

The DVD is an important basic technology that provides a springboard for the further development of multimedia. Because it offers high picture and sound quality and fast access to information, the DVD is serving to combine its two current markets of home entertainment and computers into one market for information devices. DVD-Video players and DVD-ROM drives are now commercially available, to be followed by DVD-Audio and DVD-RAM drives in the near future.

## SD-3000 DVD Player

Having taken the lead in developing the DVD format, Toshiba has now commercialized a DVD player, the SD-3000, based on that format. Adoption of Moving Picture Experts Group 2 (MPEG2) standards for images and Dolby™ Digital (AC-3) 5.1-channel Sound assures high quality, and a 120mm, CD-sized DVD can store software for almost all regular-length movies on a single side. DVD-Video also offers a range of interactive functions, including soundtracks in up to eight languages, subtitles in up to 32 languages, and multi-angle viewing. With Toshiba's original LSI system and DVD/CD-compatible dual lens pick-up, the SD-3000 can play music CDs as well as DVDs. In addition to the standard AV output, the player is equipped with a color difference output terminal for high-quality picture reproduction and a digital audio output terminal for the 5.1-channel system.



*"Dolby" and "AC-3" are trademarks of Dolby Licensing Corporation.*



SD-3000 DVD player

## Infinia 7231 High-Performance Home Desktop PC

The Infinia series of desktop computers for the consumer market is the first developed jointly by teams in Japan and the U.S. To minimize development time and cost, Toshiba made use of outsourcing and worked with the industry's top vendors from the design-in stage.

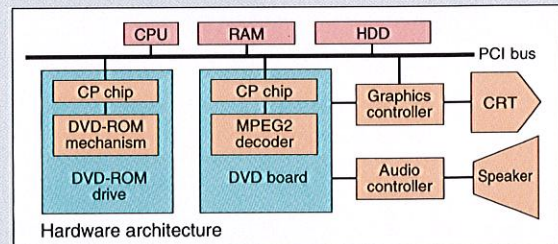


Infinia 7231 high-performance home desktop PC with built-in DVD

For easy operation, the Infinia series incorporates the InTouch module, which is connected to the USB, a new standard serial bus. The monitor employs a microfilter tube made by Toshiba that offers a 30 percent improvement over the previous model in brightness and contrast. However, the most notable feature of the Infinia 7231 is its DVD capability, providing superior multimedia functions using MPEG2 video and Dolby™ Digital (AC-3) 5.1-channel Sound audio technology.

The software architecture for using Toshiba DVD in PC applications is compatible with Active X from Microsoft Corporation. It also supports the full range of DVD features, such as multi-angle, multi-language and subpicture. To prevent illegal copying, some media are scrambled by means of copy protection chips inside the DVD-ROM drive and DVD decoder board for encryption and decryption when using the DVD in PC applications.

The Infinia adopts Toshiba's original internal digital video porting technology that bypasses the PCI bus to prevent loss of quality of the digital video data. The architecture is the same as that of the ZV port developed by Toshiba for portable PCs.



USB: Universal Serial Bus  
(A newly introduced peripheral interface that enables easy connection)

PCI: Peripheral Component Interface  
(Standard system bus specifications inside PC)

ZV port: Zoomed Video port  
(Video porting technology bypassing the system bus that utilizes high-performance, high-quality video transfer)

CP chip: Copy Protection chip  
(Data encrypting and decrypting chip to prevent illegal copying, with specifications approved by DVD-related industries)



## SD-M1002 DVD-ROM Drive

The SD-M1002 DVD-ROM drive is a next-generation storage device for PCs that will be instrumental in furthering the development of multimedia functions. The drive is capable of reading DVDs of all capacities, as well as all types of data that can be recorded on DVD discs, such as DVD-ROM and DVD-Video. Its high reliability is the result of new technology such as a 650nm short-wavelength red laser and a digital servo processor.

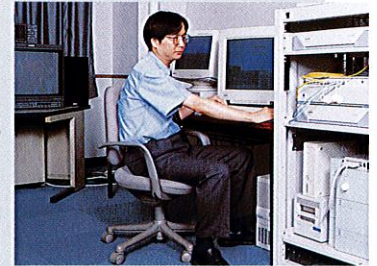
The dual lens pick-up head, developed by Toshiba, enables the SD-M1002 to read music CDs, CD-ROMs and DVDs. The SD-M1002 drive offers a fast random seek/access time with a proprietary servo processor and supports burst data transfers of 13.3Mbytes/sec in the direct memory access (DMA) mode. The AT attachment packet interface (ATAPI) facilitates integration of the drive into current desktop computer systems and multimedia upgrade kits. DVD-ROM provides capacity seven times that of a CD, as well as high-quality MPEG2 video and Dolby™ Digital (AC-3) 5.1-channel Sound audio with a DVD decoder board.



