

Product Specification

Senseair Sunlight R32

Sensor module for leakage detection of refrigerants



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General

| Item | Senseair Sunlight R32 Article No. 009-4-0001 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------------------------------|---|--------|------------|--------|------------|--------|--------------------|----------|--|-----------|--|------------|--|------------|--------|------------|--------|------------|--------|-----|-------|--|-------|--|--|--|------|-------|--|-------|--|-------|--|-------|-------|------|-------|-------|-------|-------|-------|-------|------|-------|------|-------|-------|
| Target gas | R32 (CH ₂ F ₂) ¹ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Operating principle | Non-dispersive infrared (NDIR) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Operating range | -40 – 70 °C, 0 – 95% RH (non-condensing) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Measurement range | 0 – 50% LFL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Accuracy [R32] | Standard range: ±2.5% LFL ^{2,3,4} Extended range: ±5% LFL ^{2,3,4} | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Resolution | 10 ppm (0.007% LFL) ⁵ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pressure dependence | +1% reading per kPa deviation from normal pressure | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Power supply | 3.05 – 5.5 V ⁶ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Peak current | <95 mA ⁷ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Steady state current during sampling | 84 mA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Average current, typical | <p>Table comparing continuous measurement mode and single measurement mode.^{8,9}</p> <table border="1"> <thead> <tr> <th rowspan="2">Measurement period</th> <th colspan="2">2 sample</th> <th colspan="2">8 Samples</th> <th colspan="2">32 Samples</th> </tr> <tr> <th>Continuous</th> <th>Single</th> <th>Continuous</th> <th>Single</th> <th>Continuous</th> <th>Single</th> </tr> </thead> <tbody> <tr> <td>2 s</td> <td>34 µA</td> <td></td> <td>94 µA</td> <td></td> <td></td> <td></td> </tr> <tr> <td>16 s</td> <td>18 µA</td> <td></td> <td>25 µA</td> <td></td> <td>56 µA</td> <td></td> </tr> <tr> <td>1 min</td> <td>16 µA</td> <td>8 µA</td> <td>18 µA</td> <td>10 µA</td> <td>26 µA</td> <td>20 µA</td> </tr> <tr> <td>2 min</td> <td>16 µA</td> <td>4 µA</td> <td>17 µA</td> <td>5 µA</td> <td>21 µA</td> <td>10 µA</td> </tr> </tbody> </table> | | | | | | Measurement period | 2 sample | | 8 Samples | | 32 Samples | | Continuous | Single | Continuous | Single | Continuous | Single | 2 s | 34 µA | | 94 µA | | | | 16 s | 18 µA | | 25 µA | | 56 µA | | 1 min | 16 µA | 8 µA | 18 µA | 10 µA | 26 µA | 20 µA | 2 min | 16 µA | 4 µA | 17 µA | 5 µA | 21 µA | 10 µA |
| Measurement period | 2 sample | | 8 Samples | | 32 Samples | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Continuous | Single | Continuous | Single | Continuous | Single | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 s | 34 µA | | 94 µA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 16 s | 18 µA | | 25 µA | | 56 µA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 min | 16 µA | 8 µA | 18 µA | 10 µA | 26 µA | 20 µA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 min | 16 µA | 4 µA | 17 µA | 5 µA | 21 µA | 10 µA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Measurement setting | Default: Continuous measurement mode, 2 s, 8 samples ^{9,10} Adjustable by host | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dimensions (L x W x H) | 34 x 21 x 12 mm, max | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Life expectancy | >15 years in normal commercial environments | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Storage temperature | -40 – 85 °C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Weight | 5 g | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Communication interface | UART / I ² C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Table 1 General specifications

- Note 1: Sensor measures molecules containing C-H bonds.
- Note 2: Standard measurement range 0 – 25% LFL, Extended measurement range 25 – 50% LFL.
- Note 3: -30 – 60 °C, 0 – 95% RH, after 3 ABC periods or 1 zero calibration and default measurements settings.
- Note 4: Specification is referenced to uncertainty of calibration gas mixtures (±1%).
- Note 5: Convert to %LFL: $CH_2F_2\%LFL = \frac{Sensor\ reading}{144.4}$
- Note 6: Unprotected against surges and reverse power supply polarity.
- Note 7: At sampling start/stop there is a fast transient current.
- Note 8: nRDY output pin disabled. See Figure 4 Average current.
- Note 9: See Measurement mode for detailed information.
- Note 10: ABC ON. ABC period 720h (30 days).



