



OTI-9220

4-in-1 IDE/ATAPI Integrated CD-ROM Controller

product features

Controller

- ATAPI (SFF-8020) standard support
- Unlimited host transfers at greater than 20x
- 128KB (64K x 16) built-in buffer
- PIO Mode 4 and Multiword DMA Mode 2 support
- Real-time error correction of up to 138 P and Q byte errors per block
- NX-to-1X audio playback

Digital Signal Processor (DSP)

- Support for CLV and CAV playback
- Supports 1x to 20x playback by switching the built-in VCO
- Powerful error correction strategy:
 - C1: double correction
 - C2: quadruple correction
- Digital spindle servo (built-in over-sampling filter)
- Fine search performs track jumps with high accuracy

Digital Servo (DSSP)

- Microcomputer software-based flexible servo control
- Offset cancel function for servo error signal
- Auto gain control function for servo loop

Digital Filter and DAC

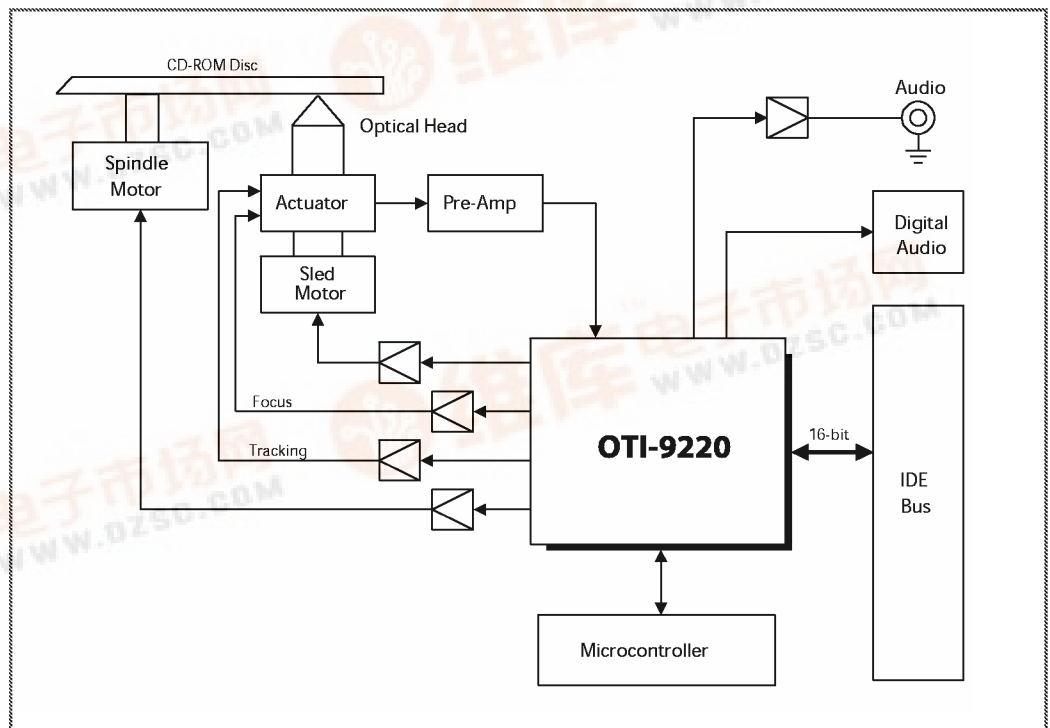
- Digital de-emphasis
- Digital attenuation
- 4Fs oversampling filter
- Uses a secondary $\Delta\Sigma$ noise shaper
- Supports double-speed audio playback

Structure

- Silicon gate CMOS IC
- 176-pin LQFP Package

Oak Technology's OTI-9220 is a 4-in-1 single-chip CD-ROM solution containing an IDE/ATAPI interface, CD-ROM decoder, DRAM buffer, digital signal processor (DSP), digital servo control, and digital-to-analog converter (DAC).

The OTI-9220 fully supports CAV (constant angular velocity) drives at peak data rates up to 20x. This speed can be achieved while supporting the PIO Mode 4 and Multiword DMA Mode 2 timing requirements of a 120ns cycle time for an entire 31-block transfer. Audio can also be played back while remaining in CAV mode, reducing spindle motor wear. The OTI-9220 has advanced power management and EMI (electromagnetic interference) reduction features. It also has programmable I/O drive buffers on some of its major interfaces. Based on Oak Technology's industry-standard OTI-912 and Sony's well-known CD-DSP, the OTI-9220 allows easy firmware migration from previous CD-ROM designs. Hardware reference designs with firmware are available that ease the task of implementing an ATAPI interface capable of handling the high data rates of a CAV drive.

