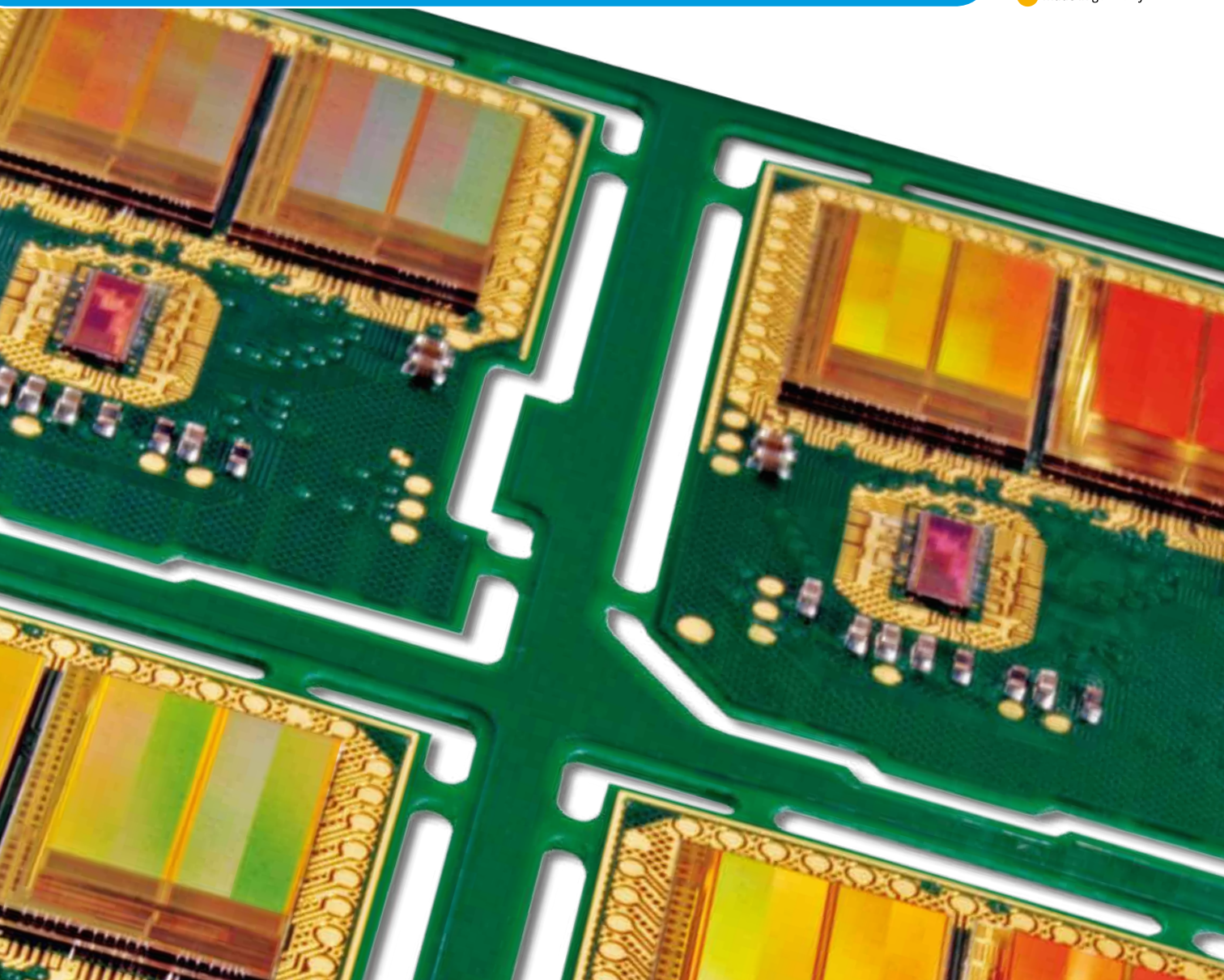


swissbit®

## INDUSTRIAL MEMORY SOLUTIONS

NAND FLASH PRODUCTS & DRAM MODULES



In more detail Swissbit offers to its customers the following areas of service:

#### PRODUCT DEPTH

- Complete line of DRAM modules and NAND Flash Solid State Drives available in a variety of interfaces and form factors
- Both leading edge technology and legacy product offerings
- Extended and industrial temperature grade products
- Unique Chip-On-Board (COB) technology
- Small form factor removable NAND Flash cards
- Memory In Package Solutions

#### SALES SERVICE AND ENGINEERING SUPPORT

- Fast, effective and experienced 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
- Worlds only COB DRAM memory module manufacturer

#### CUSTOMIZATION

- Custom DRAM module and FLASH designs
- Security features
- Individual labeling
- Design In support

#### 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

- Advantest, King Tiger Technology and Tanisys Technology test equipment
- World class application testing
- System Level Test During Burn-In (TDBI)
- Extended and industrial temperature testing
- Environmental testing

#### COMPLIANCE TO

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

#### QUALITY STANDARD

- ISO 9001:2008

#### ASSOCIATIONS

- Member of CompactFlash Association (CFA)
- Member of SATA-IO
- Member of USB Implementers Forum
- Member of SecureDigital Association (SDA)
- Member of Memory Implementers Forum
- Member of JEDEC
- Member of Small Form Factor Special Interest Group SFF-SIG





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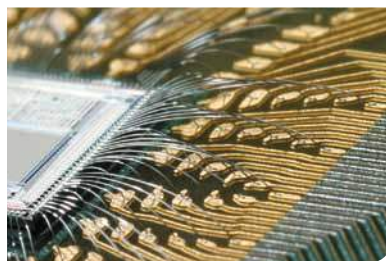
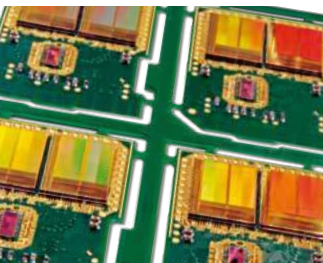
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## WHY CHOOSE SWISSBIT

Swissbit, the largest independent industrial DRAM module and FLASH storage product manufacturer in Europe, was created through a management buy-out from Siemens Memory Products in 2001. With over 20 years of experience in the memory industry Swissbit has become a world class leader in technology supplying high quality, high reliability memory storage solutions in all of the established DRAM and Flash interfaces. Swissbit's primary focus is on the demanding applications in the industrial Computer markets including Embedded Computing, Automation, Measurement, Communication, Network, Military, Aerospace, Transportation, Casino Gaming and Medical Equipment. Swissbit customers can rely on long-term availability due to a dedicated controlled Bill of Material (BOM) process that results in products with long lifecycles, reliability, endurance and longevity, even when running 24 hour / 7 day service cycles. Swissbit products feature exceptional resistance to shock and vibration and are available in commercial, extended and industrial temperature grades along with Conformal Coating if required.

