


# swissbit®

## INDUSTRIAL MEMORY SOLUTIONS

NAND FLASH PRODUCTS & DRAM MODULES



 made in germany

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

#### **PRODUCT DEPTH**

- Complete line of DRAM modules and NAND Flash Solid State Drives offering numerous interface and form factor options
- Both leading edge technology and legacy product offerings
- Extended and industrial temperature grade product lines
- 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 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
- Worlds only COB DRAM memory module manufacturer

#### **CUSTOMIZATION**

- Custom DRAM module and FLASH designs
- Security features
- Customer specific 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 Implementer Forum
- Member of SecureDigital Association (SDA)
- Member of Memory Implementers Forum
- Member of JEDEC
- Member of Small Form Factor Special Interest Group SFF-SIG



NEW



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## WHY CHOOSE SWISSBIT

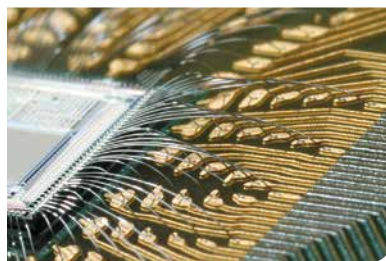
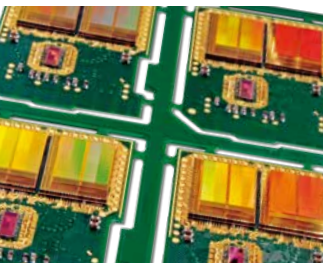
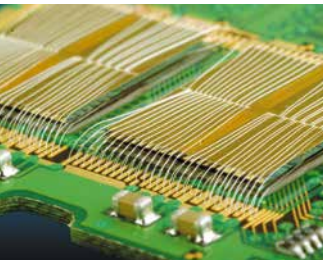
Swissbit, the largest independent industrial DRAM module and Flash storage product manufacturer in Europe, was created through a management buy-out from Siemens Memory Products in 2001. With over 20 years of experience in the memory industry Swissbit has become a world class leader in technology, supplying high quality, high reliability memory storage solutions with all established DRAM and Flash interfaces. Swissbit's primary focus is on the demanding applications in the industrial computer markets. These industrial applications have extended requirements. Therefore all Swissbit products include a broad set of additional industry specific features. Swissbit customers can rely on:

- 100% Test During Burn In (TDBI)
- Controlled Bill of Material (BOM)
- SLC technology
- Shock and vibration resistance
- Long-term availability
- High reliability and endurance
- Industrial temperature support

In addition Swissbit is the benchmark for low Total Cost of Ownership (TCO). Over 500 industrial customers all over the world, including 25 Fortune 500 companies rely on Swissbit products and services which cover all industrial applications. Swissbit products are sold in more than 30 countries through a global network including 20 distributors.

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. The latest technology and techniques are applied to offer optimal products for all customers requirements, such as System in Package (SiP), Flip-Chip and SMT technology.

Swissbit carefully selects premium materials and subassemblies, conducts rigorous quality inspections, and utilizes internal and external test laboratories and simulation systems. In addition Swissbit employs an extensive certified ISO-9001:2008 quality management process 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.



SWISSBIT'S UNIQUE 360° CUSTOMER SERVICE



Swissbit's focus is on industrial computer applications. Our designs and support are specialized for industrial customers and their demanding end applications. Swissbit provides the highest level of support with its unique 360° customer service. This customer centric approach enables Swissbit to develop solution-driven products for the most demanding applications. Customers will be supported through a pre-sales, sales and after-sales process. This means that support is an ongoing process. When a customer partners with Swissbit, they are supported by an expert sales staff that will recommend the best solution for their requirements, or even tailor products for specialized needs. After the sales dedicated FAE, in-house product development, and manufacturing teams will ensure long-term product availability and support. Swissbit is committed to providing the customer with the best product solutions and support for both current and future requirements.





#### 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 inline with the latest regulations for electrostatic discharge and electromagnetic interference. Swissbit strives 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 Life Time Monitoring feature enables users to access the memory 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.



#### 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 Spreader for DRAM modules allows temperature hot spots to be dissipated over a larger surface area and improving 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 ensures that Flash cells will be sparingly and equally used in order to prolong life time of the device.



#### READ-ONLY OPTIMIZED

Many times industrial application data will be written once to the NAND Flash and then become read-only afterwards. For these read heavy cases the firmware will be optimized in order to guarantee higher data retention and less Read Disturb.



#### TRIM SUPPORT

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. As a result a future write operation will be faster because cells are pre-erased. 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 creates an immediate increased value of the product. There are several benefits to reduced power consumption. There is an immediate cost savings in power consumption, battery life of the device is prolonged and you have less heat generated which means less cooling is required.

