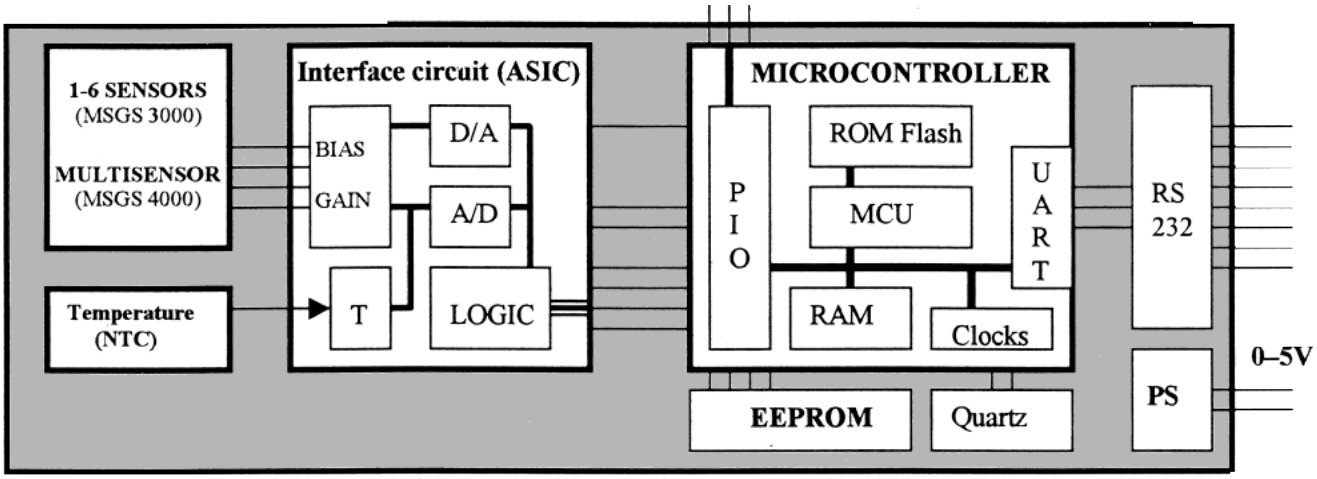
MICROSENS

Microsystem Description

PRELIMINARY

Gas Sensing Microsystem



Block diagram of the gas multisensor microsystem

■ The sensor microsystem is designed to operate from 1 to 6 semiconductor gas sensors (1-6 MSGS 3000 or 1 MSGS 4000).

The electronic interface is composed of a dedicated integrated circuit and a 8-bit microcontroller.

The dedicated interface (ASIC) includes the needed functions for the conditioning of up to 6 resistive sensors (heater control and sensor bias) and for the signal conversion (sensing resistance measurement).

It also includes a temperature measurement bloc using an external thermistor (NTC). Furthermore, the system can drive other resistive sensors in parallel such as a humidity sensor.
The 8-bit microcontroller controls the interface and computes the required data preprocessing (calibration). It implements a programmable dedicated mode of operation for each sensor.
The use of a Multiple-Time-Programmable (MTP) Flash program gives the possibility to adapt the operation mode for different sensing solutions.

The multisensor microsystem is calibrated at the end of the manufacturing following an application-specific calibration procedure.
The microcontroller handles the communication with an external computer, using a standard serial data interface (RS232).
The sensor microsystem is mounted on PCB combining SMD components and Chip-On-Board technology. Custom specific miniaturized package can be developed on request.

Main advantages

- Small size
- Calibrated multisensor system
- In-site programmable mode of operation for gas discrimination and low power
- Temperature compensation
- Easy field implementation and sensor interchangeability without recalibration
- Communication interface

Besides the obvious advantages of producing the gas sensor devices or multisensor in batch fabrication processes (cost, miniaturization, reproducibility), further advantages of using a sensor microsystem are related to the new onboard added functions of a microsystem. Dedicated to a gas multisensor, they include specific mode of operation for gas selectivity and sensors stability, power management for low power application, calibration, temperature compensation and signal preprocessing as linearisation.
The used of a calibrated microsystem facilitates the in-site replacement of the sensor microsystem, without the need of specific trained personnel.

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General specifications

Power supply	0 – 5V, < 1.5 mA for system electronic 1-6 gas sensor power depending of their operating modes
I/O interface	RS232
Sensors chip	1-6 MSGS3000 or other dedicated resistive sensors 1 MSGS 4000, 4-6 SnO2 sensor device (see detailed documentation)
Interface circuit	Sensor heaters Programmable sensor drivers: (10 bit D/A) - 6 x 35 mA / 3.5V - 3 x 70 mA / 3.5V Programmable heater pulses (5ms – 10s) or isothermal mode Voltage settable between 0 – 3.5 V with 10 bit resolution Precise determination of sensor temperature using heater current measurements Sensing resistance measurement 0.2 – 4 V bias voltage, with step of 0.2 V Resistance measurement range: 5 k Ω to 100 M Ω 13 bit A/D converter at 910 Hz measurement frequency Temperature measurement using external NTC Range: -10°C – 60°C Precision: 1.5°C without calibration
Microcontroller (XE8851)	Low voltage: 2.4 –5.5 V Low power: 200 µA at 1 MIPS Programmable mode of operation and calibration mode Sleep mode for power reduction 8-bit processor core and data bus 4096 x 22 bits on-chip MTP Flash ROM (mask ROM versions available) Serial UART Off chip EEPROM for calibration parameters
Packaging	PCB board using Chip-On-Board, Application specific package

Applications

Indoor Air Quality monitoring

Gas controllers as combustion monitoring

Environment monitoring

Portable systems

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