

TOSHIBA REVIEW

2003. VOL.58 NO.5

Special Reports

Media embedded Processor--A System-on-Chip Platform

Special Reports Media embedded Processor--A System-on-Chip Platform	Feature Articles	Frontiers of Research & Development
*MeP (Media embedded Processor) : An Open Platform for SoCs *Toshiba Media embedded Processors Solving System-on-Chip Complexity *SoC Development Methodology with MeP *System and Software Support for System-on-Chip Era *Embedded TX System RISC Processor Core for System-on-Chip (SoC) *MPEG-2 Codec LSI Based on MeP Architecture *TC90600FG Single-Chip LSI for DVD Player	*ISO 13584 PLIB-Based Data Exchange of Technical Information for Parts *Construction of Accurate Mobility Model for MOSFETs *Science Museum Guidance System Using Multimodal Knowledge Technology *Ticket Gate System Using Bluetooth™ Fast Automatic Proximity Detection *High-Strength, Reaction-Sintered Silicon Carbide Ceramic *Molten Salt Waste Disposal Equipment for Organic Halogen Compounds *Portable Partial Discharge Detector and Insulation Diagnosis Service	*Phase-Change Optical Recording Simulation Technique for Next-Generation DVD *Wireless IP System Integrating Voice and Data

Special Reports

Media embedded Processor--A System-on-Chip Platform

***MeP (Media embedded Processor) : An Open Platform for SoCs**
FUJITA Katsuji

***Toshiba Media embedded Processors Solving System-on-Chip Complexity**
MATSUI Masataka
System-on-chip (SoC) technology enables high-performance, embedded processing solutions at a low, single-chip cost. The dilemma is that while SoC complexity is increasing, the time to market of digital consumer products is decreasing.

The solution to this dilemma is to establish a design methodology that reuses prior design components wherever possible.

Toshiba provides an SoC software/hardware design platform based on an original configurable microprocessor technology; namely, the media embedded processor (MeP).

***SoC Development Methodology with MeP**
OSADA Takao MATSUMOTO Nobu
The media embedded processor (MeP) provides a new platform for developing system-on-chip (SoC) data processing units. The major part of the development is performed using C language. Users choose suitable configurations, such as the cache size, and add the hardware required for their application in C language (hardware extension).

To support such configuration and hardware extension, Toshiba has developed a tool called MeP Integrator. MeP Integrator generates software development tools, such as a compiler and a simulator, Register Transfer Language (RTL) descriptions, and verification vectors from the configuration. Furthermore, we have also proposed a new top-down design flow using MeP Integrator. As a result of applying this development methodology to an MPEG-2 codec, a design satisfying performance requirements was efficiently completed.

***System and Software Support for System-on-Chip Era**
TABE Tetsuya ODANI Masayasu TAKEUCHI Yoichiro
It is important to maintain system and software support as well as releasing very-large-scale integrated (VLSI) devices to support the system-on-chip (SoC) era. System and software support requires the provision of products and supporting services.

To meet these requirements, Toshiba has prepared system and software support from two viewpoints: system platform and common platform, taking advantage of the Toshiba Group network. We have divided these, in turn, into three categories: self-development, importation, and introduction, and have formed alliances with third-party vendors and system integration vendors to satisfy the requirements of customers. We have also focused our efforts on developing hardware-independent and reusable software taking software module architecture into consideration.

***Embedded TX System RISC Processor Core for System-on-Chip (SoC)**
SEKIGUCHI Hiroshi MITANI Ryo NAKAMURA Masato
Toshiba has launched the TX19, TX39, TX49, and TX79 series 32/64-bit processor family on the market since 1995 employing MISP-based reduced instruction set computer (RISC) architecture. We are also currently developing the TX99 high-end processor. These processors are available as intellectual property for application-specific IC (ASIC) design methodology and are implemented in Toshiba standard processors or customized system-on-chips (SoCs). Their speeds cover the range from 40 MHz to 1 GHz with instruction set upward compatibility.

Recently, these processors have been used for digital audio/video processing functions in devices such as the media embedded processor (MeP) in a single chip, providing system control functions for various multimedia LSIs.

***MPEG-2 Codec LSI Based on MeP Architecture**
OTOMO Goichi YAMAKAGE Tomoo
Toshiba has developed a single-chip MPEG-2 main profile at main level (MP@ML) codec LSI based on media embedded processor (MeP) architecture. It has a heterogeneous multiprocessor architecture in which six MeP modules with the same instruction set but different customizations concurrently execute specific tasks such as video, audio, etc. The MeP core, developed for digital media processing, provides various extensions such as very long instruction word (VLIW) and digital signal processor (DSP) extensions inherently in its architecture. Making full use of these extensions, the chip executes video, audio, and system encoding and decoding concurrently in real time.

***TC90600FG Single-Chip LSI for DVD Player**
INAGAWA Jun KOYAMA Motoaki NAKAGAWA Masaki
Toshiba has developed the TC90600FG single-chip LSI for DVD player systems. The TC90600FG integrates the front-end processor, back-end processor, and TX19 control processor into one chip. By incorporating media embedded processors (MePs) in the back end processor, expansion becomes possible simply by rewriting the firmware and correspondence with a new algorithm becomes easy. A kernel is introduced into each MeP to perform changes in individual tasks, execution time surveillance, etc., permitting the operation of two or more task engines.

