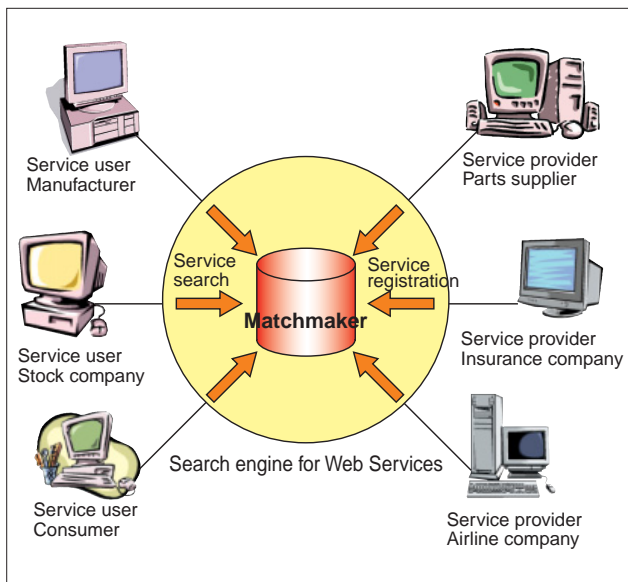


## Web Services with Matchmaker

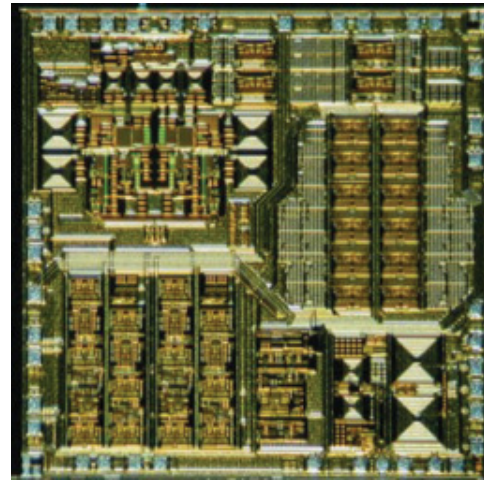


### Overview of Web Services with Matchmaker

Web Services are expected to form the infrastructure for e-business within the next couple of years. Web Services Matchmaker is a new search engine for locating appropriate services designed in cooperation with Carnegie Mellon University, U.S.A. Although most document search engines provide keyword search only, Matchmaker offers users semantic search using ontology and constraints, unifying expressions with a single concept, measuring the distance between different concepts, and choosing the most appropriate one by monitoring the invocation conditions of each service.

Matchmaker will be the key to dynamic Web Services composition in the B2B (Business to Business) world of the future.

## Direct Conversion Receiver IC



Die photograph of receiver IC

A single-chip receiver IC for third generation cellular systems, such as W-CDMA (Wideband-Code Division Multiple Access), has been developed. This IC adopts direct conversion architecture, which directly converts a received signal to the baseband, delivering small-sized low cost terminals. In general, the performance of a direct conversion receiver tends to be degraded due to DC offset, which saturates the receiver chain and deteriorates the received signal waveform. In order to prevent the DC offset, the following techniques were applied.

- A DC offset canceling circuit was embedded in the IC to cancel the DC offset.
- An active harmonic mixer was adopted as a frequency converter to reduce DC offset generation.
- A differential low noise amplifier was used to suppress the DC offset caused by local signal leakage.

Consequently, the DC offset was reduced to not more than 60 mV at the output of the IC. This results in good performance of the receiver chain. A die photograph of the receiver IC is shown in the figure. The manufacturing process was SiGe-BiCMOS (Bipolar Complementary Metal-Oxide Semiconductor) with 35 GHz  $f_T$ . Chip area is 3 mm × 3 mm.

## Zoom/Auto-Focus Micro Camera Module

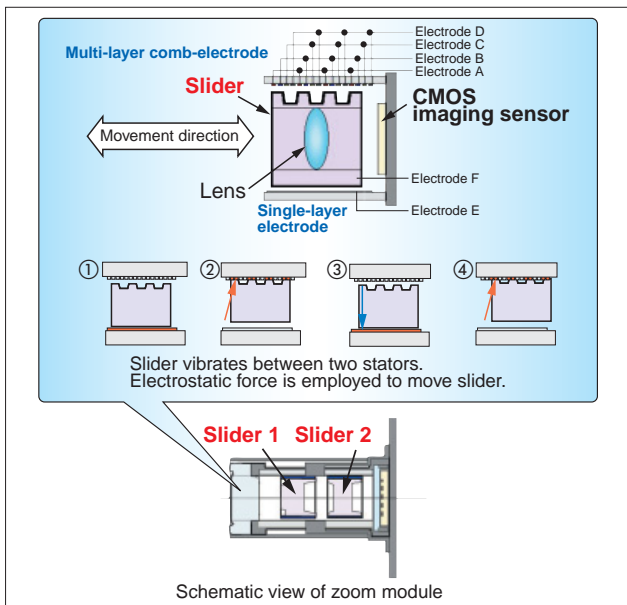


Zoom/auto-focus micro camera module

A zoom/auto-focus micro camera module has been developed for use in mobile devices. An electrostatic actuator, with low power consumption that can easily be miniaturized, is used to move the lens.

