

Diaper Odor Detector

November 2019

Diaper Odor Detector

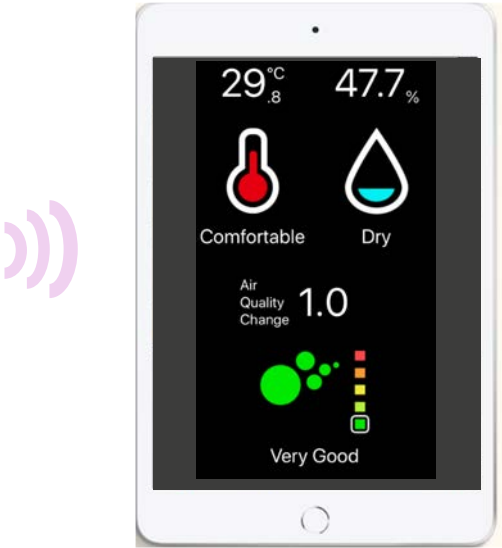
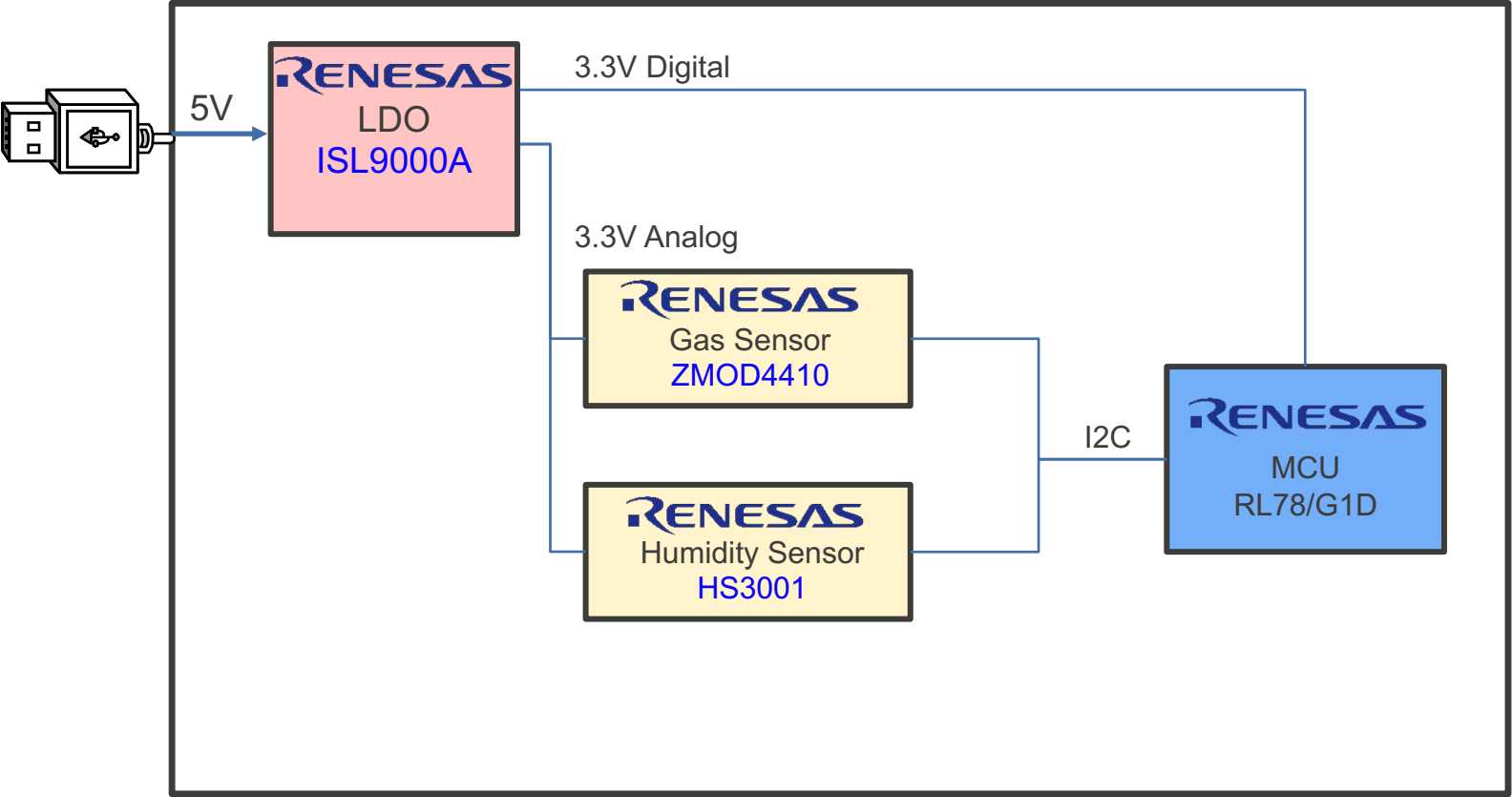
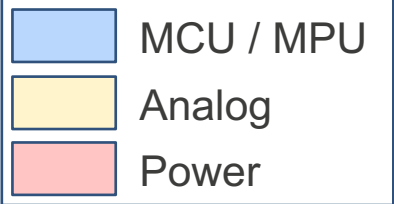
■ Overview

