

U9 Flash Memory Controller

U9

hyperston  [®]

U9 Flash Memory Controller

The Hyperstone U9 family of Flash Memory Controllers together with provided firmware offers an easy-to-use turnkey solution for industrial, high endurance, and robust Flash Memory drives or modules compatible to host systems with USB 3.1 SuperSpeed 5 Gbps interface.

- Designed to fully satisfy industrial requirements and feature requirements
- **hyReliability™** Flash Management including superior wear leveling, read disturb management, and power fail management ensuring highest reliability and durability
- **hyMap®** Flash Translation Layer and mapping offering second to none random write performance, minimal write amplification, and consequently highest endurance for random access heavy usage profiles (e.g. JEDEC Enterprise)
- Flexible 96-Bit/1K BCH ECC engine supporting all Flash Memory requirements
- Optimized 32-Bit RISC core, instruction set for Flash Memory handling
- Continuously updated Flash Memory chip support and long term availability
- High performance on-the-fly AES 128 and 256 encryption engine
- Custom features can be implemented with simple firmware upgrades
- Turnkey solution including firmware, manufacturing kit, test and development hardware, as well as reference schematics
- 16 GPIOs for customer specific applications supporting SPI, I2C and ISO7816 or additional flash CE
- Application Programming Interface (API) and Software Development Kit (SDK) to develop own Custom Firmware Extensions (CFE)
- Built-in temperature sensing capability

Targeted Applications

- Industrial USB Flash Drive
- eUSB, embedded USB module
- Ultra durable Flash Drive
- Security Flash Drive
- Multi-Chip-Package (MCP)
- Disk-on-Board

