

**Semiconductor Devices**



**Microwave Application Products**

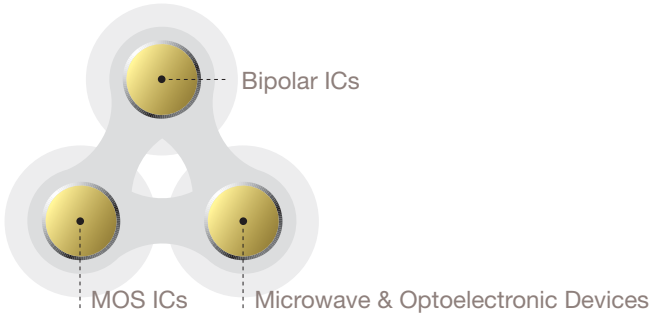


**Microwave Tubes and Radar Components**

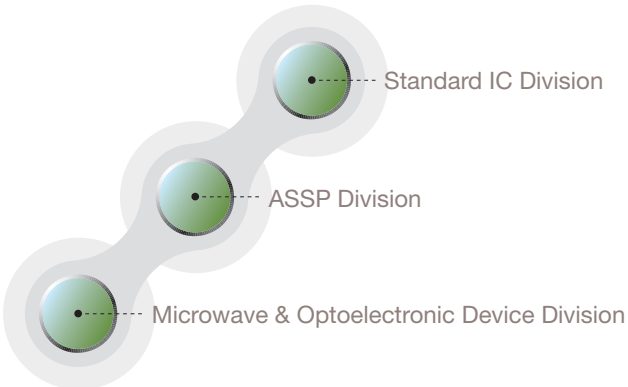


# Semiconductor Devices

Products in our semiconductor devices are mostly analog semiconductors classified broadly into three groups: Bipolar ICs, MOS ICs, and Microwave & Optoelectronic Devices.



These semiconductor products are handled by the following three divisions, covering product planning to design: Standard IC Division, ASSP Division, Microwave & Optoelectronic Device Division.



## Main Products

Note: From fiscal 2007, divisions providing the following products will be changed as follows:

- LED drivers: Standard IC Division
- Audio/video ICs: ASSP division
- Quartz crystal oscillator ICs: Standard IC Division

• **Standard IC Division: Operational amplifiers, comparators, power supply ICs, audio/video ICs, motor ICs, and communications ICs**

We focused on developing high value-added operational amplifiers and comparators. Demand for the power supply ICs for digital AV equipment holds steady. The audio/video ICs are in great demand, from TVs and audio equipment to cellular phones. The motor ICs are mainly used for the CPU cooler fan motors.



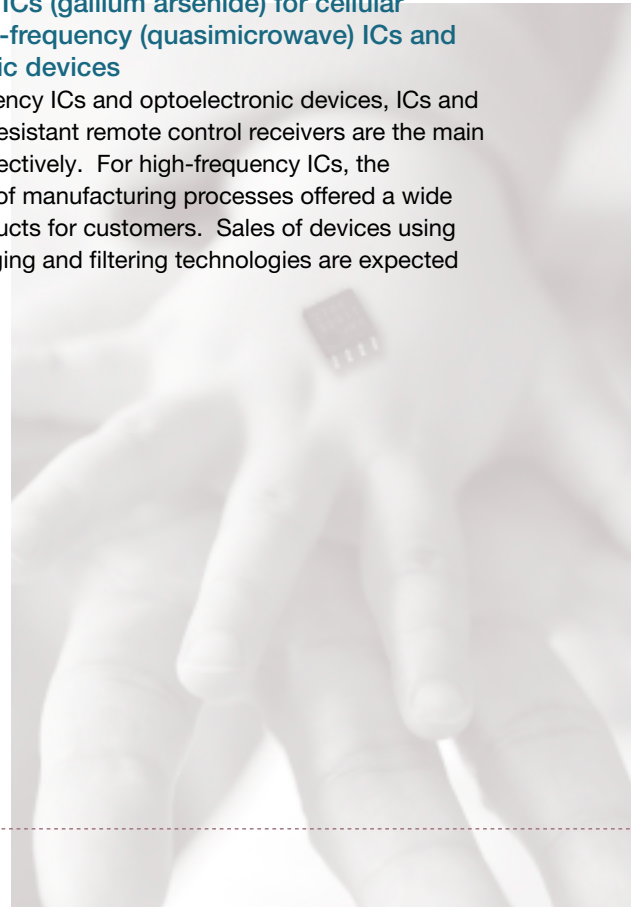
The NJU7384V is a pulse input Bipolar stepper motor driver IC. It adopts the pulse input (STEP&DIR) method and high efficiency CMOS, offering low-power consumption. It features external input RESET, Enable function, TSD (Thermal Shut Down circuit) as a protection function. It uses SSOP32 package for high output current with low thermal resistance.

