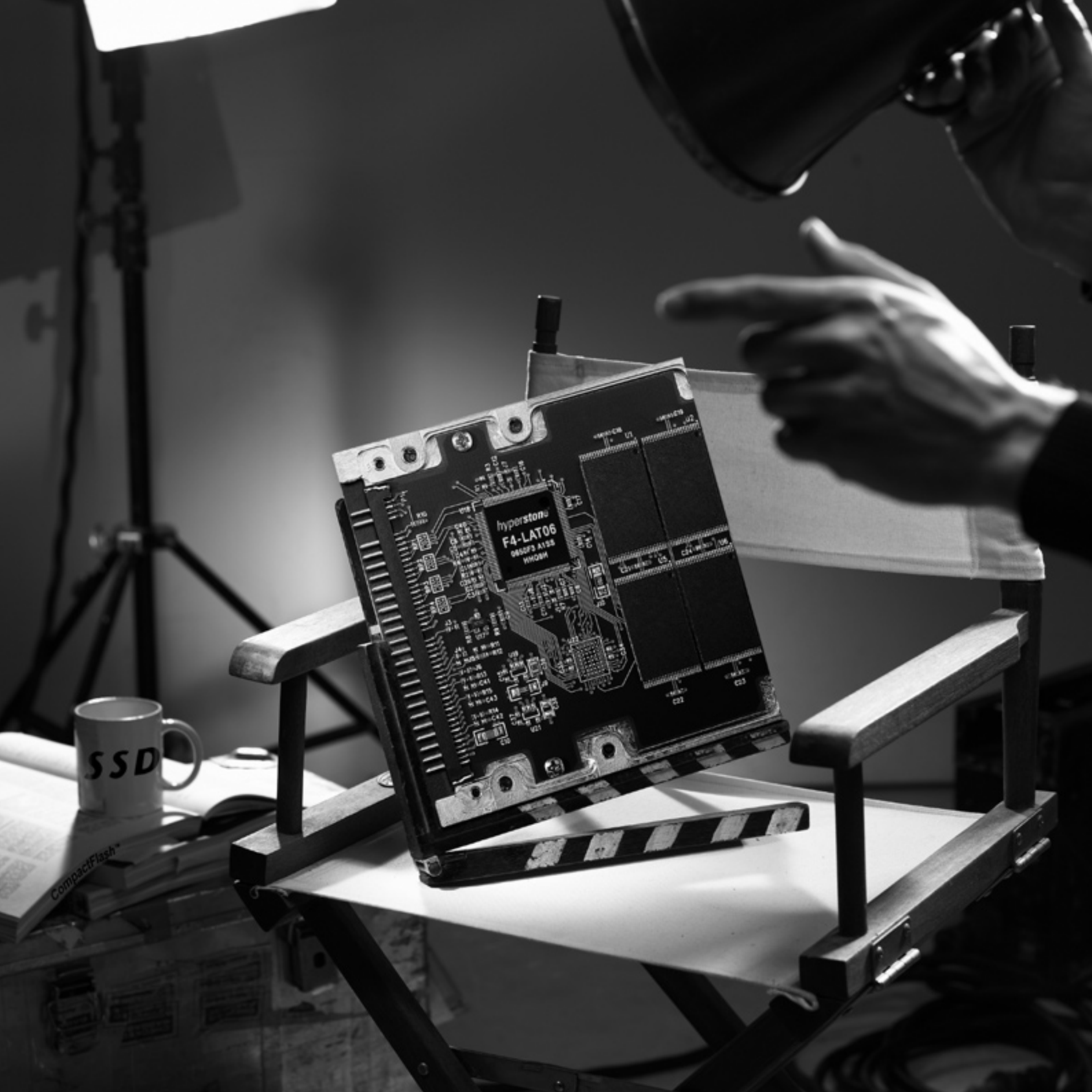
F4 Flash Memory Controller

F4

hyperstone®


hyperstone
F4-LAT06
SSD
CompactFlash

F4

Flash Memory Controller

The Hyperstone F4 family of Flash Memory Controllers together with provided application and flash specific firmware offers an easy-to-use turnkey platform for high endurance flash disks of various form factors and interface standards.

