swissbit®

EMBEDDED MEMORY & STORAGE SOLUTIONS

AUTOMOTIVE COMMUNICATIONS INDUSTRIAL NETWORKING SECURITY

made in
germany

swissbit®

CLASS 6

CE

32GB
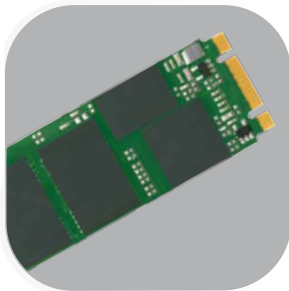
Swissbit, the largest independent embedded memory and storage solutions manufacturer in Europe, was created through a management buy-out from Siemens Semiconductor in 2001. With over 20 years of experience in the memory & storage industry Swissbit has become a world class leader in technology, supplying high quality, high reliability memory & storage solutions with all established DRAM and Flash interfaces.

Overview of services Swissbit is offering its customers:

PRODUCTS

- Complete line of DRAM modules and 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 Micro SD, 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 & storage solutions
- Security features
- Individual marking
- Design-in support
- 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

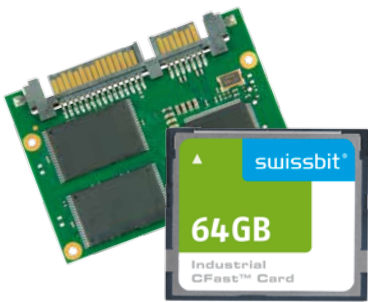- JEDEC, SDA, CFA, USB-IF, SATA-IO
- RoHS, REACH, WEEE
- UL
- FCC, CE

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

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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 & 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 & 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 needed support life cycle for these products far exceed devices designed for typical consumer applications.

Swissbit's embedded memory & storage solutions are the perfect fit for such demanding applications. They offer highest reliability and quality with long availability and controlled BOM. In order 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 our cars today require significantly higher storage capacities than before. All components used in Automotive need to operate in a wide temperature range and withstand sudden power loss as well as shock and vibration. Additionally very low failure rates are essential as replacements of malfunctioning parts can incur high costs. Swissbit is the only independent embedded memory & storage manufacturer with TS16949. Our new S–40 SD and Micro SD Memory Card lineup caters to the demands of an automotive application, offering highest reliability and quality at competitive prices.

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NETWORKING/COMMUNICATION

Typical applications:

- Base Station (BTS)
- WiMAX (WAC)
- Radio Network Controller (RNC)
- Video / IPTV – transcoding / storage
- Signaling Gateway

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 and expensive qualification and testing process and the need for products that guarantee long-term availability in order to minimize the number of re-qualifications. 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 product portfolio is very much focused on product and form factors that will be dominant in the near future in NetCom sector, such as small form factors like our newest SATA III devices like M.2, mSATA and slimSATA.
Among our solutions, we have customized products able to guarantee a high level of random performance that meets or exceeds most NetCom application requirements.
Swissbit's embedded memory & storage solutions are tested specifically for rough environmental conditions and guarantee industry leading reliability standards. Long-term relationships with our suppliers allow us to guarantee a fixed BOM along with the highest possible longevity.

SECURITY

Governments, Enterprises, Banks and Industry demand for 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 fully concentrate on system design while the computation of cryptographic operations is delegated to the trusted execution environment e.g. a smart card in the flash memory device. The Swissbit Security Interface supports all relevant mobile, portable, embedded and PC platforms.

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Swissbit NA Eagle, ID
FAE support + Sales

Swissbit NA San Jose, CA
Sales

Swissbit NA Orange County, CA
FAE support

Swissbit NA Port Chester, NY
HQ SBNA + Sales

Swissbit NA Westford, MA
R&D + FAE support
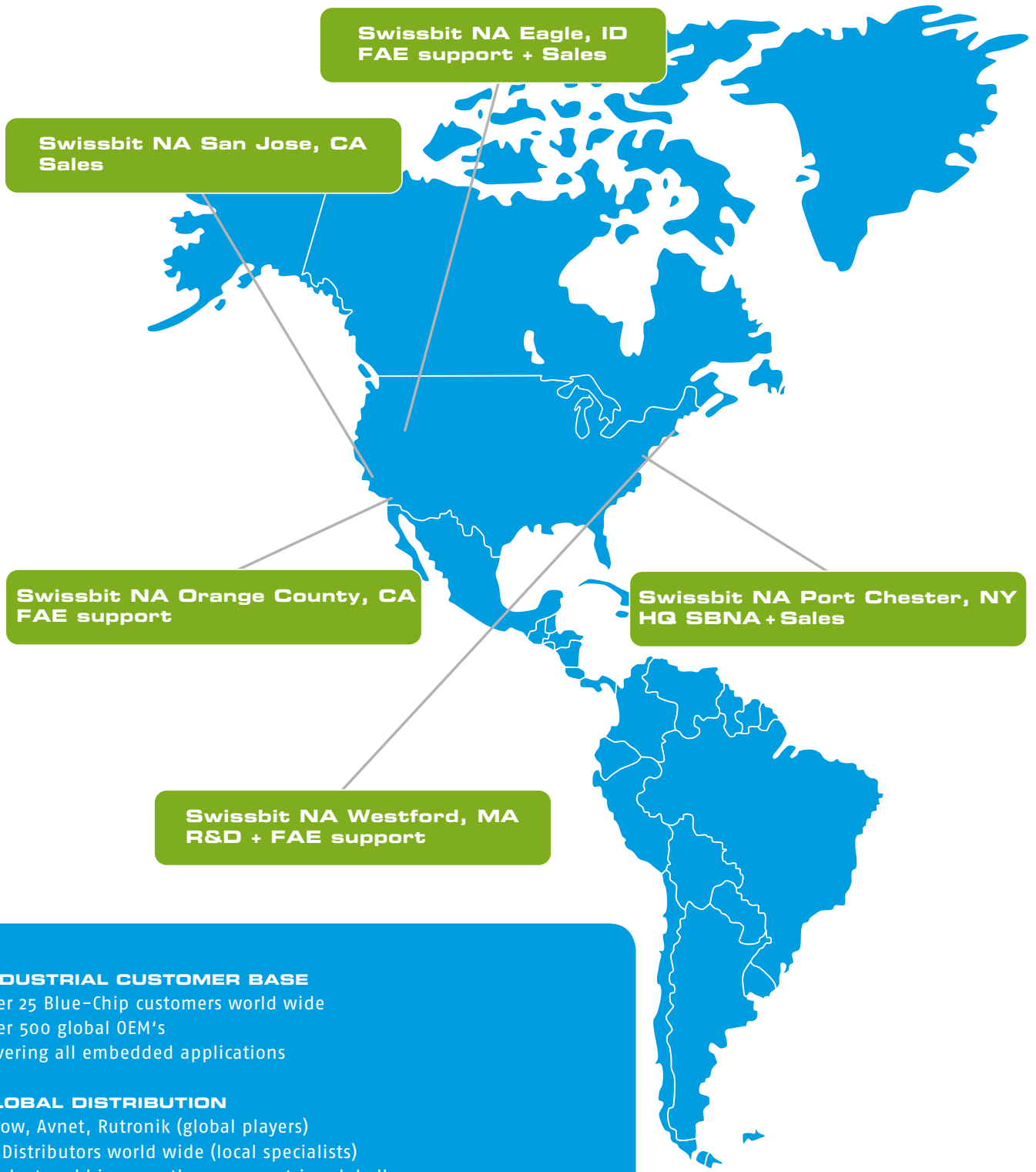
INDUSTRIAL CUSTOMER BASE
Over 25 Blue-Chip customers world wide
Over 500 global OEM's
Covering all embedded applications

GLOBAL DISTRIBUTION
Arrow, Avnet, Rutronik (global players)
20 Distributors world wide (local specialists)
Products sold in more than 50 countries globally

GLOBAL WEBSHOP PARTNERS
Digikey, Element 14 (Farnell), Mouser, webg@te (Rutronik)

swissbit®

Swissbit Group Switzerland
HQ, R&D, FAE support, Sales

Swissbit Germany Berlin
R&D + Production

Swissbit Japan
FAE support + Sales

Swissbit Taiwan
R&D, FAE support, Sales

Swissbit Germany Dresden
Design Center

Swissbit Security Munich
R&D, FAE support, Sales

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WIDE TEMPERATURE SUPPORT

Swissbit's embedded memory & 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 electro-magnetic 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 predicting imminent failure 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 the 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 or a programming library are available.

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.

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.

