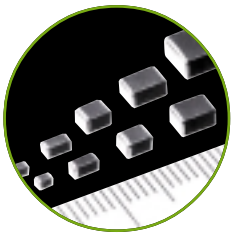
at the forefront of progress

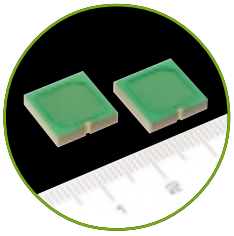
FOCUSED ON TWO STRATEGIC FIELDS

Exciting 108 puts Communications and Recording center stage. TDK's core competence in materials, process and design technologies gives it the credentials to play a leading role. Underpinned by these strengths, TDK is aggressively researching new technologies and seeking to establish powerful market positions.

COMMUNICATIONS RECORDING COMMUNICATIONS RECORDING



MULTILAYER CERAMIC CHIP CAPACITOR COMPATIBLE WITH CONDUCTIVE ADHESIVE
This multilayer ceramic chip capacitor, used in automotive-related applications, is compatible with conductive adhesive, which is extremely resilient to heat and vibrations. As no solder is used when mounting components, this capacitor is also environmentally friendly.



COMPACT, HIGH-PERFORMANCE PATCH ANTENNA FOR ETC SYSTEMS
TDK developed this patch antenna for use in ETC (Electronic Toll Collection) terminals fitted to automobiles. In doing so, TDK tapped its hybrid multilayer techniques to create an antenna that is more compact and boasts higher performance than existing products.

COMMUNICATIONS

THE RAPID ADVANCE OF DIGITAL NETWORKS

The transformation in communications will gather momentum as digital networking progresses. High-speed networks using ADSL lines, cable television networks and optical fiber are steadily being woven into the infrastructure of societies. The combination of these high-speed communications lines and the Internet is heralding the age of high-capacity broadband services. Wireless communications, notably mobile phones, are just as much a part of the story. Enhanced functionality and higher speeds are set to usher in a mobile broadband era in wireless communications, too.

A TRI-POLAR STRUCTURE FOR DEVELOPING COMMUNICATIONS TECHNOLOGIES

TDK is acting to stay abreast of the changes shaping communications. One action was to establish the Telecom Technology Development Center (TTDC) in Japan and later TDK R&D Corp. as the U.S. base of TTDC. These R&D bases join TDK Electronics Ireland (TEI) in Europe to form a formidable tri-polar structure for developing communications technologies worldwide.

The International Telecommunication Union (ITU) is championing IMT-2000 (International Mobile Telecommunications-2000) as a universal, international protocol for mobile communications. For the time being, though, Europe, the U.S. and Japan will

use different formats. TTDC aims to keep its finger on the pulse of each of these regions, responding to their different needs. Concurrently, it is pushing ahead with development of technologies targeted at two markets. One is high-frequency components and modules for mobile phones. The other market is Bluetooth™ and electronic components for high-speed LANs. TTDC will also develop products for optical communications, which is ultimately expected to become the dominant pathway for wired networks.

STEADY PROGRESS IN DEVELOPING COMMUNICATIONS PRODUCTS

Wireless Communications Field

Wireless communication is widely used in fields ranging from mobile phones and automotive applications to corporate and home networks. TDK's innovative products and technologies are giving it a growing presence in this area.

❑ Mobile Phones

The trend in electronic components for mobile devices is toward further miniaturization, lighter weight, enhanced functionality and lower prices. TDK's expertise in materials technology as well as in thin-layer formation and multilayering processes enable it to cater to this trend. TDK is working toward volume production of multilayer chip capacitors just 0.6mm x 0.3mm in size. Another focus is modularization of radio frequency (RF) circuits, which hold the key to making smaller and lighter mobile phones.

COMMUNICATIONS RECORDING COMMUNICATIONS RECORDING

❑ ITS (Intelligent Transport Systems)

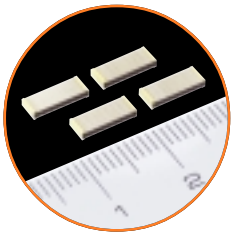
ITS such as ETC (Electronic Toll Collection) systems for expressways are becoming a reality in some parts of Japan. More will be installed. This is a field that will be driven by technological innovation. TDK wants to be at the forefront of this trend. Tapping its proprietary expertise in stacking ultra-thin layers of different types of materials to form tiny multilayer components, TDK developed two products for ETC systems: a patch antenna that is used in terminals fitted to vehicles and a compact, high-performance bandpass filter (a filter that allows only signals within a specific band of frequencies to pass) for the 5.8GHz high frequency range.

