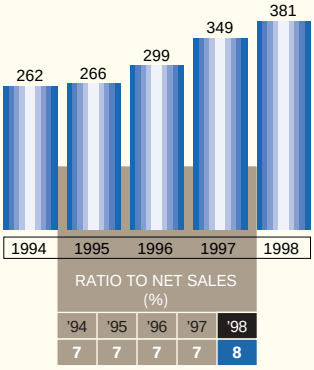
The mission of NEC's R&D activities is to develop breakthrough technologies that contribute to the foundation of new businesses in the 21st century and leading-edge technologies that support existing businesses. During fiscal 1998, NEC focused its R&D activities on the following fields: multimedia data transmission, ultra-large-capacity WDM networks, natural user interfaces (NUIs), compound semiconductor devices for next-generation communications networks, sub-0.1-micron CMOS process technologies, and nanometer-class materials and semiconductors.

R&D EXPENSES (Billion ¥)



>> In the realm of software engineering, NEC emphasized research on object technologies, Internet protocol, WebComputing—highly reliable enterprise information systems using Internet technologies in combination with distributed object technologies—and integrated and multimedia software technologies. In production engineering, NEC achieved significant advances in design and production information systems, innovative manufacturing processes and equipment, mechatronics applications, high-density semiconductor packaging, and environmental technologies.

>> NEC opened the Kansai Research Laboratories in western Japan to further strengthen its R&D activities for multimedia applications and NUIs. Moreover, NEC established its third C&C Research Laboratories in Europe, in Heidelberg, Germany, to develop technologies for multimedia communications protocols and middleware.

Highlights of the Year

- Cenju-4 parallel processing computer developed
- Ultra-large-capacity optical access technology developed
- Research laboratories opened in Japan and Germany
- World's smallest MOS transistor with 14-nanometer gate length developed
- Assembly technology for communications-use SMT optical modules developed
- High-performance HJFET for cellular phones developed
- HOLON/VP used to develop new system for major convenience store chain

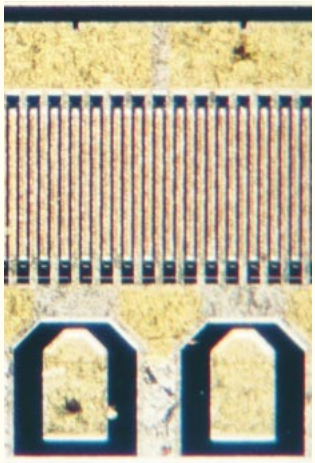
NEC Develops Cenju-4 Parallel Processing Computer

Parallel processing computers link multiple CPUs (central processing units) in a network configuration to distribute processing tasks and thus enhance processing performance. These computers are suited to semiconductor circuit design, the analysis of molecular structure, and other applications that require sophisticated scientific calculations.

NEC developed the Cenju-4 parallel processing computer based on an innovative memory architecture that integrates distributed and shared memory and message communications architectures. Cenju-4's architecture allows processors to share memory across multiple CPUs, and thus large amounts of data can be processed at high speeds.

High-Performance HJFET for Cellular Phones Developed

NEC developed a double-doped heterojunction field effect transistor (HJFET) that supports the extended battery life of cellular phones. By incorporating a novel multilayer cap and narrow recessed structure, the transistor achieves the world's highest-power-added efficiency of 64 percent when used as a high-output power transistor for digital cellular phones running on one lithium-ion rechargeable battery. Furthermore, the transistor features single-voltage operation, which simplifies circuitry design in cellular phones and thus lowers costs.



Ultra-Large-Capacity Optical Access Technology Developed

The linking of optical fibers to the home and the development of high-speed optical terminals are necessary to meet the increasing demand for the use of multimedia information through such networks as the Internet. In fiscal 1998, NEC developed a compact and inexpensive optical network unit (ONU) that can receive large volumes of data—equivalent to 20,000 telephone lines or 400 video channels.

Furthermore, NEC developed wireless transmission technology that helps create wireless multimedia home networks. Using this new technology, transmission equipment spaced 10 meters apart can transmit multimedia information at a speed of 100Mbits per second.

NEC Develops Innovative Assembly Technology for Communications-Use SMT Optical Modules

Optical modules are a key device for optical communications equipment that converts optical signals to electrical signals.

During the year under review, NEC developed the technology for an innovative surface mountable type (SMT) optical module. This technology uses optical element passive-alignment technology that obviates the need for adjustments to the optical axes during assembly and contributes to reducing module manufacturing costs and module dimensions.

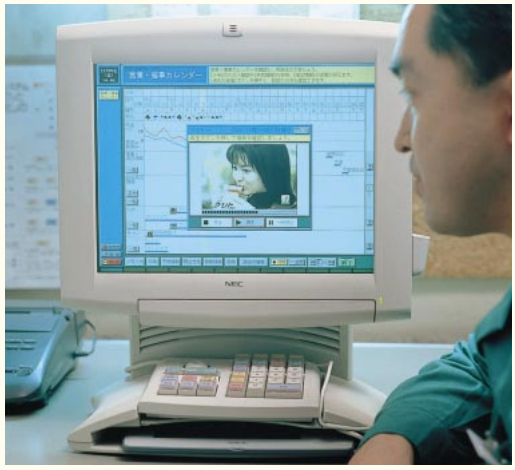
NEC Develops World's Smallest MOS Transistor with 14-Nanometer Gate Length

NEC developed and successfully operated the world's smallest metal oxide semiconductor (MOS) transistor, with a gate length of 14 nanometers (1 nanometer=1 millionth of a millimeter).

In addition, NEC has identified changes in electrical characteristics associated with size reduction in transistor geometries, thus establishing a solid foothold in the development of 10 terabit (10 trillion bits) memory devices. As the reduction in the gate length of transistors is thought to interfere with the normal operation of elements, research into the physical phenomena attributable to miniaturization is essential to enhancing the level of integration in semiconductor devices.

HOLON/VP Used to Develop New System for Major Convenience Store Chain

A new store management system, which was developed using NEC's innovative visual programming software HOLON/VP became operational at a major convenience store chain in Japan during the year under review. This strategic information system uses satellite communications to transmit large volumes of multimedia data and has been designed to be user friendly and able to operate 24 hours a day.



Compatible with the Windows NT® and Windows® 95 operating systems, NEC's HOLON/VP is a practical, general-use visual programming tool based on object-oriented technologies.