TEMPERATURE SENSOR

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

HEAT SPREADER

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

POWER FAIL PROTECTION & RECOVERY

Intelligent Power Fail Protection & Recovery protects data from unexpected power loss. During an unintentional shutdown, firmware routines and an intelligent hardware architecture ensure that all system and user data will be stored to the NAND.

WEAR LEVELING

Sophisticated Wear Leveling & Bad Block Management ensure that Flash cells are sparingly and equally used in order to prolong life time of the device.

READ-ONLY OPTIMIZED

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

TRIM SUPPORT

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

LOW POWER CONSUMPTION

Lower power consumption in electronic devices increases the value of the product as they save energy cost, prolong battery life time 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 use special methods to maintain and refresh the data for higher data integrity.

LONGEVITY
The longevity product lines use special components with a long-term supply commitment of up to 10years. These products offer lowest TCO in demanding applications with high requalification cost.

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.

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

DIGITAL SIGNATURE AND VERFICATION
Digital signatures are very popular and inevitable to protect against manipulation of data or code.

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

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

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

MOBILE BANKING AND EPURSE
Swissbit Security products for mobile banking and payment offer strong authentication and offline security.

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.

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

SECURE LOGGING
In a 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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Swissbit's focus is on embedded applications. Our designs and support are specialized for global OEM's and their demanding applications. Swissbit provides the highest level of support with our unique 360° customer service. This customer centric approach enables Swissbit to develop solution-driven products for the most demanding applications. We support our customers through entire product-life-cycle with pre-sales, sales and after-sales processes and will recommend the best solution for their requirements, or even tailor products to specific needs. Through close cooperation between our FAEs, in-house development, manufacturing teams and our strategic suppliers we can achieve and guarantee long-term product availability and support. Swissbit is committed to providing our customers with the best product solutions and support for both current and future requirements.

AFTER-SALES

- Responsive service
- Solution driven
- Failure analysis (8D reports)
- Reliability monitoring
- Legacy support & longevity programs
- PCN process
- Firmware updates / upgrades

PRE-SALES

- Design-in support
- Joint qualification
- Qualification reports
- Customizations
- Fast prototyping
- Client specific testing
- Custom labeling
- Technology consulting and training
- Validation support (CMTL, USB-IF, JEDEC, SDA etc.)

**360°
Customer
Service**

SALES

- Global Key Accounting
- Worldwide Channel service
- Product Life Cycle Management
- Active sampling process
- Market information
- Worldwide logistics services
- Long-term and Service contracts

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

Swissbit's embedded memory & storage solutions portfolio covers all relevant interfaces and form factors including SD and Micro SD Memory Cards, CompactFlash™ & CFast™ Cards, 2.5" PATA & SATA SSDs, SLIM SATA & mSATA SSDs, M.2 and USB Flash Drives (UFD) & modules.

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

Product development according to stringent design rules and extensive product qualification procedures ensure the electrical and mechanical robust-ness 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. The 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 custo-mers to access device state information and schedule replacements before the system stops working.

	SLC	EM-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

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Swissbit offers various 2.5″ SSDs with PATA & SATA interfaces. Swissbit's X-500 & X-55 SATA II SSDs are designed as a rugged and extremely reliable storage solution for reliable operation in harsh environmental conditions such as wide temperature range, shock, vibration or humidity. They use the most reliable SLC (X-500) or EM-MLC (X-55) NAND Flash available on the market today and comprise a large number of features. These features include various options for Secure Erase, Purge and Sanitize methods as well as detailed, S.M.A.R.T. based Life Time Monitoring tools that allow the user to have full control of mission critical data at any given time. The BCH-ECC (Error Correction Code) in combination with an intelligent Power Fail Protection mechanism guarantees the highest possible data reliability. Special features such as ATA-8, NCQ and TRIM commands enable higher sequential and random performance while providing the high level of reliability required in industrial applications.

The X-500 SSDs are the ideal solution for applications requiring the highest level of endurance or maximum longevity.
The X-55 series were designed for industrial applications with a balanced read / write workload and offer a more than 10x higher endurance compared to SSDs using standard MLC.

The P-120 (PATA) and X-200 (SATA II) complement Swissbit's 2.5″ SSD Product Portfolio and are an ideal fit for low to medium density applications. They are designed for long-term industrial usage and support key requirements such as long data retention, no compromise Power Fail Safety and long product life cycles.

Cross Section

LOCKING / LATCHING SATA CONNECTOR

Swissbit's X-500 & X-55 SSDs are designed with a latching SATA connector. Multiple notches support the latching cables for highest vibration and shock resistance.
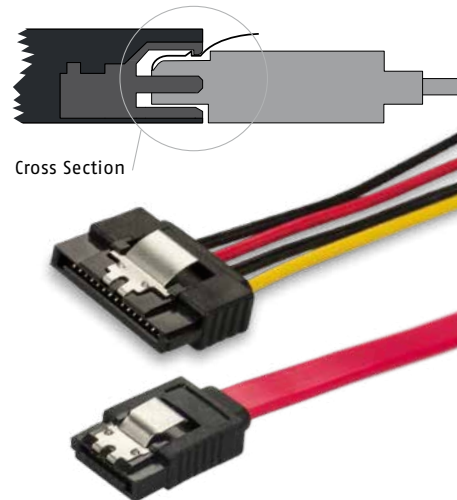
X-55	●	●	●	●	●	◐	●	★	●	●	●	○
X-500	●	●	●	●	●	◐	●	★	●	●	●	●
X-200	●	●	●	●	○	◐	○	★	●	●	○	●
P-120	●	●	●	●	◐	◐	○	●	●	◐	○	○

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

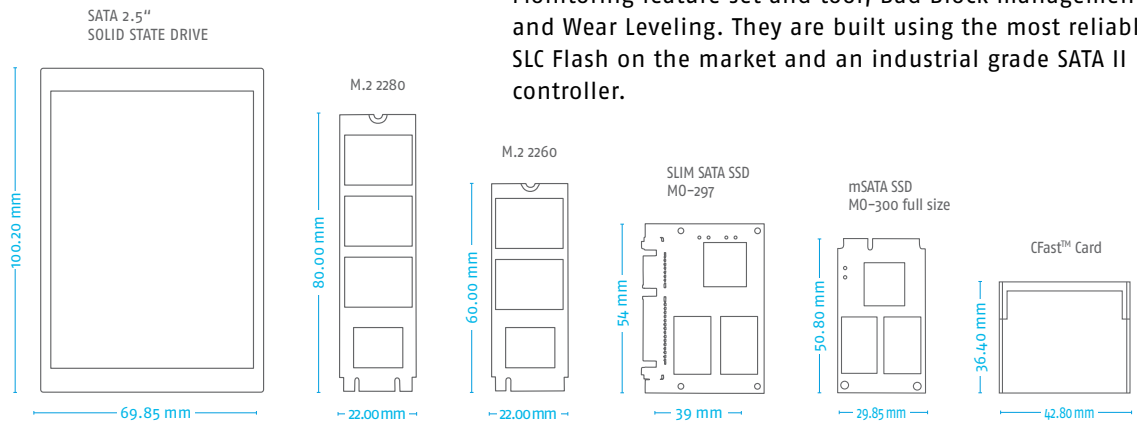|	2.5" SATA SSD	2.5" SATA SSD	2.5" SATA SSD	2.5" PATA SSD
Series Name	X-55	X-500	X-200	P-120
Interface Data Transfer Mode	SATA II – 3 Gbit/s up to UDMA6 / PIO4 / MDMA2			IDE / PATA up to UDMA4 / PIO4 / MDMA2
Connector	15 + 7 pin serial ATA with latch protection / special feature connector		15 + 7 pin serial ATA	ATA 44 pin, 2 mm pitch
Outline Dimensions	100.2 x 69.85 x 9.3 mm		100.2 x 69.85 x 9 mm	
Flash Type	EM-MLC	SLC		
Density Range	30 GB – 960 GB	16 GB – 512 GB	4 GB – 8 GB	4 GB – 32 GB
Data Retention	5 years @ life begin 3 months @ life end		10 years @ life begin 1 year @ life end	
Endurance	420 / 310 TBW (60 GB, JEDEC Client / Enterprise W/L)	2700 / 370 TBW (64 GB, JEDEC Client / Enterprise W/L)	100'000 P/E cycles (Flash cell level)	
Operating Temperature	Commercial: 0°C to +70°C Industrial: –40°C to +85°C			
Storage Temperature	–55°C to +95°C		–50°C to +100°C	
Performance Burst Rate Sequential Read (MB/s) Sequential Write (MB/s) Random 4KB Read (IOPS) Random 4KB Write (IOPS)	up to 300 MB/sec up to 220 MB/sec up to 160 MB/sec up to 12'000 up to 5'500	up to 300 MB/sec up to 240 MB/sec up to 200 MB/sec up to 14'500 up to 7'000	up to 300 MB/s up to 120 MB/s up to 95 MB/s up to 3'100 up to 25	up to 66 MB/s up to 45 MB/s up to 35 MB/s up to 3'840 up to 51
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	5V ± 10 % 3.3V optional		5 V ± 10 %	
Power Consumption	Slumber 140 mA max 700 mA Idle 200 mA		UDMA6 typ 260 mA max 320 mA Idle 140 mA	PIO typ 55 mA UDMA typ 135 mA Idle 5 mA
Features & Tools	Proven Power Fail Safety ATA security feature set Enhanced Secure Erase, Purge and Sanitize features (MIL STD) SBLTM Tool & SDK for S.M.A.R.T. based Life Time Monitoring NCQ, TRIM Advanced Wear Leveling & Bad Block management In-field firmware update		Proven Power Fail Safety Security Features available SBLTM Tool & SDK for S.M.A.R.T. based Life Time Monitoring Wear Leveling & Bad Block management	
Part Number	SFSAxxxxQvBJxss-t-dd-rrr-ccc		SFSAxxxxQvBRxss-t-dd-2r6-STD	SFPAxxxxQvB0xss-t-dd-2r3-STD

