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Epson Toyocom Develops Ultra-Small, High-Performance Crystal Atmospheric Pressure Sensor Using QMEMS Technology

Epson Toyocom Corporation, the leader in crystal devices, has developed an extremely small, high-performance quartz crystal atmospheric pressure sensor that employs an original pressure-sensing structure using QMEMS^(*1) technology. The new sensor has a cubic volume of only 12.5 cc and weighs just 15 grams yet is accurate to within 10 Pa^(*2), or about 1/10,000 of one bar^(*3), and boasts a resolution^(*4) of 0.1 Pa. Commercial development is scheduled for completion sometime in fiscal 2009.

In the past, pressure sensors have generally had to trade off performance for smaller size, and those for high-performance applications tended to be larger. Epson Toyocom's new crystal pressure sensor, however, provides both high accuracy and high resolution in a diminutive package, thanks to an extremely stable oscillating frequency provided by the tuning-fork crystal unit, which serves as a pressure-sensing element, and to a newly developed original pressure-sensing structure made possible by QMEMS technology.

The performance and features of the new pressure sensor will greatly aid device designers in their efforts to reduce the size and improve the performance of devices for a variety of meteorological and security applications. Among the applications will be

- accurate measurement of barometric pressure in meteorological observations
- measuring differences in elevation (in approximately one centimeter increments) using barometric pressure
- detecting slight changes in internal pressure resulting from the opening and closing of inside doors and windows

The new product also has potential applications in everyday electronic devices to provide accurate measurements of barometric pressure, and Epson Toyocom is deploying the original pressure-sensing structure used in this product to develop crystal pressure sensors for a variety of applications. The company aims to further improve performance and reduce size through technological advances in QMEMS-based micro-fabrication, high-stability crystal oscillation circuits, and high-precision sensors.

Main specifications

Item	Specifications
Pressure sensing range	50-150 kPa (absolute pressure ^(*5))
Total pressure accuracy	±10 Pa
Resolution	0.1 Pa
Operating temperature range	-20 to +70°C
Interface	RS-232C
External dimensions	25 x 25 x H20 mm (excluding fixtures)

Glossary

*1 QMEMS

QMEMS is a combination of “Quartz,” a crystalline material with excellent characteristics such as high stability and high precision, and “MEMS” (micro electro mechanical system). QMEMS quartz devices are created using quartz material instead of the semiconductors used by MEMS. We perform precision microfabrication on the quartz material to offer high performance in a compact package.

QMEMS is a registered trademark of Epson Toyocom.

*2 Pa (pascal)

The SI unit of pressure. A 10-cm change in elevation results in an approximately 1 Pa change in barometric pressure.

*3 Bar

A unit of a pressure. One bar is equal to the pressure applied by the atmosphere to the surface of the earth at sea level (1 bar is nearly equal to 1 kg per sq cm).

*4 Resolution

The level of measurement or detail that can be distinguished by a sensor or similar device.

*5 Absolute pressure

A pressure measurement with reference to absolute vacuum.