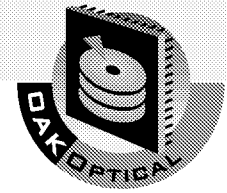


Block Diagram of CD-ROM Drive Electronics



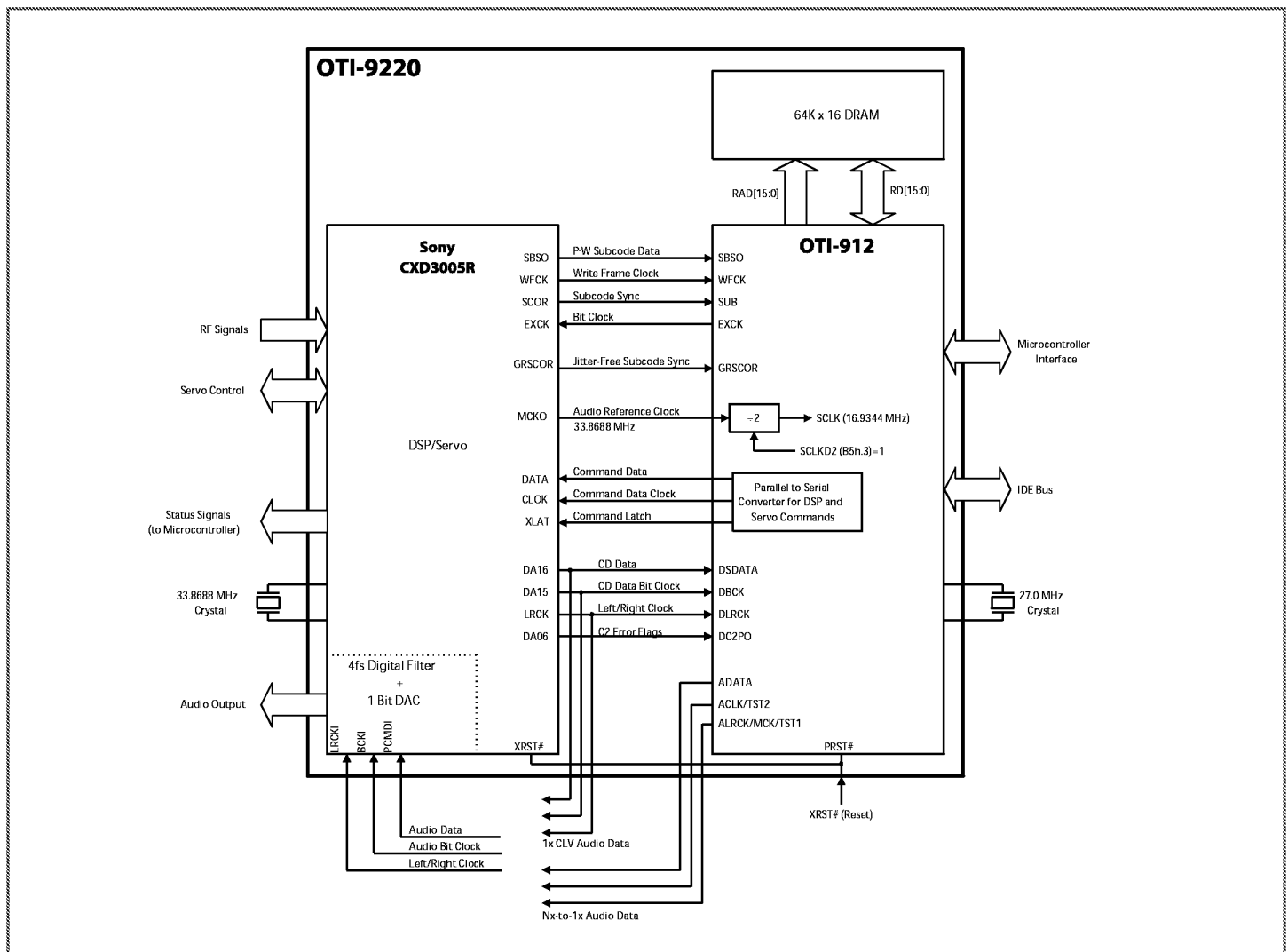
OTI-9220 Product Brief

High Level Block Diagram



The OTI-9220 consists of three major functional blocks: the Oak Technology CD-ROM Decoder (OTI-912), the Sony CD-DSP and Servo Controller (CXD3005R), and a 128KB DRAM. There are five groups of signals interconnecting the CD-DSP to the CD-ROM decoder within the OTI-9220: main channel CD data, P~W subcode data, CD-DSP command interface, jitter-free subcode sync, and an audio reference clock.

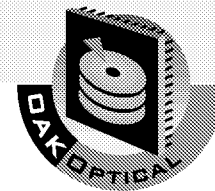
When designing a CD-ROM drive that uses the OTI-9220, one of two possible audio playback modes must be chosen: 1x CLV audio playback or Nx-to-1x audio playback. If the 1x CLV option is used, the digital audio from the CD-DSP must be connected externally to the OTI-9220's over-sampling digital-to-analog (DAC) converter. If Nx-to-1x playback is chosen, the external connection is made between the CD-ROM decoder digital audio output and the audio DAC. Nx-to-1x playback also requires extra microcontroller firmware to sequence the CD-ROM decoder correctly.



