SD Flash Interface

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Goal

- Store real time data in a compact removable media format from an embedded application

Requirements

- Physically compact
- Large storage capacity
- Low power
- Non-volatile
- Removable
- Readable by standard PC
- Simple interface to an embedded controller
- Forth-compatible

Solution

- Embedded file systems in silicon by DOSonCHIP

- Chip, module ($40), and development kits ($80) available

- http://chipdos.com/index.htm
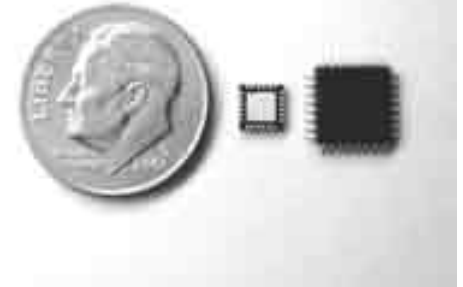
Chip

- The DOSonCHIP CD17B10 is a miniSD/SD/MMC card controller with an integrated PC compatible file system. This chip offers customers the lowest cost, lowest power, and smallest footprint solution, enabling a wide range of applications. Containing a complete FAT file system stack and media card physical interface, this all-in-one chip enables quick design-in to add removable mass data storage to your product.

- In addition, the CD17B10 can make your existing products more powerful without needing to add the complexity of an OS. Using simple, straight-forward commands, large databases and/or media files can be easily accessed as well as long-term data logging and in-the-field firmware updates - all utilizing PC compatible files.

Module

- The DOSonCHIP SD/MMC Module integrates the CD17B10 silicon and SD/MMC socket onto a simple drop-in module that is easily added to an embedded design. This module has a small 1.2" x 1.6" footprint as it mounts the CD17B10 and its components under the SD/MMC socket. All the features of the CD17B10 are available.

Typical Applications

- Data Logging
- Mobile GPS Database Storage
- Audio/Video File Storage
- FPGA Configuration Storage
- Portable Consumer Electronics
- Toys

Module Innovative Features

- About the size of an SD/MMC socket (1.2" x 1.6")

- 0.1" spaced I/O pins for protoboard / header compatibility

- Integrated real-time clock for current date & time and file-stamping

- Integrated intelligent data parsing to simplify/reduce host code (available soon)

- Future-proof with in-system firmware updates via UART

- Small enough to mount under many SD/MMC sockets to further reduce PCB space

- Consumes only 5mA (typical) in active mode; < 0.1µA in shut down mode

Module Features - 1

- Quality push-eject SD/MMC socket

- Integrated real-time clock (time & date)
  - High quality 32.768KHz watch crystal

- Low power consumption
  - 2.7V to 3.3V operation
  - 5V tolerant I/O
  - Active current 5mA @ 3.3V (typical)
  - Shutdown current < 0.1µA

Module Features - 2

- Host Interface
  - UART with autobaud detection (1200 – 230400)
  - SPI bus
  - I2C / SMB bus (planned)
- File System
  - FAT32 & FAT16 compatible
  - 4 simultaneous files open
  - Terse command set for data traffic reduction
- Physical Dimensions
  - 1.2" x 1.6" footprint
  - 0.1" spaced male header pins
  - 0.235" length header pins

Development Kit Features - 1

- The Development Kit provides a ready-to-go environment for testing and evaluating the DOSonCHIP SD/MMC Module and the CD17B10 Silicon. The development kit provides a level-shifted serial RS232 interface that is ready to connect to a PC for use with Windows' built-in HyperTerminal software.

- Using HyperTerminal, one can quickly type in commands to evaluate the module. In addition, new firmware upgrades can be easily downloaded using HyperTerminal's "Send File" command.

Development Kit Features - 2

- The Development Kit also provides external headers / jumpers to each of the the DOSONCHIP-SD signals including the RS232 port, SPI port, I2C/SM bus, reset and mode pins, card write protect, and card detect. In addition, there is a reset switch and an LED connected to the DIR line to quickly see the I/O state of the CD17B10.

- The entire development kit can be powered by a 9V battery, or optionally connect an external power supply that provides anywhere from 4.5V to 12V.

- The DOSonCHIP SD/MMC module can be removed and placed in your own application, obviating the need to purchase a module separately.

Date and Time

- Decimal formatted

- 48:22:03:12:07 is equivalent to December 3, 2007 10:48pm

- Set and read time

- Date and time lost on power-down or reset

Files

- Supports 8.3 file name format

- Subdirectories supported

- 4 open files at a time

File Commands

- Change directory
- Make directory
- File information (date & time modified, size, path)
- Open existing file for read operations
- Open new or existing file for write operations
- Read bytes from file
- Write bytes to file
- Update file pointer
- Quit or close file
- Delete file or empty directory

Other Commands

- Set numeric representation to decimal or hex
- Turn echo on or off
- Sleep
- Turn time off or on
- Set or get time and date

Development Plans

- Test Development Kit with HyperTerminal
- In Forth on a laptop:
  - Establish RS232 connection
  - Implement and test all functions
- In Forth on a ForthStamp:
  - Move code to ForthStamp
  - Test all functions
- Get rid of Development Kit:
  - Use TTL serial
  - Use SD Micro socket