STMicroelectronics takes pressure sensors to new heights

Medical Design Technology

From 750m below ground to the top of Mount Everest, smart phones and other portable devices will soon be able to pinpoint their height variation relative to sea level to better than one meter, thanks to the most recent MEMS (Micro-Electro-Mechanical Systems) sensor from STMicroelectronics (NYSE: STM), the world's leading supplier of MEMS sensors for consumer and portable applications.

The new LPS001WP is a tiny silicon pressure sensor that uses an innovative technology to provide extremely high resolution measurements of pressure – and therefore also of altitude – in an ultra-compact and thin package ideal for use in smart phones, sports watches, and other portable equipment, as well as in weather stations and automotive and industrial applications.

"MEMS technology is allowing us to continually develop new sensors that can measure physical parameters such as linear or angular motion, pressure, or magnetic fields at ever-decreasing cost and increasing accuracy," said **Benedetto Vigna**, General Manager, MEMS, Sensors and High-Performance Analog Division, STMicroelectronics. *"How these sensors are applied to meet consumer needs is limited only by our imaginations."*

One of the first expected applications is the enhancement of portable devices equipped with traditional GPS functions that can only identify the location of the device in two dimensions. With the addition of the LPS001WP, the same devices would be able to identify the precise location in all three dimensions, allowing, for example, a mobile phone to send a call to an emergency fire, medical or police service that identified not only the location of the building but also the particular floor.

The LPS001WP has an operating pressure range of 300 – 1100 millibar, corresponding to the atmospheric pressures between -750 and +9000m relative to sea level, and can detect pressure changes as small as 0.065millibar, corresponding to 80cm of altitude. The device is fabricated using a proprietary ST technology called "VENSENS" that allows the pressure sensor to be fabricated on a monolithic silicon chip. Manufacturing the device in this way eliminates wafer-to-wafer bonding and maximizes reliability.

The pressure sensor in the LPS001WP is based on a flexible silicon membrane formed above an air cavity with a controlled gap and defined pressure. The membrane is very small compared to traditional silicon micro-machined membranes and is protected from breakage by built-in mechanical stoppers. The membrane includes a piezoresistor, a tiny structure whose electrical resistance varies as the membrane flexes in response to changes in the external pressure. The change in

resistance is monitored, thermally compensated, and converted to a digital value that can be read by the equipment's host processor using the industry-standard I2C or SPI communications protocols.

Main technical features of the LPS001WP

- High resolution of 0.065millibar - able to detect to 80cm in altitude variation;
- ST's proprietary VENSENS technology providing high burst resistance, up to 20 times full scale;
- Integrated temperature sensor enabling temperature span compensation;
- Fab calibration of pressures and temperatures, eliminating the need for in-house calibration of shipped devices;
- Supplied in a small plastic land-grid-array (HCLGA-8L) package. The package is holed to allow external pressure to reach the sensing element.

The LPS001WP is the latest addition to ST's expanding portfolio of MEMS sensors that target high-volume/low-cost applications that benefit from ST's complete MEMS manufacturing chain, from wafer processing to packaging and testing. The device will be available from December 2010 at a typical price of $2.8 in quantities of 1000 units.

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