❑ Bluetooth Equipment and Wireless LANs

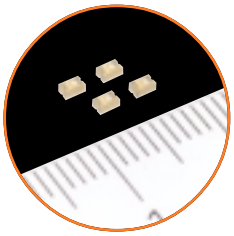
Bluetooth is an international standard in low-power wireless networks. It's fast becoming part of the vernacular. TDK has developed a nondirectional monopole antenna for wireless communications equipment operating in the 2.4GHz spectrum. Furthermore, TDK has invested in a U.S.-based venture for the development of modules and cards for high-speed wireless LANs in the 5GHz bandwidth. These innovations and actions symbolize TDK's determination to apply its unrivaled materials and circuit technologies to produce multilayer hybrid modules to deliver products that match the needs of customers in the broadband and mobile communications era.

Wireline Communications

ADSL, technology that uses ordinary copper lines to transmit digital data at high speed, is taking hold in Japan. TDK is keeping pace with emerging needs. Take TDK's POTS splitter, for example. Dividing signals into different elements, this device is crucial for facilitating the transmission of voice and data traffic at different frequencies over the same line. TDK has also developed a coil for a POTS filter used in ADSL modems. Optical communications is another strategic area. TDK already supplies optical isolators and other products. Moving forward, TDK will consider developing optical communications technologies that draw on its expertise in applications for single crystal garnet.



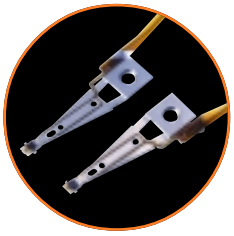
MULTILAYER CHIP ANTENNA FOR BLUETOOTH
Leveraging its hybrid materials and hybrid multilayer techniques, TDK developed this compact, high-performance antenna that stands apart from existing types.



FILTERS FOR WIRELESS ETC COMMUNICATIONS
This bandpass filter for wireless communications operates in the 5.8GHz high-frequency range used in ETCs. It was developed using hybrid multilayer techniques and is around two-thirds the size of existing filters.

COMMUNICATIONS RECORDING COMMUNICATIONS RECORDING

POTS SPLITTER FOR ADSL
TDK developed this POTS splitter for ADSL, that uses conventional copper phone lines to transmit digital data at high speed. This splitter also showcases TDK's advanced technologies.



MAGNETIC TUNNELING JUNCTION HEADS
TDK is developing magnetic tunneling junction heads (TMR), the next generation of GMR heads, with an eye on increasing HDD capacity.

RECORDING

PERIPHERAL STORAGE TECHNOLOGIES

The advent of the broadband era is fueling an increase in streaming video, image files and other forms of high-volume data. But how will all this data be stored? High-capacity HDDs and optical media, most notably DVDs, hold the answer.

HDDs have the edge in providing high-capacity storage and fast access. Technological progress is expected to continue unabated. While this makes the outlook for HDD head suppliers bright, companies must keep up with the astounding pace of progress in magnetic recording heads to succeed. Areal recording density is increasing at a rate of 100% per year. TDK is at the forefront of this progress. In fiscal 2001, TDK succeeded in developing a magnetic tunneling junction head (TMR). And to lay the groundwork for future advances, a team of Japanese and U.S. researchers at TDK's Data Storage Technology Center (DSTC) demonstrated in January 2001 the

feasibility of a technology capable of achieving an areal density of 100GB per square inch, the highest in the world. Not limiting itself to heads, TDK will also explore ways to achieve the technological breakthroughs needed so that hard disks can keep up with advances in heads.

Improvements in the ease-of-use of PC software are expected to boost HDD demand. To respond to this market trend, DSTC is focusing not only on raising areal density, but also on making HDD heads at a competitive cost for diversifying applications.

PROGRESS IN OPTICAL RECORDING TECHNOLOGY CONTINUES

Optical recording is strategically positioned alongside magnetic recording as a central R&D theme at DSTC. In fiscal 2001, TDK again broke new ground. For one, it achieved a data transmission rate of 100Mbps in an optical disk drive. Other accomplishments included development of mastering technology compatible with DVD-RW Ver.1.1, the use of a metallic responsive layer to create a 4X recording film, and a DVD that can be used with a blue laser.

In the current fiscal year, TDK intends to leverage blue laser technology to develop a DVD with 200GB of storage capacity and a data transmission rate of 200Mbps.

With these and other technologies, TDK is squarely taking aim at the Communications and Recording markets—and its goals in Exciting 108.

COMMUNICATIONS RECORDING COMMUNICATIONS RECORDING

HIGH-CAPACITY OPTICAL MEDIA
By developing high-speed phase-change layers, using blue semiconductor lasers and high-NA lenses, TDK has succeeded in developing a phase-change optical disc with a high recording data transmission rate of 70Mbps.