F9

hyperstone®

F9
Flash Memory Controller

The Hyperstone F9 family of Flash Memory Controllers together with provided application and 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.

- Designed to fully satisfy industrial reliability, endurance, 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 (FTL) offering second to none random write performance, minimal write amplification, and consequently highest endurance for random access heavy usage profiles
- Flexible 96-Bit/1K BCH ECC engine supporting all Flash Memory requirements
- Optimized 32-Bit RISC core, extended 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)

Targeted Applications
- High reliability & industrial Compact Flash™ Cards (CFC)
- IDE Disk-on-Module (DoM)
- Multi-Chip-Package (MCP)
- PCMCIA or ATA PC cards
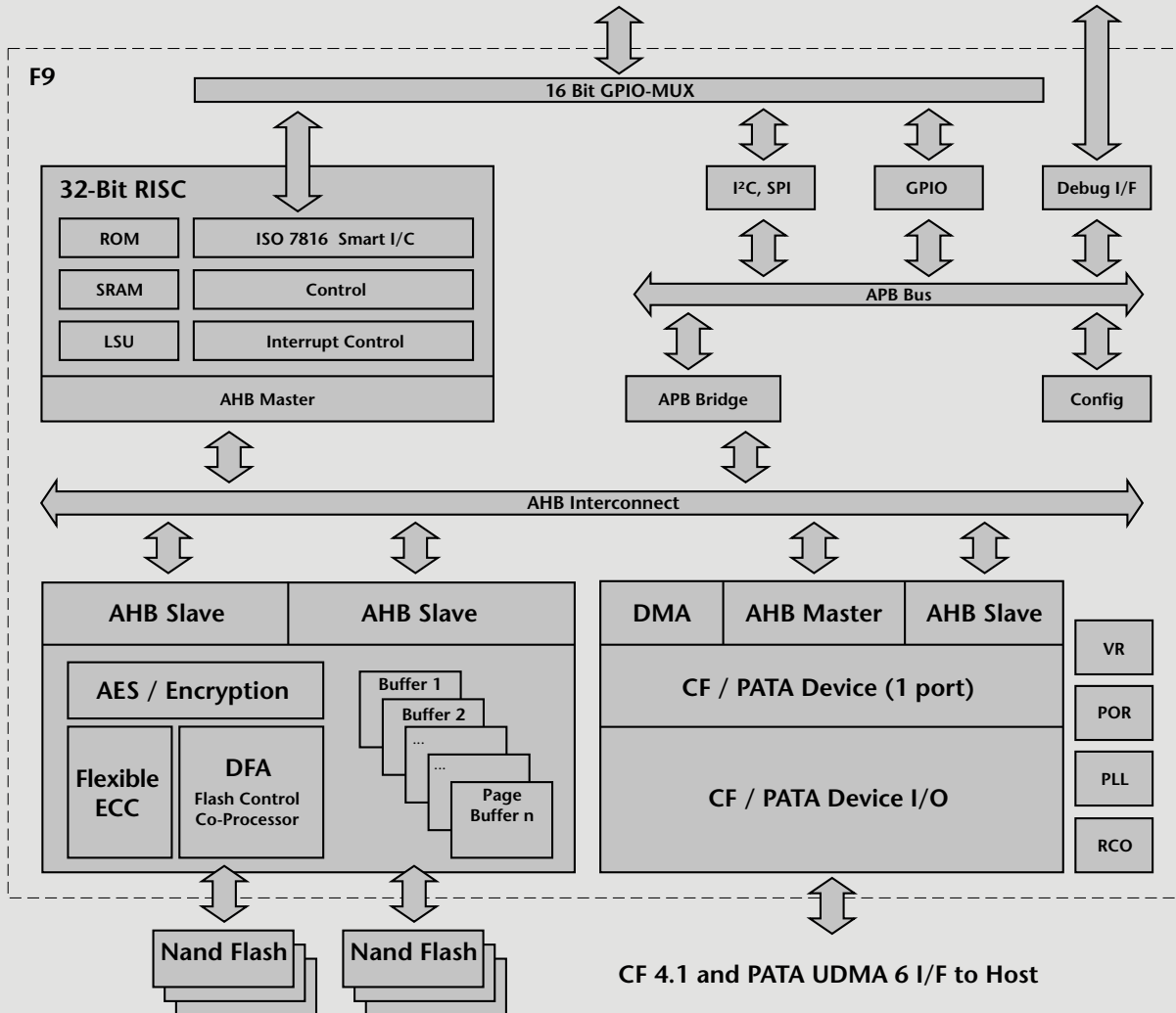- Embedded Flash – Disk-on-Board

