

A2 Flash Memory Controller

A2

*hyperston*® 



# A2

## Flash Memory Controller

The Hyperstone A2 family of Flash Memory Controllers together with provided application and flash specific firmware offers an easy-to-use turnkey platform for high endurance robust flash disks of various form factors and interface standards.

- Smallest and most power efficient SSD controller
- Patented superior read and write wear leveling together with up to 24-Bit ECC ensuring highest reliability and endurance
- Exceptional power fail robustness
- Optimized 32-Bit RISC core, instruction set and firmware for flash handling
- 4 channel controller provides optimal performance for target applications
- Most power efficient design together with power saving features
- S.M.A.R.T. features supported
- Custom features can be implemented with simple firmware upgrades
- ASSP with minimal external active components
- Turnkey solution including firmware, manufacturing kit, test and development hardware, and reference schematics for applications such as 2.5" SATA solid state disk (SSD), MO-297, MO-300, and CFast.

### Targeted Applications

- High reliability & industrial Solid State Disks (SSD) including 2.5" and 1.8" SSD, MO-297, MO-300
- SATA Disk-on-Modules (DoM)
- Embedded Flash
- Multi-Chip-Modules (MCM)
- Multi-Chip-Package (MCP)
- Disk-on-Board

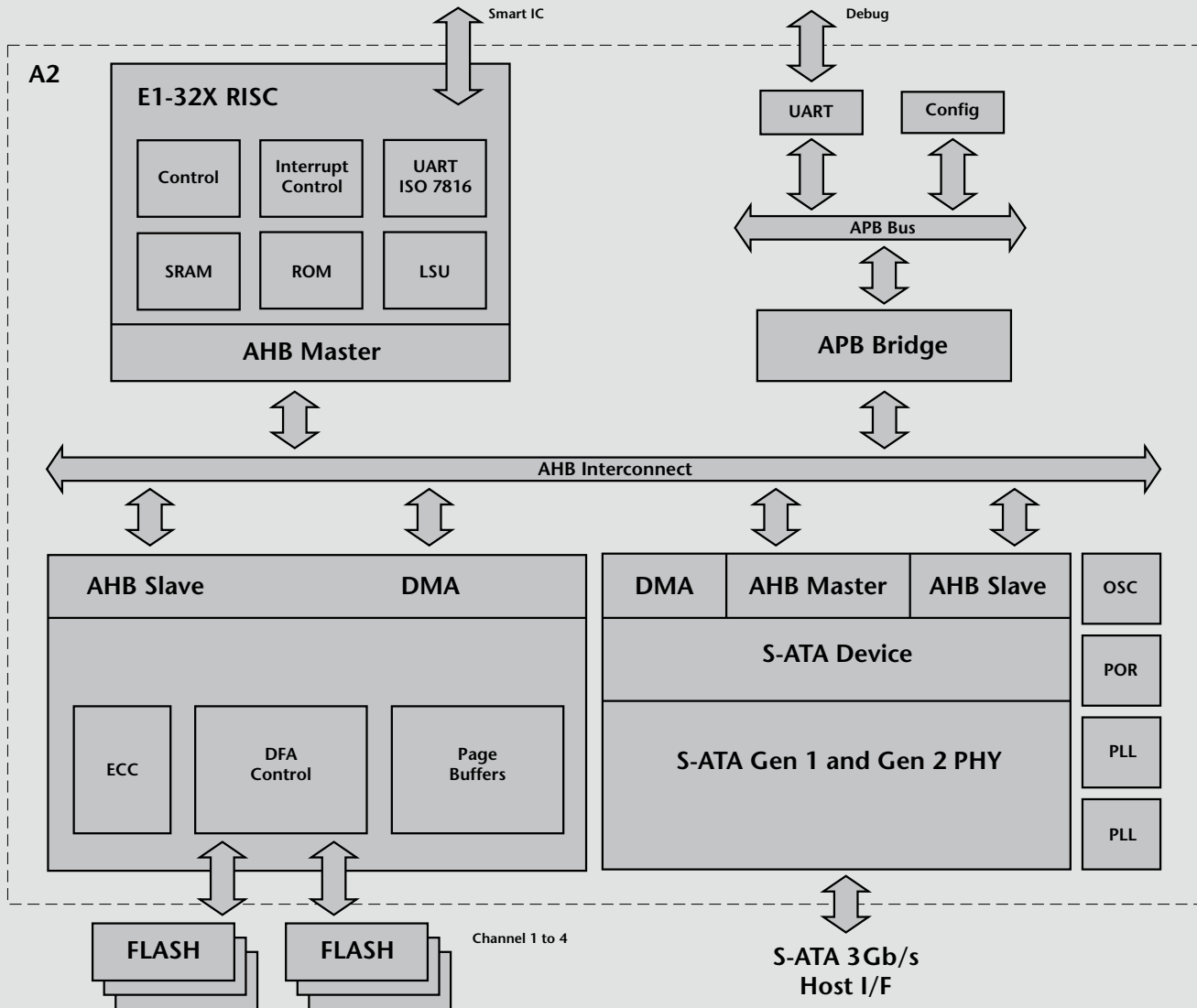
### Order Information

- A2-RAP08 --- TFBGA 201, 9×9×1.2 mm, 0.5 mm pitch, 32 CEs, RoHS, -40 to +85 °C
- A2-RAP09 --- TFBGA 201, 13×13×1.2 mm, 0.8 mm pitch, 32 CEs, RoHS, -40 to +85 °C
- A2-0ABD0 --- Tested Die/Wafer

### Compliance & Performance

- Fully compliant to Serial ATA 2.6 and CFast 1.1 specification
- Fully compliant to ATA-7 and compatible to ATA-8
- SATA partial and slumber power modes and CFast PHYSLP power modes supported
- Native Command Queuing (NCQ)
- Support for SMART Commands
- Up to 300 MB/sec burst transfer speed
- Sustained read up to 150 MB/s
- Sustained write up to 130 MB/s
- 4K random write IOPS: up to 600
- SATA Gen 1 (1.5 Gb/sec) and SATA Gen 2 (3.0 Gb/sec) transfer speeds supported
- Typical active current consumption of about 250mA
- SATA partial/slumber (~150mA) and CFast PHYSLP (~5mA) power modes supported

## A2 Block Diagram



## Controller & CPU

- High performance 32-Bit Hyperstone RISC microprocessor
- Large internal RAM provides firmware flexibility
- Eight GPIO pins for customer specific applications and ISO7816 interface for SmartCard applications
- Unique ID for security applications
- Typical active current consumption (@25°C and 100% utilization during stress test with 4x 3.3V Flashes) of about 250mA