- **Patented superior wear leveling together with ECC ensuring highest reliability and endurance**
- **Optimized 32-Bit RISC core, instruction set and firmware for flash handling**
- **Dual channel controller provides optimal performance**
- **Most power efficient design together with power saving features**
- **S.M.A.R.T. and custom features possible with simple firmware upgrades**
- **ASSP with no need for external active components**
- **Exceptional power fail robustness**
- **Turnkey solution including firmware, manufacturing kit, test and development hardware, and reference schematics for a CF card or 2.5" solid state disk, and testmetrix log files**

Targeted Applications

- High reliability & industrial CompactFlash™ Cards (CFC)
- Solid State Disks (SSD)
- IDE Disk-on-Modules (DoM)
- Embedded Flash
- Multi-Chip-Modules (MCM)
- Multi-Chip-Package (MCP)
- PCMCIA or ATA PC cards
- Disk-on-Board

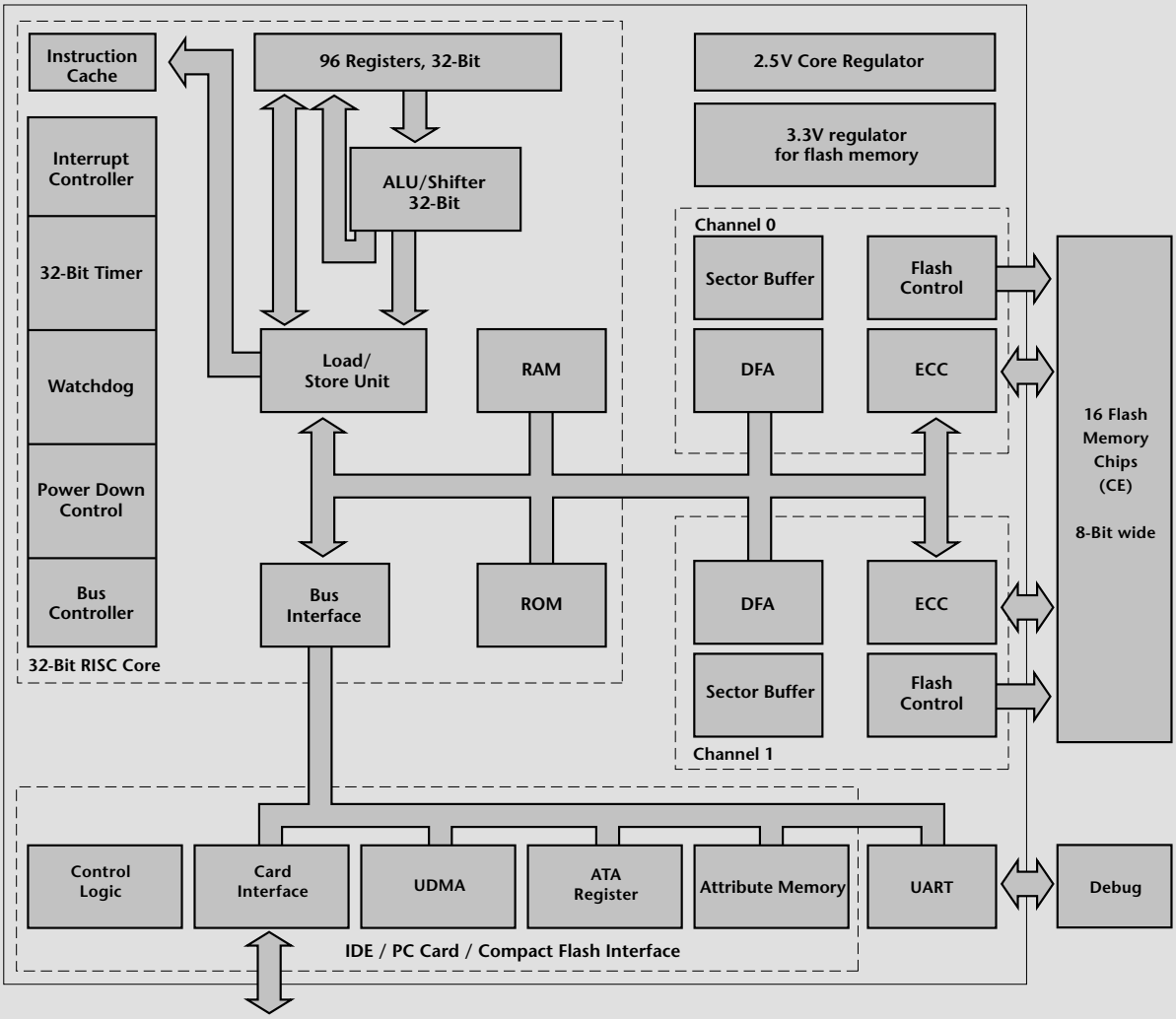
Order Information

- F4-LAT05 --- TQFP 100, 8 CEs, RoHS, 0 to +85 °C
- F4-ILAT05 --- TQFP 100, 8 CEs, RoHS, -40 to +85 °C
- F4-LAT06 --- TQFP 128, 16 CEs, RoHS, 0 to +85 °C
- F4-ILAT06 --- TQFP 128, 16 CEs, RoHS, -40 to +85 °C
- F4-0ABD0 --- KGD / Wafer, 16 CEs

Compliance & Performance

- Fully compliant to CompactFlash™ 3.0 and compatible to 4.1 specifications
- Fast ATA supporting PIO mode 6, MDMA mode 4, UDMA mode 4 in True-IDE mode
- PCMCIA specification version 2.1
- Configurable as removable, hot swappable, and fixed drive
- Sustained read up to 50 MB/s
- Sustained write up to 40 MB/s with interleaving
- Random read up to 40 MB/s
- Random write up to 9 MB/s
- Custom optimizations for specified file sizes possible
- Data transfer rate to flash memories: up to 80 MB/s
- Host data transfer rate in PIO mode 6 or MDMA mode 4 up to 25 MB/s
- Host data transfer rate in UDMA mode 4 up to 66 MB/s

F4 Block Diagram



Controller & CPU

- High performance 32-Bit Hyperstone RISC microprocessor
- 10 to 70 MHz clock frequency using adjustable internal oscillator
