TOSHIBA REVIEW

2006. VOL.61 NO.11

Special Reports

Growing World of HD DVD Products

Growing World of HD DVD ProductsHD DVD Products Opening up a New High-Definition Digital Era
KAMITAKE Takashi

HD DVD Technologies--Trends and Future Outlook
SATOH Hiroharu/NAGAI Koichi
HD DVD recorders/players were developed from DVD recorders/players, with Toshiba serving as a main pillar, to record and replay highdefinition signals. They are equipped with a blue laser diode for physical formatting; partial response maximum likelihood (PRML) technology for signal processing; the Moving Picture Experts Group - phase 4 (MPEG-4) Advanced Video Coding (AVC) and Video Codec Standard (VC-1) for video compression; and the Advanced Access Content System (AACS) for contents protection. They offer new services such as advanced interactive communication, picture-in-picture display, and Internet connectivity. These features allow users to more freely enjoy high-definition pictures than has been possible up to now.

HD-XA1 HD DVD Player
TOGASHI Yuichi/NOZAKI Mitsuyuki
Toshiba launched the world's first HD DVD player, the HD-XA1 model, at the end of March 2006. The HD DVD player offers users anunprecedented experience of high-resolution video and high-quality audio.
It also provides a number of other new and attractive features including interactive menus and sub video playback. With these advantages, the HD DVD player is leading the way toward the next generation of DVD-based home entertainment.

RD-A1 HDD Recorder with HD DVD Drive
HIGO Masatoshi/KITAMURA Tetsuya/ AZUMA Kazuki
In response to the change of TV broadcasting from analog to digital, Toshiba developed the RD-Z1 HDD&DVD recorder in 2005 as the first such model applicable to digital broadcasting. Since then, we have developed a variety of products for the digital broadcasting era.
Our latest model, the RD-A1, is the first HDD recorder equipped with an HD DVD drive.

Qosmio G30 AV Notebook PC with HD DVD-ROM
TAKABATAKE Yoshiaki/SATO Shigenobu/NAKAMURA Seiichi
The DVD Forum decided to adopt HD DVD as the standard for next-generation DVDs in 2005. In addition, licensing and distribution of the Advanced Access Content System (AACS), the new contents protection mechanism for next-generation DVDs, started in March 2006.
Many movies in HD DVD format are now being released in the United States and Japan.
Toshiba released the HD-A1 and HD-XA1 HD DVD players in March 2006, and the Qosmio G30 HD DVD model audiovisual (AV) notebook PC equipped with HD DVD-ROM in May 2006. The Qosmio G30 HD DVD model has a slim type optical disc drive (ODD) with blue laser diode conforming with the HD DVD-ROM standard. It also has movie playback software TOSHIBA HD DVD PLAYER and a central processing unit and graphics processing unit (CPU/GPU)

TS-L802A Slim Type HD DVD-ROM Drive
KISHITA Satoru/TANOUE Koki
Toshiba has developed the world's first slim type HD DVD drive for notebook PCs. The new drive, model TS-L802A, not only plays HD DVDs but also performs read and write operations for almost all types of DVDs and CDs. The development of the TS-L802A required three breakthroughs: a new three-wavelength optical head, a new specific LSI for HD DVD signal processing, and a new design for a built-in slim drive.
We succeeded in reducing the drive's height to 12.7 mm, and commercialized a high-performance yet low-priced product in a short time.

HD DVD-Recordable Disc
MORITA Seiji
The HD DVD-Recordable (HD DVD-R) disc, a write-once type of HD DVD on which data can be recorded only one time, is the latest recordable optical disc. It has a single-layer capacity of 15 Gbytes and a dual-layer capacity of 30 Gbytes. As HD DVD-R discs can be mass-produced on current DVD-R volume-production lines after changing the stamper and the organic dye, they are a cost-effective medium suitable for high-capacity archival data storage.
This paper describes Toshiba's original key technologies to materialize the HD DVD-R and presents performance data of actual volume production.

Feature Articles

Quantum Dot Lasers for Optical Communication Grown by Metal-Organic Chemical Vapor Deposition
HASHIMOTO Rei/KUSHIBE Mitsuhiro/EZAKI Mizunori
A semiconductor laser with a quantum dot (QD) active region promises ultralow threshold current, temperature-insensitive threshold current density, and high-frequency modulation.
Toshiba and the University of Tokyo have developed InAs QD lasers on GaAs substrate for 1.3 μm and 1.5 μm optical fiber communication.
We improved the optical property of the InAs QD by embedding it in GaInNAs, and successfully achieved room-temperature lasing operation with the longest wavelength of 1.288 μm in QD lasers grown on GaAs substrate by metal-organic chemical vapor deposition (MOCVD).

