JP121
Smart Range Hood With Gas Sensor

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BIG IDEAS FOR EVERY SPACE

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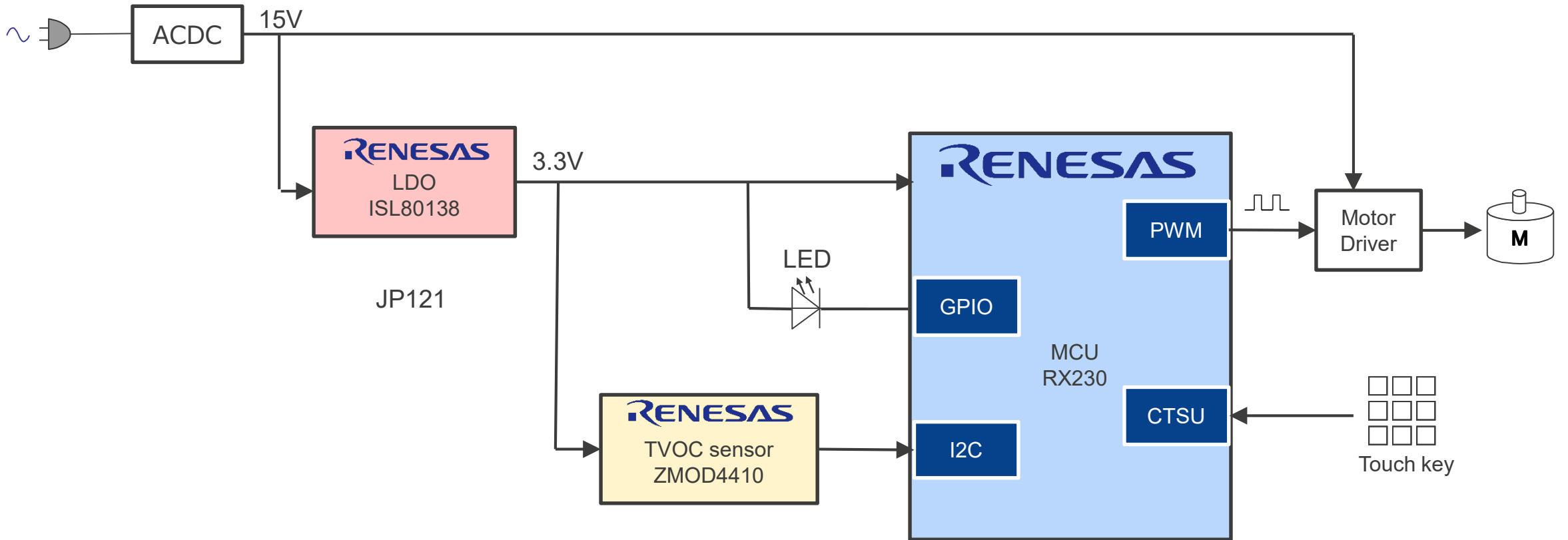# Smart Range Hood with Gas Sensor

- **Overview**

Food preparation has always been an important factor in any home/kitchen around the world. Now that appliances are getting smarter, they are able to better control and alert users to the status of the food they are preparing. In this reference design, the ZMOD4410 air quality sensor can detect food spoiling and other volatile organic compounds (VOC), such as burning food, very early, making adjustments to the conditions and alerts. In this case turn on or off the ventilation fan and send alerts to the RX231 microcontroller (MCU) which displays them to the user via an LED display.

- **System benefits**
  - Single sensor device (ZMOD4410) can detect food spoilage and VOCs, alert the users and maintain air quality in the kitchen.
  - The RX231 provides all the core functions: sensor data analysis, fan control, drive the LEDs for status and alerts, and touch switches for manual control.

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Device Category	P/N	Key Features
MCU	RX230	32-bit MCU with Enhanced DSP, FPU and CTSU Best Combination of Low-power consumption and High-performance 32-bit RXv2 CPU Core
Analog	ZMOD4410	Indoor Air Quality Sensor Platform TVOC Sensor for Indoor Air Quality Application
Power	ISL80138	High Performance 150mA LDO High Accuracy, Low Quiescent Current, Adjustable Output

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RX230 – 32-bit MCU with Enhanced DSP, FPU and CTSU
Best Combination of Low-power Consumption and High-performance 32-bit RXv2 CPU Core

