE / PE	8 GB – 16 GB	8 GB – 16 GB	8 GB – 16 GB	4 GB – 32 GB	512 MB – 2 GB
	DP	8 GB – 32 GB	4 GB – 64 GB	4 GB – 32 GB	4 GB – 32 GB	512 MB – 8 GB

SECURITY EDITIONS

The **Standard Edition SE** fits best into authentication and PKI (Public Key Infrastructure) use cases.
The card is supported by leading middleware vendors in mobile, desktop, and tablet use cases to ensure a seamless design-in into existing security infrastructures.
The **Voice Edition VE** provides in addition to the SE card Elliptic Curve Cryptography. The enormous advantage of computation and security combined with small certificate sizes makes a VE card ideal for online key and certificate exchange.
The **Premium Edition PE** offers asymmetric and symmetric cryptography like the VE cards by the embedded smart card chip, whereas the **Data Protection Edition DP** offers symmetric encryption without smart card chip by the durabit™ FW.



PKCS#11 Middleware

The newly available Swissbit PKCS#11 Middleware is available as option for the SE,VE and PE product on industrial systems. A standardized interface enables smart integration into PKI use cases during personalization and in the field for digital signature and high secure encryption.

FE cards provide a secure element according FIPS 140-2 certification. US governmental organizations and enterprises that need to follow the FIPS 140-2 security standard benefit from smart integration into a storage form factor.

SECURITY PRODUCT MATRIX		SE Standard Edition	VE Voice Edition	FE FIPS Edition	PE Premium Edition	DP Data Protection
Mobile / PC	PS-100u microSD	8 GB – 16 GB	8 GB – 16 GB	8 GB – 16 GB		8 GB – 32 GB
Medical Automotive	PS-45 SD	8 GB – 16 GB	8 GB – 16 GB	8 GB – 16 GB	8 GB – 16 GB	8 GB – 64 GB
	PS-45u microSD	8 GB – 16 GB	8 GB – 16 GB	8 GB – 16 GB	8 GB – 16 GB	8 GB – 32 GB
Industrial	PS-450 SD	4 GB – 32 GB	4 GB – 32 GB	4 GB – 32 GB	4 GB – 32 GB	4 GB – 32 GB
	PS-450u microSD	0.5 GB - 2 GB	0.5 GB - 2 GB	0.5 GB - 2 GB	0.5 GB - 2 GB	0.5 GB - 2 GB

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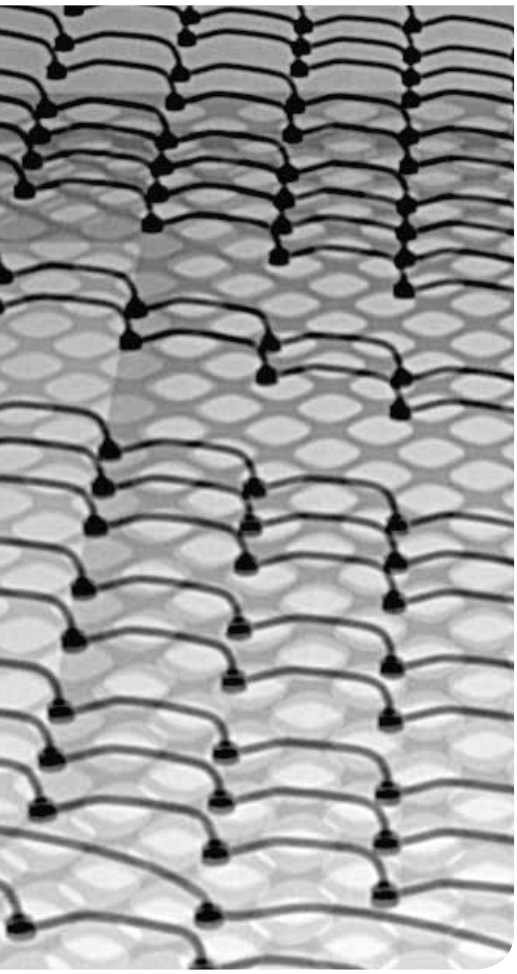
SYSTEM-IN-PACKAGE (SIP)



System-in-Package (SiP) is the processing of sensitive bare dies or chips into robust finished modules or components. With 20 years of experience, Swissbit successfully uses advanced packaging technologies to achieve the smallest form factors and to build multi-chip-packages. With this electronic integration approach, our products provide more functionality or highest memory densities inside one package, various functional blocks (RF, digital, sensors, security, and memory) as well as passive components are combined.

Beginning with the wafer and bare die handling, Swissbit utilizes a flexible chip-on-board (COB) assembly and packaging line. Processes like SMT assembly, die bonding, Au and Al wire bonding, dam&fill, transfer molding, precise separation with laser technology and sawing, housing, labeling, laser marking, etc. are very well established.

