Product Specification

Senseair Sunrise

Sensor module for battery-powered applications

Senseair

An Asahi Kasei Group Company

Table of Contents

General

Item	Senseair Sunrise Article No. 006-0-0007
Target gas	Carbon dioxide (CO_2)
Operating principle	Non-dispersive infrared (NDIR)
Operating range	0 — 50°C, 0 — 85% RH (non-condensing), (see figure 3)
Measurement range	400 — 5000 ppm; extended range up to 10000 ppm [1]
Accuracy [CO_2]	±(30 ppm +3% of reading) [2, 3] (extended range ±10% of reading)) [2, 3, 4]
Pressure dependence	1.6% reading per kPa deviation from normal pressure
RMS noise, Typ. [CO_2]	Filtered: 0.6 ppm @ 400 ppm, 25°C 2.5 ppm @ 3000 ppm, 25°C Unfiltered: 6 ppm @ 400 ppm, 25°C 17 ppm @ 3000 ppm, 25°C
Power supply	3.05 — 5.5 V [5]
Peak current	<125 mA [6]
Steady state current during sampling	99 mA
Average current, typical	45 µA [7, 8]
Measurement setting	Default: 16 s, 8 samples (adjustable by host) [7]
Dimensions (L x W x H)	33.5 x 19.7 x 11.5 mm
Life expectancy	>15 years
Storage temperature	-40 — 70°C
Weight	5 g
Communication interface	UART / I²C

Table 1 General Specifications

Note 1: Sensor is designed to measure in the range 400 — 5000ppm, extended range up to 10000ppm, which is specified in the table accuracy. Nevertheless, exposure to concentrations below 400ppm may result in incorrect operation of ABC algorithm and shall be avoided for model with ABC ON.

Note 2: 15 – 35°C, 0 – 80%RH, after 3 ABC periods.

Note 3: Specification is referenced to uncertainty of calibration gas mixtures (±1%).

Note 4: Extended range accuracy is not calibrated or guaranteed, it is extrapolated from calibrated range.

Note 5: Unprotected against surges and reverse connection.

Note 6: At sampling start/stop there is a fast transient current. See “Sunrise customer integration guidelines” (TDE7318) for details.

Note 7: See Measurement mode for detailed information

Note 8: With default settings and nRDY disabled. See Figure 4 Average current.

Description

Senseair Sunrise is a miniature sensor module for battery-powered applications. It gives full control over integration of sensor into a host system, flexibility in changing of CO_2 measurement period and power consumption.

Applications

Senseair Sunrise is designed for battery powered applications. Key Benefits

- Wide supply voltage range enables a variety of battery options
- Adjustable measurement period by host
- Adjustable ABC period by host
- Ultra-low power consumption

Installation and Soldering

Refer to Senseair Sunrise Handling manual (ANO4947).

Sample Gas Diffusion Area

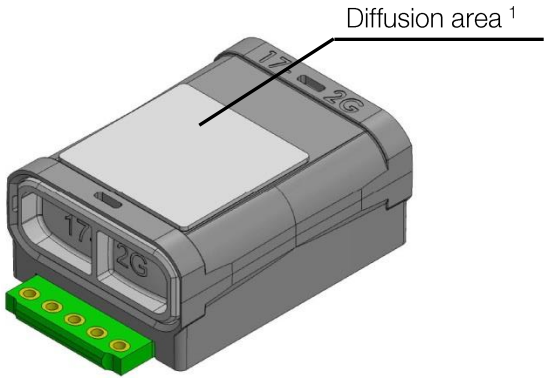

Figure 1 Sample Gas Diffusion Area

Note 1: Diffusion area must not be covered. Diminished sample gas circulation may affect response time.

Pin Configuration and Functions

Pin Configuration

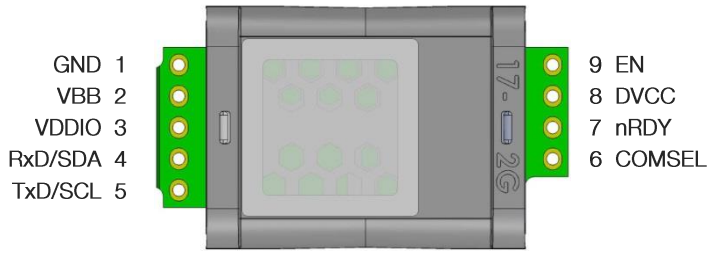

Figure 2 Pin Configuration (Top view)

