M5705 : DVD-ROM Controller with Embedded Microprocessor

INTRODUCTION

The M5705 is ALi's high-integration solution for DVD-player systems. It includes microcontroller, DVD-Decoder, CD/CD-ROM Decoder, RAM buffer I/F, microcontroller I/F, ATAPI I/F, data channel and digital servo controller. The M5705 can support up to 32X CD-ROM and 6X DVD-ROM systems. This highly integrated chip can playback not only the standard format of DVD-ROM and DVD-R disk, but also all the various CD-ROM disk types such as CD-DA, VCD, CDI, Photo CD, Karaoke CD, CD-plus, Enhanced CD, CD-R etc. The M5705 can be configured with an RF signal processor (for example, the M5703 or M5707), audio DAC, RAM buffer, and motor drivers to create a DVD-ROM system (refer to the following figure). It also integrates MPEG-2 interface (or so-called local bus) and can be designed into an ATAPI based or local bus based DVD player easily.

The M5705 decoder blocks are highly automatic that system maker just needs a little effort to control the data transfer flow. It decreases the complexity and the size of the firmware. These automatic features include : (1) Automatic error handling procedure : When errors occur, the hardware will turn off the related blocks and adjust pointers automatically. Firmware does not have to take care of all these activities. (2) Auto count target :The hardware will calculate the re-seek Q-code/ID of the target automatically. (3) Hardware will execute some ATAPI protocols automatically to reduce the firmware loading.

The M5705 supports realtime CD-ROM C1/C2/C3 ECC and DVD ECC error correction.

The M5705's digital servo implements the focus, tracking, sledge and spindle servo loop. It also provides an auto-adjustment method. Based on this chip, system manufacturers can design adjustment-free CD/DVD systems easily. The M5705 also provides a stable layer jump solution for reading data from dual layer DVD discs. This feature makes the playback go smoothly even at the point of layer change.

The M5705 includes an embedded microcontroller which is compatible with Intel 8032. And it also provides external microcontroller interface for customers to evaluate or develop the DVD-player system easily with M5705. The external microcontroller interface supports a variety of microcontrollers, such as those of Intel's and Motorola's. The M5705 supports automatic system firmware download function that system user can upgrade the system firmware directly from ATA interface or CD-R discs recorded with new version firmware. And even for a raw flash ROM on system that has no firmware code in it, user can directly download the firmware by specific command procedure through ATAPI interface.

The ATA interface can transfer data in Programmed I/O (PIO), and DMA mode. And the local bus signals for directly connecting to MPEG decoder share the pins with ATA interface.

The buffer memory is implemented with DRAM device. Both EDO and SDRAM can be used. The buffer manager is programmable to provide all of the necessary address and control signals for DRAM devices of varying access times and memory configurations. The RAM buffer interface has a 16-bit data bus and up to 16M bits of DRAM can be directly addressed by the M5705.

The package of the M5705 is 208-pin PQFP or 176-pin LQFP. And the 208-pin package can be configured to be pin-to-pin compatible with previous generation M5701.

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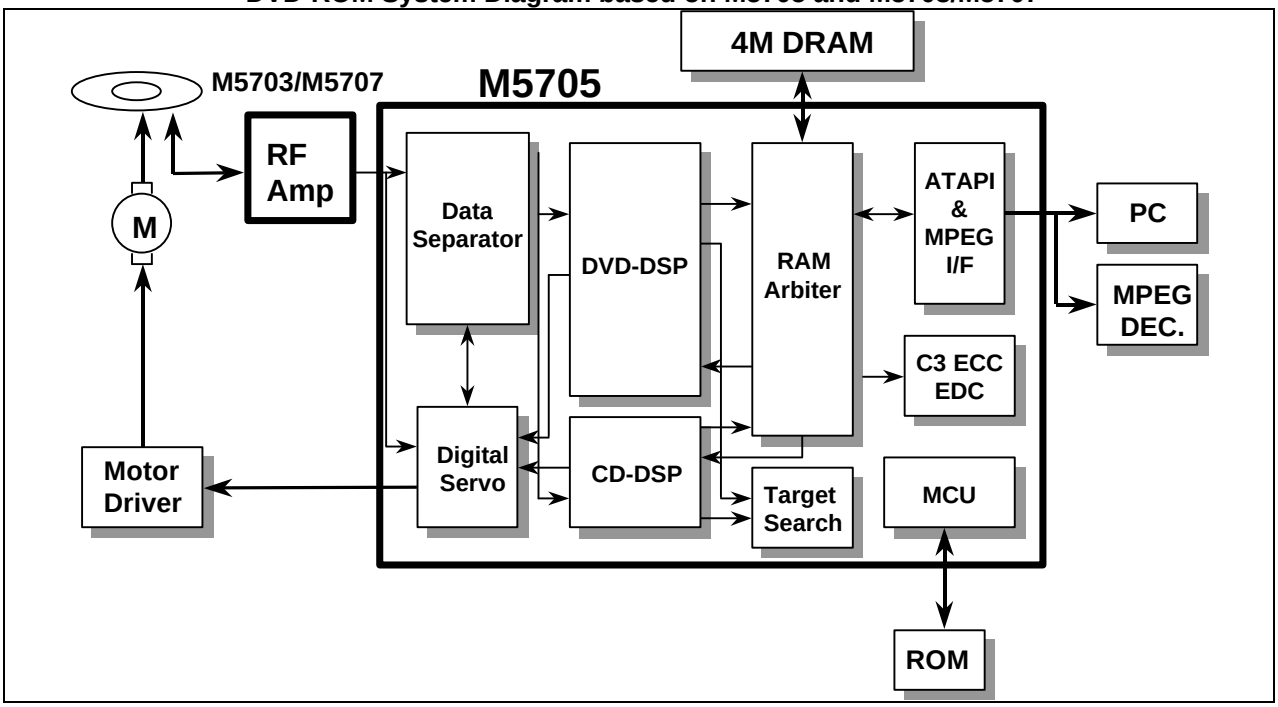
DVD-ROM System Diagram based on M5705 and M5703/M5707