The combination of Renesas' gas and humidity sensors, and RL78/G1D MCU makes it easier to monitor diaper odors in real-time through any handy device. The RL78/G1D Bluetooth® Low Energy (BLE) microcontrollers are designed for smart connectivity, with the lowest level of current consumption in the industry. It is a compact module with a built-in 32MHz crystal resonator for RF chips and antennas (already certified). This design also includes the [ISL9000A](#), a dual LDO with low noise, very high PSRR, and low IQ.

■ System Benefits

- Easily detects the odor from diapers and alerts caregivers in hospitals and/or nursing home facilities
- The ZMOD4410 gas sensor module is designed for detecting total volatile organic compounds (TVOC). Downloadable firmware libraries and source code enables detection of TVOC and odors.)

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JP010

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Device Category	P/N	Key Features
MCU	RL78/G1D	Bluetooth® Low Energy MCU with the lowest level of current consumption in the industry
Power	ISL9000A	ISL9000A is a high performance dual LDO capable of sourcing 300mA current from each output. It has a low standby current and very high PSRR and is stable with output capacitance of 1µF to 10µF with ESR of up to 200m
Analog	ZMOD4410	Indoor Air Quality Sensor Platform. TVOC Sensor for Indoor Air Quality Application. Very low average power consumption down to 1mW.
	HS3001	Relative Humidity and Temperature Sensor. High Accuracy Humidity and Temperature Measurement for Environmental Monitoring. Excellent Stability. 0.1%RH per year drift.

JP010

RL78/G1D – Bluetooth® Low Energy MCU



Bluetooth® Low Energy MCU with the lowest level of current consumption in the industry

High Integration

- Power-efficient low-end microcontrollers with Bluetooth® Low Energy
- 2.4 GHz RF transceiver
 - Compliant with Bluetooth® v4.2 Low Energy (Master/Slave) specification
 - Reception sensitivity: -90 dBm
 - Max. transmission output power: 0 dBm

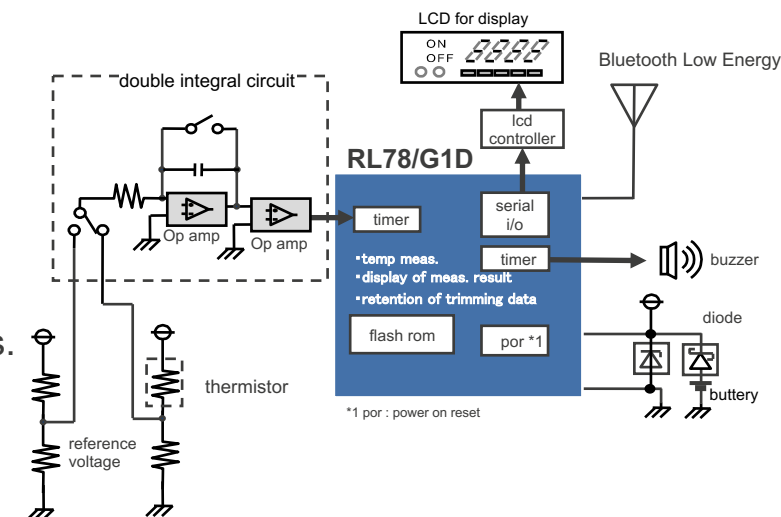
Easy to Develop and Use

- Since circuit elements necessary for connecting an antenna are built in, not only does this simplify circuit design for the antenna connection, but also reduces BOM and overall costs.
- Software stack supports wireless updating, helping to make maintenance of user software more efficient.