Swissbit's mSATA (MO-300), SLIM SATA (MO-297) and the new M.2 SSDs are ideal solutions for embedded applications requiring Solid State storage in smaller, removable form factors. Our SATA SSD modules offer a long service life combined with controlled BOM and a change notification proccess. Each unit undergoes extensive testing at the full temperature range before being released for shipment.

The X-60 SATA III series is Swissbit's latest development. The SSD Modules will be 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 525 MB/s in sequential access and 75'000 IOPS in 4KB 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 & SDK for detailed S.M.A.R.T. based Life Time Monitoring, NCQ, TRIM, advanced Wear Leveling & Bad Block management and in-field firmware update functionality.

Our SLC based X-200m mSATA and X-200s SLIM SATA SSDs are highly reliable storage solutions and are available with a range of features such as industrial temperature support from -40°C to +85°C, shock and vibration resistance, Power Fail Protection, Conformal Coating, a Life Time Monitoring feature set and tool, Bad Block management and Wear Leveling. They are built using the most reliable SLC Flash on the market and an industrial grade SATA II controller.

SATA 2.5"
SOLID STATE DRIVE

M.2 2280

M.2 2260

SLIM SATA SSD
MO-297

mSATA SSD
MO-300 full size

CFast™ Card

100.20 mm

80.00 mm

60.00 mm

54 mm

50.80 mm

36.40 mm

69.85 mm

22.00 mm

22.00 mm

39 mm

29.85 mm

42.80 mm

PRODUCT SIZE COMPARISION

X-60m	●	●	★	●	◐	●	★	●	●	●	★	○
X-60s	●	●	★	●	◐	●	★	●	●	●	★	○
X-60m2	●	●	★	●	◐	●	★	●	●	●	★	○
X-200m	●	●	●	○	◐	○	●	●	●	○	○	●
X-200s	●	●	●	○	◐	○	●	●	●	○	○	●

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

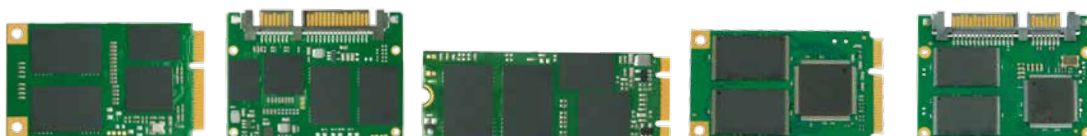|	MO-300 FULL SIZE	MO-297 SLIM SATA	M.2 2260/2280	MO-300 FULL SIZE	MO-297 SLIM SATA
Series Name	X-60m	X-60s	X-60m2	X-200m	X-200s
Interface Data Transfer Mode	SATA III – 6Gbit/s ATA8			SATA II – 3 Gbit/s up to PIO4, MDMA2, UDMA6	
Connector	52 pin PCI Express (PCIe) mini	15 + 7 pin Serial ATA	M.2 SATA	52 pin PCI Express (PCIe) mini	15 + 7 pin Serial ATA
Outline Dimensions	50.8 x 29.85 x 3.3 mm	54 x 39 x 4 mm	22 x 60 / 80 x 3.6 mm	50.8 x 29.85 x 3.3 mm	54 x 39 x 4 mm
Flash Type	MLC			SLC	
Density Range	16 GB – 480 GB			2 GB – 64 GB	
Data Retention	10 years @ life begin 1 year @ life end				
Endurance	30 TBW (60GB, JEDEC 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	−50°C to +95°C			−50°C to +100°C	
Performance Burst Rate Sequential Read (MB/s) Sequential Write (MB/s) Random 4KB Read (IOPS) Random 4KB Write (IOPS)	up to 600 MB/sec up to 525 MB/sec up to 450 MB/sec up to 75'000 up to 75'000			up to 300 MB/s up to 120 MB/s up to 95 MB/s up to 3'100 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 650 mA Idle 90 mA	typ 300 mA max 450 mA Idle 60 mA	typ 450 mA max 650 mA Idle 90 mA	typ 300 mA max 490 mA Idle 180 mA	typ 260 mA max 320 mA Idle 140 mA
Tools	Proven Power Fail Safety Enhanced Secure Erase, Purge and Sanitize features (MIL STD) SBLTM Tool & SDK for S.M.A.R.T. based Life Time Monitoring NCQ, TRIM Advanced Wear Leveling & Bad Block management In-field firmware update			Proven power fail safety SBLTM Tool & SDK for S.M.A.R.T. based Life Time Monitoring Advanced Wear Leveling & Bad Block management	
Part Number	SFSAxxxxUvAAxss-t-dd-xrx-STD	SFSAxxxxVvAAxss-t-dd-xrx-STD	SFSAxxxxMvAAxss-t-dd-xrx-STD	SFSAxxxxUvBRxss-t-dd-2r6-STD	SFSAxxxxVvBRxss-t-dd-2r6-STD

X-60 series: target specification

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 Compact-Flash™ 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 innovation is the F−60 SATA III CFast™ card series. Using state of the art controller and MLC Flash technology, the F−60 achieves data transfer rates up to 525 MB/s in sequential access and 70'000 IOPS in 4KB random access. In addition, the F−60 series feature Swissbit's proven Power Fail Safety, ATA security feature set, enhanced Secure Erase tools, a Windows or Linux tool & SDK for detailed S.M.A.R.T. based Life Time Monitoring, NCQ, TRIM, advanced Wear Leveling & Bad Block management or in−field firmware update functionality.

F-60	●	●	●	★	●	◐	●	★	●	●	●	★	○
F-240	●	●	●	★	◐	◐	○	★	●	★	●	○	●
F-100	●	●	●	●	○	◐	○	●	●	●	○	○	○

★ Industry Leading; ● default implemented; ◐ on request; ○ not available
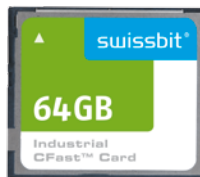
	CFAST™ CARD	CFAST™ CARD	CFAST™ CARD
Series Name	F-60	F-240	F-100
Interface Data Transfer Mode	CFast™ 2.0 – SATA III – 6 Gbit/s ATA8	CFast™ 1.0 – SATA II – 3 Gbit/s ATA7	
Connector	CFast™ Type I		
Outline Dimensions	36.4 x 42.8 x 3.6 mm		
Flash Type	MLC	SLC	
Density Range	16 GB – 240 GB	2 GB – 64 GB	2 GB – 32 GB
Data Retention	10 years @ life begin 1 year @ life end		
Endurance	30 TBW (60 GB, JEDEC Enterprise Workload)	100'000 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 Sequential Read (MB/s) Sequential Write (MB/s) Random 4KB Read (IOPS) Random 4KB Write (IOPS)	up to 600 MB/s up to 525 MB/s up to 340 MB/s up to 70'000 up to 40'000	up to 300 MB/s up to 130 MB/s up to 100 MB/s up to 3'300 up to 95	up to 300 MB/s up to 120 MB/s up to 95 MB/s up to 3'600 up to 30
MTBF	≥ 2'500'000 hours		
Shock	1500 G		
Vibration	20 G		
Humidity	85 % RH 85°C, 1'000 hrs		
Voltage	3.3 V ± 5 %		
Power Consumption	typ 450 mA max 650 mA DEVSLP <5 mA	typ 140 mA max 250 mA Idle 55 mA PHYSLP <20 mA	typ 300 mA max 420 mA Idle 180 mA
Features & Tools	Proven Power Fail Safety Enhanced Secure Erase, Purge and Sanitize features (MIL STD) SBLTM Tool & SDK for S.M.A.R.T. based Life Time Monitoring NCQ, TRIM Advanced Wear Leveling & Bad Block management In-field firmware update	Proven Power Fail Safety 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 Sophisticated Wear Leveling & Bad Block management Read Disturb Management TRIM Low Power Consumption	Proven Power Fail Safety SBLTM Tool & SDK for S.M.A.R.T. based Life Time Monitoring Evaluation kit with 2.5" SATA adapter board available Advanced Wear Leveling & Bad Block management
Part Number	SFCAxxxxHvAAxss-t-dd-xrx-STD	SFCAxxxxHvBVxss-t-dd-2r6-STD	SFCAxxxxHvBRxss-t-dd-2r6-STD