- SATA partial/slumber (~150mA) and CFast PHYSLP (~5mA) power modes supported
- Supply voltage power-down detection for full power-down robustness
- Capacitor buffered power down and write recovery possible
- Supply voltage 1.2V and for Flash I/O: 1.8V or 3.3V
- Flash memory interface supply voltage 3.3V or 1.8V

## Host Interface & Compliance

- Fully compliant with Serial ATA 2.6
- Fully compliant with ATA-7, compatible to ATA-8
- Fully compliant with CFast-1.1
- SATA Gen 1 (1.5 Gb/sec) and SATA Gen 2 (3.0 Gb/sec) transfer speeds supported
- Up to 300 MB/sec burst transfer speed
- SATA partial and slumber power modes and CFast PHYSLP power mode supported
- Native Command Queuing (NCQ) support
- TRIM support
- LBA 48 support to design drives larger than 128GB

## Flash Memory Interface & Handling

- 4 channel with four direct flash memory access (DFA) units including sector buffers and interleaving capability

- Supporting all control signals for NAND type flash memory connection
- Asynchronous SDR interface, ONFI 1.0 compliant and compatible with ONFI 2.x.
- Supporting direct connection of up to 32 flash memory chip enables (CE) - eight per channel
- Flash memory power down logic and flash memory write protect control
- BCH Error Correcting Code (ECC) capable of correcting 6 or 8 Bit in a 512 bytes sector and 24 Bit in a 1024 bytes double-sector with additional CRC
- Supporting all flash technologies MLC and SLC and all page sizes up to 16 KB
- Flash management including mapping of logical block addresses (LBA) to corresponding physical block addresses (PBA)
- Bad Block Management
- Minimal Write Amplification
- Static and Global Wear leveling to maximize write endurance
- Inherent on-the-fly garbage collection
- Read Wear leveling 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 in NAND Flash and loaded into internal memory by the boot ROM
- Firmware can be stored redundantly for recovery and for periodic refresh
- Future Flashes can be supported by simple firmware upgrades
- Customized firmware, optimizations and feature implementations possible upon request



**Hyperstone GmbH**

Line-Eid-Strasse 3  
78467 Konstanz  
Germany  
Phone: +49 7531 980 30  
Fax: +49 7531 980 338  
Email: [info@hyperstone.de](mailto: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](mailto: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](mailto:taiwan@hyperstone.com)

[www.hyperstone.com](http://www.hyperstone.com)

Content is subject to change without prior notice. A2 is a trademark 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 unless part of a separate written contract.

HS-Mkt-AM-11-07-07