

The background of the cover features a close-up, angled view of a complex electronic circuit board. The board is populated with numerous integrated circuits and intricate traces. A prominent diagonal split runs across the image, with the upper-left portion tinted in a vibrant red and the lower-right portion in a deep blue. The Hyperstone logo is positioned in the top right corner, and a smaller version of the logo is centered on a black rectangular label placed over one of the chips on the circuit board.

hyperstone®

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**NAND Flash Controllers for
Industrial and Embedded Storage**

Product Guide

Why Hyperstone?

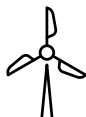
Hyperstone is a fabless NAND flash memory controller company enabling safe, reliable and secure storage systems.

With a focus on industrial solutions, the company strives to be the key component in world-class products for industrial, embedded, automotive and global data storage applications.

Hyperstone's products include NAND flash memory controllers for Serial ATA (SATA) and Parallel ATA (PATA) Solid-State Disks (SSDs), Disk-on-Module (DoM), Disk-on-Board (DoB), embedded flash solutions such as eMMC, and flash cards such as CF, SD, and microSD. USB controllers complete the portfolio. Hyperstone's hyMap® (sub-page based) flash controller firmware is supplied with the flash memory controllers and is customized for each flash application.

While the company's headquarters is based in Konstanz, Germany there are subsidiaries in Taiwan, and the USA serving a global customer base. Research and development take place at headquarters, while industry-leading partners provide world-class wafer-subcontracting, packaging and testing services.

- Industrial Grade
- Security
- Engineering Support
- Up to date Flash Support
- hyReliability®
- hyMap® Firmware
- Lower TCO
- Tools & Utilities



TOOLS & UTILITIES AVAILABLE

Use Case Tracker & hySMART™

With the Hyperstone Use Case Tracker, you can gain insights into your systems workload for easy maintenance and to keep track of your data storage devices' health status.

Use the hySMART tool to access and analyze Hyperstone vendor-specific SMART data and lifetime information through a GUI provided by Hyperstone.

hyAdmin™

Ensure easy configuration and pre-formatting of a device and ensure this is carried out securely through the hyOperator tool with a plug and preformat setup.




High Reliability NAND Flash Controllers

Download Free White Papers

Our educational series the Fundamentals of Reliable Flash Storage is available on our website. There you can download over a dozen papers on topics such as controller design, security, power fail robustness, error correction coding and so much more to assist you in the storage design process.






Our product portfolio of NAND flash memory controllers includes USB controllers, SATA controllers, SD controllers and CF PATA controllers. With our complimentary firmware, hyReliability™ features and our hyMap® Flash Translation Layer, our flash memory controllers deliver the highest endurance and reliability for embedded storage solutions.

But they must not only provide absolute power-fail robustness, error correction, wear-leveling, and data refreshing, they also have to provide many more sophisticated features you needed to ensure that data storage solutions such as SSDs, eMMC, SD-cards, USB drives, and embedded flash drives can function reliably. Due to the physical characteristics of NAND flash memory, reliable data processing is only possible with a quality NAND flash memory controller that enables the NAND flash to be used in demanding applications.

Therefore, all of our controllers come with a flash specific firmware that offers an easy-to-use turnkey solution as well as reference schematics and a layout design to assist in the design process for industrial, high endurance, and robust flash memory drives.



Due to the unique demands of reliable storage applications in industrial markets, failing storage applications are not an option for us.

If you require storage solutions, which combine reliability with the highest endurance, our NAND flash memory controllers are your best choice.

FLASH MEMORY CONTROLLER FAMILY S9

The S9 flash memory controller family with flash specific firmware offers an easy-to-use turnkey solution for industrial, high endurance, and robust flash memory drives or modules compatible to host systems with SD 7.0 interfaces, M0-297 and M0-300 and Disk-on-Board (DoB) integration. Also available as a security variant for mission critical industrial SD card applications with high security demands.

All controllers come with reference schematics and a layout design to assist in the design process.



Secure Digital has solidified its place in the industrial arena as it is now used in systems like PLC, Motion Controllers, HMI and SBC. These systems are then implemented across automation systems, robots and mobile applications, whilst also securing operations in transportation manufacturing plants. SD solutions can work as fixed or removable drives. They can serve as boot drives as well as storage for customer data..