SD-M1002 DVD-ROM drive

## Encoding/Authoring System for DVD-Video Titles

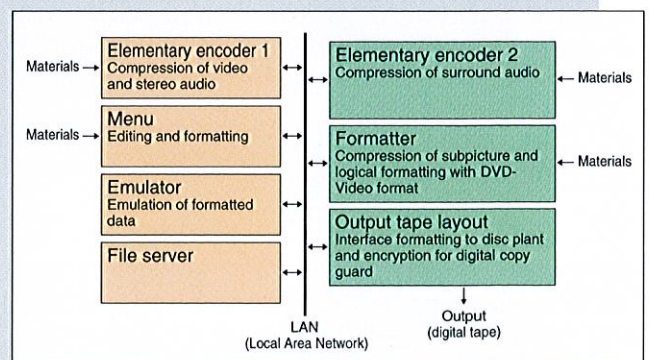
Toshiba's DVD encoding/authoring system produces digital data that comply with the DVD-Video format. The authoring system accepts digital input data from video, audio and other sources. It compresses the digital data according to the algorithm prescribed by the format, then outputs logically formatted data to the digital tape after multiplexing all data and setting parameters.



DVD authoring studio

Since the system integrates six subsystems into a high-speed network, each can be independently operated and data can be shared through the file server. This system configuration enables parallel work not only at each creation stage but also for different titles. This will contribute greatly to the title productivity of a studio.

Some subsystems have decoders for compressed data streams to check the output by themselves. The system also has an emulator to check the final logical output data thoroughly before shipment of the output digital tape to the disc replication plant. Studios in the U.S. and Japan have already begun using Toshiba's DVD encoding/authoring system to create DVD-Video titles.



DVD encoding/authoring system diagram



## High-Definition DVD

The high-definition DVD system developed by Toshiba has 1,125 scanning lines and can store and play back more than 130 minutes of theater-quality images on a 120mm optical disc. Key technologies employed in the system are high-density mastering technology to form submicro-pits on a disc; a pick-up head that uses a green second harmonics generation (SHG) laser to read out the signals from these pits; a data transfer rate more than double that of conventional DVDs; and MPEG2 image compression and decompression technology for high-definition images. These technologies are used to realize the large capacity of 7.5Gbytes per side, or 1.6 times that of DVD, and faithful real-time reproduction of high-definition images with four times the amount of video data of DVD.

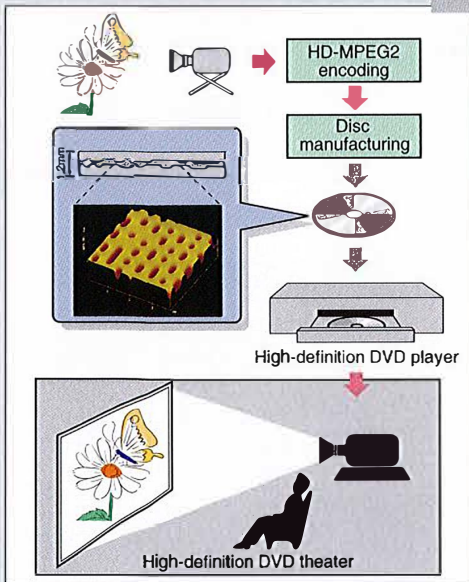
Toshiba plans to increase disc capacity to 15Gbytes per side to fit more than 130 minutes of playback time of high-definition images on a single side of a disc by the beginning of the twenty-first century.

### Selected specifications of the high-definition DVD system:

Disc capacity	7.5Gbytes per side, 15Gbytes per disc
Data transfer rate	26.58Mbps
MPEG2 system rate	25Mbps (maximum)
Image storage time	133 minutes on both sides at an average compression rate of 14Mbps (4 times that of DVD)
Laser wavelength	532nm (green SHG laser)



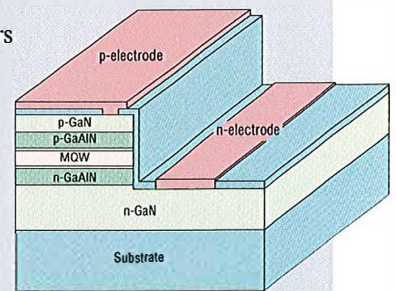
High-definition DVD player



Technologies for realizing high-definition DVD

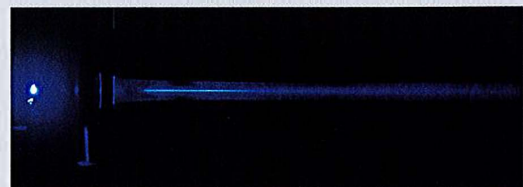
## Pulsed Operation of Blue Laser Diodes at Room Temperature

Toshiba has developed gallium nitride (GaN) based blue laser diodes that emit light at a wavelength of 417nm and operate under pulsed-current injection at room temperature. These semiconductor blue lasers will be indispensable components in the optical pick-ups of the next generation of high-definition DVD systems, which require a storage capacity of more than three times that of current DVD systems.



Device structure of a blue-light-emitting laser diode

Two major breakthroughs at Toshiba made it possible to reach this milestone. The first was the development of proprietary metal organic chemical vapor deposition (MOCVD) techniques, which facilitated the fabrication of a multi-quantum well (MQW) structure containing ultra-thin and precisely controlled InGaN layers. The second was the development of a new technique for cleanly cleaving the films grown so as to form smooth laser cavity mirrors. Both results are difficult to achieve to required standards using conventional methods. These breakthroughs enable easier manufacturing processes, which will give Toshiba an advantage as the technology moves toward production. The successful operation of these blue laser diodes will accelerate the development of the next generation of high-definition DVD systems.



Blue light emission at a wavelength of 417nm