PHILIPS - making Compact Disc better

INNOVATIVE CD SYSTEM SOLUTIONS

PHILIPS is a company that needs little introduction in the world of Compact Disc. As one of the leading inventors of the Compact Disc player, we have been active since the early 80s in developing all its key components. Leading-edge developments in CD mechanisms, loading mechanisms, circuitry, and control software have continuously kept us at the forefront of this new exciting technology. So that today one can hardly think of CD without thinking of PHILIPS, and the two words together have become synonymous with innovation, quality and high-performance.

PHILIPS LASER OPTICS AND PHILIPS SEMICONDUCTORS –

THE PERFECT TEAM

As the innovative arm of PHILIPS responsible for CD sub-assembly and component development, *PHILIPS LASER OPTICS* naturally has a wealth of technological know-how and experience in this area. Whether your interest is in CD Audio, CD-i, Video-CD, CD-ROM, CD-Recordable, games or completely new applications still on the drawing board, you'll find in us the perfect partner to help you develop your ideas to the full and to translate these ideas into working products. A partner, moreover, who can offer you the application support you need to get your innovative products to market in record time.

PHILIPS SEMICONDUCTORS is one of the world's largest semiconductor manufacturers with annual sales approaching $3 billion (1994). The company operates 15 wafer fabrication plants and 8 assembly centres around the world, manufacturing 25 million ICs and discrete semiconductors every day. An innovative total systems approach, embracing both hardware and software, is the foundation on which the company has built an unrivalled reputation as an innovative and reliable supplier of high-quality semiconductors for the consumer electronics market.

In the field of Compact Disc, PHILIPS has consistently led the way in providing ever-higher levels of integration of the various player functions. Specifically, for the CD sector of multimedia, PHILIPS is already sampling products for octal-speed CD ROM drives to meet the astonishing pace at which this sector is advancing.

Together, PHILIPS Laser Optics and PHILIPS Semiconductors is a winning combination that can help you stay competitive in today's markets.

FULL TECHNICAL SUPPORT ON YOUR DOORSTEP

Our worldwide network of sales offices, including offices in Hong Kong, Singapore, Taiwan, Korea, Japan, Brazil, the USA and Europe, means that wherever you operate, you're certain to find one of our representatives nearby. A representative who speaks your language and understands your markets. One, moreover, who can give you full technical support at all levels and provide you with a direct route to our design services.

FUTURE-PROOF DEVELOPMENT

With our broad experience in the whole range of CD-related technologies, we're uniquely placed to support not only your current design projects but also those planned for the future. Together with you, we can formulate a vision of your future market needs and set up a development roadmap with a view to meeting these needs as they arise. For you, of course, this means timely introduction of your products to market, greater competitiveness and continued market success.

CD SYSTEM SOLUTIONS TAILORED TO YOUR NEEDS

To simplify design-in and help you speed up your product creation process, PHILIPS offers a series of CD System Solutions. Each System Solution comprises CD mechanism and loader, key system ICs, software and circuit diagrams, all fully tested and optimized for a specific (reference) application. Each System Solution comes with complete technical documentation and offers a total solution that can be incorporated directly into your product or form the basis for a design evaluation.

Every system is based on a fully-digital concept from optical pick-up, servo and decoding through to the output, providing setmakers high-performance, more features, and a highly reliable adjustment-free system with no ageing effects.

In developing these system solutions, flexibility has been our guiding principle. We can quickly adapt each system concept to meet your specific requirements with regard to interfacing, cost and performance. Enabling you to tailor your products to precisely meet your market needs and keep pace with fast-moving market trends.

Starterkit

STARTER KITS AID DESIGN-IN

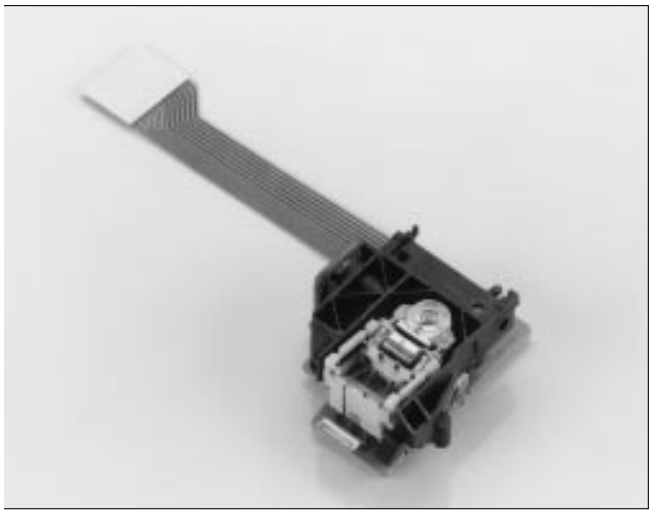
For every CD System Solution, we also offer a Starter Kit – a fully tested, working CD system comprising all the necessary hardware and key components operating according to specification, circuit diagrams and detailed layout documentation for the PC board plus all released software necessary to operate the system.

Since the Starter Kit is guaranteed to meet its specifications, it forms a valuable design-in tool, enabling swift, accurate evaluation for fast design turn-around. It's also valuable as a reference against which to judge the performance of your production models, as a trouble-shooting tool before and after production, and as the basis for your incoming quality control. In all these areas, of course, you can get full support from our application-support team whenever you need it.

SUPPORT PRODUCTS

As one of our clients, you can also benefit from the many products that come as a spin-off from our extensive development cycles. The most important of these is software, including our proprietary source codes (called Basic Player Modules). Available subject to licensing agreements, these are designed to offer the highest degree of flexibility for customizing your system to meet specific applications.

Other support products available include test discs, specific measuring equipment and customized measuring tools.



Optical pick-up

ADVANCED CD COMPONENTS AND INTEGRATED CIRCUITS

CD loaders

We offer a broad range of loaders for today's CD applications. These include: tray loaders for audio, games, Video-CD, plus half-height CD-ROM/ CD-Recordable loaders. Note, each loader incorporates a CD mechanism from the CDM 12 family (CDM 24 for CD-Recordable).

CD mechanisms

The CDM 12 family of mechanisms are of advanced design, adjustment-free, and provide high-performance with no ageing effects.
The family has been developed to suit a wide range of applications. A unique low-mass actuator, with specially developed low-power coils provides fast access in a wide range of equipment from stand-alones to portables. The proprietary Laser Detection and Grating Unit (LDGU) has excellent mechanical and thermal stability under all operating conditions and is highly reliable as it uses few parts. Furthermore, all CDM 12 mechanisms have excellent shock resistance thanks to special suspension components. And, for the highest signal-to-noise ratio, the design of the CDM 12 sledge allows the HF amplifier and laser control circuitry to be mounted on the sledge close to the photodiode detector.

For CD-Recordable applications, there is also the highly-integrated CDM 24 mechanism.

For all these components, advanced fabrication plus economies of scale from mass production guarantee the superior performance and highly competitive prices that have become the hallmark of PHILIPS' CD products.

Integrated circuits

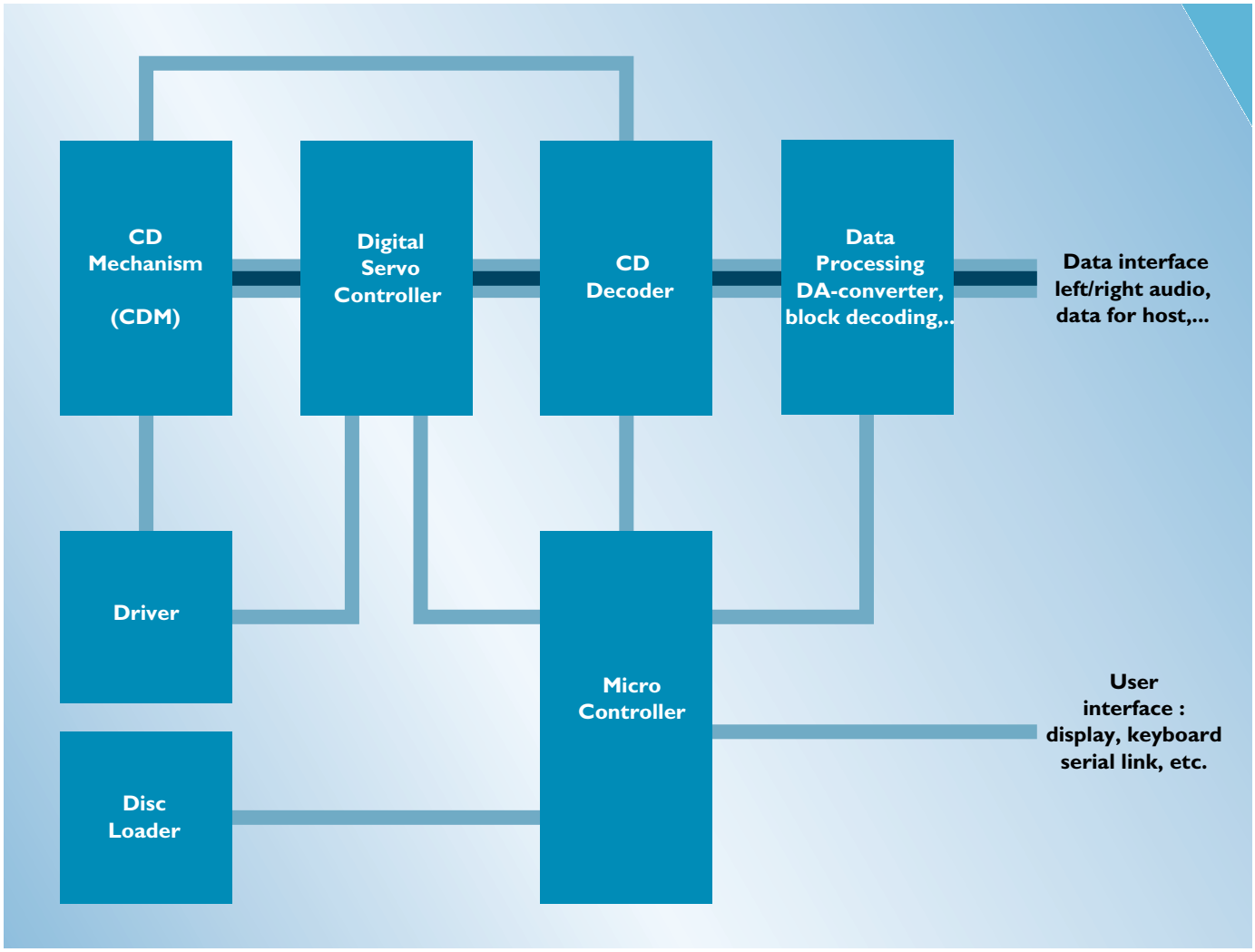
All the CD System Solutions in this guide are characterized by extremely high levels of integration thanks to PHILIPS Semiconductors' high-performance chip sets. These advanced systems-on-silicon solutions require no adjustment, reduce circuitry size, minimize the number of peripheral components, simplify board design and lower assembly costs – cost-saving features with universal appeal. Though many of the ICs used are commodity products, some are custom-designed by PHILIPS Semiconductors to provide the required functionality for a particular CD system. Naturally, this service is also available to customers looking for product differentiation.

TOTAL SUPPORT

The following pages give an overview of the system solutions, integrated circuits, CD mechanisms, loading mechanisms and software available from PHILIPS Laser Optics and PHILIPS Semiconductors. Though impressive, this product range alone cannot fully indicate the support we can offer you. Support that comes from a systems partnership with one of the world's leading innovators in CD technology. Support geared specifically toward helping you solve your problems and develop your products for market. To help you stay competitive today and in the years ahead.

SYSTEM SOLUTIONS

The basic CD player



The Basic CD-player BASIC BUILDING BLOCKS OF A TYPICAL CD APPLICATION

CD Mechanism

Consists of a rigid frame housing a motorized turntable that rotates the disc, and a radial mechanism which positions and tracks a single or 3-beam Optical pick-up across the disc.
The Optical pick-up objective-lens is moved by a focus coil which focuses a laser light spot onto the information layer of the disc. The laser spots are diffracted by the pits in the information layer to produce returning beams which strike a photodiode assembly.

Digital Servo Controller

The photodiode outputs are fed to a servo controller, where they are amplified and selectively summed to produce focus and radial position-error signals. These signals, which represent the actual focus and radial positions, are algorithmically compared with the required position, according to the microcontroller or tracking circuits, and the results used to produce appropriate drive signals for the CD mechanism (CDM) motors (sledge and focus).

CD Decoder

The decoder decodes the EFM data signal into serial digital data and subcode data. After de-interleaving, and descrambling, the integrity of the digital information is tested, and appropriate error-correction or concealment is performed. The resulting data is fed serially as sixteen-bit digital information to the digital-to-analog converter (DAC) or data processing circuit (e.g. for CD-ROM applications). During the decoding process, the decoder monitors the incoming bit-stream rate, maintains it at a constant linear velocity using a phase-locked loop, and produces appropriate drive signals for the disc motor.

Driver

The servo driver amplifies the control signals for the various motors. A wide range of digital and analog drivers is available for different applications: stand-alone, single supplied and battery supplied.

Micro-controller

The microcontroller is pre-programmed to provide the processing for the servo system and for the user interface. User commands may be given directly from keys, or via a serial control-bus or remote receiver, according to the application. The microcontroller can also be programmed to drive a range of front-panel display devices.

Disc Loader

A range of loaders exists to suit a variety of applications. Besides tray and top loaders for stand-alone applications, half-height tray loaders for built-in CD-ROM and CD-Recorder drives are available. All models incorporate a CD mechanism with disc clamping.
Discs are normally transported by a motorized disc tray, moulded to accept 12 cm and 8 cm discs. Simple interfacing normally consists of colour-coded wires for the tray motor and detector, and the wire assembly for the CD mechanism.

HIFI CD-system solutions

Pre-developed solutions for stand-alone sets and stacking systems. Each system features pre-programmed servo and user functions for quick and easy design-in.

HIFI 6000	Total solution featuring optimized digital servo system.
HIFI 6011	As HIFI 6000, but controlled by a user microcontroller via DSA interface.
HIFI 6013	As HIFI 6000, but with improved functions.
HIFI 7000	HIFI solution using Philips Semiconductors' CD7-system concept. CD decoder and digital servo controller are in one IC.
HIFI 7001	As HIFI 7000, but with microcontroller with on-board LCD driver.

PREMIUM CD-system solution

Premium-quality system providing top performance, high reliability and easy design-in. Features industrial CD mechanism, optimized servo systems and high-performance decoders.

PREMIUM 6000	Pre-developed solution for outstanding performance combined with industrial standards and reliability.

MUSIC CENTRE CD-system solution

CCA110	A pre-developed solution incorporating a HIFI 6000 CD-system plus 4-waveband stereo radio, and cassette player deck.

HEADPHONE CD-system solutions

These economy, vibration-protected, solutions provide a complete range of headphone systems to suit specific personal entertainment environments, while sharing the common features of low power and excellent playability.

HEADPHONE 7000	Headphone solution using Philips Semiconductors' CD7-system concept. CD decoder and digital servo controller are in one IC.
HEADPHONE 7001	As HEADPHONE 7000, but with microcontroller with on-board LCD driver.

TV-ENTERTAINMENT CD-system solutions

Economy and double-speed solutions for CD GAMES, including the solution for Full Motion Video (FMV) playback.

KARAOKE 6000	Pre-developed CD KARAOKE engine.
GAMES 6001	Pre-developed CD GAMES engine featuring double data transfer rates.
VIDEO 6001	Basic CD-engine for Full Motion Video applications.
VIDEO 6002	Basic CD-engine for Full Motion Video applications. SMD optimized.
VIDEO 6481	Complete system for Full Motion Video applications with complete MPEG solution
VIDEO 7000	Complete system for Full Motion Video Applications with MPEG decoding of audio/video data. Uses Philips Semiconductors' CD7-system concept. CD decoder (double-speed) and digital servo controller are in one IC.

DATA CD-system solutions

A range of pre-developed solutions to meet the ever-growing demand for optical disc-based information systems. All systems are suitable for half-height 5¼" PC drive bays and feature fast radial access.

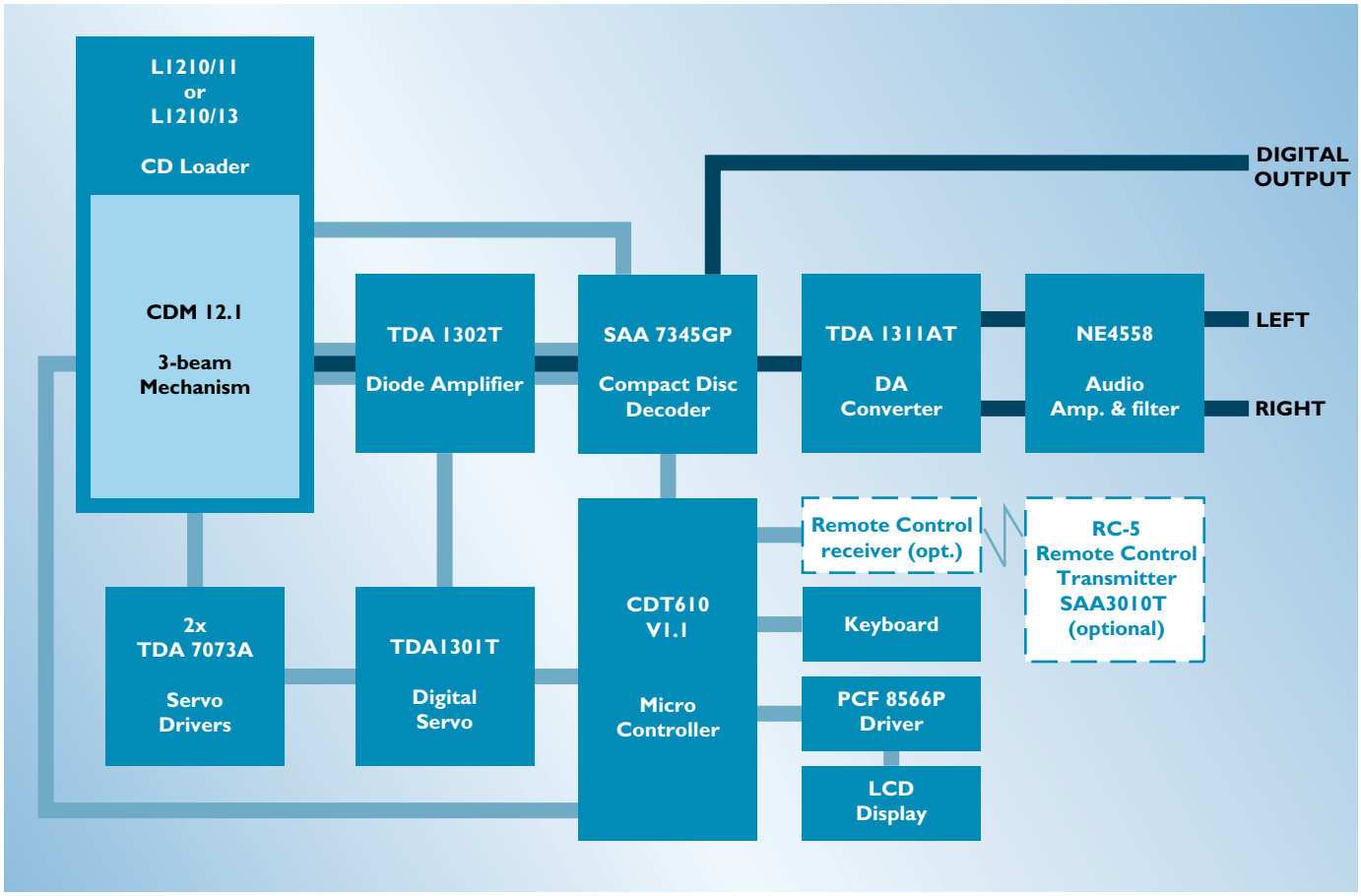
ROM 65000	CD-ROM engine; 4x standard data transfer rates.
ROM 65060	CD-ROM system with ROM 65000 engine and IDE interface; 4x standard data transfer rates.
ROM 65080	CD-ROM system with ROM 65000 engine and fully integrated SCSI interface; 4x standard data transfer rates.
ROM 65100	CD-ROM engine; 6x standard data transfer rates.
ROM 65160	CD-ROM system with ROM 65100 engine and IDE interface; 6x standard data transfer rates.
ROM 65180	CD-ROM system with ROM 65100 engine and fully integrated SCSI interface; 6x standard data transfer rates.
ROM 65200	CD-ROM engine; 8x standard data transfer rates.
ROM 65260	CD-ROM system with ROM 65200 engine and IDE interface; 8x standard data transfer rates.
ROM 65280	CD-ROM system with ROM 65200 engine and fully integrated SCSI interface; 8x standard data transfer rates.

CD RECORDABLE CD-system solutions

A range of high-performance, pre-developed solutions for data and audio recording and playback. Data rates: double-speed (write); quad-speed (read).

RECORDER E65400	CD-Recordable engine featuring fast access, write (n=2) and read (n=4); suitable for half-height drive bays.
RECORDER D65420	Data engine comprising single-chip CD-ROM block-decoder, block-encoder and buffer manager, microcontroller. For use with the E65400 for data-CD-Recorder applications.

Total player solution for stand-alone sets



HIFI 6000 basic system for stand alone CD-player

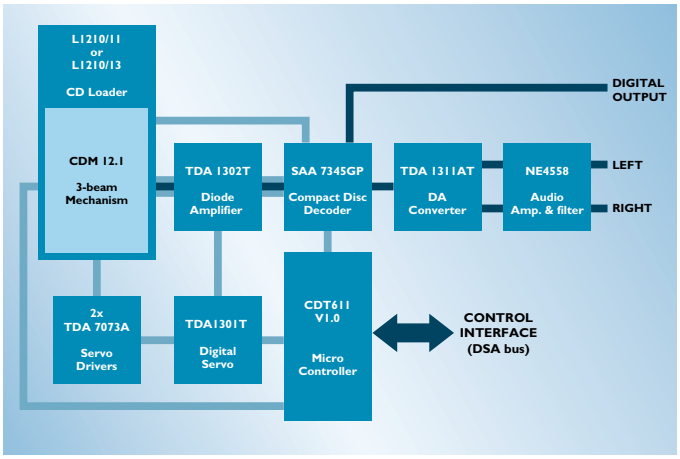
- **Total player solution for stand-alone sets.**
- **L1210/11 or L1210/13 tray-type loader with economy-class CDM 12.1.**
- **Top loader version available.**
- **Quick design-in thanks to the pre-programmed servo and user functions.**
- **Top performance and playability thanks to the digital servo system.**
- **High-performance digital decoder with high resistance to rotational shock.**

The HIFI 6000 CD-system is a complete highly-integrated pre-developed CD-engine for use in stand-alone sets. It includes a mask-programmed microcontroller which provides all the functions of a CD-player including a complete range of user and display functions accessed via a keyboard or infrared remote control.

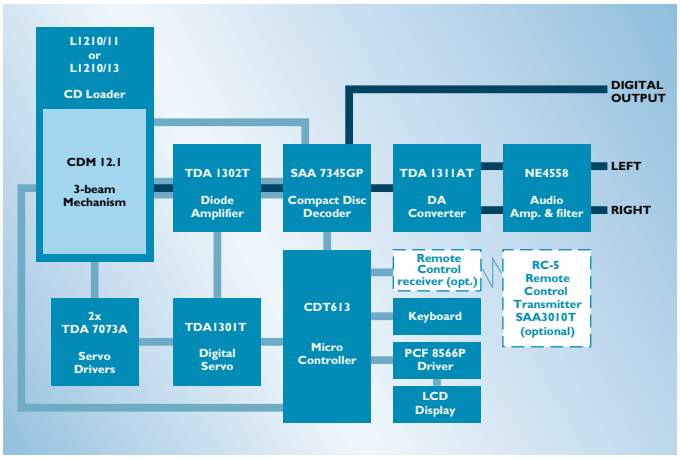
A comprehensive starter-kit is available.

The microcontroller controls all the servo and CD-decoder functions plus the input and output user functions: display, keyboard, remote control.

Both the low-height L1210/11 and standard-height L1210/13 loaders



HIFI 6011 basic system for stand alone CD-player



HIFI6013 basic system for stand alone CD-player

include the CDM 12.1 mechanism, and use special suspension units to provide the extra damping required for optimal performance against shock and vibration. A top loader version using the CDM 12.1T is an option.

The TDA1302T diode amplifier and laser supply IC buffers the diode signals for the servo control IC. The IC also amplifies and equalizes (option) the HF signal for the CD decoder and controls the power to the laser diode from the CDM 12.1.

The TDA1301T digital servo controller, assures excellent performance owing to advanced features such as enhanced tracking capability and automatic initialization procedures. No external adjustments are necessary.

Power for driving the disc drive motor, and the focus, radial tracking and sledge actuators is provided by two TDA7073A dual servo power drivers.

The SAA7345 decoder has an embedded 19k SRAM, and uses a unique FIFO overflow concealment technique which provides high resistance to rotational shock. Optimal data detection from the disc is ensured by the decoder's integrated digital PLL. Communication with the system microcontroller is via a 3-wire interface.

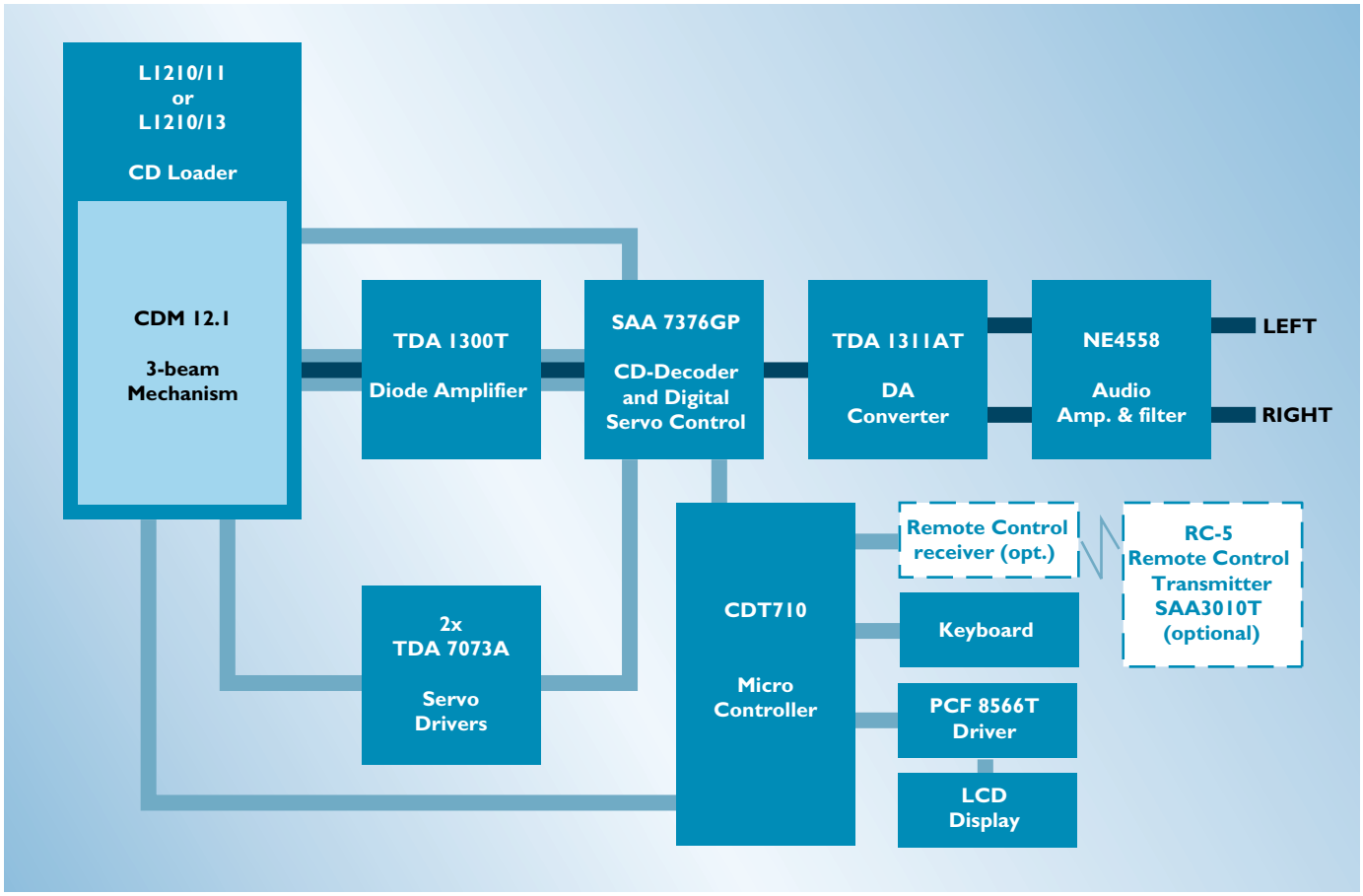
HIFI 6000 SYSTEM PERFORMANCE	
Disc size	8 and 12 cm.
Formats	CD-DA
Access time (1/3 stroke)	800 msec.
Digital output	EBU-standard
Line output	yes

AUDIO PERFORMANCE	
THD+noise	typical 0.04 %
Signal to noise ratio	typical 92dB
Amplitude (50k Ω load)	typical 2 V_{rms}

USER FUNCTION	
Remote / keyboard	scan, open/close, repeat, pause, stop, play, random, previous, next, time, review, program, fast forward, fast reverse,

POWER SUPPLY	
Supply Voltage	10 V
Requirement supply current	1 A peak, 300mA average

Highly-integrated stand-alone player system



HIFI 7000 basic system for stand alone CD-player

- **CD7-system: improved playability and additional features.**
- **One-chip CD-decoder and digital servo controller.**
- **L1210/11 or L1210/13 tray-type loader with economy-class CDM 12.1.**
- **Top loader version available.**
- **Quick design-in thanks to the pre-programmed servo and user functions.**
- **Total player solution for stand-alone sets.**

The HIFI 7000 systems are highly-integrated stand-alone systems for mid-range CD audio players. Each system includes the operating software in a mask-programmed microcontroller. In the HIFI 7001, the controller has an on-board LCD driver. Both HIFI 7000 and HIFI 7001 are completely pre-developed systems for set manufacturers. Control is via a local keyboard or infrared remote control transmitter.

The system uses the latest semiconductor concept – CD7, Philips' most recent and very-highly-integrated innovation for CD-system solutions.
The main feature of a CD7 system such as HIFI 7000 is that it uses a combined CD-decoder and digital servo controller in one chip, in this case

the SAA7376GP. The DAC section is however separate so that the audio performance of the system can be tailored precisely to individual needs.

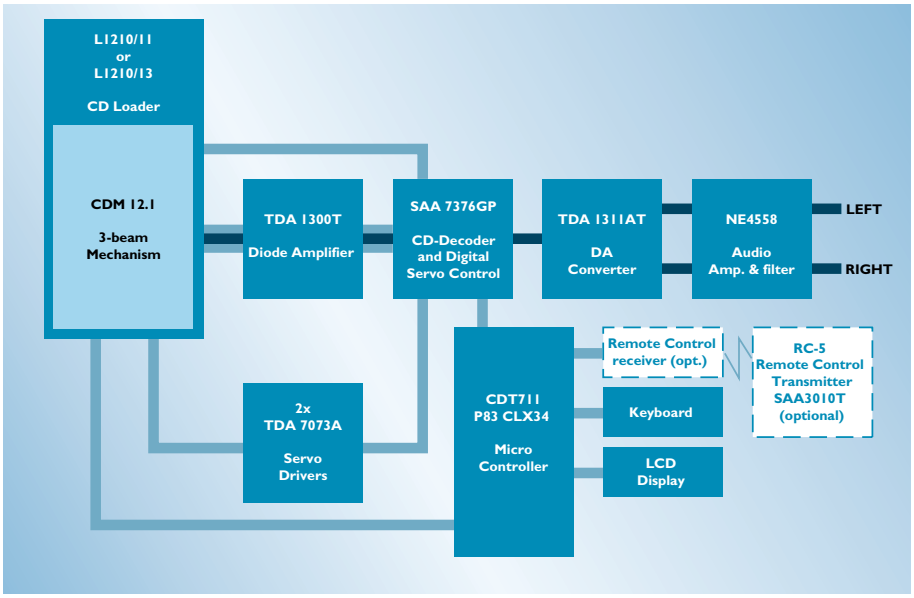
The SAA7376GP decodes and de-interleaves the EFM data and performs full error correction/concealment and digital filtering. It has an embedded 19k SRAM and also controls the speed of the disc drive motor. The servo control section processes the diode signals to generate servo control signals for the focus and radial tracking actuators and the sledge motor. No external adjustments are necessary.

Power for driving the motors is provided by two TDA7073A dual servo power drivers.

Both the slimline L1210/11 and standard-height L1210/13 loaders include the CDM 12.1 mechanism, and use special suspension units to provide the extra damping required for optimal performance against shock and vibration. A top loader version using the CDM 12.1T is an option.

The TDA1300T diode amplifier and laser supply IC buffers the diode signals for the CD7 decoder. The IC also amplifies and equalizes (option) the HF signal for the decoder and controls the power to the laser diode from the CDM 12.1.

As mentioned, the audio performance is not directly related to the CD system but depends on which Philips Semiconductors' DAC is used. Shown here is a TDA1311A continuous calibration stereo DAC with 16-bit digital input and analog voltage output. This DAC can be replaced by many other types to fulfil individual requirements for cost and performance.



HIFI 7001 basic system for stand alone CD-player

The stereo audio output is provided by a dual general-purpose op-amp.

Derivative systems

The HIFI 7001 is similar to the HIFI 7000 but has a microcontroller with on-board LCD display driver.

HIFI 7000 SYSTEM PERFORMANCE	
Disc size	8 and 12 cm.
Formats	CD-DA
Digital output	EBU-standard
Line output	yes

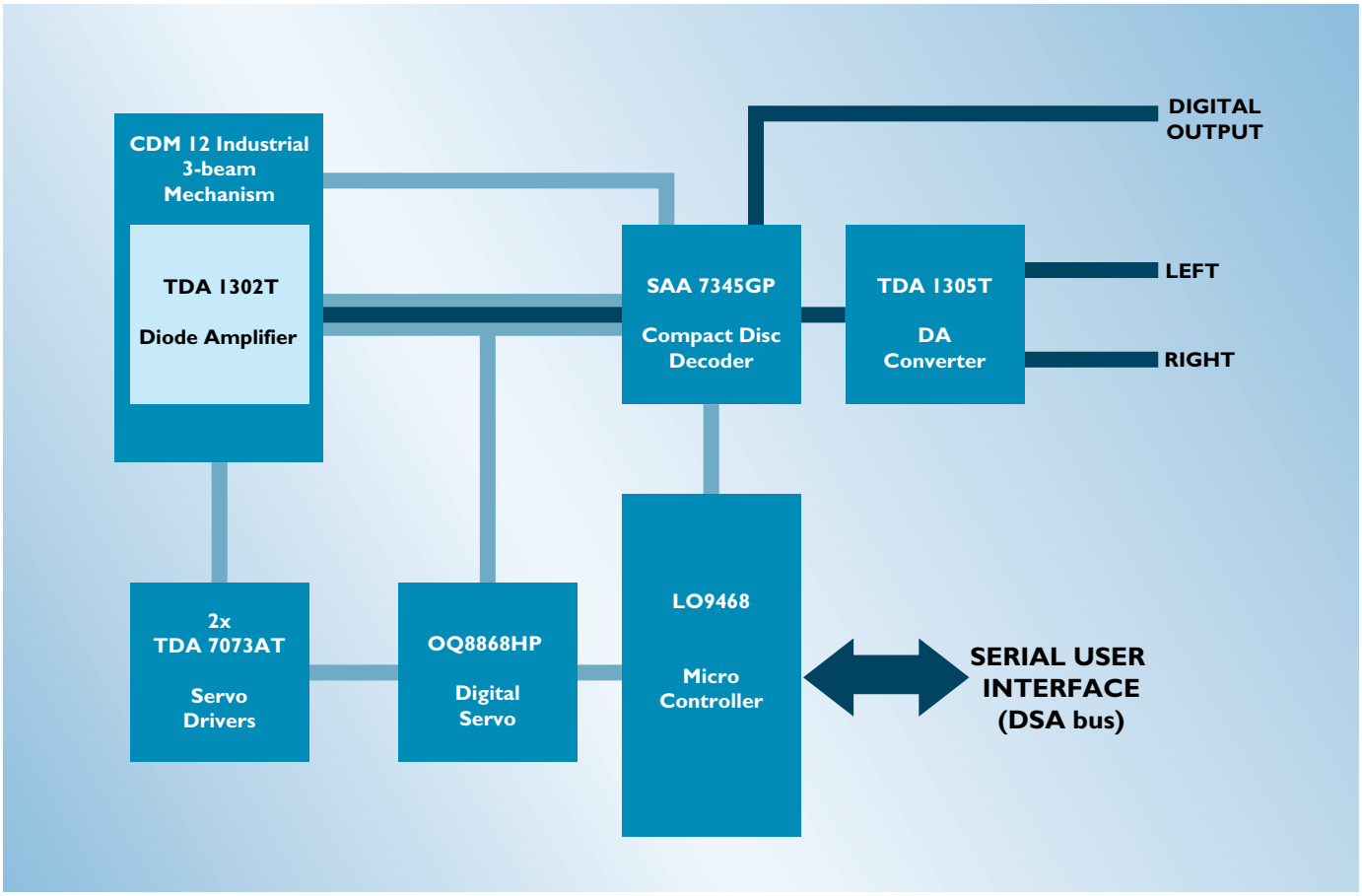
AUDIO PERFORMANCE	
Determined by DA-converter	
THD + noise	0,04 %
Signal to noise ratio	92dB
Amplitude (50k Ω load)	$2V_{rms}$

USER FUNCTION	
Remote / keyboard	open/close, play/replay, play by digit, stop/clear, next/prev, search fw/bw, pause, repeat, a-B repeat, random/shuffle, scan, program/review, time formats

POWER SUPPLY	
Supply Voltage	10 V
Requirement supply current	1 A peak, 300mA average

RELIABILITY	
MTBF (25%)	30000 Hr.

Outstanding performance and reliability, industrial-standard CDM



PREMIUM 6000 basic engine for heavy duty CD-player

- **Pre-developed solution supplied as a completely assembled module, including print-board.**
- **Heavy, industrial-standard CD-mechanism for excellent stability and performance.**
- **Comprehensive serial control interface (DSA).**
- **High-performance digital decoder with high resistance to rotational shock.**
- **Top performance and playability thanks to the digital servo system.**
- **Servo system optimized for minimum operating noise.**

The PREMIUM 6000 is a complete pre-developed CD-engine, combining the benefits of extended performance and easy design-in. The pre-developed system software in the LO9468 microcontroller, for example, reduces design-in time to an absolute minimum.

The engine is supplied as a pre-assembled module (MOD JUKEBOX, MOD PRO-AUDIO, see Section 6) to simplify assembly of CD jukeboxes and other industrial players.

The CDM 12 concept with the digital servo system, the HF amplifier and laser control system included on the sledge is an extremely robust design, giving extremely high performance. It has no potentiometers, and no ageing effects.

The microcontroller controls all the servo and CD-decoder functions. Communication with the user microprocessor is provided via a well-defined, customer-friendly 3-wire serial bus, called DSA (Data, Strobe, Acknowledge).

For accurate radial access with minimum jump-noise, the 3-beam CDM 12 INDUSTRIAL mechanism features a high-speed sledge motor with high-ratio gearing, controlled by a digital servo system, based on the OQ8868. This unique servo processor has been optimized to provide excellent performance, supported by special features such as enhanced tracking capability and automatic initialization procedures. No external adjustments are necessary.

Special suspension units were developed for the mechanism to provide the extra damping required for optimal performance against shock and vibration.

The SAA7345 decoder has an embedded 19k SRAM, and uses a unique FIFO overflow concealment technique which provides high resistance to rotational shock. Optimal data detection from the disc is ensured by the decoder's integrated digital PLL. Communication with the system microcontroller is via a 3-wire interface.

Power for driving the disc drive motor, and the focus, radial tracking and sledge actuators is provided by two TDA7073A(T) dual servo power drivers.

Digital to analog conversion is performed by a TDA1305(T). This IC is a bitstream continuous-calibration stereo DAC with 16-bit digital input, and analog voltage output.

PREMIUM 6000 SYSTEM PERFORMANCE	
Disc size	8 and 12 cm.
Formats	CD-DA
Access time (1/3 stroke)	800 msec.
Digital output	EBU-standard
Serial digital data	User programmable format

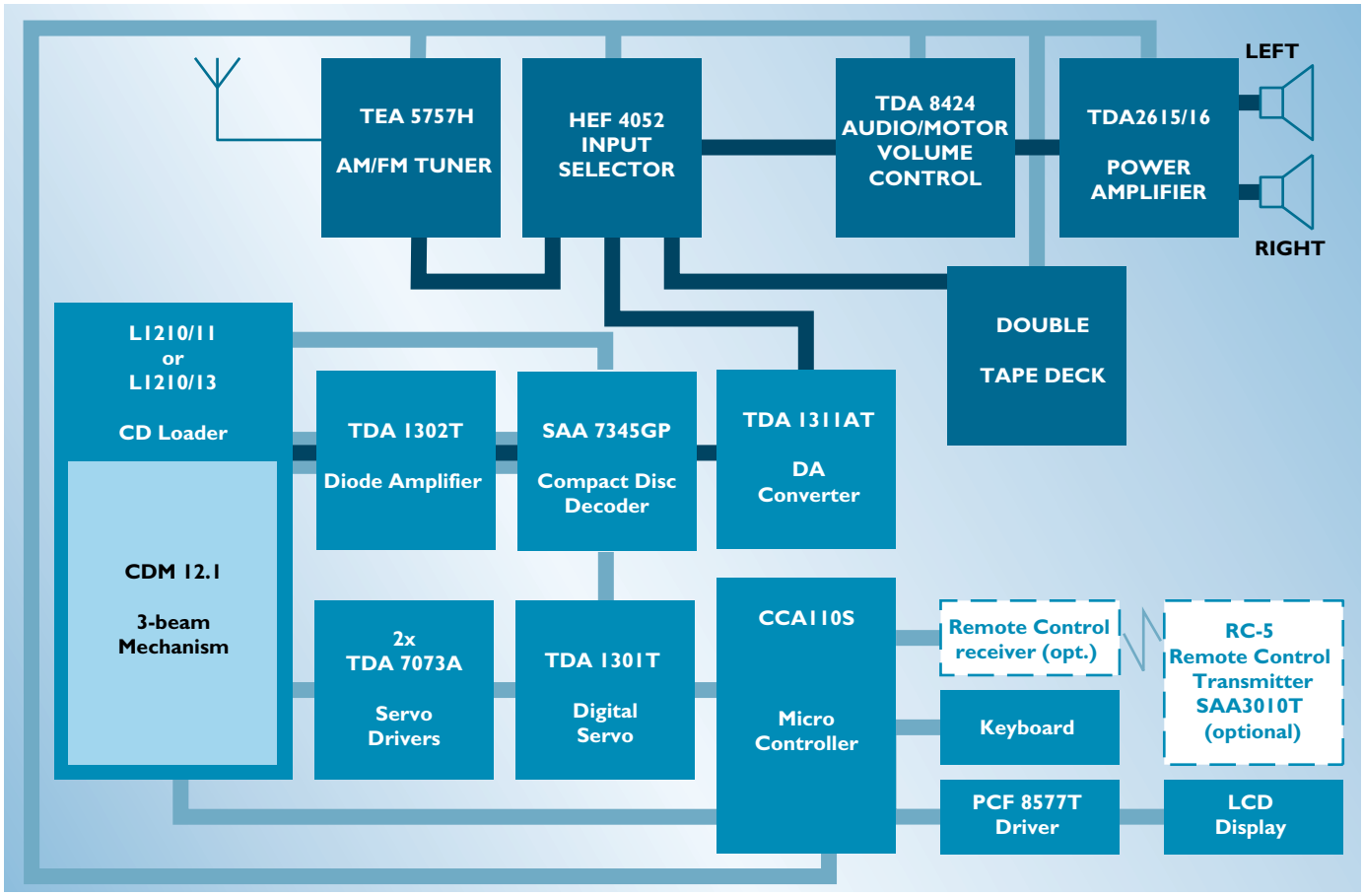
AUDIO PERFORMANCE	
Frequency response	20 Hz to 20 kHz
T.H.D.	-80 dB typ.
Channel separation	90 dB typ.
Signal to noise ratio	85 dB min.
Signal to noise ratio (A-weighted)	100 dB typ.