High Performance and Support 5V Power Supply
- Max. operating frequency: 54MHz with RXv2 core
- Built-in FPU, 88.56 DMIPS
- Up to 256 Kbytes code flash and 32 Kbytes SRAM, no wait states
- Ideal for the home appliance and industrial fields, where 5V operation, external bus, and capacitive touch support are essential
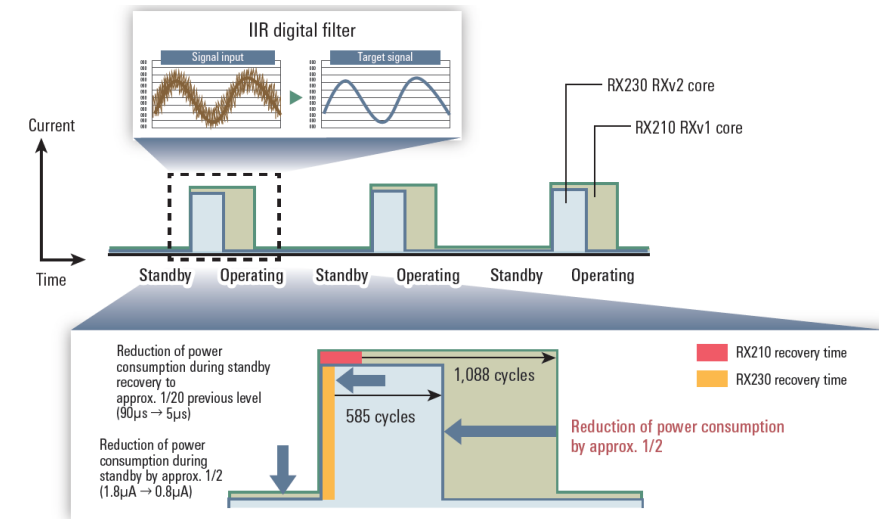
Capacitive Touch Sensors with Sensitivity and Noise Tolerance
- Up to 24 capacitive touch sensors(CTSU) channels
- Improved noise immunity, sensitivity and water resistance
- Support wet environments, support a variety of materials like wood, acrylic, glass or stone
- Operation possible when wearing gloves
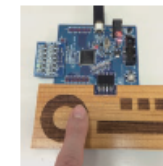
Rich Peripheral Functions and Low Power Design
- Standby current with RAM and register contents retained is 0.8μA, among the best in the industry
- Fast recovery from the standby state in as little as 5μs (when using LOCO at 4MHz)
- Incorporating external components into MCU like POR/LVD, RTC, E2 data flash, temperature sensor
- Up to 11 communication functions include RSPI, SSI and I^{2}C, up to 20 extended-function timers,12-bit ADC, 12-bit DAC, comparator, remote control signal reception

Part #	ROM (Kbytes)	RAM (Kbytes)	CTSU	Package
R5F5230xADFL R5F5230xADNE	128/256	32	6ch	LFQFP-48(7 x 7 mm, 0.5 mm pitch) HWQFN-48(7 x 7 mm, 0.5 mm pitch)
R5F5230xADFM R5F5230xADND R5F5230xADLF	128/256	32	10ch	LFQFP-64(10 x 10 mm, 0.5 mm pitch) HWQFN-64(9 x 9 mm, 0.5 mm pitch) WFLGA-64(5 x 5 mm, 0.5 mm pitch)
R5F5230xADFP R5F5230xADLA	128/256	32	24ch	LFQFP-100(14 x 14 mm, 0.5 mm pitch) TFLGA-100 (5.5 x 5.5 mm, 0.5 mm pitch)

Power Efficiency RX230 vs RX210

Capacitive Touch Solution

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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 (eCO_2)
- 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
- Algorithm support to optimize performance
- Third-party certification for compliance with well-accepted international IAQ standards