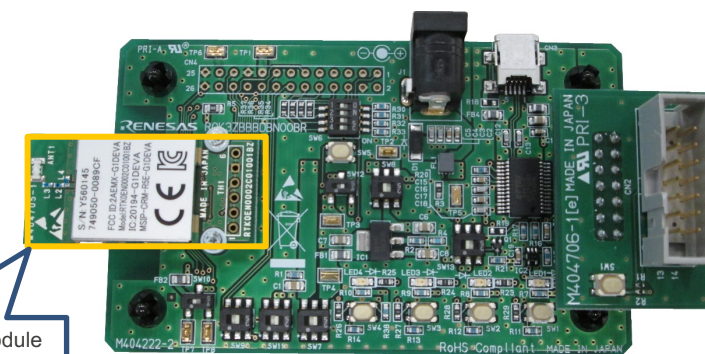
Low Power Consumption

- Achieved the lowest level of current consumption in the industry (3 V operation)
 - RF transmitter active normal mode: 4.3 mA, Low power mode: 2.6 mA
 - RF receiver active normal mode: 3.5 mA
 - Average current: 9.1 µA (1-second intervals, connection maintained, CC-RL compiler)
- Different standby mode for MCU: HALT, STOP, SNOOZE
- Low power saving mode with 6 setting (min. 0.1 µA) for RF part

Part #	Flash ROM	RAM	Package
R5F11AGG	128KB	12KB	48-pin HWQFN (6 × 6) (0.4mm pitch)
R5F11AGH	192KB	16KB	
R5F11AGJ	256KB	20KB	



BLE Evaluation Wireless module
(installation of RL78/G1D)
There is shield case.



RTK0EN0001D01001BZ
RL78/G1D Evaluation Board

ISL9000A – Two V_{OUT} 300mA LDO

Dual LDO with Low Noise, Very High PSRR and Low IQ

High Performance

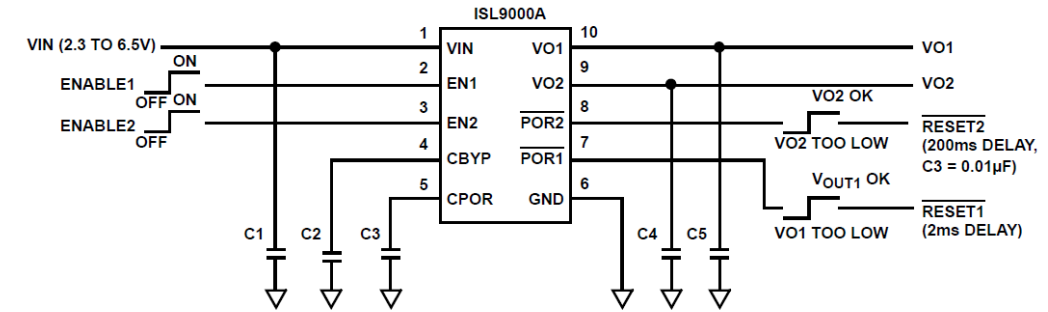
- Integrates two 300mA high performance LDOs
- $\pm 1.8\%$ accuracy over all operating conditions
- Excellent load regulation: $< 0.1\%$ voltage change across full range of load current
- Low output noise: typically $30\mu V_{RMS}$ @ $100\mu A$ (1.5V)
- Very high PSRR: 90dB @ 1kHz

High Efficiency

- Extremely low quiescent current: $42\mu A$ (both LDOs active)
- Low dropout voltage: typically 200mV @ 300mA