High Quality products "Made in Germany" and designed with Swiss Precision result in outstanding industrial memory solutions. Swissbit develops all of its products in Switzerland with manufacturing and test facilities utilizing state-of-the-art equipment, processes and production methods which are based in Germany. Swissbit uses the latest technology and techniques in order to offer optimal products for all customer needs, such as System in Package (SiP), Flip-Chip and SMT technology. As the world's only manufacturer, Swissbit utilizes the Chip-On-Board (COB) technology to produce a line of very robust and highly integrated DRAM memory modules.

Swissbit carefully selects premium materials and subassemblies, conducts rigorous quality inspections and utilizes internal and external test laboratories and simulation systems along with extensive certified ISO 9001:2008 quality management processes to ensure innovative memory solutions that meet even the highest demands of today and into tomorrow. To guarantee competitive pricing, Swissbit focuses on lean company structures, efficient processes and long-term relationships with all major semiconductor manufacturers. Because applications differ, Swissbit also offers extensive customer service and will individually tailor memory solutions to meet specific requirements of system manufacturers and integrators regarding performance and cost.





**WIDE TEMPERATURE SUPPORT**

The storage solutions from Swissbit are designed and approved to operate reliably 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 aims to exceed these limits with their 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 selected materials guarantee an extremely solid design which has been validated by intense testing.



**LIFE TIME MONITORING (LTM)**

The Swissbit LifeTimeMonitoring (SBLTM) feature enables users to access the device's detailed life time status and allows predicting imminent failure and thus 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 configuring 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 is available, the latter allowing easy integration of the SBZoneProtection functionality into customer applications.



**FAST ERASE**

This feature uses an uninterruptable sequence of single block erase commands for fastest possible destruction of user data. Even a power-off cannot stop the process which will continue after power restoration.



**CONFORMAL COATING**

For selected products Swissbit offers a special protective coating with a thin polyurethane film against aggressive environmental conditions such as dust, moisture or corrosive gas.

S-300U	●	●	●	○	○	○	● <sup>1)</sup>
S-200U	●	●	●	●	○	○	● <sup>1)</sup>
S-200/220	●	●	●	●	○	○	○
M-100	●	●	●	●	○	○	● <sup>1)</sup>
C-300	●	●	●	●	○	○	●
C-320	●	●	●	●	●	●	●
C-400	●	●	●	●	●	●	●
P-120	●	●	●	●	●	●	●
X-200	●	●	●	●	○	○	●
X-200M	●	○	●	●	○	○	●
X-200S	●	○	●	●	○	○	●
F-100	●	●	●	●	○	○	●
F-200	●	●	●	●	●	●	●
miniTWIST II	○	●	●	●	○	○	○
unitedCONTRAST II	●	●	●	●	○	○	○
USB FLASH MODULE U-110	●	○	●	●	○	○	○

● default implemented; ●<sup>1)</sup> inherently protected by molding process; ● on request; ○ not available;



### 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 Robustness

MMC / MICROSD / SDHC

Swissbit's INDUSTRIAL product lines of SecureDigital (SD) & Multimedia cards are specifically designed, manufactured and tested to withstand extreme environmental conditions. The use of SLC (Single Level Cell) Flash combined with an optimized Flash controller provides a number of enhanced product features such as built-in error correction, bad block management, sophisticated wear leveling & bad block management algorithms, power loss protection and power saving modes. Special attention is dedicated to the mechanical stability and enhanced ESD protection. A high reliability housing with special connector support provides resistance against bending and torque. Furthermore, the gold plated SD connectors will last a minimum of 10,000 insertions.

S-300U	●	●	●	○	○	○	● <sup>1)</sup>
S-200U	●	●	●	●	○	○	● <sup>1)</sup>
S-200 / 220	●	●	●	●	○	○	○
M-100	●	●	●	●	○	○	● <sup>1)</sup>

● default implemented; ●<sup>1)</sup> inherently protected by molding process; ● on request; ○ not available;