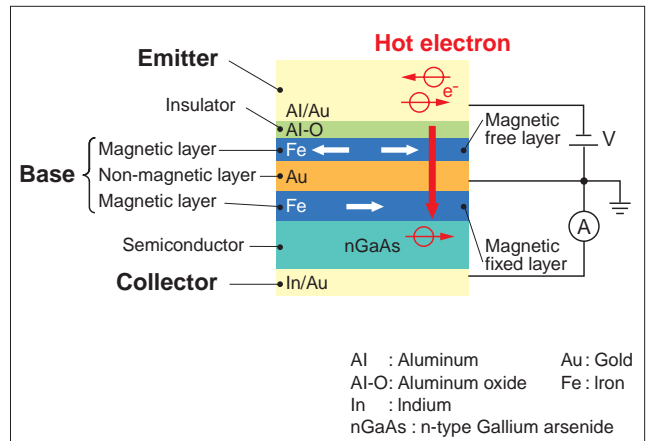
The actuator drives a slider holding the lens along the optical axis using electrostatic forces produced between the slider and the fixed electrodes. This results in a drive power consumption of a mere 20 mW. Due to its simplicity the mechanism also helps in reducing the size to a level comparable to that of a fixed-focal length lens camera module. Furthermore, the mechanical parts of the module can be mass-produced using precision molding.

The micro camera module is expected to be key technology for creating a micro image device market in the future.



Structure and motion sequence of lens drive

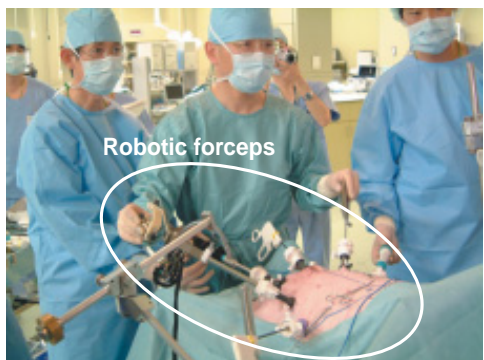
## Operation of Spin-Valve Transistor at Room Temperature



Structure of spin-valve transistor

Toshiba has developed a spin-valve transistor, the output current of which is sensitive to an external magnetic field. The current change at room temperature is as large as 200 %, which exceeds the performance of conventional two-terminal magnetoresistance devices by more than an order of magnitude. It is expected that these transistors will be applied in high-density magnetic storage read heads and in the memory cells of nonvolatile magnetic memory. The high magnetic sensitivity and operability at room temperature of the device is enabled by improving the metal/semiconductor interface by adopting epitaxial growth of the magnetic multilayer on the GaAs substrate. This device is a prototype in the field of spin-electronics, where semiconductor and magnetic technologies are combined for the development of future electron devices.

## Robotic Forceps, Magic Hand for Laparoscopic Surgery

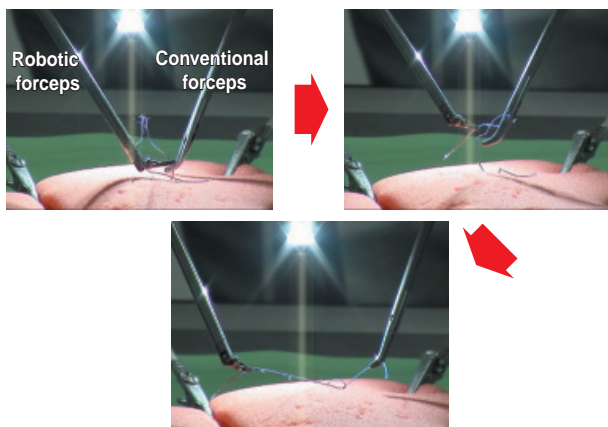


Animal experiment

Toshiba has been developing robotic forceps for laparoscopic surgery, which is a kind of minimally invasive surgery, contributing to the quality of life (QOL) of the patient. The surgeon is easily able to carry out suturing tasks from any direction by dynamically maneuvering the joints of the robotic forceps.

Prototype models of the robotic forceps of 5 mm, 10 mm and 12 mm diameter respectively have been newly developed. Performance tests on the new models are now in progress. Since the robotic forceps are a very simple and low-priced system, the use of these robotic forceps should be widespread resulting in a great contribution to safety and advanced medical treatment for the public welfare.

