

Nexperia ATAPI DVD+RW Recording Engine

Complete reference design for PC-hosted DVD+R/RW and CD-R/RW recorders

A complete development platform with hardware and software, the Philips Nexperia DVD+RW reference design speeds time-to-market for high-performance DVD recorders in computing applications. Systems based on the reference design deliver industry-leading speed and accuracy.



The Philips Nexperia™ ATAPI DVD+RW recording engine reference design gives developers of PC-hosted DVD recorders everything they need to quickly demonstrate the very fast write/read performance of the Philips DVD+RW chipset. The reference design is also a starting point for developing DVD recording peripherals. It includes:

- > a reference board with the Philips DVD+RW chipset (Nexperia PNX7850 processor, TZA1047 analog processor, TZA1042 laser power controller), memory, power drivers and a system clock
- > a complete DVD mechanism containing a laser driver, motors, actuators, memory, and the OPU66.30, a Philips-manufactured optical pickup unit (OPU)
- > industry-standard development tools, with RTOS kernel, plus datapath, engine, and DSP software

Key features

- > Delivers industry-leading performance:
 - Writes at 8x DVD+R, 4x DVD+RW; 32x CD-R, and 12x CD-RW
 - Reads at 16x DVD-ROM, DVD+R, DVD+RW, DVD-R, DVD-RW; and 40x CD-ROM, CD-DA, CD-R, CD-RW
 - Supports Dual-layer DVD+R and 24x CD-RW with firmware upgrade
- > Enhanced performance in less-than-ideal conditions
 - Adjustable laser strength provides real-time compensation for fingerprints and other defects
 - Scratch handling in excess of three mm
 - Shock detection and recovery
- > System-level solution includes:
 - Philips DVD+RW chipset (Nexperia PNX7850 processor, TZA1047 analog processor, TZA1042 laser power controller)
 - Complete DVD mechanism with Philips-manufactured OPU66.30
- > Proven modular software architecture

Target applications

The reference design can be fine-tuned for use in desktop PCs and peripherals integrating a DVD recorder. The design is well suited to double-writer and combination applications and offers power-management features that extend battery life in portable applications.

The reference design was developed in accordance to the DVD+RW standard, so it is compatible with other DVD and CD formats such as DVD-R/RW, DVD-ROM, CD-ROM, and CD-DA. A firmware upgrade supports 24x CD-RW and makes the reference design compatible with the Dual-layer DVD+R recording standard.

Industry-leading speed

When configured with the Philips DVD+RW chipset and Philips OPU66.30, the reference design delivers industry-leading speed—writing at 8x DVD+R, 4x DVD+RW, 32x CD-R and 12x CD-RW; reading at 16x DVD and 40x CD.

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Products based on the reference design are able to create 4.7-GB video or data DVDs in fewer than eight minutes for 8x DVD+R recording—twice the speed of existing DVD recorders. These same systems are able to store the equivalent of up to seven data CDs on a single disc, making it easy to transfer multi-gigabyte files between PCs.

Exceptional write speeds are due in part to a technology, developed in partnership with Intersil Corporation, that moves the write-strategy function off the processor and onto the OPU.