Order Information
- F9-ILAT06 --- TQFP-128, 14x14x1.0mm, 8 CEs, RoHS, -40 to +85 °C
- F9-RAB07 --- TFBGA-144, 10.4x10.4x1.1mm, 16 CEs, 7816 UART, API, RoHS, -40 to +85 °C
- F9-RAB06 --- TFBGA-124, 9 x 9 x 1.2 mm, 8 CEs, RoHS, -40 to +85 °C
- F9-0ABD0 --- Tested Die / Wafer

Compliance & Performance
- Fully compliant with CompactFlash™ 4.1, 5.0 and compatible to 6.1 specifications
- Sequential read up to 120 MB/s
- Sequential write up to 120 MB/s
- Secure Erase and Sanitize support
- S.M.A.R.T. and health monitoring
- -40 to +85 °C industrial grade version

F9

16 Bit GPIO-MUX

32-Bit RISC

ROM	ISO 7816 Smart I/C
SRAM	Control
LSU	Interrupt Control

AHB Master

I²C, SPI	GPIO	Debug I/F

APB Bus

APB Bridge	Config

AHB Interconnect

AHB Slave	AHB Slave

AES / Encryption

Flexible ECC	**DFA** Flash Control Co-Processor

Buffer 1
Buffer 2
...
...
Page Buffer n

DMA	AHB Master	AHB Slave

CF / PATA Device (1 port)

CF / PATA Device I/O

VR
POR
PLL
RCO

Nand Flash

Nand Flash

CF 4.1 and PATA UDMA 6 I/F to Host

Controller & CPU

- High performance 32-Bit Hyperstone RISC microprocessor
- Large internal RAM provides firmware flexibility
- Multiplexed GPIO options include up to 16 and 12 GPIOs - SPI, I²C, 8x CE or ISO7816 - for Die and F9-RAB07, respectively
- Interface logic to connect an NTC thermistor as a temperature sensor
- 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 ± 5%
- Application Programming Interface (API) and Software Development Kit (SDK)

Host Interface & Compliance

- PC-Card 8.0 (PC-Card ATA), CF 6.1 standard compatible
- ATA-7 standard compatible in True-IDE mode
- Fast ATA host-to-buffer transfer rates supporting PIO mode 6, MDMA mode 4, UDMA mode 6 in True-IDE mode
- 5V tolerant host interface I/O
- Compatible to PCMCIA specification version 2.1
- Automatic sensing of PC-Card or True-IDE host interface mode
- Configurable as removable and fixed drive
- S.M.A.R.T., Sanitize, and Secure Erase support
- Configurable Early-Acknowledge to avoid any data loss during power fail support is possible

