AK8702

HIGH SPEED MAGNETO-OPTICAL DISK CONTROLLER LSI

AK8702 is a single chip LSI device containing a SCSI block, full hardware "on-the-fly" error correction and detection block, a buffer manager and a DRAM controller for magneto-optical drives. The device supports data field requirements of the 90 and 130mm magneto-optical standards up to 4X.

The ECC capability and the efficient data manager enable the AK8702 to support data rates up to 6.66 MBytes/sec or 53.33 Mbps at the disk channel considering the non-data overheard required. Power down modes are included to lower system power requirements.

A command processor within the disk interface allows automation on disk operations, such as multiple sector reads and writes. The SCSI processor within the device emulates industry standard 53CF96 logic with minor exceptions. ECC processing is accomplished within the two internal FIFOs increasing buffer bandwidth and reducing on-the-fly correction time.

Request the AK8702 Product Specification for complete details

FEATURES

DISK FORMATS SUPPORTED
- 90mm optical disk 512-byte and 1024-byte sector formats
- 130mm optical disk 512-byte and 1024-byte sector formats

DRIVE INTERFACE
- 8-bit parallel data bus with parity option
- Sector boundary synchronization check function

HIGH SPEED REED-SOLOMON ENCODING/DECODING
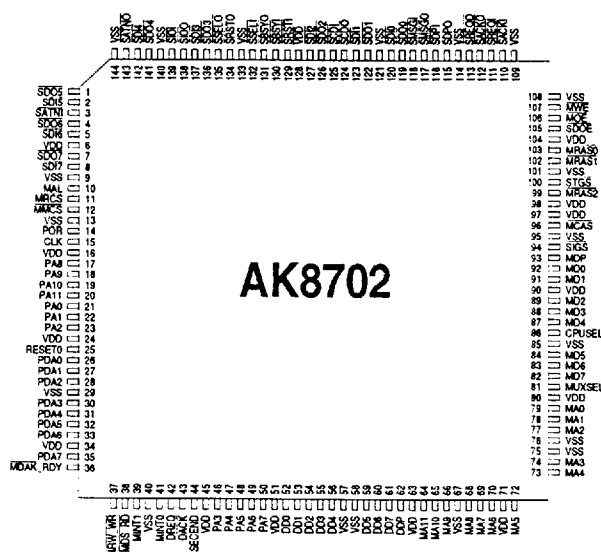- Error correction of 8 bytes/interleave:
  Maximum 40 errors/sector for 512-byte sector formats
  Maximum 80 errors/sector for 1024-byte sector formats
- On-the-fly hardware error correction of up to 6600 sectors/sec (@1024 bytes/sector) with maximum number of errors

