BENEFITS
- Small Size with Low Profile (20x20x3 mm)
- Long Life (10 years expected life)
- Fast Response
- Low Power Consumption
- Individually Calibrated (NIST Traceable)
- ROHS Compliant

APPLICATIONS
- Law Enforcement Breathalyzers
- Evidential Breath Alcohol Testing
- Portable Breath Alcohol Tester
- Personal Breathalyzers

DESCRIPTION
SPEC’s printed sensors offer the performance of the best quality electrochemical sensors at a fraction of the price. SPEC’s printed sensors are also ultra-thin, offering easy integration into wireless, portable, and networked solutions. These sensors are ideal for health, environmental, industrial and residential monitoring, because of their high performance, low cost and small size.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Measurement Range</td>
<td>0 to 1000 ppm</td>
<td>&lt; 5 ppm</td>
<td>&lt; +/- 3%</td>
<td>&lt; 180 seconds</td>
<td>20 +/- 10 nA/ppm</td>
<td>&gt; 5 years (10 years @ 23+/-3C; 40+/-10% RH)</td>
<td>-30 to +55 C (-20 to 40 C recommended)</td>
<td>0 to 100% RH (15 to 95% recommended)</td>
<td>10 to 50 uW</td>
</tr>
<tr>
<td>Resolution</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Repeatability</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Response Time</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensitivity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Expected Operating Life</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating Temperature Range</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating Humidity Range – non-condensing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power Consumption</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
CROSS SENSITIVITY

<table>
<thead>
<tr>
<th>Gas/Vapor</th>
<th>Concentration</th>
<th>Typical Response PPM Ethanol</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methane</td>
<td>500 ppm</td>
<td>&lt; 5</td>
</tr>
<tr>
<td>Ammonia</td>
<td>100 ppm</td>
<td>&lt; 5</td>
</tr>
<tr>
<td>Nitrogen Dioxide</td>
<td>10 ppm</td>
<td>&lt; 5</td>
</tr>
<tr>
<td>Hydrogen Sulfide</td>
<td>25 ppm</td>
<td>63.2</td>
</tr>
<tr>
<td>Carbon Monoxide</td>
<td>400 ppm</td>
<td>251.4</td>
</tr>
<tr>
<td>Ozone</td>
<td>5 ppm</td>
<td>&lt; 5</td>
</tr>
<tr>
<td>Sulfur Dioxide</td>
<td>20 ppm</td>
<td>11.6</td>
</tr>
<tr>
<td>Nitric Oxide (NO)</td>
<td>50 ppm</td>
<td>54.5</td>
</tr>
<tr>
<td>Chlorine</td>
<td>10 ppm</td>
<td>-14.3</td>
</tr>
<tr>
<td>n-Heptane</td>
<td>500 ppm</td>
<td>-12.6</td>
</tr>
</tbody>
</table>

TEMPERATURE EFFECT

Temperature fluctuations have a predictable, easily compensated effect on the sensor signal. The figures at below shows the typical Temperature dependency the output and baseline of 3SP_Ethanol_1000 sensors under constant humidity of 40-50 % RH. This is a very uniform and repeatable effect, easily compensated for in hardware or software.
IMPORTANT PRECAUTIONS
All sensor designs are made for air monitoring @ 1 atm +/- 0.2 atm. Because applications of use and device implementation are outside our control, SPEC Sensors cannot guarantee performance in a given device or application, and disclaims any and all liability therefore. **Customers should test under their own conditions to ensure the sensors are suitable for their requirements.**

Contact the factory to discuss specific concerns that might damage the sensor performance or life.
- Condensation and Water (1)
- Salt Water Contamination (1)
- High Temperature Operation (> 70°C) for more than 1 month
- Low Humidity Operation (< 15% RH) for more than 3 months
- High Bias voltage
- Highly contaminated air over a prolonged period
- High levels of particles or soot (unless proper filtering is provided)

(1) Use of porous PTFE membrane or filter cap may address this concern

MARKING INFORMATION
Sensors have serial numbers printed with individual NIST Traceable calibration data printed on each sensor. (CO version shown)

<table>
<thead>
<tr>
<th>Alph-Numerica Code:</th>
<th>100105 CO 1510 2.78</th>
</tr>
</thead>
<tbody>
<tr>
<td>2D Code:</td>
<td>101915010903 100105 CO 1510 2.78</td>
</tr>
</tbody>
</table>
DIMENSIONS

PCB LAYOUT GUIDELINES
SENSOR STORAGE, HANDLING AND SOLDERING

This information embodies various general recommendations concerning the storage, handling, and manual soldering conditions for SPEC SENSORS CSPEC Modules. It is only applicable for modules guaranteed by SPEC SENSORS stated in SPEC SENSORS Sensor Specification Sheet. Moreover, SPEC SENSORS’ modules are NOT warranted and should NOT be used in high temperature soldering (reflow) or pre-tinning baths.

Sensor & Module Handling
Handle sensors with care. Take precautions, including but not limited to the following:

A. DO NOT apply excessive pressure to the top or bottom of the sensor module.
B. Whenever possible, handle or make contact with the sensor module from the sides of the PCB or substrate.
C. Light vacuum pressure is possible during handling, DO NOT apply vacuum over gas sensor port.
D. If the sealed sensor package is opened, DO NOT re-seal using vacuum or nitrogen gas. DO NOT reseal with desiccant.
E. DO NOT obstruct the gas sensor port by making direct contact with any tape, apparatus, weights, etc.
F. DO NOT use silicone or other conformal coatings around the sensor or gas port-holes.
G. Operators are requested to wear powder free antistatic gloves.

Manufacturing Assembly Floor Environment
SPEC SENSORS recommends that the manufacturing assembly floor environment be maintained at controlled conditions:

A. Temperature: 18 - 26°C
B. Relative Humidity: 40 to 60%
C. Pressure: 1.0 ± 0.2 atm

Sensor & Module Storage Conditions
The shelf life for sealed, packaged components is 12 months from the pack seal date, when stored in the factory-sealed bag under the following conditions:

A. Temperature: 5 to 25 °C
B. Relative Humidity: 20 to 80%
C. Pressure: 1.0 ± 0.2 atm
D. Storage Time: 12 months

When moving from Storage Conditions to the Manufacturing Assembly Floor Environment, the sensors should be allowed to equilibrate at the new conditions for at least 24 hours prior to manufacturing.

Module Attach Soldering Process
Hand solder only. Keep the soldering iron or solder process tool away from the sensor. The sensor should not see pre-heat temperatures above 70 °C. There have been suggested cases where a heat sink cover over the sensor may be applicable to protect the sensor during processing. No Application notes to this approach available. Only to be used as reference only.

A. DO NOT heat sensor above 70 °C
B. Hand or peripheral process type approach
C. Use solder wire alloy with the lowest possible eutectic temperature
D. Use lowest possible soldering iron temperature
E. Contact the host board with the soldering iron at a 45° angle on the solder pad
F. Keep the soldering iron away from the top and bottom of the sensor module
G. DO NOT place in reflow, wave or IR reflow type processes
H. DO NOT place mounted board In a wash