Mobile RH & T Sensor System Solution, SEN208 Demo Station
Relative Humidity & Temperature Sensor Mobile System Solution with best in class sensor fusion SW

Overview

• NXP offers turn-key solutions in environmental conditions monitoring.

• SEN208 provides best in class performance in Relative Humidity (RH) & Temperature (T) accuracy in combination with ultra low power consumption, wide supply voltage range and advanced sensor fusion SW to estimate rapidly and accurately environmental conditions

• Mobile environmental system solution consists of:
  • **SEN208** RH&T sensor integrated in Nexus-7
  • Android SW stack including state of the art Sensor Fusion SW, benchmark performance in mobile systems solutions
Relative Humidity & Temperature Sensor
Mobile System Solution with best in class sensor fusion SW

Key Points

• Temperature and Humidity are measured inside the mobile, while ambient environmental conditions are of interest

• Challenges for measuring accurate environmental conditions in a mobile
  • Environmental conditions can change rapidly
    • Moving from indoor to outdoor
  • Mobiles have a large heat capacitance
    • Cold phones stay cold for long time
  • Mobiles have many internal heat sources
    • Mobiles heat up during use
  • High measurement accuracy is key for a precise and rapid prediction

• Fusion SW is required to:
  • Follow environmental changes
    • RAPID and ACCURATELY
  • Maintain accuracy, independent of phone use

Nexus 7, T change
T change: 10°C to ~21°C
Nexus 7, RH & T change
RH change: 64% to (~47 to 49%)
Relative Humidity & Temperature Sensor
Mobile System Solution with best in class sensor fusion SW

Primary Benefits

- Turn key solution for environmental Relative Humidity and Temperature monitoring within a mobile system
- SEN208 RH & T sensor
  - Ultra small form factor: 2.0 x 2.0 x 0.75mm
  - Low power:
    - 1.72V-3.6V
    - 8 µA @1Hz in high accuracy mode
    - 100 nA power down mode
  - Accuracy:
    - ± 0.2°C T; ± 2% RH
- Complete SW stack, including Fusion SW to calculate ambient parameters
  - In less than 60 seconds
  - With an accuracy of
    - < 1°C temperature
    - < 3% humidity
- Enabling context aware use cases
RH & T and Gas Sensor System Solution
Demo Station
Overview

- Demo based on system integration of Relative Humidity & Temperature sensor (SEN208), Volatile Organic Compound (VOC) transducer & controller, that contributes to a healthier & safer life by enabling use cases such as:
  - Blood Alcohol Concentration (BAC)
  - Indoor Air Quality monitoring (including CO₂ equivalent)
  - Alarm in case of hazard situations (high CO, fire, smoke, toxic gasses)

- Discrete system solution consists of:
  - SEN208, VOC transducer & VOC controller integrated in Nexus-7
  - Complete Android SW stack available
  - Use case specific Fingerprint SW
    - Indoor Air Quality Measurement (iAQI)
    - Blood Alcohol Concentration (BAC)
Key Points

• VOC Transducer:
  • Gas Sensor based on MO$_x$ technology
  • MO$_x$ resistance changes with the concentration of VOCs in the air

• VOC Controller:
  • Driving the VOC transducer requires specific analog peripherals
  • Measurements of the MO$_x$ resistance at different temperatures allow for an increased selectivity of the desired gas

• SEN208:
  • Accurate gas measurement requires compensation for Humidity and Temperature conditions

• Sensor Fusion (Fingerprint) SW
  • Unique Sensor Fusion SW tailored to the specific use cases to provide the required accuracy and selectivity

- Up to 2x RH cross-interference improvement at the average power
- More selective signature of a specific gas
- Up to 10x average power consumption reduction compared to continuous power operation
Primary Benefits

- Discrete System Solution VOC, RH & T Sensor:
  - RH and T sensor performance (SEN208) for:
    - Accurate RH+T compensated gas detection
    - Accurate environmental RH and T estimation
  - VOC specific Controller for:
    - Direct Interfacing
    - Optimal transducer performance
    - Optimized power consumption (<2mW average sensor power for any use case)
  - Sensor Fusion (Fingerprint) SW including self compensation for any drift, no need for calibration during handset manufacturing or in-field calibration by consumer
NFC Connected Smart Sensor Driver, SEN051
Demo Station
NFC Powered and Connected Smart Sensor Driver
System Solution for Interactive Gaming and IoT

Overview

• NXP provides an ultra low power NFC tag equipped microcontroller based system with dedicated sensor readout interfaces, ideal for gaming and IoT.

• NFC enabled interactive gaming system consists of:
  • SEN051 Smart Sensor Driver controlling
    • SEN208 RH & T sensor
    • Light sensor
    • Signaling (LEDs and buzzer)
    • Capacitive touch sensing
  • Embedded SW running on the Smart Sensor Driver
  • NFC readers to communicate with SEN051
  • Android application running on Nexus-7
NFC Powered and Connected Smart Sensor Driver
System Solution for Interactive Gaming and IoT

Key Points

• First of a kind monolithic integration of Cortex M0+, NFC compliant tag and dedicated sensor driver interfaces

• Ideal for both battery less and battery powered applications

• Integrated power harvesting from NFC field to supply the on board devices

• Ease of design-in and high Flexibility

• Optionally available:
  • Integrated T sensor
  • Sensors specific interfaces

Accurate temperature monitoring and logging
Connect real & virtual world via NFC powered tag
IoT applications based on environmental monitoring
NFC Powered and Connected Smart Sensor Driver System Solution for Interactive Gaming and IoT

Primary Benefits

- Cortex M0+, up to 8MHz
- NFC tag (ISO14443, Type A)
  - Integrated NFC Power Harvesting
- Wide battery supply range: 1.72-3.6V
  - Ultra Low Power consumption
- Ideal for Interactive systems (e.g. LEDs and Buzzer)
  - Up to 20mA High Current Drive and Sink capability on 4 GPIOs
- Flexible for easy design in:
  - 32KB Flash, 8KB EEPROM, 4KB SRAM
  - Up to 12 GPIOs and 6 Analog Pins
  - I²C/SPI bus interface
- 12bit and 80kSa/s ADC/DAC converter
- HVQFN24 package:
  - 4.0 x 4.0 x 0.85 mm