PRODUCT FEATURES OF FLASH & DRAM

S-300u MICRO SD MEMORY CARD	●	●	●	○	○	○	● <sup>1)</sup>	○	●	●	●	○	○
S-200u MICRO SD MEMORY CARD	●	●	●	●	○	○	● <sup>1)</sup>	○	●	●	○	○	●
S-200/220 SD MEMORY CARD	●	●	●	●	○	○	●	○	●	●	○	○	●
M-100 MULTIMEDIA CARD	●	●	●	●	○	○	● <sup>1)</sup>	○	●	●	○	○	●
C-300 COMPACTFLASH™	●	●	●	●	○	○	●	○	●	●	○	○	○
C-320 COMPACTFLASH™	●	●	●	●	●	●	●	○	●	●	●	○	○
C-440 COMPACTFLASH™	●	●	●	●	●	●	●	○	●	●	●	●	●
P-120 PATA SSD 2.5"	●	●	●	●	●	●	●	○	●	●	●	○	○
X-200m MSATA MO-300	●	○	●	●	○	○	●	○	●	●	●	○	○
X-200s SLIM SSD MO-297	●	○	●	●	○	○	●	○	●	●	●	○	○
X-200 SATA SSD 2.5"	●	●	●	●	○	○	●	○	●	●	●	○	○
X-500 SATA SSD 2.5"	●	●	●	●	○	●	●	●	●	●	●	●	○
F-100 CFAST™ CARD	●	●	●	●	○	○	●	○	●	●	●	○	○
F-240 CFAST™ CARD	●	●	●	●	●	●	●	○	●	●	●	●	●
miniTWIST II UFD	○	●	●	●	○	○	○	○	●	●	○	○	●
unitedCONTRAST II UFD	●	●	●	●	○	○	●	○	●	●	○	○	○
U-110 USB FLASH MODULE	●	○	●	●	○	○	●	○	●	●	○	○	○

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

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

Products for **aerospace/defense** applications are made for the harshest operating environments. Memory and solid state storage has to resist extreme temperature, high vibration and shocks, all while maintaining high data reliability and longevity over a period of decades.

- + Swissbit uses strictly Single Level Cell (SLC) technology and provides Military Erase procedures as well as high reliability and rugged designs targeted at extremely demanding applications.

**Communication/networking** devices have a rapid rate of development. Memory and solid storage need to be tailored to these special applications. Furthermore the devices have to be highly reliable and endure working 24 hours / 7 days.

- + Swissbit with its in-house design and manufacturing has the flexibility to customize all products to specific requirements. Swissbit products are tested under real world conditions.

**Industrial automation** applications have very specific requirements for storage / memory solutions. In addition to longevity and availability of products, ruggedized designs are also required to withstand the harsh operating environments.

- + Swissbit has the ability to support customers to find and tailor the right solutions for ambitious use cases. Furthermore full controlled BOM and 100 % Testing During Burn In ensure the longevity of customer's systems.

**Computer systems** for industrial and embedded applications need highly reliable and long-term available storage and memory components. Small form factors as well as high performance devices are needed in order to meet the requirements of industrial and embedded use cases.

- + Swissbit is the best choice for demanding embedded applications that require high performance, reliability tested, long-term availability, and customizable products.





Storage and memory for **infotainment** need to have a high performance and must be durable as well as reliable.

- + Swissbit reconciles performance, durability and reliability. State of the art technology, high quality components and rigorous 100 % test ensure that Swissbit products surpass highest standards.

Products in **test and measurement** applications can be used indoors or outdoors. This means memory and storage devices have to be able to handle environmental changes. In addition to durability, these storage products need high reliability because data retention is paramount.

- + 100 % Testing During Burn In and durable product designs based on SLC technology ensure that Swissbit memory devices are the most trusted

**Medical** applications require very high reliability because they are often used in mission-critical situations. Furthermore, healthcare devices may be in contact with liquids and require a special protection.

- + Swissbit has developed advanced reliability testing methods as well as protection features against environmental impacts including fluids.

Storage and memory solutions for **transportation / automotive** applications must withstand persistent vibration and shock. Storage solutions must also be able to handle high temperature fluctuations and show resistance to moisture, all while maintaining data integrity, high reliability and endurance.

- + Industry leading SLC Flash technology is used in Swissbit products to maximize lifetimes and ensure data integrity. 100 % tested rugged products, road maps with longevity, and small form factors all allow Swissbit to fulfill every customer requirement.