	MICROSD (SD / SDHC)	MICROSD	SECURE DIGITAL (SD / SDHC)	MULTIMEDIA CARD
Series	S-300µ	S-200µ	S-200 / 220	M-100
Interface Compliance	SDA 2.0, SDHC class 6 / 10	SDA 2.0 class 6	SDA 2.0, SDHC class 6 (10)	MMC 3.31, 4.1 & 4.2
Connector	microSD	microSD	SD	MMC
Physical Form	15.0 x 11.0 x (0.7) 1 mm	15.0 x 11.0 x (0.7) 1 mm	32.0 x 24.0 x 2.1 mm	32.0 x 24.0 x 1.4 mm
Flash Type	SLC 2x nm	SLC 4x nm	SLC	SLC
Density	2 GB - 8 GB	512 MB - 2 GB	512 MB - 8 GB	128 MB
Operating Temperature	Extended: -25°C to +85°C	Extended: -25°C to +85°C Industrial: -40°C to +85°C	Extended: -25°C to +85°C Industrial: -40°C to +85°C	Extended: -25°C to +90°C Industrial: -40°C to +90°C
Storage Temperature	-40°C to +85°C	-40°C to +100°C	-40°C to +100°C	-40°C to +100°C
Shock	50 G	1 000 G	1 000 G	1 000 G
Vibration	2 G	15 G	15 G	15 G
Humidity	93 % RH 40°C, 500 hrs	85 % RH 85°C, 1 000 hrs	85 % RH 85°C, 1 000 hrs	85 % RH 85°C, 1 000 hrs
Data Transfer Mode	SD, SPI	SD, SPI	SD, SPI	1 bit MMC, SPI
Performance	Burst Rate up to 25 MB/s Read Seq. up to 24 MB/s Write Seq. up to 22 MB/s (2 GB - 12 MB/s)	Burst Rate up to 25 MB/s Read Seq. up to 21 MB/s Write Seq. up to 13 MB/s	Burst Rate up to 25 MB/s Read Seq. up to 21 MB/s Write Seq. up to 18 MB/s (512 MB - 13 MB/s)	Burst Rate up to 6.5 MB/s Read Seq. up to 5.7 MB/s Write Seq. up to 5.9 MB/s
Voltage	2.7 - 3.6 V Normal 2.0 - 3.6 V Basic Communication	2.7 - 3.6 V Normal 2.0 - 3.6 V Basic Communication	2.7 - 3.6 V Normal 2.0 - 3.6 V Basic Communication	2.7 - 3.6 V Normal 2.0 - 3.6 V Basic Communication
Power Consumption	Read typ 50 mA Write typ 50 mA Sleep max 0.4 mA	RW typ 30 mA Write typ 40 mA Sleep max 0.4 mA	RW typ 28 mA (max 60 mA) Write typ 55 mA (max 90 mA) Sleep max 0.3 mA	Read typ 9 mA (max 15mA) Write typ 15 mA (max 20mA) Sleep max 0.2 mA
Marking	Swissbit, Part Number, Lot Code, Mfg. Date	Swissbit, Part Number, Lot Code, Mfg. Date	Swissbit, Density, CE, Pb free, Part Number, Lot Code, Mfg. Date	Swissbit, Density, CE, Pb free, Part Number, Lot Code, Mfg. Date
Target Application	Networking, Telecommunication, Enterprise Computing, Measurement, Point-of-Sale, etc.	Industrial Embedded Systems, Medical Solutions, Point-of-Sale, Gaming Industry, Automation Solutions, etc.		
Tools	-	Life Time Monitoring with SD / SPI command set		
Part Number	SFSDxxxxNvBWxss-t-dd-1r1-STD	SFSDxxxxNxBNxss-t-dd-1r1-STD	SFSDxxxxLvBNxss-t-dd-1r1-STD	SFMMxxxxOvBNxss-t-dd-1r1-STD
	<ul style="list-style-type: none"> <li>- Compliant with SDA2.0 Specification</li> <li>- Advanced Wear Leveling &amp; Block Management</li> <li>- Power Fail Protection</li> </ul>	<ul style="list-style-type: none"> <li>- Compliant with SDA2.0 Specification</li> <li>- Sophisticated Wear Leveling &amp; Bad Block Management</li> <li>- Life Time Monitoring over extended command set</li> <li>- Intelligent Power Fail Protection &amp; Recovery</li> </ul>		<ul style="list-style-type: none"> <li>- Compliant with MMC Specification</li> <li>- Sophisticated Wear Leveling &amp; Bad Block Management</li> <li>- Life Time Monitoring with extended command set</li> <li>- Intelligent Power Fail Protection &amp; Recovery</li> </ul>

## COMPACTFLASH™ CARD



CompactFlash™ (CF) cards are still the most popular Flash-based storage solution used in the embedded and industrial markets. The form factor as well as the connector is well established. With strong focus on quality, reliability, robustness and longevity, Swissbit designs its cards with no compromise.








We only select components and apply design rules which fit the stringent requirements of our industrial customers. Our hardware and firmware has been tested and qualified by our experienced team and proved in many challenging customer applications.

Swissbit's CF Series C-3x0 and C-4x0 come in both, commercial (0°C to 70°C) and industrial temperature (-40°C to 85°C) ranges, providing rugged and reliable memory for a wide range of demanding applications. They are designed to solve a broad spectrum of concerns from compatibility, booting and power fail safety issues to long-term supply, controlled BOM and outstanding Flash protocol handling techniques to ensure industry leading data integrity. In contrast to commonly promoted sequential performance values, Swissbit is especially focusing on optimized random access values, being one of the key factors in industrial applications.

	C-300	C-320	C-400	P-120
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 Disturb Management	○	ⓘ	●	ⓘ
Trim support	○	○	●	○

### FEATURE COMPARISON

● default implemented; ⓘ on request; ○ not available;

							
C-300	●	●	●	●	○	○	ⓘ
C-320	●	●	●	●	ⓘ	ⓘ	ⓘ
C-400	●	●	●	●	ⓘ	ⓘ	ⓘ

● default implemented; ⓘ<sup>1)</sup> inherently protected by molding process; ⓘ on request; ○ not available;



UDMA6 CF



	COMPACTFLASH™ CARD	COMPACTFLASH™ CARD	COMPACTFLASH™ CARD
Series	C-300	C-320	C-400
Interface Compliance	CFA4.1 / CFA3.0 True IDE / PC card	CFA4.1 / CFA3.0 True IDE / PC card	CFA5.0 / CFA4.1 & 3.0 compliant True IDE / PC card
Connector	CFC Type I	CFC Type I	CFC Type I
Physical Form	36.4 x 42.8 x 3.3 mm	36.4 x 42.8 x 3.3 mm	36.4 x 42.8 x 3.3 mm
Flash Type	SLC	SLC	SLC
Density	128 MB to 8 GB	2 GB to 32 GB	2 GB to 64 GB
Operating Temperature	Commercial: 0°C to +70°C Industrial: -40°C to +85°C	Commercial: 0°C to +70°C Industrial: -40°C to +85°C	Commercial: 0°C to +70°C Industrial: -40°C to +85°C
Storage Temperature	-50°C to +100°C	-50°C to +100°C	-50°C to +100°C
Shock	1500 G	1500 G	1500 G
Vibration	20 G	20 G	20 G
Humidity	85 % RH 85°C, 1 000 hrs	85 % RH 85°C, 1 000 hrs	85 % RH 85°C, 1 000 hrs
Data Transfer Mode	Up to UDMA4, MDMA4 & PIO6	Up to UDMA4, MDMA4 & PIO6	Up to UDMA6, MDMA4 & PIO6
Performance	Burst Rate up to 66 MB/s Read Seq. 1ch up to 24 MB/s 2ch up to 37 MB/s Write Seq. 1ch up to 10 MB/s 2ch up to 20 MB/s	Burst Rate up to 66 MB/s Read Seq. up to 45 MB/s Write Seq. up to 35 MB/s (512 MB-13 MB/s)	Burst Rate up to 133 MB/s Read Seq. up to 65 MB/s Write Seq. up to 40 MB/s Write Rand. 4k up to 300 IOPS
Voltage	3.3 V +/- 5 %, 5 V +/- 10 %	3.3 V +/- 5 %, 5 V +/- 10 %	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
Marking	WEEE, Swissbit, Density, CE, Part Number, Lot Code, RoHS		
Target Application	Industrial Embedded Systems, Medical Solutions, Point-of-Sale, Gaming Industry, Automation Solutions, etc.		
Tools	Windows / Linux Application, API/DLL for extended S.M.A.R.T. option Security & SBZoneProtection option		
Part Number	SFCFxxxxHxBKISS-t-xx-5r3-SMA 1ch SFCFxxxxHxBKXSS-t-xx-5r3-SMA 2ch	SFCFxxxxHxB0XSS-t-dd-5r3-SMA	SFCFxxxxHvBUXSS-t-dd-5r7-SMA
	<ul style="list-style-type: none"> <li>- Sophisticated Wear Leveling &amp; Bad Block Management</li> <li>- S.M.A.R.T. support with extended command set</li> <li>- Intelligent Power Fail Protection &amp; Recovery</li> <li>- Security Features available C-320 2 - 16GB: ZoneProtection option, Fast Erase option</li> </ul>		<ul style="list-style-type: none"> <li>- Low power consumption</li> <li>- High IOPS performance for 4k write (no DRAM)</li> <li>- Sophisticated Wear Leveling &amp; Bad Block Management</li> <li>- Read Disturb Management</li> <li>- Intelligent Power Fail Protection &amp; Recovery</li> <li>- S.M.A.R.T. support with extended command set</li> <li>- Trim support</li> <li>- SBZoneProtection option</li> <li>- Fast Erase option</li> </ul>