Innovative Circuit Technology for More Compact and Effective Inverters
MOCHIKAWA Hiroshi/KOYAMA Tateo
Insulated-gate bipolar transistors (IGBTs) are commonly used as the core device of inverters for AC motor drives. However, IGBTs have a limitation in terms of loss reduction because they produce a threshold voltage drop at the PN junction.
Toshiba has taken up the challenge of overcoming this limitation so as to realize low-loss inverters, and developed an innovative circuit technology called "Recovery Assist." This new circuit technology has demonstrated the ability to improve power conversion efficiency to around 99%. This, in turn, allows inverters to be downsized. Moreover, the production of heat is minimized so that an inverter can be sufficiently cooled by only a small airflow.
An experimental inverter incorporating this technology was fabricated that attained the world's highest power density of 10 W/cm3. New inverters with this technology have been applied to air conditioners, because they are particularly effective in light load mode.

Lead-Free Solders with Excellent Solderability
THAN TRONG Long/HISAZATO Yuji/NOMURA Fujio
Toshiba has developed two types of lead-free solder with excellent solderability: a medium melting temperature Sn-Cu-Co type and a low
melting temperature Sn-Ag-Cu-In-(Co,Ti) type, with melting points of 227 °C and 207°C, respectively. The addition of cobalt and titanium
lowers the surface tension of the molten solder and enhances oxidation resistance, thus improving the wettability. It was found that cobalt
diffused to the η(Cu6Sn5) phase and partially replaced tin to form a new metastable phase, η'(Cu6Sn4.2Co0.3).
The wettability and flow-up ratio of the Sn-Cu-Co solder in flow processing was found to be comparable to those of the Sn-Ag-Cu type.
The void defect ratio detected in integrated circuit (IC) packages reflowed using Sn-Ag-Cu-In-(Co,Ti) solder was about 3%, which is remarkably
low in comparison with that of Sn-Ag-Cu or Sn-Ag-Cu-In solders.

Risk Analysis and Safety Integrity Level Analysis Services for Plants, Machinery, and Equipment
SAKUMA Akira/YONEKI Shinya/KUSHIBIKI Takeshi
Following the establishment of the IEC 61508 international functional safety standard by the International Electrotechnical Commission, risk analysis has become obligatory and risk-based management has been expanding in the design of plants, machinery, and equipment.
Toshiba provides risk analysis and support services for plants, machinery, and equipment to ensure conformity with the functional safety standard, applying probabilistic safety assessment techniques developed for nuclear power plants. We also provide estimations of the frequency of hazardous events and the safety integrity level (SIL) in accordance with the requirements of the functional safety standard.

Future of Power System Monitoring Systems Using Network Computing Terminals
TSUCHIYA Takehiko/SHONO Takaya/SEKIGUCHI Katsuhiko
Power utilities are becoming increasingly interested in power system monitoring systems, influenced by a number of trends within the power industry that encompass a wide range of issues including utility deregulation, the introduction of distributed generation, and so on.
Toshiba is engaged in a project to produce a monitoring system that will cover the entire power system (power generation, power transmission, transformation of electrical energy, distribution, distributed generation, consumers) using network computing terminals structured within the same architecture.

Shipment of 235.5 MVA Air-Cooled Generator for Manzhouli Project, PRC
SAITO Kazumasa/KAKIUCHI Mikio/FUJITA Masafumi
Toshiba shipped an advanced air-cooled generator for the Manzhouli Project in the People's Republic of China (PRC) in June 2006.
This project has been advanced with Harbin Electric Machinery Co., Ltd. The generator features downsizing and higher performance in comparison with conventional air-cooled generators. The latest technologies were used in its design and manufacturing, and it has been confirmed to have successfully achieved the design specifications.

Web Service Flow Controller Enabling Orchestration of Web Services
OMORI Yoichi/MOCHIZUKI Katsuhito
Toshiba TEC Corp. has developed a Web service flow controller, containing an execution engine and a development environment, based on a standard Web service orchestration language called BPEL4WS (Business Process Execution Language for Web Services). It runs on our CrossMissionTM middleware.
The Web service flow controller enables cooperation with legacy Windows☒ processes. A business process designer can design business logic without knowing the difference between Internet-based Web services and legacy processes. The Web service flow controller also supports both the password certification and encryption functions of the Web service security standard WS-Security. Therefore, our proposed mechanism allows Internet and intranet systems based on service-oriented architecture (SOA) to be easily developed.

Frontiers of Research & Development

Computer Graphics Technology to Produce Realistic Textures on 3D Object Surfaces
Inspection of Microcracks on Weld Metal Surfaces of Underwater Structures