• **ASSP Division: Display-related ICs, audio-related ICs, and dedicated ICs**

We focused on developing LCD driver ICs for OA equipment and cellular phones, audio ICs, and quartz crystal oscillator ICs. DSPs are becoming more sophisticated.

• **Microwave & Optoelectronic Device Division: Mainly GaAs ICs (gallium arsenide) for cellular phones, high-frequency (quasimicrowave) ICs and optoelectronic devices**

For high-frequency ICs and optoelectronic devices, ICs and optical-noise-resistant remote control receivers are the main products, respectively. For high-frequency ICs, the diversification of manufacturing processes offered a wide choice of products for customers. Sales of devices using various packaging and filtering technologies are expected to increase.



## [Business Results in Fiscal 2006]

Consolidated sales in the three sections were ¥50,300 million (1.0% decrease from last year).

### • Bipolar ICs:

¥36,262 million (consolidated). The sales of the main products including operational amplifiers and comparators remained unchanged from the previous year. Sales of motor ICs increased significantly because of the following: The number of PCs manufactured was steady; The motor ICs were used for various amusement devices. On the other hand, sales of audio/video ICs decreased due to competitive pressure. 1.7% decrease from last year.

### • MOS Products:

¥10,288 million (consolidated). Quartz crystal oscillator ICs enjoyed strong sales. However, sales of audio ICs for home audio equipment and home theater equipment decreased due to inventory adjustment. As for LCD driver ICs for cellular phones, we stopped selling them. 3.5% decrease from last year.

### • Microwave & Optoelectronic Devices:

¥3,742 billion (consolidated). Chip On Board (COB) type microminiature photo reflectors were used for DVD drives (mainly for PCs) as detection sensors for inner periphery. Thanks to that, sales of optoelectronic devices increased largely. For microwave device (GaAs) ICs, sales of Bluetooth for game consoles decreased but antenna switches for cellular phones increased significantly. 14.7% increase from last year.



NJM2819 is a low noise and low saturation regulator with high-ripple rejection. It uses bipolar process and features output current of 2 A, most suitable for block requiring low input voltage and high output voltage.

## [Product Development by Division and Fiscal 2007 Target]

### ■ Standard IC Division

#### • Operational amplifiers and comparators

Sales remained unchanged from the previous year. We continue to be committed to development of high performance products, such as high-precision and high-speed products. We hold the number one position in the volume of production of operational amplifiers and comparators in Japan. We will continue to sell consumer equipment with "existing functionality at low prices" mainly in Asian markets, and develop and sell industrial equipment with "high performance and high added value" mainly in domestic market.

We will accelerate product development by applications at two Design centers (Singapore and Osaka) built in 2006. Design division in Saga Electronics Co., Ltd. (one of our subsidiaries) established as a domestic design base, in January 2004, plans to develop and design high-performance in-car products and industrial products, focusing on power supply ICs and operational amplifiers in fiscal 2007. For input/output full-swing products that have been enjoying good sales, we will expand our product lineup from consumer AV equipment up to sensor peripheral modules and in-car products. From fiscal 2007, we will be committed to designing and accelerating low-power consumption products (for digital and industrial equipment), ultra-speed and high-precision products (for industrial equipment), and low-noise products. We will also continue to develop high-performance operational amplifier ICs to achieve superior sound quality and plan to begin mass production of them.