## 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

	Temperature	Power	Shock	Vibration	ESD	EMC	CEC	Power Loss	Retention	Warranty
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 260 mA max 320 mA Idle 140 mA
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, Telecommunication, Measurement, Transportation, etc.	
Tools	Windows Freeware Application, API/DLL for extended S.M.A.R.T. option	
Part Number	SFPAxxxxQvB0xss-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

SATA SSD 2.5" X-500 SERIES



The Swissbit X-500 Series Industrial SATA II SSD 2.5" storage solution is designed for demanding applications. The Solid State Drive is a rugged, high performance and extremely reliable storage solution. The data rate reaches up to 240 MB/sec and an impressive 14'500 IOPS with 4 KB random accesses. The high end architecture utilizes up to 8 channels with the most reliable SLC NAND Flash on the market. Special features such as ATA-8, NCQ and TRIM support enable higher IOPS (input / output per second) and sequential performance providing the best combination of performance and reliability for industrial applications. Additionally, the S.M.A.R.T. (Self-Monitoring, Analysis and Reporting Technology) protocol with extended lifetime monitoring tools and software development kit enables the application or designer to have the full control of mission critical data all the time. The BCH-ECC (error correction code) ensures data reliability with the power fail protected X-500 series.

	ENHANCED SECURE ERASE OPTION	STANDARD CONFIGURATION
Life Time Monitoring / S.M.A.R.T.	●	●
Temperature Sensor	●	●
ATA Security Feature Set	●	●
Basic Erase	●	○
DoD5220.22-M	●	○
NSA (Manual 130-2)	●	○
USA AirForce AFFSSI 5020	●	○
USA Army 380-19	●	○
USA Navy NAVSO P-5239-26	●	○
IREC (IRIG) 106-07 Ch. 10	●	○
NSA 9-12	●	○

X-500 FEATURE SET  
 ENHANCED SECURE  
 ERASE OPTIONS

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

X-200 SATA SSD 2.5"  
X-500 SATA SSD 2.5"

●	●	●	●	○	○	●	●	●	●	●	●
●	●	●	●	●	●	●	●	●	●	●	●

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

NEW



**SATA SSD 2.5"  
SOLID STATE DRIVE**

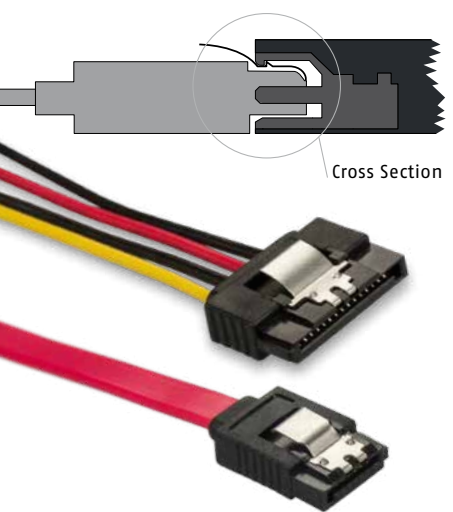
Series	X-500	
Interface Compliance	SATA II (3 Gbit/s) – ATA8	
Connector	15 + 7 pin serial ATA with latch protection	
Physical Form	100.2 x 69.85 x 9.4 mm	
Flash Type	SLC	EM*-MLC
Density	16 GB – 512 GB	on request
Write Endurance @ 64 GB ref.	≥ 2000 TBW**	≤ 59 – 590 TBW**
Data Retention	≥ 10 years @ life begin	≤ 5 years @ life begin
FLASH Shrink Frequency	~ 36 months	~ 18 months
Performance		
Sequential Read	up to 240 MB/sec	up to 220 MB/sec
Sequential Write	up to 200 MB/sec	up to 160 MB/sec
IOPS 4 KB Read	up to 14'500	up to 12'000
IOPS 4 KB Write	up to 7'000	up to 5'500
Operating Temperature	Commercial: 0°C to +70°C Industrial: -40°C to +85°C	
Storage Temperature	-55°C to +95°C	
Shock	MIL-STD810; 2'000 G, 0.4 ms; 50 G, 11 ms	
Vibration	MIL-STD810; 20 G, 10-2'000 Hz random	
Access Time	< 0.2 ms	
MTBF	≥ 2'000'000 hours	
Voltage	5 V ±10 % (optional 3.3 V Type)	
Power Consumption	Idle 0.06 W / Type 2 W / Max 5 W	
Special Features	NCQ, TRIM, S.M.A.R.T., ATA Security feature set, Enhanced Secure Erase (SW / HW)	
Tools	Windows / Linux Application & SDK for extended S.M.A.R.T. option, Formatting and Trim	
Part Number	SFSAXxxxQvBJxss-t-dd-rrr-ccc	

- Power Fail Protection
- Advanced Wear Leveling & Block Management
- Enhanced Secure Erase Features available
- High Random IOPS & Sequential Performance
- Ruggedized for "no-compromise" Design
- Self Monitoring Analysis and Reporting Technology (S.M.A.R.T.)
- Life Time Monitoring Application & Software Development Kit (SDK / API)
- Controlled BOM & PCN Process
- In-Field FW update

\* Endurance Managed; \*\* Tera Bytes Written, depends on application workload

**LOCKING / LATCHING  
SATA CONNECTOR**

The device is designed with a latching SATA connector. Multiple notches support the latching cables for highest vibration and shock requirements.

