ENVIRONMENTAL SENSING SOLUTIONS

Sensing solutions for a connected world

Humidity & Temperature

VOC

O3 & NOx

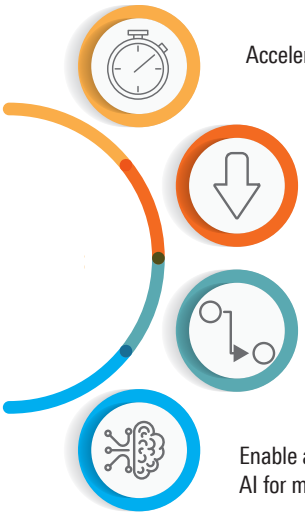
Particulate Matter

CO2

renesas.com/environmentalsensing

SENSOR OVERVIEW

RENESAS SENSOR SYSTEM ADVANTAGE



Accelerate time-to-market

Reduce development costs

No need for individual sensor firmware integration on host MCU

Enable additional analysis using AI for multi-sensor data

Discrete Sensors
Sensor + Firmware for external Host MCU

HS3/4: Humidity & temperature

ZMOD4410: Volatile organic compounds

ZMOD4510: Ozone & nitrogen dioxide

Intelligent Sensor Modules
with MCU and integrated firmware

All-in-One Sensor Module: PM2.5+ TVOC + Humidity & Temperature + RA MCU

CO2 Module: CO2+ Humidty & Temperature + RA MCU

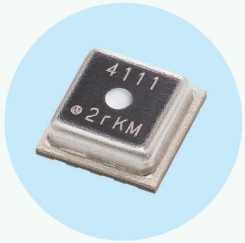
RRH46410: TVOC + RL MCU

RENESAS DISCRETE SENSORS

RENESAS OFFERS DISCRETE SENSORS WITH A SINGLE SENSING ELEMENT FOR HOST CONTROLLER INTEGRATION

HUMIDITY AND TEMPERATURE SENSOR FEATURES

- ±1.5% Relative Humidity Accuracy and ±0.2C Temperature sensor accuracy
- Fast RH response time: 3 seconds (Typical) and 14-bit resolution: 0.04%RH (Typical)
- HS4xxx can be operated at ultra-low power consumption of 0.3µA average (1Hz, 8-bit resolution) and standby current down to 25nA
- Supply voltage: 1.71V to 3.6V (HS4xxx) & 1.8V to 5.5V (HS3xxx)
- Digital (I2C) and Analog Output options available
- JEDEC Qualified to 10 years lifetime
- Miniature form factor: 2.5mm x 2.5mm x 0.9mm, 8-LGA (minimum size)



METAL-OXIDE (MOx) AIR QUALITY SENSOR FEATURES

- **ZMOD4410** is a MOx based sensor calibrated to measure TVOCs (Total Volatile Organic Compounds) and eCO2 (equivalent Carbon Dioxide) in indoor applications according to multiple international air quality standards
- **ZMOD4510** is a MOx based sensor calibrated to measure O3 (Ozone) and NO2 (Nitrogen Dioxide) in indoor and outdoor applications according to EPA air quality standards
- Firmware selectable to meet different application requirements for residential, commercial, public building, outdoor standards, ultra-low power operation and relative event detection
- Sensors provide absolute, relative and low power operation modes using embedded AI machine learning algorithms
- Siloxane resistant with multiple waterproof options available
- Fully JEDEC JESD47 Qualified – 10 year lifetime
- Miniature form factor: 3mm x 3mm x 0.7mm

ZMOD4410 IAQ Index Based on UBA

Renesas IAQ Rating	Reference Level*	Air Information	TVOC (mg/m³)	Air Quality
≤ 1.99	Level 1	Clean Hygienic Air (Target Value)	< 0.3	Very Good
2.00 - 2.99	Level 2	Good Air Quality (if no threshold is exceeded)	0.3 - 1.0	Good
3.00 - 3.99	Level 3	Noticeable Comfort Concerns (Not recommended for exposure > 12 months)	1.0 - 3.0	Medium
4.00 - 4.99	Level 4	Significant Comfort Issues (Not recommended for exposure > 1 months)	3.0 - 10.0	Poor
≥ 5.00	Level 5	Unacceptable conditions (Not recommended)	> 10.0	Bad

Based on Study by German Environmental Agency

ZMOD4510 AQI based on EPA

Air Quality Index (AQI)	Level of Concern and Air Quality Condition	NO2 Concentration [ppb]	O3 Concentration [ppb]	Color Code
0 to 50	Good	0 to 53	0 to 62	Green
51 to 100	Moderate	54 to 100	63 to 124	Yellow
101 to 150	Unhealthy for Sensitive Groups	101 to 360	125 to 164	Orange
151 to 200	Unhealthy	361 to 649	165 to 204	Red
201 to 300	Very unhealthy	650 to 1249	205 to 404	Purple
301 to 500	Hazardous	1250 to 2050	405 to 604	Maroon