F-60: target specification

To this day, CompactFlash™ (CF) cards are still 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 only select 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 and reliable memory for a wide range of demanding use cases. They are designed to solve a broad range of concerns from compatibility, booting and Power Fail Safety concerns 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 (at least until 2021). In addition, the C-300 Longevity CF Card ensures optimized backward compatibility to 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
Power Fail Protection	●	●	●	●
Power Fail Recovery	●	●	●	●
SLC NAND Flash	●	●	●	●
Controlled BOM / PCN Process	●	●	●	●
Standard S.M.A.R.T. Support	◐	◐	●	●
Security Erase / Security Feature Set	○	○	◐	◐
Read Optimized	○	●	●	●
High Small file write performance	○	●	○	●
Read Disturb Management	○	○	◐	●
Trim support	○	○	○	●
PC-Card mode compatibility / legacy system	●	●	●	◐

FEATURE COMPARISON

● default available; ◐ optional; ○ not available;

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

★ Industry Leading; ● default implemented; ◐ on request; ○ not available
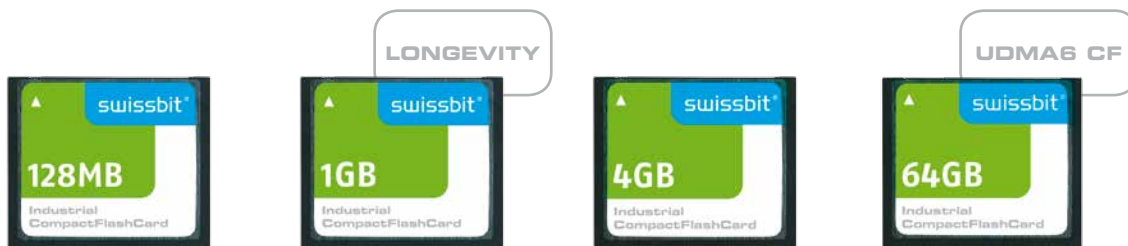
	COMPACTFLASH™ CARD	COMPACTFLASH™ CARD	COMPACTFLASH™ CARD	COMPACTFLASH™ CARD
Series Name	C-300	C-300 Longevity	C-320	C-440
Interface Data Transfer Mode		CFA4.1 True IDE / PC card – Up to UDMA4, MDMA4 & PIO6		CFA5.0 True IDE / PC card – Up to UDMA6, MDMA4 & PIO6
Connector		CFC Type I		
Outline Dimensions		36.4 x 42.8 x 3.3 mm		
Flash Type		SLC		
Density Range	128 MB to 8 GB	32 MB to 8 GB	2 GB to 32 GB	2 GB to 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 Sequential Read (MB/s) Sequential Write (MB/s) Random 4KB Read (IOPS) Random 4KB Write (IOPS)	up to 66 MB/s up to 37 MB/s up to 20 MB/s up to 3'300 up to 40	up to 66 MB/s up to 37 MB/s up to 20 MB/s up to 3'300 up to 50	up to 66 MB/s up to 45 MB/s up to 35 MB/s up to 2'800 up to 44	up to 133 MB/s up to 65 MB/s up to 40 MB/s up to 2'400 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 Security & SBZoneProtection features available SBLTM Tool & SDK for S.M.A.R.T. based Life Time Monitoring Sophisticated Wear Leveling & Bad Block management		Proven Power Fail Safety Security & SBZoneProtection features available SBLTM Tool & SDK for S.M.A.R.T. based Life Time Monitoring Sophisticated Wear Leveling & Bad Block management Read Disturb Management TRIM
Part Number	SFCFxxxxHxBKxss-t-xx-5r3-SMA	SFCFxxxxHxBKxss-t-xx-5r3-SMA	SFCFxxxxHxB0xss-t-dd-5r3-SMA	SFCFxxxxHvBUxss-t-dd-5r7-STD

FLASH MANAGEMENT MECHANISM

– Optimized Error Correction Code
– Efficient algorithms for Bad Block Management
– Real Life Time Monitoring
– Sophisticated Wear Leveling & Bad Block Management
– Power Fail Protection

MICRO SD MEMORY CARDS

Swissbit's Industrial Micro SD 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 towards longevity, life time, endurance, temperature, data retention and cost. In addition to the existing Micro SD Memory Card series, Swissbit has recently introduced the S-40u which targets read-centric applications that require the highest level of data reliability for long periods of time. The combination of MLC (Multi Level Cell) NAND Flash with innovative controller and firmware technology enable prolonged data retention and extended life cycles despite the write endurance limitations of MLC Flash. The special firmware features in the S-40u include a powerful built-in Error Correction, Read Retry, Autonomous Data Care Management, Life Time Monitoring & diagnostic features, Randomizer, Wear Leveling & Bad Block Management algorithms and intelligent Power Fail Protection.

The new S-45u (MLC version) and S-450u (SLC version) series include the same set of sophisticated features and, through the implementation of UHS-I, support data transfer rates of up to 80 MB/s.

All Swissbit Micro SD 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-40U / S-45U	●	●	●	★	●	★	●	★	★	○
S-450U	●	●	●	★	●	★	●	★	★	●

★ Industry Leading; ● default implemented; ○ not available

	MICRO SD MEMORY CARD (SD / SDHC)	MICRO SD MEMORY CARD (SD / SDHC)	MICRO SD MEMORY CARD (SD / SDHC)	MICRO SD MEMORY CARD (SD / SDHC)	MICRO SD MEMORY CARD (SD / SDHC)
Series Name	S-300µ	S-200µ	S-40µ	S-45µ	S-450µ
Interface Data Transfer Mode	SD 2.0, Class 6 / 10	SD 2.0, Class 6	SD 3.0, Class 6	SD 3.0, Class 10, UHS-I	
Connector	Micro SD				
Outline Dimensions	15 x 11 x 0.7 / 1 mm				
Flash Type	SLC		MLC		SLC
Density Range	2 GB (SD) 4 GB – 8 GB (SDHC)	512 MB – 2 GB (SD)	4 GB – 16 GB (SDHC)		512 MB – 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)		100'000 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 Sequential Read (MB/s) Sequential Write (MB/s)	up to 25 MB/s up to 24 MB/s up to 22 MB/s	up to 25 MB/s up to 21 MB/s up to 18 MB/s	up to 25 MB/s up to 24 MB/s up to 11 MB/s	up to 104 MB/s up to 70 MB/s up to 14 MB/s	up to 104 MB/s up to 80 MB/s up to 75 MB/s
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 Normal 2.0 – 3.6 V Basic Communication				
Power Consumption	Read typ 50 mA Write typ 50 mA	Read typ 30 mA Write typ 40 mA	Read typ 40 mA Write typ 60 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 Diagnostic features Life Time Monitoring Sophisticated Wear Leveling & Bad Block management	Proven Power Fail Safety SBLTM Tool & SDK for detailed Life Time Monitoring Sophisticated Wear Leveling & Bad Block management Autonomous Data Care Management		
Part Number	SFSDxxxxLvBWxss-t-dd-1r1-STD	SFSDxxxxNxBNxss-t-dd-1r1-STD	SFSDxxxxNxBMxss-t-de-1r1-STD d=G,L,H	SFSDxxxxNxBMxss-t-de-2r1-STD d=G,L,H	SFSDxxxxNxBMxss-t-de-2r1-STD d=M,D,Q

- Optimized Error Correction Code
- Efficient algorithms for Bad Block
  Management
- Diagnostic with real Life Time
  Monitoring
- Sophisticated Wear Leveling &
  Bad Block Management
- Power Fail Protection

SD MEMORY CARDS

Swissbit's Industrial Secure Digital (SD) card series are designed, manufactured and tested to withstand extreme environmental conditions.

