

FEATURES

■ General

- Single-chip integration of CD-ROM decoder, CD-ROM encoder, CIRC encoder, EFM modulator, ATIP decoder, buffer manager, and ATAPI or SCSI-2 interface logic
- Highly automated, high-performance CD-recordable formatter
- High-performance CD-ROM decoder
- Designed for easy and efficient firmware programming
- Level-1 and -2 SCAM protocol (*CL-CR3560*)
- Fully compatible with the ATAPI specification SFF-8020 (*CL-CH3460*)
- Low-power, highly efficient 0.5-micron CMOS technology
- Automatic power-down on interfaces when idle
- 128-pin QFP package

■ CD-ROM Decoder

- Supports Sony-Philips® CD-ROM, CD-I, and CD-DA™ (CD-digital audio) formats
- Supports various compact disc DSP (digital signal processor) controllers
 - Supports disc speeds up to 25-MHz MCLK
- High-performance up to 18x speed
- Supports programmable pseudo-sync-mark insertion for CD-ROM sector synchronization
- Supports automatic target sector header search for CD ROM
- Sector header validity check is done by hardware during data transfer
- Supports realtime subcode R-W correction in CD-DA™ mode

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ATAPI/SCSI CD-Recordable Encoder/Decoder

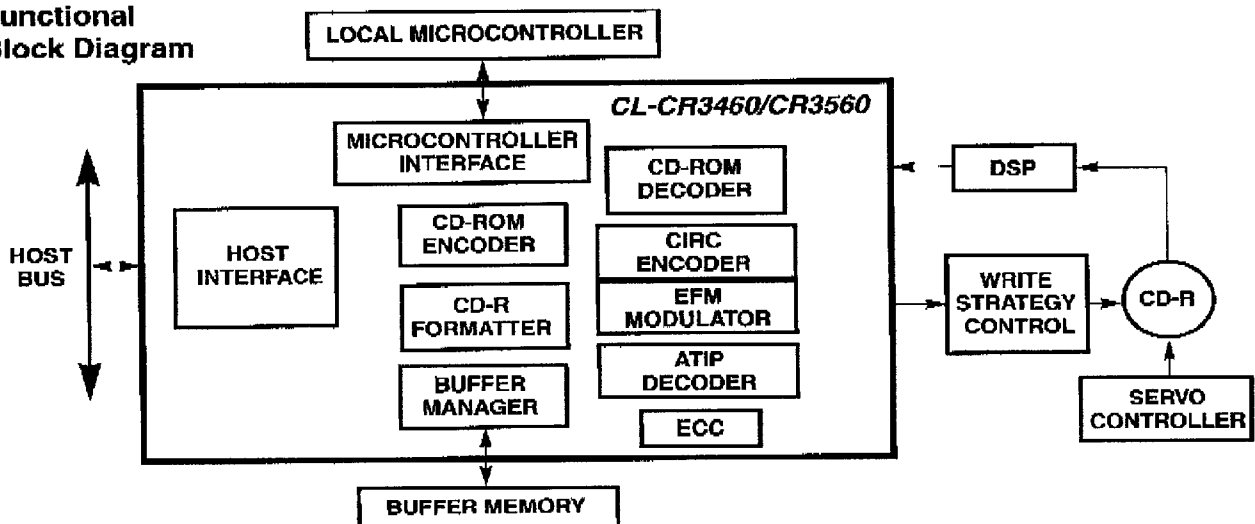
OVERVIEW

The CL-CR3460 and CL-CR3560 are single-chip, high-performance, highly-integrated ATAPI and SCSI interface devices for the CD-R/E (CD-Recordable and CD-Erasable) market. The CL-CR3460/CR3560 integrate a CD-ROM decoder, CIRC encoder, EFM modulation, ATIP decoder, buffer manager, and their respective interface logic (ATAPI or SCSI).

The CL-CR3460/CR3560 support up to 18x read and 8x record disc speeds, allowing customers to preserve all CD-R/E encode/decode electronics and firmware as the disc speed requirements increase. All write methods are supported by the CL-CR3460/CR3560: disc-at-once, track-at-once, packet recording, and multi-session-at-once. These devices incorporate the most comprehensive error correction available in the industry,

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Functional Block Diagram



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FEATURES (cont.)■ **CD-ROM Decoder** (cont.)

- Realtime CD-ROM layered ECC error correction with programmable number of sets of P/Q-word corrections per sector (up to 64 total)
- Automated CD-R packet disc read Method-1 and -2

■ **CD-ROM Encoder**

- Supports all write methods — disc-at-once, track-at-once, packet recording, and multi-session-at-once
- Fully compatible with Orange Book v2.0 specification
- Highly automated CD-R formatter eliminates the sector-by-sector intervention by the microcontroller
- Supports up to 8x recording
- Supports Subcode R-W encode
- Integrated CIRC encoder, EFM modulation circuitry, and ATIP decoder with target ATIP search function
- Provides both timing for laser power on-off control and optional C3 data output in I2S format

■ **Buffer Manager**

- Dual-port circular buffer control, access-priority resolver
- Direct addressing of up to 16 Mbytes of DRAM
- Supports variable buffer segmentation
- Supports Streaming mode
- Programmable timing control for DRAM
- FIFO-synchronized buffer RAM access with host bus and DSP data transfers

