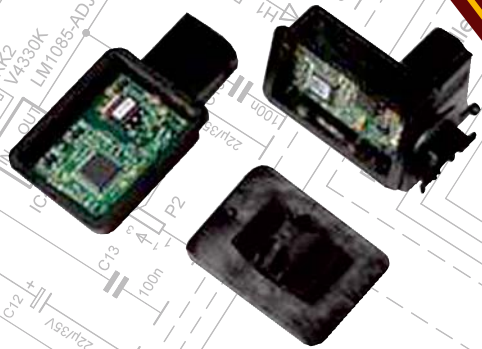


Silicon Sentry

HOLOEYE's Sensors Division

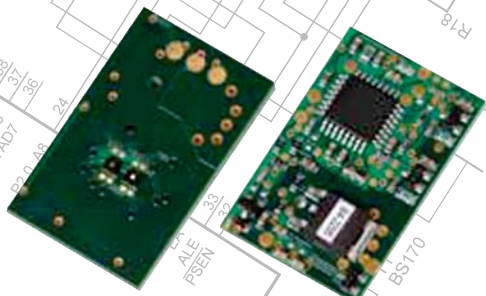


Core Technology

All sensor applications have one common requirement: a reliable sensing component. The ability to micromachine sensor chips using standard silicon wafer technologies enables Holoeye Systems to produce consistently reliable sensors in high volumes for mass market applications.

Holoeye Systems offers an array of products and technologies centered around integrated MEMS components, UV-IR optical components, and seamless ortho-planer designs.

Appropriately titled, Silicon Sentry, Holoeye Systems' line of MEM's based autonomous RFID enabled Chemical, Physical, and/or Biological sensors are ideal for monitoring critical processes and/or assets within Home Land Security, Defense, and Corporate/Personal Equipment Preservation market segments. Silicon Sentry is adequately equipped to be either your first or last line of defense.



A brief list of our technologies includes:

- Chemical Sensors
- Radiation Sensors
- Temperature Sensors
- Pressure Sensors
- Flow Sensors
- Density Sensors
- Micro Sampling Systems (Microsensors, Micropumps, Micro-valves, Micropyrolyzers)

Each Chemical Silicon Sentry relies on a high-performance micro machined IRMOS (Infra-Red Metal Oxide Semiconductor) sensor. The sensor system is produced by combining the advancements of thin film technology with patent pending IR technologies on a silicon substrate, hence the name, Silicon Sentry.

Using concentration-dependent chemisorption conductivity, and both molecular sieve and affinity thin-film technologies, each sensor has high sensitivity and selectivity to a specific target.

Services

The basis for our service and technologies are focused around Integrated MEMS components, UV-IR optical components and highly integrated & seamless Ortho-Planer designs.

- OEM & Custom Design
- OEM Sub-Modules

Key Benefits

- High Sensitivity to Oxidizing & Reducing Gas Binaries
CO (0.5 to 500 ppm) / CH₄(100 to 100,000 ppm) / NO₂ (0.1 to 2 ppm) / SO₂ (.01 to 500 ppm)
- Low Power Consumption
- Long Lifetime
- Low Cross Sensitivity
- Long-term Stability

Common Analytes

- Carbon Monoxide
- Nitrogen Oxide
- Sulfur Dioxide
- Methane
- Hydrocarbons (Ch₂-10)
- Alcohols
- Ammonia
- Butane
- Bromine
- Chlorine
- Ethylene
- Fluorine
- Hydrogen
- Hydrogen Sulfide
- COS
- LPG
- Phosgene
- Nitrogen Dioxide
- Ozone
- Toluene
- VOCs
- Oxygen
- Carbon Dioxide



Systems, Inc.

Features

Dimensions: Chip size: 2x2mm x 250um

Operation Temperature Range: (CO - 250°C - 300°C), (NO₂ - 250°C - 350°C), (CH₄ - 300°C - 350°C), (SO₂ - 300°C - 400°C)

Typical Operation Temperature: (CO - 270°C), (NO₂ - 270°C), (CH₄ - 320°C), (SO₂ - 385°C)

Ambient Temperature Range: -40°C - 125°C (lower than op. temp.)

Ambient Humidity: 0 - 95% RH

Power Consumption: <35 mW @ 2.3 - 3.0Vdc (15-20ma)

Signal Output Component: Resistance

Typical Heater Voltage: (CO /2.3 V for 270°C), (NO₂ /2.3 V for 270°C), (CH₄ /2.7 V for 320°C), (SO₂ /2.85 V for 350°C)

Temperature Coefficient rel. to R(20°C): TC≈1700 ppm/K

Typical Heater Resistance at RT: 95 Ω

Concentration Range: Can withstand (1% CO), (>10ppm NO₂), (10% CH₄), (1% SO₂) in air

Sensitivity Range: (CO /0.5 - 500 ppm), (NO₂ /0.1 - 2 ppm), (CH₄ /0.01 - 10 %), (SO₂ /10ppb - 1500 ppm)

Typical Response / Recovery Time: milliseconds

Expected Lifetime: 5-10 Years dependant upon application

Cross Sensitivity: Limited cross sensitivity, target gas selectivities are tuned by affinity catalyst applied to sensing membrane

Packaging Options: ASIC Modules, Chip-on-Board, MEMS die, MTO-39 & SOIC package with protection membrane.

Silicon Sentry

- Well suited for detection of carbon monoxide, volatile organic compounds, volatile sulfur compounds or nitrogen dioxide.
- Fast response: ~ 1 sec
- Hardware: circuitry for 2 micro-machined sensor elements with micro-controller.
- Firmware: raw data output or quantification of measured variable, measurement interval ~200 ms
- Housing: polyamide with diffusion membrane (ultrasonic welding) and cover (laser welding)
- Output: PWM or RS232 via MQS connector, PWM may be converted to voltage or 4-20ma output. "WiFi optional". The newest protocol is the "POE", power-over-ethernet a plug & play solution.

Hardware

Description:

- HT-PCB with SMD electronics
- Circuitry for 2 IRMOS sensor elements
- Micro-controller for data processing
- PWM or RS232 output

Customization:

- Number of sensor elements needed
- Sensing material selection

Firmware

Description:

- Functionality to drive sensors
- Alternate control for pumps, valves, etc..
- Algorithm for baseline correction and quantification
- Algorithm for self-diagnosis, Built-In-Self-Test

Customization:

Application-specific:

- Operation parameters for sensor elements
- Interval time, sampling to match process
- Algorithm output, corrected engineering units
- Output format and protocol, support most telemetries
- Addition of selective hydrophobic membrane technology
- Accessories to enable operation in liquids, solids, or any aggressive matrix.

Applications:

- VOC for residual solvent hazardous leak detection
- Flue-stack, water quality, Bio-waste storage
- On-line & off-line quantitative & qualitative process analysis
- Refinery, pipeline, transport & refueling stations
- Paper-pulp, polymer process, winery & semiconductor process
- Smart armor
- Air quality control systems
- Asset preservation