The use of SLC Flash in the S-200 / 220 series combined with an industrial grade Flash controller provide a number of enhanced product features such as built-in Error Correction, Wear Leveling & Bad Block Management algorithms, Power Fail Protection and power saving modes. The housing with special connector support provides resistance against bending and torque.

In addition to the existing SD Memory Card series, Swissbit has recently introduced the S-40 which targets read-centric applications that require the highest level of data reliability for long periods of time. The combination of MLC (Multi Level Cell) NAND Flash with innovative controller and firmware technology enable prolonged data retention and extended life cycles despite the write endurance limitations of MLC Flash. The special firmware features in the S-40 include a powerful built-in Error Correction, Read Retry, Autonomous Data Care Management, Life Time Monitoring & diagnostic features, Randomizer, Wear Leveling & Bad Block Management algorithms and intelligent Power Fail Protection.

The new S-45 (MLC version) and S-450 (SLC version) series include the same set of sophisticated features and, through the implementation of UHS-I, support data transfer rates of up to 80 MB/s.

All Swissbit SD 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-200 / 220	●	●	●	●	○	★	●	○	○	●
S-40 / S-45	●	●	●	★	●	★	●	★	★	○
S-450	●	●	●	★	●	★	●	★	★	●

★ Industry Leading; ● default implemented; ○ not available

WORLD'S MOST RELIABLE SLC FLASH

	SD MEMORY CARD (SD / SDHC)	SD MEMORY CARD (SD / SDHC)	SD MEMORY CARD (SD / SDHC)	SD MEMORY CARD (SD / SDHC)
Series Name	S-200 / 220	S-40	S-45	S-450
Interface Data Transfer Mode	SD 2.0, Class 6 / 10	SD 3.0, Class 6	SD 3.0, Class 10, UHS-I	
Connector	SD			
Outline Dimensions	32 x 24 x 2.1 mm			
Flash Type	SLC	MLC		SLC
Density Range	512 MB – 2 GB (SD) 4 GB – 8 GB (SDHC)	4 GB – 32 GB (SDHC)		512 MB – 2 GB (SD) 4 GB – 32 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)		100'000 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 Sequential Read (MB/s) Sequential Write (MB/s)	up to 25 MB/s up to 21 MB/s up to 18 MB/s	up to 25 MB/s up to 24 MB/s up to 11 MB/s	up to 104 MB/s up to 70 MB/s up to 14 MB/s	up to 104 MB/s up to 80 MB/s up to 75 MB/s
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 2.0 – 3.6 V Basic Communication			
Power Consumption	Read typ 28 mA Write typ 55 mA	Read typ 40 mA Write typ 60 mA	Read typ 100 mA Write typ 100 mA	
Features & Tools	Proven Power Fail Safety Diagnostic features & Life Time Monitoring through SD / SPI command set Sophisticated Wear Leveling & Bad Block management	Proven Power Fail Safety SBLTM Tool & SDK for detailed Life Time Monitoring Sophisticated Wear Leveling & Bad Block management Autonomous Data Care Management		
Part Number	SFSDxxxxLvBNxss-t-dd-1n-STD	SFSDxxxxLxBMxss-t-de-1n-STD d=G,L,H	SFSDxxxxLxBMxss-t-de-2n-STD d=G,L,H	SFSDxxxxLxBMxss-t-de-2n-STD d=M,D,Q

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 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
· General industrial computers with needs for easy to use boot mediums

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

U-110	●	○	●	●	●	●	●
unitedCONTRAST II	●	●	●	●	●	●	●
MINITWIST/CAP II	○	●	●	●	●	●	○

● default implemented; ◗ on request; ○ not available

	USB FLASH MODULE	USB FLASH DRIVE	USB FLASH DRIVE
Series Name	U–110	unitedCONTRAST II	miniTWIST/CAP II
Interface Data Transfer Mode		USB 2.0 full / high speed	
Connector	Standard: 2.54 mm – 10 Pin Low Profile: 2.00 mm – 10 Pin	USB 2.0 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	55 mm x 16 mm x 7–8 mm
Flash Type		SLC	
Density Range	1 GB to 16 GB	512 MB to 16 GB	128 MB to 4 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	Commercial: 0°C to +70°C
Storage Temperature		–50°C to +100°C	
Performance Burst Rate Sequential Read (MB/s) Sequential Write (MB/s) Random 4KB Read (IOPS Random 4KB Write (IOPS		up to 60 MB/s up to 32 MB/s up to 23 MB/s up to 1 600 up to 30	up to 60 MB/s up to 18 MB/s up to 12 MB/s up to 1 300 up to 33
MTBF		≥ 3'000'000 hours	
Shock		50 G	
Vibration		15 G	
Humidity		85 % RH 85°C, 500 hrs	
Voltage	5 V ± 10 % (3.3 V ± 5 % optional)	5 V ± 10 %	
Power Consumption		Full Speed typ 90 mA High Speed typ 100 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 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	Proven Power Fail Safety Windows / Linux – Spare block read out Small form factor Optimized Wear Leveling Password manager available
Part Number	2.54 mm: SFUIxxxxJvBPxss-t-dd-2п-STD 2.00 mm: SFUIxxxxKvBPxss-t-dd-2п-STD	SFU2xxxxEvBPxss-t-dd-1п-STD	SFU2xxxxDvBP1ss-t-dd-1п-STD

Security is becoming mandatory in diverse markets. Data breaches and compromised IT environments are becoming a reality. Customers and solution providers are rightly concerned about risks, creating a necessity to improve security in a reliable and flexible fashion.

In the telecommunications market, it has been widely publicized that GSM calls can easily be tapped. Reports about the mass interception of internet data on a global scale compromises the trust of the privacy of communications. Sophisticated attacks on industrial facilities raise questions about liability, 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 supports its customers in Industrial, Medical, Government, Telecommunications and Banking sector to deliver secure systems.

Each and every system requires storage to operate. While globally recognized as a leader in high-reliable Flash memory solutions, Swissbit also designs, develops and manufactures security products that provide additional security functions and features. Swissbit demonstrates a continuous and uninterrupted migration path towards secure systems while maintaining 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 – PS-100U SERIES

The security product series in the MICRO SD form factor addresses the growing demand for mobile and portable 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 in high speed. Additional security functions of the card can be activated to protect any data.

Valuable data such as sensitive files, emails, photos and even voice calls can be protected by encryption, access protection or made resistant against tampering by digital signature. Depending on the use case the best fitting product can be chosen.

Our PS–100u series provides high security by the optional smart card chip or by the Swissbit security firmware. The block diagram below illustrates the architecture of the Swissbit Security Interface, the Flash Controller and the Encrypted Flash Chip.
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 mobile phones and tablets like Android™ and BlackBerry™.

Partner and Customer solutions (like applications, services, middleware, license control)

Swissbit Security Interface

Flash Memory Controller with Swissbit Security Firmware

AES

APP

(optional) Secure Element

Java Applet

(Encrypted) Flash Memory

PS-100u SERIES

Compliance	SD 3.0 SD, ASSD V1.1
Data transfer	SPI mode supported, Speed class 10
Density	4 GB / 8 GB / 16 GB
Temperature	Extended: −25°C to 85°C
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 80 k EEPROM for applets and secure storage
Drivers / API	WinXP, 7, 8, Vista, Linux, BlackBerry, Android SDK available

The Standard Edition PS-100u SE fits best into authentication and PKI (Public Key Information) 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.

Typical applications are:
· Mobile email encryption
· Digital signature
· User authentication for PC and mobile login
· True random number generation

The Voice Edition PS-100u VE provides Elliptic Curve Cryptography. The enormous advantage of computation and security combined with small certificate sizes make the PS-100u VE card ideal for online key- and certificate exchange.

Solution providers choose the PS-100u VE card to build secure mobile voice solutions. The users (caller and person called) only need to enter their PIN in their mobile device and the security chip performs end-to-end encryption on the behalf of users. All encryption keys for authentication and key agreements remain highly protected in the card at all times. Only AES key stream segments suitable for voice stream encryption are passed to the mobile host application.
The PS-100u VE extends the features of the PS-100u SE.

The PS-100u DP and PS-100u PE card provide flash memory encryption, secure logging and flexible CD-ROM storage.
The PS-100u PE offers asymmetric and symmetric cryptography by the embedded smart card, whereas the PS-100u DP offers symmetric encryption without smart card.