Part #	Operation Condition	Package
ZMOD4410AI1V ZMOD4410AI1R	1.7-3.6V -40° to +65° Est. CO2 400-5000ppm Ethanol in air 0-1000ppm	3.0 × 3.0 × 0.7mm, 12-LGA
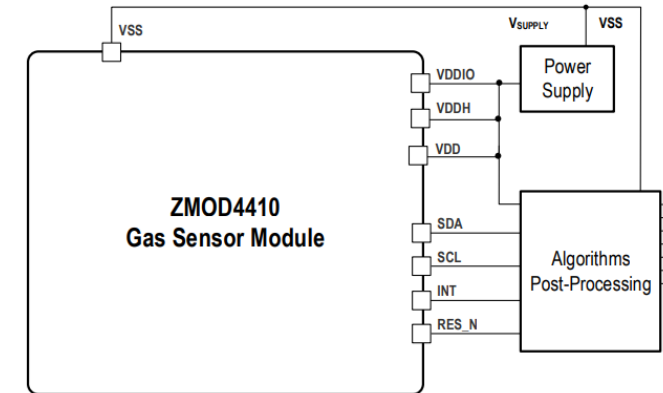
ZMOD4410 typical application
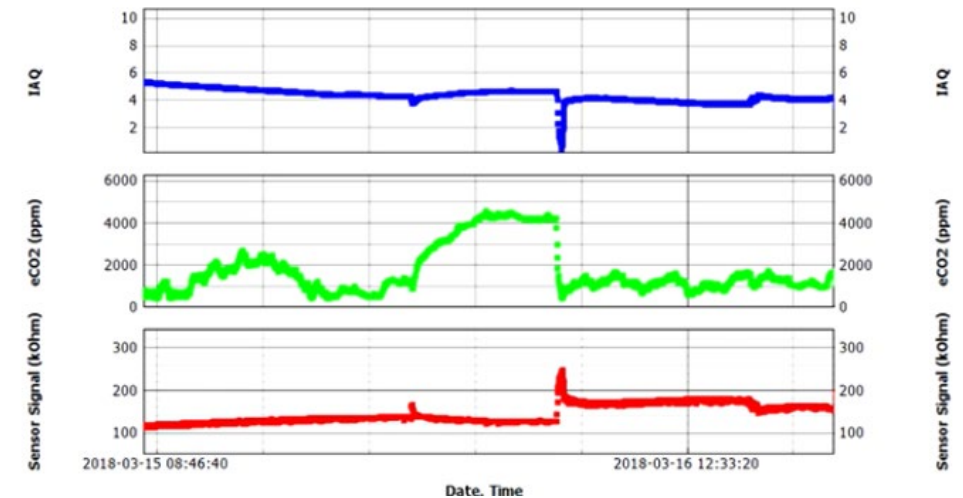
Measuring IAQ and Est CO_2 level with ZMOD4410

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ISL80138 – High Performance 150mA LDO
High Accuracy, Low Quiescent Current, Adjustable Output

High Performance and Wide Input Range

- Wide V_{IN} range of 6V to 40V
- Adjustable output voltage from 2.5V to 12V
- I_{OUT} is 150mA
- ±1% accurate voltage reference (over temperature, load)

High Efficiency

- Ultra low 18µA typical quiescent current
- Low 2µA of typical shutdown current
- Low dropout voltage of 295mV at 150mA
- Low 26µVRMS noise

Excellent Safety

- 40V tolerant logic level (TTL/CMOS) enable input
- 5kV ESD HBM rated
- Thermal shutdown and current limit protection

Part #	V_{IN} Range(V)	V_{OUT} Range(V)	Enable Pin	Package
ISL80138IVEAJZ	6 to 40	ADJ	Yes	14 Ld HTSSOP
ISL80138IVEAJZ-T	6 to 40	ADJ	Yes	14 Ld HTSSOP
ISL80138IVEAJZ-T7A	6 to 40	ADJ	Yes	14 Ld HTSSOP
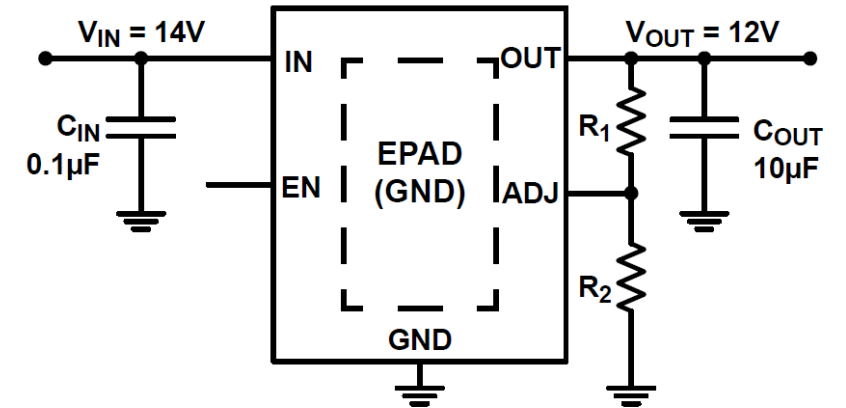
Typical Application Circuit
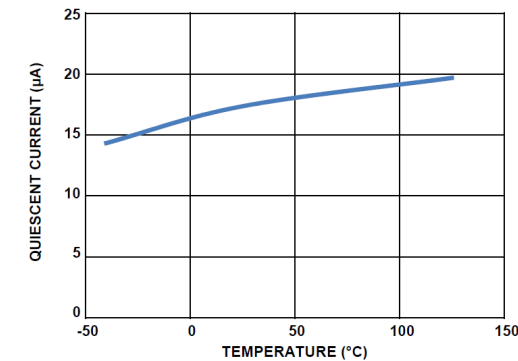
Quiescent Current vs Temperature (at UNITY gain). V_{IN} = 14V

ISL80138EVAL1Z Evaluation Board

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