

Press Release
June 2011

New Epson Inertial Measurement Unit Offers World Class Energy Consumption and Size

- New IMU ideal for embedding in industrial products -

Munich, June 6, 2011: Seiko Epson Corporation ("Epson", TSE: 6724) today announced the commercial development of a new inertial measurement unit^(*) (IMU) named the S4E5A0A0. The new IMU provides stable, accurate measurement capability and among the lowest power consumption and smallest form factor in its class*. Epson will begin shipping samples in July 2011.

IMUs are devices that can accurately sense inertial motion, from slight inclinations to large movements. Traditionally, IMUs were embedded in specialized equipment for aerospace applications and other uses that require highly accurate, stable measurement of inertial measurement. Then, several years ago, IMUs developed for industrial applications began finding their way into a variety of products in this growing new market. However, these industrial IMUs not only needed to be more accurate and stable, they also needed to be smaller and draw less power, to make them easier to embed in products in this market.

Recognizing this need, Epson, a leader in the crystal device industry, set out to develop a new IMU, using an original approach that combined its patented QMEMS⁽²⁾ quartz gyroscopic (angular rate) sensors⁽³⁾ with the semiconductor technology and know-how it developed for GPS and other positioning devices.

Epson's development effort culminated in the commercialization of the S4E5A0A0, an IMU that offers outstanding measurement accuracy and stability while being among the smallest and most energy efficient IMUs in its class. The compact S4E5A0A0 module is 24 x 24 x 10 mm and consumes 30 mA when operating at 3.3V.

The IMU includes triple gyroscopes and a tri-axis accelerometer⁽⁴⁾, for six degrees of freedom. The gyroscope provides high accuracy and stability (± 300 deg/s), while the accelerometer offers a dynamic range of ± 3 G. It offers excellent angular rate measurement performance (angle random walk⁽⁵⁾: 0.24deg/ $\sqrt{\text{hr}}$) and stability (gyro bias instability⁽⁶⁾: 6 deg/h). The device is also equipped with industry-standard SPI and UART interfaces.

The S4E5A0A0 is suited to industrial applications in areas such as inertial motion analysis and control, motional analysis and control, moving object control, vibration control and stabilization, and navigation systems. The smaller, lighter, lower-power IMU gives designers of these applications greater design flexibility and allows these Epson IMUs to be embedded in industrial products where this was once not an option.

"The new inertial measurement unit is an important milestone in product development for Epson," said Torao Yajima, managing director. "By leveraging our renowned crystal and semiconductor technologies, Epson has once again shown how it is leading the industry in providing solutions that meet significant market needs and generate value for customers."

In its SE15 long-range corporate vision, Epson has identified sensing as an important growth business. The company will thus continue to leverage its crystal-based QMEMS technology in the sensing of quantities such as time, pressure and angular velocity, driving further advances in convergence with semiconductor and software technologies, to provide customers with a wide array of device solutions, including products, modules and systems that are easy to use and that they know they can trust.

* According to Epson research as of the end of May 2011

Upcoming trade shows

Epson will have booths at a pair of upcoming trade shows, where it will demonstrate the new IMU.

- Sensors Expo & Conference
Date: June 6-8 Place: Rosemont, Illinois, U.S.A Booth number: 909
Official web site: <http://www.sensorsmag.com/sensors-expo>
- Sensor+Test 2011
Date: June 7-9 Place: Nürnberg, Germany Hall 12, booth number: 12-655
Official web site: <http://www.sensor-test.de/welcome-to-the-measurement-fair-sensor-test-2011/>

Features and specifications of the S4E5A0A0 IMU

- 1) Small and lightweight
External dimensions: 24 x 24 x 10 mm
Weight: 7grams
- 2) Low power consumption
30 mA at VDD = 3.3V
- 3) High-accuracy, high-stability measurement performance
 - Angle random walk: less than 0.24 deg/ $\sqrt{\text{hr}}$ (accuracy)
 - Gyro bias stability: less than 6 deg/hr (stability)
 - Initial bias error: ± 0.5 deg/s (1σ) (static stability)
- 4) Comes standard with SPI and UART digital serial interfaces

Main current applications

- Motion analysis & control
- Control of moving objects
- Navigation systems
- Vibration control and stabilization
- Movement analysis

Examples of potential industrial applications:

- High-precision measuring instruments
- Vehicle dead reckoning and vibration analysis
- Motion analysis of vehicles themselves
- Satellite antenna and camera tracking and stability control
- Vibration sensing in control systems for machine tools

Glossary

(*1) inertial measurement unit (IMU)

A device for sensing inertial motion that consists of angular rate sensors on three axes and accelerometers in three directions. IMUs are primarily used to measure and control the behavior of mobile objects.

(*2) QMEMS

QMEMS is a combination of “Quartz,” a crystalline material with excellent characteristics such as excellent frequency stability and high precision, and “MEMS” (micro electro mechanical system). QMEMS devices, produced via a microfabrication process on a quartz material instead of on a semiconductor material like MEMS, offer high performance in a compact package.

QMEMS is a registered trademark of Epson Toyocom.

(*3) gyroscopic (angular rate) sensor

A sensor that measures rotation angle (angular rate) of an object per unit of time with respect to a reference axis.

(*4) accelerometer

A sensor that measures changes of velocity per unit of time

(*5) angle random walk

The angular error buildup with time that is due to white noise in angular rate

(*6) gyro bias instability

The random variations having 1/f noise density characteristics of gyro output bias calculated by averaging a specified finite length of sampling times and time intervals

Links

See the following page for more information about this product:

<http://www.epson.jp/e/products/device/>

See the You Tube product demo (Epson Device Channel):

<http://www.youtube.com/user/epsondevicejp#p/u>

Read the September 30, 2010, press release announcing the development of the IMU:

<http://www.epson.jp/osirase/2010/100930.htm>

About Epson Europe Electronics GmbH

Epson Europe Electronics GmbH is a marketing, engineering and sales company and the European Headquarters for Electronic Devices of the Seiko Epson Corp., and Epson Toyocom Corp., Japan. Since 1989 headquartered in Munich/Germany with 60 employees, Epson Europe Electronics GmbH has several European sales representatives and has a European-wide network of distributors. Epson Europe Electronics provides value added services for Semiconductors and Quartz Devices targeted to the mobile communication, automotive and home visual market. Epson products are recognised for energy saving, low power, small form factors and rapid time to market.

Information about Epson Europe Electronics GmbH is available in the Internet under www.epson-electronics.de

About Epson

Epson is a global imaging and innovation leader that is dedicated to exceeding the vision of customers worldwide through its compact, energy-saving, high-precision technologies, with a product lineup ranging from printers and 3LCD projectors for business and the home, to electronic and crystal devices.

Led by the Japan-based Seiko Epson Corporation, the Epson Group comprises nearly 75,000

employees in 100 companies around the world, and is proud of its ongoing contributions to the global environment and the communities in which it operates.

<http://global.epson.com/>

Further information

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