PS-100u SE	●	●	●	●	●	○	○	○	○	○
PS-100u VE	●	●	●	●	●	●	●	○	○	○
PS-100u PE	●	●	●	●	●	●	●	●	●	●
PS-100u DP	○	○	○	○	○	○	○	●	●	●

●supported; ○not available;

made in germany

Swissbit commits to offering the highest quality, JEDEC standard and customized DRAM modules for industrial applications. As a DRAM module manufacturer, we use strategic multiple sources of DRAM suppliers to offer our customers a reliable, long-term supply of leading edge and legacy memory module products. Special focus is put into working with suppliers that offer extended availability of DRAM die revisions, avoiding frequent requalification efforts with our customers.

Swissbit's quality focus starts with sourcing the highest quality grade DRAMs and utilizing fully compliant JEDEC module raw cards either as in-house PCB design or from top quality design partners. For all modules the passives and other active components selected are of the highest available quality grade. Using Surface Mount Technology (SMT) processes in production on fully certified facilities in Germany allows Swissbit to sustain a quality focus during the entire assembly process. Traceability is guaranteed through the complete manufacturing and testing flow. We ensure the highest quality level for our customers with world class application testing. Swissbit uses internally developed application software to test 100 % of all modules under real world conditions with diverse pattern and stress methods and to cover the complete memory array including ECC components by constantly adapting to the latest memory controller features. For industrial temperature grade modules the application tests are performed at −40°C and 85°C $T_{AMBIENT}$.

With a stringent internal product qualification, fast customer return processing and the dedication to be an always improving company, Swissbit constantly works on providing its customers the best DRAM modules available on the market at a competitive price. Swissbit is committed and able to design, manufacture and test customer-specific module solutions. We offer PCB design and layout services, development of individual test solutions, thermal simulations, DRAM component sourcing, controlled manufacturing and special coating options.

By using Swissbit DRAM modules you can keep the total system cost at a minimum.

DRAM SPECIFIC OPTIONS

	❄️	🔧	🌡️	♨️	🌿	💧
DDR1 DIMM/RDIMM	◑	○	○	○	○	
DDR1 SODIMM/SO-RDIMM	◑	○	○	○	○	
DDR2 DIMM/RDIMM	◑	○	○	○	○	
DDR2 SODIMM	◑	○	○	◑	○	
DDR3 DIMM	◑	○	○	○	●	
DDR3 RDIMM	◑	○	●	◑	●	
DDR3 MINIDIMM	◑	○	●	◑	●	
DDR3 SODIMM/SO-UDIMM	◑	○	●	◑	●	◑
DDR3 XR-DIMM	◑	●	●	○	●	

● default implemented; ◑ on request; ○ not available

69.60 mm

30.00 mm

DDR4, FASTER AT LOW POWER

With its architectural features and the later extension to 1.35V the DDR3 technology had the widest range of data rates. But finally the end of the DDR3 technology evolution has come. Further improvements were necessary to open a path for even higher data rates.

The new JEDEC standard DDR4 addresses these require-ments. Its spec targets a doubling of the data rate from today's DDR3-1600 to a blazing DDR4-3200. Already the introduction of DDR4 starts at 2133 Mb/s and offers a 30% higher bandwidth compared to the main stream DDR3L speed.

At the same time the operating voltage could be reduced from 1.35V to 1.20V. Together with several new power saving features like an improved termination scheme, data bus inversion and grouping of banks the total power consumption and heat dissipation has significantly been reduced against DDR3L.
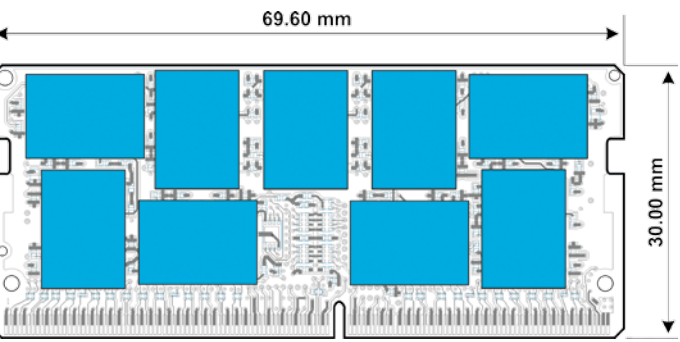
The DDR4 standard also adds reliability features like CRC and command / address bus parity.

DDR4 has been fully standardized at JEDEC and is supported by the most recent memory controllers.

Swissbit will offer a complete portfolio of DDR4 modules as they are released by JEDEC, focusing on the form factors that are most important to the industrial market, beginning with ECC SODIMMs.

made in germany

Designers of rugged platforms face a difficult decision when planning their memory layout. Either they use DRAM components directly soldered to the system board, the most rugged but also expensive and inflexible solution, or they take standard SODIMMs and try to ruggedize them by using straps or glue in order to fix them in their socket.

Swissbit in cooperation with the SFF–SIG consortium (Small Form Factor – Special Interest Group) has developed a rugged module called XR–DIMM™, the abbreviation XR standing for eXtreme Rugged.

Using special mezzanine connectors and mounting holes to attach the module to the system board creates a true rugged system with the easy integration and flexibility of DIMM solutions and the shock and vibration immunity of memory down implementations.

The XR–DIMM closely follows the DDR3 72 bit SODIMM standard and makes design–in as easy as using a JEDEC module, unburdening the system designer of memory channel layout.

With multiple module densities the system integrator can create different memory populations with one system platform, avoiding multiple system board SKUs and taking benefit in perfectly tested modules with a just in time purchase option.

	Memory down	SODIMM with fixture	XR–DIMM
DESIGN-IN/LAYOUT	Difficult	Easy	Easy
FLEXIBILITY OF MEMORY POPULATION	Difficult	Easy	Easy
TESTABILITY AFTER SOLDERING	Medium	Easy	Easy
UPGRADE/REPAIR	Difficult	Easy	Easy
REQUIRED BOARD SPACE	Small to Medium	Medium to Small	Medium to Small
STACKABLE SOLUTION	No	Yes	Yes
PROTECTION AGAINST SHOCK	Good	Medium (with glue / strap)	Good
PROTECTION AGAINST VIBRATION	Good	Bad	Good
MEMORY COST	Low to Medium	Low	Medium

LONG UDIMM/WITH AND WITHOUT ECC

	Data Rate / CL	Density	Org	Height	Voltage	Pins	Partnumber	Package
DDR4-UDIMM	2133 / CL15	4 GB – 16 GB	X64	31.25 mm	1.20 V	288	SHUxxx64xxxxxxx–ssR	BGA
DDR3L-UDIMM	1600 / CL11	2 GB – 8 GB	x64	1.18" (29.97 mm)	1.35 / 1.50 V	240	SLUxxx64xxxxxxx–ssR	BGA
DDR3L-UDIMM ECC	1600 / CL11	2 GB – 8 GB	x72	1.18" (29.97 mm)	1.35 / 1.50 V	240	SLUxxx72xxxxxxx–ssR	BGA
DDR2-UDIMM	800 / CL6	512 MB – 2 GB	x64	1.18" (29.97 mm)	1.80 V	240	SEUxxx64xxxxxxx–ssR	BGA
DDR2-UDIMM ECC	800 / CL6	1 GB – 2 GB	x72	1.18" (29.97 mm)	1.80 V	240	SEUxxx72xxxxxxx–ssR	BGA
DDR1-UDIMM	400 / CL3	512 MB – 1 GB	x64	1.25" (31.75 mm)	2.50 V	184	SDUxxx64xxxxxxx–ssR	TSOP
DDR1-UDIMM ECC	400 / CL3	512 MB – 1 GB	x72	1.25" (31.75 mm)	2.50 V	184	SDUxxx72xxxxxxx–ssR	TSOP
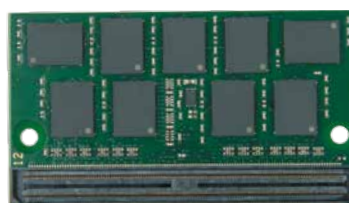
SODIMM/WITH AND WITHOUT ECC/RUGGED XR-DIMM