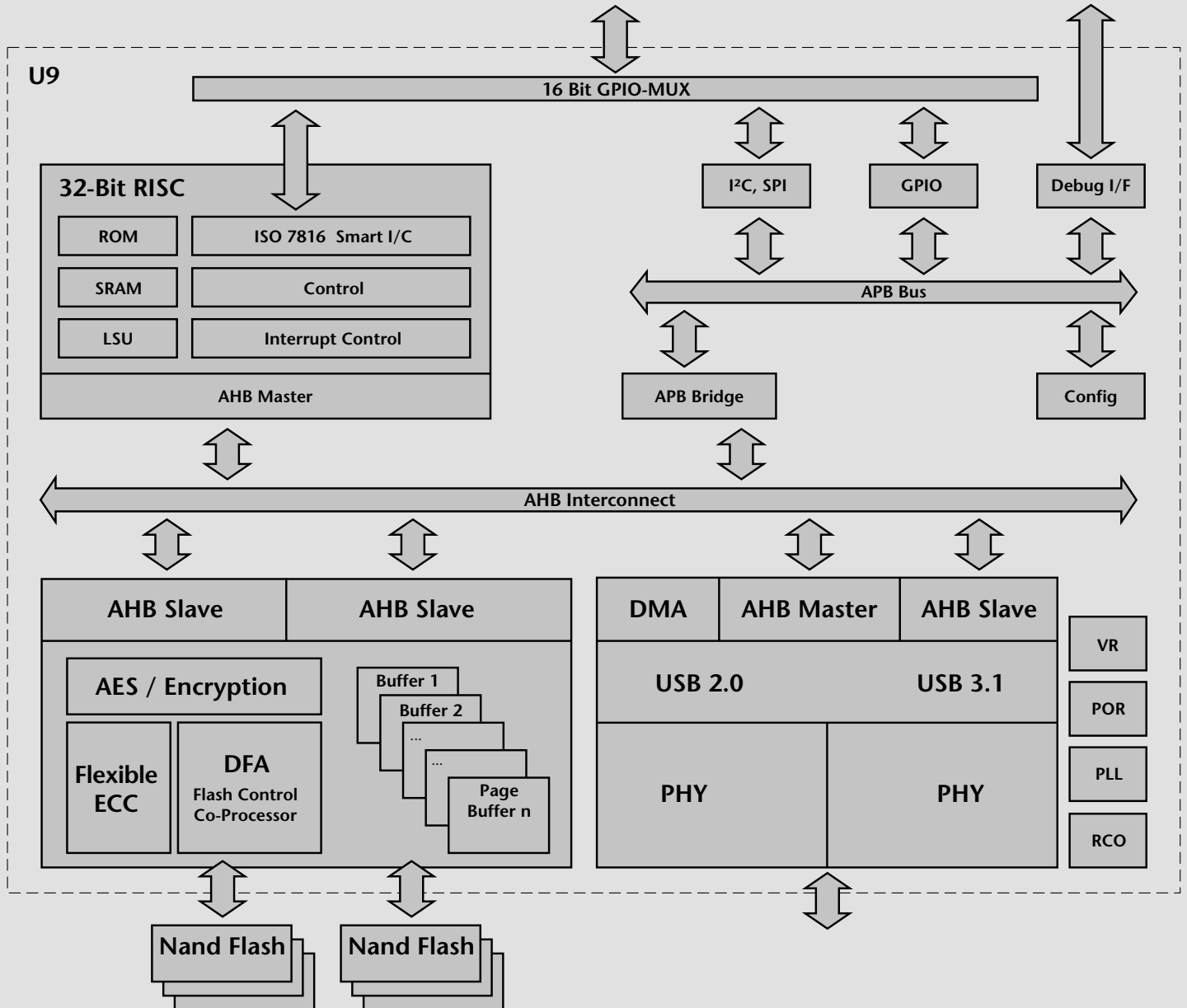
Order Information

- U9-RBB06 --- TFBGA-124, 9x9x1.2mm, 8 CEs, RoHS, -40 to +85 °C (tape-and-reel)
- U9-RBB06-Y --- TFBGA-124, 9x9x1.2mm, 8 CEs, RoHS, -40 to +85 °C (tray)
- U9-0BBD0 --- Tested Die/Wafer
- Custom package versions available upon request

Compliance & Performance

- Fully compliant with USB 3.1 Gen 1 specifications
- USB mass storage device class (MSC)
- USB Attached SCSI (UASP) support
- SuperSpeed, High-Speed, Full-Speed
- Host transfer rate of up to 5 Gbps
- Sequential read up to 200 MB/s
- Sequential write up to 150 MB/s
- Sustained 4K random write over 5 MB/s
- Secure Erase and Sanitize support
- S.M.A.R.T. and health monitoring
- -40 to +85 °C industrial grade version

U9 Block Diagram



Controller & CPU

- High performance 32-Bit Hyperstone RISC microprocessor
- Large internal RAM provides firmware flexibility
- 16 GPIO pins for customer specific applications, multiplexed interface options include: 16 GPIO, SPI, I2C, 8x CE and ISO7816
- NTC thermistor interface and ADC for high accuracy temperature logging and optimized read/write operations
- Unique ID for security applications
- AES-128 and AES-256 support with CBC and XTS modes, high performance on-the-fly encryption/decryption
- Hardware RNG
- Flexible clock frequency generation through internal oscillator and PLL
- Automatic power-down mode during wait periods for host data or Flash Memory operation completion, automatic sleep mode during host inactivity periods
- On-chip switching voltage regulator for 1.2V controller core power
- Supply voltage $3.3V \pm 5\%$
- Application Programming Interface (API) and Software Development Kit (SDK)

Host Interface & Compliance

- Compliant to USB 3.1 Gen1
- USB mass storage device class (MSC)
- USB human interface device class (HID) support is possible
- 4 configurable endpoints
- Supporting Full-Speed, Hi-Speed and SuperSpeed 5Gbps transmissions
- Bulk, isochronous, and interrupt transfer modes
- USB Attached SCSI (UASP) support
- S.M.A.R.T. Sanitize, and Secure Erase support using ATA pass through command
- Configurable Early-Acknowledge to avoid any data loss during power fail

Flash Memory Interface

- Direct Flash Memory Access (DFA) co-processor incl. page buffers and interleaving capability
- DDR interface compliant with Toggle DDR and ONFI 2.3, compatible with all DDR Flash Memory devices
- Asynchronous SDR interface, ONFI 1.0 compliant compatible with all legacy interface Flashes
- 2-Channels with data transfer rate to Flash up to 200 MB/s each
- Flexible 96-Bit/1K BCH ECC engine supporting all Flashes
- CRC for additional reliability
- Direct connection of up to 8 Flash Memory chip enables (CE)
- Flash Memory power down logic and write protect control
- Supporting all Flash technologies and all page sizes up to 16KB
- On-chip voltage regulator for 1.8V Flash Memory I/O power