2.5" SSD SATA & PATA / IDE



Swissbit's Solid-State Drive (SSD) line are drop-in replacements for traditional 2.5" hard disk drives (HDD). These SSDs are offered in both, Parallel ATA (PATA) and Serial ATA (SATA) interfaces. This line is designed for industrial usage and does not support dedicated optimization techniques commonly used in „Enterprise SSDs“.

Critical factors like long data retention, no compromise power fail safety and long product lifecycles are key for our industrial customers. For that reason our SSD line uses the most reliable SLC Flash combined with rugged hardware design and state-of-the-art firmware technologies to provide the best performance in quality, reliability and data integrity. For many applications, especially in the lower and middle densities Swissbit's SSDs are the HDD replacement of choice.

	SLC	MLC	TLC
High Density	⦿	●	●
Total Cost Per Bit	⦿	●	●
Reliability & Durability	●	⦿	○
Industrial Temperature	●	⦿	⦿
Low Power Consumption	●	⦿	⦿
Write Performance	●	⦿	⦿
Partial Programming	●	○	○
ECC Requirement	●	⦿	○
Data Retention	●	○	○
Longevity	●	○	○

**NAND FLASH TECHNOLOGY COMPARISON**

● best; ⦿ average; ○ worst

P-120  
X-200

P-120	●	●	●	●	⦿	⦿	⦿
X-200	●	●	●	●	○	○	⦿

● default implemented; ●<sup>1)</sup> inherently protected by molding process; ⦿ on request; ○ not available;



**PATA SSD 2.5"  
SOLID STATE DRIVE**

**SATA SSD 2.5"  
SOLID STATE DRIVE**

Series	P-120	X-200
Interface Compliance	IDE / ATA 133	SATA II – 3 GBit/s
Connector	ATA 44 pin, 2 mm pitch	15 + 7 pin serial ATA
Physical Form	100.2 x 69.85 x 9.0 mm	100.2 x 69.85 x 9.0 mm
Flash Type	SLC	SLC
Density	4 GB – 32 GB	4 GB – 128 GB
Operating Temperature	Commercial: 0°C to +70°C Industrial: -40°C to +85°C	Commercial: 0°C to +70°C Industrial: -40°C to +85°C
Storage Temperature	-50°C to +100°C	-50°C to +100°C
Shock	1 500 G	1 500 G
Vibration	20 G	20 G
Humidity	85 % RH 85°C, 1 000 hrs	85 % RH 85°C, 1 000 hrs
Data Transfer Mode	up to PIO4, MDMA4, UDMA4	PIO, MDMA, up to UDMA6
Performance	Burst Rate up to 66 MB/s Read Seq. up to 45 MB/s Write Seq. up to 35 MB/s	Burst Rate up to 300 MB/s Read Seq. up to 120 MB/s Write Seq. up to 95 MB/s
Voltage	5 V +/- 10 %	5 V +/- 10 %
Power Consumption	PIO typ 55 mA UDMA typ 135 mA Idle 5 mA	UDMA6 typ 260mA, max 320mA Idle 140mA
Marking	Swissbit, Density, CE, Pb free, Part Number, Lot Code, Mfg. Date, Pin Mode	Swissbit, Density, CE, Pb free, Part Number, Lot Code, Mfg. Date
Target Application	Industrial Embedded Systems, Medical Solutions, Point-of-Sale, Gaming Industry, Automation Solutions, etc.	
Tools	Windows / Linux Application, API/DLL for extended S.M.A.R.T. option	
Part Number	SFPAxxxxQvBOxss-t-dd-2r3-STD	SFSAxxxxQvBRxss-t-dd-2r6-STD

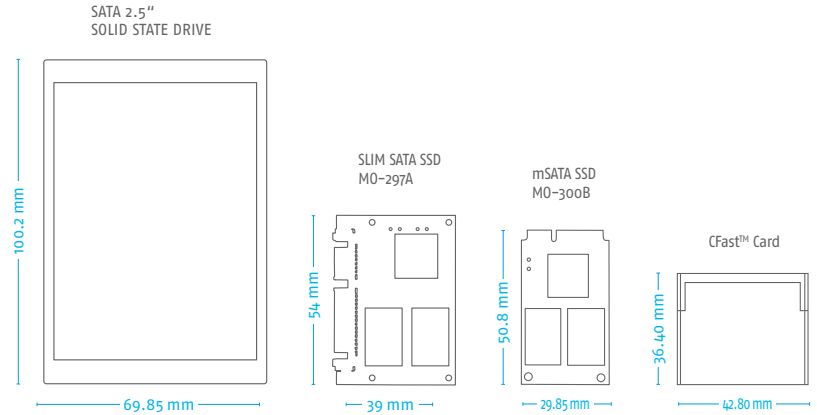
- ATA 133 compliant
- Sophisticated Wear Leveling & Bad Block Management
- S.M.A.R.T. support with extended command set
- Intelligent Power Fail Protection & Recovery
- Security Features available

- Ideal Replacement for 2.5" SATA HDDs
- Low Power Consumption
- No Noise or Temperature Issues
- Long Useful Life
- S.M.A.R.T. support
- Advanced Wear Leveling & Block Management
- Power Fail Protection
- Security Features available

## MSATA SSD, SLIM SATA & CFAST™

### SLIM SATA SSD (MO-297A) MSATA SSD (MO-300B)

The X-200 Series Slim SATA & mSATA embedded SSDs standard is ratified by JEDEC under specification number MO-297A & MO-300B. These products are designed as a cost efficient Solid State Drive alternative to larger size SSDs in embedded applications. The Slim SATA X-200s includes the same standard 22-pin SATA connector as the 2.5" drives. This allows system designers to leverage standard SATA cabling or host connections for their application.