Die stacking, especially for flash and DRAM, is one of our expertises besides the integration of additional hardware features and an experienced team of testing and quality engineers. Our own Memory-In-Package line qualifies (but does not limit) Swissbit as the development and production partner for any dedicated or customized memory-related product with challenging integration or reliability requirements. If you cannot satisfy the special demands regarding space and performance using traditional components and processes, Swissbit offers feasibility studies, manages or supports your development project, and produces prototypes and small and mid-size volumes (up to 50,000 pieces / month). We will aid you beginning at your project's conception: from the design phase, prototyping, determining the circuit layout, and material selection to preparing the appropriate packaging for transport.

Swissbit produces and develops according to **ISO 9001:2008, TS 16949,** and **ISO 14001** approved processes and is an experienced partner in global industrial and automotive accounts.

Swissbit´s technology portfolio combined with its strong engineering know-how and experience enables new, innovative MCP (Multi Chip Packages)/SiP/COB configurations like stacked dies, side-by-side, sensors integration, etc. System-in-Package solutions could be smaller, cheaper, and having tighter security.

System-in-Package benefits:

- Reduced process complexity
- Lower TCO (total cost of ownership)
- Reduced system board space due to smaller sized solutions than individually packaged ICs
- Layer count reduction in System PCB
- Reduced board mounted height
- Mixed analog / digital design
- Reduced system board test complexity

SWISSBIT SIP AND COB COMPETENCY

CONCEPTION	DEVELOPMENT	VERIFICATION & QUALIFICATION	PRODUCTION	LOGISTICS
• Product definition • Feasibility studies • Verification plan • Qualification plan • Design for test • Design for production • Design to cost	• Package development • Process development • Substrate layout • Test engineering and development • Failure analysis consulting	• Product verification • Debugging • Optimization • Reliability testing • Life time • Compliance to CE / FCC / VCCI, UL, RoHS, and REACH	• Fast prototyping • Ramp up • Yield management • Series production of: •SMT •SiP •COB •MCP •BGA	• Stock management • Supply chain management • One-stop sourcing

SWISSBIT IS OFFERING THE FOLLOWING PRODUCTION TECHNOLOGIES

SMD

SEPARATION/ SINGULATION

DIE ATTACH/CHIP BONDING/ DIE STACKING

WIRE BONDING

ENCAPSULATION

ADHESIVE APPLY

MARKING

CONFORMAL COATING

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PRE-SALES

YOUR FUTURE WITH OUR SOLUTION

Swissbit's 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.

Our services include

- TCO support
- consulting (design / concept / technology)
- qualification cycle support & joint qualification
- evaluation units
- hardware customization
- firmware customization
- midware customization for security products
- consulting for your future product generations

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.

Our services include

- local high level engineering support
- longevity of product lines – up to ten years
- field support (including firmware upgrades)
- full product and service life support
- stringent PCN process

SALES

LOCAL SUPPORT – GLOBALLY

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.

Our services include

- Global Account and Key Account Management
- highly sophisticated channel partners who can support sampling within 24 hours
- fast, reliable response time
- highly reliable inventory management using an integrated CRM/ERP/BI system for smart data analysis and forecasting

SWISSBIT PART NUMBER – THE DNA OF YOUR SPECIFIC PRODUCT

Flash and Security Part Number Decoder

S	F	CF	2048	H	4	B	O	2	TO	-	I	-	M	S	-	*	-	*
1	2	3	4	5	6	7	8	9	10		11		12	13		14		15

Swissbit Memory (1)

Memory Type (2)

F: Flash Products

Product Type (3)

U2: USB 2.0 Flash Drive
UI: UFD internal / Module
CA: CFast™
CF: CompactFlash™
SD: SD memory card
MM: Multimedia card
PA: PATA / IDE
SA: SATA
PC: PCIe

Density (4)

0016: 16 MB	4096: 4 GB	030G: 30 GB
0032: 32 MB	8192: 8 GB	060G: 60 GB
0064: 64 MB	016G: 16 GB	120G: 120 GB
0128: 128 MB	032G: 32 GB	240G: 240 GB
0256: 256 MB	064G: 64 GB	480G: 480 GB
0512: 512 MB	128G: 128 GB	960G: 960 GB
1024: 1 GB	256G: 256 GB	001T: 1 TB
2048: 2 GB	512G: 512 GB	002T: 2 TB

Product Dimension (5)

H: CompactFlash™ / CFast™
J: UFD Module 2.54 mm terminal header
K: UFD Module 2.00 mm terminal header
L: SD memory card
M: M.2 SSD
N: microSD memory card
O: Multimedia card
Q: SSD 2.5”
U: mSATA (MO-300)
V: SLIM SATA (MO-297)

Product Generation (6)

Memory Organization (7)

Technology (8)

Chips / Channels (9)

Flash Supplier (10)

SA: Samsung
MT: Micron Technology
TO: Toshiba
MA: Macronix
HY: SK Hynix

Temperature Rating (11)

I: Industrial Temp. (-40°C to +85°C)
E: Extended Temp. (-25°C to +85 / 90°C)
C: Commercial Temp. (0°C to +70°C)