USER INTERFACE	
Type	serial asynchronous bidirectional No. of lines Data Strobe Acknowledge

POWER SUPPLY	
Supply Voltage	5 V, 9 V
Supply current (5 V)	1 A max.

RELIABILITY	
MTBF (25%)	30000 Hr.

Music-centre solution



CCA110 Music-center solution

- **Single microcontroller system for:**
  - **CD system such as HIFI 6000 or HIFI 6013**
  - **digitally-tuned four-band radio system**
  - **single/double cassette tape deck**
  - **electronically-controlled audio**
  - **clock/timer/sleep function**
- **Suitable for a wide range of battery and mains-fed equipment (fixed and portable).**

The CCA110 is a computer-controlled music centre system comprising an FM, MW, LW and SW stereo radio (for battery and mains-fed portables, micro and mini audio systems), combined with a cassette player deck and a CD player.

The entire system is controlled by a single pre-programmed CMOS micro-controller (CCA110S).

The CD player system of the music centre is the same as the stand-alone CD player system HIFI 6000 described on page 2.6, but without the micro-controller, LCD driver, display panel and remote control transmitter and receiver ICs. The radio system is based on a self-tuned radio (STR) system circuit.

The ICs at the heart of the music centre system are:

TEA5757(H): AM/FM receiver including synthesizer and stereo decoder. The inherent Fuzzy logic behaviour of STR, which mimics manual tuning, yields a potentially fast yet reliable tuning. Search for next/previous station is fast, due to the analog solution, and the search requires no IF-counter for stop detection.

HEF4052: input source selector (radio/CD/tape/aux).

TDA8424: I^2C-bus controlled hi-fi audio processor for home audio systems. It includes volume, balance bass, treble and mute control (optional).

TDA2615/16(Q): 2 – 10/20 W (maximum output power) hi-fi audio amplifier with mute.

PCF8577(T): I^2C-bus controlled LCD driver providing 32 segment drive lines and 2 backplane select lines (64 segments total.)

RC-5 remote control receiver/ amplifier (optional).

SAA3010T: RC-5 remote control transmitter (optional).

Main features of the CCA110:

CD player
- 3-beam CDM 12.1 mechanism and motorized tray loader
- full CD control including: random and scan play, track programming features, track/search up/down control, A-B repeat, track and disc repeat, direct track selection, various display formats, and a service mode

Tuning
- Four bands FM, MW, LW and SW
- FLL tuning principle
- Search up/down tuning with wrap round. Actual search is done by the TEA5757 IC and the frequency found is read by the microcontroller
- Manual up/down tuning
- 10 presets for FM; 5 presets for MW, LW and SW
- Preset scan pausing for 10 s on every station before selecting the next preset in that band
- AST (Automatic Store Tuning) searches for and stores the strongest (FM, MW LW and SW) transmitters
- Saving last band and frequency of the station at power off (in standby mode)
- 16 geographical area options (programmable).

Sound control
- Volume up/down control by means of a motor-controlled potentiometer
- Volume, balance, bass and treble control by means of an
- I^2C-bus controlled audio processor or by potentiometers
- Audio select key to select the audio function bass, treble and balance controls by means of the audio up/down keys
- Selectable inputs: radio, CD, tape and auxiliary
- Mute output to mute the power amplifiers (via pin or audio processor)
- Saving last sound settings in RAM at power off (standby mode).

Clock functions
- 12 hr/24 hr clock display function, also in standby mode
- Switch on/off timer functions
- Sleep timer function.

Display

Icons: CD INTRO, CD REPEAT, CD RANDOM, SLEEP, TIMER ON/OFF, CD MEMORY, CD TRACK, FM, MW, LW, SW, MHz, kHz, CH, AM/PM CLOCK, STEREO

Other: two 7-segment digits for CD TRACK or PRESET, and four 7-segment digits for frequency and time.

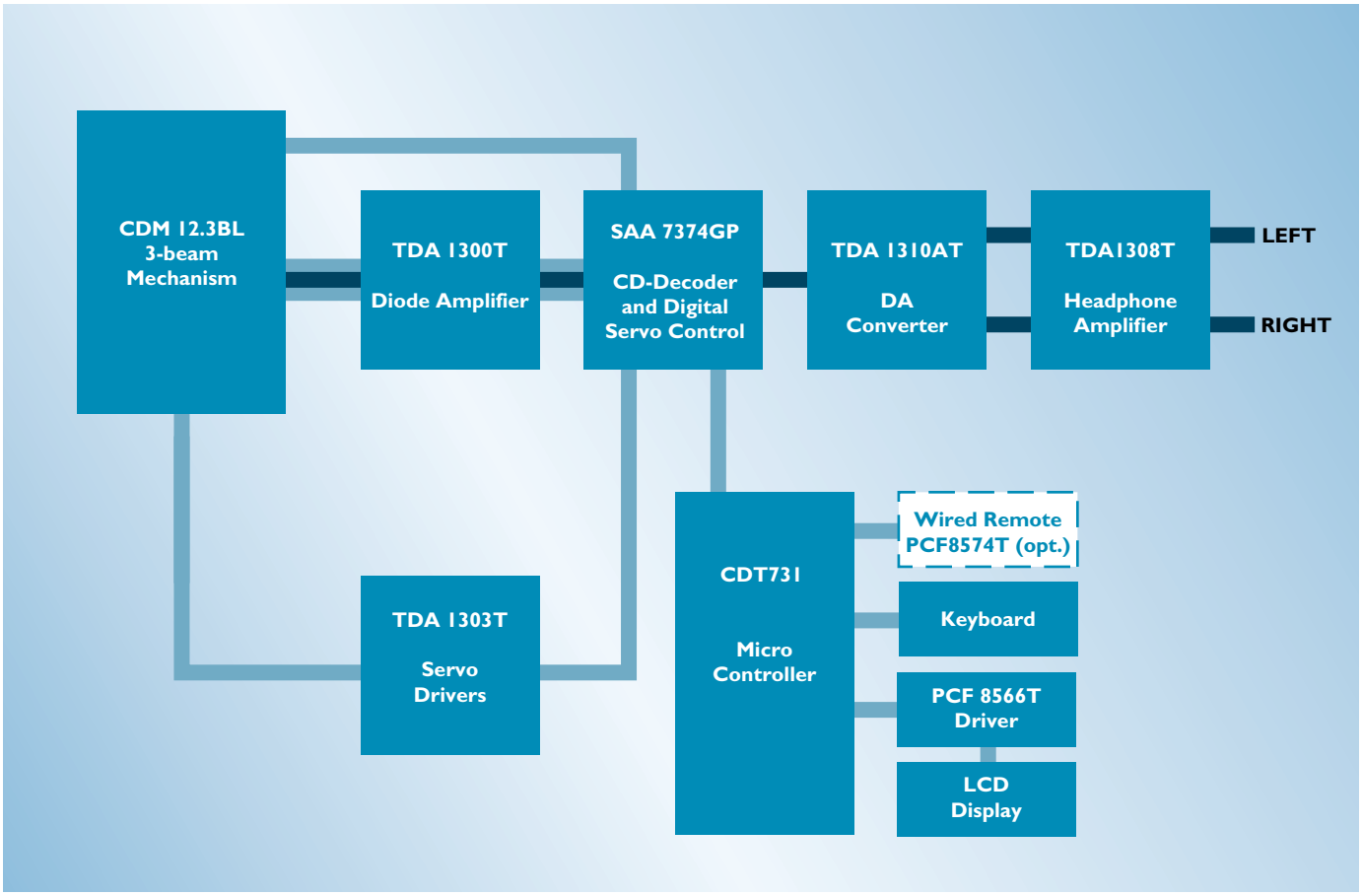
Control
- 36 local keys or RC-5 remote.

Cassette deck
- Key to select tape mode
- Automatic detection of play mode when the play key is pressed
- Interfaces with a mechanically-controlled deck
- CD synchro record mode. In CD mode the CD starts playing when the record key is pressed.

Auxiliary input
- Key to select auxiliary mode.

Switching on/off
- Momentary on/off switch
- Continuous mains power supply allows the RAM to save the preset data and clock functions
- Recall of last mode (radio/CD/tape/aux.). In radio mode, last band, preset and frequency, analog sound settings when switching on from standby
- Output to allow the power supply to be controlled by the timer functions.

Economical solution for CD headphone stereo players



HEADPHONE 7000 mid-range portable CD-player

- **CD7-system: improved playability and additional features.**
- **One-chip CD decoder and digital servo controller.**
- **Compact, low-power CD-mechanism CDM 12.3BL.**
- **Features a unique ball-clamping turntable. No external disc clamping parts are needed.**
- **Low-power, low-voltage – up to 5 hours playing time.**
- **Total player solution for personal, portable systems.**

The HEADPHONE 7000 is a highly-integrated CD system performing all the functions of a mid-range portable CD player, including software. HEADPHONE 7000 is a low- voltage, low-power consumption system providing long playing time. Fully pre-developed, this system can be used with a
customers' own design of case.

The system uses the latest semicon-ductor concept – CD-7, Philips' most recent and very-highly-integrated innovation for CD-system solutions. The HEADPHONE 7000 system uses a combined CD-decoder and digital servo controller in one chip, the SAA7374GP. This IC decodes and de-interleaves the EFM data and performs

full error correction/concealment and digital filtering. It has an embedded 19k SRAM and also controls the speed of the disc drive motor. The servo control section processes the diode signals to generate servo control signals for the focus and radial tracking actuators and the sledge motor.

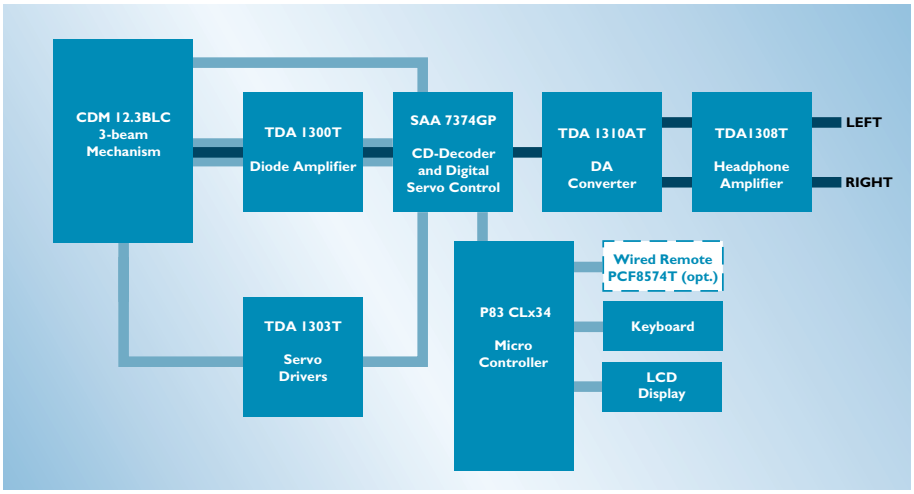
Power for driving the focus and radial actuators and sledge motor is provided by the TDA1303 triple digital servo driver.

The lightweight, compact 3-beam mechanism is just 14.4 mm high which allows for slimline designs. The unique ball-clamping turntable provides optimal ease of design-in. No external mechanical parts are needed for clamping a disc.

The TDA1300 diode amplifier and laser supply circuit buffers the diode signals for the CD7 decoder. The IC also amplifies and equalizes (option) the HF signal for the decoder and controls the power to the laser diode from the CDM 12.3BL.

The audio performance is not directly related to the CD system but depends on which Philips Semiconductors' DAC is used. Shown here is a TDA1311A continuous calibration stereo DAC with 16-bit digital input and analog voltage output. The stereo audio output is provided by a headphone amplifier circuit: TDA1308.

Control and display is from a user interface via a local keyboard and display. If desired, all the local keyboard functions can be operated from a wired remote unit via the I²C bus by using the I/O expander IC PCF8574T.



HEADPHONE 7001 mid-range portable CD-player

The system's mask-programmed microcontroller is a low-voltage circuit designed for low-power applications.

Derivative systems

The **HEADPHONE 7001** is similar to the HEADPHONE 7000 but has a microcontroller with on-board LCD display driver.

HEADPHONE 7000 SYSTEM PERFORMANCE	
Disc size	8 and 12 cm.
Formats	CD-DA
Access time (1/3 stroke)	800 msec.

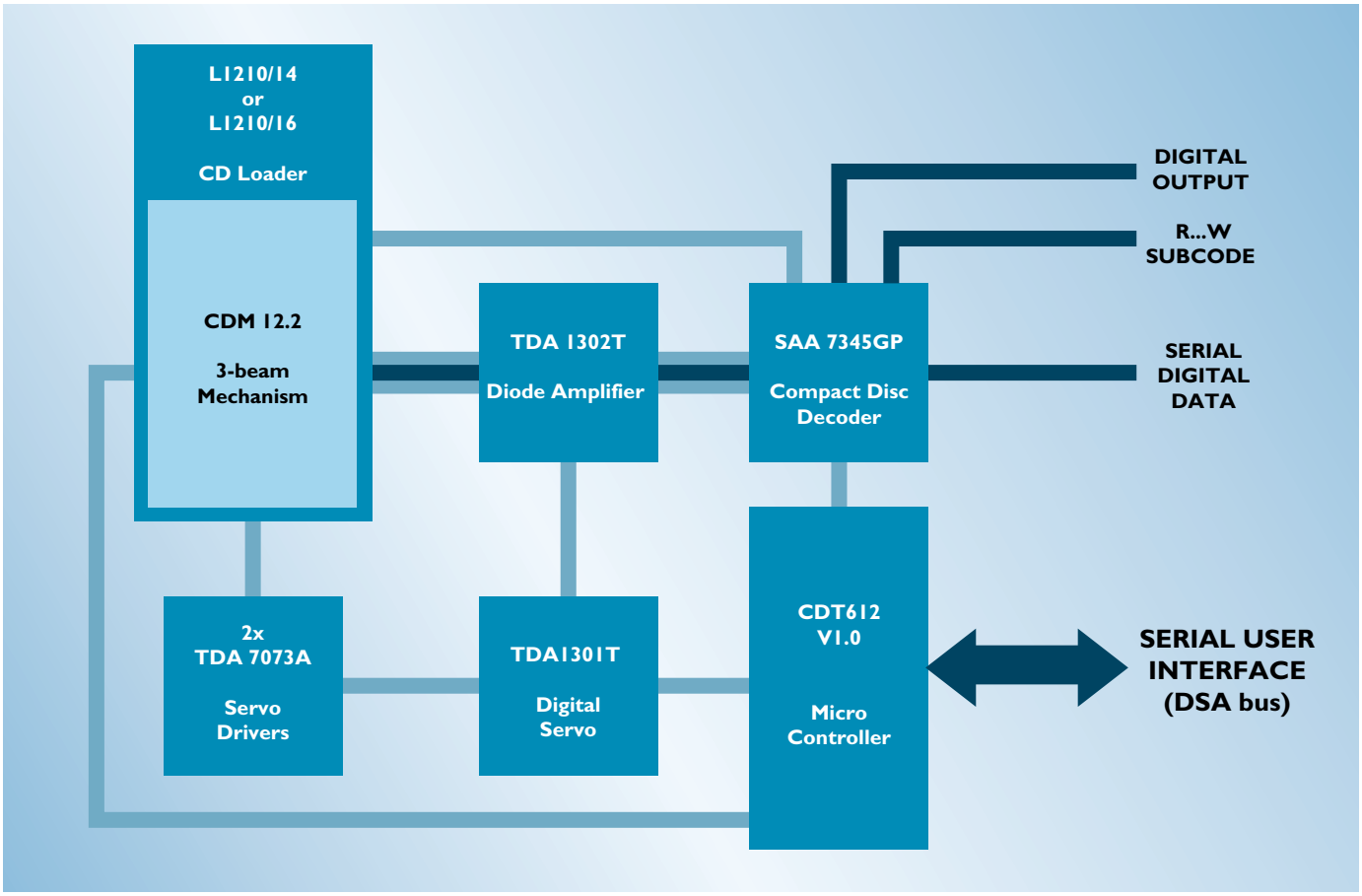
AUDIO PERFORMANCE	
Determined by DA-converter	
THD + noise	0,05 %
Signal to noise ratio	92dB

USER FUNCTION	
Keyboard	play/pause, stop/clear, next/previous, search fw&bw, store, hold/resume, mobile/standalone

POWER SUPPLY	
battery	3.3 V
adaptor	3.5 V

RELIABILITY	
MTBF (25%)	30000 Hr.

Double data transfer rates for Games applications



GAMES 6001 Double speed CD sub-system

- **The basic CD-engine for double-speed Games applications.**
- **Double-speed CDM 12.2 CD-mechanism.**
- **LI210/14 tray-type loader; top loader prepared (uses CDM 12.2T).**
- **Pre-developed software available.**
- **Digital servo system, optimized for excellent performance at dual speeds.**
- **High-performance digital decoder with high resistance to rotational shock.**

The GAMES 6001 is the basic CD-engine for Games applications. Double data transfer rates are obtained by the use of the CDM 12.2.

A pre-programmed microcontroller is available to control all the servo and CD-decoder functions. Communication with the user microcontroller is provided via a user-friendly, serial bus called DSA (Data, Strobe, Acknowledge).

A comprehensive starter-kit is available.

The GAMES 6001 is controlled by a digital servo system based on the TDA1301 IC. This unique servo processor has been optimized to provide excellent performance at single

and double-speed, and is supported by special features such as enhanced tracking capability and automatic initialization procedures. No external adjustments are necessary.

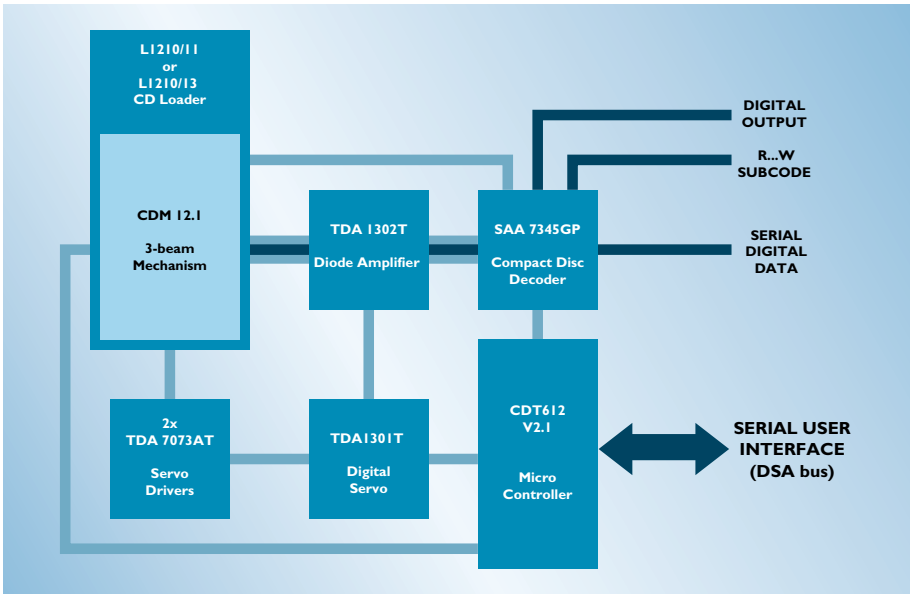
The SAA7345 decoder has an embedded 19k SRAM, and uses a unique FIFO overflow concealment technique which provides high resistance to rotational shock. Optimal data detection from the disc is ensured by the decoder's integrated digital PLL.

The L1210/14 tray-type loading mechanism contains special suspension units to provide increased damping for double-speed operation.

Related systems

The **KARAOKE 6000** system is the basic CD-engine for KARAOKE applications. It provides the user with the serial, digital audio data. All subcode channels are decoded and can be used for further Karaoke processing.

Most of the system is similar to the GAMES 6001 system. However, a different loader incorporating the CDM 12.1 CD- mechanism is used for optimal price/performance. A pre-programmed mask microcontroller is available.



KARAOKE 6000 CD sub-system

KARAOKE 6000 features

- Economy-class CDM 12.1 CD-mechanism.
- L1210/11 or L1210/13 tray-type loading mechanisms. Top loader prepared.
- Pre-developed software available.
- The basic CD-engine for Karaoke applications.
- Digital servo system, optimized for excellent performance at dual speeds.
- High-performance digital decoder with high resistance to rotational shock.

GAMES/KARAOKE 6000 SYSTEM PERFORMANCE	
Disc size	8 and 12 cm.
Data transfer rate	n=1 n=2
Formats	CD-DA, CD ROM mode 1, CD ROM mode 2, CD-XA, Photo CD
Access time (1/3 stroke)	800 msec.
Digital output	EBU-standard
Subcode channels	Q,R,S,T,U,V,W

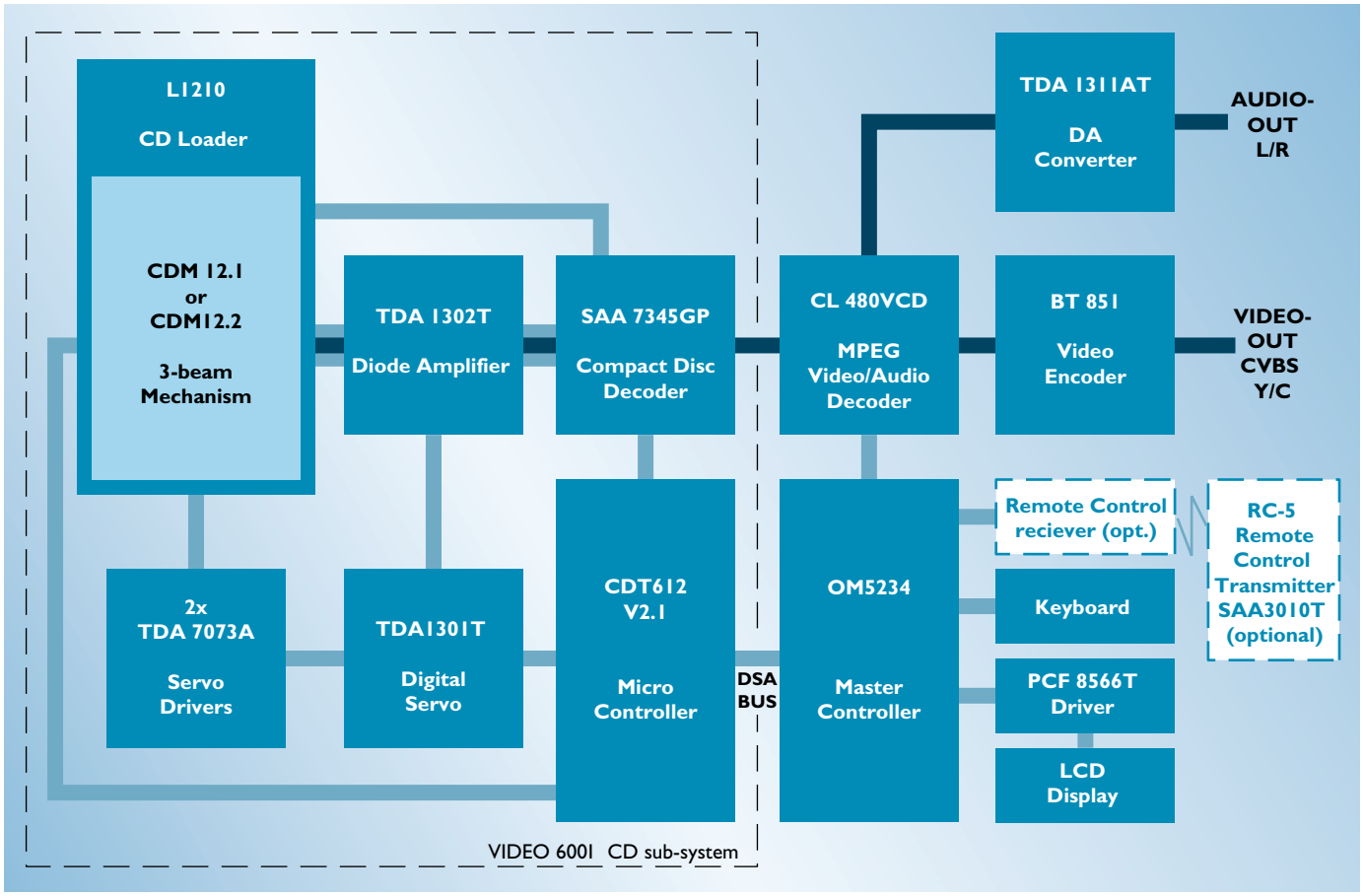
AUDIO PERFORMANCE
Determined by DA-converter

USER INTERFACE	
Type	serial asynchronous bidirectional No. of lines Data Strobe Acknowledge

POWER SUPPLY	
Supply Voltage	5 V, 12 V
Supply current (5 V)	1 A max.

RELIABILITY	
MTBF (25%)	30000 Hr.

The versatile Full Motion Video solution



VIDEO6481 VideoCD-player including MPEG1 decoding

- **The basic CD-engine for Full Motion Video applications.**
- **Single speed CDM 12.1 or double-speed CDM 12.2 CD-mechanism**
- **L1210 tray-type loader; top loader prepared.**
- **Pre-developed software available.**
- **Digital servo system, optimized for excellent performance at dual speeds.**
- **High-performance digital decoder with high resistance to rotational shock.**

The VIDEO 6001 is the basic CD-engine for Full Motion Video applications. Double data transfer rates are obtained by using the CDM 12.2.

A pre-programmed mask microcontroller is available to control all the servo and CD-decoder functions. Communication with the user microprocessor is provided through a user-friendly, serial bus called DSA
(Data, Strobe, Acknowledge).

A comprehensive starter-kit is available.

The system is controlled by a digital servo system based on the TDA1301T. This unique servo processor has been optimized to provide excellent

performance at dual speeds, supported by special features such as enhanced tracking capability and automatic initialization procedures. No external adjustments are necessary.

The SAA7345 decoder has an embedded 19k SRAM, and uses a unique FIFO overflow concealment technique which provides high resistance to rotational shock. Optimal data detection from the disc is ensured by the decoder's integrated digital PLL.

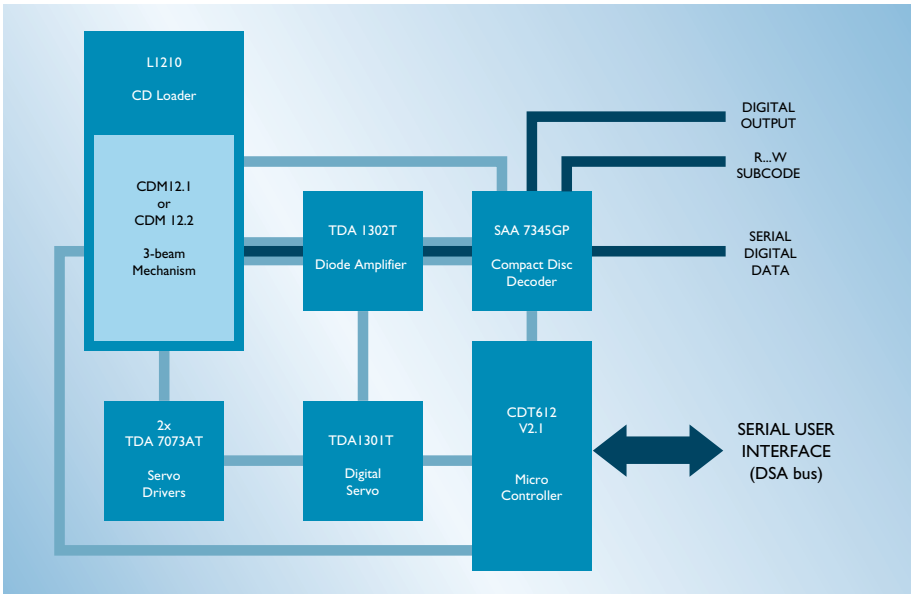
With the VIDEO 6001 sub-system, customers only have to develop the user part to make a complete Full Motion Video player. So all the features that make a player stand out in the market place are still determined by the customer's own development.
The VIDEO 6001 will however facilitate and speed up this process.

Derivative systems

VIDEO 6002 is a video CD-system based on the VIDEO 6001 system but optimized for surface-mount components. The system caters for single and double-speed rates and therefore can be used with CDM 12.1 as well as with the CDM 12.2 or CDM 12.2T (top loader version).

VIDEO 6481 is a video CD-system based on the VIDEO 6002 system but extended to include an MPEG audio/video decoder, and digital video encoder for Full Motion Video applications. The system is also 'prepared for' karaoke functions.

The system is controlled by a pre-programmed master microcontroller which communicates with the VIDEO 6002's controller via a 3-wire (DSA) bus. A local keyboard, infrared remote control (for all CD functions, Video-CD menu selection and OSD controls) and LCD display are provided.



VIDEO 6002 CD sub-system

The MPEG decoding is based around a CL480VCD circuit which decodes data streams in accordance with version 2.0 of the Video-CD standard. The IC requires only a 4 Mbit DRAM to store the encoded/decoded data, play control data and on-screen display data.

The BT851 video encoder encodes digital YUV data from the MPEG decoder into a PAL/NTSC (user selectable) CVBS or S-video signal. The composite analog video signal is available at two output pins. If desired, this allows one output to provide baseband composite video, and the other output to drive an RF modulator.

The audio performance is not directly related to the CD system but depends on which Philips Semiconductors' DAC is used. Shown here is a TDA1311A continuous calibration stereo DAC with 16-bit digital input and analog voltage output.

VIDEO 6001 SYSTEM PERFORMANCE	
Disc size	8 and 12 cm.
Data transfer rate	n=1 or 2
Formats	CD-DA, CD ROM mode 1, CD ROM mode 2, CD-XA, Photo CD
Access time (1/3 stroke)	800 msec.
Digital output	EBU-standard
Subcode channels	Q,R,S,T,U,V,W

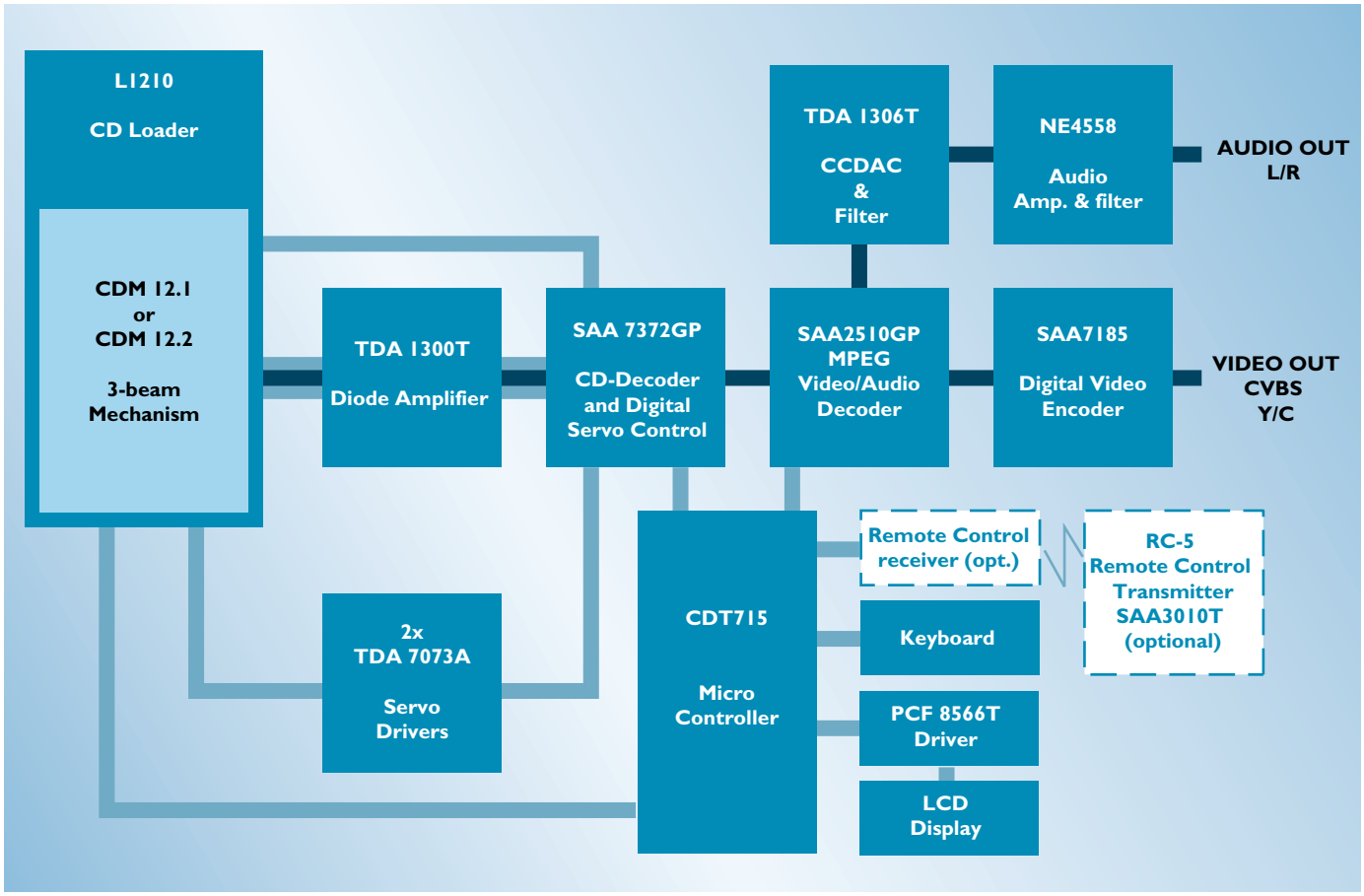
AUDIO PERFORMANCE
Determined by DA-converter

USER INTERFACE	
Type	serial asynchronous bidirectional No. of lines Data Strobe Acknowledge

POWER SUPPLY	
Supply Voltage	5 V, 12 V
Supply current (5 V)	1 A max.

RELIABILITY	
MTBF (25%)	30000 Hr.

Complete Full Motion Video system with MPEG decoding



VIDEO 7000 CD sub-system

- **CD7-system: improved playability and additional features.**
- **One-chip CD-decoder and digital servo controller.**
- **Single speed CDM 12.1 or double-speed CDM 12.2 CD-mechanism**
- **L1210 tray-type loading mechanism. Top loader prepared.**
- **Pre-developed software available.**
- **MPEG decoding of audio/video data.**
- **Fully implements Video-CD decoding to White Book 2.0 specification.**

The VIDEO 7000 is a complete pre-developed CD-system with MPEG decoding for Full Motion Video applications.

A pre-programmed microcontroller is available. Control is via a local keypad or infrared remote control transmitter.

The system uses the latest semiconductor concept – CD7, Philips' most recent and very-highly-integrated innovation for CD-system solutions.
The main feature of a CD7 system such as VIDEO 7000 is that it uses a combined CD-decoder and digital servo controller in one chip, in this case the double-speed SAA7372GP.
The DAC section is however separate so that the audio performance of the

system can be tailored precisely to individual needs.

Another distinguishing feature of this system is the inclusion of a Video-CD MPEG audio/video decoder, and digital video encoder.

The SAA2510GP MPEG decoder decodes data streams in accordance with version 2.0 of the Video-CD standard. The IC requires only 4 Mbit of DRAM to store the encoded/decoded data, play control data and on-screen display data.

The SAA7185 digital video encoder (DENC2-M) encodes digital YUV video data into PAL or NTSC CVBS or S-video signals. The circuit accepts CCIR-compatible YUV data with 720 active pixels per line in 4:2:2 multiplexed formats such as MPEG decoded data from the SAA2510. It includes a sync clock generator and on-chip DACs.

Digital to analog conversion in the VIDEO 7000 system is performed by a TDA1306T. The TDA1306T is a continuous-calibration stereo filter-DAC (CCDAC).

A comprehensive starter-kit is available.

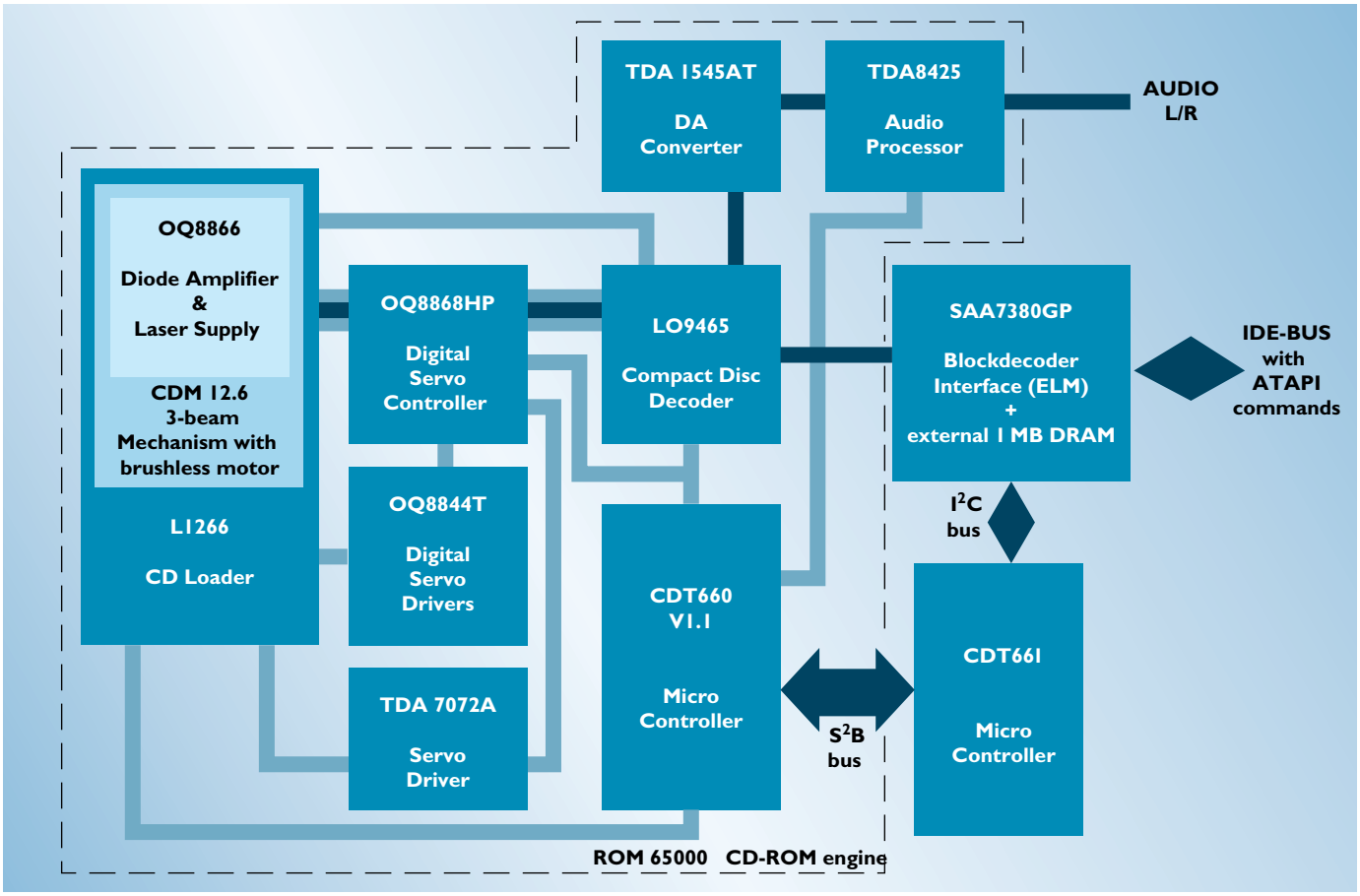
SYSTEM PERFORMANCE	
Disc size	8 and 12 cm.
Data transfer rate	n=1 or 2
output:	analog stereo line output digital output IEC 958 CVBS and Y/C (S-VHS)

AUDIO PERFORMANCE
Determined by DA-converter

USER FUNCTION	
Remote / keyboard	open/close, play/replay, stop/clear, next/prev, search fw/bw, pause, repeat, A-B repeat, random/shuffle, scan, program/review, FPS, time formats

POWER SUPPLY	
Supply Voltage	10 V
Requirement	1 A peak, 300mA average

Quad-speed systems for 5¼" half-height CD ROM applications



ROM 65060 CD-ROM quad speed system with IDE interface

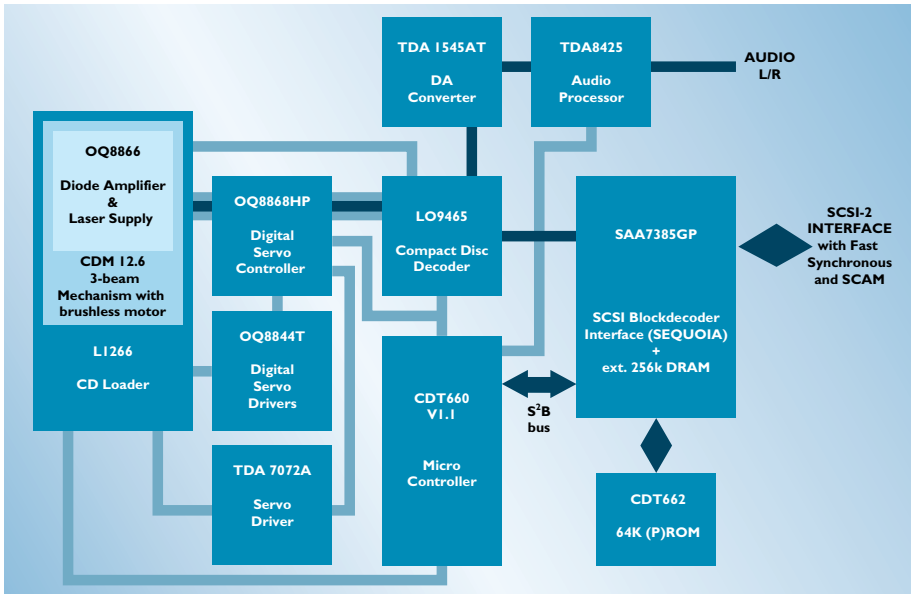
- **CD-ROM engine with pre-programmed microcontroller, and serial digital data output for further processing.**
- **Highly-integrated IDE and SCSI interface solutions.**
- **Comprehensive, user-friendly serial control interface (S²B).**
- **Audio channel switching for bilingual CD-ROM applications.**
- **L1266 loader with special suspension and clamping for the CDM 12.6 three-beam mechanism.**
- **Fast radial access and quadruple data transfer rates.**

The ROM 65000 is a complete, pre-developed CD-ROM engine, providing fast access times and data transfer rates up to sustained quadruple speed (600 kbytes/s). The engine can be extended to provide IDE and SCSI interfacing options based on two new block decoder circuits.

