Micro-Varicon™ Dielectric/Conductivity Sensor Specifications

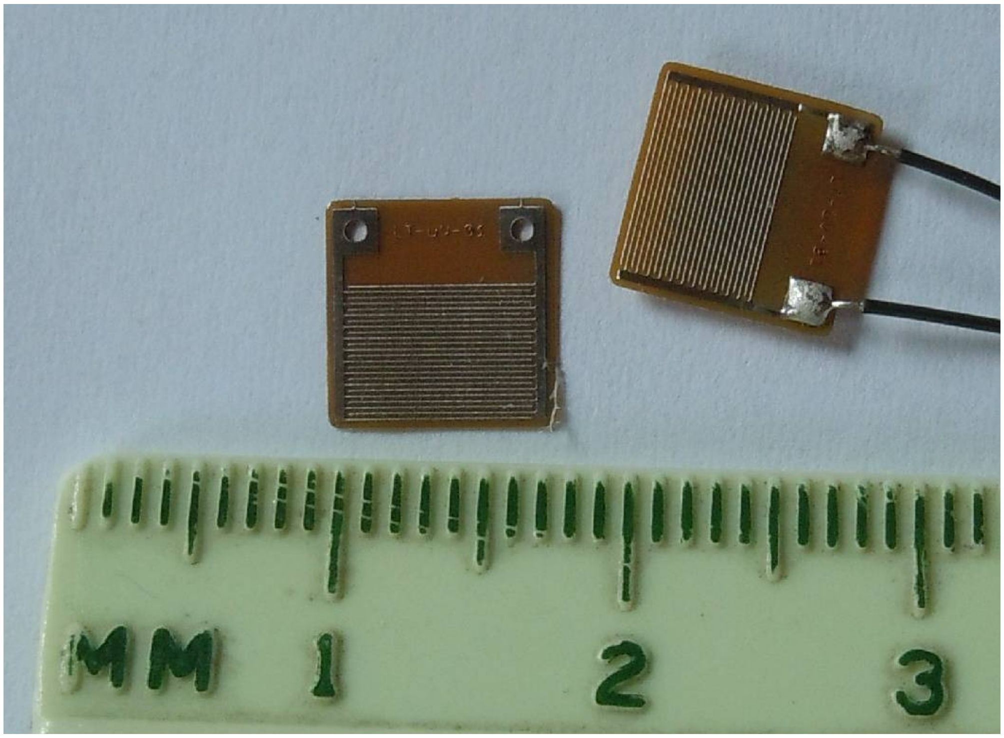

Figure 1
Micro-Varicon Dielectric/Conductivity Sensor

DESCRIPTION

The Micro-Varicon sensor is a miniature, thin, flexible dielectric sensor designed for cost-sensitive use where space is limited. The electrode array is patterned on a polyimide substrate, and the Micro-Varicon sensor can be supplied with or without Teflon insulated leads.

The Micro-Varicon sensor head is 0.32" x 0.32" (8.0 mm x 8.0 mm) square and only 0.004" (100 um) thick. The tin-plated electrodes have 0.004" (100 um) widths and spaces. The Micro-Varicon sensor can measure the dielectric/conductive properties of materials within approximately 0.004" (100 um) of the electrode surface.

The Micro-Varicon sensor is suitable for high pressure applications and is ideal for measuring the dielectric properties and cure state of epoxies, bulk molding compound (BMC), sheet molding compound (SMC), silicones, thermosets, urethanes, RIM and composite materials. When used without leads, the sensor will tolerate temperatures up to 375 °C. When supplied with leads, the sensor will operate up to 200 °C.

GENERAL SPECIFICATIONS

Dimensions:

Length, sensor head	: 0.32" (8.0 mm)
Width, sensor head	: 0.32" (8.0 cm)
Thickness, sensor head	: 0.004" (100 um)
Width, electrode	: 0.004" (100 um)
Spacing, electrode	: 0.004" (100 mm)

Composition:

Substrate, sensor head	: Polyimide
Electrodes	: Copper with tin flash
Lead insulation	: Teflon

Operational:

Temperature, maximum	: 375 °C (700 °F) without leads
	: 200 °C (392 °F) with supplied leads

Sensor Parameters:

A/D ratio	Base capacitance
10 cm (est.)	~10 pF (est.)*

* Actual value may vary

Temperature sensor : None

Lambient Technologies LLC
649 Massachusetts Avenue, Cambridge, MA 02139
857-242-3963
www.lambient.com
info@lambient.com

Note about base capacitance:

The base capacitance in the dielectric measurement software may need to be adjusted if additional cabling connects the sensor to the dielectric instrument. Base capacitance will also vary with the arrangement of leads attached to the sensor. *To reduce base capacitance, avoid twisting the leads together; instead, let the leads run parallel to each other with some distance between them.*

Adjusting the base capacitance is necessary to obtain reasonably accurate measurements of permittivity. If the user is only concerned about loss factor or ion viscosity, the base capacitance adjustment is not critical. Ion viscosity is not sensitive to base capacitance.