90 MB/s

Max. Sequential
Write Speed

90 MB/s

Max. Sequential
Read Speed

10 MB/s

RDM
Read Speed

Interface	SD 7.0 (UHS-I), SDUC, OTP 1.0, LVS 1.0, SD2.0, SD3.0, up to 104 MB/s host transfer rate and 400 MB/s flash I/F speed	
Type	Standard Package	Security Package
Product Name	S9-LAK08 LGA 64	S9-LASK08 LGA 64
Flash Supported	SLC, MLC, up to date 3D technologies, pSLC	
Flash Channels	1	
Chip Enables	4	
Max. Sequential Write Speed	90 MB/s	
Max. Sequential Read Speed	90 MB/s	
RDM Read Speed	10 MB/s	
Steady State 4k RDM Write	7.5 MB/s	
Temperature Range	Industrial Temperature -40°C to +85°C	
Firmware Features	Global Wear Leveling, Read Disturb Management, Dynamic Data Refresh, Safe Flash Handling, Near-Miss Error Correction Code	
ECC	BCH up to 96-Bit, 4k GCC* Soft Decoding & Calibration	
API	Available in security packages and tested die security variant. API simultaneously enables AES, RNG, SHA and other proprietary firmware solutions	

More Information

For more details please visit www.hyperstone.com

*GCC – Generalized Concatenated Code: 3D TLC ECC with analytically determined error-floor

FLASH MEMORY X1 CONTROLLER FAMILY

The X1 flash memory controller family compatible to SATA 3.3. Also available as a security variant for mission critical industrial SSDs, CFast Cards and or embedded flash storage modules including U.2, M.2, M0-297 and M0-300 and Disk-on-Board (DoB) integration.

Hyperstone's X1 is designed for demanding NAND flash storage applications that require the highest standard of industrial quality. The X1 can be used in 1.8" and 2.5" SSDs, CFast cards, M.2 modules, DoB solutions and other embedded SATA flash systems that guarantee reliable and secure data processing between the host interface and NAND flash arrays. Hyperstone flash controllers are complete turnkey solutions that deliver not only high reliability and endurance but also the robust design to withstand industrial temperatures.



400 MB/s

Max. Sequential
Write Speed

525 MB/s

Max. Sequential
Read Speed

150 MB/s

RDM
Read Speed

Interface	SATA 3.3, ATA-8, CFast 2.0 up to 6 GBit/s host transfer rate and 400 MB/s flash I/F speed	
Type	Standard Package	Security Package
Product Name	X1-RAB06 TFBGA 124	X1-RASB06 TFBGA 124 X1-RASB07 TFBGA 144
Flash Supported	SLC, MLC, up to date 3D technologies, pSLC	
Flash Channels	2	
Chip Enables	16 (8 per flash channel)	
Max. Sequential Write Speed	400 MB/s	
Max. Sequential Read Speed	525 MB/s	
RDM Read Speed	150 MB/s	
Steady State 4k RDM Write	100 MB/s	
Temperature Range	Industrial Temperature -40°C to +85°C	
Firmware Features	Global Wear Leveling, Read Disturb Management, Dynamic Data Refresh, Safe Flash Handling, Near-Miss Error Correction Code	
ECC	BCH up to 96-Bit/1k, 120-Bit / 2k + 4k GCC* Soft Decoding & Calibration	
API	Available in security packages and simultaneously enables AES, RNG and other proprietary firmware solutions	

More Information

For more details please visit www.hyperstone.com

FLASH MEMORY CONTROLLER FAMILY U9

The Hyperstone U9 NAND flash controller offers compatibility to host systems with USB 3.1 SuperSpeed 5 Gbps interface. For mission critical industrial USB devices, there is an API available to add proprietary security features.

Ideal controller for ensuring USB based NAND flash solutions can be successfully implemented in industrial applications. Nowadays USB flash drives and eUSBs find themselves in the industrial arena and Hyperstone's U9 has since been efficiently managing the data processing in a range of demanding applications in global data communications. Hyperstones USB controller can be used to ensure the reliable design of eUSBs, USB flash drives, disk-on-module and flexible disk-on-board solutions.