The engine's tray-type loader and CD mechanism used are suitable for installation in a 5¼" half-height PC drive bay.

A pre-programmed, masked micro-controller is available, offering the user a comprehensive control interface to reduce the design-in cycle. The microcontroller controls all the servo and CD-decoding functions.

The L1266 tray-type loader assembly is easy to build-in, and contains special suspension units to provide the extra damping and clamping required when operating at quadruple speed.



ROM 65080 CD-ROM quad speed system with SCSI-2 interface

Features:

- Fully-integrated single-IC SCSI-2 interface including 33 MHz 80C32 controller
- 48 mA SCSI drivers
- Fast, synchronous, block-oriented host transfer (10 Mbytes/s)
- Supports SCSI plug-and-play with SCAM
- High data integrity with error flag processing and 3rd layer correction
- Red book audio pass-through & block-oriented host data transfer
- Supports 1Mbyte cache RAM
- General-purpose I/Os for servo control

For fast radial access, the 3-beam CDM 12.6 features a high-speed sledge motor with high-ratio gearing. It is controlled by an adjustment-free digital servo system, based on the OQ8868.
This unique servo processor has been optimized to provide excellent performance, supported by special features such as enhanced tracking capabilities and automatic initialization procedures. No external adjustments are
necessary.

The OQ8866 HF amplifier and laser supply IC is incorporated on the sledge of the CDM 12.6 mechanism.
This improves the signal-to-noise ratio because the diode currents are converted to the HF signal close to the source.

Furthermore, the CDM 12.6 features a brushless disc motor, which gives the system its long lifetime and superb reliability even at the high (quadruple) speed.

An LO9465 single-chip decoder IC decodes and deinterleaves the EFM data signal, ready for further processing by a CD-ROM block decoder.

The LO9465 features improved error-correction for CD-ROM applications.

Easy design-in
A comprehensive starter-kit is available for CD-ROM drive manufacturing companies. This contains a fully operational sample and the necessary technical documentation.

Derivative systems:
ROM 65060. This is a complete quad-speed CD-ROM system based on the ROM 65000 engine, but with an IDE interface. The interface is based on the SAA7380 (ELM) CD-ROM block decoder IC.

Features:

- Interfaces to IDE-bus without external drivers.
- Compatible with ATA register set and ATAPI command set.

ROM 65080.
This is a complete quad-speed CD-ROM system based on the ROM 65000 engine, but with a SCSI interface. The interface is based on the SAA7385 (SEQUOIA) CD-ROM block decoder IC.

ROM65000 SYSTEM PERFORMANCE	
Disc size	8 and 12 cm.
Storage capacity : mode 1 mode 2	 553 Mbytes Mbytes 635
Formats	CD-DA, CD ROM mode 1, CD ROM mode 2, CD-ROM XA, Photo CD, Video CD
Access time (1/3 stroke)	235 msec.
Seek time (1/3 stroke)	180 msec.
Digital output	EBU-standard
Sustained transfer rate	600 kbyte/sec.

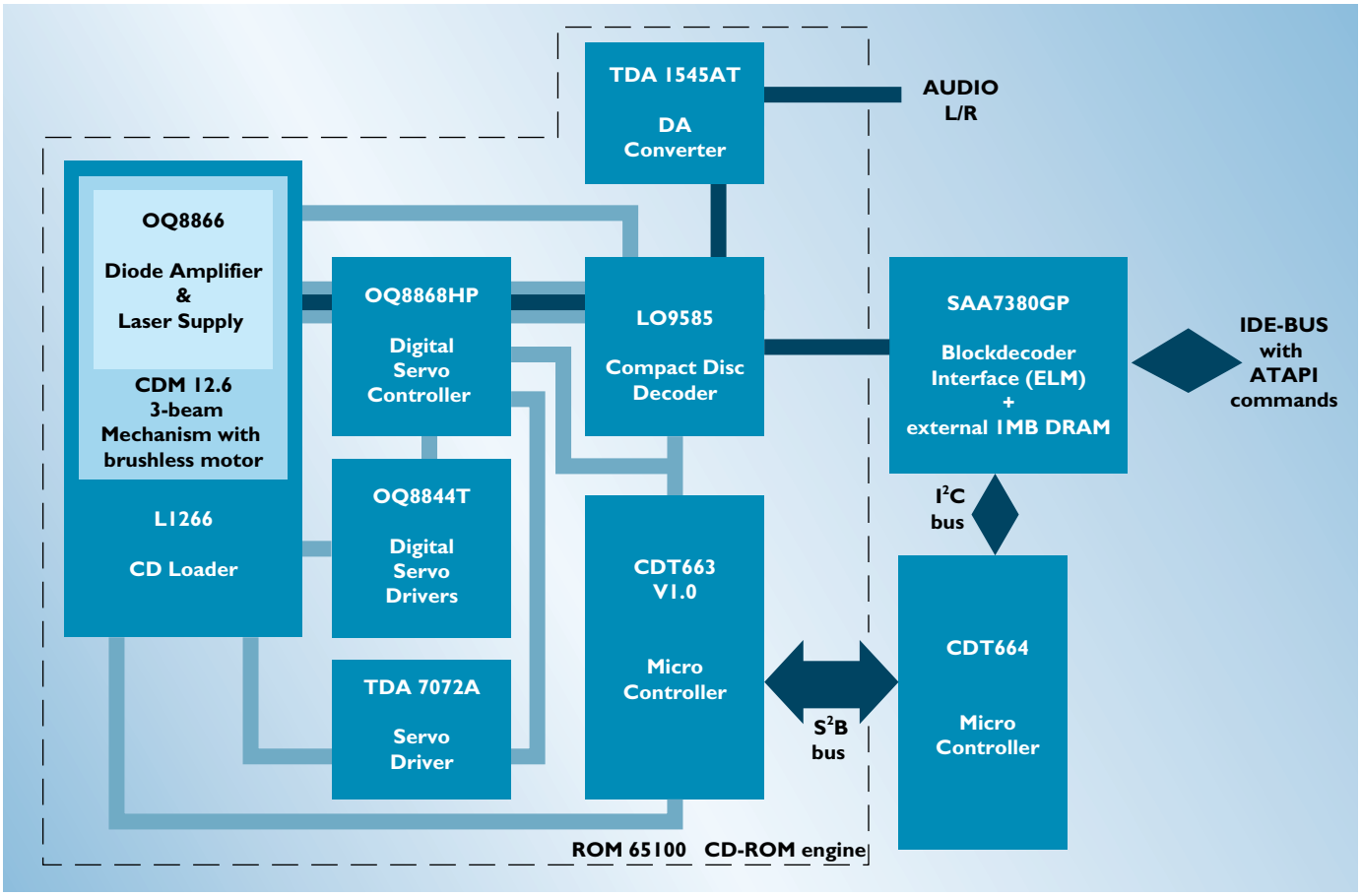
USER INTERFACE	
Type	serial asynchronous bidirectional
No. of lines	TXD (transmit data) RXD (receive data) CPR (control up ready) SUR (servo unit ready)

DATA INTERFACE	
Default	CD-ROM I²S
Audio format	software selectable
R...W subcode	serial format

POWER SUPPLY	
Supply Voltage	5 V, 12 V

RELIABILITY	
MTBF (100%)	50000 Hr.

Hex-speed system for 5¼" half-height CD ROM applications



ROM 65160 CD-ROM hex speed system with IDE interface

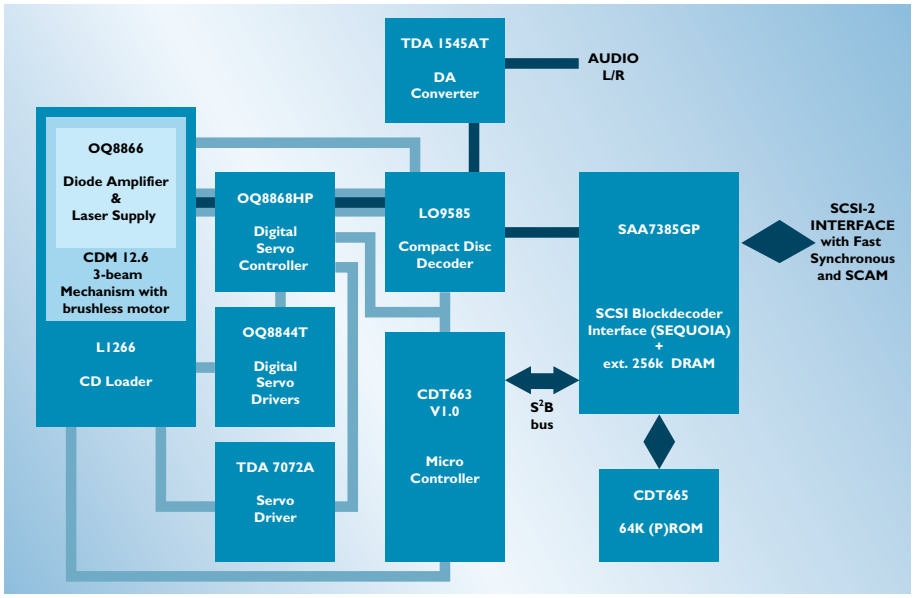
- **Upgrade of ROM 65000 (4x) system providing data transfer rates up to 975 kbytes/s (6x).**
- **CD-ROM engine with pre-programmed microcontroller and serial digital data output for further processing.**
- **L1266 tray loader with special suspension and clamping for the CDM 12.6 three-beam mechanism.**
- **Comprehensive, user-friendly serial control interface (S²B).**

The ROM 65100 or 'hexaROM' is a complete pre-developed CD-ROM engine for applications with drive rotation speeds up to six times standard speed. This improved performance comes from using a faster CD decoder IC (LO9585) than in the ROM 65000 engine, Philips-patented *zoned bit rate* techniques, and an improved digital servo system. The same mechanism used in the ROM 65000 is employed – the CDM 12.6, whose full potential can now be exploited. The engine can be extended to provide IDE and SCSI interfacing options based on two new block decoder circuits.

Together, these components are optimized for an average sustained data rate of 900 kbytes/s. The tray-type loader and CD mechanism used are suitable for installation in a 5¼" half-height PC drive bay.

A pre-programmed, masked micro-controller is available, offering the user a comprehensive control interface to reduce the design-in cycle. The microcontroller controls all the servo and CD-decoding functions.

The tray-type loader allows easy build-in, and contains special suspension units to provide the extra damping and clamping required during hex-speed operation.



ROM 65180 CD-ROM hex speed sub player with SCSI-2 interface

Features:

- Fully-integrated single-IC SCSI-2 interface including 33 MHz 80C32 controller
- 48 mA SCSI drivers
- Fast, synchronous, block-oriented host transfer (10 Mbytes/s)
- Supports SCSI plug-and-play with SCAM
- High data integrity with error flag processing and 3rd layer correction
- Red book audio pass-through & block-oriented host data transfer
- Supports 1Mbyte cache RAM
- General-purpose I/Os for servo control

For fast radial access, the 3-beam CDM 12.6 features a high-speed sledge motor with high-ratio gearing. It is controlled by an improved adjustment-free digital servo system, based on the OQ8868HP. This unique servo processor has been optimized to provide excellent performance, supported by special features such as enhanced tracking capabilities and automatic initialization procedures.

The OQ8866 HF amplifier and laser supply IC is incorporated on the sledge of the CDM 12.6 mechanism. This improves the signal-to-noise ratio because the diode currents are converted to the HF signal close to the source.

Furthermore, the CDM 12.6 features a brushless disc motor, which gives the system its long lifetime and superb reliability even at the high (sextuple) speed.

Besides enabling higher data rates than the LO9465 used in ROM 65000 systems, the new LO9585 decoder IC consumes less power. Like the LO9465, the LO9585 features improved error-correction for CD-ROM applications.

Easy design-in

A comprehensive starter-kit is available from Philips Key Modules for CD-ROM drive manufacturing companies. This contains a fully operational sample and the necessary technical documentation.

Derivative systems

ROM 65160. This is a complete hex-speed CD-ROM system based on the ROM 65100 engine, but with an IDE interface. The interface is based on the SAA7380 (ELM) CD-ROM block decoder IC.

Features:

- Interfaces to IDE-bus without external drivers.
- Compatible with ATA register set and ATAPI command set.

ROM 65180. This is a complete hex-speed CD-ROM system based on the ROM 65100 engine, but with a SCSI interface. The interface is based on the SAA7385 (SEQUOIA) CD-ROM block decoder IC.

ROM65100 SYSTEM PERFORMANCE	
Disc size	8 and 12 cm.
Storage capacity : mode 1 mode 2	 553 Mbytes 635 Mbytes
Formats	CD-DA, CD ROM mode 1, CD ROM mode 2, CD-ROM XA, Photo CD, Video CD
Access time (1/3 stroke)	235 msec.
Seek time (1/3 stroke)	180 msec.
Digital output	EBU-standard
Sustained transfer rate	900 kbyte/sec.

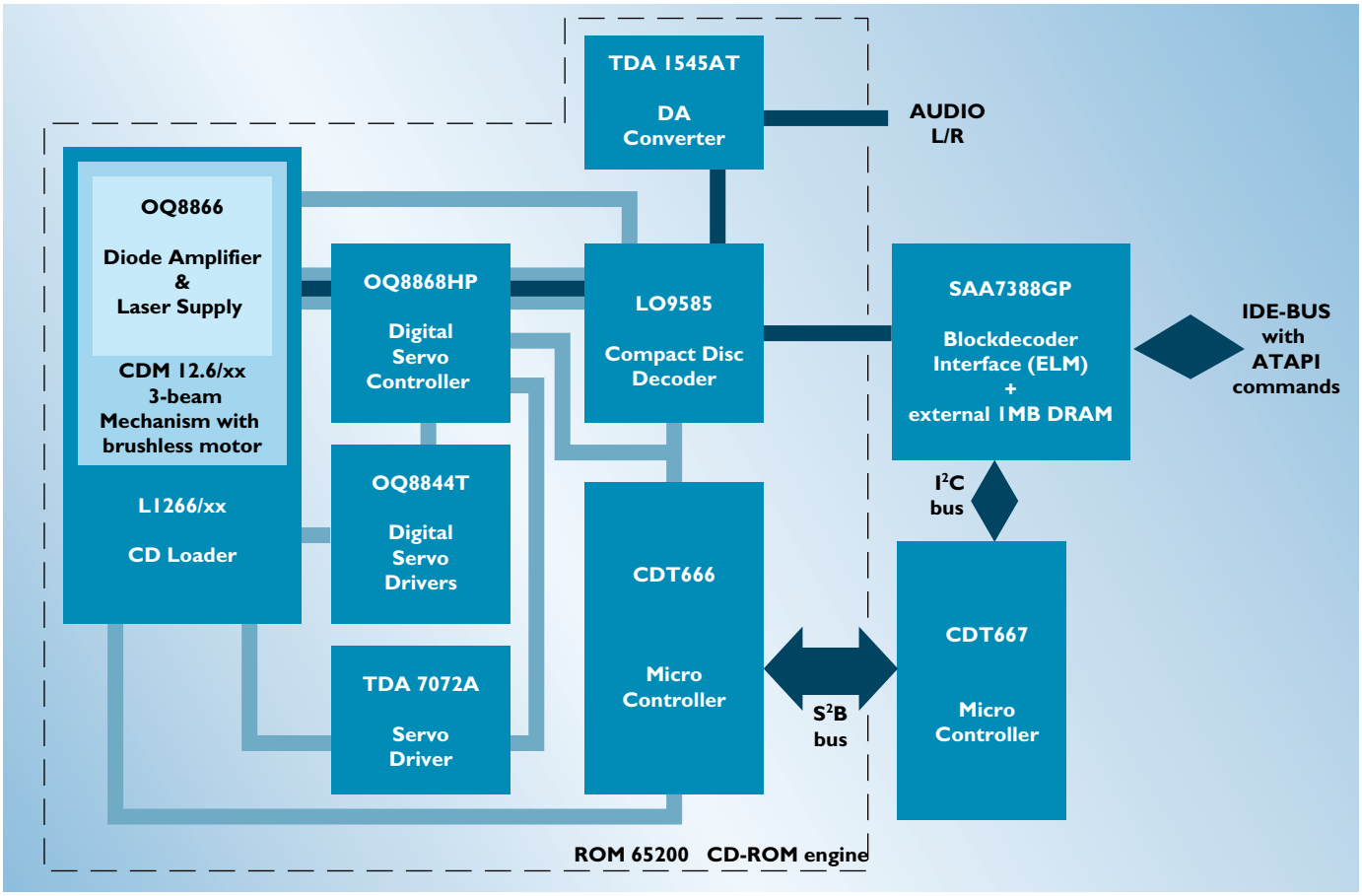
USER INTERFACE	
Type	serial asynchronous bidirectional
No. of lines	TXD (transmit data) RXD (receive data) CPR (control up ready) SUR (servo unit ready)

DATA INTERFACE	
Default	CD-ROM I^2S
Audio format	software selectable
R...W subcode	serial format

POWER SUPPLY	
Supply Voltage	5 V, 12 V

RELIABILITY	
MTBF (100%)	50000 Hr.

Octal-speed system for 5¼" half-height CD ROM applications



ROM 65260 CD-ROM octal speed system with IDE interface

- **Up to 8x data transfer rates (1050 kbytes/s).**
- **CD-ROM engine with pre-programmed microcontroller, and serial digital data output for further processing.**
- **Highly-integrated IDE and SCSI interface solutions.**
- **LI266/xx incorporating the improved CDM 12.6/xx.**
- **Comprehensive, user-friendly serial control interface (S^2B).**

The ROM 65200 is a complete pre-developed CD-ROM engine for applications with drive rotation speeds up to eight times standard speed. This improved performance comes from using a faster CD decoder IC (LO9585) than in the ROM 65000 engine, Philips-patented *zoned bit rate* techniques, and an improved digital servo system. An improved CDM 12.6/xx mechanism is employed, whose full potential can now be exploited. The engine can be extended to provide IDE and SCSI interfacing options based on two new block decoder circuits.

Together, these components are optimized for an average sustained data rate of 1050 kbytes/s. The tray-type loader and CD mechanism used are suitable for installation in a 5¼" half-height
PC drive bay.

A pre-programmed, masked microcontroller is available, offering the user a comprehensive control interface to reduce the design-in cycle. The microcontroller controls all the servo and CD-decoding functions.

The tray-type loader allows easy build-in, and contains special suspension units to provide the extra damping and clamping required during octal-speed operation.

For fast radial access, the 3-beam CDM 12.6/xx features a high-speed sledge motor with high-ratio gearing. It is controlled by an improved adjustment-free digital servo system, based on the OQ8868HP. This unique servo processor has been optimized to provide excellent performance, supported by special features such as enhanced
tracking capabilities and automatic initialization procedures.

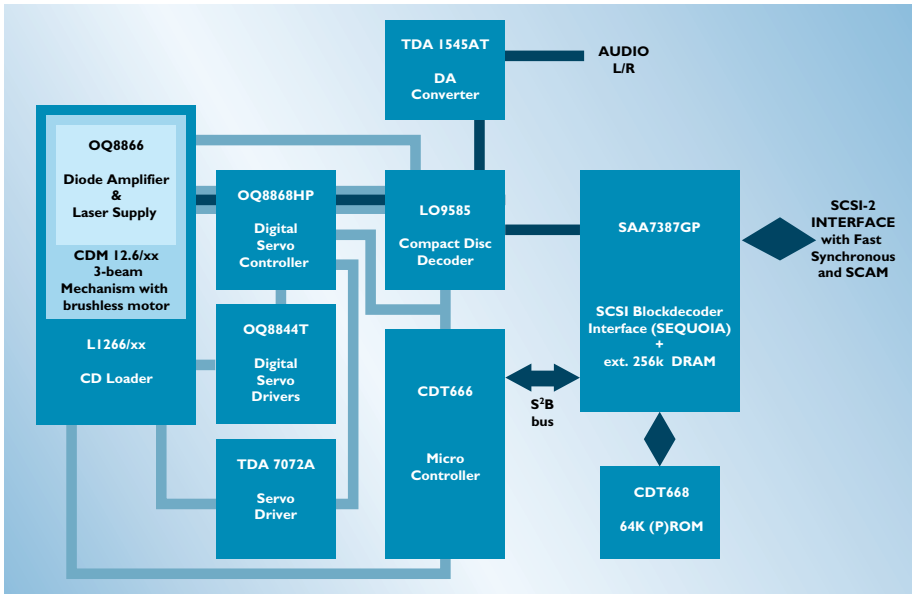
The OQ8866 HF amplifier and laser supply IC is incorporated on the sledge of the CDM 12.6/xx mechanism. This improves the signal-to-noise ratio because the diode currents are converted to the HF signal close to the source.

Furthermore, the CDM 12.6/xx features a brushless disc motor, which gives the system its long lifetime and superb reliability even at the high (octuple) speed.

Besides enabling higher data rates than the LO9465, the new LO9585 decoder IC consumes less power. Like the LO9465, the LO9585 features improved error-correction for CD-ROM applications.

Easy design-in
A comprehensive starter-kit will be available from Philips Key Modules for CD-ROM drive manufacturing companies. This contains a fully operational sample and the necessary technical
documentation.

Derivative systems
ROM 65260. This is a complete octal-speed CD-ROM system based on the ROM 65200 engine, but with an IDE interface. The interface is based on the SAA7388 (ELM) CD-ROM block decoder IC.



ROM 65280 CD-ROM octal speed system with SCSI-2 interface

ROM65200 SYSTEM PERFORMANCE	
Disc size	8 and 12 cm.
Storage capacity : mode 1 mode 2	 553 Mbytes Mbytes 635
Formats	CD-DA, CD ROM mode 1, CD ROM mode 2, CD-ROM XA, Photo CD, Video CD
Access time (1/3 stroke)	235 msec.
Seek time (1/3 stroke)	180 msec.
Digital output	EBU-standard
Sustained transfer rate	1050 kbyte/sec.

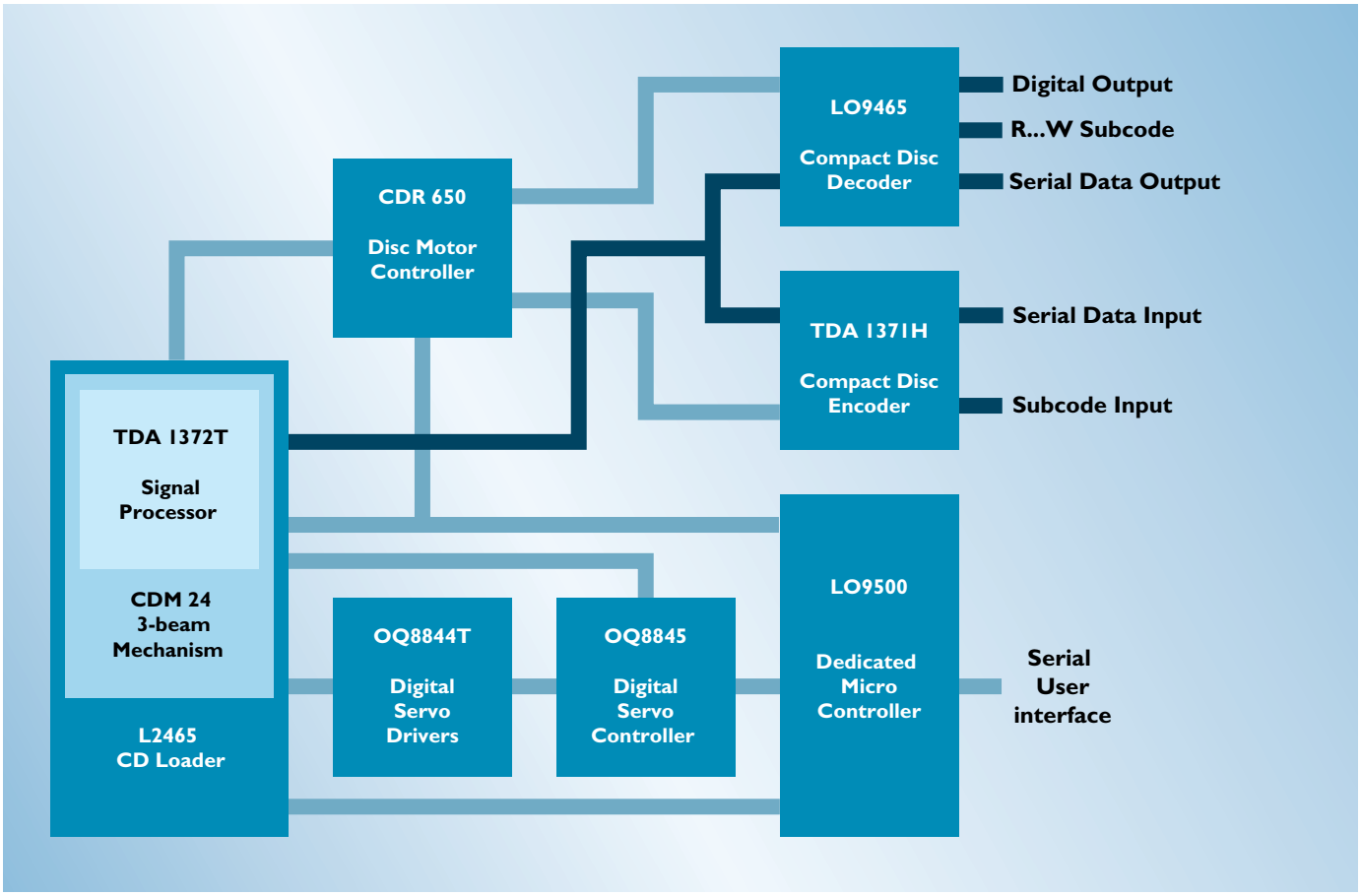
USER INTERFACE	
Type	serial asynchronous bidirectional
No. of lines	TXD (transmit data) RXD (receive data) CPR (control up ready) SUR (servo unit ready)

DATA INTERFACE	
Default	CD-ROM I^2S
Audio format	software selectable
R...W subcode	serial format

POWER SUPPLY	
Supply Voltage	5 V, 12 V

RELIABILITY	
MTBF (50%)	60000 Hr. target

CDR-engine for double-speed recording and quad-speed playback



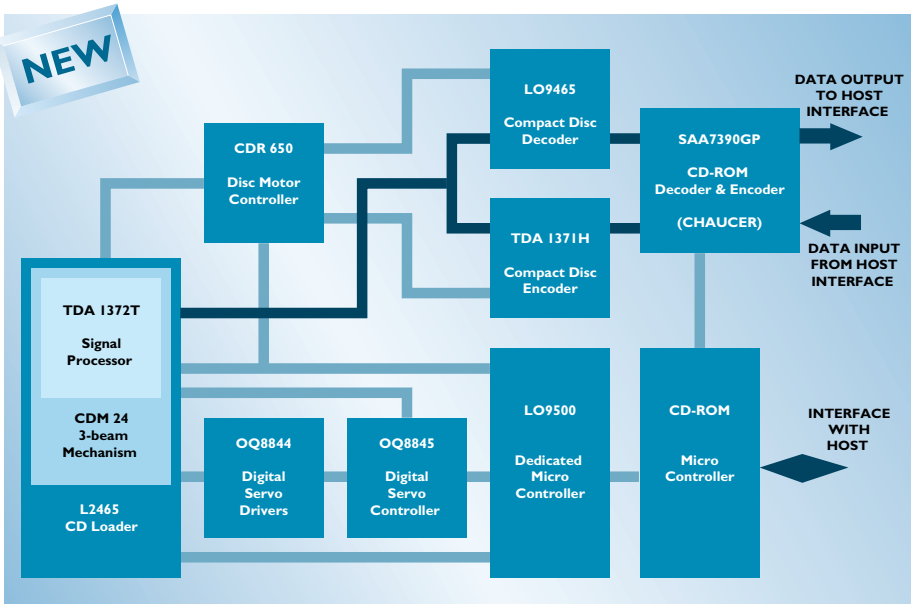
E65400 CD-Recorder sub-system

- **L2465 tray-type loader assembly for 5¼" half-height plug-in applications. (option: Charcoal grey colour).**
- **Fast access: 350 ms at n=4.**
- **Incorporates all basic functions of a CD-Recordable application (audio and data).**
- **Up to double-speed recording and quadruple-speed playback.**
- **Versatile and comprehensive interface.**
- **Highly refined servo and laser control.**

The RECORDER E65400 CD-Recordable engine provides all the basic functions of a CD-Recordable application. It incorporates a CD encoder and decoder and a dedicated microcontroller. Recording can be up to double-speed, and playback up to quad-speed with fast access. The system accepts 12 cm and 8 cm discs from all brands, for both playback and recording.

The E65400 uses the CDM 24 mechanism and L2465 loader and is designed so that:

- together with a data-user part (block-decoder, block-encoder, buffer manager and host interface), a 5¼" half-height data CD-Recorder/CD-ROM player can be made.



D65420 Data CD-Recorder system

- together with an audio-user part (DAC, ADC, display and features), an audio CD-Recorder/ CD-Player can be made.

The pre-programmed, dedicated microcontroller ensures reliable operation and provides a versatile and user-friendly interface. It handles all servo, calibration and laser control functions during read, write and access operations. It also controls CD-decoding and encoding operations.

Main features of the RECORDER E65400:
- All servo and access functions
- Power calibration functions
- Read and write functions
- CD decoding and encoding functions
- Interfaces with a data or an audio path
- Accepts 8 cm and 12 cm discs.

An E65400 starter-kit is available.

Derivative systems

The **D65420 DATA ENGINE** is an extension of the basic E65400 engine, forming the basis for a data CD-Recorder. Together with the E65400 and a user part (buffer manager and host interface), the D65420 can be used to make a 5¼"-inch half-height data CD-recorder drive.

The D65420 DATA ENGINE is a highly-integrated approach, using the SAA7390 IC (nickname: Chaucer). The SAA7390 is a high-performance CD-R, CD-I interface IC with external SCSI or ATAPI options. It includes block decoder, block encoder and buffer manager.

Though the CD-recordable interface module for the E65400 can be adapted to suit a range of interface standards, the first available using the SAA7390 will be a SCSI solution (see figure).

SAA7390 features:
- Fully-integrated CD-ROM block encoder/decoder
- Third level error corrector
- Third layer ECC syndrome calculation
- Third layer encode/decode and buffer management
- Block-oriented host transfers
- Generic interface with 16.9 Mbyte/s transfer for external SCSI (53CF92) or ATAPI IC
- Designed for 8x read and 6x write speeds
- Supports 256k, 1M or 4M, 70 ns low-cost DRAMs
- Ten-level arbitration logic in buffer manager

E65400/D65420 SYSTEM PERFORMANCE	
Disc size	8 and 12 cm.
Data transfer rate	read (n=1 or 2 or 4) write (n=1 or 2)
CDROM mode 1	n=1 n=2 n=4
176.4, 352.8, 705.6 kb/s, 76.4, 352.8 kb/s	
D65420:	150kb/s (D65420) 300kb/s (D65420) 600kb/s (sustained) (D65420)
Formats	CD-DA, CD ROM mode 1, CD ROM mode 2, CD-I, CD-XA, CD-Bridge, Photo CD,
Video	CD, CDR
Access time read(1/3 stroke n=4)	<350msec.
Digital output	EBU-standard
Subcode channels	Q,R,S,T,U,V,W

USER INTERFACE	
Type	high speed serial synchronous bidirectional
No. of lines	Data out Data in Clock Acknowledge

DATAINTERFACE	
Default	CD-ROM I^2S
Audio format	software selectable
R...W subcode	serial format

POWER SUPPLY	
Supply Voltage	+5 V, +12 V
Power consumption (n=4)	4 W

RELIABILITY	
MTBF (50%)	60000 Hr.

The ultimate application flexibility...
...available for Philips' customers

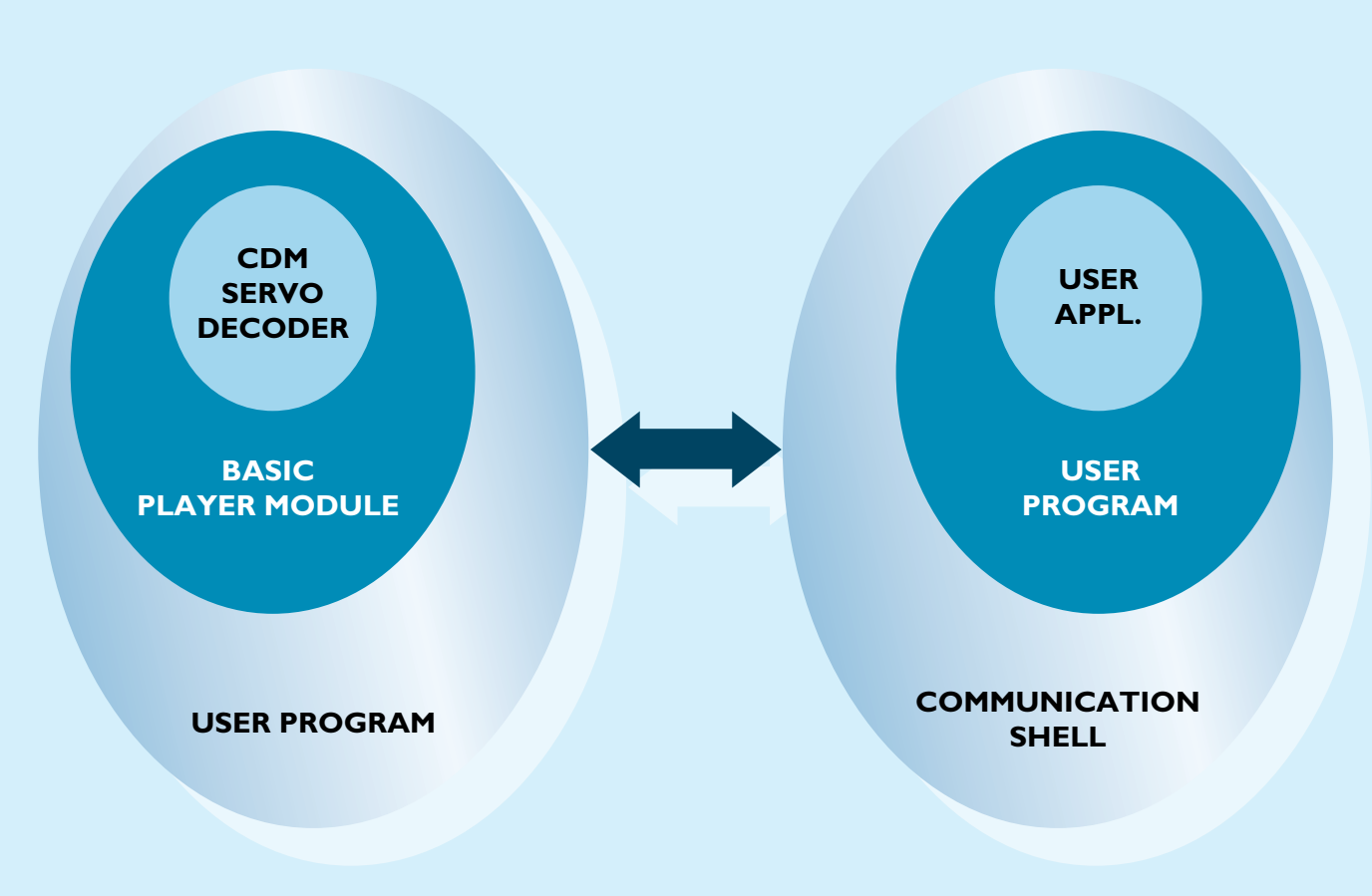


Fig.1 Basic Player Modules – two-microcontroller approach

A Basic Player Module (or BPM) is that part of the firmware that controls the servo and CD-decoding functions. The figures show two possible application options:

- the two-microcontroller approach
- the single-microcontroller approach.

Fig.1 shows the two-microcontroller approach. Around the BPM, a communication shell is written. This takes care of the interface between the BPM and an external (user) microcontroller. Hardware communication lines are used between the two microcontrollers. An example of this can be seen in our GAMES 6001 application. The hardware protocol used here is the DSA-interface.
This set-up allows for maximum flexibility and facilitates significantly upgrades of applications, because the user program is independent of the servo/decoder program.

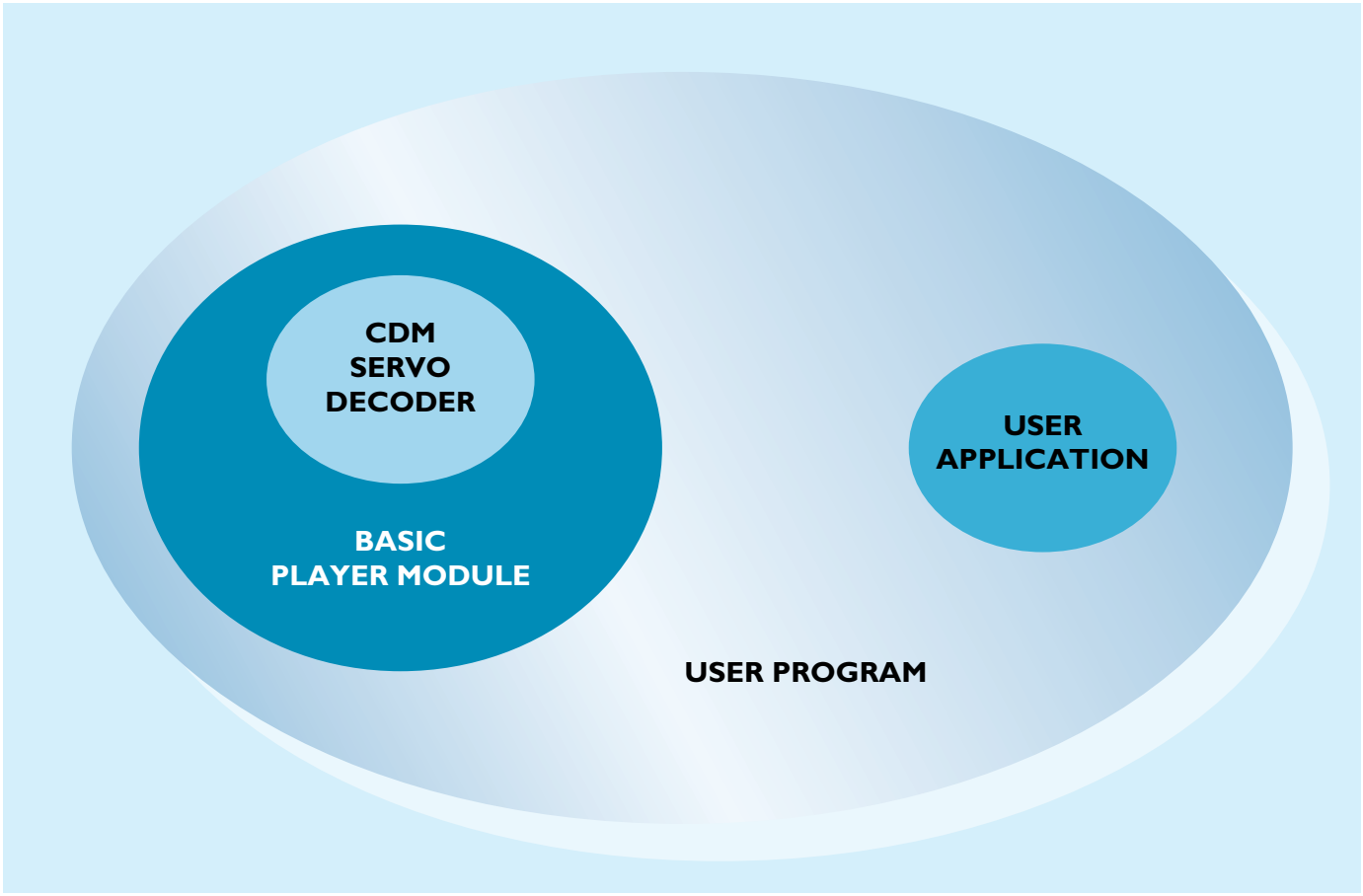


Fig.2 Basic Player Modules – integrated-microcontroller approach

Fig.2 shows a more cost-effective approach – the user program is integrated with the BPM in one microprocessor. Interfacing takes place in software. An example of this approach is our HIFI 6000 system.

By making this firmware available (license agreement is required), our customers can develop in-house the user software for their specific applications. Software support from Philips is available.

Basic Player Modules are not only related to the specific servo/decoder application, but also to the CD-mechanism. All servo related coefficients which have been optimized for the
specific applications are embedded in this firmware. Therefore, different BPMs are available. Please contact your local sales-office for more information on Basic Player Module firmware.