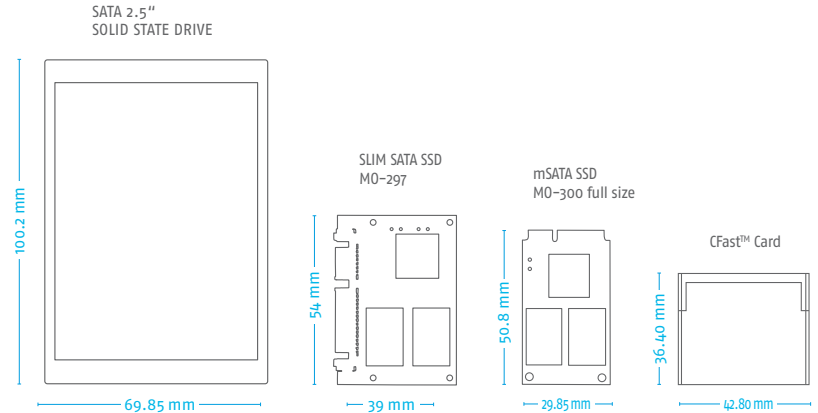


Cross Section

## MSATA SSD, SLIM SATA & CFAST™

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

The X-200 Series Slim SATA & mSATA embedded SSD standard is ratified by JEDEC under specification number MO-297 & MO-300. 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 melting 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.

X-200M	●	○	●	●	○	○	○	●	●	●	○	○
X-200S	●	○	●	●	○	○	○	●	●	●	○	○
F-100	●	●	●	●	○	○	○	●	●	●	○	○
F-240	●	●	●	●	○	○	○	●	●	●	●	●

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



	mSATA SSD MO-300 full size	SLIM SATA SSD MO-297	CFAST™ CARD	CFAST™ CARD
Series	X-200m	X-200s	F-100	F-240
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 + 7 pin Serial ATA	CFast™ Type I	CFast™ Type I
Physical Form	50.8 x 29.85 x 3.3 mm (MO-300 full size)	54 x 39 x 4.00 mm (MO-297)	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 – 64 GB	2 GB – 64 GB	2 GB – 32 GB	2 GB – 64 GB (low density on request)
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	1500 G	1500 G	1500 G	1500 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 55 mA, Sleep 5 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, Telecommunication, Measurement, Transportation, etc.			
Tools	Windows Freeware Application, API/DLL for extended S.M.A.R.T. optional		Windows Freeware Application, API/DLL for extended S.M.A.R.T. optional Evaluation kit with 2.5" SATA adapter board available	Windows / Linux Freeware 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> </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 range 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-440	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-440	●	●	●	ⓘ	ⓘ	ⓘ	●	●	●	●	●

● 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-440
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, others on request
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, Telecommunication, Measurement, Transportation, etc.		
Tools	Windows Freeware Application, API/DLL for extended S.M.A.R.T. option Security & SBZoneProtection option		
Part Number	SFCFxxxxHxBK1ss-t-xx-5r3-SMA 1ch SFCFxxxxHxBK1xss-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</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> </ul> |
|---|---|



### 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 SD Memory Cards (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, sophisticated wear leveling and 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 Memory Card 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;



**MICRO SD MEMORY CARD (SD / SDHC)**

**MICRO SD MEMORY CARD**

**SD MEMORY CARD (SD / SDHC)**

**MULTIMEDIA CARD**

	MICRO SD MEMORY CARD (SD / SDHC)	MICRO SD MEMORY CARD	SD MEMORY CARD (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	MICRO SD	MICRO SD	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, others on request
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	1 500 G	1 500 G	1 000 G	1 000 G
Vibration	50 G	50 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, WEEE, Part Number, Lot Code, Mfg. Date	Swissbit, Density, CE, Pb free, WEEE, 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, Telecommunication, Measurement, Transportation, 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>



**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% in-process 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 16 GB	512 MB to 16 GB	128 MB to 4 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
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, CE, Swissbit, Density	WEEE, CE, Swissbit
Target Application	Industrial Embedded Systems, Medical Solutions, Point-of-Sale, Gaming Industry, Automation Solutions, etc.		
Tools	Windows –Spare Block read out		
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 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 on 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.