NJM2749M 2ch operational amplifier offers low input offset voltage, low offset temperature drift, and uses JFETs (Junction Field-Effect Transistors) at input. It has a low input offset voltage (0.8 mV typ, 2.5 mV max.) and a low offset temperature drift of 6  $\mu\text{V}/^\circ\text{C}$  typ.

# Semiconductor Devices

## • Power-supply ICs

Demand for the low dropout power supply ICs for digital equipment including digital still cameras (DSC) and car-audio equipment held steady.

Our lineup of products developed in recent years has expanded, widening the choice available to customers and resulting in increased sales.

From fiscal 2007, we plan to commercialize high-current and high-voltage power-supply ICs. We will also expand the lineup of high-value-added DC/DC converter ICs based on BCD (Bipolar-CMOS-DMOS mixed) technology, and respond to the system ICs market with our integrated product of the existing series power supply and power monitor ICs.

## • Motor ICs

We have positioned motor ICs for the CPU cooler fan motors as the leading products and were committed to selling the motor ICs for two-phase motor. In addition, we have enhanced the lineup of motor ICs for three-phase DC motor and stepper motors to improve the sales structure by applications.

Our cooling-fan motor-driver ICs (5-V fan motor driver ICs) using CMOS technology account for about 10% of the world market. The features include reduced motor noise and low power consumption, which are unique to our cooling-fan motor-driver ICs.

In fiscal 2007, we will develop high-output current and high-voltage products (for fan motors and stepping motors) using the BCD technology and focus on selling products for amusement devices.



NJU26120 is a digital signal processor with 24-bit DSP core featuring lip sync delay, eala, ealaBass, 7BandPEQ, tone controller, soft clipper, headphone surround sound, and continuous wave detector. Suitable for various types of audio equipment.

## ■ ASSP Division

### • Display-related ICs

Main products in this division are LCD driver ICs for cellular phones, cars, and OA equipment. Whereas the market of organic EL driver ICs was expected to grow, it was forced to struggle. We have promoted white LED backlight driver ICs for color LCDs. As for color LCD driver ICs for cellular phones, we stopped selling them.

From fiscal 2007, we will be committed to designing and selling white LED backlight driver ICs for in-car equipment and medical devices.

### • Audio-related ICs

We focused on selling class-D amplifier ICs for TVs and amusement devices.

We started selling portable audio products-specific ICs.

From fiscal 2007, we will strengthen the promotion of class-D amplifier ICs and also concentrate our efforts on commercializing high-power ICs for car audio systems. In addition, we will be committed to selling memory audio ICs, which are typical products in this digitalized age.

### • Quartz crystal oscillator ICs

Sales of quartz crystal oscillator ICs for cellular phones and flat-screen TVs increased due partly to successful downsizing. We continue to focus on selling lower-voltage and higher-frequency ICs.