Based on EPA guidelines

SENSOR OVERVIEW

RENESAS INTELLIGENT SENSOR MODULES

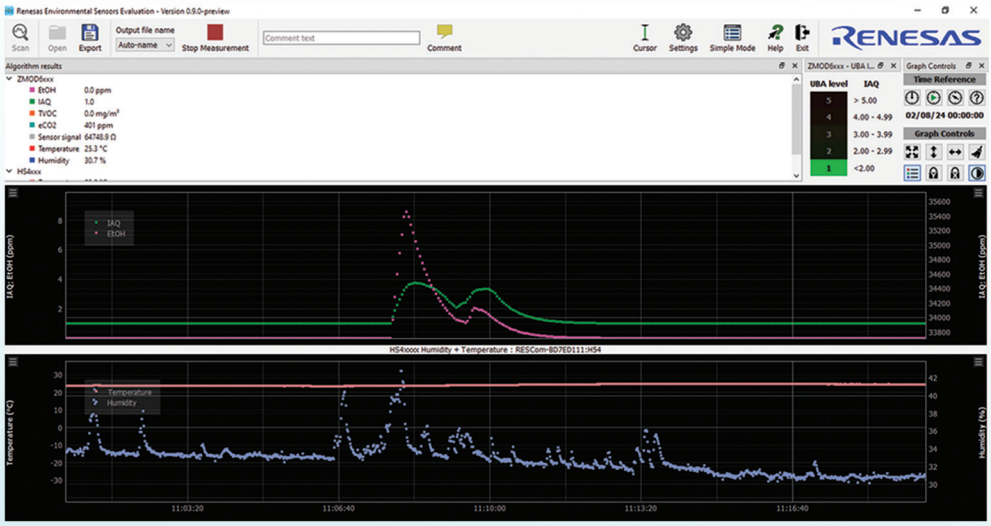
INTELLIGENT SENSOR MODULES ARE EQUIPPED WITH ONE OR MORE SENSING ELEMENTS AND AN ONBOARD MCU WITH INTEGRATED FIRMWARE OFFERING EASE OF DESIGN, AND FAST TIME-TO-MARKET

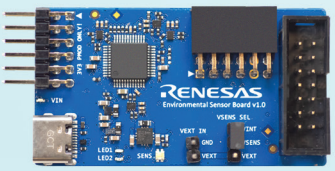
METAL OXIDE (MOX) SENSOR MODULE: RRH46410

- RRH46410 is a Renesas MOx sensor module with integrated MCU for fast time-to-market measuring Total Volatile Organic Compunds (TVOC) and equivalent Carbon Dioxide (eCO2)
- The module comes with preloaded firmware options – Standard IAQ, ultra-low power mode, relative odor detection, and public building air quality (PBAQ)
- Average power consumption as low as 0.2mW for ultra-low power operating mode
- Sensor provides absolute, relative and ultra-low power operation modes using embedded AI machine learning algorithms
- Supports I2C and UART output interface
- Siloxane resistant with waterproof membrane covering gas inlet port
- Fully JEDEC JESD47 Qualified – 10 year lifetime
- Miniature form factor: 4.5mm x 4.0mm x 0.95mm

ENVIRONMENTAL SENSOR EVALUATION PLATFORM

Quickly and easily evaluate all discrete and intelligent sensor module offerings from Renesas using the EVKs. EVKs consist of an ESCOM board which connects to specific sensor daughter boards. The standardized daughter boards and interface ensure compatibility across the sensor portfolio. Accompanying GUI identifies connected sensors and displays selectable data related to the sensors.





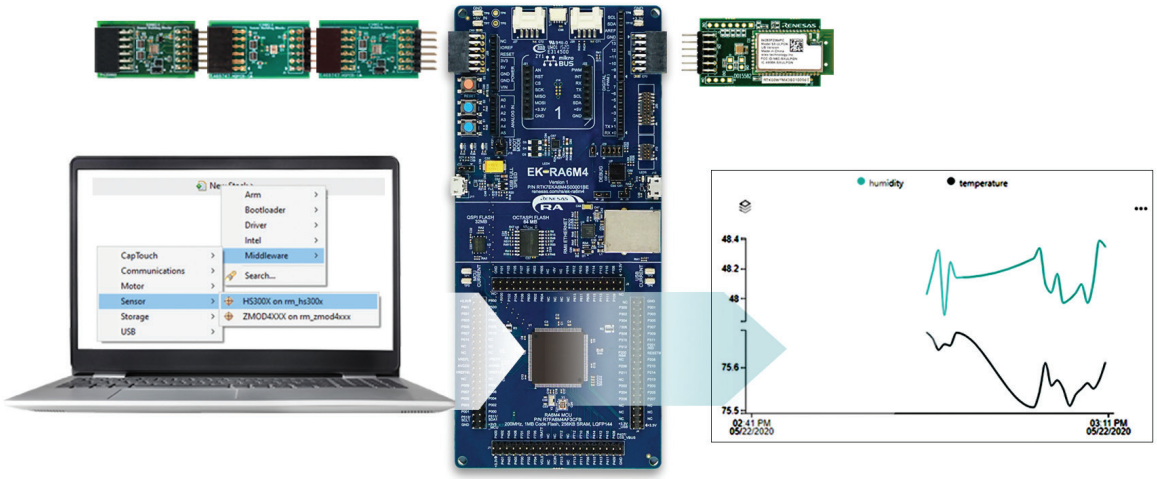
LIST OF EVALUATION KITS:

- renesas.com/hs4000-evk
- renesas.com/zmod4410-evk
- renesas.com/zmod4510-evk
- renesas.com/rrh46410-evk

QUICK-CONNECT PLATFORM

FAST PROTOTYPING FOR SENSOR SYSTEMS

Renesas sensors are integrated into the Quick-Connect platform to enable rapid hardware and software prototyping using standardized boards and interfaces. Quick-Connect Studio automatically generates production-ready firmware for sensor systems with MCUs and wireless modules. Quick-Connect IoT supports Pmod sensor expansion boards which can be connected to a range of MCU evaluation boards to test the hardware system solutions.



renesas.com/quickconnect

renesas.com/quickconnectstudio

Pmod EXPANSION BOARDS

renesas.com/US082-HS3001EVZ

renesas.com/QCIOT-HS4001POCZ

renesas.com/US082-ZMOD4410EVZ

renesas.com/US082-ZMOD4510EVZ

Visit **renesas.com/environmentalsensing** to request samples, download documentation and learn more.

RENESAS

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