	Data Rate / CL	Density	Org	Height	Voltage	Pins	Partnumber	Package
DDR4-SODIMM ECC	2133 / CL15	4 GB – 16 GB	X72	30 mm	1.20 V	260	SHNxxx72xxxxxxx–ssRT	BGA
DDR3L-SODIMM	1600 / CL11	1 GB – 8 GB	x64	1.18" (29.97 mm)	1.35 / 1.50 V	204	SLNxxx64xxxxxxx–ssRT	BGA
DDR3L-SO-UDIMM	1600 / CL11	2 GB – 8 GB	x72	1.18" (29.97 mm)	1.35 / 1.50 V	204	SLNxxx72xxxxxxx–ssRT	BGA
DDR3-SODIMM	1600 / CL11	1 GB – 8 GB	x64	1.18" (29.97 mm)	1.50 V	204	SGNxxx64xxxxxxx–ssRT	BGA
DDR3-SO-UDIMM	1600 / CL11	1 GB – 8 GB	x72	1.18" (29.97 mm)	1.50 V	204	SGNxxx72xxxxxxx–ssRT	BGA
DDR3-XR-DIMM™	1600 / CL11	1 GB – 8 GB	x72	38 mm x 67.5 mm	1.35 / 1.50 V	240	SLVxxx72xxxxxxx–ssRT	BGA
DDR2-SODIMM	800 / CL6	512 MB – 4 GB	x64	1.18" (29.97 mm)	1.80 V	200	SENxxx64xxxxxxx–ssR	BGA
DDR1-SODIMM	400 / CL3	256 MB – 1 GB	x64	1.25" (31.75 mm)	2.50 V	200	SDNxxx64xxxxxxx–ssR	BGA
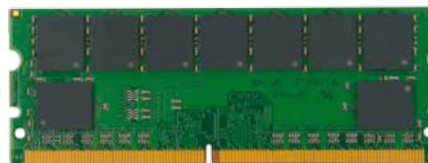
MINI-UDIMM/MICRODIMM/100PIN-DIMM

	Data Rate / CL	Density	Org	Height	Voltage	Pins	Partnumber	Package
DDR3-MiniUDIMM	1600 / CL11	2 GB – 8 GB	x72	1.18" / 0.74"	1.50 V	244	SGLxxx72xxxxxxx–ssRT	BGA
DDR2-MicroDIMM	667 / CL5	1 GB	x64	1.18" (29.97 mm)	1.80 V	214	SEMxxx64xxxxxxx–ssR	BGA
DDR1-100PIN_DIMM	333 / CL2.5	128 MB – 512 MB	x72	1.00" (25.40 mm)	2.50 V	100	SDUxxx32xxxxxxx–ssR	TSOP

HEAT SPREADER

The critical condition for DRAMs is a high die temperature, because it leads to loss of cell information. With die sizes continually shrinking, the power dissipation is concentrated on only a few square millimeters. Adding a heat spreader to a module allows the hot spots to easier dissipate the temperature over a bigger surface. This heat spreader levels out the module heat dissipation, thus reducing the hot spot temperature and improving the module reliability.

Swissbit offers heat spreader solutions for some of its industrial temperature grade SODIMMs and MiniDIMMs.

CONFORMAL COATING

Industrial DRAM modules often do not operate in a clean air environment as compared to standard office or home conditions. A heavy-industry environment with hot or humid air, aggressive chloride of sulfite loaded gas or dust can reduce the life span of a DRAM module by corroding the PCB lines or solder contacts.

Swissbit offers a full module surface coating with a thin film of polyurethane which effectively protects against most hazardous environmental conditions. With this protection the endurance of the module is heavily improved, thus reducing maintenance periods and avoiding sudden breakdown of a system. This option is currently available for SODIMMs as well as for several Flash products.

TEMPERATURE SENSOR

For all DDR3 SODIMMs, MiniDIMMs and registered DIMMs, Swissbit offers as a standard an integrated temperature sensor within the SPD device. It allows permanent monitoring of the module temperature over the system management bus.

By utilizing this feature the system management can actually control the self heating of the module in a more accurate manner than by using calculation methods for memory throttling. This results in higher useable bandwidth and avoids overheating of the module.

CORROSION RESISTANCE

For demanding applications Swissbit uses a thick layer of 30 micro inch gold on the DIMM contacts and special sulfur corrosion resistant passives to offer highest reliability and longest lifetime.

INDUSTRIAL TEMPERATURE RANGE

Besides modules for commercial temperature range 0°C to 70°C, Swissbit also offers products for an extended temperature range of 0°C to 85°C $T_{AMBIENT}$ as well as full industrial temperature range –40°C to 85°C $T_{AMBIENT}$.

With intensive application testing of each individual module at low and high temperature, Swissbit ensures the highest quality and reliability of their products.

LONG RDIMM / STANDARD HEIGHT / WITH ECC AND C/A PARITY

	Data Rate / CL	Density	Org	Height	Voltage	Pins	Partnumber	Package
DDR3-RDIMM ECC+PARITY	1333 / CL9	1 GB – 8 GB	x72	1.18" (29.97 mm)	1.50 V	240	SGPxxx72xxxxxxx–ssR	BGA
DDR2-RDIMM ECC+PARITY	800 / CL6	1 GB – 4 GB	x72	1.18" (29.97 mm)	1.80 V	240	SEPxxx72xxxxxxx–ssR	BGA

LOW PROFILE LONG RDIMM, UDIMM / WITH ECC

	Data Rate / CL	Density	Org	Height	Voltage	Pins	Partnumber	Package
DDR3-RDIMM ECC+PARITY	1333 / CL9	2 GB – 4 GB	x72	0.70" (17.78 mm)	1.50 V	240	SGPxxx72xxxxxxx–ssR	BGA
DDR3-UDIMM ECC	1333 / CL9	2 GB – 4 GB	x72	0.70" (17.78 mm)	1.50 V	240	SGUxxx72xxxxxxx–ssR	BGA
DDR2-RDIMM ECC+PARITY	800 / CL6	1 GB – 2 GB	x72	0.72" (18.29 mm)	1.80 V	240	SEPxxx72xxxxxxx–ssR	BGA

VLP MINIRDIMM WITH ECC, REGISTERED SO-RDIMM WITH ECC

	Data Rate / CL	Density	Org	Height	Voltage	Pins	Partnumber	Package
DDR3-MiniRDIMM	1333 / CL9	2 GB – 4 GB	x72	0.72" (18.29 mm)	1.50 V	244	SGHxxx72xxxxxxx–ssR	BGA
DDR2-MiniRDIMM	667 / CL5	1 GB	x72	0.72" (18.29 mm)	1.80 V	244	SEHxxx72xxxxxxx–ssR	BGA
DDR2-SO-RDIMM	667 / CL5	1 GB – 2 GB	x72	1.18" (29.97 mm)	1.80 V	200	SEGxxx72xxxxxxx–ssR	BGA
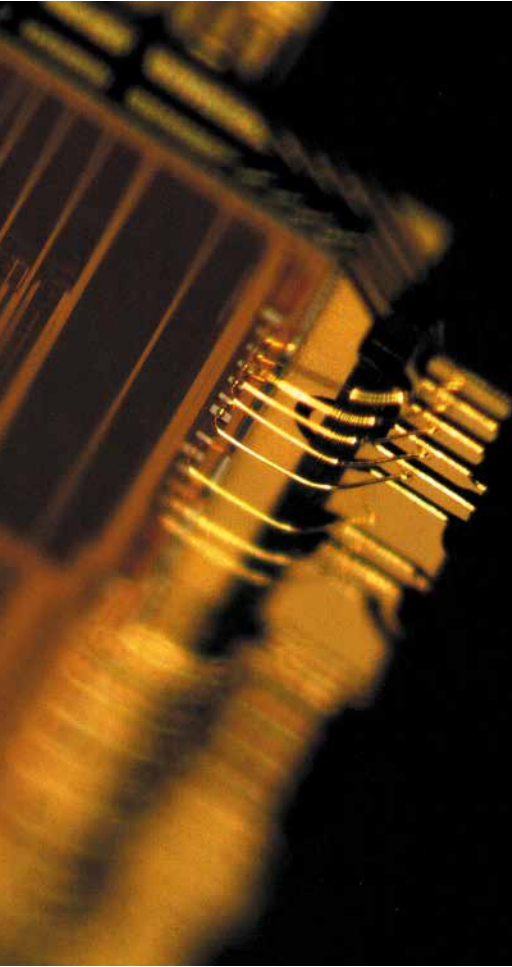
System-in-Package (SiP) is the processing of sensitive bare dies or chips into robust finished modules or components. With 20 years of experience, Swissbit successfully uses advanced packaging technologies in order to achieve smallest form factors and to built Multi-Chip-Packages. With this electronic integration approach our products provide more functionality or highest memory densities inside one package, various functional blocks (RF, digital, sensors, security and memory) are combined, as well as passive components.

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 expertise besides the integration of additional hardware features and an experienced team of testing and quality engineers. Our own Memory-In-Package line qualifies (but not limits) Swissbit as the development and production partner for any dedicated or customized memory−related product with challenging integration or reliability requirements. If you cannot achieve 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 from the time of inception of your project: 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 of 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 dice, side-by-side, sensors integration etc. System in Package solutions could be smaller, cheaper and having higher security.