O=present □=option [O]=choice

DELIVERABLE SYSTEM ICs

IC	TDA1300T	TDA1302T	TDA1301T	OQ8868HP	LO9465	LO9585	SAA7345GP	SAA7370GP	SAA7372GP	SAA7374GP	SAA7376GP	OQ8844T	OQ8845	TDA1303T	TDA7072A(T)	TDA7073A(T)	TDA1305T	TDA1306T	TDA1310A(T)	TDA1311A(T)	TDA1545A(T)	TDA8425	NE4558	TDA1308(T)	SAA2510GP	SAA7185	SAA7380GP	SAA7385GP	SAA7387GP	SAA7388GP	SAA7390GP	TDA1371H	OM5234/FBx/...	OM5232/FBP/507	OM5232/FBP/512	OM5234/FBP/522	OM5234/FBB/536	OM5234/FBP/536	OM5232/FBP/...	VARIOUS	OM5238/FBx/...	OM5238/FBx/...	VARIOUS
IC-function	diode amplifier/laser supply	diode amplifier/laser supply	dig. servo processor	dig. servo	cd decoder	cd decoder up to N=8	cd decoder	cd decoder & servo (N=4)	cd decoder & servo (N=2,VCD)	cd decoder & servo low power	cd decoder & servo (N=1)	dig. servo driver	dig. servo controller	dig. servo driver	servo power driver	servo power driver	BCC DA convertor & filter	BCC DA convertor & filter	DA convertor	DA convertor	DA convertor	audio processor	audio amp & filtering	audio hps amplifier	Video CD MPEG1 decoder	dig. video encoder	cd ROM decoder/interface (N=6)	cd ROM decoder/interface SCSI2(N=6)	cd ROM decoder/interface SCSI2 (N=8)	cd ROM decoder/interface (N=8) IDE	cd ROM devoder & encoder	cd encoder	CCA110 microcontroller	CDT610 V1.1 microcontroller	CDT611 V1.0 microcontroller	CDT612 V1.0 microcontroller	CDT612 V2.1 microcontroller	CDT612 V2.1 microcontroller	CDT613 V1.3 microcontroller	CDT660 V1.1 microcontroller	CDT661 microcontroller	CDT662 ROM	CDT663 V1.0 microcontroller
IC-name	DALAS	DALAS	DSIC2	DSICS	CD65		CD6	CD7	CD7	CD7	CD7	DSD2	DSICR	DSD1	single BTL	dual BTL		BCCDAC	CCDAC	CCDAC	CCDAC	dil					ELM	SEQUOIA	SEQUOIA	ELM	CHAUCER	CDCEP		DIL-40	DIL-40	DIL-40	QFP-44	DIL-40	DIL-40	QFP-44, PLCC-44			PLCC-44/QFP-44
application																																											
HIFI																																											
HIFI6000		O	O				O									2				O			O											O									
HIFI6013		O	O				O									2				O			O																O				
HIFI6011		O	O				O									2				O			O												O								
HIFI7000	O										O					2				O			O																				
HIFI7001	O										O					2				O			O																				
PREMIUM 6000				O			O									2	O																										
CCA110		O	O				O									2				O													O										
HPS																																											
HEADPHONE 7000	O									O				O					O					O																			
HEADPHONE 7001	O									O				O					O					O																			
CDV																																											
GAMES 6001		O	O				O									2																				O							
KARAOKE 6000		O	O				O									2																						O					
VIDEO 6001		O	O				O									2																						O					
VIDEO 6002		O	O				O									2																					O						
VIDEO 6481		O	O				O									2																					O						
VIDEO 7000	O								O							2		O							O	O																	
CDROM																																											
ROM 65000				O	O							O			O						O	O																		O			
ROM 65060				O	O							O			O						O	O					O													O	O		
ROM 65080				O	O							O			O						O	O						O												O		O	
ROM 65100				O		O						O			O						O																						O
ROM 65160				O		O						O			O						O						O																O
ROM 65180				O		O						O			O						O							O															O
ROM 65200				O		O						O			O						O																						
ROM 65260				O		O						O			O						O									O													
ROM 65280				O		O						O			O						O								O														
CDR																																											
REC E65400					O							O	O																			O											
REC D65420					O							O	O																		O	O											

DELIVERABLE SYSTEM Mechanisms

application	CDT664 microcontroller (OM5238/FBx/...)	CDT665 ROM (OM5238/FBx/...)	CDT666 microcontroller, PLCC-44/QFP-44 (To be defined)	CDT667 microcontroller (OM5238/FBx/...)	CDT668 ROM (OM5238/FBx/...)	CDT711 microcontroller (P83CL8X34../...)	CDT710 microcontroller (OM5232/FBx/...)	CDT715 microcontroller (OM5238/FBx/...)	CDT731 microcontroller (P83CLx34.../...)	CDT73x microcontroller (P83CL834.../...)	PREMIUM 6000 Microcontroller (LO9468)	servo processor (LO9500)	CDR650 V1.0 motor processor (CV4557A28)	non-volatile memory (PCF8522(T))	LCD display driver (PCF8566(T))	LCD display driver (PCF8577C(T))	wired remote (PCF8574(T))	RC5 transmitter (SAA3010(T))	RC5 amplifier
HIFI																			
HIFI6000															o			□	□
HIFI6013															o			□	□
HIFI6011																			
HIFI7000							o							□	o			□	□
HIFI7001						o								□				□	□
PREMIUM 6000											o								
CCA110																o		□	□
HPS																			
HEADPHONE 7000									o						o		□		
HEADPHONE 7001										o							□		
CDV																			
GAMES 6001																			
KARAOKE 6000																			
VIDEO 6001																			
VIDEO 6002																			
VIDEO 6481																			
VIDEO 7000								o						□	o			□	□
CDROM																			
ROM 65000																			
ROM 65060																			
ROM 65080																			
ROM 65100																			
ROM 65160	o																		
ROM 65180		o																	
ROM 65200			o																
ROM 65260			o	o															
ROM 65280			o		o														
CDR																			
REC E65400												o	o						
REC D65420												o	o						

application	Mechanism: CDM 12.1 — Economic for audio, video and games	CDM 12.1T — Economic top loading; audio, video and games	CDM 12.2T — 2x top load for video, games, computer	CDM 12.3BL — compact; audio portable, low power	CDM 12.3BLC — compact; audio portable, low power, low voltage	CDM 12.6 — 6x, fast access; CDROM; incl. OQ8866 (OSDALAS1)	CDM 12.6/xx — 8x, fast access; CDROM; incl. OQ8866 (OSDALAS1	CDM12 industrial — Professional standards and high reliability; incl. TDA1302T (DALAS)	CDM 24 — double speed write, quad read; CD-R; incl. TDA1372 (AEGER)	Loaders: L1210/01 — low height tray , inc. CDM12.1	L1210/03 — standard height tray assembly, inc. CDM12.1	L1210/04 — standard mount tray assembly, inc. CDM12.2	L1210/06 — low height tray assembly, inc. CDM12.2; incl. TDA1302T (DALAS)	L1266 — half height tray-loader, inc. CDM12.6; incl. OQ8866 (OSDALAS1)	L1266/xx — half height tray-loader, inc. CDM12.6/xx; incl. OQ8866 (OSDALAS1)	L2465 — half height tray-loader, inc. CDM24; incl. TDA1372 (AEGER)	Modules: MOD JUKEBOX — full assem. funct. unit, inc. CDM12 incl.	MOD PRO-AUDIO — full assem. funct. unit for prof. audio, grey	MOD PRO-AUDIO — full assem. funct. unit for prof. audio, black
HIFI																			
HIFI6000		[O]								[O]	[O]								
HIFI6013		[O]								[O]	[O]								
HIFI6011		[O]								[O]	[O]								
HIFI7000		[O]								[O]	[O]								
HIFI7001		[O]								[O]	[O]								
PREMIUM 6000																		[O]	[O]
CCA110										[O]	[O]								
HPS																			
HEADPHONE 7000				[O]	[O]														
HEADPHONE 7001				[O]	[O]														
CDV																			
GAMES 6001			[O]									[O]	[O]						
KARAOKE 6000		[O]								[O]	[O]								
VIDEO 6001		[O]	[O]							[O]	[O]	[O]	[O]						
VIDEO 6002		[O]	[O]							[O]	[O]	[O]	[O]						
VIDEO 6481		[O]	[O]							[O]	[O]	[O]	[O]						
VIDEO 7000		[O]	[O]							[O]	[O]	[O]	[O]						
CDROM																			
ROM 65000														o					
ROM 65060														o					
ROM 65080														o					
ROM 65100														o					
ROM 65160														o					
ROM 65180														o					
ROM 65200															o				
ROM 65260															o				
ROM 65280															o				
CDR																			
REC E65400																o			
REC D65420																o			

INTEGRATED CIRCUITS

INTEGRATED CIRCUITS FOR CD SYSTEMS

type	*description*	*nickname*	*package*	*page*
Pre-programmed microcontrollers				
for stand-alone three-beam CD systems e.g. HIFI 6000				
OM5232/FBP/507	CDT610V1.1 in DIP40		DIP40	3.5
OM5232/FBB/507	CDT610V1.1 in QFP44		QFP44	3.5
for three-beam sub-systems for CD audio applications e.g. HIFI 6011				
OM5232/FBP/512	CDT611V1.0 in DIP40		DIP40	3.5
for three-beam sub-systems e.g. PREMIUM 6000				
P83C654/FBBB/530	LO9468 in QFP44		QFP44	3.5
for CD sub-systems used in CD games application GAMES 6001 and karaoke application KARAOKE 6000				
OM5234/FBP/522	CDT612V1.0 in DIP40		DIP40	3.5
OM5234/FBB/522	CDT612V1.0 in QFP44		QFP44	3.5
improved version for games application GAMES 6002 and VIDEO-CD application VIDEO 6001				
OM5234/FBP/536	CDT612V2.1 in DIP40		DIP40	3.5
OM5234/FBB/536	CDT612V2.1 in QFP44		QFP44	3.5
improved CDT610 with additional direct track selection via digit keys for stand-alone audio systems such as HIFI 6013				
OM5232/FBx/...	CDT613V... in DIP40 or QFP44		DIP40/QFP44	3.5
for CD-walkman systems				
P83CL781HFH/...	CDT631V... in QFP44		QFP44	3.5
for HIFI 7000, VIDEO 7000 and HEADPHONE 7000 systems				
OM5232/FBP/...	CDT710 with/without LCD display driver for stand-alone audio system based upon single chip CD decoder/servo controller; used in HIFI 7000 system		SAA7376	3.5
OM5238/FBx/...	CDT715 for stand-alone CD-video solution based on single-chip CD decoder/servo controller SAA7372, V-CD decoder and digital video decoder SAA7185, used in VIDEO 7000 system		SAA2510	3.5
P83CL834.../...	CDT731 with on-chip LCD display driver for CD-walkman system based on single-chip CD decoder/servo controller, used in HEADPHONE 7000 system		SAA737x	3.5
for the quad-speed CD-ROM system ROM 65000				
OM5234/FBB/538	CDT660V1.1 in QFP44		QFP44	3.5
OM5234/FBA/538	CDT660V1.1 in PLCC44		PLCC44	3.5
CV3924B	CDT660V1.1 in QFP44		QFP44	3.5
CV3924A	CDT660V1.1 in PLCC44; packed in tubes		PLCC44	3.5
CV3924AT	CDT660V1.1 in PLCC44; packed in tape & reel		PLCC44	3.5
for controlling the ELM block-decoder and DSA-bus; used with CDT660 in the quad-speed CD-ROM system ROM 65060				
OM5238/FBx/...	CDT661V1.1 in QFP44/PLCC44		QFP44/PLCC44	3.5
for the hexa-speed CD-ROM system ROM 65100				
OM5234/FBB/551	CDT663V1.0 in QFP44		QFP44	3.5
OM5234/FBA/551	CDT663V1.0 in PLCC44		PLCC44	3.5
CV3934A	CDT663 in PLCC44		PLCC44	3.5
CV3934B	CDT663 in QFP44		QFP44	3.5
CDT663A/1.0-(B/1.0)	CDT663 V.10 ROM65100		PLCC-44, QFP-44	3.5
for controlling the ELM block-decoder and DSA-bus; used with CDT663 in the hexa-speed CD-ROM system ROM 65160				
-	CDT664			3.5
for the octal-speed CD-ROM system ROM 65200				
-	CDT666			3.5
for controlling the ELM block-decoder and DSA-bus; used with CDT666 in the octal-speed CD-ROM system ROM 65260				
-	CDT667			3.5
for D65420 CD-Recordable systems				
CV4557-A28/1A28	CDR650V1.0 in PLCC28		PLCC28	3.5
Generic microcontrollers				
OM5232/34/38	80C51-based microcontrollers		DIP40, QFP44	3.5
P83CL434/834	80C51-based microcontrollers with on-board LCD driver		DIP42, QFP44	3.5
P83CL781	Low-voltage 80C51-based microcontrollers		DIP40, QFP44	3.5
Data amplifier and laser supply circuits				
TDA1302T	data amplifier and laser power control	DALAS	SO20	3.6
TDA1300T	low-voltage data amplifier and laser power control	DALAS2	SO20	3.6
Servo controllers				
OQ8868	digital servo control for 2-stage 3-beam CD mechanism	DSICS	QFP44	3.7
M3 improved version				
TDA1301T	digital servo control for 2-stage 3-beam CD mechanism	DSIC2	SO28L	3.8
Compact Disc decoders				
SAA7345GP/SS	CD decoder with on-chip RAM and digital filter	CD6	QFP44	3.9
SAA7345GP/DS	double-speed CD decoder with on-chip RAM and digital filter	CD6	QFP44	3.9
SAA7345GP/TT	triple-speed CD decoder with on-chip RAM and digital filter	CD6	QFP44	3.9
SAA7345H/LV	low voltage CD decoder with on-chip RAM and digital filter	CD6	TQFP44	3.9
LO9465	hex-speed CD decoder	CD65		3.10
LO9585	octal-speed CD decoder			3.10

type	*description*	*nickname*	*package*	*page*
SAA7370GP	quad-speed single-chip CD decoder and digital servo controller for data applications	CD7	QFP64	3.11
SAA7370AGP	up to octal-speed single-chip CD decoder and digital servo controller for data applications	CD7	QFP64	3.11
SAA7372GP	double-speed single-chip CD decoder and digital servo controller for data applications e.g. V-CD	CD7	QFP64	3.11
SAA7374GP	low-voltage double-speed single-chip CD decoder and digital servo controller	CD7	QFP64	3.11
SAA7376GP	single-speed single-chip CD-decoder and digital servo controller for audio applications	CD7	QFP64	3.11
CD driver circuits				
TDA7072A(T)	CD single motor-drive circuit in BTL configuration (short circuit protected)		DIP8, SO8	3.12
TDA7073A(T)	CD dual motor-drive circuit in BTL configuration (short circuit protected)		DIP16, SO16L	3.12
OQ8844	triple digital servo driver	DSD2	SO20	3.13
TDA1303T	digital servo driver	DSD1	SO24L	3.14
Miscellaneous digital audio circuits				
SAA7346H	Compact Disc shock absorption circuit	SHOARMA	QFP44	3.15
Digital-to-analog converters (DACs)				
TDA1305(T)	bitstream/continuous calibration filter-DAC with up-sampling filter		SO28L	3.27
TDA1306T	bitstream/continuous calibration filter-DAC with up-sampling filter		SO24L	3.27
TDA1307	high-end digital bitstream conversion filter		DIL42SHR	3.27
TDA1310A(T)	continuous calibration DAC with current output		DIP8, SO8	3.27
TDA1311A(T)	continuous calibration DAC with voltage output		DIP8, SO8	3.27
TDA1312A(T)	continuous calibration DAC with voltage output		DIP8, SO8	3.27
TDA1313(T)	continuous calibration DAC with voltage output		DIP16, SO16	3.27
TDA1314T	quad sign-magnitude filter DAC with voltage output		SO28L	3.27
TDA1386T	continuous calibration DAC with up-sampling filter		SO24L	3.27
TDA1387T	continuous calibration DAC with current output		DIP8, SO8	3.27
TDA1541A	high-performance 16-bit DAC		DIP28	3.27
TDA1541A/R1	high-performance 16-bit DAC		DIP28	3.27
TDA1541A/S1	single crown 16-bit DAC		DIP28	3.27
TDA1541A/S2	double crown 16-bit DAC		DIP28	3.27
TDA1543(T)	economy 16-bit DAC (I^2S bus format)		DIP8	3.27
TDA1543A(T)	economy 16-bit DAC (Japanese format)		DIP8	3.27
TDA1544(T)	low noise economy 16-bit DAC (Japanese format)		DIP8, SO16L	3.27
TDA1545A(T)	high-performance continuous calibration DAC with current output		DIP8, SO8	3.27
TDA1546T	bitstream/continuous calibration filter-DAC with DSP features		SO28	3.27
TDA1547	premium-grade BiMOS bitstream DAC		DIP32SHR	3.27
TDA1548T	low-voltage bitstream/continuous calibration filter-DAC with DSP features		SO28	3.27
TDA1549(T)	bitstream continuous calibration DAC		DIP16, SO16	3.27
Analog-to-digital converters (ADCs)				
SAA7360GP	high-performance bitstream ADC		QFP44	3.28
SAA7361GP	premium-grade bitstream ADC		QFP44	3.28
SAA7366T	economy bitstream ADC		SO24L	3.28
SAA7367T	economy bitstream ADC		SO16	3.28
Digital-to-analog converters and analog-to-digital converters (ADDAs)				
TDA1309H	low-voltage bitstream continuous calibration ADC + DAC		QFP44	3.28
Headphone driver				
TDA1308T	headphone/line-out driver for digital audio		SO8	3.16
Video-CD decoder				
SAA2510GP	Video-CD MPEG audio/video decoder for stand-alone Video-CD applications		QFP100	3.17
Digital Video encoder				
SAA7185	digital PAL/NTSC video encoder	DENC2	PLCC68	3.18
CD-ROM block-decoders				
SAA7380GP	hexa-speed CD-ROM block-decoder with AT and Atapi interface	ELM	QFP80	3.19
SAA7388GP	octal-speed CD-ROM block-decoder with AT and Atapi interface	ELM	QFP80	3.19
SAA7385GP	high-speed(>4x) CD-ROM block-decoder with SCSI-2 interface with SCAM	SEQUOIA		3.20
SAA7387GP	octal-speed CD-ROM block-decoder with SCSI-2 interface with SCAM	SEQUOIA		3.20
CD encoder				
TDA1371	Compact disc encoderCDCEP	QFP44		3.21
CD-Recordable				
GLG30738	CD-ROM block decoder	CDBD		3.22
CEO27A	CD-ROM block encoder	CDB2		3.23
SAA7390GP	High-speed block decoder/encoder for CD-Recordable	CHAUCER		3.24
OQ8845	Digital servo controller	DSICR	SO28	3.25
TDA1372	Preamplifier and error signal generator	AEGER	QFP44	3.26
LCD segment drivers with I^2C-bus interface:				
PCF8566(T)	segment driver (24 drive outputs)		DIP40,VSO40	3.28
PCF8576T	segment driver (40 drive outputs)		VSO56, FCC	3.28
PCF8577C(T)	segment driver (32 drive outputs)		VSO40, FCC	3.28

The following text summarizes the functions of the ICs at the heart of the CD systems described in Section 2. More data is given in the individual data sheets.

Photodiode amplifiers and laser supply circuits: TDA1300T & TDA1302T

These two ICs, one of which is a 3 V version, derive adequately filtered currents for radial tracking, focus control, and the HF data signal for the CD decoder. They can be used with a wide range of 3-beam/sledge optics with
p- or n-sub lasers, and with single or double Foucault focus error detectors. They have built-in equalizers to permit double or single speed modes of operation that can be changed 'on the fly'. After a single initial adjustment has been made, the ICs maintain the laser output constant, regardless of ageing. The ICs are in SO packages, allowing them to be mounted on a CD mechanism extremely close to the photodiode for high signal-to-noise ratio.

Single-chip digital servo control system: TDA1301T

This highly-integrated 1-chip digital servo control system (DSIC2) minimizes peripheral components, is adjustment-free, and performs all the servo functions, except control of the disc drive motor, in CD players with two-stage three-beam/sledge optics. The system is optimized for low-voltage, low-power applications. The servo characteristics can be adjusted over a wide range via a 3-wire serial interface which allows the system to be tailored, via a microcontroller, to suit a variety of Philips or other CD mechanisms. The functions performed by the IC are:

- Photodiode signal processing
- servo loop
- Radial servo loop
- Sledge motor servo loop.

OQ8868, OQ8845

The OQ8868 (DSICS) is similar to the TDA1301T but is optimized for use in CD-ROM applications. For CD-Recordable applications, the equivalent circuit is the OQ8845.

Servo power drivers:
TDA1303T
This servo power driver is a low-power, low-voltage IC for CD players with 3-beam 2-stage optics. It includes three class-D amplifiers which receive the PDM signals from the servo control IC and process them for the radial tracking and focus actuators, and the sledge motor. The IC also includes a switched-mode power supply for the laser diode to minimize power losses during the DC to DC conversion. The IC also includes a battery voltage indicator. The gain of the class-D amplifiers is stabilized against supply voltage fluctuations.

OQ8844
The OQ8844 is similar to the TDA1303T but optimized for CD-ROM applications.

TDA7072A(AT), TDA7073(AT)
These two servo power drivers are a single and a dual bridge-tied-load (BTL) power driver respectively. They receive control signals from the servo control and CD decoder ICs and generate power for driving the radial tracking and focus actuators, and the sledge and disc drive motors. Although these ICs are powered from a single 3 V to 18 V supply, the BTL configuration allows them to feed bidirectional direct current to the loads.

Compact disc decoders:
Each system in this guide uses one of two decoding concepts – CD6 and CD7. Both feature single-chip CMOS CD decoder ICs with I2S output, on-chip SRAM and digital filtering. The CD7 decoders, in addition, incorporate the digital servo control function.
CD6 concept:
SAA7345, LO9465, LO9585
Together with the single-chip digital servo control IC (DSIC2), a servo power driver, and a CD mechanism, the CD6 decoders provide a complete front-end three-beam decoding system. In addition to the basic signal processing features which are standard for a quality CD decoder (EFM demodulation, sub-code processing and error correction/concealment), the CD6 decoders provide control signals for the disc drive motor, achieve higher digital performance and offer a wide range
of features.

For CD digital audio applications, an SAA7345 circuit (single-, double, or triple-speed version) is available.

For CD-ROM and CD-I applications, there are the LO9465 and LO9585 – single-chip decoders with front-end 6-bit ADC with digital equalizer and improved error-correction facilities. The LO9465 can operate at data rates up to 6x those of standard audio CD; the LO9585 at rates up to 8x.

CD7 concept: SAA737x
The CD7 decoders are even more highly integrated. They combine the servo control and CD6 decoder functions on a single-chip. There are CD7 decoder versions for up to 8x standard speed operation to suit all CD-audio, CD-ROM and Video-CD applications.

By selecting a stereo audio DAC from our extensive range, it is possible to tailor the performance of CD6- or CD7-based CD-audio players while using the same core system.

The CD7 family of decoders (SAA737x) interfaces directly to a wide range of graphics decoders.

CD-ROM block encoders/ decoders: SAA738x, SAA7390
To satisfy the need for ever-faster CD-ROM drives, the SAA738x range of block decoder buffer managers can handle data rates up to 8x standard speed. They integrate real-time error detection/correction and host data

Pre-programmed microcontrollers for CD systems

		OM5232	OM5234	OM5238	P83CL781	P83CL434	P83CL834
ROM capacity	Kbytes	8	16	32	16	4	8
RAM capacity	bytes	256	256	512	256	128	256
Supply voltage	V	4 to 6	4 to 6	4 to 6	1.8 to 12	2 to 5.5	
Supply current (16 MHz):							
operating	mA	26.5	28	35	24 @ 3 V	tbd	
idle (+ sleep)	mA	6	6	6	0.75 @ 3 V	tbd	
power down	µA	50	50	100	<10	tbd	
I/O ports	pins	32	32	32	32	12	
Frequency range	MHz	1.2 to 16	1.2 to 16	1.2 to 16	1.8 to 12	0.7 to 12	
EEPROM/OTP version		✔	✔	✔		✔	
Power-on reset		✔	✔	✔	✔	✔	
Timers		2	2	3	3	2	
Watchdog timer				✔			
LCD driver						22-24 segments	
						1-4 backplanes	
Packages		DIP40, QFP44, PLCC44,	DIP40, QFP44, PLCC44,	DIP40, QFP44, PLCC44,	QFP40, QFP44,	DIP42SHR QFP44,	

The servo control and decoding functions of a CD player are controlled via a 3-line interface and by a dedicated pre-programmed CMOS microcontroller (OM5232/34/38, or the low-voltage P83CL781, P83CL434/834). The latter have an on-chip LCD driver.

All types are derivatives of the industry-standard 8051 with architectural enhancements that make them suitable

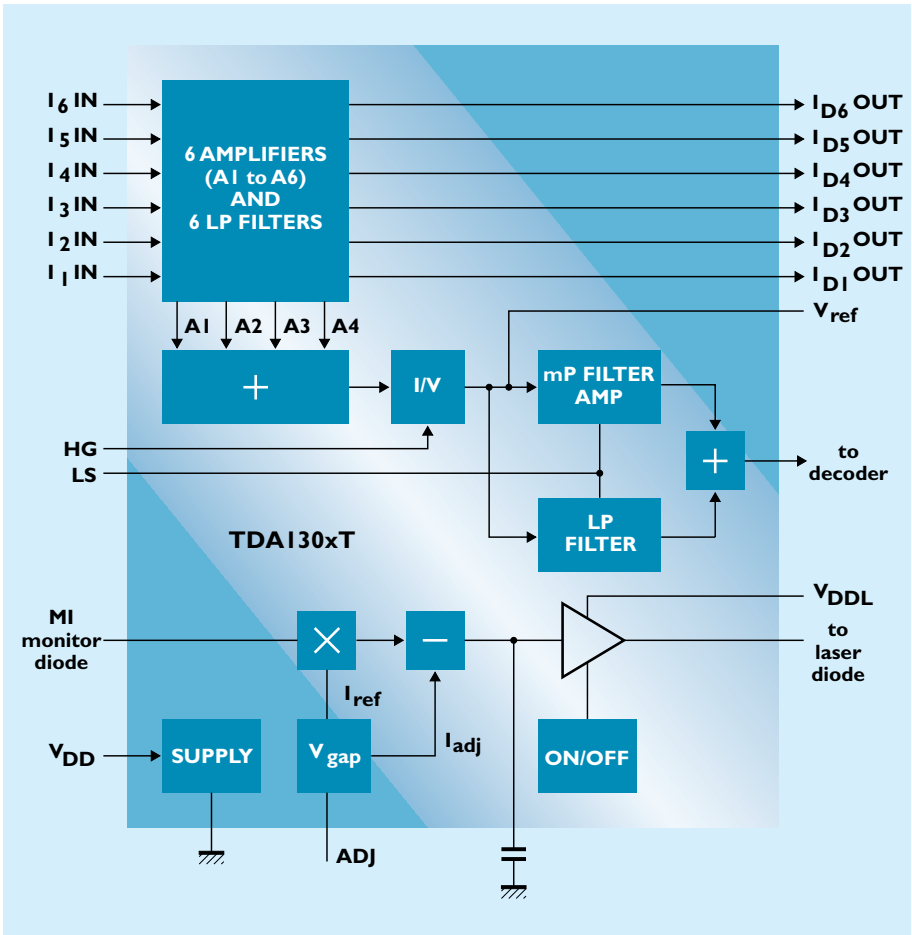
TDA1302T: Data amplifier and laser supply circuit (DALAS)
TDA1300T: Low-voltage circuit (DALAS2)

- **Six input buffer amplifiers with low-pass filtering and with virtually no offset.**
- **HF data amplifier with a high- or low-gain mode.**
- **Two built-in equalizers for single or double-speed mode, ensuring high performance in both modes.**
- **Fully automatic laser control including stabilization and on/off switch with separate supply (VDDL) for power reduction.**
- **Optimized interconnection between the pick-up detector and digital servo processor (e.g. TDA1301T).**
- **Adjustable laser bandwidth and laser switch-on current slope.**
- **p-sub laser monitor.**
- **n-sub laser monitor (TDA1300T only).**
- **Low power consumption.**

The TDA1300T and TDA1302T are data amplifier and laser supply circuits for three-beam pick-up detectors in a wide range of CD mechanisms and read-only optical systems. The devices can be used with diode units with p- or n- (TDA1302T only) sub lasers, and with single or double Foucault focus error detectors. The devices contain 6 amplifiers from which adequately filtered currents for radial tracking and focus control, and the HF data signal for the CD decoder are derived.
The circuits have built-in equalizers to permit single or double-speed modes of operation (switched by a control pin).

After a single initial adjustment, the circuit will maintain control over the laser diode current, providing a constant light output with no ageing effects.

The ICs are in a small-outline package to allow them to be mounted close to the laser pick-up on the sledge for maximum signal-to-noise ratio.



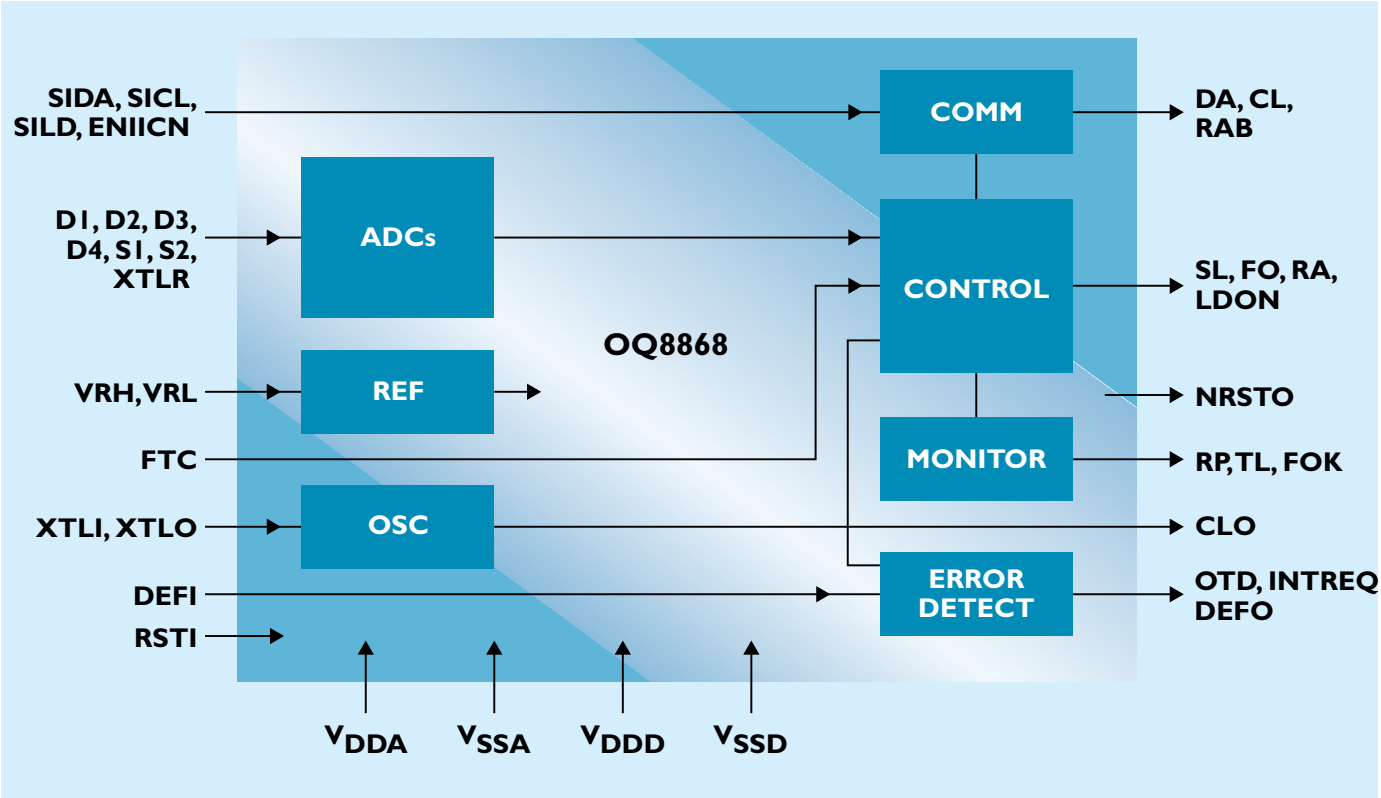
QUICK REFERENCE DATA	
(typ. values unless stated otherwise)	
supply voltage, V_{DD}	
TDA1300T:	3.0 - 5.5 V
TDA1302T:	3.4 - 5.5 V
Diode current amplifiers: amplification, G_{dn}	1.55 dB
diode output offset current, $I_{os(d)}$	100 nA max.
-3 dB bandwidth, B	50 kHz min.
RFE amplifier: equalization delay, $t_{d(eq)}$	320 ns
flatness delay (double-speed), $t_{d(f)}$	5 ns
Laser supply: output current, I_o	-100 mA max.
Package	SO24L

Digital servo controller (DSICS)

- **Focus, radial and sledge servo loop.**
- **Built-in access procedure.**
- **Supply voltage 5 V only.**
- **Sophisticated track-loss detection mechanism.**
- **Automatic focus start-up procedure and in-lock indication (incl. fast focus restart).**
- **Automatic gain control for the complete focus and radial loop.**
- **Defect detector.**
- **Extended radial error signal.**
- **Flexible system oscillator.**
- **Automatic initialisation and jump procedure for radial servo.**
- **Automatic offset and gain control for radial error.**
- **Single/double Foucault and astigmatic focusing possible.**

The OQ8868 provides all servo functions for two-stage CD-systems except the spindle motor control. It offers a high degree of integration combined with low additional cost of external components. The servo characteristics are widely adjustable by means of a three-wire serial interface, enabling the OQ8868 to be tailored to the requirements of a broad range of

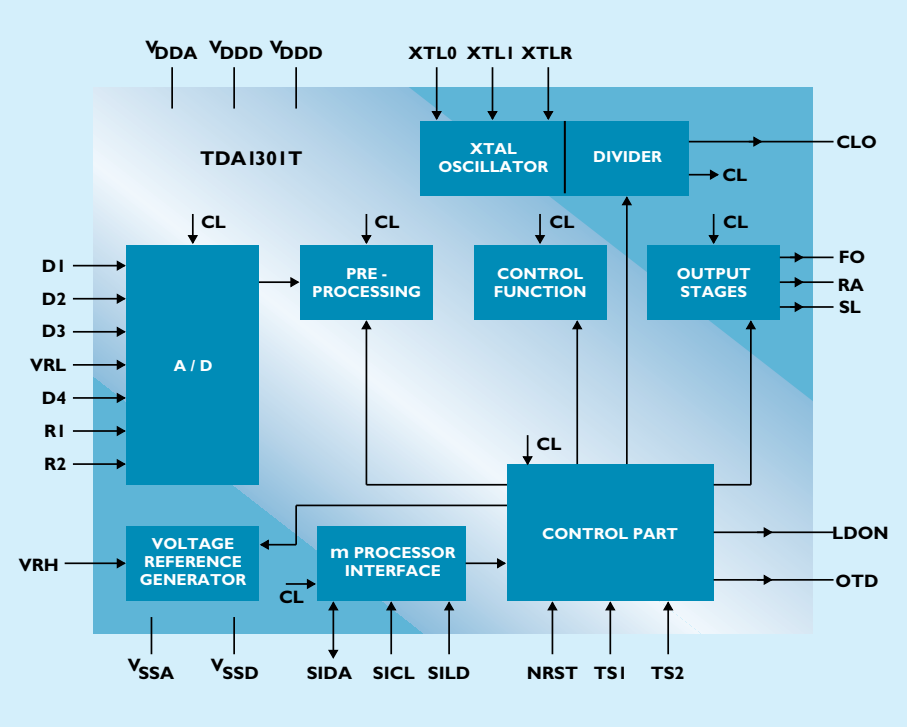
QUICK REFERENCE DATA	
(typ. values unless stated otherwise)	
supply voltage, digital part	5 V
supply voltage, analog part	5 V
supply current, digital part	17 mA
supply current, analog part	5 mA
maximum quiescent current	10 µA
power dissipation	115 mW
maximum input current, D1, D2, D3, D4	12 µA



Digital servo controller (DSIC2)

- **Diode signal preprocessing.**
- **Focus, radial and sledge-motor servo loop.**
- **Three-line serial interface via the microcontroller.**
- **Full digital signal processing.**
- **Low power consumption, down to 30 mV.**
- **Low voltage supply, 3 to 5.5 V.**
- **Integrated analog-to-digital converters and digital servo loop filters.**
- **Double speed possible.**
- **Easy application (e.g. no external adjustments required, no component ageing).**
- **Highly robust and shock resistant.**
- **Fully-automatic jump procedure for radial servo.**
- **Automatic focus start-up procedure and built-in FOK (Focus OK).**
- **Fast radial jump or access procedure.**
- **Self-operating servo-control without continuous communication via the microcontroller.**
- **Direct communication to photodiode optics; no external preprocessing.**

The TDA1301T is a fully digital servo processor that provides all servo functions except spindle motor control in two-stage, three-spot compact disc systems. The device offers a high degree of integration combined with the low additional cost of external components. The servo characteristics can be adjusted over a wide range via a three-line serial interface. This offers enormous flexibility for meeting the requirements of different CD mechanisms. The circuit is optimized for

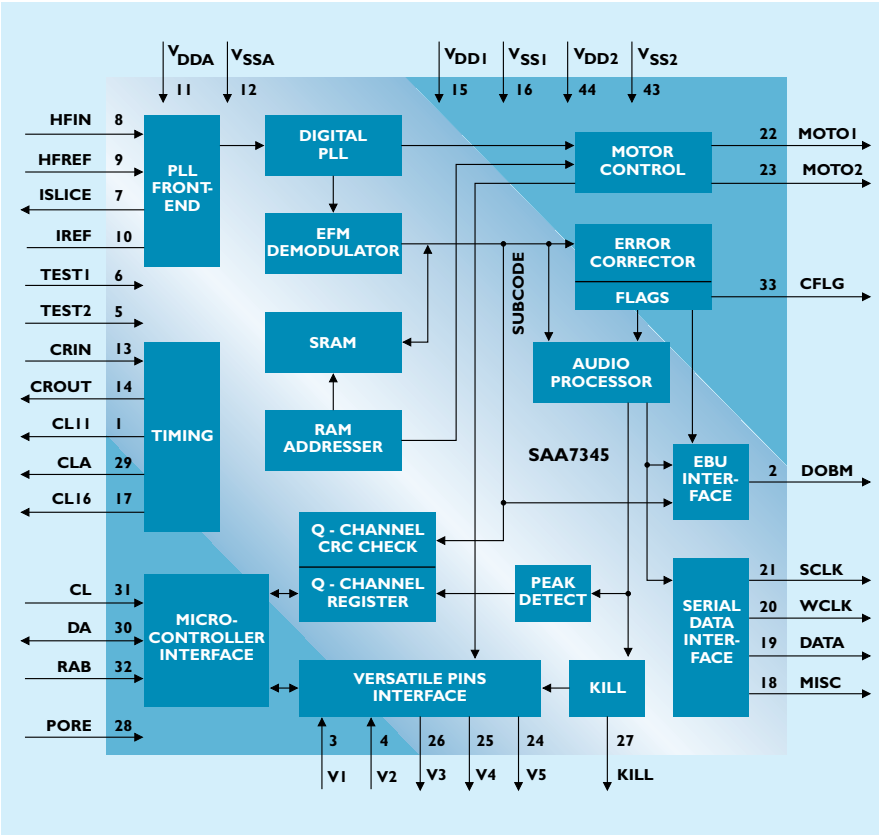


QUICK REFERENCE DATA	
(typ. values unless stated otherwise)	
supply voltage, V_{DD}	3 - 5.5 V
Diode current amplifiers	
amplification, G_{dn}	1.55 dB
diode output offset current, $I_{os(d)}$	100 nA max.
3 dB bandwidth, B	50 kHz min.
RFE amplifier	
equalization delay, $t_{d(eq)}$	320 ns
flatness delay (double-speed), $t_{d(f)}$	5 ns
Laser supply	
output current, I_o	-100 mA max.

CD decoder with on-chip RAM and digital filter

- **Integrated data slicer and clock regenerator.**
- **Digital Phase-Locked Loop (PLL).**
- **Demodulator and Eight-to-Fourteen Modulation (EFM) decoding.**
- **Subcoding microcontroller serial interface.**
- **Integrated programmable motor speed control.**
- **Error correction and concealment functions.**
- **Embedded SRAM for de-interleave and FIFO.**
- **FIFO overflow concealment for rotational shock resistance.**
- **Digital audio interface (European Broadcasting Union).**
- **2 to 4-times oversampling integrated digital filter.**
- **Audio data peak level detection.**
- **Versatile audio data serial interface.**
- **Digital de-emphasis filter.**
- **Kill interface for Digital-to-Analog Converter (DAC) deactivation during digital silence.**
- **Compact Disc Read Only Memory (CD-ROM) modes.**
- **Single-speed version: SAA7345GP/SS.**
- **Double-speed versions: SAA7345GP/DS**
  SAA7345H/LV
  (low-voltage, 3 V).
- **Triple-speed version: SAA7345GP/TT.**

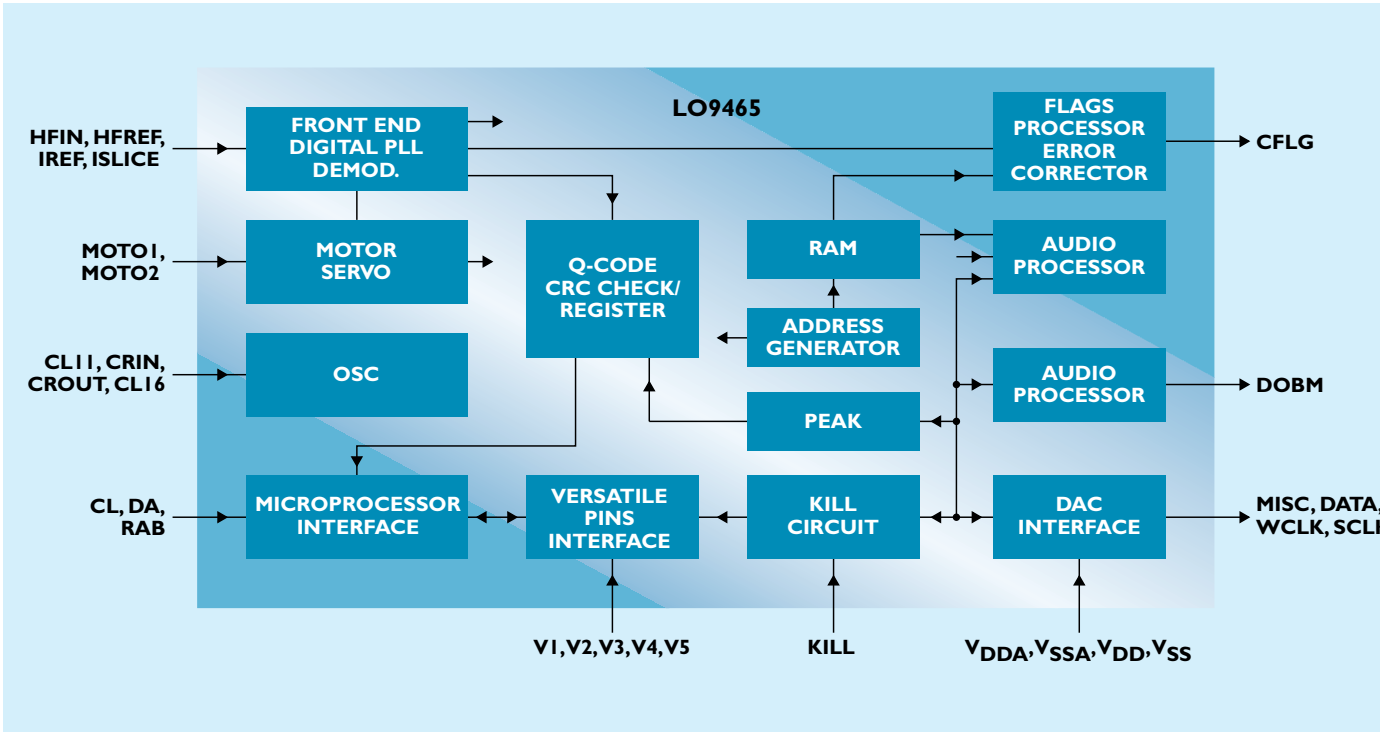
The SAA7345 incorporates the CD signal processing functions of decoding and digital filtering. The device is equipped with on-board SRAM and includes additional features to reduce the processing required in the analog domain. Different speed versions are available.