Accurate, reliable performance

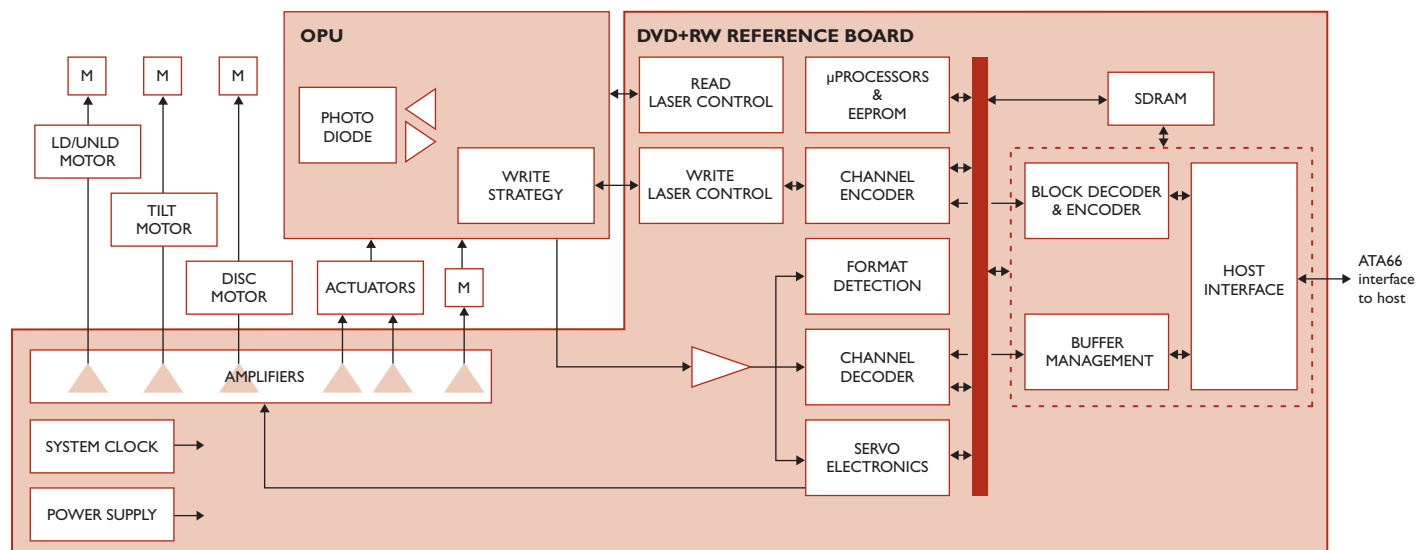
Error correction, defect handling, and servo control algorithms let the system cope with extremes—reading data from discs with scratches in excess of three mm. A forward-sense laser power control loop compensates for laser drift caused by temperature and aging. For discs that have been handled, laser strength can be increased to write through fingerprints. The analog processor can also read while writing, increasing write control.

Sophisticated defect management features enhance performance in less-than-ideal operating conditions. The servo controller resists jarring, especially in laptop applications where keyboard 'shocks' can impact performance. Dynamic tilt adjustment improves the writability and playability of different DVD and CD media. The servo controller also copes with misalignments in the manufacturing process, reducing the negative impact of lower-quality media.

Reference design hardware

The reference design is built around the Philips DVD+RW chipset, which includes the PNX7850 processor, the TZA1047 analog processor, and the TZA1042 laser power controller. The chipset brings industry-leading speed and accuracy to computer and consumer applications such as home video recording, creating digital photo albums on DVD, PC data backup, and data archiving. The reference design also includes a DVD mechanism, complete with a Philips-manufactured OPU.

Conceptual Overview



PNX7850 processor

The PNX7850 processor performs the encoding and decoding functions required for very fast write and read performance in a DVD recorder. Integrating a 32-bit MIPS RISC processor, a servo DSP, a buffer manager with UDMA66 ATAPI host interface, and an audio processor, the PNX7850 delivers advanced functionality in a single-chip format. Extensive hardware automation reduces processor load.

TZA1047 analog processor

The TZA1047 is a flexible analog processor for use in the optical bit engine of a DVD/CD-recordable system. It provides RF functionality, a read laser controller, and a sophisticated servo processor. High integration reduces chip count and lowers overall system cost. Programmable options let the designer fine-tune performance.

TZA1042 laser power controller

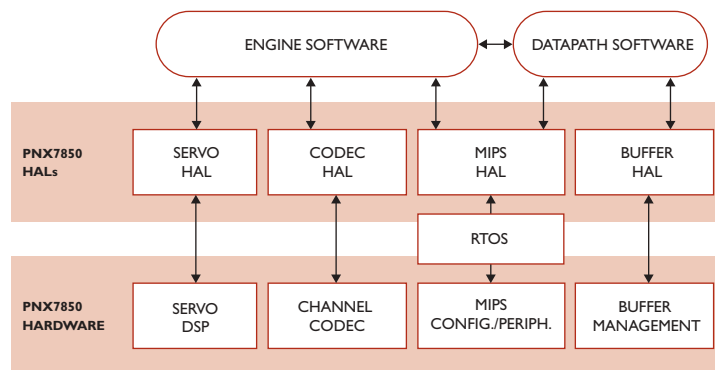
The TZA1042 is a laser power controller for DVD/CD recordable systems. It manages operation of the laser diode driver IC and controls the writing process. The TZA1042 supports real-time compensation for fingerprints and other defects. On-chip features and programming options improve performance in high-speed drives.

