

OTD: Mems Ultra Low Power Methane Thermal Conductivity Sensor

KWJ has a patented MEMS methane sensor and has demonstrated feasibility for selective detection of gases like methane. Its major attributes include low cost and scalable MEMS fabrication, ultra small size for fast response and ultra-low mass for micro-watt operation. Methane leak detection is relevant for industrial and residential applications and a compact sensor with integrated wireless electronics can be easily deployed in various locations as independent or networked nodes.



Figure 2. Control electronics board + sensor

Figure 1 shows a representative SEM micrograph of the KWJ MEMS sensor which incorporates a suspended poly-silicon structure ($\sim 100\mu\text{m} \times 2\mu\text{m}$) on a 2mm x 2 mm die with 8 sensor elements. The performance characteristics of sensor/circuit/firmware system in development are summarized in Table 1. The control electronics board with the MEMS sensor can be seen in Figure 2.

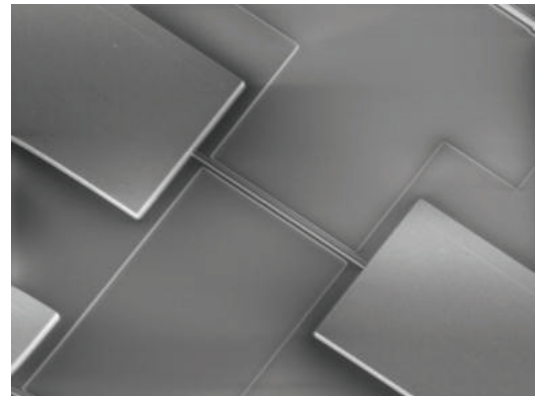


Figure 1. MEMS sensor

Table 1. Performance characteristics of KWJ MEMS Methane Sensor

1. Measuring range: 0-5% CH₄ in air
2. Sensitivity: 0.35% CH₄
3. Lower Detection Limit: 0.4% CH₄
4. Interferent compensation: Temperature (10-40°C), RH (0-70%)
5. Sensor Power Consumption: 18-98 μW (depending on duty cycle)
6. Operating protocol: square pulse, 20ms/4980ms ON/OFF cycle
7. Interference rejection: 3-gas-algorithm/filter; low-false-alarm rate

The sensitivity of the sensor when integrated with benchtop electronics (UEI data logger with 24-bit ADC, NI board with 16 bit DAC) can be observed to be about 200 ppm or lower as shown in Figure 3.

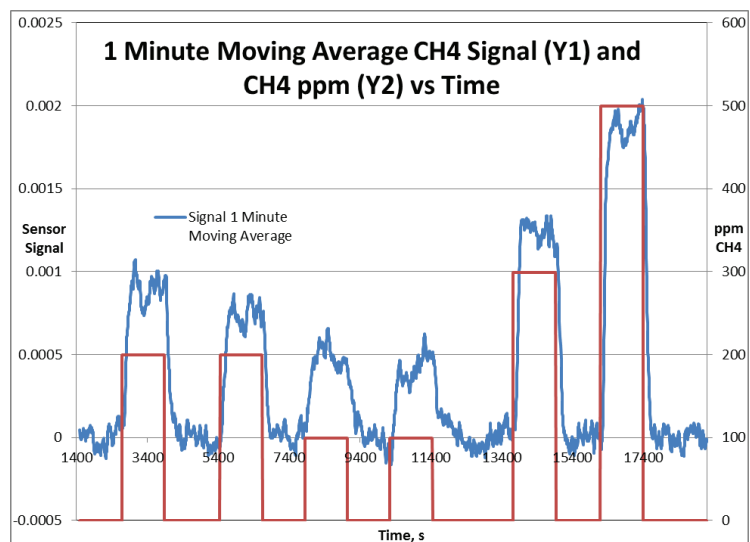


Figure 1. Sensor signal for 100-500 ppm CH₄ with KWJ MEMS sensor and benchtop NI 16 bit DAC and a 24-bit UEI ADC system