150 MB/s

Max. Sequential
Write Speed

200 MB/s

Max. Sequential
Read Speed

15 MB/s

RDM
Read Speed

Interface

USB 3.1 Gen1
up to 5 GBit/s host transfer rate and 200 MB/s flash I/F speed

Product Name

U9-RBB06 TFBG124
U9-RB1B06 TFBGA124 for TLC flash in pSLC mode

Flash Supported

SLC, MLC, pSLC

Flash Channels

2

Chip Enables

16 (incl. 8 multiplexed GPIOs)

Max. Sequential Write Speed

150 MB/s

Max. Sequential Read Speed

200 MB/s

RDM Read Speed

15 MB/s

Steady State 4k RDM Write

5 MB/s

Temperature Range

Industrial Temperature Range -40°C to +85°C

Firmware Features

Global Wear Leveling, Read Disturb Management, Dynamic Data Refresh, Safe Flash
Handling, Near-Miss Error Correction Code

ECC

BCH 24, 40, 48, 60, 72, 96

API

Develop your own firmware extension to enable AES, RNG or other
proprietary firmware solutions

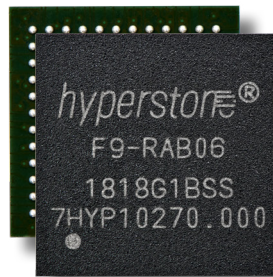
More Information

For more details please visit www.hyperstone.com

FLASH MEMORY CONTROLLER FAMILY F9

The Hyperstone F9 NAND flash memory controller together with flash specific firmware offers an easy-to-use turnkey platform for industrial, high-endurance CompactFlash cards or memory modules compatible to host systems with CompactFlash™, IDE or PATA interfaces.

Compact Flash was the standard industrial interface for many years and delivered long lasting products in a mature form factor. Hyperstone is committed to supporting this interface. Even though it is widely understood as a legacy interface, Compact Flash is still a valid alternative for many systems and maintains a strong footing across a range of markets.



100 MB/s

Max. Sequential
Write Speed

120 MB/s

Max. Sequential
Read Speed

15 MB/s

RDM
Read Speed

Interface

CF 6.1, PIO6, MDMA4, UDMA6
up to 133 MB/s host transfer rate and 200 MB/s flash I/F speed

Product Name

F9-ILAT06 TQFP 128
F9-RAB06 TFBGA 124
F9-RAB07 TFBGA 144

Flash Supported

SLC, MLC, pSLC

Flash Channels

2

Chip Enables

8 for F9-ILAT06 and F9-RAB06
16 for F9-RAB07 (incl. 8 multiplexed GPIOs)

Max. Sequential Write Speed

100 MB/s

Max. Sequential Read Speed

120 MB/s

RDM Read Speed

15 MB/s

Steady State 4k RDM Write

4 MB/s

Temperature Range

Industrial Temperature Range -40°C to +85°C

Firmware Features

Global Wear Leveling, Read Disturb Management, Dynamic Data Refresh,
Safe Flash Handling, Near-Miss Error Correction Code

ECC

BCH 24, 40, 48, 60, 72, 96 automatic configuration

More Information

For more details please visit www.hyperstone.com

Data Security

If it's smart, it's vulnerable.

The global threat of data manipulation and theft is growing and in the industrial space where data is increasingly sensitive and connected, ensuring a secure system is mission critical. Hyperstone controllers are designed securely, and incorporate a range of hardware encryption engines and security geared firmware features to bolster the security of any given storage device based on one of our controllers.


After all, we believe security should not be an afterthought. Security should be built-in not bolt-on an integral aspect of the design, which becomes the beating heart and the brains behind a secure system.

While our controllers are designed with secure hardware and firmware, Hyperstone further offers an Application Programming Interface to enable companies to design their own proprietary firmware extension and enhance the security capabilities of a storage design without disclosing code to third parties. The API allows companies to use the high quality flash management from Hyperstone, all while developing a security geared product with value added features and differentiation.



Custom Solutions & API

There is no 'one size fits all' and we are eager to support non-standard designs and custom solutions.



Whether you need fully assembled, qualified products with your branding, security and encryption features or custom firmware to fit your specific use-case, we offer it all. With our development tools and API you can enable firmware extensions for your specific NAND flash or security application.

- Turnkey manufacturing of any form factor including SiP and MCP with your branding
- NAND flash sourcing, BOM control and lifecycle management
- A variety of tools to customize configurations
- An Application Programming Interface (API), a software extension of Hyperstone's standard firmware, which enables Custom Firmware Extensions (CFEs)
- You do not need to implement advanced flash management features, as you will benefit from Hyperstone's flash management system
- The API provides access to several embedded firmware features and additional interfaces through the host interface to implement customized, added-value application features
- You retain full control of the added features – no disclosure needed
- The API kit includes software (C source code compiled for different OSs) and hardware (development boards and debug interface) as well as detailed documentation

The background is a dark, abstract composition. It features a large, dark blue triangular shape on the left side, which transitions into a lighter blue area. A prominent red triangle is positioned in the upper right corner. Overlaid on the dark blue area are faint, light-colored circuit board patterns, including lines and circular components, suggesting a technological or electronic theme.

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