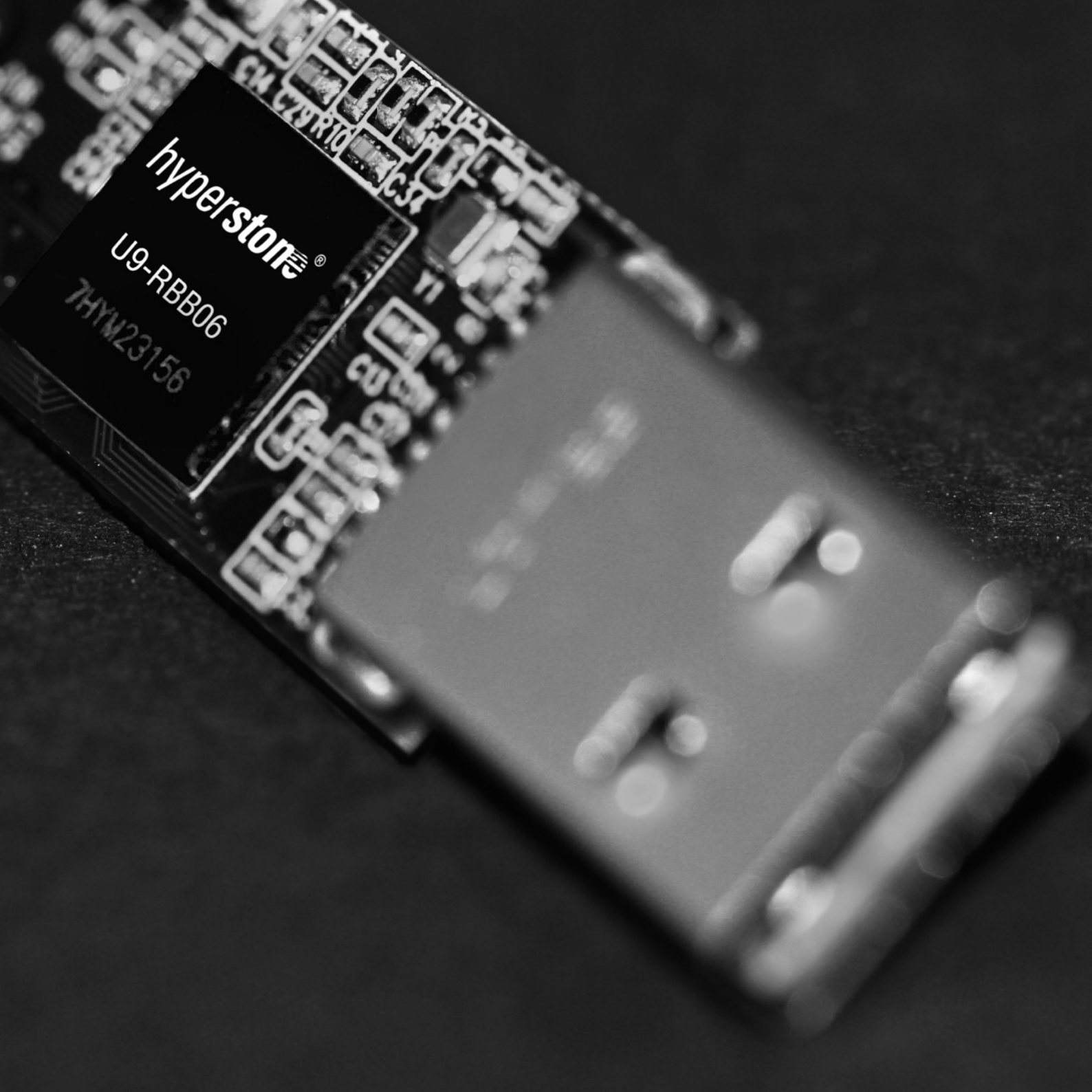
Flash Memory Management

- hyReliability™ Flash Memory Management optimizing reliability, power fail safety, endurance, data retention, and performance
- hyMap® Flash Translation Layer offering class-leading random write performance, minimal write amplification, and highest endurance for random usage profiles (e.g. JEDEC Enterprise)
- Complete Flash Translation Layer (FTL) for random Flash data access including mapping of logical block addresses (LBA) to physical block addresses (PBA)
- Bad Block Management
- Static, Dynamic and Global Wear leveling to maximize write endurance
- Intelligent garbage collection
- Read Disturb Management, dynamic data refresh to maximize data retention and refresh data subject to read disturbance
- Management of sudden power-fails
- Interleaving, cache, and multi-plane programming
- Firmware is stored redundantly for recovery and refresh
- In-Field Firmware update without user data loss
- Customized firmware, optimizations and feature implementations possible upon request.

hyperston®

U9-RBB06

7HYM23156





Hyperstone GmbH

Line-Eid-Strasse 3
78467 Konstanz
Germany
Phone: +49 7531 980 30
Fax: +49 7531 980 338
Email: info@hyperstone.de

Hyperstone Inc. - USA

465 Corporate Square Drive
Winston-Salem, NC 27105
USA
Phone: +1 336 744 0724
Fax: +1 336 744 5054
Email: us.sales@hyperstone.com

Hyperstone Asia Pacific - Taiwan

3F., No. 501, Sec.2, Tiding Blvd.
Neihu District, Taipei City 114
Taiwan, R.O.C.
Phone: +886 2 8751 0203
Fax: +886 2 8797 2321
Email: taiwan@hyperstone.com

www.hyperstone.com

Content is subject to change without prior notice. U9, hyReliability and hyMap are trademarks of Hyperstone GmbH. Other brand, product, or company names are property of the respective holder. Warranties, implied or expressed as well as liabilities for any damage resulting from using provided information in this document are excluded until part of a separate written contract.