PRODUCT SIZE COMPARISON

## CFAST™ CARD - THE NEXT COMPACTFLASH™ GENERATION



The CFast™ card combines the CompactFlash™ (CF) card form factor with a Serial ATA (SATA) interface. With this merging of two industry standards, the CFast™ card specification was created to replace existing hard drives and CompactFlash™ in applications requiring small form factors, long life endurance and the ability to withstand shock, vibration, extreme temperatures (-40°C to +85°C), high altitude and other aggressive environments. Swissbit's CFast™ is designed to provide rugged storage for embedded and industrial systems. In these markets, performance, data and system reliability, system downtime, power fail robustness and flexibility are important design considerations.

The CFast™ card operates with 3.3 Volt low power source and supports three SATA power management states: Active, Partial and Slumber. This standard is a perfect choice for both, boot devices and removable applications, where low to medium storage densities (up to 64GB) are required and the physical size of conventional mechanical or solid state hard drives are impractical. Certainly, the Swissbit CFast™ card comes with full engineering and customizing support and life time monitoring features, like S.M.A.R.T. with our intelligent flash managing algorithms and error correction, the latest F-200 Series will continue to provide the same reliability parameters using 32nm Flash instead of 4xnm technology while offering competitive pricing and SLC memory densities.

<b>X-200M</b>	●	○	●	●	○	○	ⓘ
<b>X-200S</b>	●	○	●	●	○	○	ⓘ
<b>F-100</b>	●	●	●	●	○	○	ⓘ
<b>F-200</b>	●	●	●	●	ⓘ	ⓘ	ⓘ

● default implemented; ● ⓘ inherently protected by molding process; ⓘ on request; ○ not available;



	mSATA SSD MO-300B		SLIM SATA SSD MO-297A		CFAST™ CARD		CFAST™ CARD	
Series	X-200m		X-200s		F-100		F-200	
Interface Compliance	sATA II – 3 Gbit/s ATA7		sATA II – 3 Gbit/s ATA7		CFast™ – sATA II – 3 Gbit/s ATA7		CFast™ – sATA II – 3 Gbit/s ATA8/ATA7 compliant	
Connector	52 pin PCI Express (PCIe) mini		15 + 7pin Serial ATA		CFast™ Type I		CFast™ Type I	
Physical Form	50.8 x 29.85 x 3.3 mm (MO-300B)		54 x 39 x 4.00 mm (MO-297A)		36.4 X 42.8 X 3.6 mm		36.4 X 42.8 X 3.6 mm	
Flash Type	SLC		SLC		SLC		SLC	
Density	2 GB – 32 GB		2 GB – 32 GB		2 GB – 32 GB		2 GB – 64 GB	
Operating Temperature	Commercial: 0°C to +70°C Industrial: -40°C to +85°C		Commercial: 0°C to +70°C Industrial: -40°C to +85°C		Commercial: 0°C to +70°C Industrial: -40°C to +85°C		Commercial: 0°C to +70°C Industrial: -40°C to +85°C	
Storage Temperature	-50°C to +100°C		-50°C to +100°C		-50°C to +100°C		-50°C to +100°C	
Shock	1 500 G		1 500 G		1 500 G		1 500 G	
Vibration	20 G		20 G		20 G		20 G	
Humidity	85 % RH 85°C, 1 000 hrs		85 % RH 85°C, 1 000 hrs		85% RH 85°C, 1 000 hrs		85 % RH 85°C, 1 000 hrs	
Data Transfer Mode	up to PIO4, MDMA2, UDMA6		up to PIO4, MDMA2, UDMA6		up to PIO4, MDMA2, UDMA6		up to PIO4, MDMA2, UDMA6	
Performance	Burst Rate up to 300 MB/s Read Seq. up to 120 MB/s Write Seq. up to 95 MB/s		Burst Rate up to 300 MB/s Read Seq. up to 120 MB/s Write Seq. up to 95 MB/s		Burst Rate up to 300 MB/s Read Seq. up to 120 MB/s Write Seq. up to 95 MB/s		Burst Rate up to 300 MB/s Read Seq. up to 130 MB/s Write Seq. up to 100 MB/s Write Rand. 4k up to 600 IOPS	
Voltage	3.3 V +/- 5 %		5 V +/- 10 %		3.3 V +/- 5 %		3.3 V +/- 5 %	
Power Consumption	typ 300 mA, max 490 mA Idle 180 mA		typ 260 mA, max 320 mA Idle 140 mA		typ 300 mA, max 420 mA Idle 180 mA		typ 140 mA, max 250 mA Idle 80 mA, Sleep 8 mA	
Marking	Swissbit, Density, Part Number, Lot Code, Mfg. Date				WEEE, Swissbit, Density, CE, Part Number, Lot Code, Mfg. Date, RoHS			
Target Application	Industrial Embedded Systems, Medical Solutions, Point-of-Sale, Gaming Industry, Automation Solutions, etc.							
Tools	Windows / Linux Application, API/DLL for extended S.M.A.R.T. optional				Windows / Linux Application, API/DLL for extended S.M.A.R.T. optional Evaluation kit with 2.5" sATA adapter board available		Windows / Linux Application, API/DLL for extended S.M.A.R.T. optional Evaluation kit with 2.5" sATA adapter board available Security & SBZoneProtection option	
Part Number	SFSAXxxxUvBRxss-t-dd-2r6-STD		SFSAXxxxVvBRxss-t-dd-2r6-STD		SFCAXxxxHvBRxss-t-dd-2r6-STD		SFCAXxxxHvBVxss-t-dd-2r6-STD	
	<ul style="list-style-type: none"> <li>- Ideal Replacement for 2.5" SATA HDDs</li> <li>- Cost efficient SATA SSD module</li> <li>- sATA II Interface compliant</li> <li>- Advanced Wear Leveling &amp; Block Management</li> <li>- S.M.A.R.T. support</li> <li>- Power Fail Protection</li> </ul>				<ul style="list-style-type: none"> <li>- Alternative for expensive sATA SSD</li> <li>- Replacement for CFC by sATA Chipset</li> <li>- sATA II Interface compliant</li> <li>- Advanced Wear Leveling &amp; Block Management</li> <li>- S.M.A.R.T. support</li> <li>- Power Fail Protection</li> </ul>		<ul style="list-style-type: none"> <li>- Power modes (slumber, sleep)</li> <li>- Low Power removable or fix SATA SSD</li> <li>- High IOPS performance for 4k write (no DRAM)</li> <li>- Sophisticated Wear Leveling &amp; Bad Block Management</li> <li>- Read Disturb Management</li> <li>- Intelligent Power Fail Protection &amp; Recovery</li> <li>- S.M.A.R.T. support with extended command set</li> <li>- Trim support</li> <li>- SBZoneProtection option</li> <li>- Fast Erase option</li> </ul>	