Compact Disc CIRC/EFM decoders

- **Playback speed up to n=4 (LO9465), n=8 (LO9585).**
- **Improved error-correction facility.**
- **On-chip automatic gain control of the EFM signal.**
- **On-chip front-end 6-bit A/D converter.**
- **EFM-demodulator and protected demodulator timing.**
- **Subcode data processing.**
- **Integrated digital 2-4x oversampling filter.**
- **Audio peak level detection.**
- **Microprocessor serial interface.**
- **Flag output for indication of C1 or C2 correction and concealment.**
- **CIRC error detection and correction.**
- **Audio data interpolation processing.**
- **Integrated spindle motor control with programmable bandwidths.**
- **Digital audio interface (EBU).**
- **Digital de-emphasis filter.**
- **Absolute time output available.**
- **Flags output indicating correction level.**

The LO9465/9585 are single-chip Compact Disc CIRC/EFM decoders featuring an improved error-correction facility. They are intended for use in CD-ROM and CD-i systems.

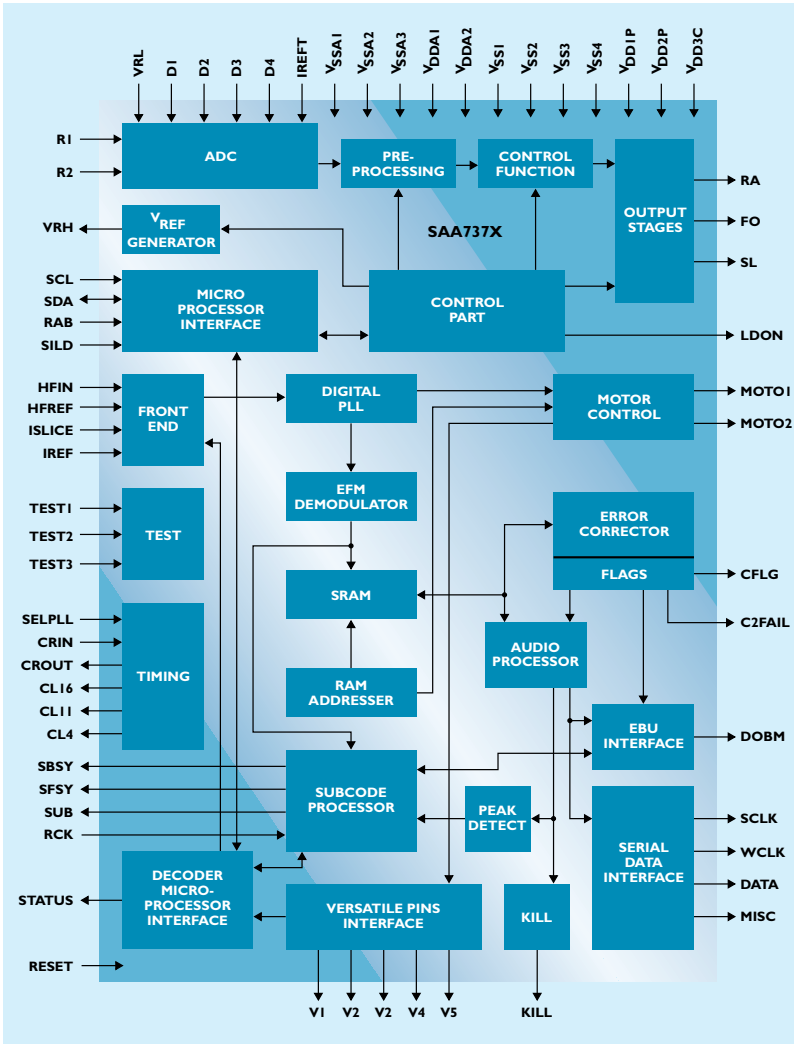


Digital servo processor and Compact Disc decoder (CD7)

- **single-speed: SAA7376**
  double-speed: SAA7372 and SAA7374
  up to quad-speed: SAA7370
  up to octal-speed: SAA7370A
- **Low-voltage: SAA7374 (3.0-5.5 V);**
  SAA7372 and SAA7376 (3.4-5.5 V).
- **CD-ROM mode: SAA7370/70A/72/74.**
- **Lock-to-disc mode (not SAA7376).**
- **Full error correction strategy; t = 2 and e = 4.**
- **Full CD-graphics interface.**
- **All standard decoder functions implemented digitally.**
- **FIFO overflow concealment for rotational shock resistance.**
- **Digital audio interface (EBU), audio and data (SAA7376: audio only).**
- **2x and 4x oversampling digital filter.**
- **Audio data peak level detection.**
- **Kill interface for DAC deactiviation during digital silence.**
- **All TDA1301T digital servo functions, plus extra hi-level functions.**
- **Low focus noise (10 dB better than TDA1301T).**
- **Automatic closed loop gain control available for focus and radial loops.**
- **Pulsed sledge support.**

The SAA737x family are a series of highly-integrated circuits that combine the functions of a CD decoder IC and digital servo IC in a single chip. The decoder part is based on the SAA7345 CD6 decoder with an improved error-correction strategy. The servo part is based on the TDA1301T (DSIC2) with several improvements and additional features incorporated.

Low-voltage types for portable applications are available.

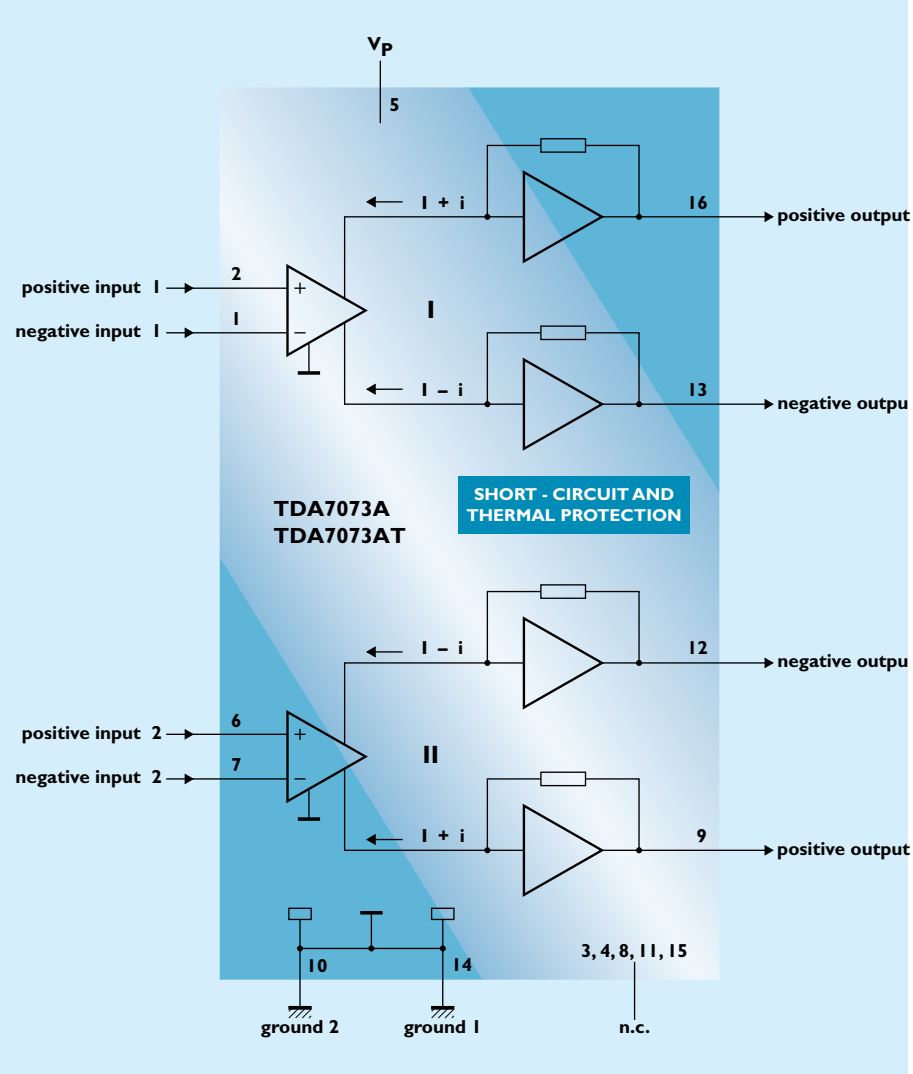


CD motor-drive circuit in BTL configuration

- **No external components.**
- **Very high slew rate.**
- **Single power supply.**
- **Short-circuit proof.**
- **High output current (0.6 A).**
- **Wide supply voltage range.**
- **Low output offset voltage.**
- **Suitable for handling PWM signals up to 176 kHz.**
- **ESD protected on all pins.**

The TDA7072A and TDA7073A are respectively single- and dual-power driver circuits in a BTL configuration, for use as power drivers for servo systems with a single supply. They are specially designed for compact disc players and are capable of driving focus, tracking, sledge functions and spindle motors.

They have a built-in MCL protection circuit activated when the difference in current between the output terminal of each amplifier exceeds 100 mA (typically 300 mA). This level of 100 mA allows for headphone applications (single-ended).



QUICK REFERENCE DATA	
(typ. values unless otherwise stated)	
positive supply voltage, V_P	5.0 V
internal voltage gain, G_v	33.5 dB
total quiescent current, I_P (& RL = ∞)	4 mA*
slew rate, SR	12
max output current, I_o	0.6 A
input bias current, I_{bias}	100 nA
cut-off frequency, f_∞ (-3 dB)	1.5 MHz

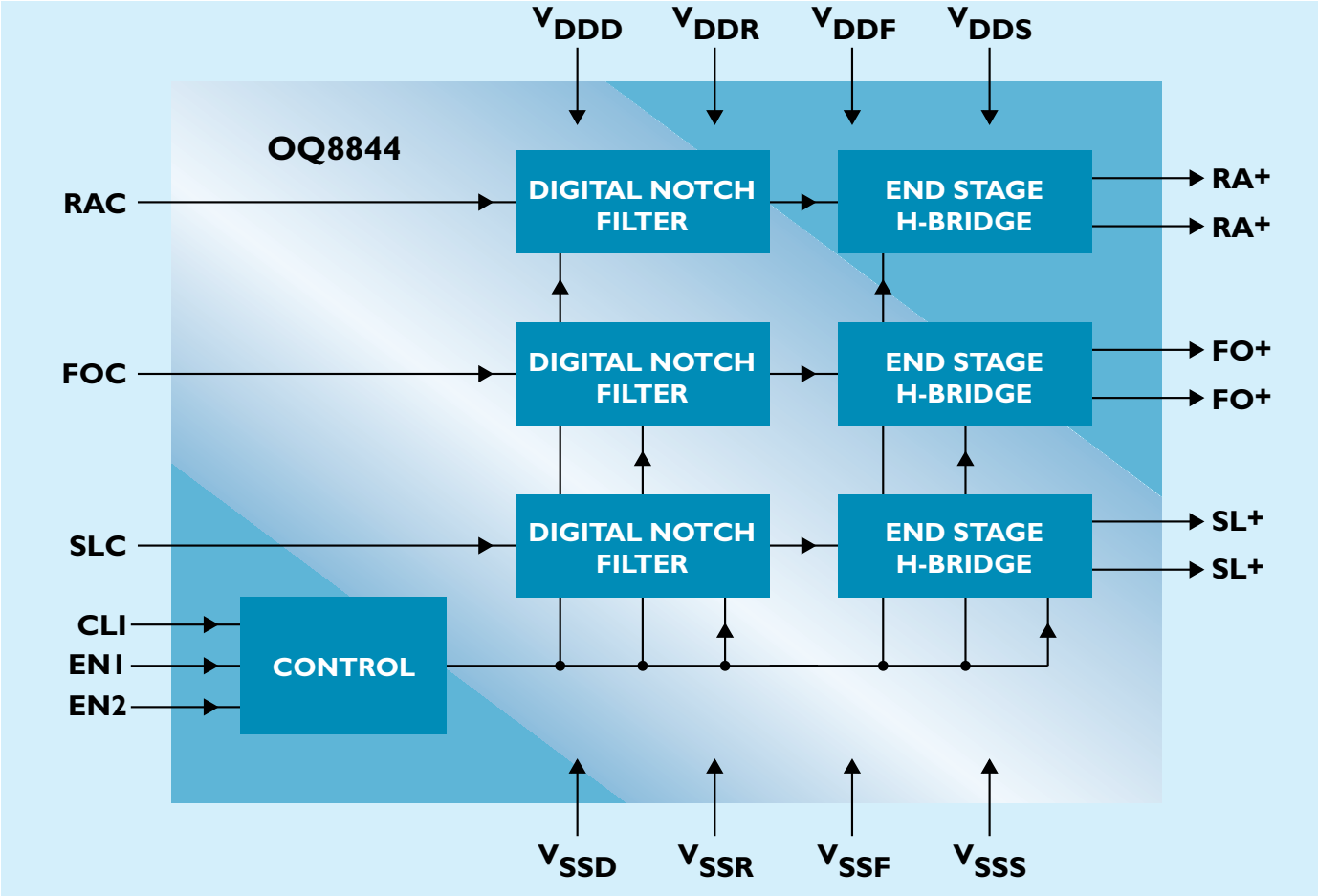
* 8 mA for the TDA7073A

Triple digital servo driver

- **1-bit class-D focus actuator driver (4 Ω).**
- **1-bit class-D tracking actuator driver (4.5 Ω)..**
- **1-bit class-D sledge actuator driver (3 Ω).**
- **Supply voltage 5 V only.**
- **Separate power supply pins for all drivers.**
- **Higher efficiency than conventional drivers.**
- **Built-in digital notch filters.**
- **Enable input for focus/tracking driver.**
- **Enable input for sledge driver.**
- **Differential output for the drivers.**
- **Small package SOT163A (SO20).**

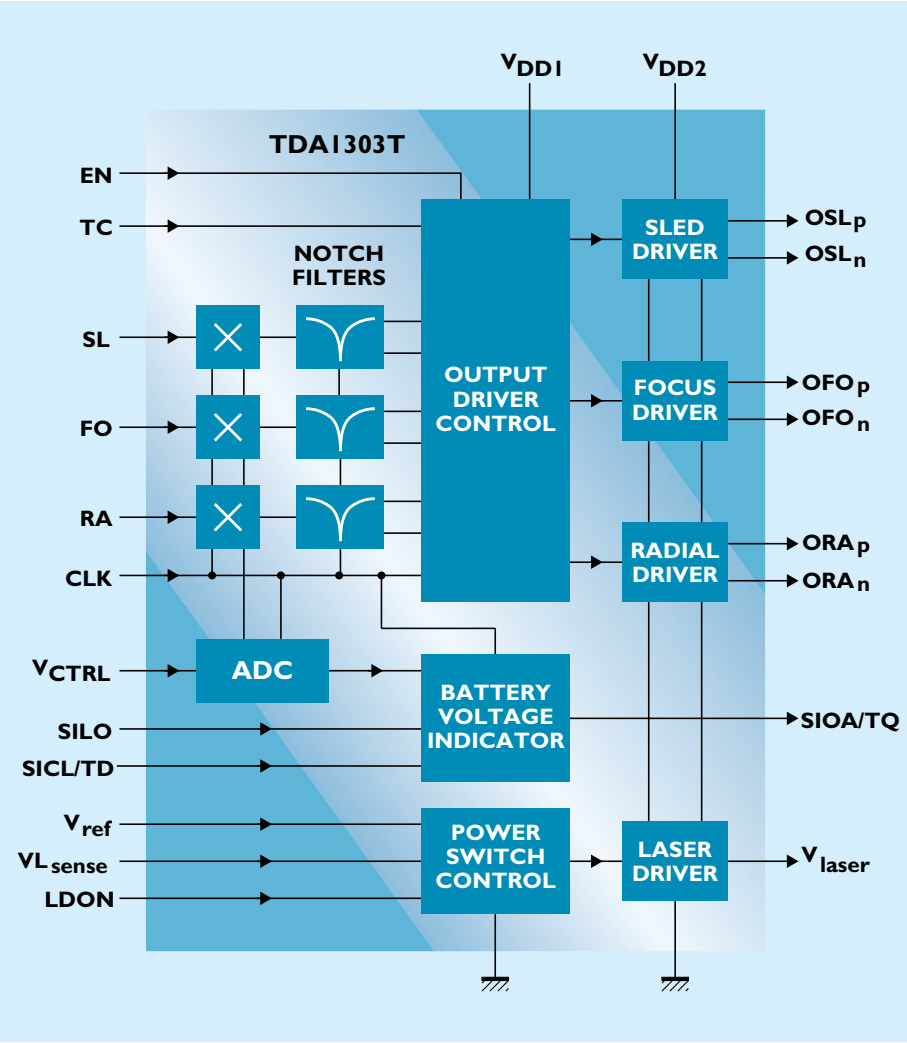
The OQ8844 contains three 1-bit class-D power drivers specially designed for digital servo applications. The main benefits of this principle are its higher efficiency and its higher integration level. When using these power drivers in a digital servo application, the statement 'complete digital servo loop' becomes more realistic.

QUICK REFERENCE DATA	
(typ. values unless stated otherwise)	
supply voltage, digital part	5 V
supply voltage, focus	5 V
supply voltage, tracking	5 V
supply voltage, sledge	5 V
max supply current, focus	250 mA
max supply current, tracking	250 mA
max supply current, sledge	560 mA
max input clock frequency	5 MHz



Digital servo driver

- **Optimized for low voltage and low power applications.**
- **Suppression of idle switching.**
- **Optimized for the most commonly used CD mechanisms.**
- **Total output resistance < 4 Ω.**
- **Continuous gain control to compensate for battery voltage variations.**
- **Battery voltage indication.**
- **Switched-Mode Power Supply for DC/DC down-conversion for laser supply voltage.**
- **Single supply voltage rail.**
- **Full digital signal processing.**



The TDA1303T provides identical output driver functions for the motor/actuator for focus, radial and sledge control, and features a Switched-Mode Power Supply (SMPS) for the laser diode and a battery voltage indicator output.

The circuit contains 3 class D amplifiers for processing pulse duration modulation (PDM) signals for focus, radial and sledge control of servo mechanisms.

The gain of the class D amplifiers is continuously adapted to compensate for fluctuating battery voltage by means of an analog-to-digital converter (ADC) which continuously monitors battery voltage.

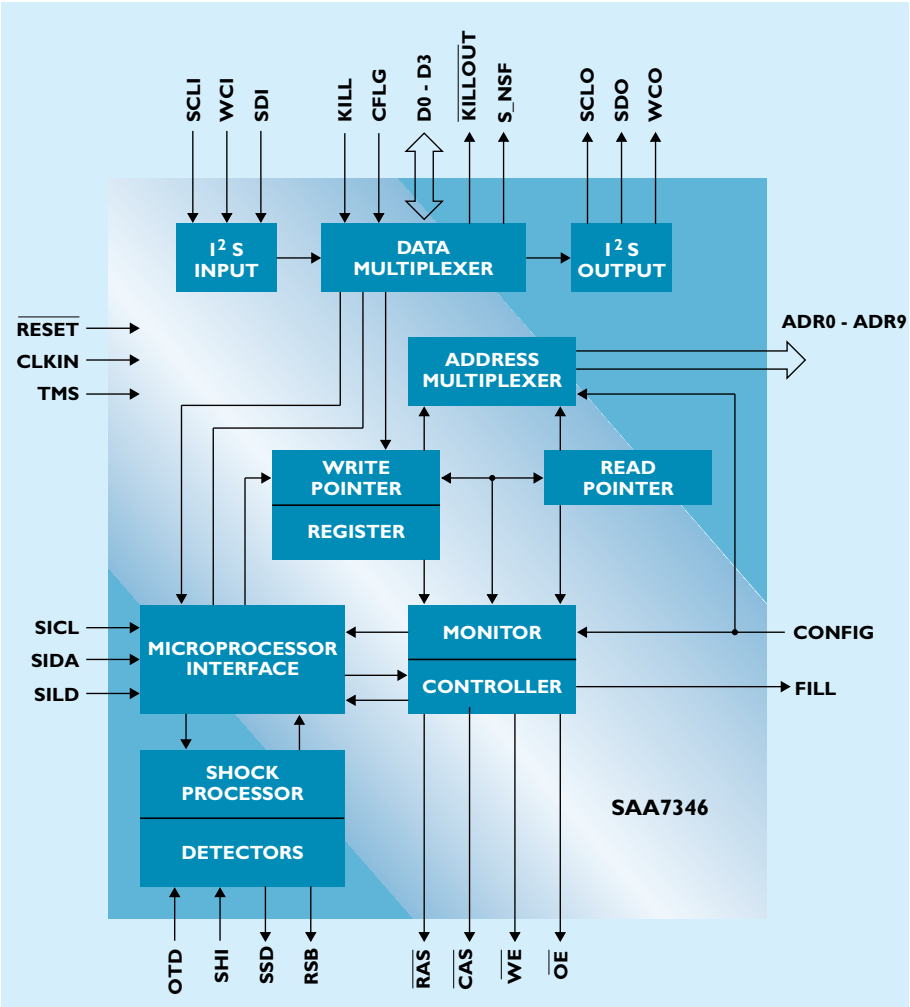
The laser supply voltage is produced by an SMPS to minimize power loss in the DC/DC down-conversion.

QUICK REFERENCE DATA	
(typ. values unless stated otherwise)	
digital stabilized supply voltage, V_{DDD1}	5.0 V
digital unstabilized supply voltage, V_{DDD2}	5.0 V
analog supply voltage, V_{DDA}	5.0 V
digital stabilized supply current, I_{DDD1}	1 mA
digital unstabilized supply current, I_{DDD2}	0.75 mA
analog stabilized supply current, I_{DDA}	1 mA
max output current per stage, I_o	300 mA
max output resistance, R_o	4 Ω
laser SMPS sense input voltage, V_{ls}	2.5 V
laser SMPS sense input current, V_{ls}	
input clock frequency, f_{clk}	4.2336 MHz
total power dissipation, P_{tot}	12.5 mW
operating ambient temperature range	-40 to +85 °C

Shock-absorbing RAM addresser

- **Absorbs linear and rotational shocks.**
- **Absorbs multiple shocks per second.**
- **Interfaces directly with CD decoders SAA7345, SAA7347 and SAA7370.**
- **Multi-speed I^2S-bus input with single-speed I^2S output.**
- **Controls 1 or 4 MBit of external DRAM.**
- **Easy serial interface for communication with common microcontrollers.**
- **By-pass/power-down mode.**
- **Kill interface for DAC deactivation.**
- **Can be used for: 'sampling' part of a disc, reducing access pauses between jumps, delivering a programmable delay and generating a fixed audio rate from Constant Angular Velocity (CAV) discs.**

The SAA7346H can be used to improve the shock resistance of a CD player. It operates with a 1 MBit or 4 Mbit DRAM, functioning as a customized DRAM controller with serial I/O and on-board shock detectors. Audio data is continuously stored in the DRAM and during shocks the data can be 'played' to maintain an uninterrupted output.

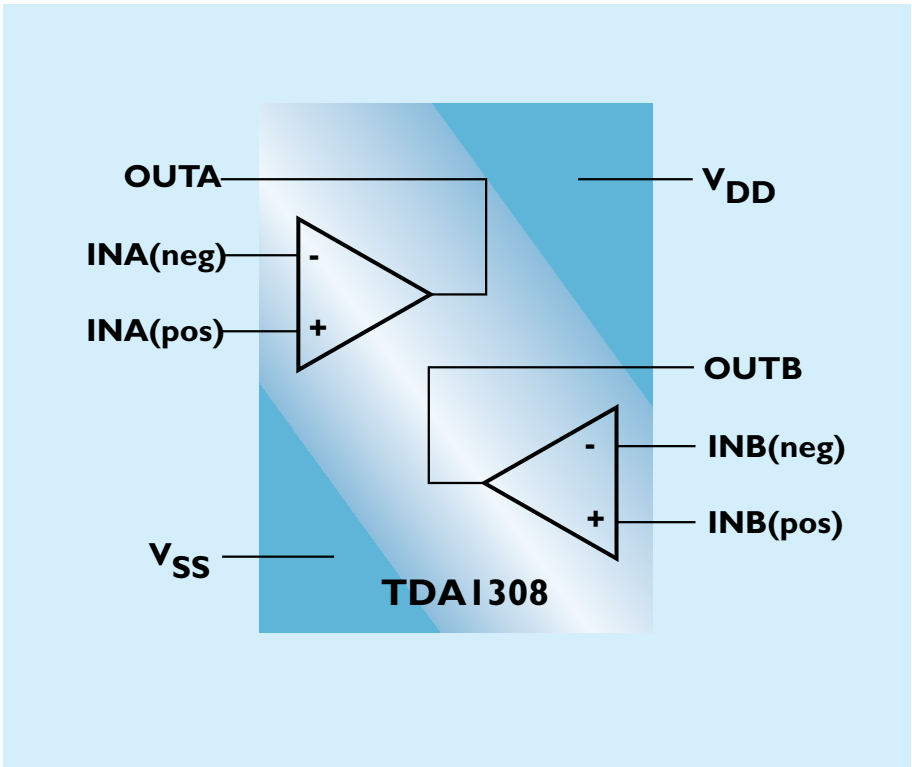


QUICK REFERENCE DATA	
(typ. values)	
supply voltage, V_{DD}	5.0 V
supply current, I_{DD}	12 mA
clock frequency, f_{clk}	16.9344 MHz
I^2L input word clock frequency, $f_{i(clk)}$	88.2 kHz
operating ambient temperature range	-40 to + 85 °C

Class-AB stereo headphone driver

- **Wide operating temperature range.**
- **No switch ON/OFF clicks.**
- **Excellent power supply ripple rejection.**
- **Low power consumption.**
- **Short-circuit resistance.**
- **High S/N ratio, high slew rate, low distortion.**
- **Large output voltage swing.**

The TDA1308T is an integrated class-AB stereo headphone driver developed primarily for portable digital audio applications.



QUICK REFERENCE DATA	
(typ. values)	
Supply voltage, V_{DD} single dual	 5.0 V 2.5 V
negative supply voltage, V_{SS}	-2.5 V
supply current (no load), I_{DD}	3 mA
total power dissipation, P_{tot}	15 mW
max output power, P_o (THD < 1%)	60 mW
signal-to-noise (S/N) ratio	110 dB
THD plus S/N ratio	0.03%
channel separation, $\cdot_{cs}$	70 dB
power supply ripple rejection, PSRR	90 dB*
operating ambient temperature range	-40 to +85 °C

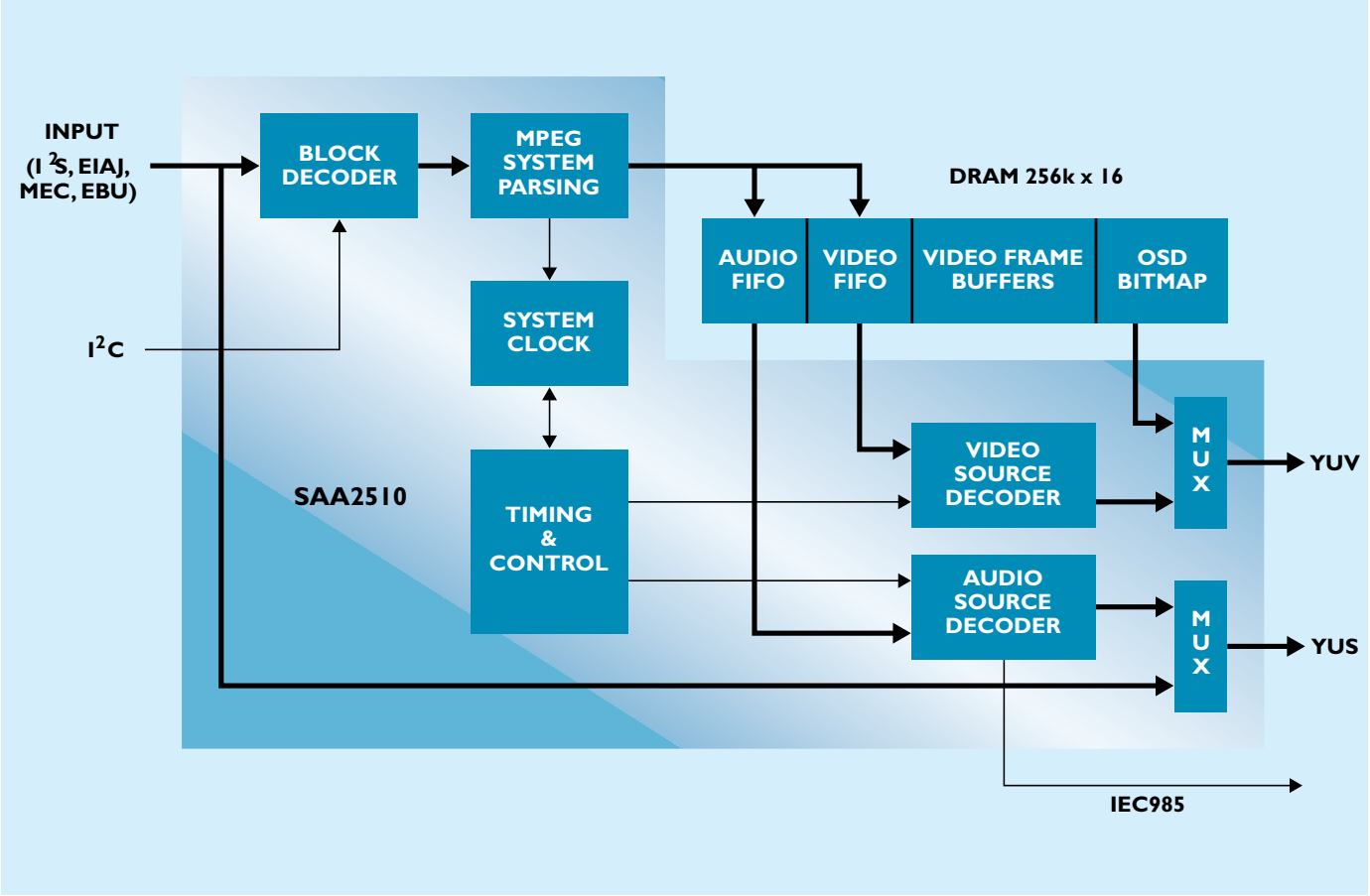
* f_i = 100 Hz, $V_{ripple(p-p)}$ = 100 mV

Video-CD MPEG audio/video decoder

- **MPEG decoding of audio/video data.**
- **Integrated OSD and block decoder.**
- **Supports I^2S, EIAJ, MEC and EBU input formats.**
- **Flexible video output: YUV 4:2:2 format, DMSD-bus compatible.**
- **Audio output at 44.1 kHz (16, 18 or 20 bits per sample; I^2S, EIAJ, MEC and EBU formats).**
- **IEC958 digital audio output (with loop-through).**
- **Play control sector buffering.**
- **Supports high-resolution still-picture playback.**
- **I2C-bus interface for microcontroller.**
- **Selectable internal video timing generator.**
- **Internally-generated 90 kHz MPEG clock.**
- **Requires only 4 Mbit DRAM.**

The SAA2510 is for MPEG (Moving Picture Expert Group) decoding of audio/video data in consumer video-CD applications. It decodes data streams in accordance with version 2.0 of the video-CD standard. The IC requires only 4 Mbit of DRAM to store the encoded/decoded data, play control data and on-screen display (OSD) data.

QUICK REFERENCE DATA	
	(typ. values)
supply voltage	3.3 V, 5 V
operating temp. range	0-70 °C



Digital PAL/NTSC video encoder

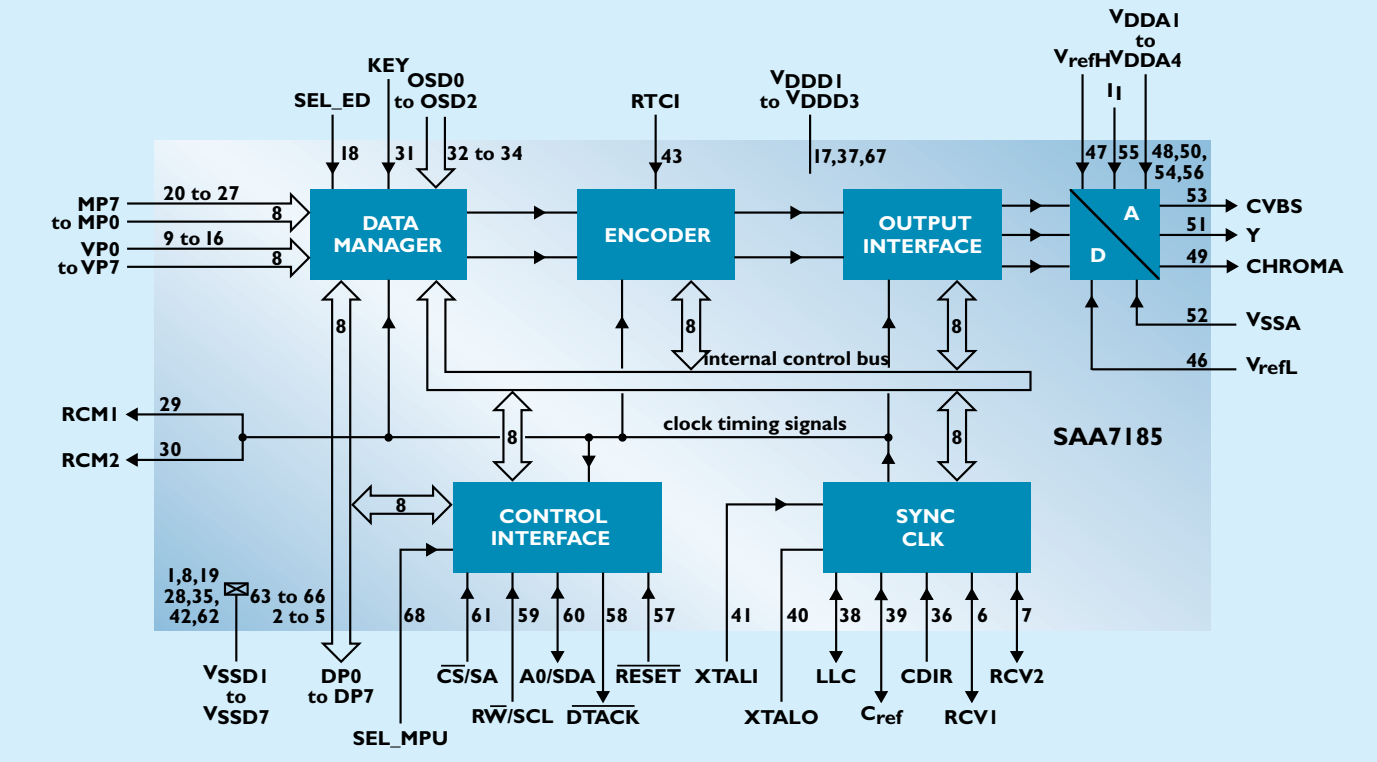
- CMOS 5 V device.
- Digital PAL/NTSC encoder.
- System pixel frequency 13.5 MHz.
- Accepts MPEG decoded data on YUV input port.
- Input data format Cb, Y, Cr etc. or Y and Cb, Cr on 16 lines.
- Three DACs for CVBS, Y and C operating at 27 MHz with 10-bit resolution.
- CVBS, Y and C output simultaneously.
- I²C-bus control port.
- Encoder can be master or slave.
- Programmable horizontal and vertical input synchronization phase.
- Programmable horizontal sync output phase.
- Internal test pattern generator.
- Overlay with Look-Up Tables (LUTs) 8 x 3 bytes.
- Controlled rise/fall times of output syncs and blanking.
- Down-mode of DACs.
- PLCC68 package.

The SAA7185 encodes digital YUV video data to an NTSC, PAL, CVBS or S-Video signal.

The circuit accepts CCIR-compatible YUV video data with 720 active pixels per line in 4:2:2 multiplexed formats, for example, MPEG decoded data. It includes a sync/clock generator and on-chip digital-to-analog converters (DACs).

The circuit is compatible with the DIG-TV2 family.

QUICK REFERENCE DATA	
(typ. values unless otherwise stated)	
analog supply voltage, V_{DDA}	5.0 V
digital supply voltage, V_{DDD}	5.0 V
analog supply current, I_{DDA}	50 mA
digital supply current, I_{DDD}	140 mA
input signal voltage levels, V_i	TTL
analog output signal voltage, $V_{o(p-p)}$	2 V
minimum load resistance, R_L	80 Ω
operating ambient temperature range	0-70 °C



CD-ROM block-decoders (ELM) with IDE and ATAPI interface

- **Real-time third-level error corrector, using internal fast SRAM.**
- **IDE interface.**
- **Compatible with ATA register set and ATAPI (AT-Additional Packet Interface) command set.**
- **n=6 decoding (SAA7380) in ROM 65100**
  n=8 decoding (SAA7388) in ROM 65200.
- **Supports Q-W subcode de-interleaving and correction.**
- **Supports up to 2 Mbyte DRAM.**

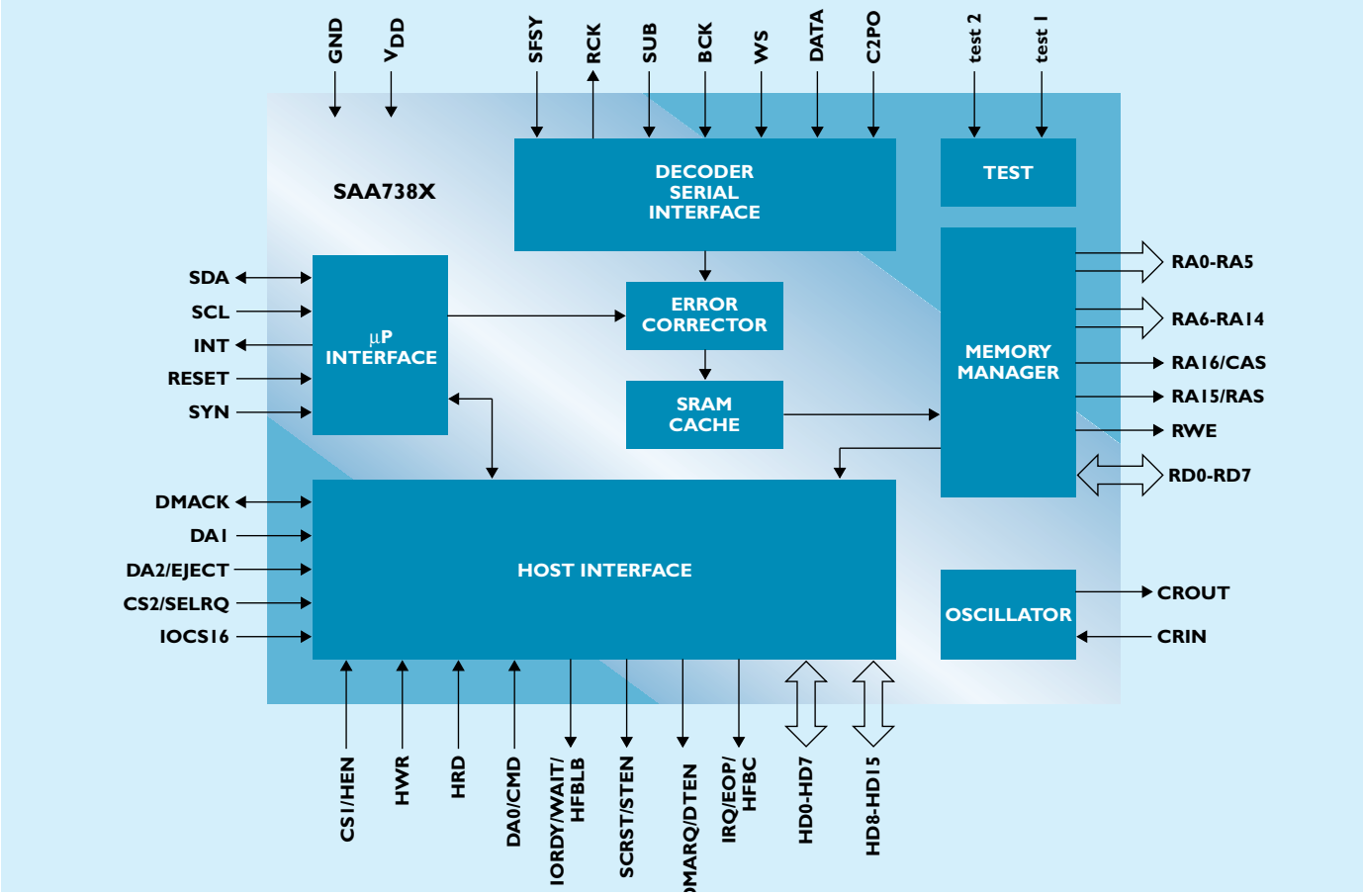
The SAA7380 and SAA7388 circuits (nickname: ELM) are CD-ROM block decoders with on-chip IDE interface (no external bus drivers are needed).

The SAA7380 supports data rates higher than six-times standard speed to match the data rates supplied by engines such as the ROM 65100.

The SAA7388 supports rates higher than eight-times standard speed to match the ROM 65200 engine.

Both types support the ATAPI command set.