System-in-Package benefits:

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

swissbit®

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, 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

made in germany

SYSTEM IN PACKAGE (SIP) **37**

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
CA: CFast™
CF: CompactFlash™
PC: PCIe
UI: UFD internal / Module
SD: SD Memory Card
MM: Multimedia Card
PA: PATA / IDE
SA: SATA

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	
2048: 2 GB	512G: 512 GB	

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: MICRO SD 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)

Design Option (15)

Configuration (14)

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

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)
O: MLC ODP (octal die package)

Temperature Rating (11)

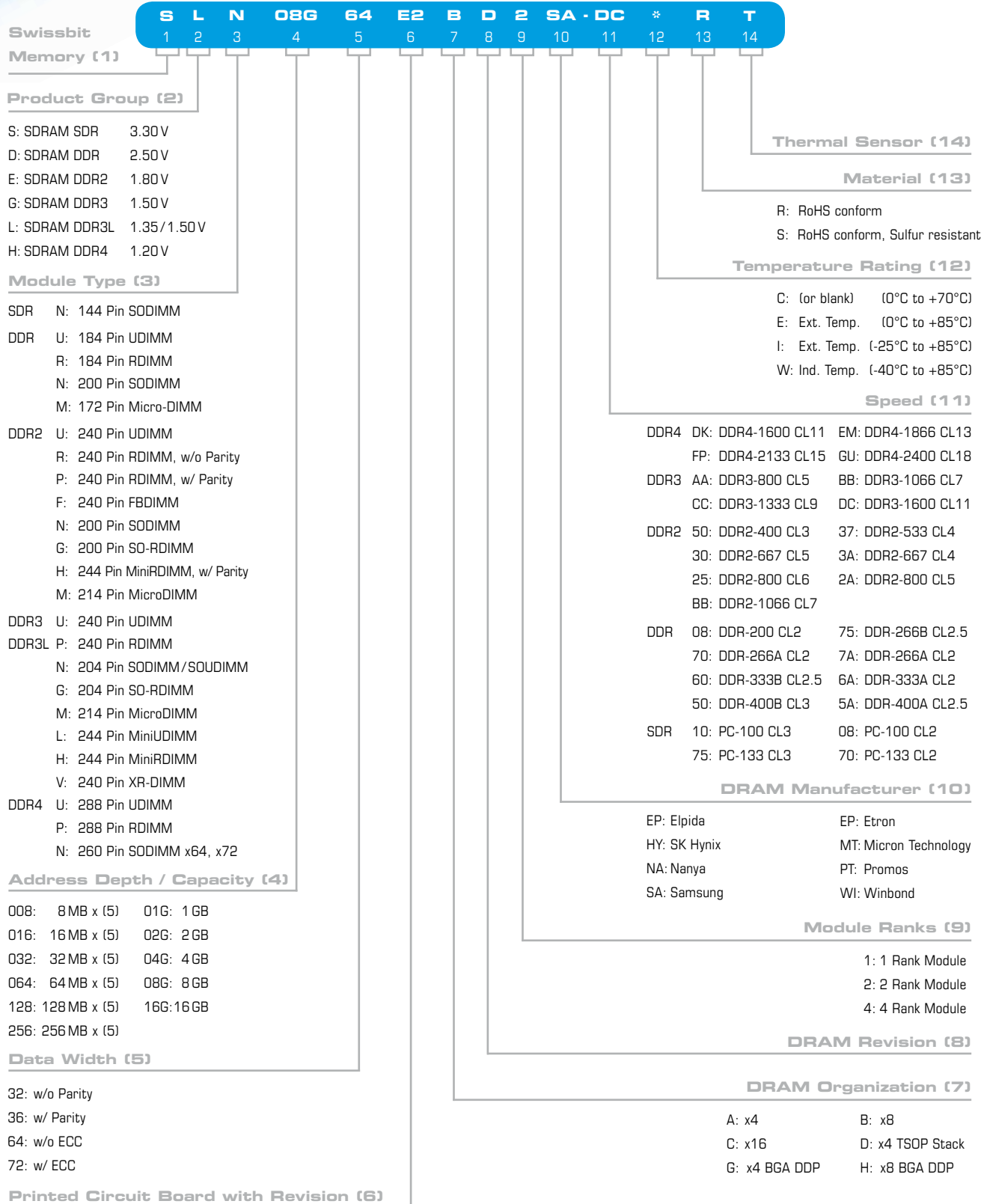I: Industrial Temp. (-40°C to +85°C)
E: Extended Temp. (-25°C to +85 / 90°C)
C: Commercial Temp. (0°C to +70°C)

Flash Supplier (10)

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

Chips / Channels (9)

DRAM Part Number Decoder

S	L	N	08G	64	E2	B	D	2	SA - DC	❄	R	T
1	2	3	4	5	6	7	8	9	10	11	12	13	14

Swissbit Memory (1)

Product Group (2)

S: SDRAM SDR   3.30 V
D: SDRAM DDR   2.50 V
E: SDRAM DDR2   1.80 V
G: SDRAM DDR3   1.50 V
L: SDRAM DDR3L   1.35 / 1.50 V
H: SDRAM DDR4   1.20 V

Module Type (3)

SDR	N:	144 Pin SODIMM
DDR	U:	184 Pin UDIMM
	R:	184 Pin RDIMM
	N:	200 Pin SODIMM
	M:	172 Pin Micro-DIMM
DDR2	U:	240 Pin UDIMM
	R:	240 Pin RDIMM, w/o Parity
	P:	240 Pin RDIMM, w/ Parity
	F:	240 Pin FBDIMM
	N:	200 Pin SODIMM
	G:	200 Pin SO-RDIMM
	H:	244 Pin MiniRDIMM, w/ Parity
	M:	214 Pin MicroDIMM
DDR3	U:	240 Pin UDIMM
DDR3L	P:	240 Pin RDIMM
	N:	204 Pin SODIMM / SOUDIMM
	G:	204 Pin SO-RDIMM
	M:	214 Pin MicroDIMM
	L:	244 Pin MiniUDIMM
	H:	244 Pin MiniRDIMM
	V:	240 Pin XR-DIMM
DDR4	U:	288 Pin UDIMM
	P:	288 Pin RDIMM
	N:	260 Pin SODIMM x64, x72

Address Depth / Capacity (4)

008:	8 MB x (5)	01G:	1 GB
016:	16 MB x (5)	02G:	2 GB
032:	32 MB x (5)	04G:	4 GB
064:	64 MB x (5)	08G:	8 GB
128:	128 MB x (5)	16G:	16 GB
256:	256 MB x (5)		

Data Width (5)

32: w/o Parity
36: w/ Parity
64: w/o ECC
72: w/ ECC

Printed Circuit Board with Revision (6)

Thermal Sensor (14)

Material (13)

R: RoHS conform
S: RoHS conform, Sulfur resistant

Temperature Rating (12)

C: (or blank)   (0°C to +70°C)
E: Ext. Temp.   (0°C to +85°C)
I: Ext. Temp. (-25°C to +85°C)
W: Ind. Temp. (-40°C to +85°C)

Speed (11)

DDR4	DK: DDR4-1600 CL11	EM: DDR4-1866 CL13
	FP: DDR4-2133 CL15	GU: DDR4-2400 CL18
DDR3	AA: DDR3-800 CL5	BB: DDR3-1066 CL7
	CC: DDR3-1333 CL9	DC: DDR3-1600 CL11
DDR2	50: DDR2-400 CL3	37: DDR2-533 CL4
	30: DDR2-667 CL5	3A: DDR2-667 CL4
	25: DDR2-800 CL6	2A: DDR2-800 CL5
	BB: DDR2-1066 CL7	
DDR	08: DDR-200 CL2	75: DDR-266B CL2.5
	70: DDR-266A CL2	7A: DDR-266A CL2
	60: DDR-333B CL2.5	6A: DDR-333A CL2
	50: DDR-400B CL3	5A: DDR-400A CL2.5
SDR	10: PC-100 CL3	08: PC-100 CL2
	75: PC-133 CL3	70: PC-133 CL2

DRAM Manufacturer (10)

EP: Elpida	EP: Etron
HY: SK Hynix	MT: Micron Technology
NA: Nanya	PT: Promos
SA: Samsung	WI: Winbond

Module Ranks (9)

1: 1 Rank Module
2: 2 Rank Module
4: 4 Rank Module

DRAM Revision (8)

DRAM Organization (7)

A: x4	B: x8
C: x16	D: x4 TSOP Stack
G: x4 BGA DDP	H: x8 BGA DDP

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