SCSI INTERFACE
- Complies with ANSI SCSI-1 and SCSI-2 standards
- Connects directly to single ended SCSI bus with built-in 48mA drivers
- Connectable to differential SCSI busses
- Supports 10 MBytes/sec Fast-SCSI synchronous transfers
- Maximum possible asynchronous data rate 5 MBytes/sec
- Integrated command set with internal DMA controller and ring buffer manager
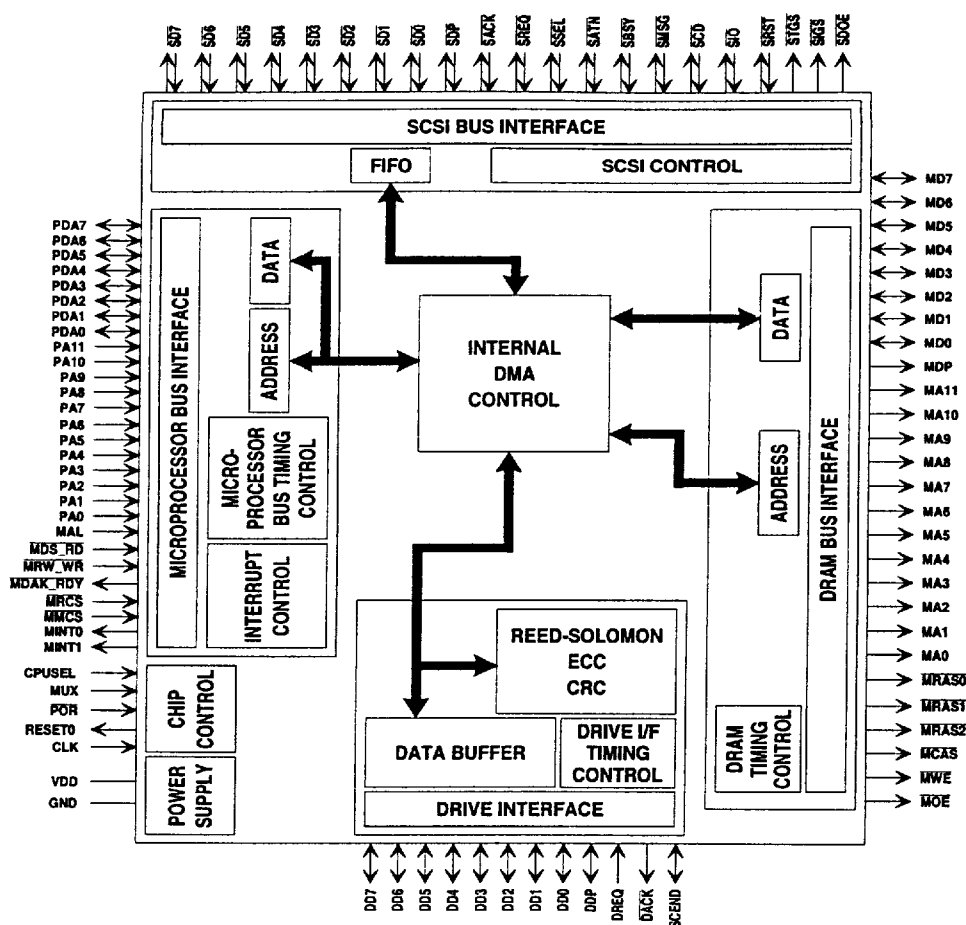
DRAM INTERFACE
- Supports up to 16 MBytes of DRAM
- Generation of refresh signals
- Support of x4, x8, x9 bit DRAM configurations
- Ring buffer manager with full/empty warning/abort
- Off-line buffer copy/compare function
- DRAM parity generation/check

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Figure 1:: Block Diagram

FUNCTIONAL DESCRIPTION

AK8702 contains several programmable functional blocks which work together to automate various disk and SCSI operations.

SCSI

The SCSI interface complies to ANSI standard X3.131-1986 as well as the X3.131-199X (SCSI-2) standards. All SCSI operations are performed according to commands from the external microprocessor. It is possible to efficiently implement all functions required by the two standards.

All commands requiring data transfers can be programmed to either transfer data between the SCSI bus and the buffer DRAM, or between the SCSI bus and the microprocessor via the FIFO register. Data transfers between the SCSI bus and the buffer DRAM can be performed in parallel and independent of the drive interface. Also, by utilizing the ring buffer management function, it is possible to make the AK8702 responsible for

synchronizing the drive and SCSI processes. The device supports Fast-SCSI 10 MBytes/sec data transfers as well as normal SCSI 5 MBytes/sec synchronous transfers (both requiring 20 MHz clock). Depending on cable loading and proper termination, 5 MBytes/sec transfers may be achieved in asynchronous transfers.

AK8702 can be directly connected to a single ended 8-bit wide SCSI bus. It is possible to connect it to a differential 8-bit SCSI bus by adding some glue logic and external differential transceivers controlled by on-chip signals.

DRIVE INTERFACE

The drive interface block performs data transfers between DRAM, the drive (ENDEC/ FORMATTER), and the necessary error correction/ detection. See Figure 2 for a block diagram.

RING BUFFER MANAGER

AK8702 includes a powerful Ring Buffer Manager block. By utilizing the features of this block it is possible to transfer data efficiently with minimum intervention from the microprocessor. An auto abort feature is supported as well as Drive DMA and SCSI DMAs are synchronized.

ABORT

AK8702 supports features for prematurely stopping data transfers of SCSI and Drive interfaces. When an error occurs at the SCSI interface, Drive interface or Ring Buffer management, the device can stop data transfers immediately. This function is user programmable.

DRAM INTERFACE

The AK8702 can address up to 16 MBytes of DRAM with an internal DMA controller and may be configurable for 256K, 512K, 1M, 2M, 4M, 8M and 16M of DRAMs.

MICROPROCESSOR INTERFACE

All registers in the AK8702 can be accessed by an external microprocessor. These control, status and interrupt registers are accessible by common Intel and Motorola type microprocessor interfaces. Both multiplexed bus and separate address and data bus interfaces are supported. Microprocessor may access DRAM data via a special window enable.