Flash Package Classification (12)

M: SLC SDP (single die package)
D: SLC DDP (dual die package)
Q: SLC QDP (quad die package)
N: SLC ODP (octal die package)
G: MLC SDP (single die package)
L: MLC DDP (dual die package)
H: MLC QDP (quad die package)

PIN Mode (13)

O: 1 nCE & R/nB
1: 2 nCE & R/nB
2: 4 nCE & R/nB
A: LGA 1 nCE & R/nB
B: LGA 2 nCE & R/nB
C: LGA 4 nCE & R/nB
E: COB 1 nCE
F: COB 2 nCE
G: COB 4 nCE & R/nB
H: COB 8 nCE & R/nB
O: 2 TSOP, single channel, 1 nCE & R/nB
P: 2 TSOP, single channel, 2 nCE & R/nB
Q: 2 TSOP, single channel, 4 nCE & R/nB
S: TSOP 1 nCE & R/nB
T: TSOP 2 nCE & R/nB
U: TSOP 4 nCE & R/nB

Configuration (14)

Design Option (15)

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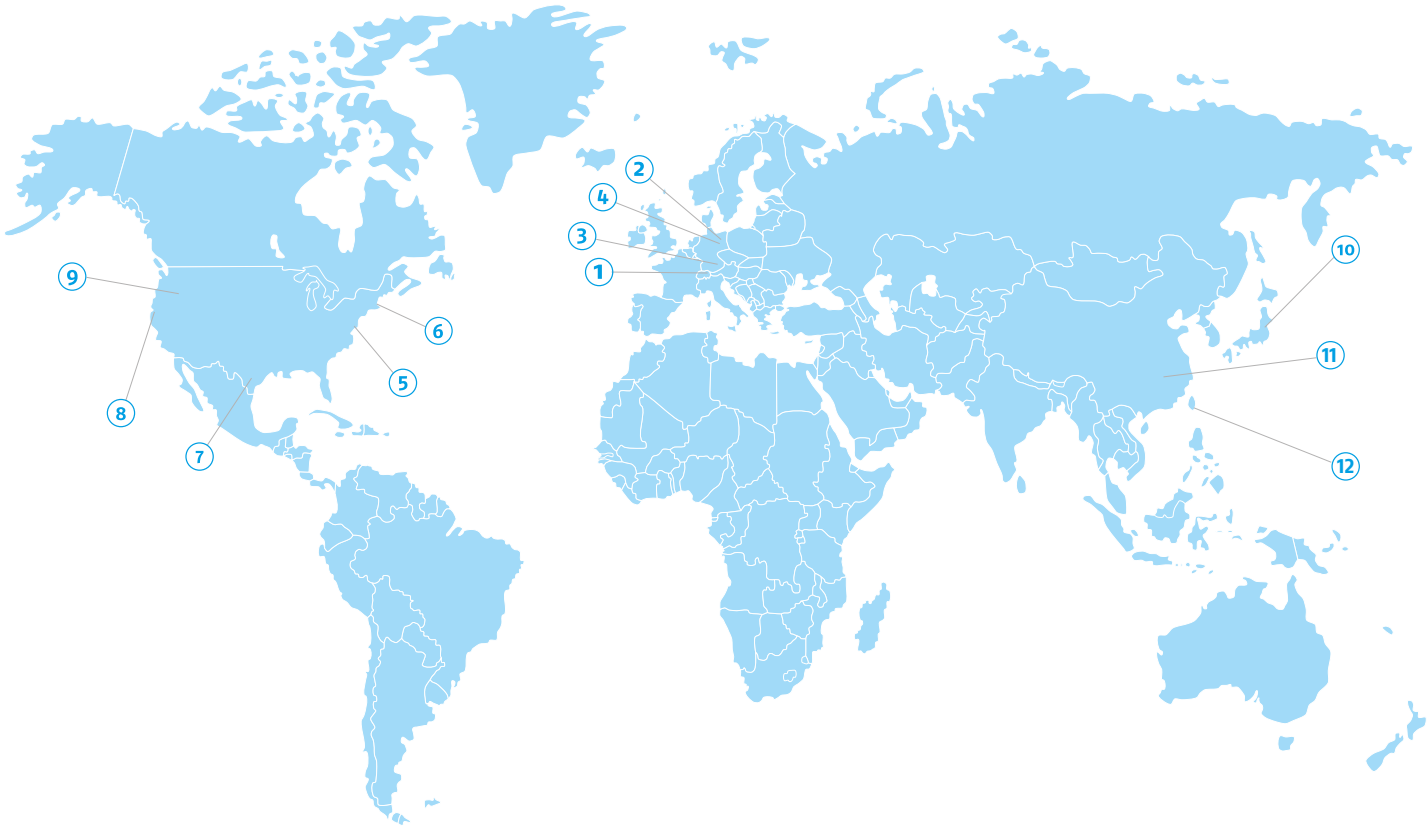

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