**UNIVERSAL SERIAL BUS - USB FLASH DRIVE / MODULE**

The Universal Serial Bus (USB) interface is very well established and has completely overtaken other forms of serial or parallel interfaces for computer peripherals and memory storage devices. Advantages of USB are its flexibility, reasonably fast sequential data transfer rate and its ability to obtain power through the connector. Almost every computer or embedded system supports devices with the standard USB socket and several internal on-board terminal headers. Swissbit is offering both 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% implemented final system test at full temperature range (-40° to +85°C) qualify Swissbit's USB Flash Drive (UFDs) not only for commercial but also and especially 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.

							
<b>miniTWIST II</b>	○	●	●	●	○	○	○
<b>unitedCONTRAST II</b>	●	●	●	●	○	○	○
<b>USB FLASH MODULE U-110</b>	●	○	●	●	○	○	○

● default implemented; ●<sup>1)</sup> inherently protected by molding process; ● on request; ○ not available;



	USB FLASH MODULE	USB FLASH DRIVE	USB FLASH DRIVE
Series	U-110	unitedCONTRAST II	miniTWIST/CAP II
Interface Compliance	USB 2.0 high speed, USB 1.1 compliant		
Connector	Standard: 2.54 mm – 10 Pin Low Profile: 2.00 mm – 10 Pin	USB 2.0 A-Plug	USB 2.0 A-Plug
Physical Form	36.8mm x 26.65 mm x 2.4 mm	68.0 mm x 18.0 mm x 8.0 mm	55.0 mm x 16.0 mm x 7.0-8.0 mm
Flash Type	SLC	SLC	SLC
Density	1 GB to 8 GB	512 MB to 8 GB	128 MB to 4 GB
Operating Temperature	Commercial: 0°C to +70°C Industrial: -40 to +85°C	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	-50°C to +100°C	-50°C to +100°C
Shock	50 G	50 G	50 G
Vibration	15 G	15 G	15 G
Humidity	85 % RH 85°C, 500 hrs	85 % RH 85°C, 500 hrs	85 % RH 85°C, 500 hrs
Data Transfer Mode	full / high speed	full / high speed	full / high speed
Performance	480 Mbit/s USB 2.0 high speed Read Seq. up to 32 MB/s Write Seq. up to 23 MB/s	480 Mbit/s USB 2.0 high speed Read Seq. up to 32 MB/s Write Seq. up to 23 MB/s	480 Mbit/s USB 2.0 high speed Read Seq. up to 18 MB/s Write Seq. up to 12 MB/s
Voltage	5 V +/- 10 %	5 V +/- 10 %	5 V +/- 10 %
Power Consumption	Full Speed typ 90 mA High Speed typ 100 mA	Full Speed typ 90 mA High Speed typ 100 mA	Full Speed typ 80 mA High Speed typ 100 mA
Marking	WEEE, Swissbit, Density, CE, FCC, Part Number, Lot Code	WEEE, Swissbit, Density	WEEE, Swissbit
Target Application	Industrial Embedded Systems, Medical Solutions, Point-of-Sale, Gaming Industry, Automation Solutions, etc.		
Tools	Windows / Linux Application		
Part Number	SFUxxxxlvBPxss-t-dd-2n-STD – 2.54 mm SFUxxxxkvBPxss-t-dd-2n-STD – 2.00mm	SFU2xxxxEvBPxss-t-dd-1n-STD	SFU2xxxxDvBP1ss-t-dd-1n-STD
	<ul style="list-style-type: none"> <li>- Bootable USB Drive</li> <li>- Compliant with USB Specification 2.0 high speed</li> <li>- Support latest OS as Fixed Drive</li> <li>- Connector Pitch Variations</li> <li>- Robust Design and Shock Vibration Resistant</li> </ul>	<ul style="list-style-type: none"> <li>- Approved USB Host Solution</li> <li>- Hot Pluggable / Plug &amp; Play</li> <li>- Optimized Wear Leveling</li> <li>- Custom Marking Option</li> <li>- Security Features</li> <li>- Password Manager available</li> </ul>	<ul style="list-style-type: none"> <li>- Low Power Consumption</li> <li>- Small Form Factor</li> <li>- Optimized Wear Leveling</li> <li>- Rotating Clip or Cap Option</li> <li>- Password Manager available</li> </ul>

## DRAM MODULES

Swissbit commits to offering the highest quality, JEDEC standard and customized DRAM modules for industrial applications. As a DRAM module manufacturer, we use strategic dual 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, where defined, with 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) and Chip-On-Board (COB) 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  $-40^{\circ}\text{C}$  and  $85^{\circ}\text{C T}_{\text{AMBIENT}}$ .

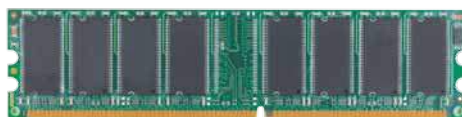
With a stringent internal product qualification, fast customer return processing and the dedication to be an always improving company, Swissbit constantly works on providing its customers the best DRAM modules available in the market at a competitive price. Swissbit is committed and able to design, manufacture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

With our Swissbit DRAM modules you can keep the total system cost at a minimum.