LOW POWER MODES

The AK8702 can be placed in low power consumption mode. When the AK8702 enters low power mode, the AK8702 divides down its internal clock by 1/32.

In low power mode, the AK8702 continues to monitor the SCSI bus activities and responds to Bus initiated Selection/Reselection as defined in the SCSI protocol. The DRAM interface adjusts the refresh cycles accordingly. If retention of DRAM data is not necessary, DRAM refreshes can be disabled in order to further save power.

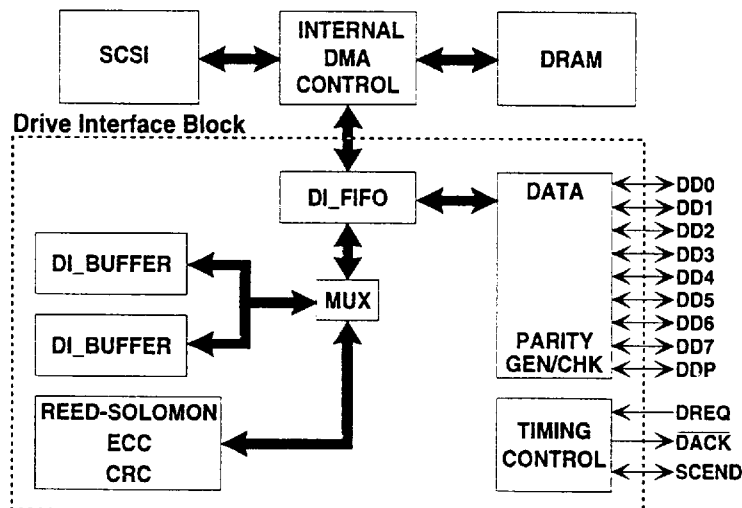Microprocessor may continue to access the registers as in normal operation.

RESET

The AK8702 supports four levels of resets.
   1)Hardware reset
   2)Software reset
   3)Block command reset
   4)SCSI reset

Figure 2::   Drive Interface Block

REGISTER MAP

<table>
<tr><th colspan="2"></th><th>ADDRESS</th><th>DESCRIPTION</th></tr>
<tr><td rowspan="11"></td><td rowspan="10">BUFFER MANAGER</td><td>0x00-0x01</td><td>DRAM I/F Configuration</td></tr>
<tr><td>0x02</td><td>DRAM Refresh Count</td></tr>
<tr><td>0x03</td><td>DMA Schedule</td></tr>
<tr><td>0x04-0x05</td><td>Drive I/F Configuration</td></tr>
<tr><td>0x06-0x09</td><td>Ring Buffer Limits</td></tr>
<tr><td>0x0A-0x0D</td><td>Ring Buffer Threshold</td></tr>
<tr><td>0x0E-0x0F</td><td>Ring Buffer Count</td></tr>
<tr><td>0x10-0x15</td><td>SCSI Active and Prearm Counts</td></tr>
<tr><td>0x16-0x18</td><td>Microprocessor DMA Address</td></tr>
<tr><td>0x19-0x1D</td><td>Drive I/F Active and Prearm Counts</td></tr>
<tr><td>0x1E-0x20</td><td>Control/VU Active and Prearm Counts</td></tr>
<tr><td rowspan="4">DRIVE INTERFACE</td><td>0x21</td><td>Drive Active and Prearm Sub Command</td></tr>
<tr><td>0x22-0x23</td><td>Drive Interface Command and Control</td></tr>
<tr><td>0x24-0x26</td><td>ECC Error Count, Threshold and Interrupt</td></tr>
<tr><td>0x27-0x28</td><td>Interrupts</td></tr>
<tr><td colspan="2">MICROPROCESSOR</td><td>0x2A-0x2B</td><td>Microprocessor Control and Data</td></tr>
<tr><td colspan="2">SCSI</td><td>0x31-0x3C</td><td>SCSI Control, Interrupts and Test</td></tr>
<tr><td colspan="2">GENERAL</td><td>0x3F</td><td>Full Power Select</td></tr>
</table>

ORDERING INFORMATION

PART NUMBER	DESCRIPTION
AK8702	High Speed Magneto-Optical Disk Controller LSI

RELATED TECHNICAL PUBLICATIONS

DOCUMENT #	DESCRIPTION
AK8702	AK8702 Product Specification
GLGEN1	General Glossary of Terms

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