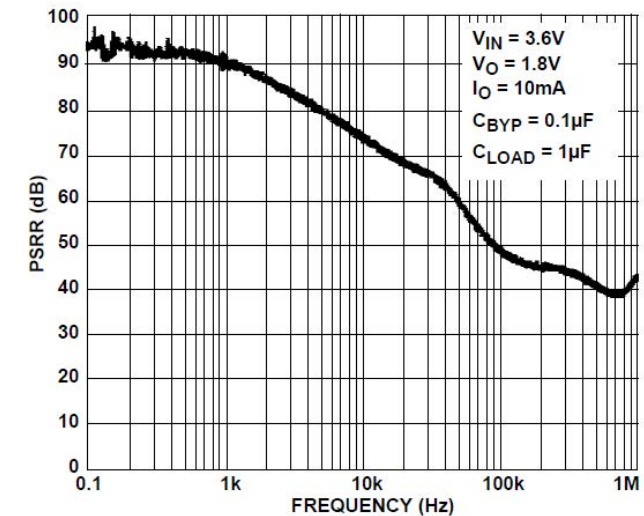
Excellent Safety

- Separate enable and POR pins for each LDO
- Current limit and overheat protection
- Soft-start and staged turn-on to limit input current surge during enable



C1, C4, C5: $1\mu F$ X5R CERAMIC CAPACITOR
 C2: $0.1\mu F$ X7R CERAMIC CAPACITOR
 C3: $0.01\mu F$ X7R CERAMIC CAPACITOR

Typical Application Circuit



PSRR vs Frequency

Part #	Vout1 (V)	Vout2 (V)	Package
ISL9000AIRNxZ	3.3	1.8 to 3.3	10Ld 3x3 DFN
ISL9000AIRMxZ	3.0	2.7 to 3.3	10Ld 3x3 DFN
ISL9000AIRLLZ	2.9	2.9	10Ld 3x3 DFN
ISL9000AIRKxZ	2.85	1.8 to 3.3	10Ld 3x3 DFN
ISL9000AIRJxZ	2.8	1.5 to 3.3	10Ld 3x3 DFN
ISL9000AIRFxZ	2.5	1.8 to 2.8	10Ld 3x3 DFN
ISL9000AIRCxZ	1.8	1.8 to 2.8	10Ld 3x3 DFN

ZMOD4410 – Indoor Air Quality Sensor Platform

TVOC Sensor for Indoor Air Quality Application

Flexible Measure Target:

- Measurement of total organic compounds (TVOC) concentrations and indoor air quality (IAQ)
- Module algorithm estimates carbon dioxide level (eCO2)
- Algorithm to set a control signal to trigger an external action based on IAQ and odor change
- Configurable alarm/interrupt output with static and adaptive Levels

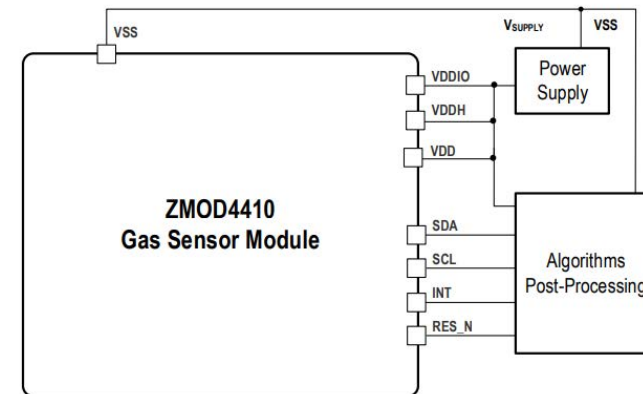
Low Power

- Very low average power consumption down to 1mW
- Excellent for low-voltage and low-power battery applications

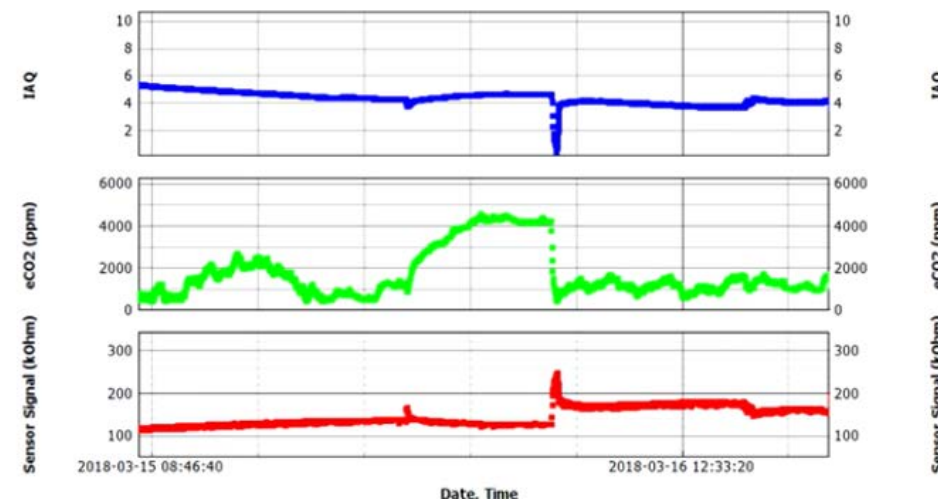
Easy to Use:

