

Piezo actuators with haptic feedback

New dimensions in performance

- Unrivalled acceleration, force and response time
- Compact and powerful piezo technology
- Unprecedented quality of haptic feedback for a broad range of applications

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TDK Corporation presents the innovative piezo actuator with haptic feedback and integrated sensor functionality. The new actuator features unrivalled performance in terms of acceleration, force and response time, and thus offers an unprecedented quality of haptic feedback. The compact and powerful actuator enhances the sensory experience of HMIs significantly by engaging the full range of human tactile sensitivity.

The new actuator is based multilayer piezo plates with cost-effective copper inner electrodes. Thanks to the multilayer technology the actuators can be driven with relatively low operating voltages up to 120 V. When activated, the piezo plates only expand minimally in the z axis, but due to the constant volume of the piezo effect contract simultaneously in both the x and y axes. The new component employs cymbals on both sides of the plate as levers to amplify the contraction by a factor of 15 in the z axis. The actuator is initially available in two types, a 5 N type that achieves a displacement of up to 100 μm and a 20 N type that can achieve a displacement of more than 200 μm . Despite their compact dimensions of 12.7 mm x 12.7 mm x 1.6 mm and 26 mm x 26 mm x 2.4 mm, respectively, the new actuators can generate forces of up to 5 N and 20 N.

Compared with conventional electromagnetic solutions such as eccentric rotary motors (ERMs) and linear resonant actuators (LRAs), the piezo actuator with haptic feedback features the highest acceleration and force, the lowest insertion height and the fastest response time, all in a single component with integrated sensor functionality: Under a load of 0.1 kg, the 5 N type delivers an acceleration of 5.0 g with a rise time of 2 ms while the 20 N type features 15.0 g after just 1 ms.

Unlike conventional electromagnetic solutions the piezo actuator with haptic feedback can excite the entire stimulation range between 1 Hz and 1000 Hz. They thus have no significant frequency or amplitude limitations for customized haptic feedback to key human mechanoreceptors. In this way, the new actuator enables designers to custom develop high-definition haptic feedback profiles that users expect from cutting-edge HMIs. Applications for the piezo actuator with haptic feedback can be found, for example, in vehicles, smartphones and tablets, household appliances, ATMs and vending machines, game controllers, industrial equipment and medical devices.

Main applications

- Vehicles, smartphones and tablets, household appliances, ATMs and vending machines, game controllers, industrial equipment and medical devices.

Main features and benefits

- Very large forces of 5 N and 20 N, respectively
- Large displacement of 100 µm and 200 µm, respectively
- Extremely low insertion height of 1.6 mm and 2.4 mm, respectively

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 2016, TDK posted total sales of USD 10.2 billion and employed about 92,000 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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Please forward reader inquiries to marketing.communications@epcos.com.

Contacts for regional media

Region	Contact		Phone	Mail
ASEAN	Mr. K. UNTERWEGER	EPCOS Components PTE LTD SINGAPORE	+65 6597 0618	klaus.unterweger@epcos.com
Greater China	Ms. S. SUEN	EPCOS LTD HONG KONG	+852 3669 8224	stella.suen@epcos.com
Europe	Mr. C. JEHLE	EPCOS Munich, GERMANY	+49 89 54020 2441	christoph.jehle@epcos.com
India	Mr. G. DALVI	EPCOS India Private Ltd. Mumbai, INDIA	+91 22 2575 0804	girish.dalvi@epcos.com
Japan	Mr. A. TESHIMA	TDK Corporation Tokyo, Japan	+813 6852 7102	pr@jp.tdk.com
North America	Ms. D. MARTIN	EPCOS Inc. Fountain Hills AZ, USA	+1 480 836 4104	debbie.martin@epcos.com
South America	Mr. C. DALL'AGNOL	EPCOS do Brasil Ltda. Gravataí, BRAZIL	+55 51 3484 7158	candido.dallagnol@epcos.com