Pin Functions

Pin #	Symbol	I/O Type	Description
1	GND	Power	Ground
2	VBB	Power	Sensor supply voltage
3	VDDIO	Power	I/O supply voltage for TXD/SCL and nRDY.
4	RxD/SDA	I/O	Sensor UART receive input / I²C bidirectional serial data; True Open-Drain when operating as output.
5	TxD/SCL	I/O	Sensor UART transmit output / I²C clock input; True Open-Drain when operating as output, 100kΩ internal Pull-Up to VDDIO.
6	COMSEL	Input	Communication select, valid at power-up: HIGH = UART (Default, internal Pull-Up, can be left floating); LOW = I²C (Connect to GND).
7	nRDY	Output	Measurement ready output; True Open-Drain, active LOW; 1MΩ internal Pull-Up to VDDIO.
8	DVCC	Power	Internal supply voltage output. Not intended to supply external systems, leave floating if not used.
9	EN	Input	Enable (active high). Drive this pin over 1.2V to turn on the sensor. Drive this pin below 0.4V to put the sensor into shutdown mode. Do not leave floating. Connect to VBB if not used.

Table 2 Pin Functions

Specifications

Absolute Maximum Ratings

Over operating temperature range (unless otherwise noted); all voltages are with respect to GND [1]

Symbol	Description		Min	Max	Unit
	Voltage				
VBB	Supply voltage		-0.3	6	V
VDDIO	I/O supply voltage				
nRDY	Ready output				
RxD/SDA	UART / I²C				
TxD/SCL	UART / I²C				
EN	Enable				
DVCC	Internal supply voltage output		-0.3	VBB + 0.3 or 4.3 whichever is less	V
COMSEL	Communication select	EN = HIGH	-0.3	DVCC + 0.3	V
		EN = LOW	-0.3	0.3	
	Current				
DVCC	Maximum output current		Internally limited		A
COMSEL, RxD/SDA, TxD/SCL	Instantaneous maximum current limit			25	mA

Table 3 Absolute Maximum Ratings

Note 1: Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. These are stress ratings only, which do not imply functional operation of the device at these or any other conditions beyond those indicated under Recommended Operating Conditions. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

Recommended Operating Conditions

Over operating temperature range (unless otherwise noted)

Symbol	Description	Min	Typ	Max	Unit	Test conditions
	Voltage					
VBB	Supply voltage	3.05	3.3	5.5	V	
VDDIO	I/O supply voltage for TXD/SCL and nRDY.	0		5.5	V	
COMSEL	Communication select	0		DVCC	V	
EN	Enable	0		VBB	V	
RxD/SDA	UART / I²C	0		VDDIO	V	
TxD/SCL	UART / I²C	0		VDDIO	V	
	Current					
I_{COMSEL} [2]	DC injection current	-2		2	mA	(V_{IN}<GND, V_{IN}>DVCC)
I_{DVCC} [1, 2]	Internal supply voltage current	0		25	mA	

Table 4 Recommended Operating Conditions

Note 1: Leave floating if unused.
Note 2: Limited to the value specified.