UNBUFFERED DIMM PRODUCTS



LONG UDIMM / WITH AND WITHOUT ECC

	Data Rate / CL	Density	Org	Height	Voltage	Pins	Partnumber	Package
<b>DDR3-UDIMM</b>	1333 / CL9	1 GB - 8 GB	x64	1.18" (29.97 mm)	1.50 V	240	SGUxxx64xxxxxxx-ssR	BGA
<b>DDR3-UDIMM ECC</b>	1333 / CL9	1 GB - 8 GB	x72	1.18" (29.97 mm)	1.50 V	240	SGUxxx72xxxxxxx-ssR	BGA
<b>DDR2-UDIMM</b>	800 / CL6	512 MB - 2 GB	x64	1.18" (29.97 mm)	1.80 V	240	SEUxxx64xxxxxxx-ssR	BGA
<b>DDR2-UDIMM ECC</b>	800 / CL6	1 GB - 2 GB	x72	1.18" (29.97 mm)	1.80 V	240	SEUxxx72xxxxxxx-ssR	BGA
<b>DDR1-UDIMM</b>	400 / CL3	512 MB - 1 GB	x64	1.25" (31.75 mm)	2.50 V	184	SDUxxx64xxxxxxx-ssR	TSOP
<b>DDR1-UDIMM LP</b>	400 / CL3	512 MB - 1 GB	x64	1.00" (25.40 mm)	2.50 V	184	SDUxxx64xxxxxxx-ssR	COB
<b>DDR1-UDIMM ECC</b>	400 / CL3	512 MB - 1 GB	x72	1.25" (31.75 mm)	2.50 V	184	SDUxxx72xxxxxxx-ssR	TSOP
<b>DDR1-UDIMM ECC LP</b>	400 / CL3	512 MB - 1 GB	x72	1.00" (25.40 mm)	2.50 V	184	SDUxxx72xxxxxxx-ssR	COB



SO-DIMM / WITH AND WITHOUT ECC / RUGGED XR-DIMM

	Data Rate / CL	Density	Org	Height	Voltage	Pins	Partnumber	Package
<b>DDR3-SODIMM</b>	1333 / CL9 *)	1 GB - 8 GB	x64	1.18" (29.97 mm)	1.50 V *)	204	SGNxxx64xxxxxxx-ssRT	BGA
<b>DDR3-SO-UDIMM</b>	1333 / CL9 *)	1 GB - 8 GB	x72	1.18" (29.97 mm)	1.50 V *)	204	SGNxxx72xxxxxxx-ssRT	BGA
<b>DDR3-XR-DIMM™</b>	1333 / CL9	1 GB - 4 GB	x72	38 mm x 67.5 mm	1.50 V *)	240	SGVxxx72xxxxxxx-ssRT	BGA
<b>DDR2-SODIMM</b>	800 / CL6	512 MB - 4 GB	x64	1.18" (29.97 mm)	1.80 V	200	SENxxx64xxxxxxx-ssR	BGA
<b>DDR2-SODIMM LP</b>	800 / CL6	512 MB - 2 GB	x64	0.94" / 1.18"	1.80 V	200	SENxxx64xxxxxxx-ssR	COB
<b>DDR1-SODIMM</b>	400 / CL3	256 MB - 1 GB	x64	1.25" (31.75 mm)	2.50 V	200	SDNxxx64xxxxxxx-ssR	BGA
<b>DDR1-SODIMM LP</b>	400 / CL3	256 MB - 2 GB	x64	1.00" (25.40 mm)	2.50 V	200	SDNxxx64xxxxxxx-ssR	COB
<b>DDR1-SODIMM ECC</b>	400 / CL3	256 MB - 1 GB	x72	1.00" (25.40 mm)	2.50 V	200	SDNxxx72xxxxxxx-ssR	COB
<b>SDR-SODIMM</b>	133 / CL3	128 MB - 1 GB	x64	1.00" (25.40 mm)	3.30 V	144	SSNxxx64xxxxxxx-ssR	COB
<b>SDR-SODIMM ECC</b>	133 / CL3	128 MB - 1 GB	x72	1.00" (25.40 mm)	3.30 V	144	SSNxxx72xxxxxxx-ssR	COB

\*) DDR3-1600 CL11 and / or DDR3L (1.35V) on request



MINI-UDIMM / MICRODIMM / 100PIN-DIMM

	Data Rate / CL	Density	Org	Height	Voltage	Pins	Partnumber	Package
<b>DDR3-MiniUDIMM</b>	1333 / CL9	1 GB - 4 GB	x72	1.18" / 0.74"	1.50 V	244	SGLxxx72xxxxxxx-ssRT	BGA
<b>DDR2-MicroDIMM</b>	667 / CL5	1 GB	x64	1.18" (29.97 mm)	1.80 V	214	SEMxxx64xxxxxxx-ssR	BGA
<b>DDR1-100PIN_DIMM</b>	333 / CL2.5	128 MB - 512 MB	x72	1.00" (25.40mm)	2.50 V	100	SDUxxx32xxxxxxx-ssR	TSOP

## RUGGEDIZED DIMMS



Designers of rugged platforms face a difficult decision when planning their memory layout. Either they use memory components directly soldered to the system board, the most rugged but also expensive and inflexible solution, or they take standard SO-DIMMs and try to ruggedize them by using straps or glue in order to hold 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 implementations with DRAMs soldered to the board. The XR-DIMM closely follows the DDR3 72bit 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.



### DESIGN IN / LAYOUT

### FLEXIBILITY OF MEMORY POPULATION

### TESTABILITY AFTER SOLDERING

### UPGRADE / REPAIR

### REQUIRED BOARD SPACE

### STACKABLE SOLUTION

### PROTECTION AGAINST SHOCK

### PROTECTION AGAINST VIBRATION

### PRIZE

	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
PRIZE	Low to Medium	Low	Medium

REGISTERED DIMM PRODUCTS



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

	Data Rate / CL	Density	Org	Height	Voltage	Pins	Partnumber	Package
<b>DDR3-RDIMM ECC+PARITY</b>	1333 / CL9	1 GB - 8 GB	x72	1.18" (29.97 mm)	1.50 V	240	SGPxxx72xxxxxx-ssR	BGA
<b>DDR2-RDIMM ECC+PARITY</b>	800 / CL6	1 GB - 4 GB	x72	1.18" (29.97 mm)	1.80 V	240	SEPxxx72xxxxxx-ssR	BGA
<b>DDR1-RDIMM ECC</b>	400 / CL3	512 MB - 2 GB	x72	1.20" (30.48 mm)	2.50 V	184	SDRxxx72xxxxxx-ssR	TSOP / BGA
<b>SDR-RDIMM ECC</b>	133 / CL3	256 MB - 512 MB	x72	1.20" (30.48 mm)	3.30 V	168	SSRxxx72xxxxxx-ssR	TSOP



LOW PROFILE LONG RDIMM, UDIMM / WITH ECC

	Data Rate / CL	Density	Org	Height	Voltage	Pins	Partnumber	Package
<b>DDR3-RDIMM ECC+PARITY</b>	1333 / CL9	2 GB - 8 GB	x72	0.70" (17.78 mm)	1.50 V	240	SGPxxx72xxxxxx-ssR	BGA
<b>DDR3-UDIMM ECC</b>	1333 / CL9	2 GB - 4 GB	x72	0.70" (17.78 mm)	1.50 V	240	SGUxxx72xxxxxx-ssR	BGA
<b>DDR2-RDIMM ECC+PARITY</b>	800 / CL6	1 GB - 2 GB	x72	0.72" (18.29 mm)	1.80 V	240	SEPxxx72xxxxxx-ssR	BGA



