

FOR IMMEDIATE RELEASE

New High Temperature SOI Electronics Extends the Temperature Range of Pressure Transducers

February 1, 2005

Kulite Semiconductor Products, Inc. has developed new high temperature electronics to be used with high output pressure transducers, designed for pressure measurements at temperatures of +250°C (+482°F) and beyond. These transducers have a high level output, 0.5V to 5V typical, and operate with unregulated supplies from 8V to 32V.

The key factor that made these developments possible was an electronic interface designed using an SOI (Silicon On Insulator) process integrated with Kulite sensors using SOI technology. As Kulite SOI pressure sensors have been in use for several years, here are some details of the new electronic interface.

The main target in the design of the circuit was the high temperature capability, in excess of any other commercially available devices. For this purpose, the SOI process was selected, in which the individual components of the circuit are dielectrically isolated from each other. This feature eliminates the main problems encountered at high temperatures with other circuits, which are the parasitic leakage currents. These currents, which typically double every 6°C, render conventional electronics inoperable above +125°C (+257°F), and only a few carefully designed circuits were able to achieve a maximum operating temperature of +175°C (+347°F).

Kulite designed the new SOI electronic interface such that all functions necessary for a high output level transducer are implemented on a single chip. These functions are: pre-regulator, precision regulator, instrumentation amplifier, output stage, gain control, and offset control. Kulite designed the topology of the circuit, which was then layed out and manufactured by an outside contractor.

Due to the single chip implementation, Kulite can provide precision, +250°C (+482°F) high level pressure transducers in extremely small sizes, e.g. 0.5in diameter. Considering the proven advantages of our SOI sensors, such as high proof and burst pressure, very good stability, low hysteresis and non-linearity, these new transducers will enable high accuracy pressure measurements in applications where such measurements were impossible before. The new transducers are ideally suited for:

- internal combustion engine measurements (in-cylinder pressure, exhaust, etc)
- oil and geo-thermal explorations and drilling
- gas turbines
- aircraft engines
- jet engines stall detection

Another advantage of the new high temperature transducers is the elimination of bandwidth and speed limitations of present implementations. Currently, if a pressure measurement is needed in a high temperature environment, tubing is used such that the sensor is exposed to a lower temperature. This approach however has the significant disadvantage of bandwidth and speed limitations. Using the new Kulite high temperature transducers, all the characteristics of the pressure signal, static and dynamic, can be measured. This advantage is in fact enhanced by the small size of the sensor, which results in a high measurement bandwidth.

Presently the new transducers have a voltage output; we are in the process of developing similar transducers with a current output (two-wire, 4 to 20mA).

The table below shows the typical characteristics of this new family of transducers.

Operating temperature range	-55° to +250°C (-67° to +482°F)
Compensated temperature range	-55° to +225°C (-67° to +437°F)
Available Pressure ranges (specify)	1psi to 20,000psi
Pressure measurement mode	Absolute, Gage, Differential
Proof pressure	2x full scale pressure (typical)
Burst pressure	3x full scale pressure (typical)
Supply voltage	8V to 16V or 16V to 32V
Nominal output voltage	0.5V to 5V
Accuracy – temperature effects	±1% of full scale per 100°C
Output type	3-wire (single ended) or 4-wire (differential)
High level EMI/lightning protection	Available in 0.625" or larger packages
Bandwidth (3dB)	5kHz to 10kHz
Current consumption	20mA max, 10mA typical
Hysteresis	0.1% of full scale
Non-linearity	0.1% of full scale
Repeatability	0.1% of full scale
Resolution	Infinitesimal