QUICK REFERENCE DATA	
(typ. values)	
supply voltage	5 V
operating temperature range	0-70 °C



CD-ROM block-decoders (SEQUOIA) with SCSI interface

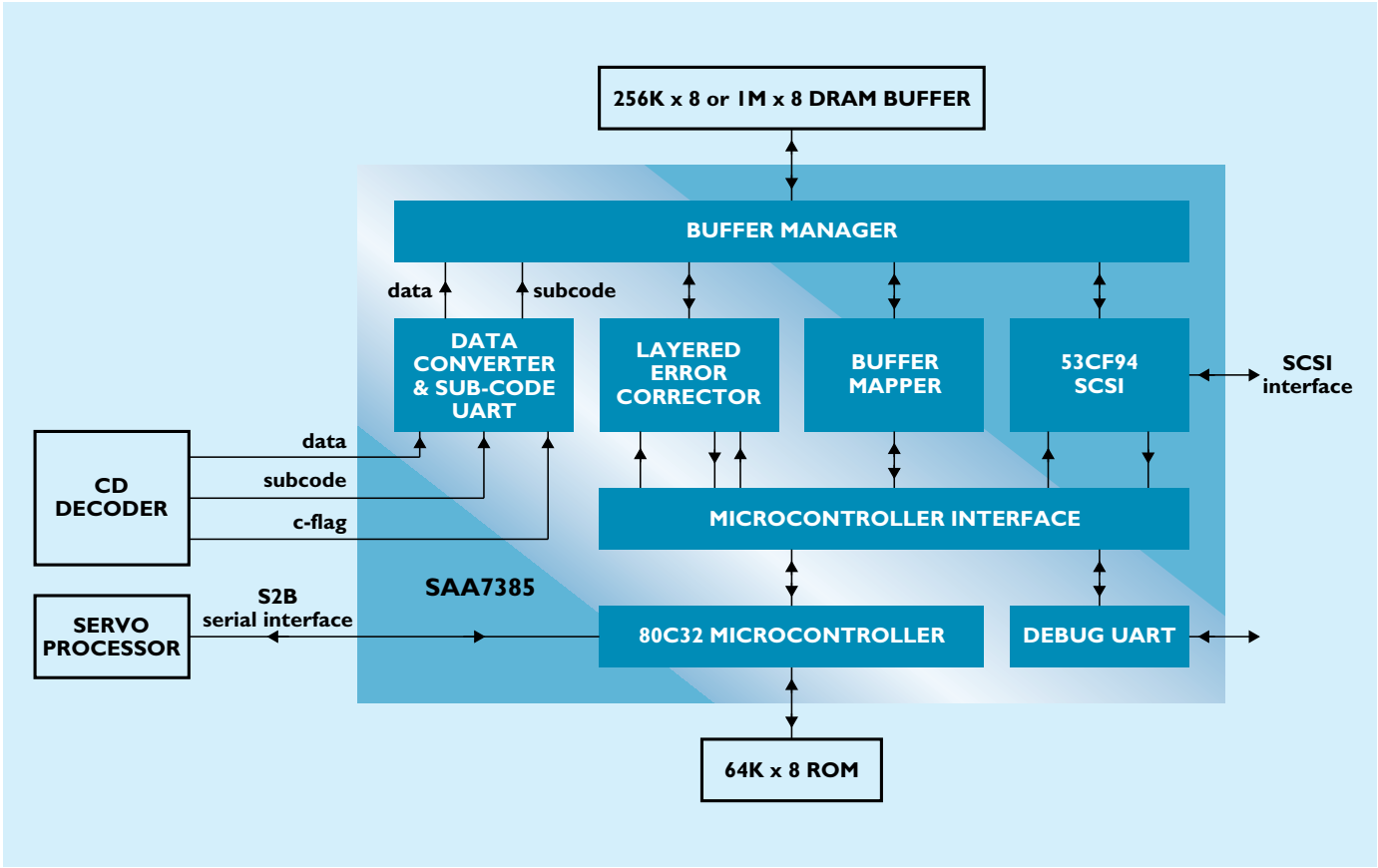
- **n=6 decoding (SAA7385) in ROM 65100**
  n=8 decoding (SAA7387) in ROM 65200.
- **Third-level error corrector.**
- **Fully integrated fast synchronous SCSI-2 interface including '8051' microcontroller.**
- **48 mA SCSI drivers.**
- **Block-oriented host data transfer (10 Mbytes/s).**
- **Supports SCSI plug-and-play with SCAM.**
- **High data integrity with error flag processing and 3rd layer correction.**
- **Red book audio pass-through & block-oriented host data transfer.**
- **Supports 1 Mbyte cache RAM.**
- **General-purpose I/Os for servo control.**

The SAA7385 and SAA7387 (nickname: SEQUOIA) are CD-ROM block decoders with a SCSI interface.

The SAA7385 supports data rates up to six- times standard speed higher to match the data rates supplied by engines such as the ROM 65000 & 65100.

The SAA7387 supports rates up to eight-times standard speed to match the ROM 65200 engine.

QUICK REFERENCE DATA	
(typ. values)	
supply voltage	5 V
operating temperature range	0-70 °C

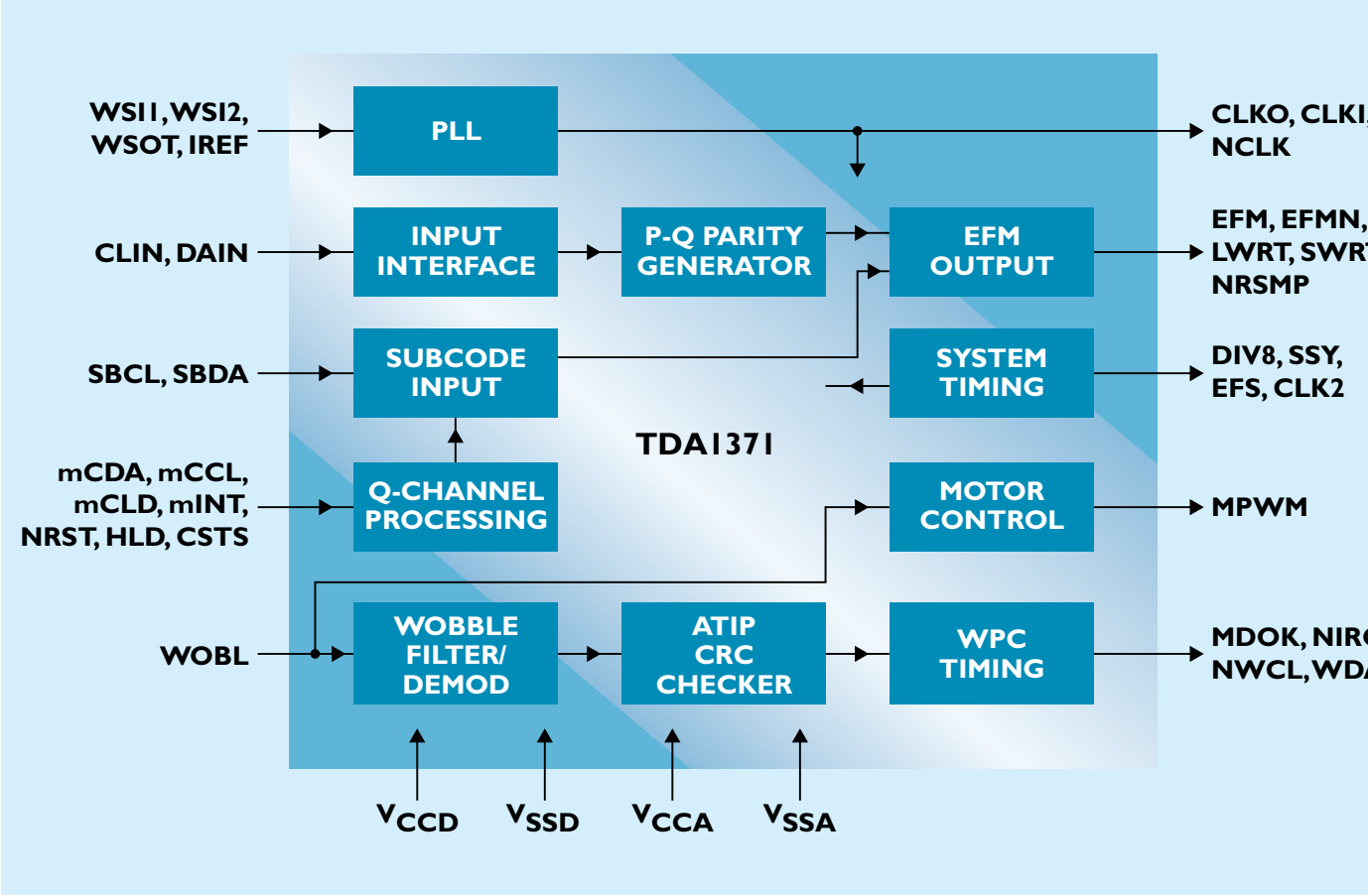


Compact Disc CIRC-EFM encoder (CDCEP)

- **Internal RAM for C1, C2 parity calculation.**
- **Programmable input format.**
- **Internal system clock regeneration.**
- **ATIP demodulation.**
- **ATIP cyclic redundancy check.**
- **Motor error signal output.**
- **ATIP/subcode synchronisation.**
- **Suitable for at least n=2.**
- **Serial microprocessor interface.**
- **P and Q subcode channels generator.**
- **R,...,W subcode channels serial input.**
- **Laser write signals.**

The TDA1371 is a modified and functionally extended follow-up of the first generation Compact Disc Encoder.
A wobble processor is embedded.
The main function is to convert serial, digital input data to EFM-format, according the RED BOOK specification, and to decode the ATIP-information from the CDR-disc.

QUICK REFERENCE DATA	
(typ. values)	
supply voltage - digital part	5 V
supply voltage - analog part	5 V
supply current - digital part	14 mA
supply current - analog part	2 mA
power dissipation (n=1)	80 mW
power dissipation (n=2)	160 mW

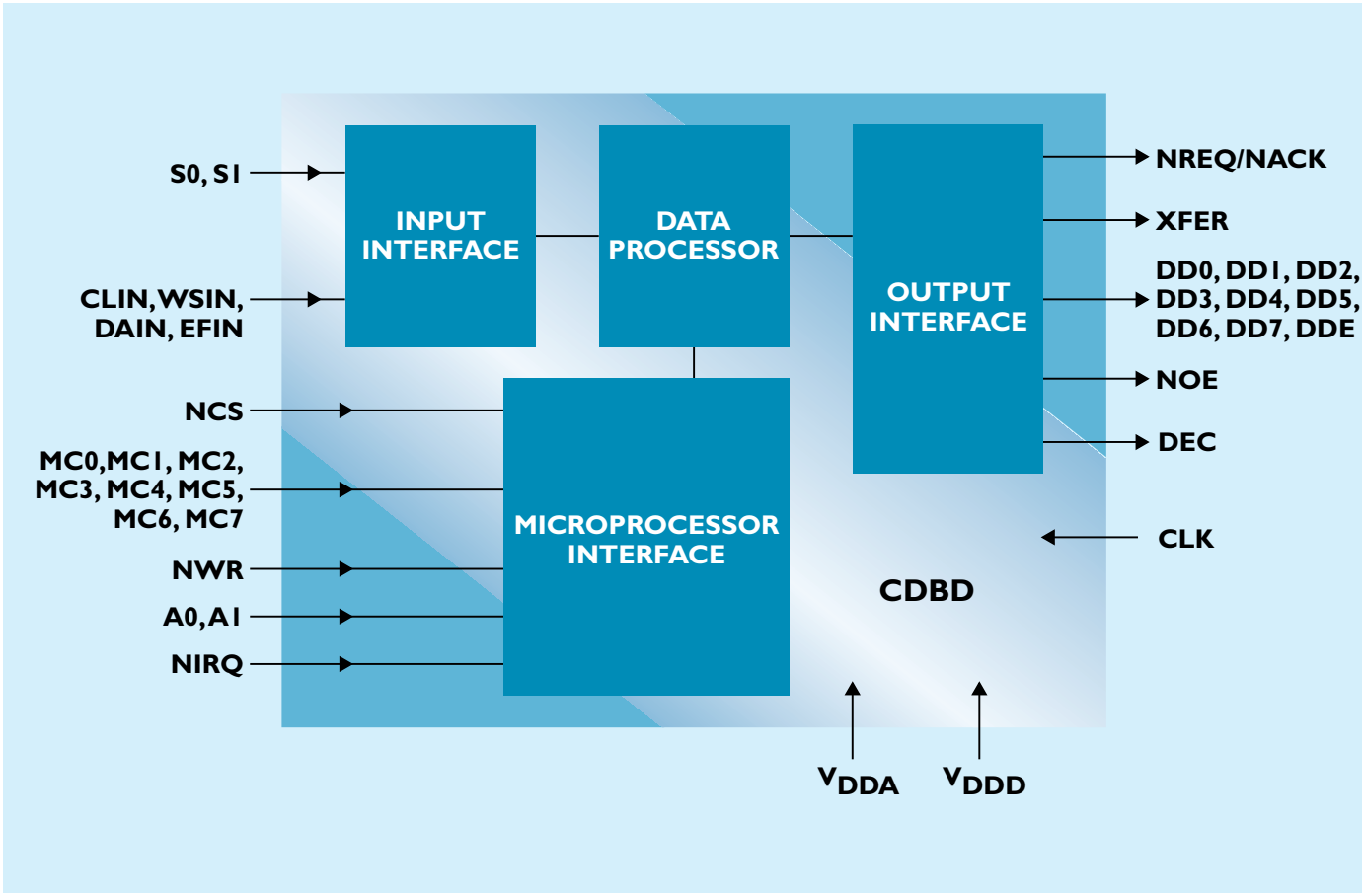


Compact Disc Block Decoder

- **Suitable for at least n=4.**
- **Input format based on MEC, SONY and I2S EFM-decoder output formats.**
- **Parallel output format with common request acknowledge protocol.**
- **Serial output format according to DEC interface protocol.**
- **Parallel or serial output format.**
- **Suitable for Yellow (CD-ROM) and Green (CDI) Book data.**
- **Parallel microprocessor interface with direct accessible registers.**
- **Special mode to output the error flag over the data bus.**

The CDBD performs the basic functions on EFM decoded data to convert it to block structured descrambled data. It performs EDC but not ECC. Different output formats can be selected. The output is serial or parallel with 'output enable' to allow for the possibility of bus structured architecture. The device is programmable via a microprocessor interface.

QUICK REFERENCE DATA	
(typ. values unless stated otherwise)	
supply voltage	5 V
maximum system clock frequency	30 MHz
maximum data input frequency	30 MHz
quiescent current	10 µA

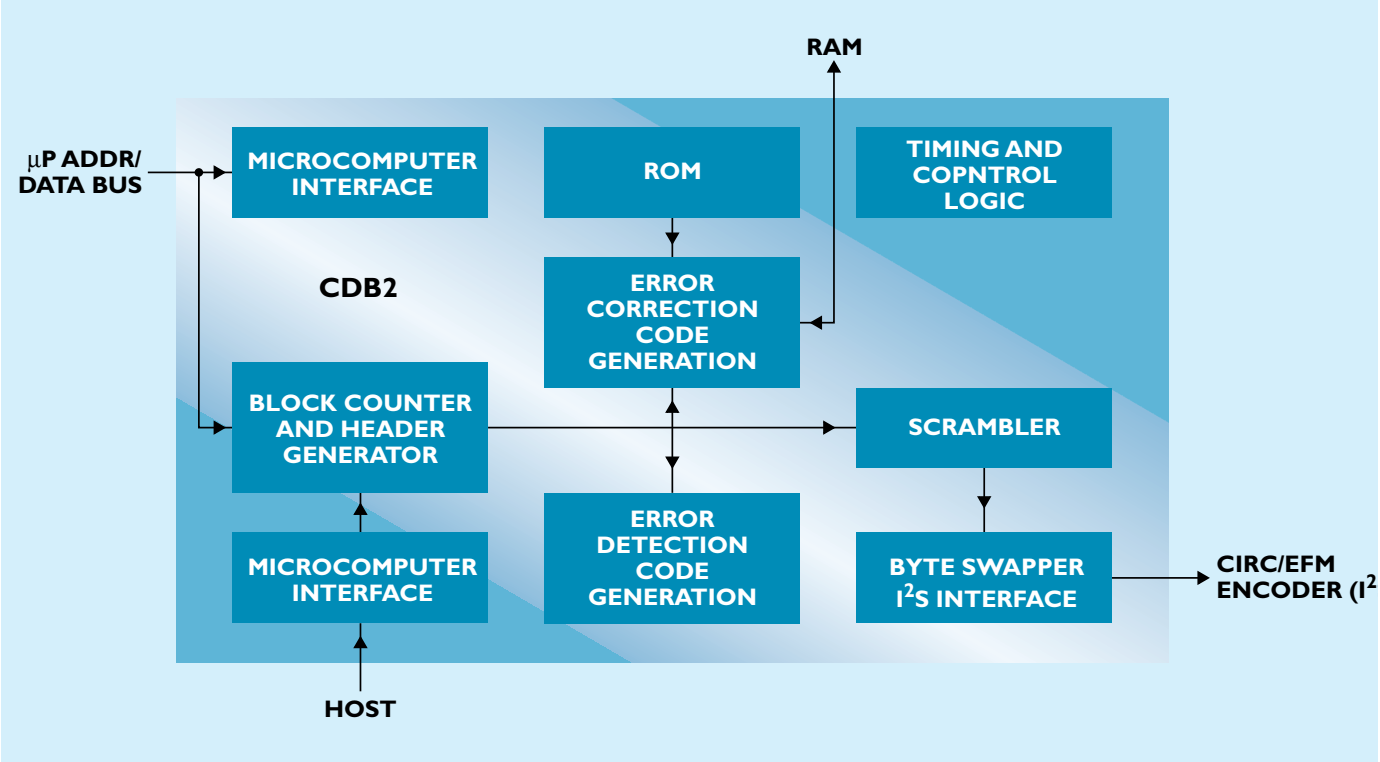


Compact Disc Block Encoder

- **Embedded real-time parity encoding.**
- **Performs all CD-ROM/XA mode 0,I and 2 functions.**
- **Performs all CDI form I and 2 functions.**
- **Automatic sync and header generation.**
- **Fully programmable via an easy microprocessor interface.**
- **Easy host-interface via request/acknowledge handshaking.**
- **Low power CMOS.**
- **Optional automatic calculation of EDC in CDI, form 2.**
- **Single 5 V power supply.**
- **Max. speed up to n=5.**
- **Features 'Philips' standard interface format, I^2S.**
- **'Bypass' possibility. Host data is directly fed to the output.**

The CDB2 is designed to be a part of the encoding data path of a CD-Recordable system. All the data acquisitions and manipulations, conforming the CD-ROM/CDI rules are embedded in this chip:
reformatting data into CD-ROM blocks,
providing each block with the necessary parity bytes, giving the decoding part the possibility of a third layer error correction. Data is scrambled, swapped and formatted into I2S format.

QUICK REFERENCE DATA	
(typ. values unless stated otherwise)	
supply voltage	5 V
maximum clock frequency	22 MHz
input voltage	5 V
output voltage	5 v

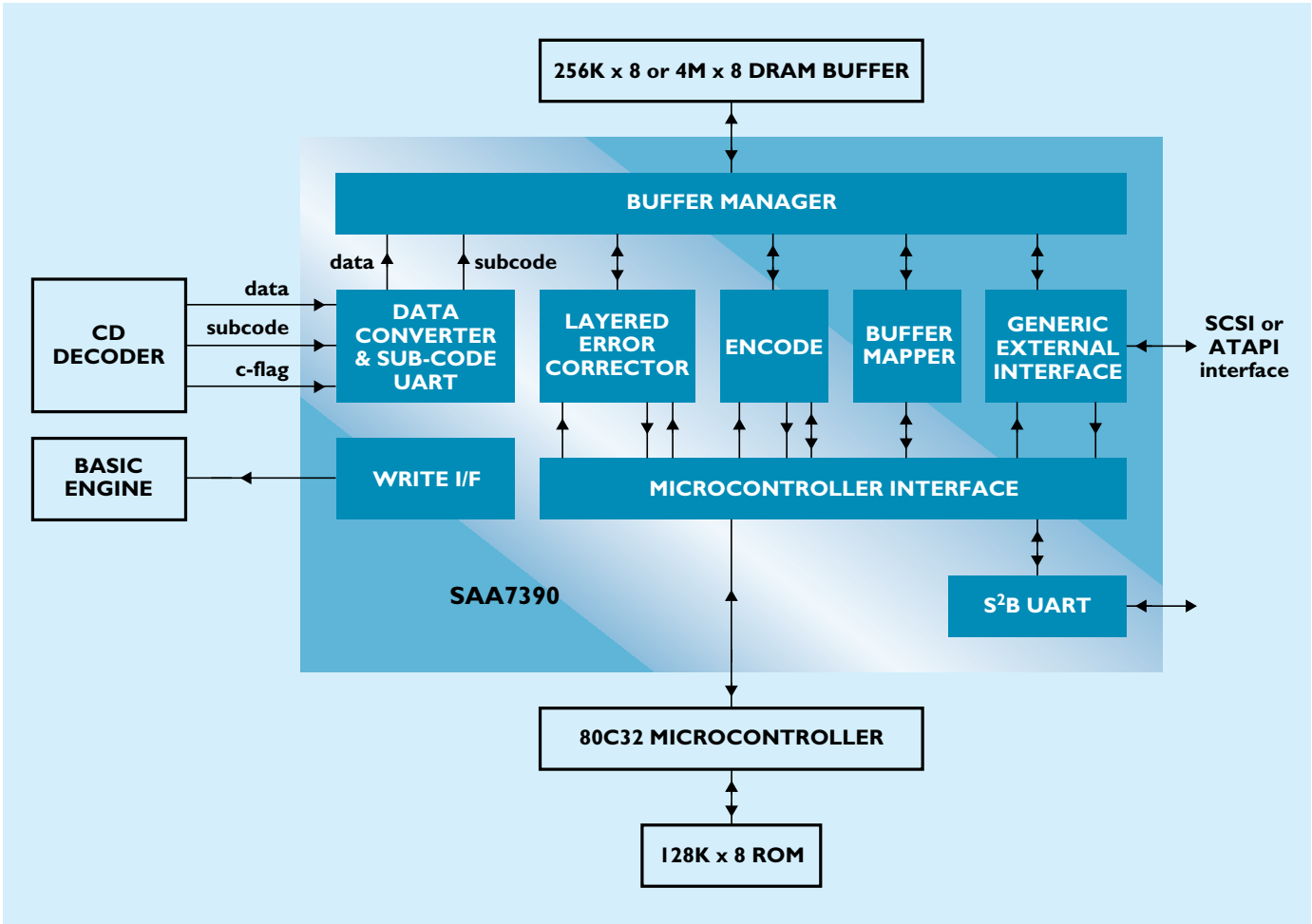


High-speed CD-Recordable block decoder/encoder (CHAUCER)

- **Third-level error corrector.**
- **Third layer ECC syndrome calculation.**
- **Third layer encode/decode and buffer management.**
- **Block-oriented host transfers.**
- **Generic interface with 16.9 Mbyte/s transfer for external SCSI (53CF92) or ATAPI IC.**
- **Designed for 8x read and 6x write speeds.**
- **Supports 256K, 1M or 4M, 70 ns low-cost DRAMs.**
- **Ten-level arbitration logic in buffer manager.**

The SAA7390 (nickname: CHAUCER) is a highly integrated CD-ROM block decoder and encoder. It supports data rates during reading of up to eight times standard speed, and during writing of up to six times standard speed.

QUICK REFERENCE DATA	
(typ. values)	
supply voltage	5 V
operating temperature range	0-70 °C

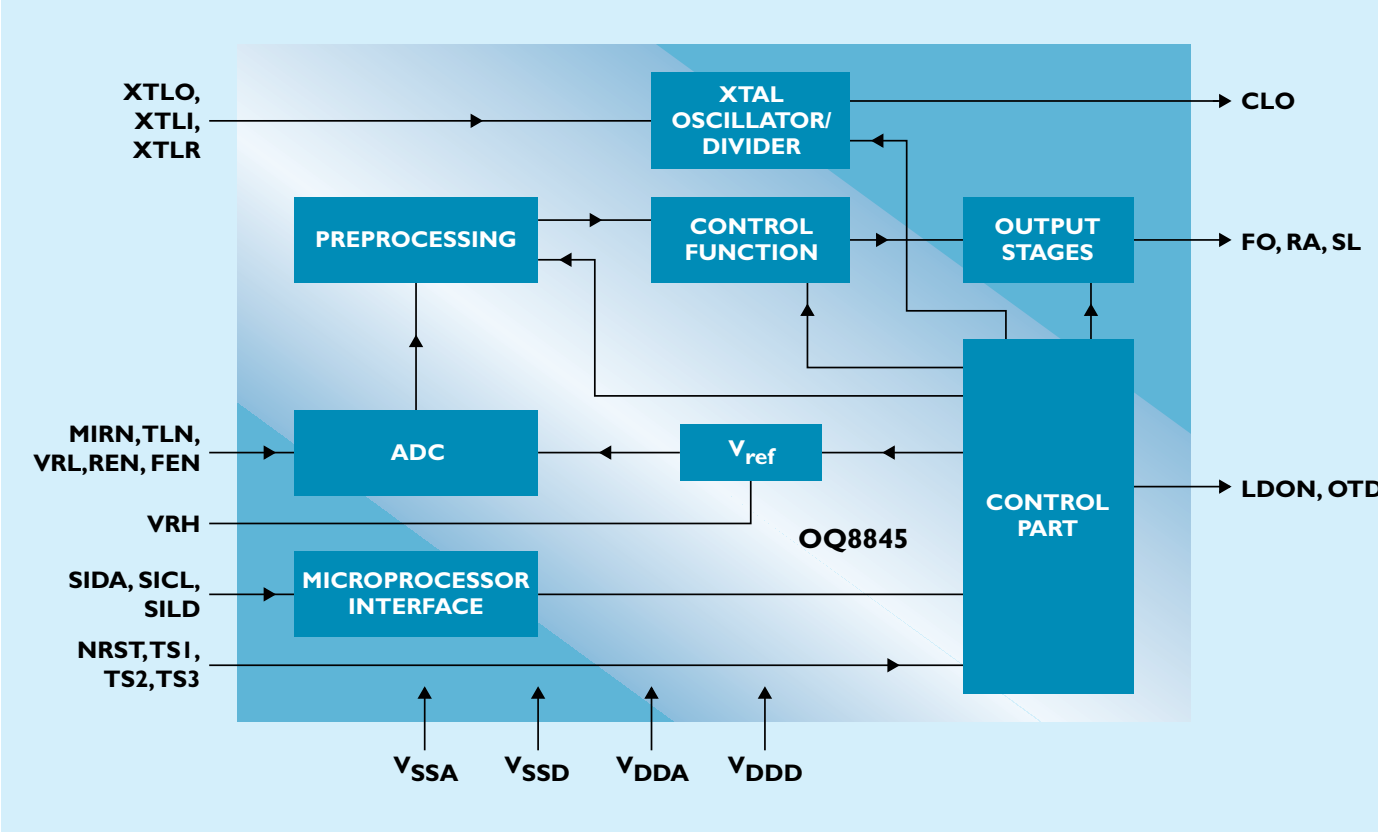


DSICR

- **Focus, radial and sledge servo loop.**
- **Built-in access procedure.**
- **Supply voltage 5 V only.**
- **Sophisticated track-loss detection mechanism.**
- **Automatic focus start-up procedure and in-lock indication (incl. fast focus restart).**
- **Automatic electrical offset compensation for focus error.**
- **Automatic offset control for track-loss.**
- **Extended radial error signal.**
- **Flexible system oscillator.**
- **Automatic jump procedure for radial servo.**
- **Automatic offset and gain control for radial error.**
- **Defect and shock detector.**

The OQ8845 provides all servo functions (except spindle motor) for two-stage CD and CD-Recordable systems. It offers a high degree of integration, combined with low additional cost of external components. The servo characteristics are widely adjustable through a three-wire serial interface which offers a high degree of flexibility, enabling the controller to be used in a wide range of CD-mechanisms.

QUICK REFERENCE DATA	
(typ. values unless stated otherwise)	
supply voltage - digital part	5 V
supply voltage - analog part	5 V
supply current - digital part	10 mA
maximum quiescent current	10 µA
max supply current - analog part	4 mA
maximum input current - FEN, REN, TLN	15.8 µA
maximum input current – MIRN	24.3 µA
power dissipation	95 mW

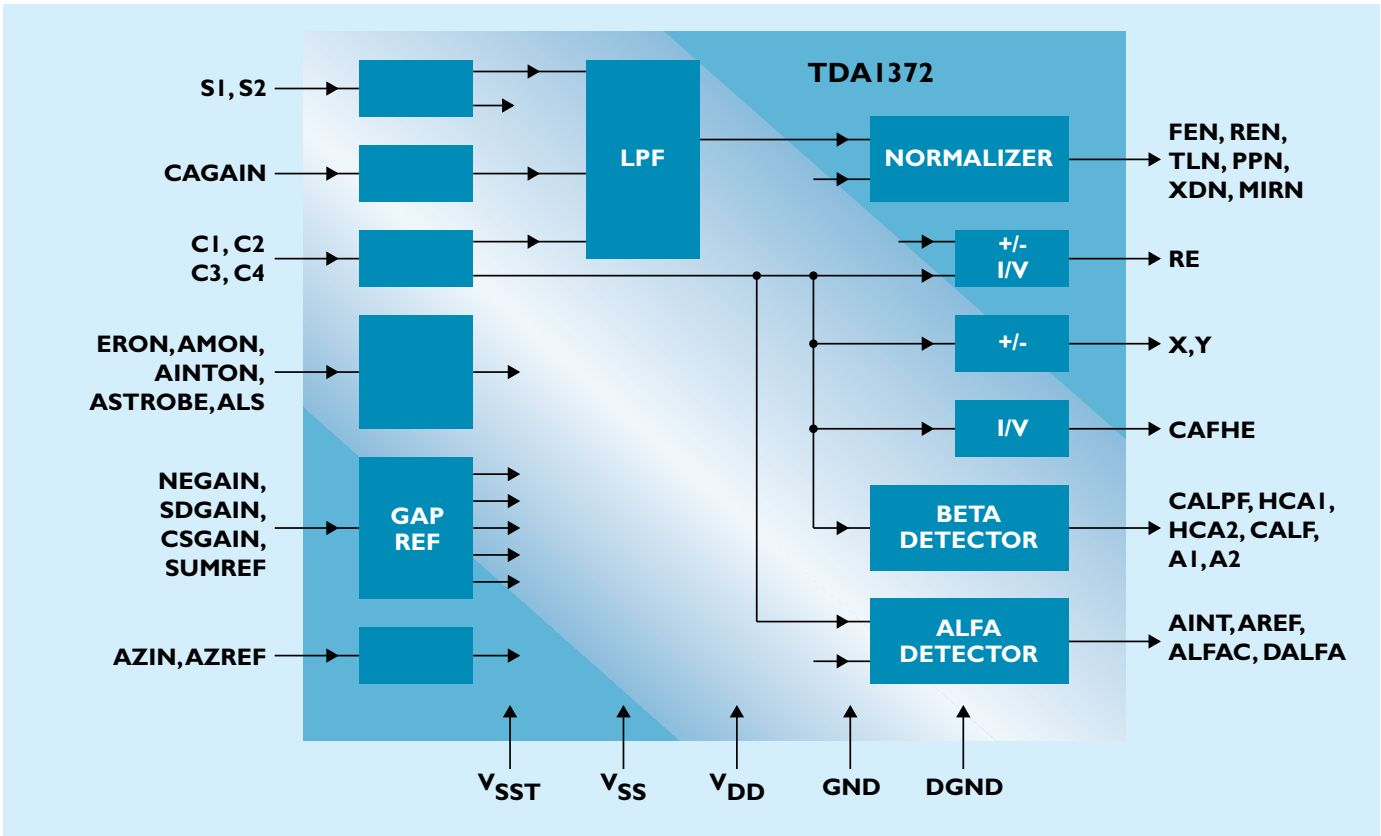


Pre-amplifier and error signal generator for CD-Recordable

- **Offset-free pre-amplifiers.**
- **Normalized error signal, independent of the detected light level.**
- **Completely integrated filters for normalized error signals.**
- **Drop-out concealment.**
- **Spot position signals.**
- **Detector for optimum laser power calibration.**
- **Detector for optimum laser power control.**
- **On-chip band gap reference for temperature independent transfer functions.**
- **HF-amplifier.**
- **Signal for fast track counting.**

The TDA 1372 is a preamplifier and error-signal generator intended for 3-spot, push-pull tracking systems. Error signals to focus the laser spot on the disc and to control the position of the spots across the tracks are generated independently of the intensity of light falling on the detectors. The data signal is detected and amplified. Signals to determine the optimum laser power and to control the laser power during writing data are also
generated.

QUICK REFERENCE DATA	
(typ. values unless stated otherwise)	
supply voltage, VDD	5 V
supply voltage, VSS	−5 V
detector input current range	100 µA
minimum bandwidth normalized error signals	40 kHz
minimum HF-amplifier bandwidth	4 MHz



Survey of stereo audio DACs (ranked by typical THD + N at 0 dB performance per category)

Type	Description	Over-sampling (x f_s)	Data input format	Typ. THD + N at 0 dB dB(%)	Typ. THD + N at -60 dB dB(%) [4]	Typ. signal-to-noise ratio (dB) [4]	Typ. output voltage (or current) V (mA)	Supply voltage (V)	Power dissipation (mW)	Package
Bitstream DAC										
TDA1547[1]	top-grade BiMOS bitstream DAC	24	1-bit, 192f_s	−101(0.0009)	−51(0.02)	113	1.0	5 ±10%	800	DIP32S
Bitstream/continuous calibration DACs										
TDA1549(T)[5]	bitstream/CC DAC	24	"S", 4f_s, 18-bit	−90(0.003)	−50(0.32)	110	1.5	3.4 to 5.5	35	DIP16, SO16
16-bit DACs										
TDA1541A/S2[3]	double crown 16-bit DAC	1	I^2S, up to 8f_s	−95(0.002)	−47(0.4)	112	(4.0)	5 ±10%	700	DIP28
TDA1541A/S1[3]	single crown 16-bit DAC	1	I^2S, up to 8f_s	−95(0.001)	−47(0.4)	112	(4.0)	5 ±10%	700	DIP28
TDA1541A[3]	high-performance 16-bit DAC	1	I^2S, up to 8f_s	−95(0.0018)	−42(0.79)	112	(4.0)	5 ±10%	700	DIP28
TDA1541A/R1[3]	high-performance 16-bit DAC	1	I^2S, up to 8f_s	−95(0.001)	−43(0.79)	112	(4.0)	5 ±10%	700	DIP28
TDA1543(T)	economy 16-bit DAC	1	I^2S, up to 4f_s	−75(0.018)	−33(2.2)	96	(2.3)	3 to 8	250	DIP8, SO16
TDA1543A(AT)	economy 16-bit DAC	1	"S", up to 4f_s	−75(0.018)	−33(2.2)	96	(2.3)	3 to 8	250	DIP8, SO16
Continuous calibration DACs										
TDA1313(T)[5]	continuous calibration DAC with voltage output	1	"S", up to 8f_s	−88(0.004)	−38(1.3)	98	4.2	3 to 5.5	30	DIP16, SO16
TDA1545A(AT)	continuous calibration DAC with current output	1	"S", up to 4f_s	−88(0.004)	−35(1.7)	101	(1.0)	3 to 5.5	6	DIP8, SO8
TDA1387T	continuous calibration DAC with current output	1	I^2S, up to 4f_s	−88(0.004)	−35(1.7)	98	(1.0)	3 to 5.52	8	DIP8, SO8
TDA1312A(AT)5)	continuous calibration DAC with voltage output	1	"S", up to 8f_s	−68(0.04)	−33(2)	92	2.0	4 to 5.5	8	DIP8, SO8
TDA1311A(AT)[5]	continuous calibration DAC with voltage output	1	"S", up to 4f_s	−68(0.04)	−33(2.2)	92	2.0	4 to 5.5	8	DIP8, SO8
TDA1310A(AT)	continuous calibration DAC with current output	1	"S", up to 4f_s	−65(0.05)	−33(2.2)	95	(1.0)	3 to 5.5	6	DIP8, SO8

Survey of stereo audio filter-DACs (ranked by typical THD + N at 0 dB performance per category)

Bitstream/continuous calibration filter-DACs										
TDA1305T(AT)[2][6]	bitstream/CC filter-DAC	96	I^2S, "S", 1f_s, up to 20-bit	−90(0.003)	−46(0.5)	108	1.5	3.4 to 5.5	70	SO28
TDA1546T[2]	bitstream/CC filter-DAC + DSP features	96	I^2S, "S", 1f_s, up to 20-bit	−88(0.004)	−44(0.6)	108	1.5	3.8 to 5.52	65	SO28
TDA1548T[2]	low-voltage bitstream/CC filter-DAC + DSP features	96	I^2S, "S", 1f_s, up to 20-bit	−85(0.005)	−35(1.8)	95	0.7	2.7 to 4	50	SO28
Continuous calibration filter-DACs										
TDA1306T2)[6]	CC filter-DAC	4	I^2S, "S", 1f_s, up to 20-bit	−70(0.032)	−42(0.8)	108	1.1	5 ±10%	85	SO24
TDA1386T[2]	CC filter-DAC	4	I^2S, "S", 1f_s, up to 20-bit	−70(0.032)	−42(0.8)	108	2.0	5 ±10%	50	SO24
Quadruple sign-magnitude filter-DAC										
TDA1314T[5]	quad sign-magnitude filter-DAC with voltage output	4	2 xc I^2S, 1f_s, 18-bit with sign	−70(0.03)	−42(0.8)	110	2.0	5 ±5%	85	SO28

Notes: [1] measured with SAA7350 and 20-bit input; [2] includes digital filter; [3] high sound quality: dynamic element matching (DEM); [4] A-weighting; [5] includes I/V converter.

Survey of stereo audio ADCs (ranked by typical THD + N at 0 dB performance per category)

Type	Description	Oversampling (x f_s)	Data input format	Typ. THD + N at 0 dB dB(%)	Typ. signal-to-noise ratio (dB) [4]	Supply voltage (V)	Power dissipation (mW)
SAA7366T	economy bitstream ADC	128	data output format: I^2S + one pseudo I^2S	−88(0.004)	95	5 ±10%	350
SAA7367T	economy bitstream ADC	128	data output format: I^2S + one pseudo I^2S	−88(0.004)	95	5 ±10%	tbf
SAA7360GP	high-performance bitstream ADC	128	data output format: I^2S + two pseudo I^2S	−90(0.003)	102	5 ±10%	410
SAA7361GP	premium-grade bitstream ADC	128	data output format: I^2S + two pseudo I^2S	−94(0.002)	102	5 ±10%	410

Notes: [1] measured with SAA7350 and 20-bit input; [2] includes digital filter; [3] high sound quality: dynamic element matching (DEM); [4] A-weighting; [5] includes I/V converter.

Survey of stereo audio ADCs + DACs

Type	Description		Over-sampling (x f_s)	Data input format	Typ. THD + N at 0 dB dB(%)	Typ. THD + N at -60 dB dB(%) [4]	Typ. signal-to-noise ratio (dB) [4]	Typ. output voltage (or current) V (mA)	Supply voltage (V)	Power dissipation (mW)	Package
TDA1309H	low-voltage bitstream/CC ADC + DAC	ADC		I^2S, "S", 16-bit, 18-bit output	−85(0.005)	−35(1.7)	95		2.7 to 4.0	72	QFP44SL
		DAC	256	I^2S, "S", 16-bit, 18-bit input	−90(0.003)	−44(0.6)	104	0.5		84	

Notes: [1] measured with SAA7350 and 20-bit input; [2] includes digital filter; [3] high sound quality: dynamic element matching (DEM);

LCD segment drivers with I2C-bus interface

	PCF8566(T)	PCF8576T	PCF8577C(T)
Segment drive outputs	24	40	32
Multiplex rate	1:1, 1:2, 1:3, 1:4	1:1, 1:2, 1:3, 1:4	1:1, 1:2
Segments driven per IC	24/48/72/96	40/80/120/160	32/64
Max. ICs per system	16	16	8
Max. segments driven per system	1536	2560	512
Supply voltage	2 to 6 V	2 to 9 V	2.5 to 9 V
Max. supply current:			
operating at 5 V	90 µA	180 µA	250 µA
power saving mode	40 µA	60 µA	
Display data RAM	24 x 4 bits	40 x 4 bits	
Blinking modes	0.5, 1, 2 Hz	0.5, 1, 2 Hz	
Package	DIP40, VSO40	VSO56	DIP40, VSO40

COMPACT DISC MECHANISMS

CDM 12.1

Economical performance for audio, video and games applications.
Lightweight 3-beam LDGU* with holographic pick up, providing excellent thermal stability.
Economical, low-profile frame.
Unique low-mass actuator for fast, accurate focusing and radial tracking.
Reliable, long-life, DC motors.

CDM 12.2T

For top loaders; includes ornamental plate.
Double-speed for video, games and computer applications.
High-efficiency DC motors for double speed operation.

CDM 12.3BL

Compact mechanism for audio portable applications.
Overall height of only 14.3 mm.
Lightweight 3-beam LDGU with holographic pick up, providing excellent thermal stability.
Unique low-mass actuator for fast, accurate focusing and radial tracking, low power consumption and high shock resistance.
Laser output adjustment on LDGU foil.
Ball-clamping turntable.

CDM 12.3BLC

As CDM 12.3BL but low-power, low-voltage mechanism.

CDM 12.6

Fast access and high-speed data transfer for CD-ROM applications.
Selected high-speed sledge motors and higher gear ratios for fast radial access.
Integrated diode pre-amplifier for high signal-to-noise ratio and high data-integrity at up to sextuple data-transfer rates.
Brushless turntable motor.

CDM 12 INDUSTRIAL

Professional standards and high reliability for industrial applications.
Lightweight 3-beam LDGU with holographic pick up, providing excellent thermal stability.
Heavy die-cast frame, for minimum relative pick-up mass.
Unique low-mass actuator for fast, accurate focusing and radial tracking.
Integrated diode pre-amplifier for high signal-to-noise ratio and high data-integrity at double data-transfer rates.

