NEC Electronics Sets Its Sights on the Digital Consumer and Automotive Markets

In this special issue, we would like to introduce how our company is tackling the key digital consumer and automotive markets - two areas where we have been concentrating our efforts. In our overview of our endeavors in the digital consumer segment, we will provide a look at our image processing/display devices, network connectivity-related devices and microcontrollers that will pave the way for the coming Ubiquitous Information Age. The outline on our efforts in automotive sector will examine how we are meeting the challenge of multi-core processors to respond to the increasing incorporation of electronics and information technologies in automobiles, as well as introduce in-vehicle intelligent power devices that will serve as a bridge for the mechanical elements of the automobile. Finally, the reader will learn about our high-performance, low-power consumption process technologies and products that serve as the technology platform to drive all of our advances, and the low-cost HW/SW verification environment.

Senior Vice President
NEC Electronics Corporation
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1 Introduction

While continuing to expand our strength in our three core business divisions: SoC (System on Chip), Microcomputers, and Discrete and ICs, NEC Electronics is pouring its efforts into the digital consumer market where we are focusing on image processing/image display devices, and in the automotive market where the highest standards of reliability are demanded. Because these markets also demand solutions at ever lower cost and with reduced energy consumption, we are actively developing a common platform of basic technologies that address both these requirements. Leveraging the innovative application technologies in each of our core businesses and exploiting the crystallization of the constituent technologies that comprise the technology platform for all major products groups, we are moving forward with the development of industry-leading products (see **Fig.**).

2 Our Endeavors in the Digital Consumer Segment

For NEC Electronics, the digital consumer segment is primarily those devices that support and empower people to enjoy a full and rich life and includes the many digital devices for personal use and employed in the home ranging from digital televisions to game platforms. While digital consumer devices, which mostly fall into the information home appliance segment, are trending toward bigger screens and higher resolution, they are also acquiring greater connectivity/telecommunications functionality for linking to various networks. However, while responding to this demand for ever higher performance and functionality, NEC Electronics is simultaneously confronted by the daunting challenge of meeting the severe requirements for lower power consumption, lower manufacturing costs and more compact engineering. Also in the digital consumer sector, the transition to more “intelligent” devices and a “smarter” residential environment as typified by the various home electronics and appliances that incorporate IT technology is

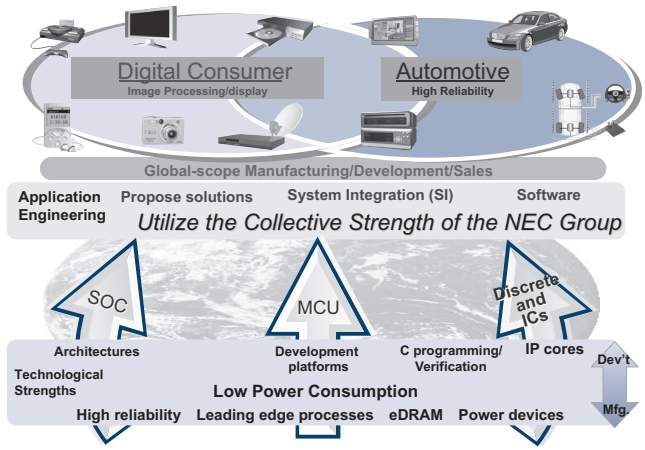

Fig. Future directions for NEC Electronics.

becoming a dominant theme.

