Semiconductor Solutions Pursued by NEC Electronics

In the last ten years, semiconductor devices and especially system LSI's became capable of performing increasingly complex functions, yielding higher performance at lower prices thanks to, the advent of technologies that achieve low power circuits and high levels of parallelism, and also the rapid advance of sophisticated software, in addition to the conventional device miniaturization. On the other hand, due to the complexity of these individual technologies, it is becoming difficult to integrate them in a timely manner with the most suitable cost to provide customers with optimum solutions. In view of that, NEC Electronics is promoting activities to provide solutions that best satisfy customers based on the most suitable platform designed for each business area.

Senior Vice President,
NEC Electronics
FUKUMA Masao

1 Three Business Areas and Core Technologies

The business of NEC Electronics is currently centered on three business areas. As shown in **Fig**., these areas are 1) SoC area including ASIC/ASSP for AV, mobile, automotive and others, 2) MCU area targeted on a wide range of applications centered on electronic equipment control and especially automotive electronics, and 3) discrete semiconductors such as LCD drivers and power devices where NEC Electronics has market strengths. Optimal platforms are being constructed for the three areas above, taking advantage of their specific technological features. Moreover, technologies that are common to all areas such as design environment, basic devices and mass production serve as common technology foundations that support the three business areas above.

2 SoC Area

In this area, it is especially important to create a platform based on the most suitable architecture. This enables a SoC comprising complex functions to adopt the structure that optimizes the performance of each application, offering the advantage of more easily satisfying customer needs. For example, as featured in this Special Issue, the EMMA platform is available for digital AV and the SCOMBO platform is available for DVD control, forming a varied lineup of products to satisfy customer needs. In addition, we have exclusive architectures in the form of dedicated SoC's such as audio processors for mobile phones and image recognition processors for automotive applications, resulting in high added values in the market. For every SoC, we also offer high reliability by integrating design/verification environments of embedded software and hardware.

3 MCU Area

The need for MCU has been diversifying in the last years. Therefore, comprehensive activities ranging from development to mass production and maintenance are necessary in this area. Special attention is driven by flash microcontrollers, where the previously usual mask ROM containing the embedded program memory is replaced by flash memory, permitting to rewrite software after the customer's set has been manufactured. This allows for higher flexibility, and consequently shorter development time and reduced maintenance cost for the customer. We prepared a general platform for flash microcontrollers featured
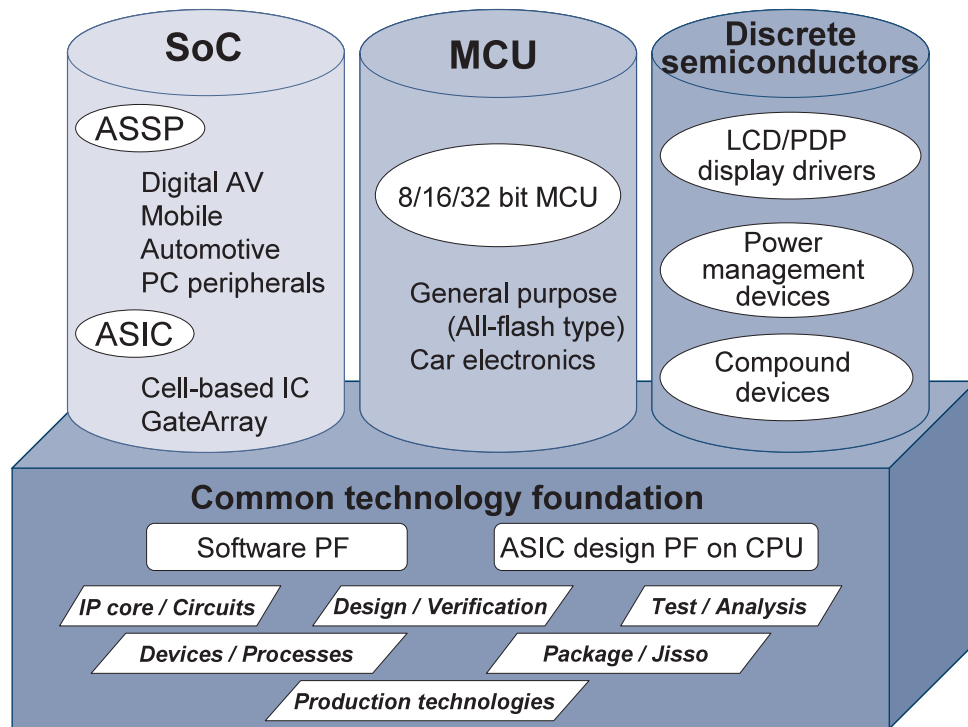
Fig. NEC Electronics business activities.

by a rich product lineup, specialized low-power and low-cost technologies, and a complete development environment, providing customers with the maximum benefit of the high flexibility.

4 Discrete Semiconductors Area

This area is represented by LCD drivers, power devices, and several compound semiconductors, all of them complying with the IDM model. In this Special Issue, we will present power control devices for lithium ion batteries. These products contribute to improving the customers' competitiveness in manufacturing lithium ion battery packs through lower cost and smaller sizes achieved by improvements in device structures and production processes and Jisso technologies.

5 Technology Foundation

The three areas above constitute our company's fundamental business areas, and they are supported by our common technology foundation. Common technology foundation covers devices/processes, IP-cores/circuits, design/verification, test/analysis, package/Jisso, software, mass production, and others. So

far, the usual practice for these core technologies was to conduct development according to a roadmap resulting in device miniaturization, supply voltage reduction, or package miniaturization. However, as we gradually approach physical limits and face higher and higher degrees of complexity, it becomes difficult to obtain cost performance improvements using existing methods. Therefore, the new approaches such as using new materials and structures that have never been used for devices before, and introducing design verification technologies based on high-level languages are necessary. In this Special Issue, we will show our new technologies that may represent potential paradigm shifts such as platform-based designs using CPU cores, advanced CMOS using High-k materials, packaging technologies with new structure SIP implementations, failure diagnosis technologies integrated with design, etc.

6 Conclusion

"Platform" is an especially important keyword in the IDM semiconductor solutions pursued by NEC Electronics. This will allow customers to obtain the best solution in a short time and at a low cost. We are also focusing on core technology development that may result in true paradigm shifts, striving to always provide customers with the latest technologies.