



OTI-9790

ATAPI/USB 32X READ/8X Write Controller with Integrated CD-DSP, CD Servo, Wobble Servo, and Write Strategy

Highly integrated CD-R/RW controller

- ATAPI/USB 32X block decoder
- 8X CD encoder
- 32X CD-DSP
- CD servo
- 12X wobble servo
- Dynamic write strategy
- Audio DAC

Oak Technology's OTI-9790 provides the highest level of integration of any CD-R/RW controller of its kind, with 32X decoder and 8X encoder performance. In addition to a highly automated block decoder/encoder, the OTI-9790 integrates CD-DSP, CD servo, wobble servo, dynamic write strategy, and audio DAC circuits that offer the best performance in the industry.

VARIETY OF INTEGRATED CONTROLS

The block decoder and CD encoder of the OTI-9790 are highly automated, greatly reducing the complexity and size of the firmware, as well as the required firmware storage and allowing the use of an inexpensive microcontroller. The OTI-9790 also allows the microcontroller direct access to DRAM, eliminating the need and cost of additional SRAM.

The CD-DSP and CD servo of the OTI-9790 use advanced digital signal processing techniques to minimize the analog circuitry required. This approach provides greater immunity to system noise and offers increased flexibility. The advanced architecture results in reduced error rates, greater seek accuracy and improved seek access time, particularly for CD-R/RW media.

The CD-DSP block of the OTI-9790 converts the analog RF data received from the pre-amplifier into digital data. The data is then EFM decoded and C1/C2 error corrected. The CD-DSP utilizes an advanced data slicing technique and digital asymmetry control loop, offering more programmability for frequency and gain. The digital PLL for data/clock offers fast response and recovery from defects.

The CD servo block of the OTI-9790 is responsible for spindle motor speed control, optical pickup, focus, tracking and sled movement. All servo loops are digital with integrated ADC and DAC I/O. Digital filter, gain, and constant parameters are implemented with high precision. Advanced track counting enables a jump of an exact number of tracks up to 2047, substantially reducing the seek time. Stable one-track re-seek ensures no buffer underflow and improves buffer effectiveness for host transfer and nX-to-1X playback. These and other advanced tracking and focus enhancements help keep drive head centered and focused on the track, resulting in a much faster seek time, particularly for CD-R/RW media.

The wobble servo of the OTI-9790 supports speeds up to 12X, allowing for much faster open session reading. The write strategy block offers a high degree of programmability, allowing many different implementations of CD-R and CD-RW strategies. The dynamic write strategy scheme implemented on the OTI-9790 allows for automatic fine adjustments for the write pulses, ensuring a much higher degree of interchange compatibility.

Key Features

- Highly automated
- Microcontroller direct access to DRAM
- Supports native PIO mode 4
- Supports DMA mode 2
- Supports UDMA -33
- Supports SCSI passthrough mode

Improved disk readability

- Lower C1/C2 error rate
- Improved eccentricity tolerance
- Improved focus
- Wobble tolerance

Improved seek performance

- Highly accurate 2047 track short seek
- Programmable velocity table
- Fast long seek with center position servo
- Accurate one-track re-seek
- PAM sled control for stiction

Advanced low power process

- Low power 0.35mm, 3.3V process
- 5V tolerant I/O
- ATAPI compliant I/O levels
- Enhanced power-down modes
- Single crystal operation
- 208-pin LQFP package

TECHNICAL SPECIFICATIONS

ATAPI/USB Decoder

- Highly automated decoder
- Integrated USB interface
- Supports ATAPI (SFF-8020) standard
- Supports PIO mode 4 and multiword DMA mode 2
- Supports up to 32X decode
- Supports automatic target sector header search
- Supports Method 1 and 2 packet transfers
- Jitter-buffered sync
- Supports CD-DA data transfer
- Real-time P and Q error correction
- Supports up to 16 MByte buffer memory
- Supports microcontroller direct access to buffer memory
- Supports SCSI controller DMA bus interface
- Enhanced power management

CD Encoder

- Highly automated encoder
- Supports encode speeds of 1X, 2X, 4X, 6X, and 8X
- Orange book 2 linking and writing pulse controls
- PLL controlled encoder clock
- Supports SubP, Q, R-W encode function
- Programmable SubQ writing sequence
- High-performance ATIP decoder

CD Digital Signal Processor (CD-DSP)

- Supports disk speeds from 1X-to-32X
- Supports multiple CLV speeds from 1X-to-16X
- Supports continuous CAV operation from ID to OD
- Firmware controls
- CLV/CAV transitions
- Wide bit-clock capture range ($\pm 50\%$)
- Jitter-free feature (+8/-9 frames)
- C1 correction up to 2 symbols
- C2 correction up to 4 symbols
- DAC accepts 1X audio data during nX-to-1X CD operation
- Digital audio output with de-emphasis filter, digital attenuation, and anti-aliasing
- Second order DS 1-bit DAC
- Supports 2X playback for IEC-958 digital output

CD Digital Servo

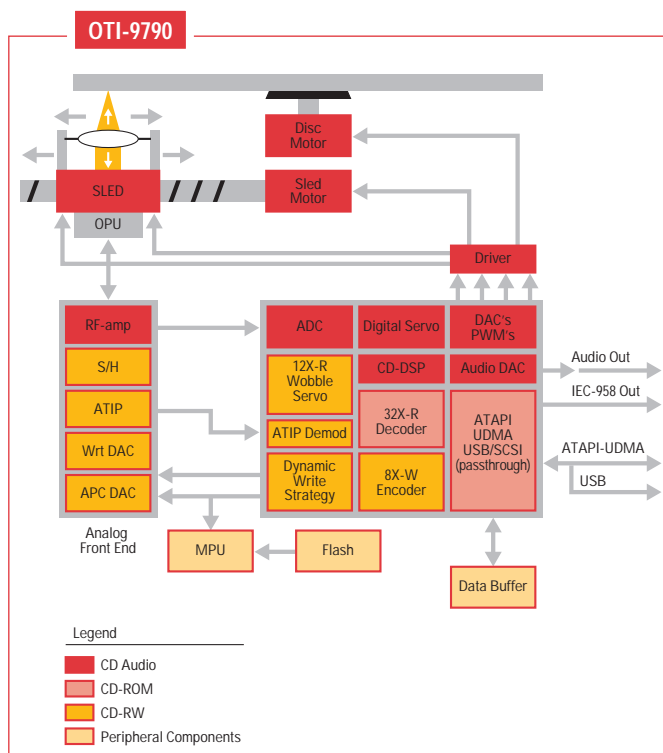
- Fast and accurate 2047 track search with acceleration profile
- Accurate one-track re-seek
- Center position servo loop and track counter for long seeks
- Run-out compensation for reliable operation at > 8000PRM
- PAM sled control for smooth movement during normal play
- Automatic focus offset, balance, and gain calibration
- Automatic tracking offset, balance, and gain calibration
- Shock detection
- Programmable defect detection
- Supports Hall sensor and back EFM spindle motor sensor
- RPM control based on spindle motor or data-rate feedback
- Firmware definable CAV/CLV profile

Wobble Servo

- Supports encode speeds of 1X, 2X, 4X, 6X, and 8X

Write Strategy

- Dynamic write strategy allows automatic fine tuning of pulse widths in real time
- Support laser power modulation CD-R strategy
- Supports laser pulse-width modulation CD-R strategy
- Supports laser pulse-position modulation CD-RW strategy
- Timing resolution of $1/32T$ at 8X write speed
- Supports running OPC



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