

Piezo components for automotive

New EPCOS copper piezo actuators set benchmark

- Long operating life of more than 1 billion switching cycles at 170 °C
- Performance increased by 20 percent
- Piezoelectric coupling factor of more than 75 percent

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TDK Corporation presents the third generation of EPCOS piezo actuators with copper internal electrodes, which offer both improved performance and higher cost-effectiveness. These innovative actuators are characterized by their outstanding stability and reliability. They can complete a billion switching cycles without failures at 170 °C. Silver-palladium actuators already exhibit significant failure rates under these extreme conditions. The new copper piezo actuators thus set the benchmark with respect to operating life. The maximum number of cycles even under harsh operating conditions such as high temperature and humidity is one of the most important criteria for the use of piezo actuators in energy-efficient fuel injection systems for automobiles.

The third generation of EPCOS piezo actuators with copper electrodes is designed with a minimum proportion of inactive zones in the multilayer actuator and thus achieves the highest possible volume efficiency. As a result, the actuator performance is 20 percent higher than that of conventional designs of the same size. The basis for this is a ceramic material newly developed by TDK, whose piezoelectric coupling – conversion of electrical power into mechanical power – is higher than 75 percent. Thanks to this innovative material in combination with the volume efficient actuator design, these new copper piezo actuators have a significantly higher performance than predecessor models and competitor products.

TDK is still the only company to use relatively inexpensive copper for the internal electrodes of its piezo actuators. In contrast, competitors use silver-palladium alloys. In the case of very high proportions of silver in the electrode material, however, silver migration can occur and thus cause failure of the actuators – especially under high humidity conditions. In addition to the use of copper internal electrodes, TDK has developed a new lead-free high melting metal bond that exhibits no loss of contacting, even at high temperatures. The new piezo actuators withstand a 2000-hour test at 200 °C with no signs of embrittlement.

Glossary

- Piezo actuator: a ceramic multilayer component which expands when a voltage is applied and develops considerable force

Main applications

- Fuel injection systems for diesel and gasoline engines

Main features and benefits

- Significantly improved stability and reliability
- Long operating life of more than 1 billion switching cycles at 170 °C
- 20 percent greater performance than conventional designs
- Piezoelectric coupling of more than 75 percent
- High temperature tolerance up to 200 °C
- Compact dimensions thanks to highest possible volume efficiency

About TDK Corporation

TDK Corporation is a leading electronics company based in Tokyo, Japan. It was established in 1935 to commercialize ferrite, a key material in electronic and magnetic products. TDK's portfolio includes electronic components, modules and systems* marketed under the product brands TDK and EPCOS, power supplies, magnetic application products as well as energy devices, flash memory application devices, and others. TDK focuses on demanding markets in the areas of information and communication technology and consumer, automotive and industrial electronics. The company has a network of design and manufacturing locations and sales offices in Asia, Europe, and in North and South America. In fiscal 2014, TDK posted total sales of USD 9.6 billion and employed about 83,000 people worldwide.

* The product portfolio includes ceramic, aluminum electrolytic and film capacitors, ferrites, inductors, high-frequency components such as surface acoustic wave (SAW) filter products and modules, piezo and protection components, and sensors.

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