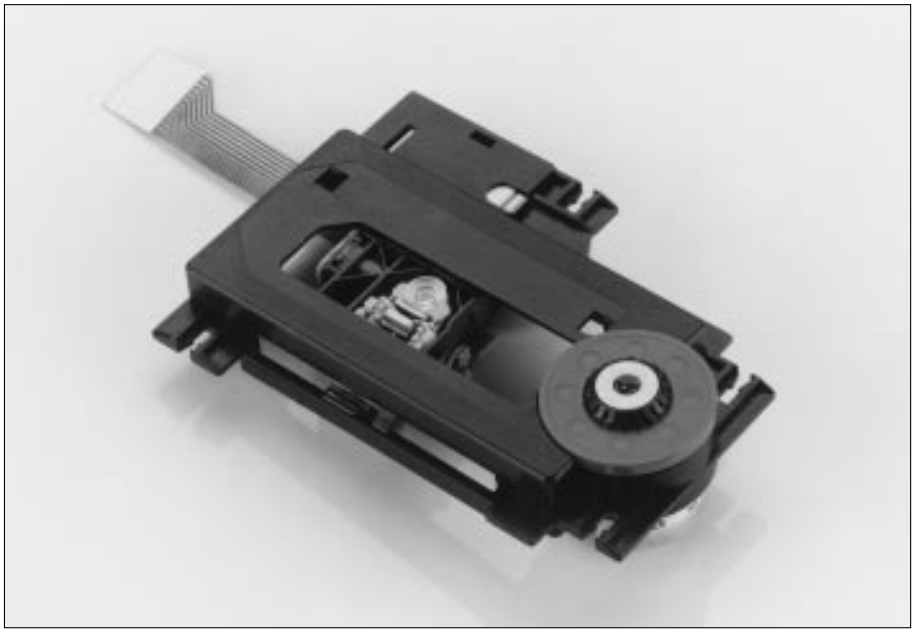
CDM 24

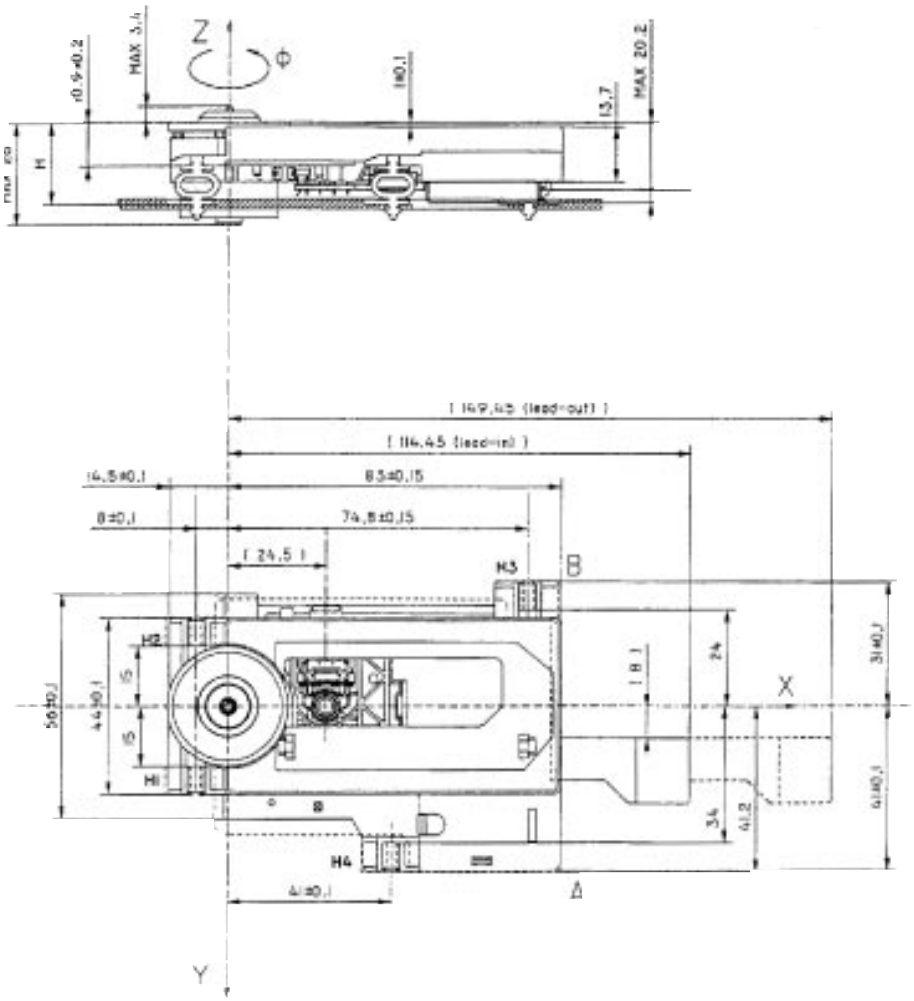
Three-beam push-pull light-pen with high-intensity laser for CD-Recording in the organic-dye layer of Recordable discs.
Selected high-speed sledge motors and higher gear ratios for fast radial access.
Integrated signal processor for high signal to noise ratio and high data-integrity at quadruple data-transfer rates.
Brushless turntable motor.

** LDGU: Laser Detector Grating Unit*

Economical performance for audio, video and games applications

- **Lightweight 3-beam LDGU with holographic pick-up, providing excellent thermal stability.**
- **Economy-class low-profile frame.**
- **Unique low-mass actuator for fast, accurate focusing and radial tracking.**
- **Reliable long-life DC motors.**
- **Top-loading version with ornamental plate available (CDM 12.1T).**

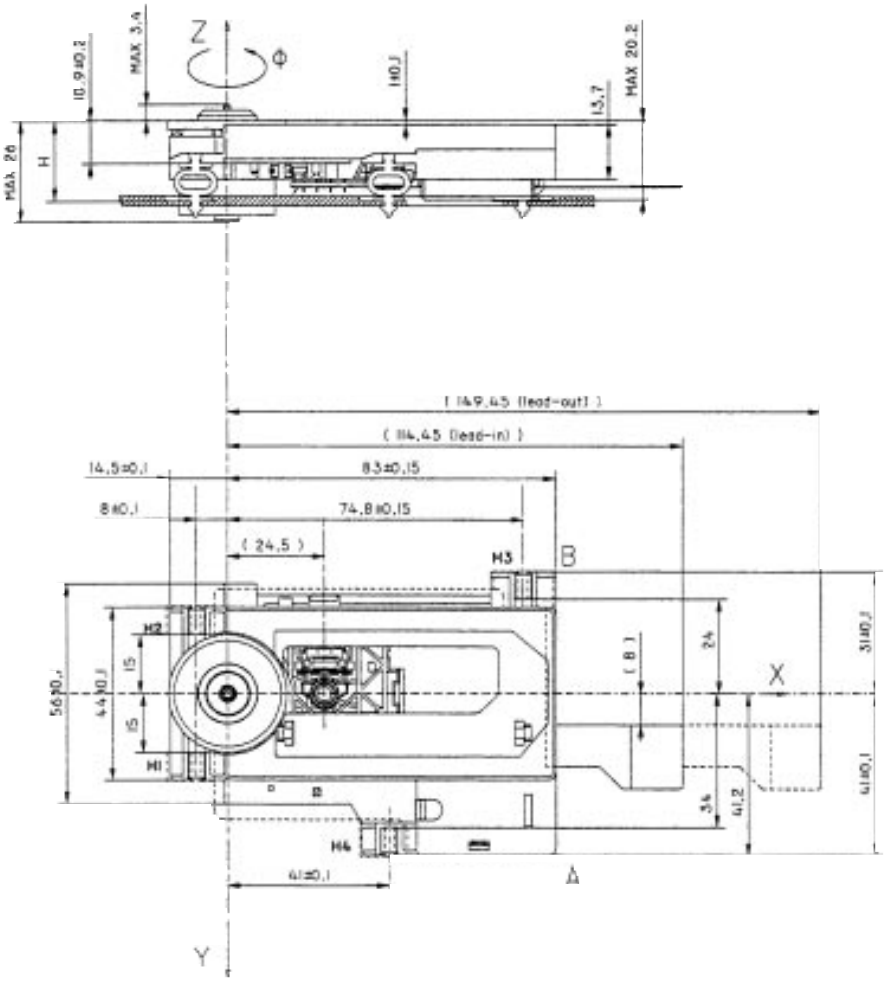




CDM 12.1(T)TECHNICAL DATA (typ. values)	
Disc motor	RF310T-11400
Sledge motor	PPN 13
Mech. sledge speed	13 mm/s (3.5V)
Moving mass actuator	0.56 gr
Focus error detection	Single Foucault
Focus resonance freq.	30 Hz
Focus AC-sensitivity	0.28 N/A
Focus DC-sensitivity	0.8 mm/V
Focus resistance	18 Ω
Radial error detection	3-beam
Tracking resonance freq.	49 Hz
Tracking AC-sensitivity	0.32 N/A
Tracking DC-sensitivity	0.35 mm/V
Tracking resistance	18 Ω
Wavelength	780 nm
Power intens. (obj. lens)	max. 0.5 mW
Numerical aperture	0.45
Lifetime	5000 Hr (B10)
MTBF (100%)	27000 Hr
Operational temp. range	5 to 55 °C
Storage temperature	-25 to 55 °C
Storage exposure	70 °C (48Hr)
Allowed impact	max. 100 g (6msec)
Vibration (2g/0.15mm)	10-150 Hz

Double-speed for video, games and computer applications

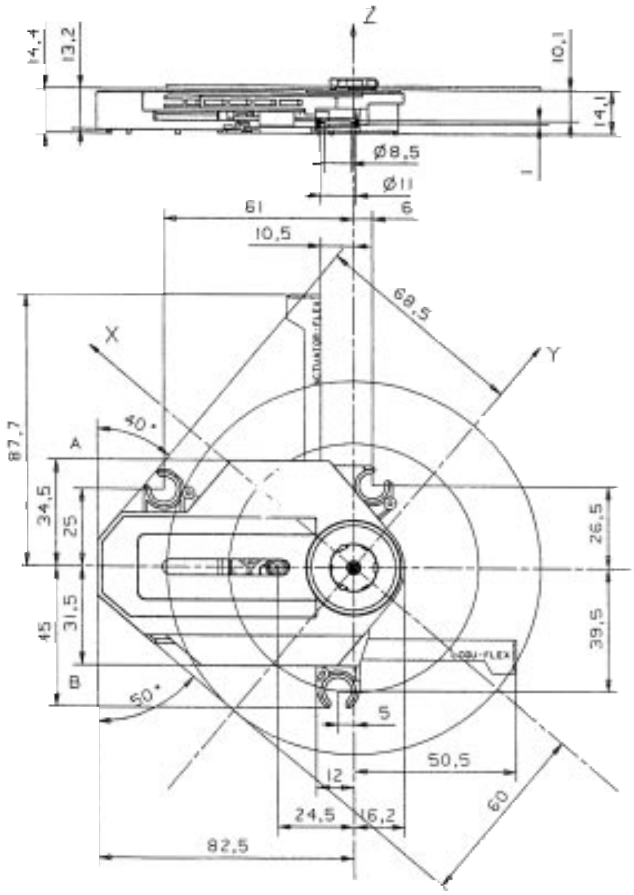
- **For top loaders; includes ornamental plate.**
- **Increased data-transfer rates due to high-efficiency double-speed motors.**
- **Lightweight 3-beam LDGU with holographic pick-up, providing excellent thermal stability.**
- **Unique low-mass actuator for fast, accurate focusing and radial tracking.**



CDM12.2(T) TECHNICAL DATA (typ. values)	
Disc motor	RF310T-11400
Sledge motor	PPN 13
Mech. sledge speed (3.5V)	13 mm/s
Moving mass actuator	0.56 gr
Focus error detection	Single Foucault
Focus resonance freq.	30 Hz
Focus AC-sensitivity	0.28 N/A
Focus DC-sensitivity	0.8 mm/V
Focus resistance	18 Ω
Radial error detection	3-beam
Tracking resonance freq.	49 Hz
Tracking AC-sensitivity	0.32 N/A
Tracking DC-sensitivity	0.35 mm/V
Tracking resistance	18 Ω
Wavelength	780 nm
Power intensity (obj. lens)	max. 0.5 mW
Numerical aperture	0.45
Lifetime	5000 Hr (B10)
MTBF (100%)	27000 Hr
Operational temp. range	5 to 55 °C
Storage temperature range	-25 to 55 °C
Storage exposure	70 °C (48Hr)
Allowed impact	max. 100 g (6msec)
Vibration (2g/0.15mm)	10-150 Hz

Compact mechanism for audio portable applications

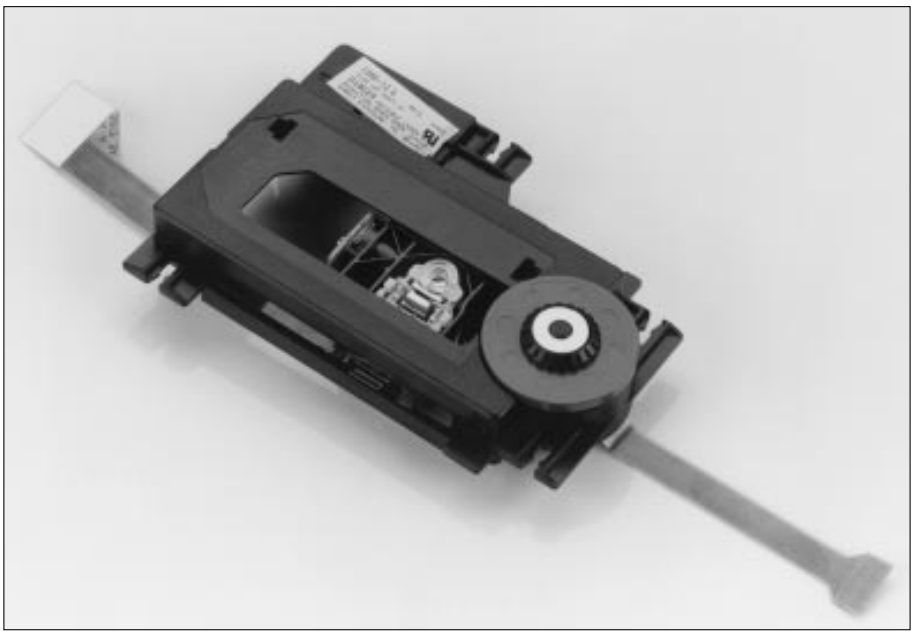
- **Unique ball-clamping turntable. No external clamping parts required.**
- **Economy-class low-profile frame; overall height only 14.4 mm.**
- **Unique low-mass actuator for fast, accurate focusing and radial tracking, low power consumption and high shock resistance.**
- **Can be mounted in any position.**
- **CDM 12.3BLC only: extra low power and low voltage (laser, actuators and motors) for extended battery life.**

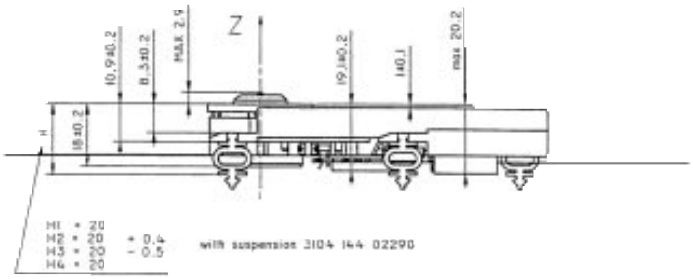


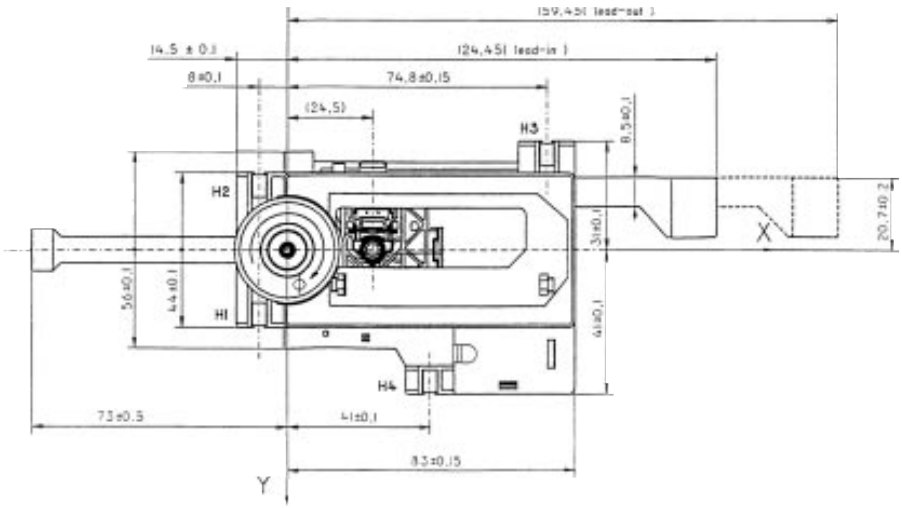
CDM12.3BLC TECHNICAL DATA (typ. values)	
Disc motor	RF410CH-10350
Sledge motor	FF030PK-08250
Mech. sledge speed (3.5V)	13 mm/s
Moving mass actuator	0.56 gr
Focus error detection	Single Foucault
Focus resonance freq.	30 Hz
Focus AC-sensitivity	0.25 N/A
Focus DC-sensitivity	0.65 mm/V
Focus resistance	18 Ω
Radial error detection	3-beam
Tracking resonance freq.	49 Hz
Tracking AC-sensitivity	0.25 N/A
Tracking DC-sensitivity	0.24 mm/V
Tracking resistance	18 Ω
Wavelength	780 nm
Power intensity (obj. lens)	max. 0.5 mW
Numerical aperture	0.45
Lifetime	2000 Hr (B10)
MTBF (25%)	30000 Hr
Operational temp. range	-10 to 55 °C
Storage temperature range	-25 to 55 °C
Storage exposure	70 °C (48Hr)
Allowed impact	max. 100 g (6msec)
Vibration (3g/0.2mm)	10-150 Hz

Fast access and up to hex-speed data-transfer for CD ROM applications

- **Small size, suitable for half-height mounting in computer applications.**
- **Fast radial access due to high-speed sledge motor and higher gear ratios.**
- **Up to octal data-transfer rates and extended reliability due to brushless disc motor (CDM 12.6/xx).**
- **Unique low-mass actuator for fast, accurate focusing and radial tracking.**
- **Integrated diode pre-amplifier for maximum signal-to-noise ratio.**



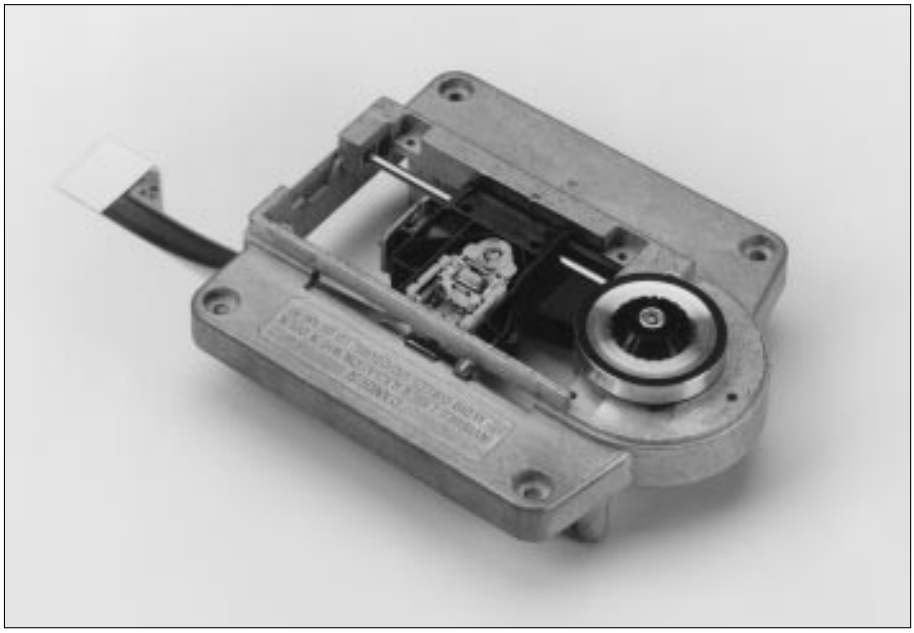


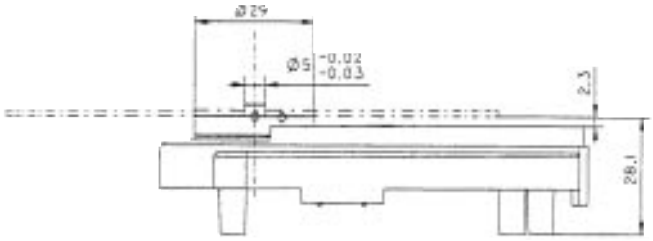


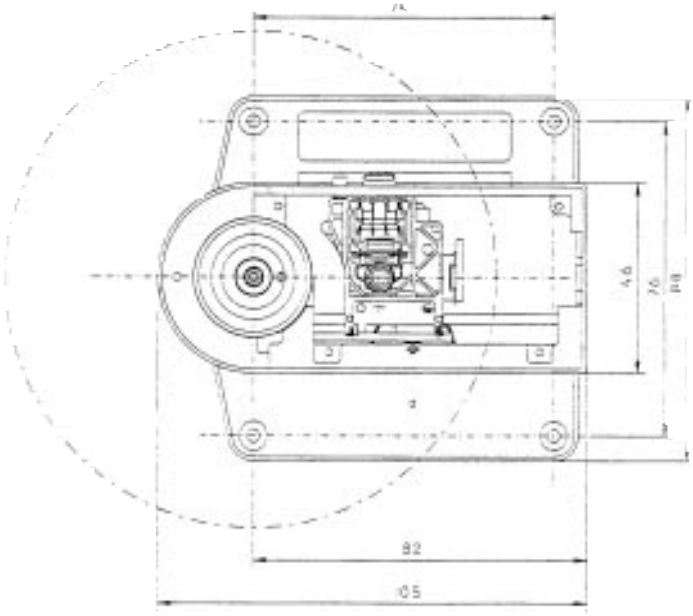
CDM12.6 TECHNICAL DATA (typ. values)	
Disc motor	Brushless
Sledge motor	FF030PK-08250
Mech. sledge speed (6.5V)	0.1 m/s
Moving mass actuator	0.56 gr
Focus error detection	Single Foucault
Focus resonance freq.	30 Hz
Focus AC-sensitivity	0.25 N/A
Focus DC-sensitivity	0.65 mm/V
Focus resistance	18 Ω
Radial error detection	3-beam
Tracking resonance freq.	49 Hz
Tracking AC-sensitivity	0.25 N/A
Tracking DC-sensitivity	0.24 mm/V
Tracking resistance	18 Ω
Wavelength	780 nm
Power intensity (obj. lens)	max. 0.5 mW
Numerical aperture	0.45
Lifetime	5000 Hr (B10)
MTBF (100%)	30000 Hr
Operational temp. range	5 to 55 °C
Storage temperature	-25 to 55 °C
Storage exposure	70 °C (48Hr)
Allowed impact	max. 100 g (6msec)

Professional standards and high reliability

- **Lightweight 3-beam LDGU with holographic pick up, providing excellent thermal stability.**
- **Heavy die-cast frame for high performance.**
- **Integrated diode pre-amplifier for high signal-to-noise ratio.**
- **Unique low-mass actuator for fast, accurate focusing and radial tracking, low power consumption and high shock resistance.**



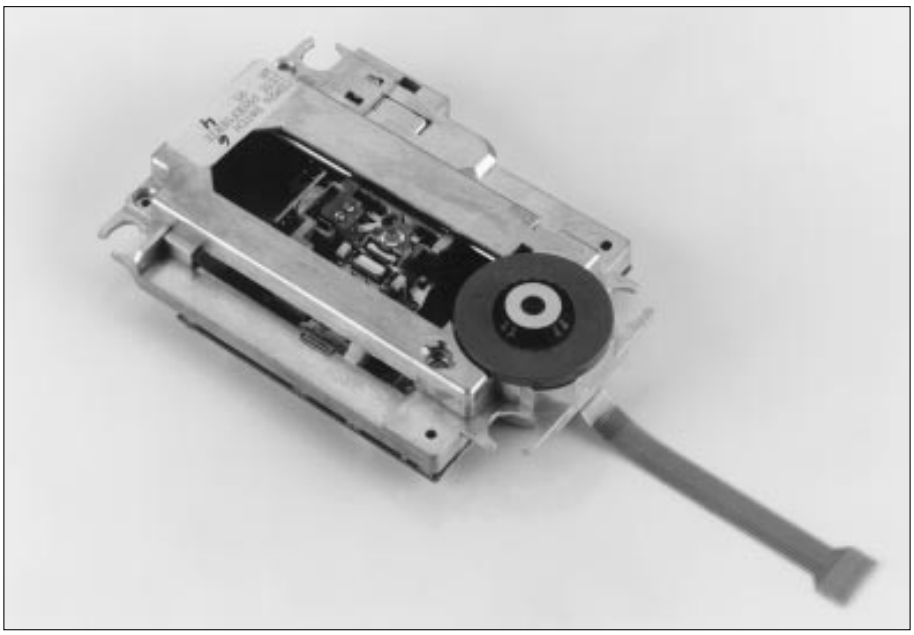


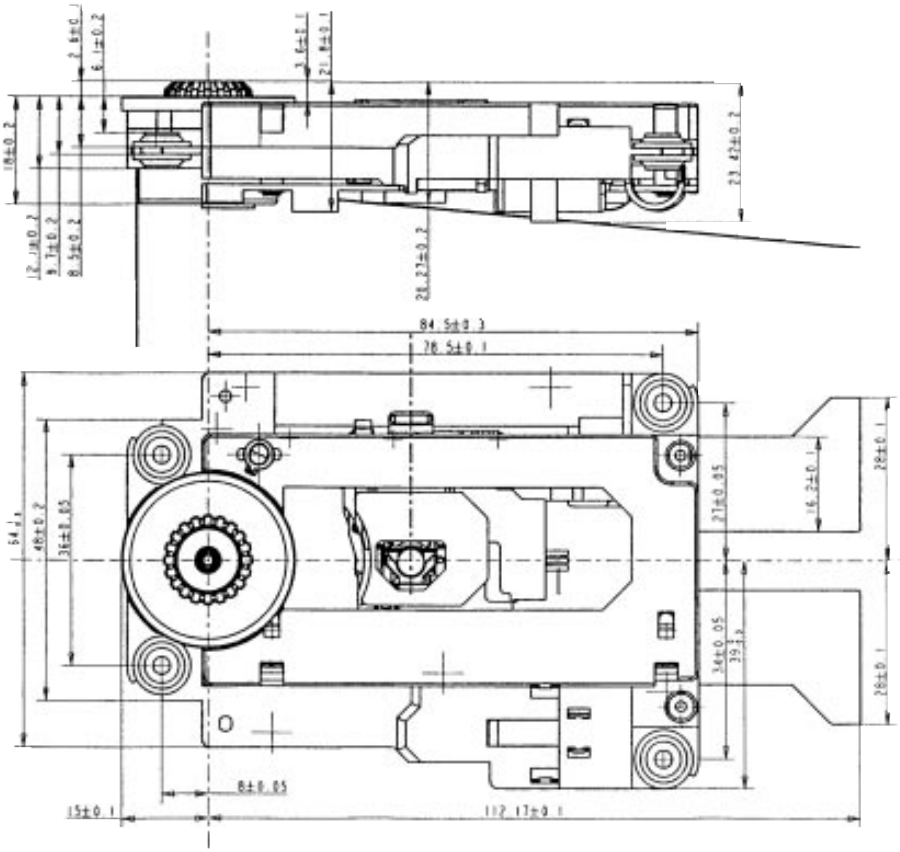


CDM12 INDUSTRIAL TECHNICAL DATA (typ. values)	
Disc motor	RF300CH-11400
Sledge motor	FF030PK-08250
Mech. sledge speed	0.05 m/s (3.5V)
Moving mass actuator	0.56 gr
Focus error detection	Single Foucault
Focus resonance freq.	30 Hz
Focus AC-sensitivity	0.25 N/A
Focus DC-sensitivity	0.65 mm/V
Focus resistance	18 Ω
Radial error detection	3-beam
Tracking resonance freq.	49 Hz
Tracking AC-sensitivity	0.25 N/A
Tracking DC-sensitivity	0.24 mm/V
Tracking resistance	18 Ω
Wavelength	780 nm
Power intensity (obj. lens)	max. 0.5 mW
Numerical aperture	0.45
Lifetime	7500 Hr (B10)
MTBF (25%)	30000 Hr
Operational temp. range	5 to 55 °C
Storage temperature	-25 to 55 °C
Storage exposure	70 °C (48Hr)
Allowed impact	max. 100 g(6msec)
Vibration (3g/0.2mm)	10-150 Hz

Double-speed write, quadruple-speed read

- **Small size, suitable for half-height mounting in computer applications (L2465).**
- **Fast radial access due to high-speed sledge motor and higher gear ratios.**
- **Quadruple data-transfer and extended reliability due to brushless disc motor.**
- **Unique low-mass actuator for fast, accurate focusing and radial tracking.**
- **Integrated signal processor TDA1372.**





CDM 24 TECHNICAL DATA (typ. values)	
Disc motor	Brushless
Sledge motor	FF030PK
Moving mass actuator	0.6 gr
Focus error detection	astigmatic
Focus resonance freq.	50 Hz
Focus AC-sensitivity	0.28 N/A
Focus DC-sensitivity	0.33 mm/V
Focus resistance	18 Ω
Radial error detection	diff. push-pull
Tracking resonance freq.	68 Hz
Tracking AC-sensitivity	0.27 N/A
Tracking DC-sensitivity	0.1 mm/V
Tracking resistance	18 Ω
Wavelength	780 nm
Numerical aperture	0.5
Lifetime	5000 Hr (B10)
MTBF (50%)	60000 Hr
Operational temp. range	5 to 55 °C
Storage temperature	-25 to 55 °C
Storage exposure	70 °C (48Hr)
Allowed impact	t.b.f.

For easy, fast and reliable design-in

ACCESSOIRIES CD-Mechanisms									
				CDM 12.1	CDM 12.2(T)	CDM 12.3 (C)	CDM 12.6	CDM 12 industrial	CDM 24
CODENUMBER		**ITEM**	**q't/ CDM DESCRIPTION**	page 4.2	page 4.3	page 4.4	page 4.5	page 4.6	page 4.7
3104 149 24001	SUS121N1	4	Suspension grommet for single speed	●					
3104 149 24011	CL121	1	Clamping device	●	●				
3104 149 24021	SUS124N2	4	Suspension grommet for double speed		n=2				
3104 149 24031	SPR123	6	Suspension spring for single and double speed			●			
3104 149 24041	DAM123	3	Suspension damper for single and double speed			●			
3104 149 24101	CL12IND	1	Clamping device					●	
3104 149 24051	ORNPLATE	1	Ornamental plate	●		●	●	●	●
3104 149 24061	ADHSTRIP	1	Adhesive strip (to be used for fixation of ornamental strip)	●		●	●	●	●
3104 149 24111	EP12IND	1	Extension plate					●	
3104 149 24121	CF12IND	1	Cover frame					●	
3104 149 24131	DAM12IND	4	Suspension damper					●	
3104 149 20111	KT12INDJB	1,4,4	Jukebox KIT including: clamping device, suspension springs & grommet					●	
3104 149 24151	SUS126	4	Suspension grommet				●		

LOADER ASSEMBLIES AND DISC CHANGERS

LI210/11
Low-height loader, complete with CDM 12.1, for general audio, video and games applications.

LI210/13
Standard-height loader, complete with CDM 12.1, for general audio, video and games applications.

LI210/14
Standard-height loader, complete with CDM 12.2, for double-speed video and games applications.

LI210/16
Low-height loader, complete with CDM 12.2, for double-speed video and games applications.

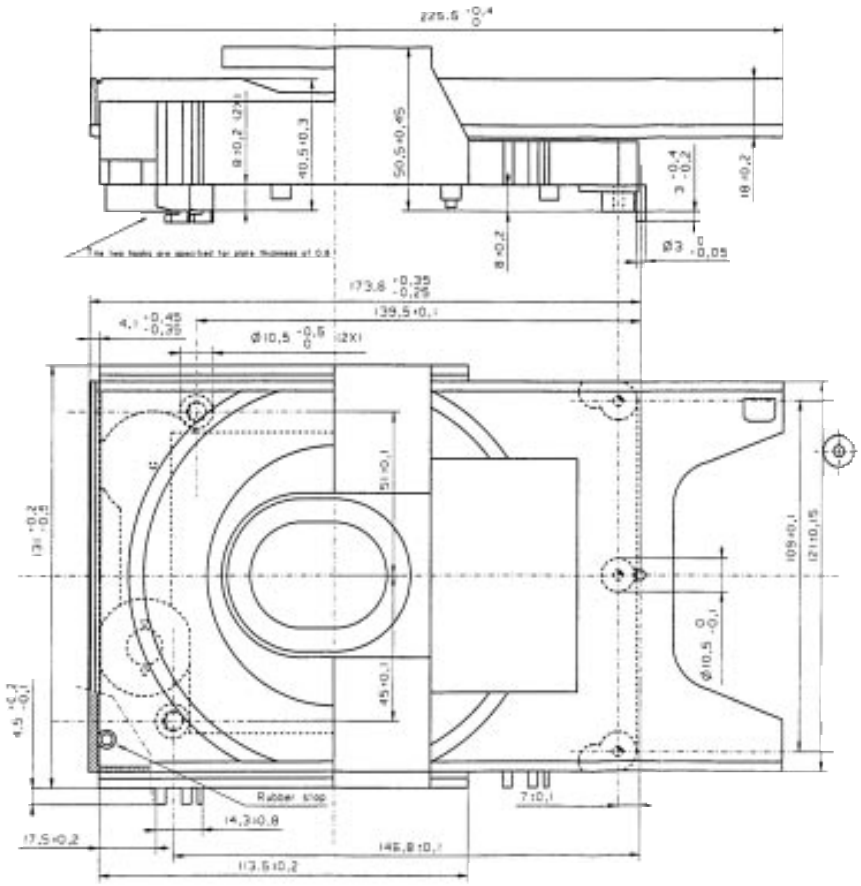
LI266/01 and LI266/02
5¼", half-height loader assembly for CDM 12.6. Including damping, suspension and clamping, optimized for up to sextuple-speed operation.
Tray colour: /01 computer white
/02 charcoal.

L2465
5¼", half-height loader assembly for CDM 24. Including damping, suspension and clamping, optimized for quadruple speed operation.
Tray colour: /01 computer white
/02 charcoal.

CI203
Three-disc changer, complete with CDM 12.2.

Low-height tray loader assembly incorporating CDM 12.1

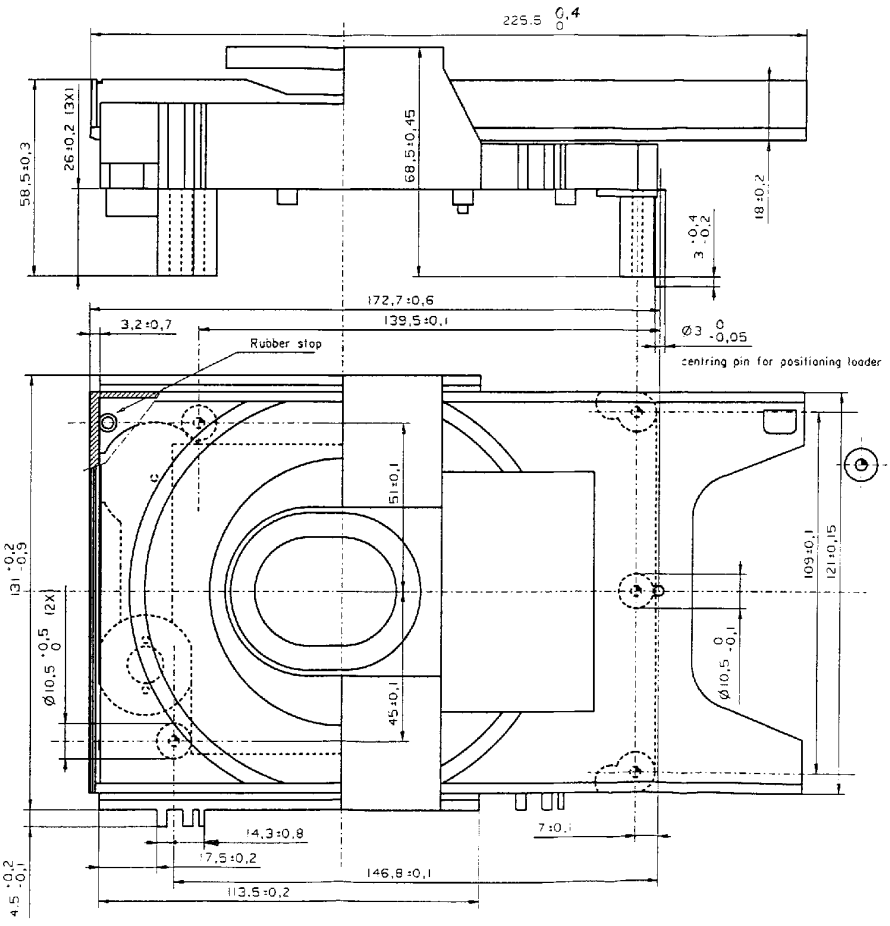
- **Designed for general audio and games applications.**
- **Meets UL-flammability and safety standards.**
- **Includes suspension, damping and clamping parts.**
- **Fully wired, with simple interface.**



TECHNICAL DATA (typ. values)	
Tray motor	RF310TA-11400
Load time (3.5 V)	1.7 s
Eject time (3.5V)	1.7 s
Push tray stroke	3.5 mm
Push tray force	max. 5 N
Max. current switch	1 A
Max. voltage switch	15 V
Lifetime (no. of cycles)	20000
Operational temp. range	5 to 55 °C
Storage temp. range	-25 to 55 °C
Storage exposure	70 °C (48 Hr)
Allowed impact	max. 60 g (6 msec)
Working position	horizontal
Loading noise	max. 73 dBA

Standard-height tray loader assembly incorporating CDM 12.1

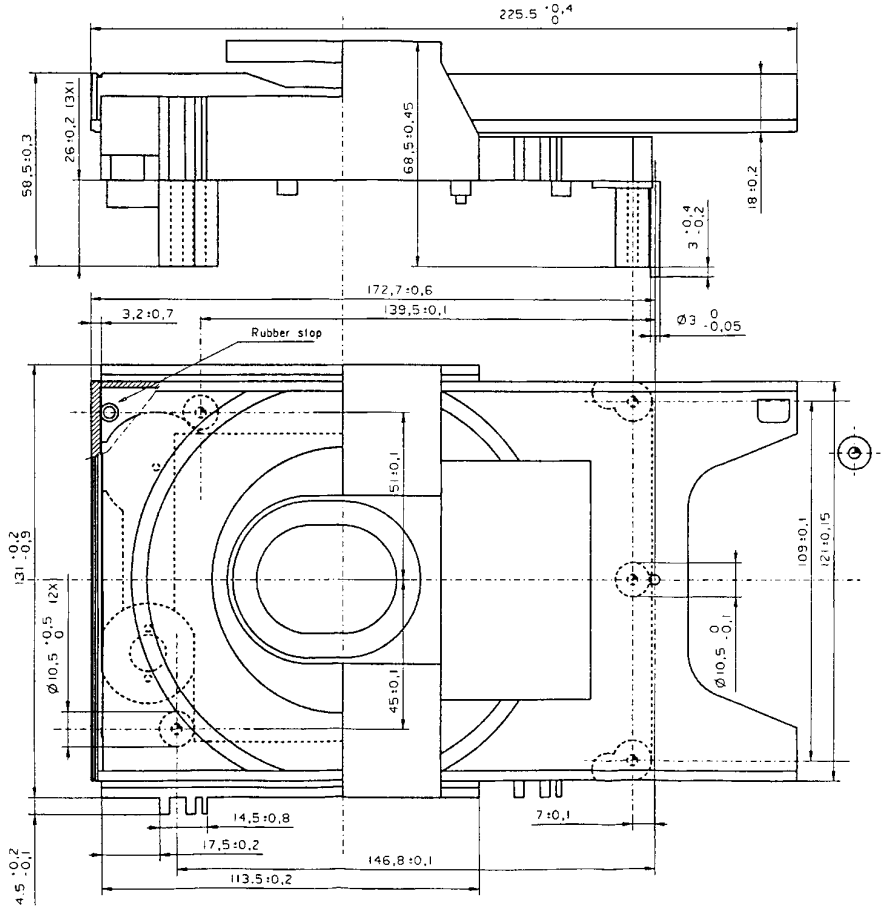
- **Designed for general audio and games applications.**
- **Meets UL-flammability and safety standards.**
- **Includes suspension, damping and clamping parts.**
- **Fully wired, with simple interface.**



TECHNICAL DATA (typ. values)	
Tray motor	RF310TA-11400
Load time (3.5 V)	1.7 s
Eject time (3.5V)	1.7 s
Push tray stroke	3.5 mm
Push tray force	max. 5 N
Max. current switch	1 A
Max. voltage switch	15 V
Lifetime (no. of cycles)	20000
Operational temp. range	5 to 55 °C
Storage temp. range	-25 to 55 °C
Storage exposure	70 °C (48 Hr)
Allowed impact	max. 60 g (6 msec)
Working position	horizontal
Loading noise	max. 73 dBA

Standard-height tray loader assembly incorporating CDM 12.2

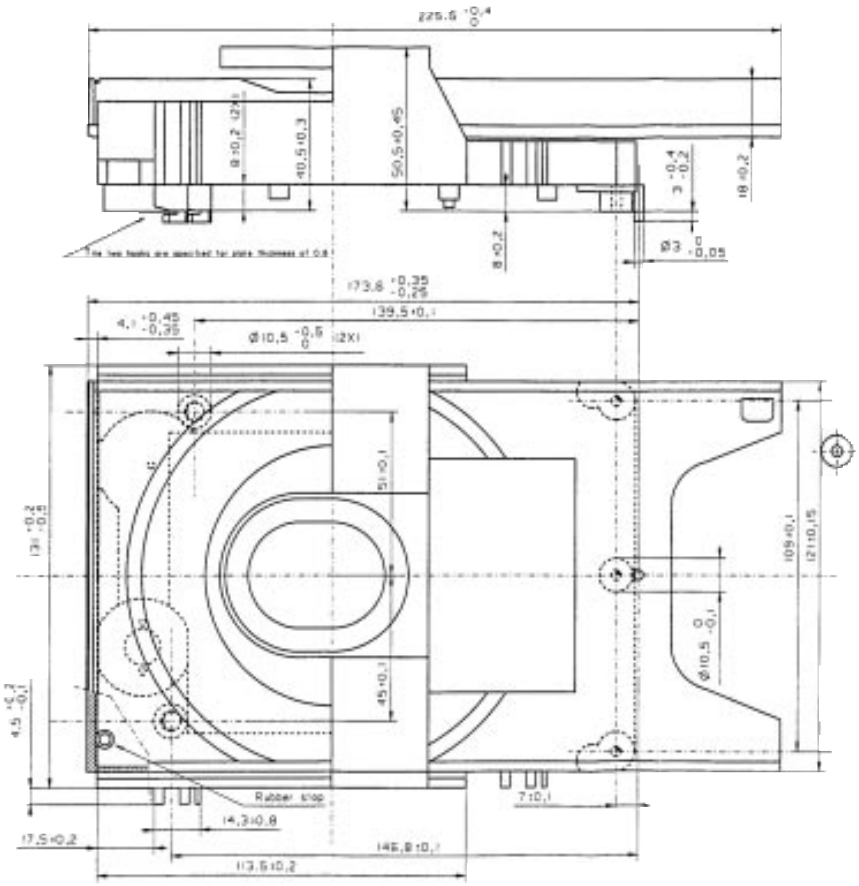
- **Designed for double-speed games applications.**
- **Meets UL-flammability and safety standards.**
- **Includes double-speed suspension, damping and clamping parts.**
- **Fully wired, with simple interface.**