OTI-9220 High Level Block Diagram

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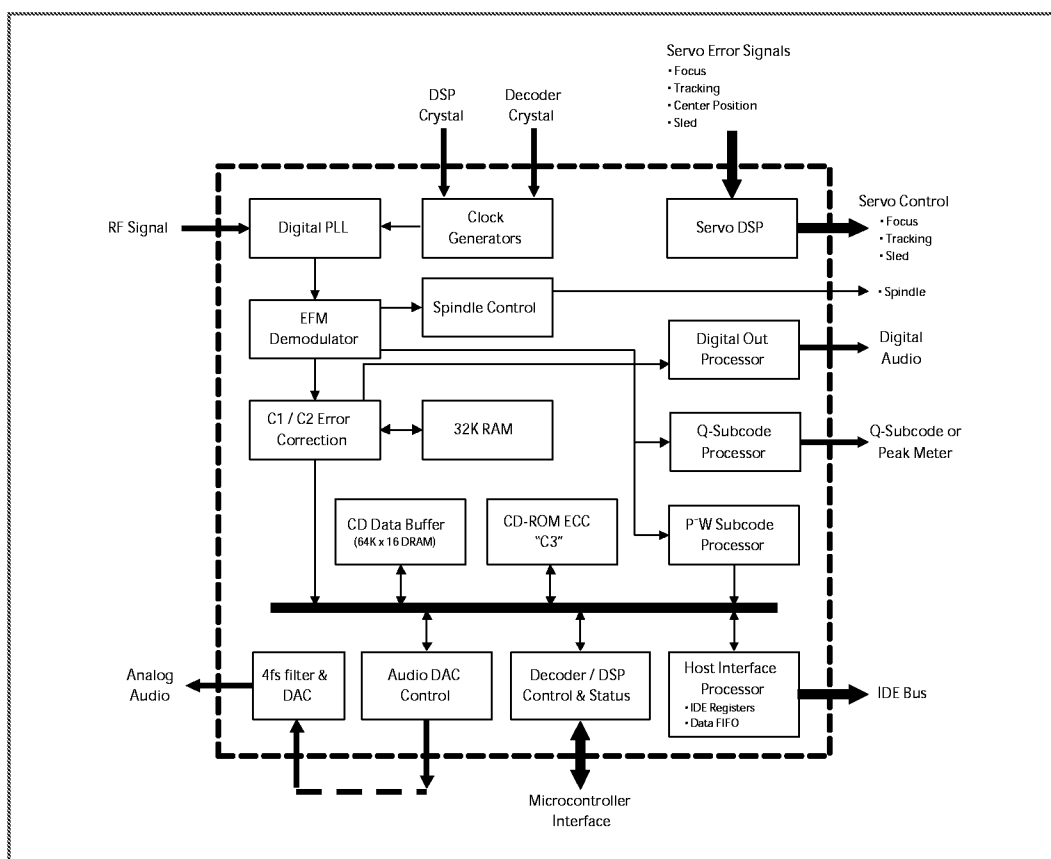
Detailed Block Diagram



The key functional blocks of the OTI-9220 are: servo DSP, EFM demodulator, C1/C2 error corrector, CD-ROM buffer, ECC data corrector, microcontroller interface, and IDE interface. The servo DSP uses the servo error signals as feedback to keep the optical head over the spiral CD track. The DSP also has acceleration and braking algorithms for the optical head to jump to a new location when requested. The amplified RF signal from the optical head is routed to the digital PLL where the clock signal is extracted. The serial data stream is sent through an eight-to-fourteen demodulator and is temporarily stored in a 32K RAM. The CD-DA or CD-ROM data is then error corrected where a maximum of two C1 errors and four C2 errors can be corrected. The data is then stored in a 128KByte buffer. The P~W subcode data, which is extracted by the EFM demodulator, is also stored in the

128KByte buffer. If configured by the microcontroller, a third layer of data correction ("C3") will be performed by the Reed-Solomon ECC processor on the Mode 1 and Mode 2/Form 1 CD-ROM data. The CD-ROM or audio data is then sent to the IDE host. Operation of the OTI-9220 is controlled by the microcontroller through an 8-bit bus.

The OTI-9220 has the ability to read CD-DA data at Nx speed and store the data in the CD-ROM data buffer. The audio data is then sent to the digital-to-analog converter (DAC) at the normal 1x audio playback rate. This allows the system to remain in CAV mode when reading CD-ROM data or playing CD-DA data, thereby reducing spindle motor wear and allowing uninterrupted audio playback when shock is applied to the drive.



OTI-9220 Detailed Block Diagram