Description

Senseair Sunlight is a low-cost miniature sensor module for leakage detection of refrigerants containing R32. Customer has full control over integration of sensor into a host system, flexibility in changing of measurement period and power consumption.

Sensor key benefits:

- Fast response time
- Very low power consumption
- Immunity to poisoning
- Maintenance-free
- Long term stability
- Long lifetime
- Individually calibrated
- LED light source
- Compatible with IEC 60079-29-1, and sensor element part at IEC & UL 60335-2-40

Installation and soldering

Refer to Senseair Sunlight Handling manual (ANO4947).

Sample gas diffusion area

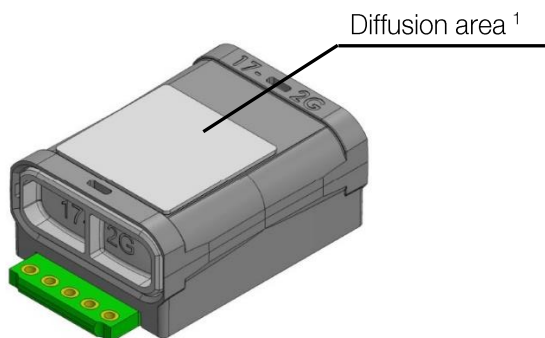


Figure 1 Sample gas diffusion area

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

Pin configuration and functions

Pin configuration

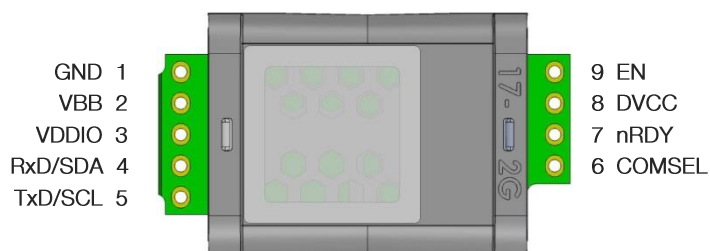


Figure 2 Pin configuration (top view)

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 / I ² C bidirectional serial data; True Open-Drain when operating as output. |
| 5 | TxD/SCL | I/O | Sensor UART transmit output / I ² C clock input; True Open-Drain when operating as output, 100 k Ω 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 = I ² C (Connect to GND). |
| 7 | nRDY | Output | Measurement ready output; True Open-Drain, active LOW; 1M Ω 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 1.2 V to turn on the sensor. Drive this pin below 0.4 V to put the sensor into shutdown mode. Do not leave floating. Connect to VBB if not used. |

Table 2 Pin functions

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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 |
| EN | Enable | | | | |
| VDDIO | I/O supply voltage | | -0.3 | 6.5 ² | V |
| RxD/SDA | UART / I ² C | | | | |
| TxD/SCL | UART / I ² C | | | | |
| nRDY | Ready output | | -0.3 | 6.5 | V |
| DVCC | Internal supply voltage output | | -0.3 | VBB + 0.3 or 4.3 whichever is less | V |
| COMSEL | Communication select | EN = HIGH EN = LOW | -0.3 -0.3 | DVCC + 0.3 0.3 | V |
| Current | | | | | |
| DVCC | Maximum output current | | Internally limited | | A |
| COMSEL, RxD/SDA, TxD/SCL | Instantaneous maximum current limit | | 15 | | 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.