By using 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>	1600 / CL11	1 GB - 8 GB	x64	1.18" (29.97 mm)	1.50 V	240	SGUxxx64xxxxxxxx-ssR	BGA
<b>DDR3-UDIMM ECC</b>	1600 / CL11	1 GB - 8 GB	x72	1.18" (29.97 mm)	1.50 V	240	SGUxxx72xxxxxxxx-ssR	BGA
<b>DDR2-UDIMM</b>	800 / CL6	512 MB - 2 GB	x64	1.18" (29.97 mm)	1.80 V	240	SEUxxx64xxxxxxxx-ssR	BGA
<b>DDR2-UDIMM ECC</b>	800 / CL6	1 GB - 2 GB	x72	1.18" (29.97 mm)	1.80 V	240	SEUxxx72xxxxxxxx-ssR	BGA
<b>DDR1-UDIMM</b>	400 / CL3	512 MB - 1 GB	x64	1.25" (31.75 mm)	2.50 V	184	SDUxxx64xxxxxxxx-ssR	TSOP
<b>DDR1-UDIMM LP</b>	400 / CL3	512 MB - 1 GB	x64	1.00" (25.40 mm)	2.50 V	184	SDUxxx64xxxxxxxx-ssR	COB
<b>DDR1-UDIMM ECC</b>	400 / CL3	512 MB - 1 GB	x72	1.25" (31.75 mm)	2.50 V	184	SDUxxx72xxxxxxxx-ssR	TSOP
<b>DDR1-UDIMM ECC LP</b>	400 / CL3	512 MB - 1 GB	x72	1.00" (25.40 mm)	2.50 V	184	SDUxxx72xxxxxxxx-ssR	COB



SODIMM / WITH AND WITHOUT ECC

	Data Rate / CL	Density	Org	Height	Voltage	Pins	Partnumber	Package
<b>DDR3L-SODIMM</b>	1600 / CL11	2 GB - 8 GB	x64	1.18" (29.97mm)	1.35 V	204	SLNxxx64xxxxxxxx-ssRT	BGA
<b>DDR3L-SO-UDIMM</b>	1600 / CL11	2 GB - 8 GB	x72	1.18" (29.97mm)	1.35 V	204	SLNxxx72xxxxxxxx-ssRT	BGA
<b>DDR3-SODIMM</b>	1600 / CL11	1 GB - 8 GB	x64	1.18" (29.97 mm)	1.50 V	204	SGNxxx64xxxxxxxx-ssRT	BGA
<b>DDR3-SO-UDIMM</b>	1600 / CL11	1 GB - 8 GB	x72	1.18" (29.97 mm)	1.50 V	204	SGNxxx72xxxxxxxx-ssRT	BGA
<b>DDR2-SODIMM</b>	800 / CL6	512 MB - 4 GB	x64	1.18" (29.97 mm)	1.80 V	200	SENxxx64xxxxxxxx-ssR	BGA
<b>DDR2-SODIMM LP</b>	800 / CL6	512 MB - 2 GB	x64	0.94" / 1.18"	1.80 V	200	SENxxx64xxxxxxxx-ssR	COB
<b>DDR1-SODIMM</b>	400 / CL3	256 MB - 1 GB	x64	1.25" (31.75 mm)	2.50 V	200	SDNxxx64xxxxxxxx-ssR	BGA
<b>DDR1-SODIMM LP</b>	400 / CL3	256 MB - 2 GB	x64	1.00" (25.40 mm)	2.50 V	200	SDNxxx64xxxxxxxx-ssR	COB
<b>DDR1-SODIMM ECC</b>	400 / CL3	256 MB - 1 GB	x72	1.00" (25.40 mm)	2.50 V	200	SDNxxx72xxxxxxxx-ssR	COB
<b>SDR-SODIMM (on request)</b>	133 / CL3	128 MB - 256 MB	x64	1.18" (29.97mm)	3.30 V	144	SSNxxx64xxxxxxxx-ssR	TSOP

<b>DDR1 DIMM</b>	●	○	○	○
<b>DDR1 SODIMM</b>	●	○	○	○
<b>DDR2 DIMM</b>	●	○	○	○
<b>DDR2 SODIMM</b>	●	○	●	○
<b>DDR3 DIMM</b>	●	○	○	●
<b>DDR3 SODIMM / SO-UDIMM</b>	●	●	●	●

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

## RUGGEDIZED DIMMS



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.