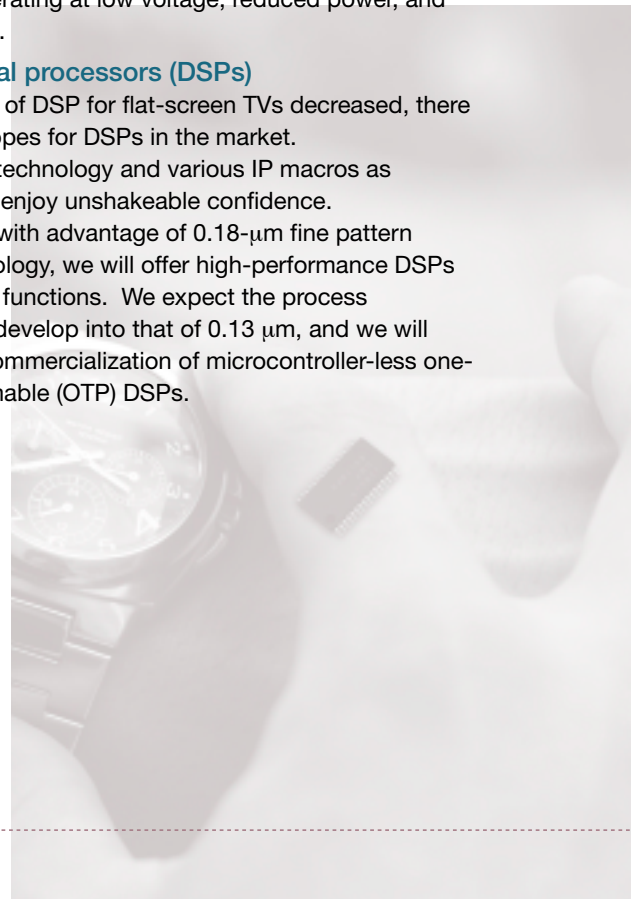
In fiscal 2007, we will be committed to selling quartz crystal oscillator ICs for optical communications and digital equipment operating at low voltage, reduced power, and high frequency.

### • Digital signal processors (DSPs)

Although sales of DSP for flat-screen TVs decreased, there are still high hopes for DSPs in the market.

Our DSP core technology and various IP macros as resources, still enjoy unshakeable confidence.

In fiscal 2007, with advantage of 0.18- $\mu\text{m}$  fine pattern process technology, we will offer high-performance DSPs with additional functions. We expect the process technology to develop into that of 0.13  $\mu\text{m}$ , and we will promote the commercialization of microcontroller-less one-time programmable (OTP) DSPs.







NJW1195 is a 4ch electronic volume with 4-input and 2-output selector. It features resistance ladder volume for low output noise voltage and low harmonics. Available as an electronic volume for 2ch differential transmission with 2-input and 1-output selector. Suitable for pure audio equipment such as player and amplifiers, AV amplifiers, and AV receivers.

## ■ Microwave & Optoelectronic Device Division

### • Microwave devices (GaAs IC)

We started selling new Global System for Mobile (GSM) communications products that we had developed using Low Temperature Co-fired Ceramics (TLCC) technology for two years.

Sales of ICs for cellular phones remain strong. In Japanese cellular phone market, receiver front-end ICs and antenna switch ICs are the main products. We developed new ICs (multiband: W-CDMA, CDMA2000, GSM, UMTS) for all carrier systems including W-CDMA, which support the sales of the GaAs ICs field. With demand for low noise amplifiers for GPS equipped on cellular phones and personal digital assistants (PDAs) increasing, we have been improving the lineup of amplifiers including two-stage (gain switch, bypass circuit) type, amplifier with standby function, and that with advanced low noise filter, etc.

From fiscal 2007, we will start to sell low noise amplifiers with wide band and low harmonics supporting one segment broadcasting for cellular phones and personal computers.

### • Optoelectronic devices

COB type microminiature photo reflectors enjoyed brisk sales as detection sensors for inner periphery of DVD drive and we also expanded sales of them for lens modules for cellular phones.

We completed development of photodiode for Blu-ray mounted on COB package, and it is expected to be used for HD DVD players and the next generation game consoles.

In fiscal 2007, we will accelerate development of remote control receivers with filters to prevent noise from LCD-TV backlight, as well as remote control receivers for AV equipment that we have sold. We will launch light sensors for PDAs and also diversify the product line of optoelectronic devices for LCD TV and light equipment. At the same time, we will promote collaborative research on power amplifiers with universities.



8 is a low noise amplifier designed mainly for one segment broadcasting. It features good gain flatness, and low gain characteristic in out-of-band in the UHF television band, achieving low current consumption, low noise figure and low harmonics. An ultra-small and ultra-thin package adopted.