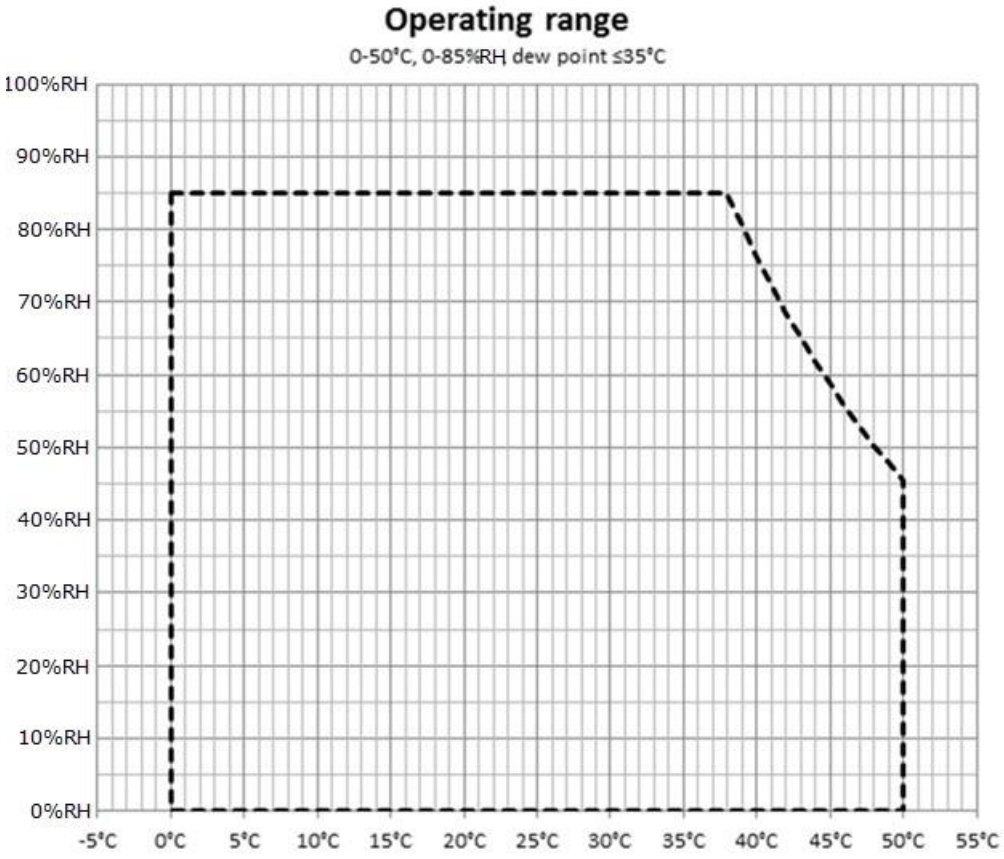

Figure 3 Operating range

Electrical Characteristics

Over operating temperature range, V_{EN} = V_{BB} = 3.3V and default settings:
Continuous mode, 16s measurement period, 8 samples, unless otherwise noted.

Symbol	Description		Min	Typ	Max	Unit
	Operating voltage					
V_{DVCC} [1]	Supply voltage output		2.74		2.91	V
V_{IH}	Input high voltage	COMSEL, RxD/SDA, TxD/SCL ENABLE	2.0 1.2			V V
V_{IL}	Input low voltage	COMSEL, RxD/SDA, TxD/SCL ENABLE			0.82 0.4	V V
V_{HYS}	Input hysteresis	COMSEL, RxD/SDA, TxD/SCL	164			mV
	Operating current					
I_{VBB}	Operating peak current Operating average current	$V_{EN} \geq 1.2V$; $3.05 \leq V_{BB} \leq 5.5V$		 45[2]	125	mA µA
	Shutdown current					
I_{VBB}	Supply quiescent current	$V_{EN} \leq 0.3V$; $3.05 \leq V_{BB} \leq 5.5V$		0.2	1	µA
I_{EN}	Enable pin leakage current	$V_{EN} = V_{BB} = 5.5V$		5.5		µA
I_{VDDIO}	I/O supply leakage current	V_{DDIO} = 3.3V		0.2	1.1	µA
I_{IN}	Input leakage current	V_{DDIO} = 3.3V; RxD/SDA, TxD/SCL		0.1	1	µA

Table 5 Electrical Characteristics, Typical values at T_A = 25°C.

Note 1: Output is not intended to supply external systems, leave floating if unused.
Note 2: nRDY disabled