This LSI enables the number of parts of a DVD player system to be decreased and the mounting board area to be reduced compared with the conventional PG5 series.

Feature Articles

***ISO 13584 PLIB-Based Data Exchange of Technical Information for Parts**
ITO Satoshi MINAMINO Noriko
The ISO 13584 Parts Library (PLIB) is a series of international standards for computer-sensible representation and exchange of technical specifications of parts. This paper describes the various types of technical data exchange based on the Library Management System (LMS), and shows their effectiveness in the B-to-B e-commerce field. Since worldwide efforts to develop PLIB-based dictionaries have become more active, practical use of PLIB-based data exchange can be expected in the near future.

***Construction of Accurate Mobility Model for MOSFETs**
ISHIHARA Takamitsu MATSUZAWA Kazuya
Lowering of production costs and faster development speeds are required in the semiconductor business field. Simulation technology is useful for such tasks. However, it is necessary to improve simulators for the accurate evaluation of various characteristics of semiconductor devices. The aim of a device simulator is to evaluate the electrical properties of semiconductor devices. In order to increase the reliability of device simulators, Toshiba has formulated an accurate mobility model for MOSFETs with an oxynitride gate insulator. The knowledge obtained through the construction of this accurate mobility model will contribute to the physical understanding of electric current modulation.

***Science Museum Guidance System Using Multimodal Knowledge Technology**
FUKUI Mika SUZUKI Masaru FUJII Hiroko
Toshiba has developed a multimodal knowledge and information on demand system as an application of ubiquitous computing. This system provides nuggets of multimodal knowledge composed of video/audio streaming data and text data to users via wireless network. It delivers whatever knowledge is appropriate to the user's situation in the ubiquitous computing environment to a terminal in the user's hand. The user can input questions using voice and can retrieve detailed information.

For practical verification of this system, we have developed a science museum guidance system and have been conducting an open experiment since September 2002 at the Toshiba Science Institute in Kawasaki City, Japan.

***Ticket Gate System Using Bluetooth™ Fast Automatic Proximity Detection**
YAMAMOTO Takehiko KAMBE Minoru SATA Yutaka
As the market for Bluetooth™-embedded consumer terminals gradually expands, Bluetooth™ is expected to be increasingly used in mobile commerce and ubiquitous services in the future. In order for Bluetooth™ to function as an ad-hoc communication platform for these services, there are several technical issues to be solved including faster connection setup and automatic device detection functionality in the proximity.

In the present study, a fast and automatic proximity detection technique that could solve these issues was developed using Bluetooth™, and applied to an automatic ticket gate system.

***High-Strength, Reaction-Sintered Silicon Carbide Ceramic**
SUYAMA Shoko KAMEDA Tsuneji ITOH Yoshiyasu
The use of silicon carbide ceramics in hot parts and wear-resistant parts has steadily increased due to their environmental resistance, high thermal resistance, high wear resistance, high stiffness, high thermal conductivity, low thermal expansion, and low density. If high strength, high toughness, and low cost are realized, demand for silicon carbide ceramics can be expected to greatly increase for various energy and industrial applications.

Toshiba has developed a new, high-strength, reaction-sintered silicon carbide (RS-SiC). The world's highest strength, exceeding 1,000 MPa, was obtained by controlling the fine structure to the nanolevel. This paper introduces applications for this high-strength RS-SiC.

***Molten Salt Waste Disposal Equipment for Organic Halogen Compounds**
SHOJI Yuichi HODOTSUKA Masatoshi YAMAMOTO Keiichi
Molten alkaline salts, such as sodium hydroxide, can decompose organic halogen compounds represented by chlorofluorocarbons (CFCs) and perfluorocarbons (PFCs), which cause global warming, without generating any harmful by-products such as dioxins. Since halogenous elements can be incorporated in the molten salts as inorganic salts, equipment corrosion by strong acid does not occur.

Decomposition of substances such as CFCs, PFCs, and volatile organic compounds (VOCs) was experimentally proved, and CFC processing equipment was commercially developed. This processing equipment can decompose 1 ton of CFC12 per year. To decompose 1 kg of CFC12, 1 to 2 kWh of electric power and 2.8 kg of sodium hydroxide are required.

***Portable Partial Discharge Detector and Insulation Diagnosis Service**
SASAKI Keiichi WATANABE Takeshi ITOH Kaneyoshi
The number of aging facilities more than 20 years old in office buildings and industrial facilities has recently been increasing. Users are therefore giving considerable thought to the appropriate renewal time for facilities such as high-voltage power distribution equipment. Moreover, there is a tendency to shift from time-based maintenance (TBM) to condition-based maintenance (CBM) in order to reduce the total cost of plant operation. TBM places importance on periodic inspections, while CBM monitors the equipment's condition to minimize maintenance time and cost. To meet these needs, Toshiba has developed a new portable partial discharge detector that enables quantitative evaluation of insulation degradation. We have also launched an on-site insulation diagnosis service utilizing this detector.

Frontiers of Research & Development

***Phase-Change Optical Recording Simulation Technique for Next-Generation DVD**

***Wireless IP System Integrating Voice and Data**