### DESIGN IN / LAYOUT

### FLEXIBILITY OF MEMORY POPULATION

### TESTABILITY AFTER SOLDERING

### UPGRADE / REPAIR

### REQUIRED BOARD SPACE

### STACKABLE SOLUTION

### PROTECTION AGAINST SHOCK

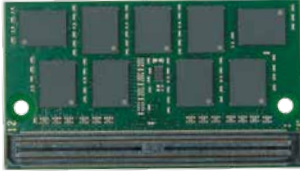
### PROTECTION AGAINST VIBRATION

### MEMORY COST

	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



**SPECIAL UNBUFFERED DIMMS**



**RUGGED XR-DIMM**

**DDR3-XR-DIMM™**

Data Rate / CL	Density	Org	Height	Voltage	Pins	Partnumber	Package
1600 / CL11	2 GB - 8 GB	x72	38 mm x 67.5 mm	1.50 V	240	SGVxxx72xxxxxxxx-ssRT	BGA



**MINI-UDIMM / MICRODIMM / 100PIN-DIMM**

**DDR3-MiniUDIMM**

Data Rate / CL	Density	Org	Height	Voltage	Pins	Partnumber	Package
1333 / CL9	1 GB - 8 GB	x72	1.18" / 0.74"	1.50 V	244	SSLxxx72xxxxxxxx-ssRT	BGA

**DDR2-MicroDIMM**

Data Rate / CL	Density	Org	Height	Voltage	Pins	Partnumber	Package
667 / CL5	1 GB	x64	1.18" (29.97 mm)	1.80 V	214	SEMxxx64xxxxxxxx-ssR	BGA

**DDR1-100PIN DIMM**

Data Rate / CL	Density	Org	Height	Voltage	Pins	Partnumber	Package
333 / CL2.5	128 MB - 512 MB	x72	1.00" (25.40 mm)	2.50 V	100	SDUxxx32xxxxxxxx-ssR	TSOP

**DDR3 XR-DIMM**  
**DDR3 MINIDIMM**

DDR3 XR-DIMM	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
DDR3 MINIDIMM	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

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

**DDR3L, THE NEW STANDARD**

DDR3 so far has been the interface technology with the widest range of speed grades. Due to the architectural features like fly-by-bus, data bus and IO calibration DDR3 of today has more than twice the speed of the initial components, and extensions are still in the pipeline.

Due to the technology roadmaps it was possible to significantly lower the power consumption. With the latest DRAM technology it was also possible to reduce the supply voltage. While the standard DDR3 voltage is at 1.50 V, the

new DDR3L components are operated at 1.35 V, reducing the memory power consumption by ~15 % under realistic conditions.

DDR3L has been standardized at JEDEC and is supported by the latest memory controllers. All new Swissbit DDR3L modules are fully backwards compatible to DDR3. They can be operated both with 1.35 V and 1.50 V and be used both in the newest systems and less recent platforms, which helps to reduce inventory cost.



**SPECIAL REGISTERED DIMMS**



**VLP MINIRDIMM WITH ECC, REGISTERED SO-RDIMM WITH ECC**

	Data Rate / CL	Density	Org	Height	Voltage	Pins	Partnumber	Package
<b>DDR3-MiniRDIMM</b>	1333 / CL9	2 GB – 4 GB	x72	0.72" (18.29 mm)	1.50 V	244	SGHxxx72xxxxxxx-ssR	BGA
<b>DDR2-MiniRDIMM</b>	667 / CL5	1 GB	x72	0.72" (18.29 mm)	1.80 V	244	SEHxxx72xxxxxxx-ssR	BGA
<b>DDR2-SO-RDIMM</b>	667 / CL5	1 GB – 2 GB	x72	1.18" (29.97 mm)	1.80 V	200	SEGxxx72xxxxxxx-ssR	BGA

**DDR2 SO-RDIMM**  
**DDR3 MiniRDIMM**

DDR2 SO-RDIMM	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
DDR3 MiniRDIMM	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>

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

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	SGPxxx72xxxxxxx-ssR	BGA
<b>DDR2-RDIMM ECC+PARITY</b>	800 / CL6	1 GB - 4 GB	x72	1.18" (29.97 mm)	1.80 V	240	SEPxxx72xxxxxxx-ssR	BGA
<b>DDR1-RDIMM ECC</b>	400 / CL3	512 MB - 2 GB	x72	1.20" (30.48 mm)	2.50 V	184	SDRxxx72xxxxxxx-ssR	TSOP / BGA
<b>SDR-RDIMM ECC</b>	133 / CL3	256 MB - 512 MB	x72	1.20" (30.48 mm)	3.30 V	168	SSRxxx72xxxxxxx-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 - 4 GB	x72	0.70" (17.78 mm)	1.50 V	240	SGPxxx72xxxxxxx-ssR	BGA
<b>DDR3-UDIMM ECC</b>	1333 / CL9	2 GB - 4 GB	x72	0.70" (17.78 mm)	1.50 V	240	SGUxxx72xxxxxxx-ssR	BGA
<b>DDR2-RDIMM ECC+PARITY</b>	800 / CL6	1 GB - 2 GB	x72	0.72" (18.29 mm)	1.80 V	240	SEPxxx72xxxxxxx-ssR	BGA