OPU66.30 optical pickup unit

Optimized for use with the Philips DVD+RW chipset, the Philips OPU66.30 integrates the write-strategy function, thus off-loading the PNX7850 processor and improving write performance. The OPU measures only 20.25 mm in height and weighs only 40 g, making it suitable for portable or desktop applications. The OPU optics, designed for high-speed DVD and CD operation, are supported by a 3D actuator controlled by four wires.

Software tools

To help designers optimize performance, the PNX7850 is supported by an extensive suite of software tools. The tools are built around a modular architecture, so the software is highly reusable. Adding next-generation hardware requires only minimal software changes. The tools employ hardware abstraction layers (HALs) to reduce complexity and offer automation features to minimize tight timing constraints.



The PNX7850's layered software architecture simplifies development and makes it easy to fine-tune performance.

Real-time operating system

The PNX7850 uses a proven, scalable RTOS for embedded applications. The RTOS is portable, takes up very little space, and delivers high performance. It provides POSIX-compliant threads, semaphores, messages, and more.

Editor, compiler, simulator, and debugger

The PNX7850 toolset includes the full-featured CodeWright® text editor, the High C/C++™ optimizing compiler, and an RTOS-aware debugger for MIPS applications. For non-intrusive, real-time tracing and debugging, even in a ROM-only system, the debugger can be used via the PNX7850 serial port or EJTAG interface. The toolset runs on Microsoft Windows® and Sun Solaris™ host systems and includes a PNX7850 CPU simulator.

Datapath software

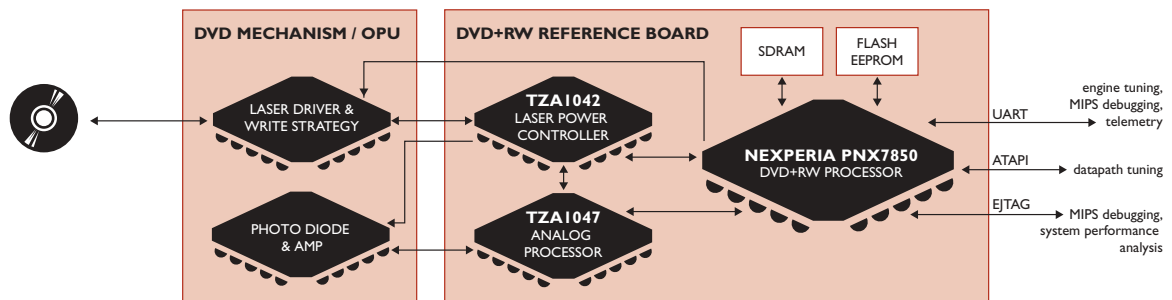
The datapath manages the datastreams exchanged between the host PC and the PNX7850 processor. It ensures correct data handling and supervises error recovery, disc concepts, and the host interface. The datapath software enables clean, object-oriented design. It is component-based for easy maintenance, reuse, and extensibility and offers a HAL that masks the lower-level details of the PNX7850 processor. It also includes control, media standards, dispatch/sequence, and stream layers.

Engine software

The engine decodes data read from the disc and forms a continuous datastream. In encode mode, it receives a datastream from the datapath, encodes the data, and aligns to the ATIP/ADIP information while generating the write signals for the laser driver.

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The Philips Nexperia DVD+RW reference design includes all the hardware and software needed to begin development of computer and consumer DVD recorder products.

In both encode and decode modes the engine controls the servo and actuator functions. The engine software uses callbacks instead of complex state machines for faster execution. For consistency within the datapath, it handles all types of data, including TOC and ATIP, as a stream. It also allows the datapath to determine system-level strategies for recovery. The engine software supports local and remote datapaths (including S2B functionality), and includes an engine API and sequence, utility, servo, and HAL layers.

DSP software

DSP software, provided as a pre-compiled object downloaded by the MIPS processor into the DSP RAM, speeds implementation of the servo DSP. The engine software also provides coefficients to customize and tune servo behavior. The engine software communicates with the servo DSP through a defined API.

Telemetry and tuning software tools

Philips makes available software tools that provide telemetry and tuning functions. The telemetry software monitors playability with unparalleled depth and accuracy. The tuning software makes it possible to control, monitor, and adjust system performance on the fly, from a standard PC.

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SCL 76

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