VLP MINIRDIMM WITH ECC, REGISTERED SO-RDIMM WITH ECC

	Data Rate / CL	Density	Org	Height	Voltage	Pins	Partnumber	Package
<b>DDR2-MiniRDIMM</b>	667 / CL5	1 GB	x72	0.72" (18.29 mm)	1.80 V	244	SEHxxx72xxxxxx-ssR	BGA
<b>DDR2-SO-RDIMM</b>	667 / CL5	1 GB - 2 GB	x72	1.18" (29.97 mm)	1.80 V	200	SEGxxx72xxxxxx-ssR	BGA

## CHIP ON BOARD (COB)



Chip-On-board (COB) technology involves mounting DRAM or Flash semiconductor dies directly on a substrate and connect them by bond wires to the PCB without the need of packaged component. A coating of an Epoxy encapsulant (or Glob Top) is then applied that hermetically seals and protects the die and the wire bonded interconnections. The Glob Top also acts like a heat spreader between the dies and improves the heat emission together with the low thermal resistance between the die and the PCB.

A COB memory module as offered by Swissbit provides customers with the following advantages:

- The COB process allows DRAM modules with only 1.00" (25.4 mm) height and 3.0 mm thickness
- The thermal properties of Swissbit modules are superior to standard SMT modules. COB modules dissipate heat more efficiently and will run lower die junction temperatures in demanding convective cooling conditions.
- Swissbit COB modules and Flash products like the SD card are inherently ruggedized for shock and vibration due to the COB technology and the Glob Top encapsulation process.

## 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 in order to achieve smallest form factors and to build Multi-Chip-Packages. With this microelectronic 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, glob top dispensing, precise separation with laser technology, 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 requirement. 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, 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.

## INDUSTRIAL TEMPERATURE RANGE



In addition to 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<sub>AMBIENT</sub> as well as full industrial temperature range -40°C to 85°C T<sub>AMBIENT</sub>. With intensive application testing of each individual module at low and high temperature, Swissbit ensures the highest quality and reliability of their products.

## CONFORMAL COATING



Industrial DRAM modules are often not operated in a clean air environment as compared to standard office or home conditions. A heavy industry environment with hot or humid air, aggressive chloride or 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 greatly 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.

## 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.

## MINIATURIZATION

One of Swissbit's main capabilities is miniaturization. This is not just limited to the design and production of small form factors but also provides e.g. DRAM test or flash handling algorithms which achieve highest reliability and life times by dealing with the power, temperature and space restrictions of small and smallest devices. Our portfolio reaches from ultra low profile DIMMs or highest integration wire-bonded modules to highly integrated uSD-Cards, Chip Card Inlays or custom Multi-Chip-Packages.

# FLASH PART NUMBER DECODER



**Swissbit  
Memory (1)**

**Memory Type (2)**

F: Flash Products

**Product Type (3)**

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

**Density (4)**

0016: 16 MByte	4096: 4 GByte
0032: 32 MByte	8192: 8 GByte
0064: 64 MByte	016G: 16 GByte
0128: 128 MByte	032G: 32 GByte
0256: 256 MByte	064G: 64 GByte
0512: 512 MByte	128G: 128 GByte
1024: 1 GByte	256G: 256 GByte
2048: 2 GByte	512G: 512 GByte

**Product Dimension (5)**

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

**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
- S: TSOP 1 nCE & R/nB
- T: TSOP 2 nCE & R/nB
- U: TSOP 4 nCE & R/nB
- E: COB 1 nCE
- F: COB 2 nCE

**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: Hynix
- TO: Toshiba

**Chips / Channels (9)**

DRAM PART NUMBER DECODER



Swissbit  
Memory (1)

Product Group (2)

- S: SDRAM SDR
- D: SDRAM DDR
- E: SDRAM DDR2
- G: SDRAM DDR3
- L: SDRAM DDR3L

Module Type (3)

- SDR U: 168 Pin UDIMM 3.3V  
R: 168 Pin RDIMM 3.3V  
N: 144 Pin SODIMM 3.3V
- DDR U: 184 Pin UDIMM 2.5V  
R: 184 Pin RDIMM 2.5V  
N: 200 Pin SODIMM 2.5V  
M: 172 Pin Micro-DIMM 2.5V
- DDR2 U: 240 Pin UDIMM 1.8V  
R: 240 Pin RDIMM 1.8V, w/o Parity  
P: 240 Pin RDIMM 1.8V, w/ Parity  
F: 240 Pin FBDIMM  
N: 200 Pin SODIMM 1.8V  
G: 200 Pin SO-RDIMM 1.8V  
H: 244 Pin Mini RDIMM 1.8V, w/ Parity  
M: 214 Pin MicroDIMM 1.8V
- DDR3 U: 240 Pin UDIMM 1.5V  
P: 240 Pin RDIMM 1.5V  
N: 204 Pin SODIMM/SODIMM 1.5V  
G: 204 Pin SO-RDIMM  
M: 214 Pin MicroDIMM 1.5V  
L: 244 Pin MiniUDIMM  
V: 240 Pin XR-DIMM

Data Depth (4)

- 008: 64 MB    256: 2 GB    08G: 8 GB
- 016: 128 MB    512: 4 GB
- 032: 256 MB    01G: 8 GB
- 064: 512 MB    02G: 16 GB
- 128: 1 GB    04G: 32 GB

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 /  
Heat Spreader (14)

RoHs/ Lead Free (13)

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)

- DDR3 AA: DDR3-800 CL5    AB: DDR3-800 CL6
- BA: DDR3-1066 CL6    BB: DDR3-1066 CL7
- CA: DDR3-1333 CL7    CB: DDR3-1333 CL8
- CC: DDR3-1333 CL9
- DA: DDR3-1600 CL9    DB: DDR3-1600 CL10
- 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)

- MT: Micron Technology
- EP: Elpida
- QI: Qimonda
- SA: Samsung
- HY: Hynix
- WI: Winbond

Module Ranks (9)

- 1: 1 Rank Module
- 2: 2 Rank Module

DRAM Revision (8)

DRAM Organization (7)

- A: x4    E: x8 TSOP Stack
- D: x4 TSOP Stack    C: x16
- B: x8    G: x4 BGA Stack

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