TECHNICAL DATA (typ. values)	
Tray motor	RF310TA-11400
Load time (3.5 V)	1.7 s
Eject time (3.5V)	1.7 s
Push tray stroke	3.5 mm
Push tray force	max. 5 N
Max. current switch	1 A
Max. voltage switch	15 V
Lifetime (no. of cycles)	20000
Operational temp. range	5 to 55 °C
Storage temp. range	-25 to 55 °C
Storage exposure	70 °C (48 Hr)
Allowed impact	max. 60 g (6 msec)
Working position	horizontal
Loading noise	max. 73 dBA

Low-height tray loader assembly incorporating CDM 12.2

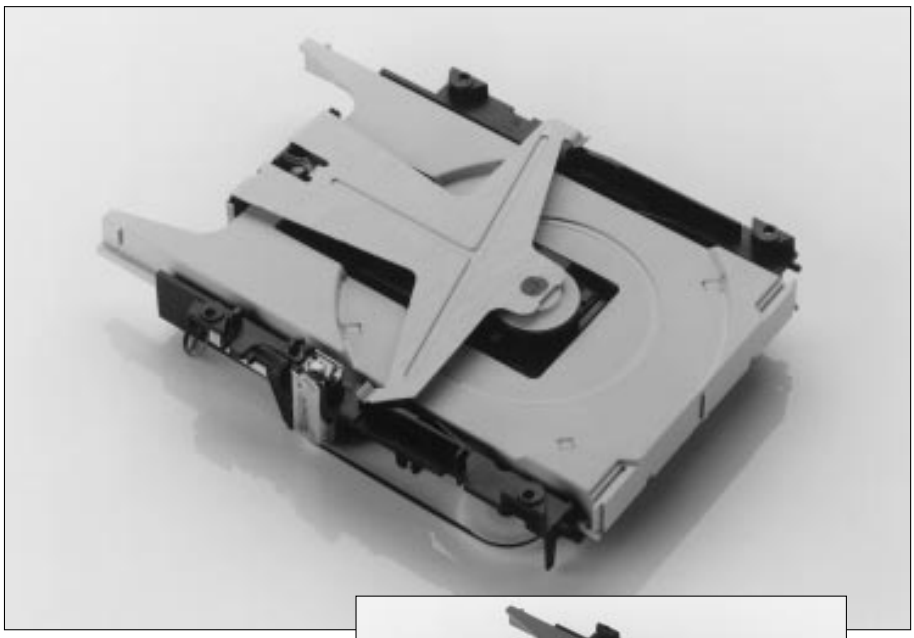
- **Designed for double-speed games applications.**
- **Meets UL-flammability and safety standards.**
- **Includes double-speed suspension, damping and clamping parts.**
- **Fully wired, with simple interface.**



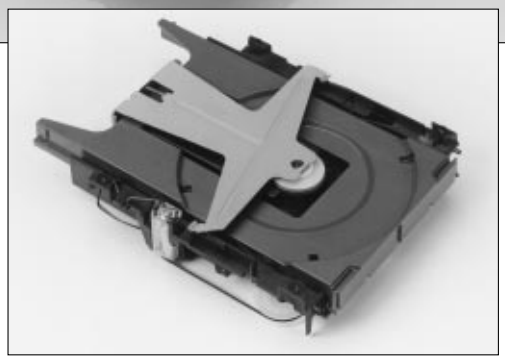
TECHNICAL DATA (typ. values)	
Tray motor	RF310TA-11400
Load time (3.5 V)	1.7 s
Eject time (3.5V)	1.7 s
Push tray stroke	3.5 mm
Push tray force	max. 5 N
Max. current switch	1 A
Max. voltage switch	15 V
Lifetime (no. of cycles)	20000
Operational temp. range	5 to 55 °C
Storage temp. range	-25 to 55 °C
Storage exposure	70 °C (48 Hr)
Allowed impact	max. 60 g (6 msec)
Working position	horizontal
Loading noise	max. 73 dBA

Half-height tray-loader assembly incorporating CDM 12.6

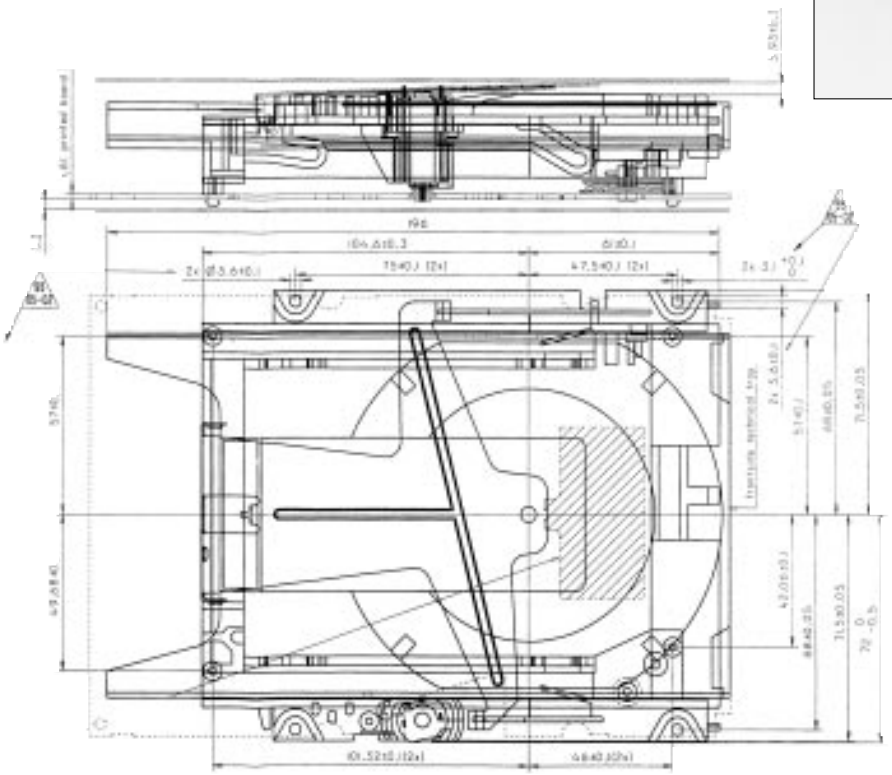
- **Suitable for 5¼", half-height mounting in computer applications.**
- **Special suspension and clamping for up to octal-speed (CDM 12.6/xx, L1266/xx).**
- **UL prepared.**



L1266/01



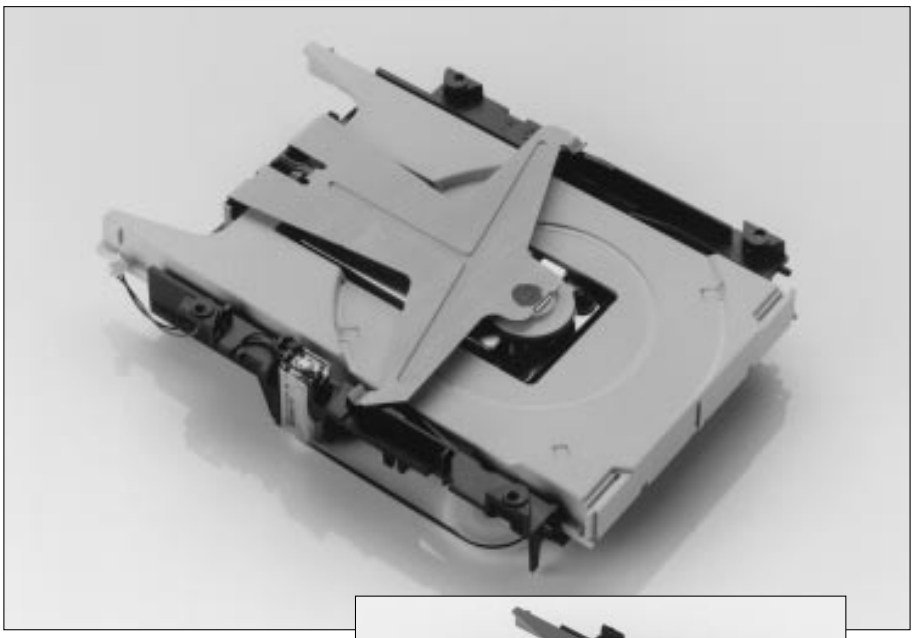
L1266/02



TECHNICAL DATA (typ. values)	
Tray motor	PPN13
Load time (3.5 V)	1.7 s
Eject time (3.5V)	1.7 s
Push tray stroke	3.5 mm
Push tray force	max. 5 N
Max. current switch	1 A
Max. voltage switch	15 V
Lifetime (no. of cycles)	20000
Operational temp. range	5 to 55 °C
Storage temp. range	-25 to 55 °C
Storage exposure	70 °C (48 Hr)
Allowed impact	max. 50 g (6 msec)
Working position	horizontal
Loading noise	max. 73 dBA

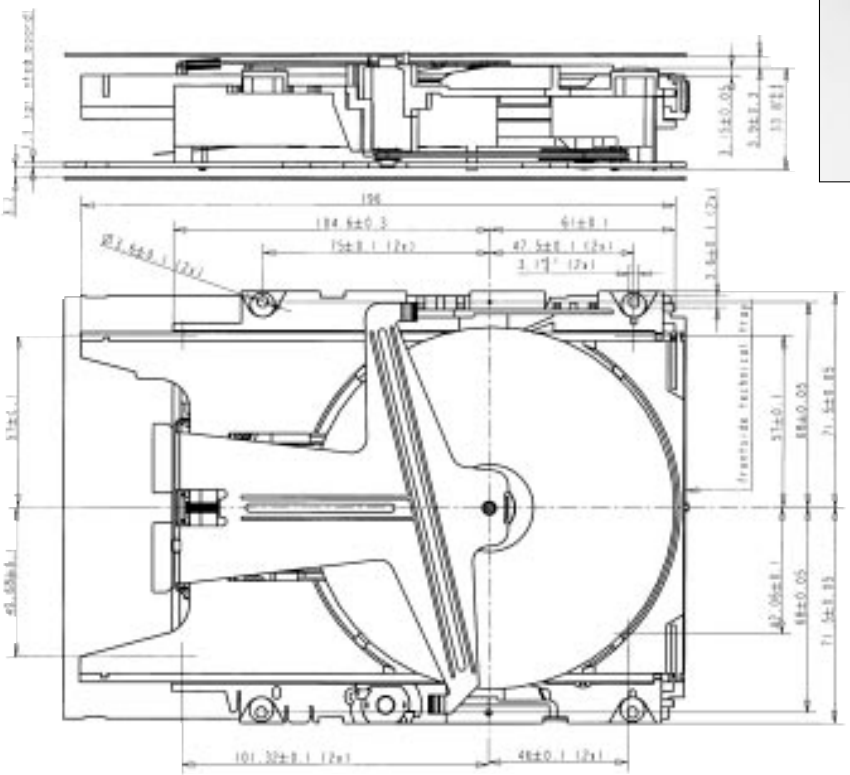
Half-height tray-loader assembly incorporating CDM 24

- **Suitable for 5¼", half-height mounting in recordable computer applications.**
- **Fully wired, with simple interface.**
- **Special suspension and clamping for quadruple-speed CDM 24.**
- **Meets UL-flammability and safety standards.**



L2465/01

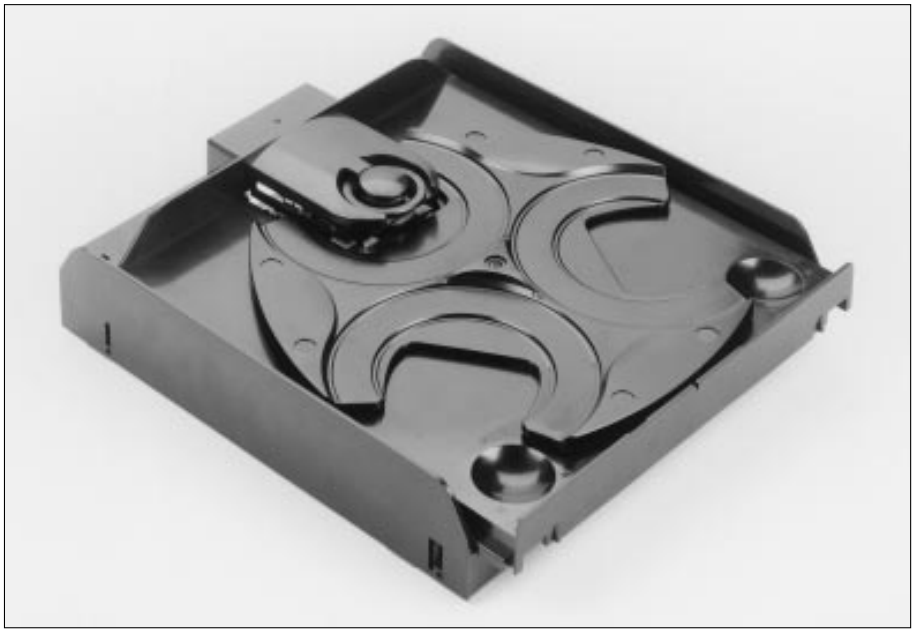
L2465/02

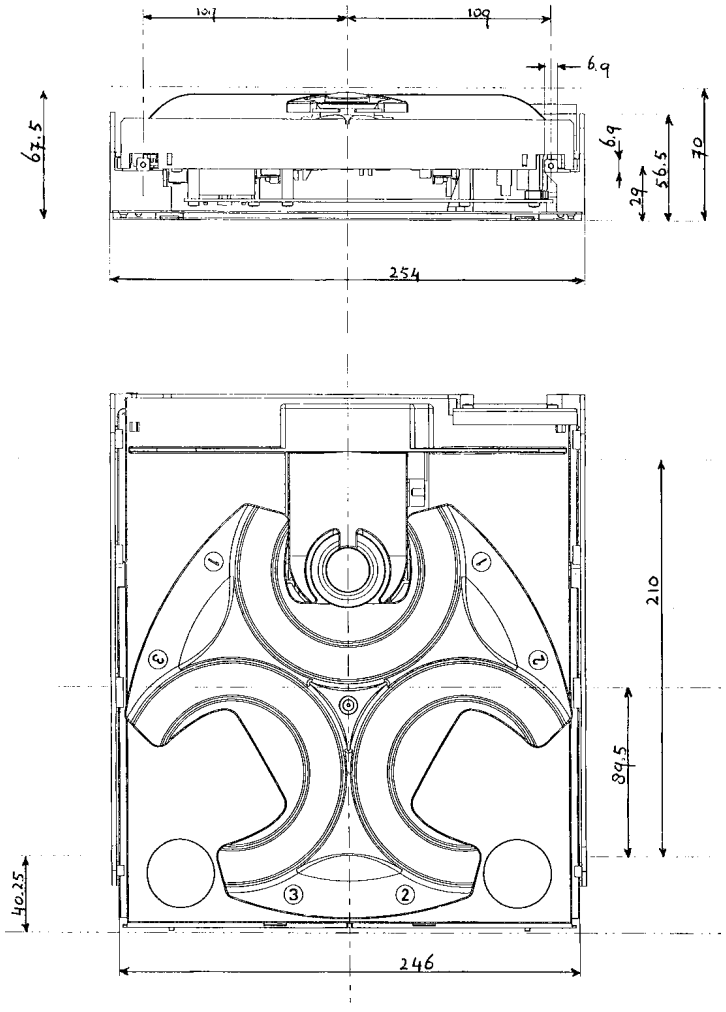


TECHNICAL DATA (typ. values)	
Tray motor	PPN13
Load time (3.5 V)	1.7 s
Eject time (3.5V)	1.7 s
Push tray stroke	3.5 mm
Push tray force	max. 5 N
Max. current switch	1 A
Max. voltage switch	15 V
Lifetime (no. of cycles)	20000
Operational temp. range	5 to 55 °C
Storage temp. range	-25 to 55 °C
Storage exposure	70 °C (48 Hr)
Allowed impact	max. 50 g (6 msec)
Working position	horizontal
Loading noise	max. 73 dBA

Three-disc changer incorporating CDM 12.2

- **Carousel can change discs in two directions.**
- **Two discs in the carousel can be changed while playing a third disc.**
- **Dimensions: 252 x 70 x 284 mm (w x h x d).**





TECHNICAL DATA (typ. values)	
Tray motor Carrousel motor	mabuchi RF500TB-12560
Load/eject time	ca. 2.05 s
Disc change time	ca. 2.05 s
Dimensions width height depth	 252 mm 70 mm 284 mm
Lifetime (no. of cycles) disc changes	60000
Operational temp. range	5 to 55 °C
Storage temp. range	-25 to 55 °C
Working position	horizontal

MODULES AND DRIVES

OVERVIEW CD-MODULES AND DRIVES

MOD JUKEBOX

Complete, assembled plug-and-play unit, based on the PREMIUM 6000 system. The standard application for jukeboxes.

MOD PRO-AUDIO

Complete, assembled plug-and-play unit, based on the PREMIUM 6000 system, for top-performance audio applications.

CDD2000

Complete 5¼" half-height RC-Recordable drive. Quad-speed read, double-speed write. Internal drive with SCSI II interface.

Fully assembled functional unit incorporating CDM 12 INDUSTRIAL

- **Complete PREMIUM 6000 system on a print-board, assembled with the CDM 12 INDUSTRIAL.**
- **With extension plate and print-board.**
- **Special, heavy-duty suspension.**
- **UL prepared.**
- **Designed for jukebox applications.**

MOD JUKEBOX TECHNICAL DATA (typ. values)	
ACCESORIES	MOD JUKEBOX
Extension plate	Yes
Turntable cap	Yes
Cover frame	Yes
Ornamental plate	Yes
Suspension	Yes

The solution for professional audio applications

- **Complete PREMIUM 6000 system on a print-board, assembled with the CDM I2 INDUSTRIAL.**
- **With ornamental plate.**
- **Specially developed for top performance, professional audio applications.**
- **UL prepared.**

MOD PRO AUDIO TECHNICAL DATA (typ. values)	
ACCESORIES	MOD PRO-AUDIO
Extension plate	No
Turntable cap	Yes
Cover frame	Yes
Ornamental plate	Yes
Suspension	No

CD-Recordable drive: Quad-speed read, double-speed write

- **Records CD-ROM (XA) CD-Bridge Multi-Session CD-I and CD-Audio discs.**
- **Conforms to Write-Once CD format (Orange Book part II).**
- **Track At Once Disc At Once and Incremental Packet Writing modes supported.**
- **Motorized tray loading for easy operation.**
- **Leading-edge optical technology for data security and integrity.**
- **NEW: Double-speed recording and up to quad-speed reading.**
- **NEW: Industry-standard 5¼" profile for building into PCs and workstations.**
- **NEW: Incremental Packet Writing acc. Orange Book for data archiving applications.**

CDD2000 TECHNICAL DATA (typ. values)	
CD-formats supported	CD-DA, CD-ROM (XA), CD-Bridge, Multi-session, CD-i, Video-CD
write methods	Track at once, Incremental packet writing,multi-session
capacity mode 1 (63min media) mode2 (63 min. media) mode 2 (74 min. media)	 550 Mb 630 Mb 740 Mb
average access time max access time	390 msec. 750 msec
interface	SCSI II
transfer rate mode 2 (quad speed) mode 2(double speed) mode 2 (single speed)	 705.6 kb/s 352.6 kb/s 176.4 kb/s
dimensions(HxWxD)	41.4x146x106 mm
data buffer	1 Mb
disc loading	tray

SUPPORT TOOLS

Available for development and testing purposes...

To facilitate the development and production of mechanisms and applications, various tools are necessary. Often, these are not available 'off-the-shelf' but have to be developed specially. At Philips, we make these tools available to customers on request for their own engineering purposes. Available are pre-programmed microcontrollers with test loops for various applications, boards to measure signals from CD-mechanisms, and a measuring circuit for digital servo loops, to name but a few.

Player development and training tools are available from Philips Semiconductors and described later in this section. Test discs, see below, are available from Philips Laser Optics.

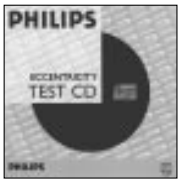
SBC442
BURN-IN TEST DISC

Used for burn-in tests, maintenance and repair.
Total playing time: 65' 00"
Contents: Continuous 1 kHz reference tone.

SBC429
AUDIO SIGNALS DISC 1

This disc contains audio signals useful in measuring the performance of a player. The quality is of the highest standard, all signals have been computer-generated, computer-assembled and digitally recorded according to the IEC908 Compact Disc Digital Audio System.
Contains 99 tracks. Full information is supplied with the disc.
Caution before starting the disc: a number of audio signals have been recorded at maximum level (0 dB).

ECCENTRICITY TEST DISC 150µm



Purpose: checks loading mechanism and radial focusing unit.
Contents: 24 CD-Audio tracks (identical to SBC444)
Skew: 0.4°

VERTICAL DEVIATION TEST DISC 0.4°

Purpose: checks loading mechanism and radial focusing unit.
Contents: 24 CD-Audio tracks (identical to SBC444).
Skew: 0.4°

SBC444
PLAYABILITY REFERENCE TEST DISC

Reference test disc for playability measurements.
Contains 24 tracks standard CD-Audio.
Pauses are variable down to 0 seconds.
Track 14 is recorded without pre-emphasis.
Track 15 is recorded with pre-emphasis.

SBC444A
PLAYABILITY TEST DISC

Purpose: adjustment/checking. The disc is not within specification concerning local defects. It is not assumed that the player is able to replay each track on the disc.
Contains 24 tracks standard CD-Audio (identical to SBC444).
Contains the following defects:
- Interruption in information layer: 0.4-0.5-0.6-0.7-0.8-0.9-1 mm.
- Black dot area read-out side: 300-500-600-800 µm.
- Simulated fingerprint.

CD player development/training tools

CD servo software module for CD6 systems

This software module supports customers with a ready-made software interface to a full single-speed CD player using Philips' CD6 decoder SAA7345, 1-chip digital servo processor TDA1301T and three-beam CD player mechanism CDM 12.1. The module is written in the PL/M-51 language for 8051-series microcontrollers (code size less than
2 k). It performs all the communication with the ICs and provides all the low-level servo functions such as turn servos on/off, monitor servo performance and perform jumps.
The module provides:

- Radial control
- Focus control
- Spindle motor control
- Access to disc area
- Sledge position control
- Audio control (mute, attenuate etc.)
- Sub-code reading.

Full error recovery is incorporated and service mode functions are included. The module can be used with a wide variety of CD applications requiring only the addition of a user interface.

Requirements for using this software module are:

- A 12 MHz 8051-series microcontroller
- A PL/M-51 compiler for the microcontroller
- Five output lines and one I/O for controlling the CD decoder SAA7345 (CD6) and digital servo processor TDA1301T (DSIC2).
- The main program should have an interrupt routine

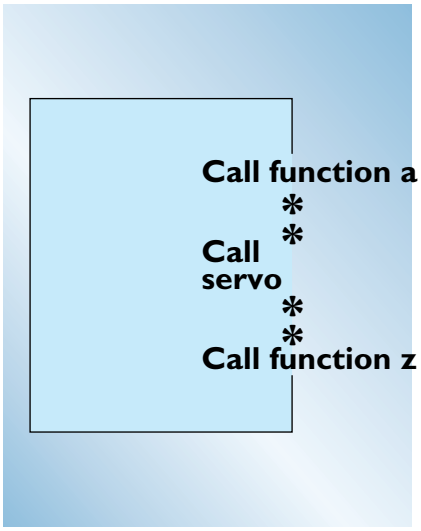


Fig.1 Main loop

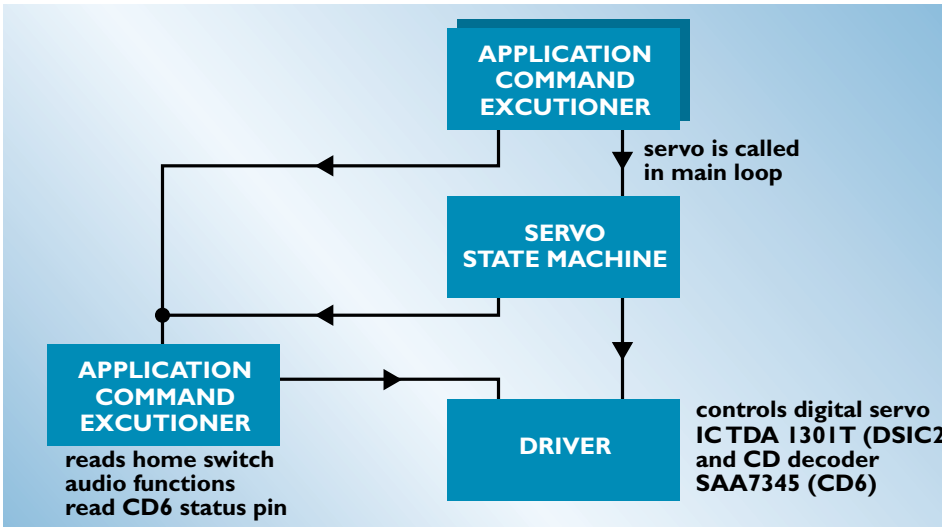


Fig.2 Architecture of the servo software module showing the relationship to other modules

CD player training tool

The CD player training tool shown in Fig.3 is intended for use as a training aid, for system development or for CD mechanism characterization. It is not intended to be an example of CD system robustness. The speed of the software is not a priority, nor does the software incorporate corrective actions.

Important features of the CD player training tool are:

- Operates with an IBM-compatible PC with MS-DOS or a mainframe terminal
- Connection to a PC or mainframe terminal via a Centronics parallel port (printer port)
- Various three-beam CD mechanisms can be connected
- Mechanism-related and storable/retrievable data files provide mechanism-independence.

The main advantages of using this tool are:

- Requires no system development prior to study
- Allows immediate start of study/evaluation/development activities
- All parameters are easy to access
- Has a direct relationship with CD Application Notes
- Enhances language independence
- The software can be used to control a CD player application which uses at least a 1-chip digital servo processor TDA1301T (DSIC2) and a CD decoder SAA7345 (CD6).

The system consists of a complete three-beam CD player (less microcontroller and power supply), a Centronics parallel interface, and a CD player software package on a floppy diskette. It allows an IBM-compatible PC with an MS-DOS operating system and a mouse to exercise the basic CD microcontroller functions and a number of special evaluation functions.

The hardware of the training tool consists of:

- A mechanism PCB for connection to a Philips CDM 12 or CDM 12.1 mechanism or a Sanyo DV90V1 or Sony KSM210 (two types) mechanism via a flexible connector. The PCB contains two TDA7073 dual BTL servo power drivers and a TDA1302T photodiode amplifier and laser supply IC.
- A decoder PCB with an SAA7345 CD decoder (CD6), a TDA1301T 1-chip digital servo processor (DSIC2), a TDA1545AT continuous calibration stereo DAC, and a TDA1308 stereo audio amplifier for driving an audio amplifier or headphone. There is also an AES/EBU signal output and facilities for connecting an external DAC, a Centronics interface and a power supply

- A Centronics parallel interface for connecting between the decoder PCB and a computer.
- The training tool software allows the CD player hardware to be controlled at three levels:
- A HIGH level as a complete CD player with basic functions
- A MEDIUM servo system oriented level which is very useful for activities such as characterizing a CD mechanism
- A LOW level extended programmable parameter level which allows the individual parameters of programmable ICs to be changed.

Other important features of the training tool software are:

- Easy mouse manipulation
- Pull-down menus
- Pop-up windows that can be opened, shifted, tiled and closed
- Multiple windows on the screen at the same time give a complete overview
- On-screen messages
- Program maintains internal IC settings
- One-to-one relationship between the software and the various device specifications and Application Notes.

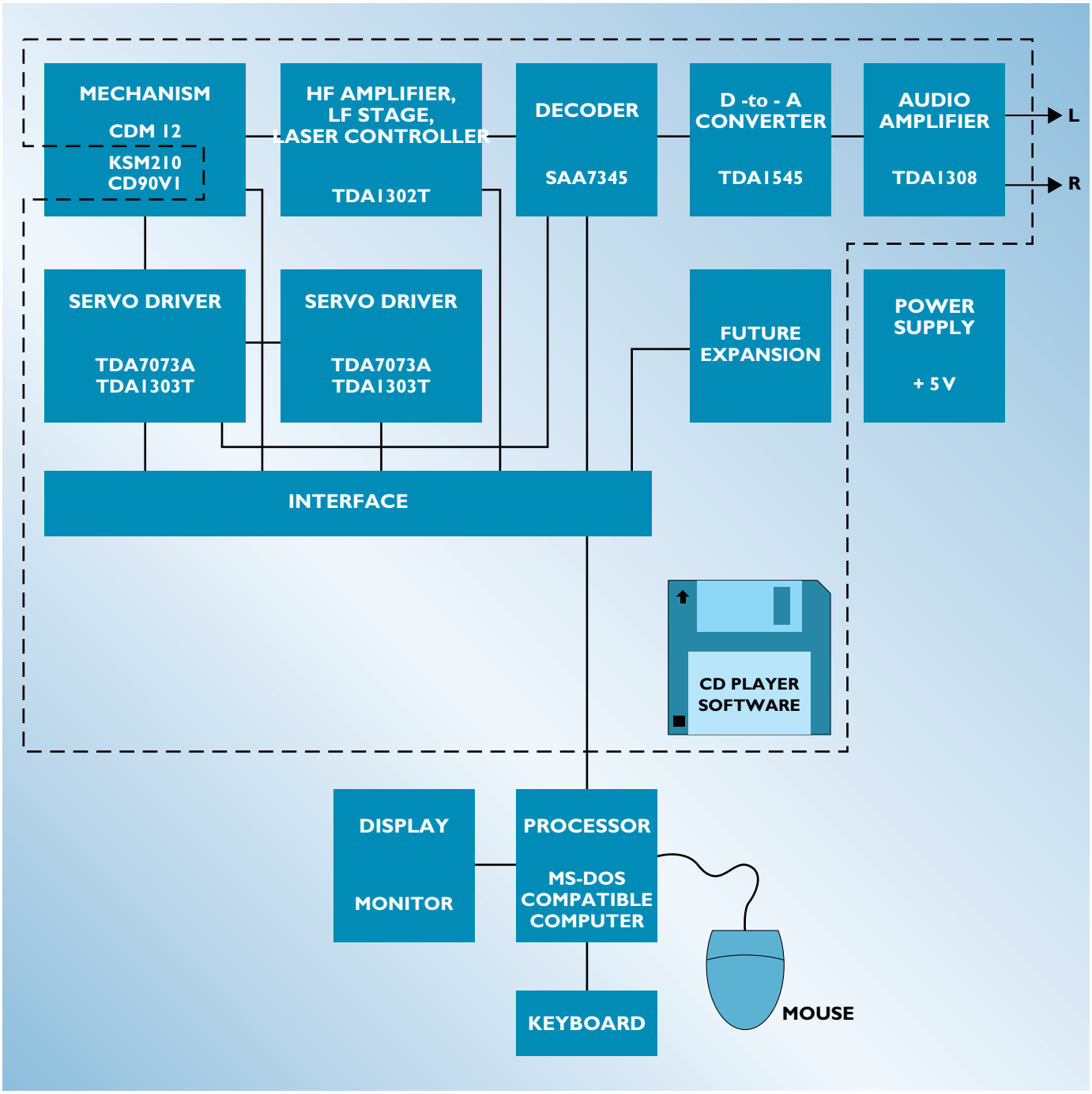


Fig.3 Full digital compact disc player training tool

CD7-DS compact disc player development system

The CD7-DS system shown in Fig.4 is a complete skeleton 3-beam CD player consisting of the following two modules:

- A 3-beam mechanism plus loader (CDM12.1 + L1210) with the main system PCB mounted on the underside. The main system PCB contains a 1-chip fully-digital servo controller/CD decoder IC SAA737x (CD7), a diode amplifier and laser supply IC TDA1302 (DALAS), two dual servo power driver ICs TDA7073A, a continuous-calibration DAC TDA1545A (CCDAC), a stereo audio amplifier IC TDA1308 used as a line amplifier, and a stereo audio amplifier IC TDA1308 used as a headphone amplifier with volume control
- A PCB (microcontroller module) containing the system microcontroller (P87C528) and an RS232 interface for testing the system via a computer. The microcontroller module also incorporates a normal user interface consisting of a keypad and a liquid crystal display driven by a PCF8566 LCD driver IC.

The main features of the CD7-DS system are:

- Uses single-chip fully-digital servo controller/CD decoder IC SAA737x (CD7)
- Operates with three-beam optics
- Allows use of single/double Foucault and astigmatic focus optics
- Fast jump (access) time
- Communication with the CD7 decoder is via the I^2C-bus or the DSIC-CD6 bus
- Can operate with various DACs from our comprehensive range
- Implements the following functions via the system microcontroller:
  - reset at power on
  - idle state
  - read Table Of Contents (TOC)
  - play
  - stop
  - next/previous track
  - fast forward/reverse
  - pause
- Single-speed and double-speed operation
- Digital audio (DOBM) interface
- Optimized for mechanical shock immunity
- CD-Graphics interface signals available
- Can maintain CD operation with the microcontroller disconnected
- Minimum number of adjustments
- Few peripheral components
- Versatile output lines of the CD decoder (V4 and V5) are used to drive the tray loader.

Modes of operation

The system software has two modes of operation – the test mode and the normal mode.

The test mode is based on a menu structure known as the CD 'test harness' which gives the user access to all the features of the system hardware and software via the RS232 serial interface. This requires a 'dumb' terminal (e.g. VT100) or a PC running a communications program in connect mode. The test menus are constructed by the CD7-DS microcontroller writing messages to the computer which displays them on the screen so that the user can make a selection by pressing a key on the computer keyboard.

In the normal mode, the system behaves like a normal CD player. The 'test harness' is inactive, and all the CD functions are available from the keypad/display on the microcontroller module. If only normal CD operation is required, there is no need to connect a cable to the RS232 connector on the microcontroller module.

Documentation

'Full digital compact disc player training tool user guide (version 2.0).' Ordering code: NBA/AN9404
'Servo module design description for compact disc applications.' Ordering code: SAU/AN93005
'CD7-DS Compact Disc Development System (Version 1.0).' Ordering code: SAU/AN95024.

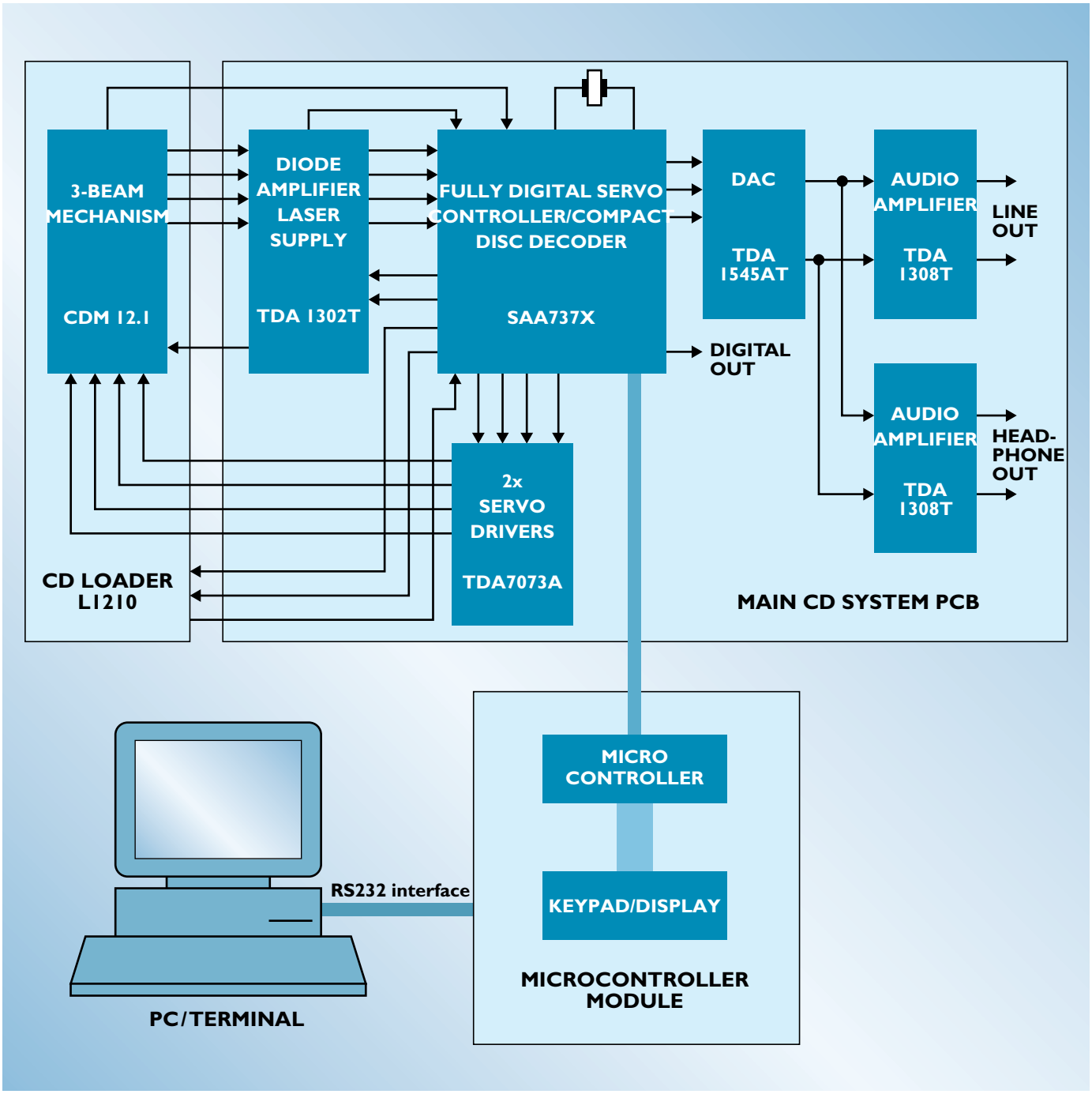


Fig.4 CD7-DS compact disc player development system

DOCUMENTATION

DOCUMENTATION

Title	Ordering code
DATA HANDBOOKS	
Data handbook IC01a: Semiconductors for Radio and Audio Systems 1995	9398 652 61011
Data handbook IC01b: Semiconductors for Radio and Audio Systems 1995	9398 652 62011
PORTABLE/PERSONAL/HOME RADIO/AUDIO SYSTEMS CCAxxx AND CPRxxx	
Outline Specification CCA110S, µC for a CD, Digital Tuned Radio and Cassette Recorder;	
Battery and Mains-fed (Version 1.0)	AN95002
User manual CCA110S, µC for a CD, Digital Tuned Radio and Cassette Recorder;	
Battery and Mains-fed (Version 1.0)	AN95003
Diagrams and Performance of Music Centre system CCA110 (Version 1.0)	AN95005
Specification proposal CCA110S; µC for Radio/CD/Tape system with SW band	ERA95001
I²S BUS	
I²S bus specification	9398 332 10011
DSA bus	
Interface bus Description, September 1993	*
COMPACT DISC SYSTEMS	
Outline Specification for the CDT610 Compact Disc Player System (Version 1.3)	SAU/AN93025
User Manual for the CDT610 Compact Disc Player System (Version 1.1)	SAU/AN93027
Specification of CDT610 Software	SAU/AN93018
Outline Specification for the CDT611 Compact Disc Player System (Version 1.0)	SAU/AN92021
User Manual for CDT611 Compact Disc Player System (Version 1)	SAU/AN93006
Outline Specification for the CDT613 Compact Disc Player System (Version 1.1)	AN94034
User's manual CDT613 Compact Disc Player System (Version 1.0)	AN94038
Outline Specification for the CDT710 Compact Disc Player System (Version 1.1)	AN95009
Outline Specification for the CDT715 Video Compact Disc Player System (Version 1.0)	SSW95006
Outline Specification for the CDT731 Compact Disc Player System (Version 1.0)	AN95022
CD7-DS Compact Disc Development System (Version 1.0)	AN94024
Premium 6000, Application Specification, June 95	*
Games 6001, Outline Specification, June 93	*
Video 6002, Application Specification, March 95	*
ROM 65000, Application Specification, March 95	*
ROM 65000, Interface Description, March 95	*
D65420 Recorder, Application Specification, V1.0, September 1995	*
E65400, Application Specification, September 1995	*

Title	Ordering code
COMPACT DISC CIRCUITS	
Servo interface and control	
TDA1300 Digital Amplifier and Laser Supply	NBA/AN9503
TDA1301 Digital Servo IC for controlling 2 stage 3 beam servo mechanisms	NBA/AN9401
TDA1302 Printed Circuit Board description	NBA/AN9302
OQ8866 (OS DALAS) Product Specification, May 95	*
OQ8868 (DSICS) Product Specification, April 95	*
LO9465 Preliminary Specification	*
LO9465 User Manual	*
CD driver circuits	
TDA1303 Digital Servo Driver for driving CD-mechanism motor/actuators	NBA/AN9304
TDA7072A(T)-TDA7073A(T) Power Drivers for Servo Systems	ERA/AN9209
OQ8844 (DSD2) Device specification, May 1993	*
CD-ROM	
How to use ELM in an ATAPI CD-ROM system (Version 1.0)	SAU/UM95014
CDR650 Preliminary Specification, August 1995	*
CDT660 Product Specification, June 1995	*
CD Recordable	
CE027A (CDB2) Device Specification, January 1994	*
GLG30738 (CDBD) Device Description	*
OQ8845 (DSICR) Preliminary Specification, March 1993	*
TDA1371 Preliminary Specification, August 1994	*
TDA1372 (AEGER) Preliminary Specification, March 1993	*
Converters/miscellaneous	
Audio data converters and miscellaneous digital audio ICs. Designer's guide. August 1995	9397 750 00151
CD MECHANISMS AND LOADERS	
CDM 12.1(T) Product Specification, May 1995	*
CDM 12 Industrial/Mod jukebox/Mod prod Audio product specification, June 1995	*
CDM 12.3 BL Production Specification, February 1995	*
CDM 12.3B Product Specification, November 1994	*
CDM 12.6 Product Specification, September 1995	*
L1210 Product Specification, June 1995	*
L1266 Product Specification, July 1995	*
L2465 Preliminary Product Specification, April 1995	*
* available from Philips Key Modules	

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