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) additional 8 CE multiplexed with GPIO
- Flash Memory power down logic and write protect control
- Supporting all Flash technologies including 3D Nand and pSLC modes
- 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 second to none random write performance, minimal write amplification, and consequently highest endurance for random access heavy usage profiles (e.g. JEDEC Enterprise)
- Optimized for fast boot-up times
- Bad Block Management
- Static, Dynamic and Global Wear leveling to maximize system write endurance
- Intelligent garbage collection
- Read Disturb Management and Dynamic Data Refresh to maximize data retention
- 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
- Secure erase, fast erase and secure TRIM
- Health-Monitoring and S.M.A.R.T. support
- Customized firmware, optimizations and feature implementations possible upon request.
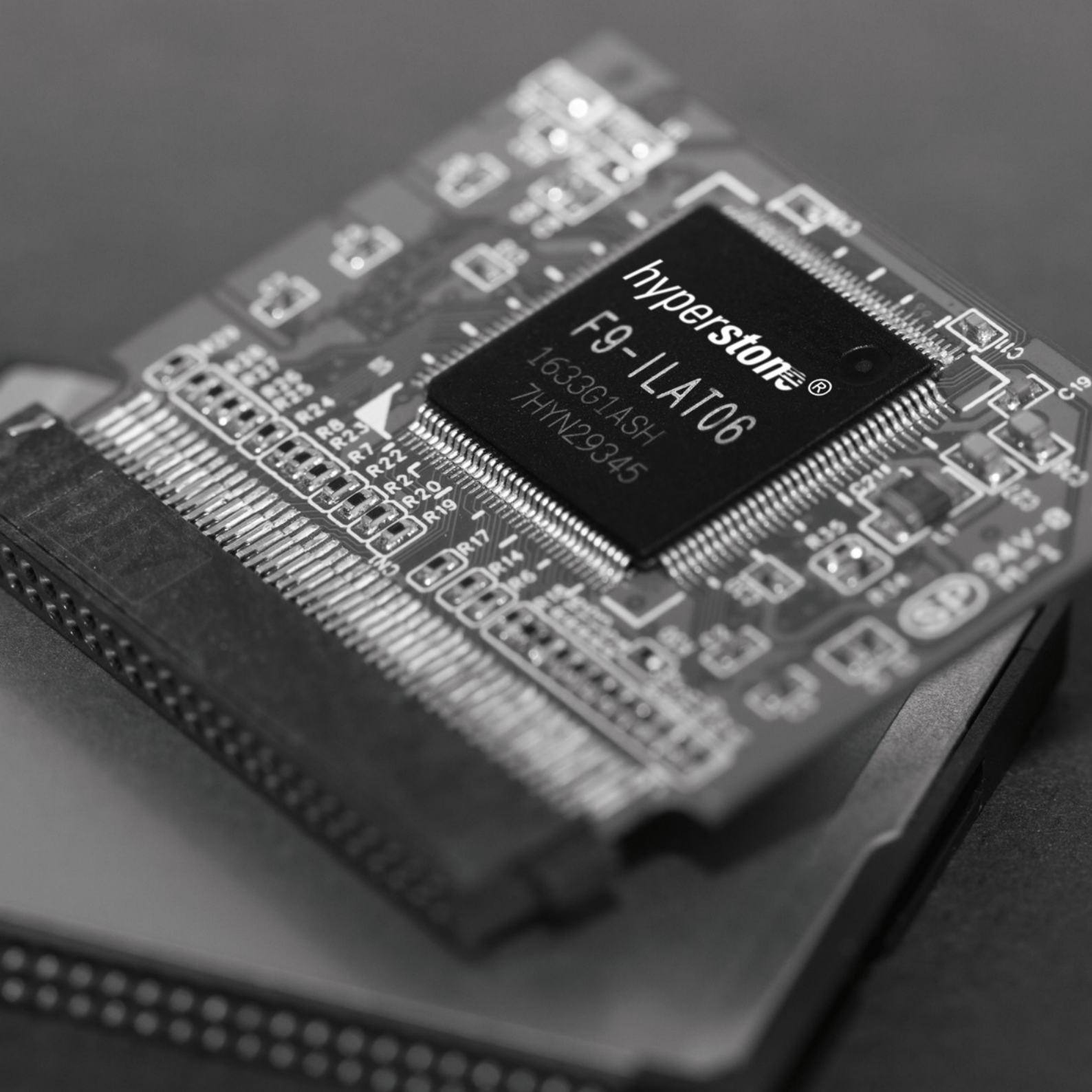
hyperston®

Hyperstone GmbH
Line-Eid-Strasse 3
78467 Konstanz
Germany
Phone: +49 7531 9803 0
Email: eu.sales@hyperstone.com

Hyperstone Inc. - USA
486 N Patterson Drive Suite 301
Winston-Salem, NC 27101
USA
Phone: +1 336 744 0724
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
Email: ap.sales@hyperstone.com

www.hyperstone.com