<b>DDR1 RDIMM</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>DDR2 RDIMM</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>DDR3 RDIMM</b>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>

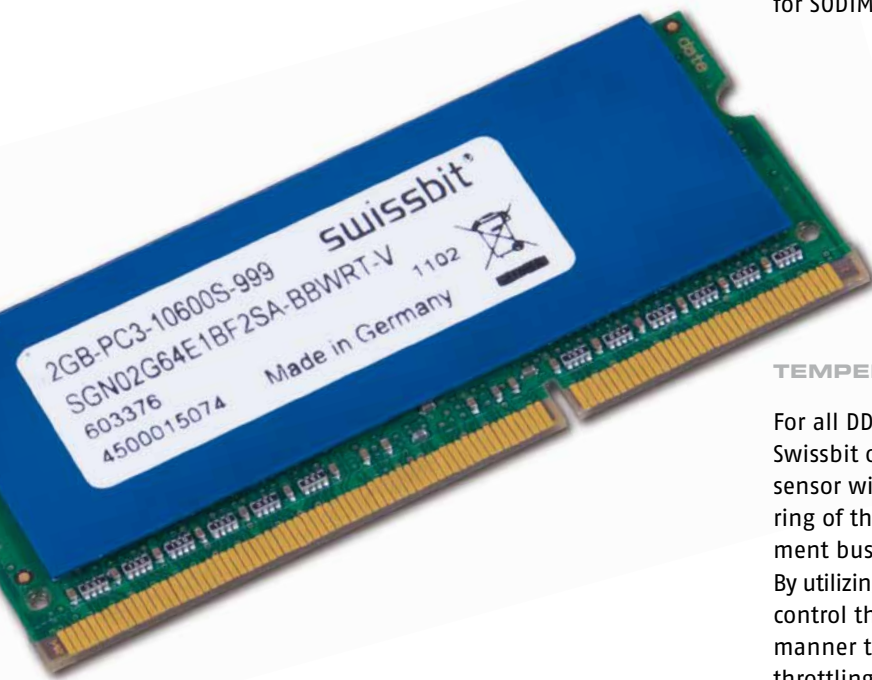
● default implemented; ○ on request; ◯ not available;

## DRAM SPECIFIC OPTIONS

### 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.



### 30µ" GOLD ON CONTACT

For demanding applications Swissbit use a thick layer of 30 micro inch gold on the DIMM contacts to offer highest reliability and long lifetime.

### 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.

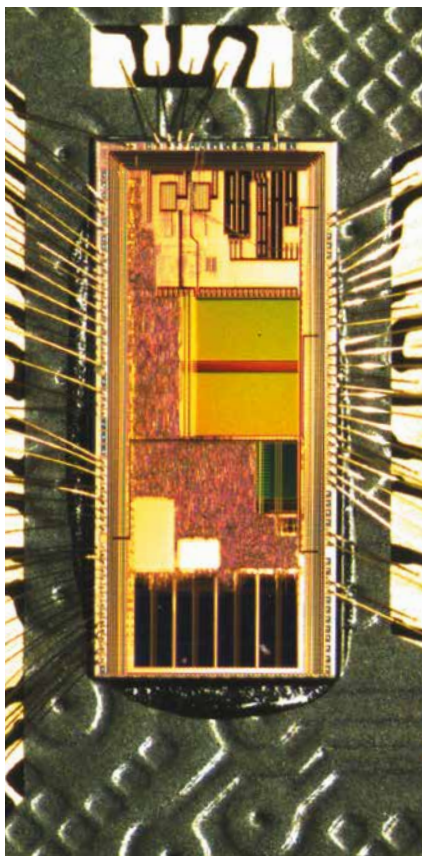
By utilizing this feature the system management can actually control the self heating of the module in a more accurate manner than by using calculation methods for memory throttling. This results in higher useable bandwidth and avoids overheating of the module.