■ **Microcontroller Interface**

- Supports high-speed Intel[®]- and Motorola[®]-type microcontrollers, such as the 8051 or 68HC11
- Supports non- and multiplexed address and data buses
- Supports Intel[®]- and Motorola[®]-type byte ordering for word-wide microcontroller instructions
- Hardware wait states provided by LREADY signal with programmable or automatic wait state timing

■ **ATAPI Host Interface (CL-CR3460)**

- True realtime hardware/software ATAPI compatibility
- Hardware implementation of ATAPI packet and reset commands
- Automated protocol control on block data transfers for ATAPI read/write commands
- Direct interface to ATAPI bus with programmable 4- or 12-mA drivers
- Supports any host speed with programmable and automatic wait-state generation
- Supports fast ATA transfer speeds — up to PIO mode 4 and single/multi-word DMA mode 2
- Provision for daisy-chaining two ATA or ATAPI drives
- Compatible with the CL-CR3560 CD-R SCSI controller

■ **SCSI Host Interface (CL-CR3560)**

- Supports SCSI-2 Initiator/Target modes
- Supports direct single-ended SCSI interface through 48-mA SCSI bus drivers
- Supports differential SCSI interface using differential control outputs for external drivers
- Supports asynchronous DMA/PIO transfers up to 5 Mbytes/sec. and synchronous DMA/PIO transfers up to 10 Mbytes/sec.
- Supports programmable automatic disconnect after SCSI command bytes received
- Supports a set of automatic SCSI sequences
- Automatic disconnect and reconnect based on buffer threshold or empty conditions
- Supports scatter/gather operation for transfer between SCSI bus and buffer
- Supports Level-1 and -2 SCAM protocol
- Compatible with the CL-CR3460 CD-R ATAPI controller

OVERVIEW (cont.)

using realtime CD-ROM-layered ECC error correction with a programmable number of P/Q-word corrections per sector (up to 64 total). The CL-CR3460/CR3560 also support realtime subcode R-W correction in CD-DA™ mode. Other hardware-enabled features include automatic target-header search, sector-header validity check during data transfer, programmable pseudo-sync mark insertion for sector synchronization, and automated CD-R packet disc read Method 1 and Method 2. The CL-CR3460/CR3560's DSP interface supports various CD-ROM DSPs from numerous manufacturers. The DSP interface includes three types of interface signals: the

main data channel signals, subcode channel signals, and serial DSP programming signals.

The integrated CD-R formatter is a built-in control processor that executes formatter instructions stored in the buffer memory, controls the CD-ROM encoder, and specifies how each block is generated/encoded through an entire recording operation. The built-in high-performance buffer manager of the CL-CR3460/CR3560 controls the flow of data between the external DRAM data buffer and all other internal blocks. These interfaces store and retrieve data to/from external buffer memory using interleaved access.

ADVANTAGES

Unique Features

- Very high integration, highly automated design

- Supports disc speeds up to 18x read and 8x write

- Both SCSI and ATAPI versions available

- Realtime ECC correction (up to 64 P/Q-word corrections/sector) and Erasure Pointer correction, with no microcontroller intervention

- Realtime subcode error R-W correction in CD-DA™ mode

- Supports all write methods --- disc-at-once, track-at-once, packet recording, and multi-session-at-once

- Supports up to ATA PIO Mode 4 and DMA Mode 2 transfers (CL-CR3460)

Benefits

- Single-chip integration of CD-ROM encoder/decoder, CIRC encoder, EFM modulator, ATIP decoder, buffer manager, and host interface logic

- Low cost, low component count, easy firmware development

- Supports disc speeds well above current industry requirements

- Common firmware development for SCSI and ATAPI; complete market coverage

- Improves system performance, reduces firmware overhead and microcontroller performance requirements, and improves reliability and correction capability

- Exceeds advanced ECC requirements of state-of-the-art CD-ROM designs for a variety of media/performance combinations

- Highly improved performance and easier firmware development

- Enables transfer rates of the highest performance systems

OVERVIEW (cont.)

In addition, the CL-CR3460/CR3560 support streaming mode, or the hardware automation of concurrent host and disc transfers from the same buffer segment. These features ease firmware programming and decrease microcontroller intervention.

Direct connection to the ATAPI interface is an important capability of the CL-CR3460, along with fast ATA transfer speeds up to PIO Mode 4 and multi-word DMA Mode 2. Support for ATAPI packet and ATAPI reset commands is provided in hardware. For faster response times, the CL-CR3460 supports most of the ATAPI multiple-block-transfer protocol in hardware.

The highly automated and optimized SCSI interface of the CL-CR3560 has control and sequencer engines to produce a highly efficient SCSI target controller. All

required controls are provided to perform complex synchronous and asynchronous SCSI DMA data transfers. The CL-CR3560 improves firmware overhead through automatic SCSI sequences, which assist the target firmware by implementing common SCSI operations in hardware.

The automation, high-performance, and high-integration features of the CL-CR3460/CR3560 have real end-user benefits in the highly competitive CD-R/E market, where time-to-market is imperative. The CL-CR3460/CR3560 are positioned to follow the speed curve as the requirements increase by its 18x read and 8x record capability. Additionally, these high-integration devices provide lower end-user costs — a true benefit in this extremely cost-competitive environment.