

Contribution to the World by Technology

TDK was established for the purpose of industrializing ferrite. Ever since then, we have created products that contribute to the development of society through our unique technology development. For us, doing our part for the world with our technologies also means contributing to society through our businesses. This philosophy is an integral, indelible part of TDK, and our mission will always be to work for social development by way of our high-quality products and services.

Research and development costs



TDK has focused on stepping up new product development for the ever-diversifying electronics sector, in advanced memory products and microelectronics modules for cellular communications in particular. Based on our materials and design technology, we have also concentrated our energies on devices for saving energy and environmentally friendly automotive applications, as well as next-generation infrastructure device research and development.

TDK selected as one of Thomson Reuters' Top 100 Global Innovators





Corporations and research organizations selected for this award are judged not only on patent filing volume, but also on an assessment of whether or not they have commercialized notable inventions on a global scale. Criteria for selection includes: number of patents, success rate, global reach of patent portfolio, and influence of patents in citations. TDK received especially high ratings for number of patents, success rate, and influence of patents in citations.

Sales ratio for our three key sectors: ICT, automotive, and industrial equipment & energy*

93.4

To help us overcome the challenges of the current competitive environment, we at TDK have conducted reviews and revisions of our entire business portfolio over the past few years, implementing structural reforms including the optimization of our manufacturing sites. Because we have made a certain level of progress on these initiatives, we have now concluded large-scale structural reforms. By focusing our business resources on our three priority markets of ICT, automotive, and industrial equipment & energy, as well as our five priority segments as of FY 2014 (mentioned below), we have secured growth and made the shift to a balanced profit structure where we can boost profits in each segment.

*Includes HDD heads and suspensions

Three priority markets and five priority segments





Automotive

electric vehicles (HEV) and electric vehicles (EV), as well as self-driving vehicles currently under develop-

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Magnetics Technology from TDK Leads into the Future

Our mission is contributing to culture and industry through creativity. Ever since our founding days, the TDK Group has been advancing state-of-the-art magnetics technology, with the aim of helping to build a sustainable society. This section highlights a number of products used in areas to which TDK is devoting special attention.

In an increasingly networked world, the power of craftsmanship which is a core strength of TDK also provides advantages when it comes to realizing other goals, such as making mobile devices more compact and versatile or enabling data centers to store more data while consuming less energy

Industrial Equipment & Energy

The use of renewable energy sources is expanding worldwide. The lineup of innovative TDK products in this area is instrumental in efforts to resolve serious issues such as global warming and the depletion o resources.

CICT

Endeveloping wireless charging systems for mobile devices. These not only make charging more convenient, they also help to protect the products against damage from water or sweat.



Wireless charging for mobile devices

Beyond incorporating wireless communication capabilities such as Wi-Fi and Bluetooth, mobile devices and wearable devices these days are starting to go wireless in the charging process as well. TDK has harnessed its advanced knowhow in magnetics technology to create a highly efficient, ultra low-profile wireless charging system. This approach also makes it possible

to eliminate the need for cumbersome battery replacement in very small electronic devices such as hearing aids. The system is suitable mainly for hearing aids and other wearable devices such as smart watches, as well as for mobile devices. It enables charging without physical contact.

The wireless charging systems that we are developing are employed in wireless charging systems for cellular phones, tablets, and various other electronic devices. The convenience of charging by simply placing a device on the charger is of course a huge advantage, but the approach also brings various other benefits. Reliability problems caused by conventional cables and connectors can be eliminated, and resistance against water damage and corrosion can be improved. And since there are no batteries that need to be replaced, the environmental load caused by discarded batteries can also be reduced.

During development, a major focus was on how to downsize the coil while keeping the rise in temperature as low as possible. To find the optimal specifications, various combinations of coil shape and magnetic sheet material and thickness had to be evaluated under real world conditions with actual prototypes. It was a long and difficult process. By utilizing magnetics technology which is one of TDK's strong points, we succeeded in realizing an industry-leading low-profile, light-weight product with high efficiency.

Wireless charging systems require no exposed contacts and therefore are extremely safe, which makes applications for wearables such as hearing aids and other healthcare products highly promising. With the aim of having sophisticated technology enhance the convenience of the end product, we will continue to develop, design, and manufacture products that help in dealing with environmental issues and the rapid aging of society.

tech power

Feng Lung Chien [right] TDK Taiwan Corporation Amos Chen [left] Power Group TDK Taiwan Corporation







We want to help create an environmentally and peoplefriendly society using TDK's

Department Manager, Power Group

Automotive

High-accuracy position sensors made possible by TDK's magnetics technology contribute to improved fuel economy and enjoyable and comfortable driving.



Position sensors

Used in the DCT^\star of automotive, this position sensor, which incorporates a magnet and magnetic sensor chip, performs position detection without physical contact. As the output of the sensor changes according to the orientation of the magnetic field of the magnet, the distance to the target object can be measured with high accuracy. The sensor can be used also when immersed in water, oil, or other fluids, and stable operation is maintained even in environments with high levels of noise



* DCT (Dual Clutch Transmission) is a type of transmission used in motor vehicles. It comprises two separate clutch and gear systems whose engagement with each other is altered in order to change gears. Compared to conventional automatic or manual transmissions, the energy loss when switching gears is significantly lower. n recent years, this system has become increasingly popular, as it helps to improve fuel economy and results in smoother gear changes, which makes for more enjoyable and comfortable driving.