### 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<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.

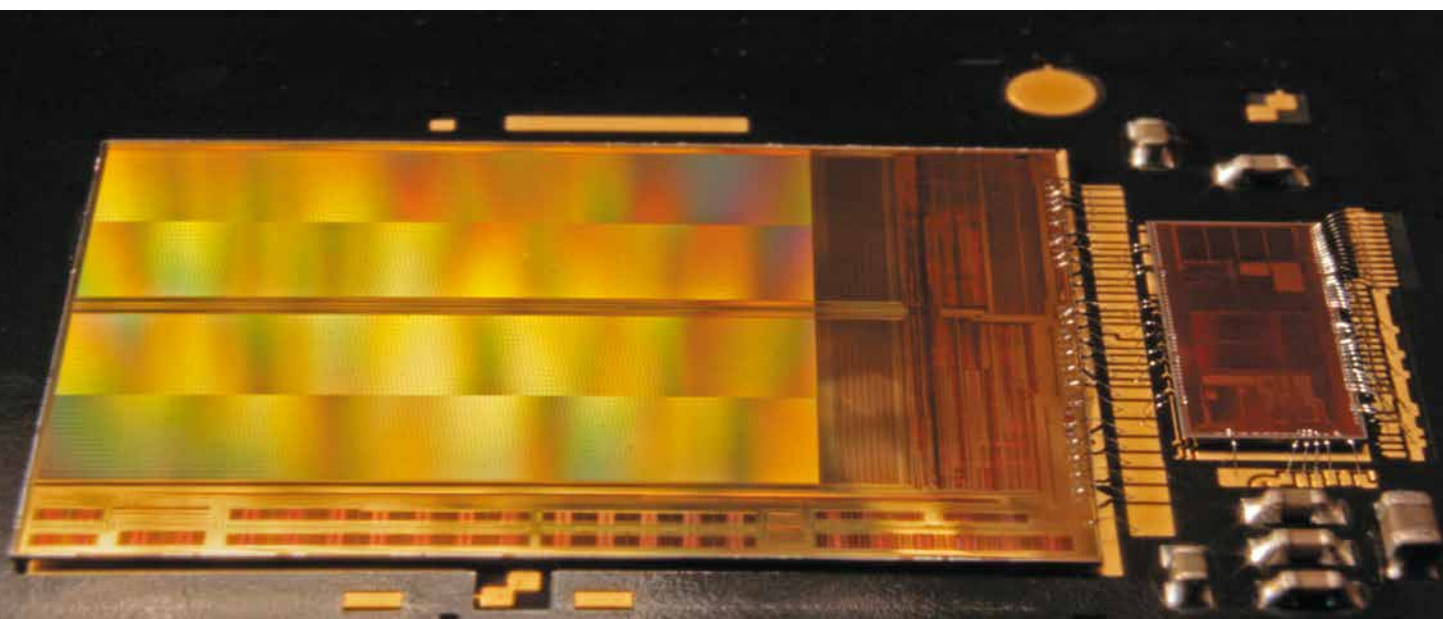
## SYSTEM IN PACKAGE (SiP)



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 the smallest form factors built into Multi-Chip-Packages. With this microelectronic integration approach our products provide more functionality and highest memory densities inside one package. Various functional blocks (RF, digital, sensors, security and memory) can be combined, as well as passive components in a single package.

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, under fill, molding, precise singulation with laser technology, housing, labeling, laser marking, tampon printing etc. are very well established.

Swissbit has extensive expertise in die stacking and the integration of additional hardware features, especially for Flash and DRAM devices. An internal Memory-In-Package line positions Swissbit as a development and production partner for dedicated or customized memory based products that have challenging integration and reliability requirements. If customers require additional resources for designs that have special space or performance demands, Swissbit has experienced teams of design, test, and quality engineers along with project managers to provide feasibility studies or manage entire development projects. In-house prototype, small, and mid-size assembly lines allow volumes up to 50,000 pieces per month. Swissbit will provide support from the inception of a project, through design phase, prototyping, circuit layout and material selection, to providing the proper packaging for storage and transport.



FLASH Part Number Decoder



**Swissbit Memory (1)**

**Memory Type (2)**

F: Flash Products

**Product Type (3)**

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

**Density (4)**

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

**Product Dimension (5)**

- H: CompactFlash™ / CFast™
- J: UFD Module 2.54mm terminal header
- K: UFD Module 2.00mm terminal header
- L: SD Memory Card
- 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
- 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: SK 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 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 MiniRDIMM 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/SOUDIMM 1.5V  
G: 204 Pin SO-RDIMM  
M: 214 Pin MicroDIMM 1.5V  
L: 244 Pin MiniUDIMM  
H: 244 Pin MiniRDIMM  
V: 240 Pin XR-DIMM
- DDR3L N: 204 Pin SODIMM/SOUDIMM 1.35V

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)
- 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)

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: SK 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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