Process Probe™
1840
Instrumented Wafers
Photoresist Track Systems
PRECISE TRACK TEMPERATURES FROM THE HIGHLY ACCURATE 1840 METROLOGY SYSTEM

Advanced lithography processes demand tight control of photoresist bake temperatures and temperature uniformity. Even with a uniform hot plate temperature, exhaust flow, purge flow, chamber design and construction all contribute to degraded wafer temperature uniformity - particularly in proximity bake applications.

Since direct measurements of hot plate temperatures do not accurately reflect wafer temperatures, SensArray developed the Process Probe 1840 instrumented wafer. With measurement errors < 0.05°C, it sets the standard for accurate measurement of actual wafer bake temperatures.

The Process Probe™ 1840 instrumented wafer provides accuracy previously unattainable in real time hot plate temperature measurements. Directly measure wafer temperature stability and uniformity without dependence on imprecise process monitors or contact temperature sensors. With 1 to 34 element arrays of platinum RTDs, the 1840 delivers the highest calibration stability with minimal hysteresis.

A four wire lead system to each sensor provides the most precise measurements. 1840 wafers incorporate 1000 Ω RTDs for compatibility with Thermal TRACK™ and Thermal MAP® systems, or with commercial measurement instruments. The calibration procedure includes NIST traceability to ensure the highest possible accuracy.

0°C to 250°C HIGH PRECISION RTD WAFER

- Excellent sensor-to-sensor precision within-wafer: <0.03°C
- Highly accurate real time measurement
- ±0.05°C absolute error, sensor-to-sensor wafer-to-wafer for highest measurement accuracy
- Up to 34 each 1000 Ω RTD (Resistance Temperature Detector) sensors

AT A GLANCE

<table>
<thead>
<tr>
<th>Accuracy</th>
<th>±0.05°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensor-to-Sensor</td>
<td>&lt; 0.03°C</td>
</tr>
<tr>
<td>Sensor Type</td>
<td>RTD</td>
</tr>
<tr>
<td>Wiring Specifics</td>
<td>Polyimide coated copper leads</td>
</tr>
<tr>
<td>Sensor Quantity</td>
<td>1-34</td>
</tr>
</tbody>
</table>

SPECIFICATIONS

<table>
<thead>
<tr>
<th>Substrates</th>
<th>Silicon, GaAs, glass and ceramic, or customer supplied bare, coated or patterned 2-12” wafers</th>
</tr>
</thead>
<tbody>
<tr>
<td>RTD Sensor</td>
<td>Thin Film Platinum</td>
</tr>
<tr>
<td>Resistor</td>
<td>1000 Ω nominal at 0°C</td>
</tr>
<tr>
<td>Resistance vs T</td>
<td>0.00375 Ω/Ω/°C</td>
</tr>
<tr>
<td>Max. Current</td>
<td>200 µA</td>
</tr>
<tr>
<td>Accuracy</td>
<td>±0.05°C absolute</td>
</tr>
<tr>
<td></td>
<td>&lt;0.03°C sensor-to-sensor, NIST traceable ITS 90</td>
</tr>
<tr>
<td>Connection</td>
<td>Four wire resistance measurements with common current source return</td>
</tr>
<tr>
<td>Lead Materials</td>
<td>Polyimide coated copper</td>
</tr>
<tr>
<td>Lead Length</td>
<td>48” (1.2m) standard, other lengths available</td>
</tr>
<tr>
<td>Feedthrough</td>
<td>Polyimide flat cable film feedthrough, 10^-6 Torr capable</td>
</tr>
<tr>
<td>Sensor Connector</td>
<td>80 pin Hirose HDS or 62 pin D-type HDS (2 D-type connectors for &lt;17 sensors)</td>
</tr>
</tbody>
</table>
BENEFITS OF USING THE PROCESS PROBE 1840

- Perform preventative monitoring
- Determine center-to-edge temperature variation for adjusting heater zone set points
- Diagnose thermal problems quickly with less downtime
- Utilize the highest accuracy metrology to tune the critical plate temperatures
- Evaluate run-to-run, month-to-month chamber repeatability

FLEXIBLE SLEEVING

Within the highly flexible silicone sleeved lead assembly, a Kevlar filament prevents tensile stress. This sleeving enables more options in placement and ease of handling. The Hirose HDS or high density sub-miniature D-type connector provides four wire connections for each sensor, and plugs directly into SensArray’s data acquisition systems.

INTEGRATED SENSOR INTERFACE

High measurement accuracy and stability result from the careful design of the 1840. Efficient heat transfer from silicon to the RTD sensor chip is achieved while controlling differential thermal stresses in the bonding and encapsulation materials.

COMMON USES

- Process visualization
- Tool installation and start up
- Engineering analysis
- Troubleshooting assistance
- Chamber matching
- PM qualification
- Process optimization

SIMPLE TO INSTALL AND USE

For ease of customer use, a compact cable is created by bonding the insulated leads in close proximity and then placing them into multiple ribbons of wires, encapsulated with polyimide film. To protect the flat cable in vacuum applications, the assembly is bordered by two nickel ribbons with a thickness slightly greater than the leads that distribute the compressive force, allowing repeated placement. Ribbons are welded to the wafer-mounted stress relief bridge and a stress relief assembly integrated in the flat cable.

INTEGRATED SENSOR INTERFACE

Coating
Platinum Foil Leads
Protective Coating
Pair of Copper Wire Leads
RTD
Polyimide Bond
Metallized Ceramic Bond Pad

This assures measurement accuracy and reduces hysteresis and drift. Calibration offset and drift are minimized because the sensor’s platinum foil connections to the four wire copper leads are placed distant from the sensor—thus decreasing lead thermal conduction related measurement errors.
KLA-TENCOR SERVICE and SUPPORT
Customer service is an integral part of KLA-Tencor's portfolio that enables our customers to accelerate yield. Our vast customer service organization collaborates with worldwide customers to achieve the required productivity and performance at the lowest cost. K-T Services includes comprehensive contracts, time and materials, spares, asset management, customer training, and yield consulting.

KLA-Tencor Corporation
One Technology Drive
Milpitas, CA 95035
phone 408.875.3000
www.kla-tencor.com

SensArray Division
5451 Patrick Henry Drive
Santa Clara, CA 95054
phone 408.986.5600
fax 408.986.5601
toll free 1.877.377.5600