Working together as a team to realize quality that merits the trust of customers

Seiji Fukuoka [left] Manager Automotive Group, Applied Products Section, Sensor Department, Sensor Business Group. TDK Corporation

Toshihiko Oyama [right] ssistant Manager Automotive Group, Applied Products Section. ensor Department, Sensor Business Group, IDK Corporation



Wireless position sensors that can detect distance and rotation angle of target objects are essential components of DCTs, because they can provide accurate data about gear movement. Our newly developed sensor uses three magnets mounted to a moveable element. This allows highly accurate detection over a range of several tens of millimeters, based on the changes in the magnetic field that occur when the element moves. The use of magnets with outstanding environmental resistance ensures stable measurement even when facing the harsh environmental elements to which motor vehicles are exposed, including high temperatures, dust, water, oil, etc. The expertise in magnetics technology gathered by TDK since its founding has led to the realization of compact magnets in a layout that enables reliable detection over a wide area. The smaller size also contributes to a reduction in the use of resources.

During the development process for this product, numerous difficult challenges had to be overcome before the intended functionality and quality could be realized. Many customer consultations and a multitude of specification matching were required, and we also worked across several departments internally and repeatedly came together for discussion sessions. In this way, the problems were eventually solved one by one. As this is a product that helps to improve the energy efficiency of cars, we intend to continue working together as a team towards further improvements in functionality, in order to meet the expectations that customers and society at large are placing on us.

O Industrial Equipment & Energy

Smaller and more robust temperature sensors enable higher functionality and greater energy savings.

NTC (Negative Temperature Coefficient) temperature sensors

These compact sensors use a wafer base and have exposed electrical contacts on the top and bottom, allowing them to be directly incorporated in IGBT (Insulated Gate Bipolor Transistor) power modules. These modules are a type of semiconductor device that plays a vital role in implementing power control for frequency converters in industrial equipment. NTC temperature sensors integrated in power-saving-type IGBT power modules for industrial and automotive drive systems enable accurate temperature monitoring and control.







Precise temperature monitoring is a prerequisite for the most efficient operation possible of IGBT modules in the frequency converters of industrial drive systems. Working in cooperation with leading semiconductor manufacturers, we were aiming for a compact yet robust and accurate wafer-based temperature sensor. The main challenges for my team were to develop a metallization for optimal bonding and to create a component able to fully withstand the high temperatures and pressure occurring during the semiconductor assembly process. These challenges were met and overcome through persistent repeated attempts. The result is the S860 series of NTC temperature sensors which can measure very delicate resistance value changes at temperatures as high as 125 °C. This makes it possible to operate the IGBT power module at its limit temperature where efficiency is highest, which in turn contributes to making industrial drive systems more energy efficient.

Our next goal, a new product currently under development, is a sensor that will sustain operation at up to 200 °C. It is destined for use in the next generation of power modules. By expanding our lineup of embedded-type NTC sensors, we aim to contribute to further energy savings

C DK's Vision for Future Society

At TDK, we consider it our mission to utilize our unique products and technologies for the greater good. Based on this vision, we seek to maximize the possibilities of the world of electronics. Here we outline our proposed contributions to the future.

Building a lively, upbeat society where people can live in accordance with who they really are

Applications in medical and health care fields



The percentage of elderly people is on the rise around the world, particularly in developed countries. At TDK, we are forging ahead with technical innovation with the goal of enabling people to live as they desire—and in good health—as they age, a wish common to everyone on the planet.

As more and more medical and healthcare equipment and devices enabling people to maintain optimal health and a comfortable living environment become available, TDK makes recharging these devices ever-more convenient with our wireless charging technologies. Our simple wireless system, an example of people-friendly equipment that does not require setup, eliminates risks such as electric shock and short circuits.

In addition, TDK's magnetic sensor technology plays an important role in preventive medicine, a field critical to the treatment of illness. Our high-performance sensors, which are being built into a variety of medical and healthcare devices, are now expected to come into a wide range of uses. They can help, for instance, to prevent serious diseases by accurately assessing blood flow and detecting irregularities such as blocked blood vessels at an early stage. In addition, our sensing technologies can assist people with disabilities in moving better by detecting neural signals, which in turn lessens the burden of physical labor put on nursing care personnel. In this way, we do our part for society through product development.

We offer new value via a fusion of regional resources and elemental technologies

Doing our part in the energy field



In Japan, for instance, TDK works to fuse regional resources and elemental technologies to resolve the two key social issues of national low energy self-sufficiency rates and the withdrawal of industry from the regions, while at the same time offering new value.

By utilizing TDK's sensing technologies, we will accelerate the introduction of IT in the various businesses which have previously been relying on experience and intuition.

In doing so, we will nurture regional businesses to become profitable. Meanwhile, we also maximum natural energy use with a view to meeting local electric power needs. TDK's power electronics products and anti-noise parts—which serve to cut costs associated with energy conversion and conveyance—facilitate the efficient use of energy. In addition, our research and development is also progressing in the area of harnessing miniscule amounts of energy, including heat, vibration, pressure, and temperature variation in the surrounding environment.

As the task of securing stable energy sources becomes increasingly difficult in tandem with climate change and world population growth, we seek to build systems where energy is generated and consumed in the same place, thereby fostering a more dynamic community.