In the section focusing on image processing/display-related devices in this special issue, we will introduce the innovative architecture for EMMA3 - the next-generation platform in the EMMA series of semiconductors for digital home electronics. EMMA3 realizes the high performance and high functionality necessary for the next-generation DVD system to handle the recording and playback of HDTV content, and is compatible with MPEG-4 AVC/H.264, which is the encoding technology adopted by the next generation of DVDs such as HD-DVD. Next the reader will meet our LCD controller/driver IC for mobile phones. Taking advantage of built-in capabilities including display image data recognition, data correction and MobileAGCPS for backlight dimming control, this IC makes it possible to minimize power consumption of the LCD module's backlight without sacrificing the quality of the display image. In the introduction of our enhancement of functions for connectivity to telecommunications networks, we will talk about the system LSI "M2" for third-generation mobile phones (3G~3.5G), as well as discuss the GaAs switch IC for wireless broadband. In the development of M2, NEC Electronics has achieved an unprecedented level of power consumption efficiency through the synergy of circuit, device and architecture technologies. As a key device in the RF wireless field, the GaAs switch IC for wireless broadband not only realizes high performance, but also is setting new standards for shrinking and slimming the package through advances in packaging technology.

As for products that answer the trend towards more intelligent devices, this feature will introduce our 16-bit All-Flash Microcontroller 78K0R series, which boasts power performance on a par with the highest levels in the industry. Through a variety of measures including adoption of an advanced Flash CMOS process and some innovative CPU core design, this series delivers 16-bit microcontroller performance with power consumption equivalent to that of an 8-bit microcontroller.

3 Making a Move in the Automotive Segment

From in-vehicle microcontrollers that already total over 50 in a typical model to an array of analog and optical devices, the modern automobile is using a growing number of semiconductors. In this diverse domain of devices, NEC Electronics focuses on in-vehicle microcontrollers, anti-theft security/safety systems, navigation systems and also high-load, high-current power devices that connect the microcontroller and machine.

In order to satisfy growing expectations for cars with enhanced security, safety, comfort and eco-friendly performance, we are not only seeking higher performance, lower power consumption and standardized interfaces for in-vehicle microcontrollers and other semiconductors for automobiles, but also meeting strict conditions for high reliability through "Zero Defect" programs and other quality assurance as well as improving resistance to high temperatures and noise to enhance operating environment characteristics.

As one of the steps undertaken to secure higher performance and reliability, we are bringing enhanced performance through LSI with multicore CPU for car navigation where a level of processing on a par with a modern PC is required, and raising reliability by reduction of the software development load. In the case of our development of the system LSI for car navigation with a built-in SMP (Symmetric MultiProcessor), the extraction of maximum performance from the hardware and improvement of software re-use efficiency are expected thanks to adoption of a high-performance general purpose multiprocessor and an SMP-compatible OS.

Next we will talk about the various in-vehicle power devices that link the microcontroller and the mechanical components. By providing intelligent power devices with their high current/low on-resistance as an alternative to the conventional mechanical relays that have been used up to now, we are helping to realize more compact and lighter ECUs and also contributing to improvement of reliability.

4 Toward a Common Platform of Technologies

While pursuing both higher speed and lower power in response to the needs of each of the previously mentioned areas, we are also tackling ways to bring costs down and shrink the development cycle. At the same time, we continue to chal-

lenge the limits of the physics, searching for solutions to problems such as those caused by on-chip variations as we push the envelope of LSI technology.

One example of these efforts is the cell-based IC CB-55L. This is the product of 55nm CMOS process technology and will serve as a common platform not only in the digital consumer and automotive markets but also a broad range of other segments. Its unique characteristic is the realization of high performance while significantly reducing power consumption - the result of exploiting our merits as an integrated device maker (IDM) to introduce new process technologies and the collaboration of circuit technologies.

On the subject of shrinking the development cycle and elevating reliability, this feature will touch on our processor design and verification technologies made possible by Hybrid emulator. This technology will facilitate high-precision, high-speed pre-assessment with low cost, and enable improvement of tested product quality by widening the scope of its application. In this special issue, we will introduce an example of how this technology has not only simplified the verification of microcontrollers and software in the in-vehicle device market, but also contributed to reducing both the development cycle and costs.

5 Conclusion

Through this special issue, we hope that the reader will gain a better insight into the various products and the common platform of technologies that NEC Electronics is developing for the digital consumer and automotive markets. In the future, we aim to continue our efforts to provide customers with the very cutting edge of technology and products.