Average current

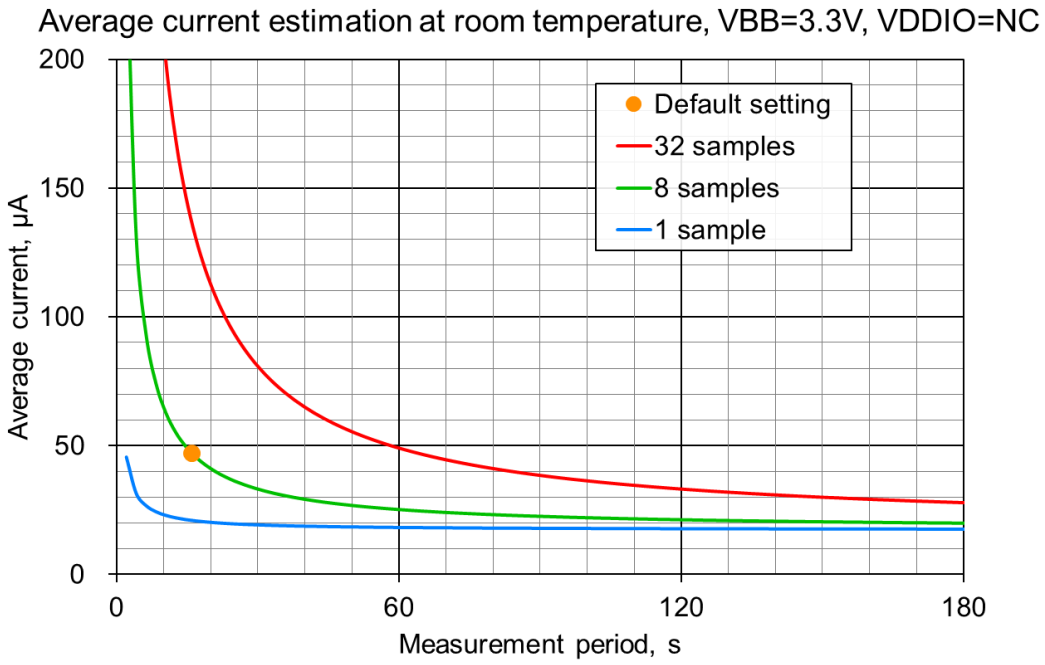

Figure 4 Average current

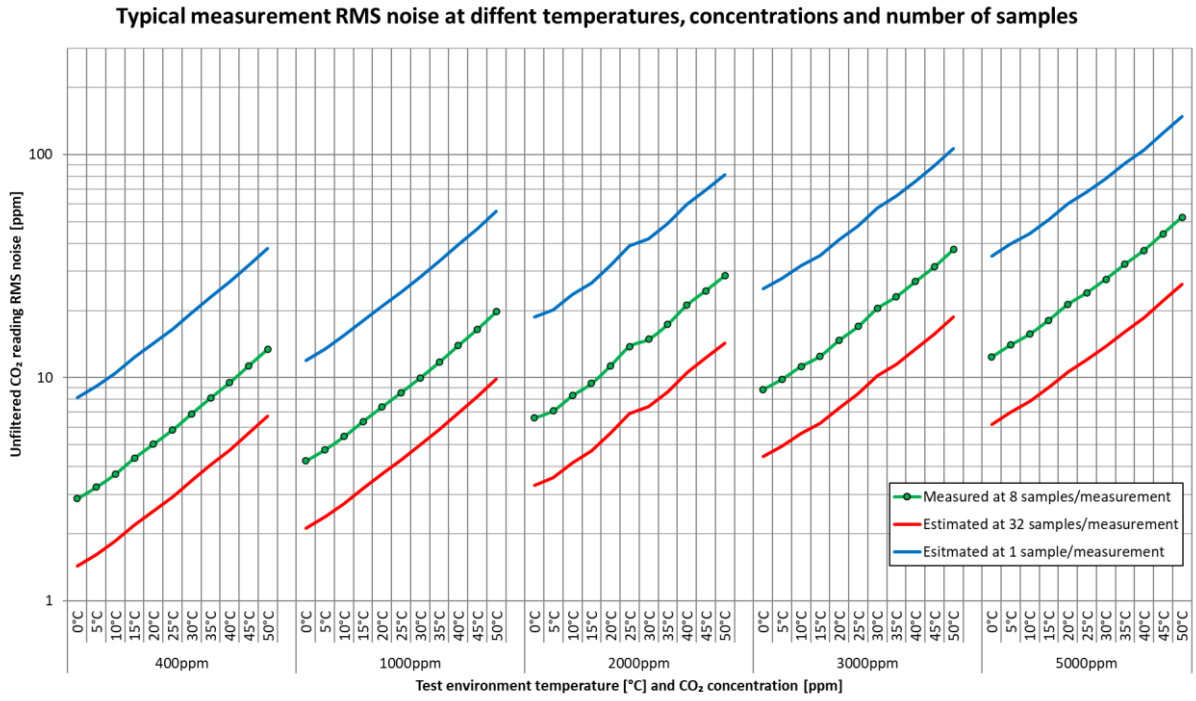

Figure 5 Measurement RMS noise

Measurement Mode

The Senseair Sunrise supports two modes of operation for measurement of CO_2 concentration: Continuous measurement mode and Single measurement mode. The default operation mode for Senseair Sunrise is Continuous measurement mode.

1) In Continuous measurement mode, the sensor measures at regular intervals (measurement period, default setting 16s). The host can read measurement data after each measurement and does not need to send any command to trigger measurements.
2) In Single measurement mode, the sensor waits for the hosts command to measure. The host needs to send a command sequence to trigger each measurement.

See “Sunrise customer integration guidelines” (TDE7318) for details.

Communication

Refer to "Modbus on Senseair Sunrise" (TDE5514) and "I2C on Senseair Sunrise" (TDE5531). See “Sunrise customer integration guidelines” (TDE7318) for details.

Dimensions

Refer to drawing 740-00993.

Maintenance

Senseair Sunrise has a built-in self-correcting ABC algorithm. ABC period is adjustable by host. Discuss your application with Senseair in order to get advice for a proper calibration strategy.

Handling

Refer to Handling Manual (ANO4947)

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