- ZMOD4410 Evaluation Kit
- Manuals, application notes, blog, and white papers
- Instructional videos
- Programming libraries, example codes, and algorithm support to optimize performance
- Third-party certification for compliance with well-accepted international IAQ standards

Part #	Operation Condition	Package
ZMOD4410	1.7-3.6V -40° to +65° Est. CO ₂ 400-5000ppm Ethanol in air 0-1000ppm	3.0 × 3.0 × 0.7mm, 12-LGA



ZMOD4410 typical application



Measuring IAQ and Est CO₂ level with ZMOD4410

HS300x – Relative Humidity and Temperature Sensor

High Accuracy Humidity and Temperature Measurement for Environmental Monitoring

High Accuracy

- $\pm 1.5\%$ RH accuracy (HS3001)
- $\pm 0.2^{\circ}\text{C}$ temperature accuracy (HS3001, HS3002)

Excellent Stability

- 0.1% RH per year drift
- MEMS silicon-carbide sensor technology

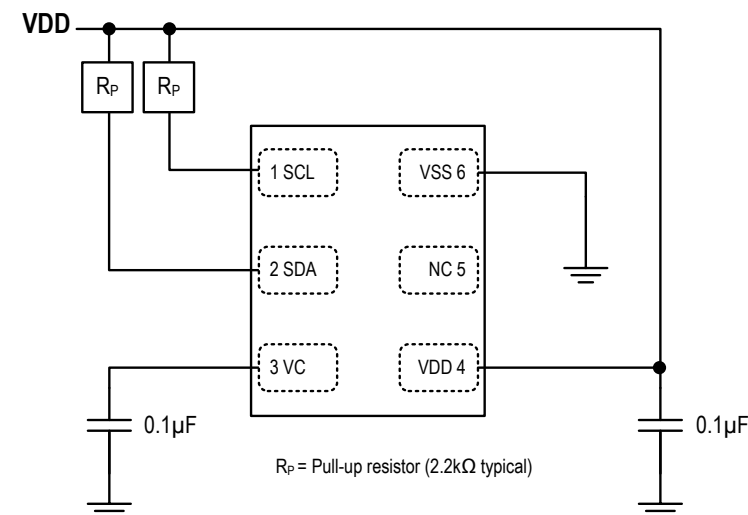
Fast Response

- Less than 6 seconds humidity response, in still air
- Less than 2 seconds temperature response

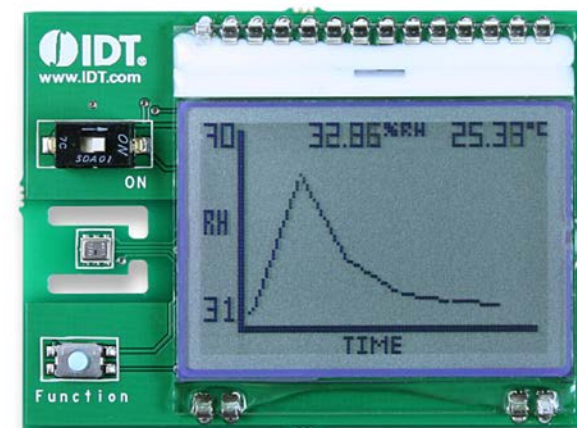
Extended Supply Voltage

- 2.3V to 5.5V, 24.4 μA at 3.3V (one RH+Temp per second)
- 1.8V custom order

Part #	Feature	Package
HS3001	$\pm 1.5\%$ RH	3 \times 2.41 \times 0.8 LGA
HS3002	$\pm 1.8\%$ RH	3 \times 2.41 \times 0.8 LGA
HS3003	$\pm 2.8\%$ RH	3 \times 2.41 \times 0.8 LGA
HS3004	$\pm 3.8\%$ RH	3 \times 2.41 \times 0.8 LGA



Typical Operating Circuit



SDAH02 Evaluation Kit

[Renesas.com](https://www.renesas.com)