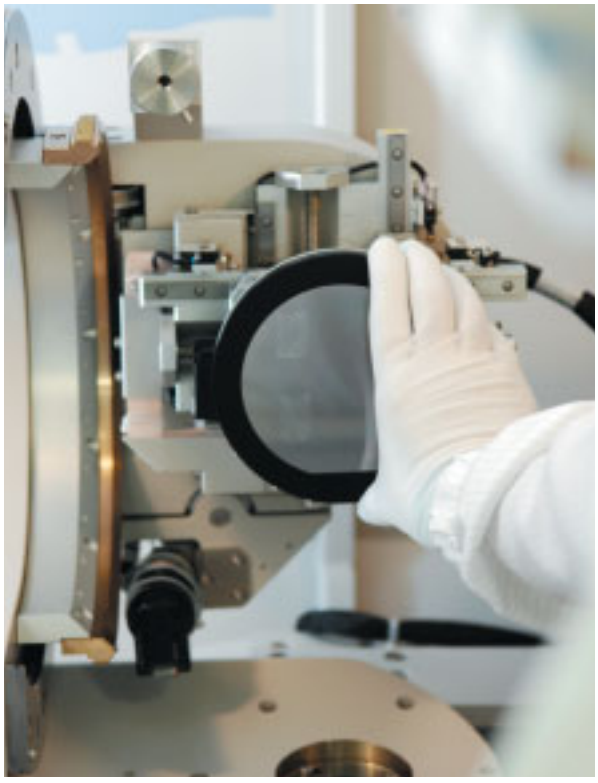
Research and Development



The R&D expenses totaled ¥6,182 million, which are divided into halves research and development.
The staff of 410 works in development teams for each product division and the number of research themes is 300.
The research laboratory that develops its core technology covers the following fields:
1) Advanced device development;
2) Intellectual property management;
3) Technical support and management.
It also advances research activities using its partnership with universities and outside laboratories.
We also publish research papers in international journals and exhibit at public expositions (Japan, China, Singapore, the United States, and Europe, etc.). We will focus on the following activities: Developing products targeted at AV digital market; Providing our products and services to customers quickly through the operation of design centers founded last year in Osaka and Singapore; Brushing up our process technology and production technology as bases for high-performance products that meet the needs of electric equipment market; Investing in development of environmentally-friendly and microminiature package (ESON®, EQFN®, and WPCSP®) in the digital consumer equipment (cellular phones, personal computers, and DSCs) market.
The activities of each product division are as follows:

[Microwave Tubes and Radar Components Division]

We are developing electron tubes and radar components for various radars and microwave band modules, centered on low-noise signal transmitters, SiC (Silicon Carbide) devices and modules for solid-state radars integrating SiC devices.

[Microwave Applications Division]

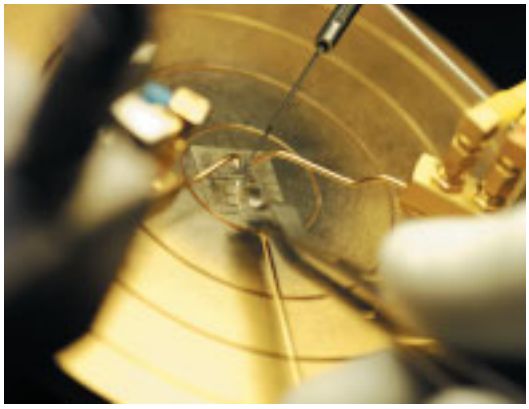
We have developed PLL LNBs (Phase Locked Loop Low Noise Block Downconverter) for satellite communications and have promoted a line of ODU (Outdoor Unit) products for satellite communications, and have developed low-power general-purpose models. In addition, for terrestrial communications, we developed the overseas line of 26-GHz band FWA (Fixed Wireless Access) products for home consumers and developed modules for domestic digital

terrestrial broadcasting. In microwave sensors, we are working toward development of FMCW module using technology for development of our 24-GHz standing wave radar.

[Semiconductors Division]

We have started the development of high-speed and current-feedback type operational amplifiers following the development of high-accuracy amplifiers and CMOS low-noise amplifiers. For power ICs, we have promoted the development of high efficiency synchronous rectifier switching power supplies and high-current output LDO (low dropout) regulators. In addition, we are promoting the development of sophisticated lithium-ion battery charge-control ICs. For audio-related ICs, we have strengthened the lineup of high-accuracy and high-quality sound electronic volume ICs and promoted products with bass enhancement function with our original surround technology. For video ICs, we have developed HDTV (High Definition TeleVision)-compliant broadband video amplifiers and switches, and have pursued commercialization of isolation amplifiers for in-car AV equipment. For motor ICs, we are developing high-voltage motor drivers. For communications ICs, we are developing one-chip front-end ICs for keyless products, and now we are promoting products for in-car application, and have released operational amplifiers and power-supply ICs.

For Audio DSPs, we are continuing the development of products for flat-screen TVs and in-car audio market. This term, we developed a DSP with built-in OTP (one-time programmable) for the flat-screen TV market. We have positioned Class-D amplifiers as those for DSP back-end processors and are developing high power products. For quartz crystal oscillator ICs, in addition to small and thin ICs, we have started the development of crystal oscillator ICs that suppress frequency deviation due to power variation while reducing current consumption.



For GaAs ICs, we completed the development of low noise amplifiers (LNAs) for W-CDMA triple band and antenna switches and introduced new products to the market. This LNA achieves low noise, high gain, high performance with a high-voltage ESD (ElectroStatic Discharge) and downsizing using a new circuit with enhancement HJFET (heterojunction FET). As for antenna switches, we have developed a low-harmonics, high-voltage ESD and downsizing using a new circuit with enhancement/depression HJFET. In the GSM field, the technologies developed for W-CDMA are developed horizontally. We have completed the development of microminiature single-pole double-throw (SPDT) switches for wireless LAN and Bluetooth (2.4- GHz band wireless) and will begin mass production. We are also promoting the development of multiband antenna switch modules for GMS, ultra-compact and low-current consumption LNA for GPS, and power amplifiers for wireless LAN.

For optoelectronic devices, we have commercialized a photodiode pickup for HD DVD and Blu-ray. We are continuing development of blue-wavelength IC processes. In light sensors, we commercialized a compact COBP (Chip On Board Package) for portable devices and bolster the lineup for LCD TVs and light equipment. We have commercialized compact COBP photo reflectors and are promoting further miniaturization.

Additionally, we are conducting research on millimeter-wave chips for vehicle radar, CCD (Charge Coupled Device) correlators for optical fiber communications, and high-frequency ICs for wireless LAN, etc.