TEST MEASUREMENT (Typical results—actual results may vary)

A/D ratio	10 cm (est.)
Base capacitance	10 pF (est.)
Gain$_{Mid\text{-}con}$	TBD
Phase$_{Mid\text{-}con}$	TBD

Table 1
Typical 10 Hz test results in air @ 20° C

Results that differ significantly from those in Table 1 may indicate a sensor that is dirty, moist or damaged. Refer to the following section on cleaning. If the sensor response after cleaning is still outside the typical range, please consult with Lambient Instruments.

CLEANING

Clean sensors with acetone, trichlorethlyene or other solvent to remove oils and contaminants. Solvents or water adsorbed onto the surface of the sensor normally will not interfere with cure monitoring because it is released at elevated temperature, and would not be present at typical process temperatures.

At room temperature, however, adsorbed solvent or water may appear as an additional conductive component that may dominate the measurement. In this case the gains in air may be elevated (less negative, approaching 0 dB at low frequencies) and phases may be significantly negative. Heating the sensor above 100 °C for a short time should remove adsorbed material and return the response in air to reference values listed in the **TEST MEASUREMENT** section.

LAY-UP TECHNIQUES

1. To prevent a short circuit between the bond pads, sensors with attached leads should not contact electrically conductive surfaces.

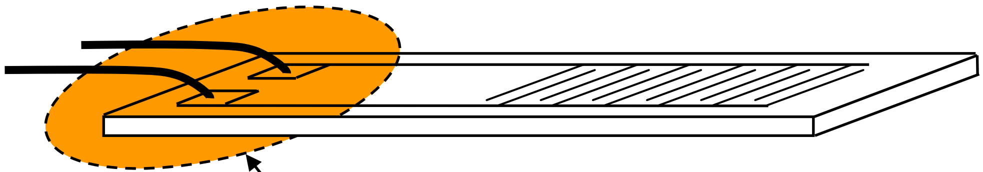

Figure 2
Insulating bond pad area

A good way to prevent short circuits of the sensor is to apply Kapton or polyimide tape to the sensor or to the surface on which the sensor will rest.

2. To reduce base capacitance, avoid twisting the leads together; instead, let the leads run parallel to each other with some distance between them.

3. Place samples on the sensor, insuring good contact with the electrodes. Cover the entire electrode array as shown in Figure 3.

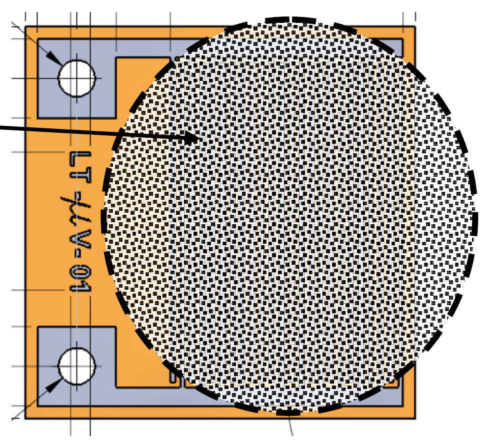

Figure 3
Sample application area

4. Solid samples, or solid samples which melt during processing, will require applied pressure. The sensors with attached leads are designed to withstand high pressures and temperatures up to 200 °C. Sensors without leads will tolerate temperatures up to 375 °C.

5. The thickness of the sample should be at least 0.004” (100 um), otherwise the sensor will also detect air or material on the other side of the sample.

6. Composite materials containing graphite or other conductive fibers will require use of a filter layer to prevent shorting of the electrodes. Glass cloth with small pore size, or fiberglass felt, is recommended for these situations.

COMPATIBILITY OTHER DIELECTRIC INSTRUMENTS

Compatible with:

Micromet Instruments/Holometrix-Micromet	*NETZSCH Instruments*
Eumetric System II Microdielectrometer	DEA 230/1
Eumetric System III Microdielectrometer	DEA 230/2
Eumetric 100A	DEA 230/10
ICAM 1000/1500/2000	DEA 231/1
MDE Series 10/20 Cure Monitor	DEA 231/4

Lambient Technologies LLC
649 Massachusetts Avenue
Cambridge, MA 02139
857-242-3963
www.lambient.com
info@lambient.com