- Large internal RAM provides firmware flexibility
- Automatic power-down during wait periods, power saving incl. automatic wake-up and sleep mode with Icc < 250 µA
- Supply voltage 5.0V ± 10 % or 3.3V ± 10%
- On-chip voltage regulator for 3.3V flash power supply
- On-chip voltage regulator for 2.5V core power supply
- Internal voltage detector

Host Interface & Compliance

- Fully compliant to CompactFlashTM 3.0 and compatible to 4.1 specifications
- Fast ATA host-to-buffer transfer rates supporting PIO mode 6, MDMA mode 4, UDMA mode 4 in True-IDE mode
- PCMCIA specification version 2.1
- Configurable as removable, hot swappable, and fixed drive
- Memory mapped or I/O operation
- Automatic sensing of PCMCIA or True-IDE mode
- Four integrated sector buffers and PCMCIA attribute memory
- PCMCIA configuration option register, card configuration and status register and pin replacement register support

Flash Memory Interface & Handling

- Dual channel with two direct flash memory access (DFA) units
- Supporting all control signals for NAND type flash memory connection
- Supporting direct connection of up to 16 flash memory chip enables (CE) - eight per channel
- Flash memory power down logic and flash memory write protect control
- Error Correcting Code (ECC) capable of correcting 4 symbols in a 512 Bytes sector with additional CRC
- Supporting all flashes and technologies MLC and SLC
- Firmware storage in flash memory
- Firmware is loaded into internal memory by the boot ROM
- Flash management including mapping of logical block addresses (LBA) to corresponding physical block addresses (PBA)
- Bad Block Management
- Wear leveling
- Sudden power-fail management
- Interleaving, cache, and multi-plane programming

…and much more

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 Ave 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, TidingBlvd.
Neihu District, Taipei City 114
Taiwan, R.O.C.
Phone: +886 2 8751 0203
Email: ap.sales@hyperstone.com

www.hyperstone.com

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