This development, in collaboration with Keio University, is the partial result of a project concerning an advanced support system for endoscopic and other minimally invasive surgery by the New Energy and Industrial Technology Development Organization (NEDO).



Suturing task performed with robotic forceps (5 mm dia.)

## Toshiba's DNA Chip for Individual Patient Therapy for Hepatitis C



The electrochemical DNA chip

Toshiba has developed an electrochemical DNA (Deoxyribonucleic Acid) chip and detection system that employs an original current detection method to support development of individual treatment regimes for patients infected with hepatitis C.

DNA chips have high densities of DNA probe molecules on the surface of a Si or glass substrate. By studying whether DNA molecules in the samples form bonds with the probe DNA on the DNA chip, Toshiba can investigate the presence of target DNA in a sample.

In Toshiba's electrochemical detection method, intercalator molecules are added to the DNA chip, and Toshiba can detect the existence of bonding between probe DNA and sample DNA by studying the electric current induced by the oxidization of these intercalator molecules.

Toshiba has developed a DNA chip enabling the performance of typing of single nucleotide polymorphisms (SNPs) in the host genes, which can predict the therapeutic effect of interferon.

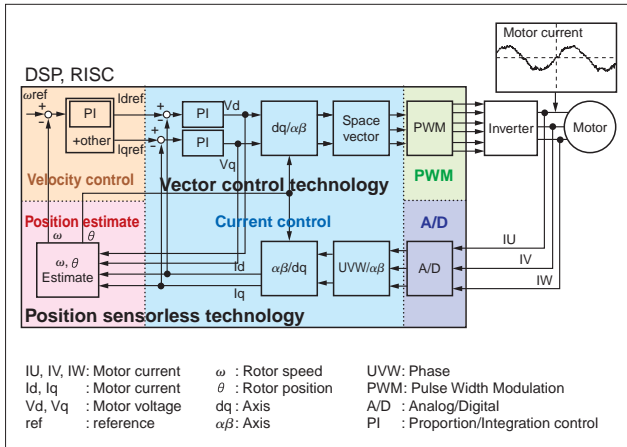
Toshiba has also developed a DNA detection system, which makes cost-effective, simple and accurate DNA analysis possible.

In the next step, Toshiba will develop a DNA chip system for diagnosis of other diseases and prediction of drug side effects aimed at the construction of a standardized platform for DNA analysis that supports individualized therapy regimes.



The DNA detection system

## Sinusoidal Drive Inverters for Air Conditioners



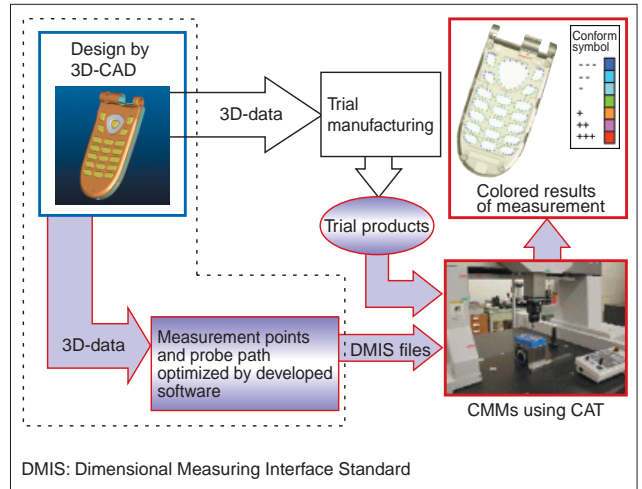
Simplified schematic of sinusoidal drive inverter

Toshiba has developed and commercialized sinusoidal drive inverters for motors to be built into air conditioner compressors, in place of former rectangular drive inverters. The key technologies for the sinusoidal drive are vector control and rotor position sensing without a sensor, both of which are constructed with high speed computing units such as DSP (Digital Signal Processor), RISC (Reduced Instruction Set Computer), and so on. It is possible to realize highly efficient and low vibration/noise compressors with this sinusoidal drive technology. Toshiba has released the top-class energy saving air conditioner series New Plasma Ion Daiseikai™ for home use, Super Power Eco™ for office use, and the inverter series of Vector IPDU™ (Intelligent Power Drive Unit).



Sinusoidal drive inverter product lineup

## Geometry Evaluation Technology for Machinery Components Using CAT



Measurement of components using CAT

The CAT (Computer Aided Testing) system, that measures the geometry of components with CMMs (Coordinate Measuring Machines) utilizing 3D-CAD (Three-Dimensional Computer Aided Design) data, is used for 3D-measurement of components.

The application software that optimizes measuring points and CMM probe paths was developed for CAT system utilization, because the conventional CAT system required a lot of time for off-line programming and the measuring lead-time was too long.

The software developed by Toshiba makes it possible to start measurement immediately after completion of trial manufacturing, and contributes to the dramatic shortening of lead-time for development of products such as cellular phones and personal computers.