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Features List

Data Separator

- **Built-in data slicer and data PLL for data recovery from RF signal.**
- **Supports digital/analog slice level adjustment.**
- **Built-in auto calibration function.**
- **Built-in auto wire range control function.**

DVD-DSP

- **Built-in synchronous pattern/ID detection /protection/separation.**
- **Built-in EFM+ (8 to 16) demodulation circuit.**
- **Built-in high performance RSPC ECC circuit.**
- **Supports up to 6X DVD-ROM system with ECC correcting "on the fly".**
- **Built-in descrambler/EDC circuit.**

CD-DSP

- **Synchronous pattern detection, protection and interpolation.**
- **Built-in EFM demodulation circuit, subcode demodulation circuit.**
- **Dual C1 correction and quadrule C2 correction.**
- **Subcode Q data can output with audio data synchronously.**

Digital Servo

- **Built-in A/D and D/A converters for servo control signals processing.**
- **Built-in digital controller for focus, tracking servo control of CD/DVD systems.**
- **Built-in CLV/CAV auxiliary function for spindle servo control.**
- **Built-in "Seek Sensor" auxiliary circuit for seek control.**
- **Automatic adjustment of focus servo and tracking servo, for loop gain, offset and balance.**
- **Built-in RF gain automatic adjustment function.**
- **Built-in AFC circuit and APC circuit for CLV and AFC circuit for CAV spindle servo of CD/DVD systems.**
- **Built-in defect and shock protection function.**

DRAM Interface

- **Supports up to 16 Mb EDO DRAM and SDRAM.**
- **Separate buffer address pointers and automatic address calculation that save firmware effort.**
- **Read-ahead cache scheme for multimedia isochronous transfer.**
- **Protection logic preventing uncorrected sectors being released to the host.**

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Target Search

- **Built-in target sector searching circuit for auto-searching the target sector.**
- **Automatic data buffering after the target sector has been located.**

C3 ECC/EDC

- **Programmable Reed-Solomon Product Code (RSPC) that allows different error correction schemes for CD-ROM.**
- **Built-in On-chip EDC function.**
- **Support up to 32X CD-ROM system with ECC correcting "on the fly".**

Host Interface

- **Supports ATA PIO mode 4 timing**
- **Supports Multiword DMA mode 2 timing**
- **Compliant with SFF-8020(ATAPI) 2.5, ATA 3(Overlapping feature), and SFF-8090 (ATAPI for DVD) standard**
- **High current drivers with slew rate control for direct connecting to the ATA bus and noise immunity.**
- **Automatic Read Control Circuit for host data transfer.**
- **Automatic wake up from power down on host reset or command write**
- **Automatic sequence for packet command receiving and Automatic updating of the host task file registers**
- **Supports ATAPI write command that can let user update firmware from PC.**
- **Built-in authentication circuit for copy protection.**
- **Multiplexed MPEG decoder interface (local bus).**

Microcontroller Interface

- **Embedded microcontroller compatible with Intel 8032 command set**
- **Supports Intel 8032 series, Motorola MCUs, and the two stage (indexing) access method that fits most MCUs**
- **Supports automatically download firmware function directly from ATAPI interface to flash memory**
- **Supports "on-system" upgrade flash memory function from CD-R discs or ATAPI interface**
- **High speed register (buffer RAM) access to meet the requirement of high performance system**
- **Supports Direct mapped access to the buffer RAM using ready bit handshaking**

Packaging

- **208-pin PQFP or 176-pin LQFP**

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