Note 2: Do not input signals or an I/O pull-up power supply while the device is not powered (EN = LOW or VBB out of recommended operating condition). The current injection that results from input of such a signal or I/O pull-up might cause malfunction and the abnormal current that passes in the device at this time might cause degradation of internal elements.



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 / I ² C | 0 | | VDDIO | V | |
| TxD/SCL | UART / I ² C | 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.

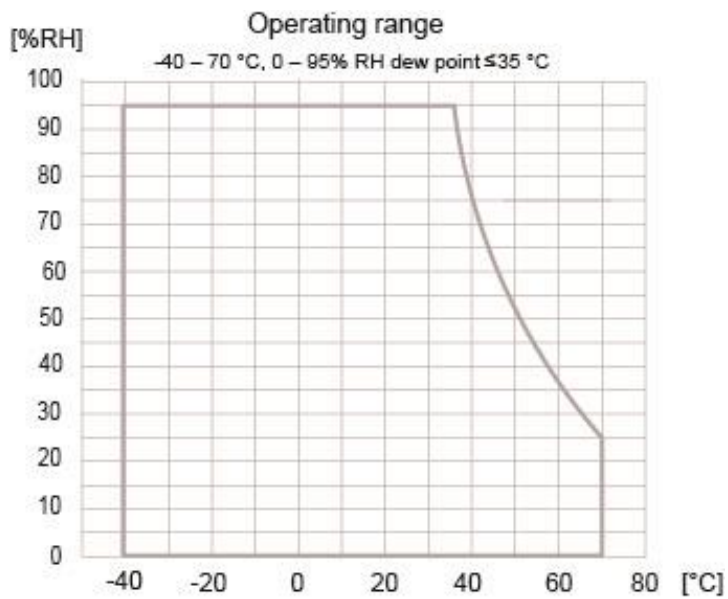


Figure 3 Operating range

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Electrical characteristics

Over operating temperature range, $V_{EN} = V_{BB} = 3.3$ V and default settings:
Continuous mode, 2 s measurement period, 8 samples, unless otherwise noted.

| Symbol | Description | Min | Typ | Max | Unit |
|----------------|---------------------------------|--|------|------|---------|
| Voltage | | | | | |
| V_{DVCC}^1 | Supply voltage output | 2.70 | | 2.91 | V |
| V_{IH} | Input high voltage ² | COMSEL RxD (UART) | 2.32 | | V |
| | | SDA (I ² C) SCL (I ² C) | 2.0 | | |
| | | ENABLE | 1.2 | | |
| V_{IL} | Input low voltage ² | COMSEL RxD (UART) | | 0.54 | V |
| | | SDA (I ² C) SCL (I ² C) | | 0.81 | |
| | | ENABLE | | 0.4 | |
| V_{HYS} | Input hysteresis | COMSEL, RxD/SDA, TxD/SCL | 270 | | mV |
| Current | | | | | |
| I_{VBB} | Operating peak current | $V_{EN} \geq 1.2$ V; $3.05 \leq V_{BB} \leq 5.5$ V | | 94 | mA |
| | Operating average current | | | 94 | μ A |
| I_{VBB} | Supply quiescent current | $V_{EN} \leq 0.3$ V; $3.05 \leq V_{BB} \leq 5.5$ V | 0.2 | 1 | μ A |
| I_{EN} | Enable pin leakage current | $V_{EN} = V_{BB} = 5.5$ V | 5.5 | | μ A |
| I_{VDDIO} | I/O supply leakage current | $V_{DDIO} = 3.3$ V | 0.2 | 1.1 | μ A |
| I_{IN} | Input leakage current | $V_{DDIO} = 3.3$ V; RxD/SDA, TxD/SCL | 0.1 | 5 | μ A |

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: Different voltage levels on pins RxD/SDA and TxD/SCL depending on if UART or I²C is used.
 Note 3: nRDY output pin disabled.

Average current

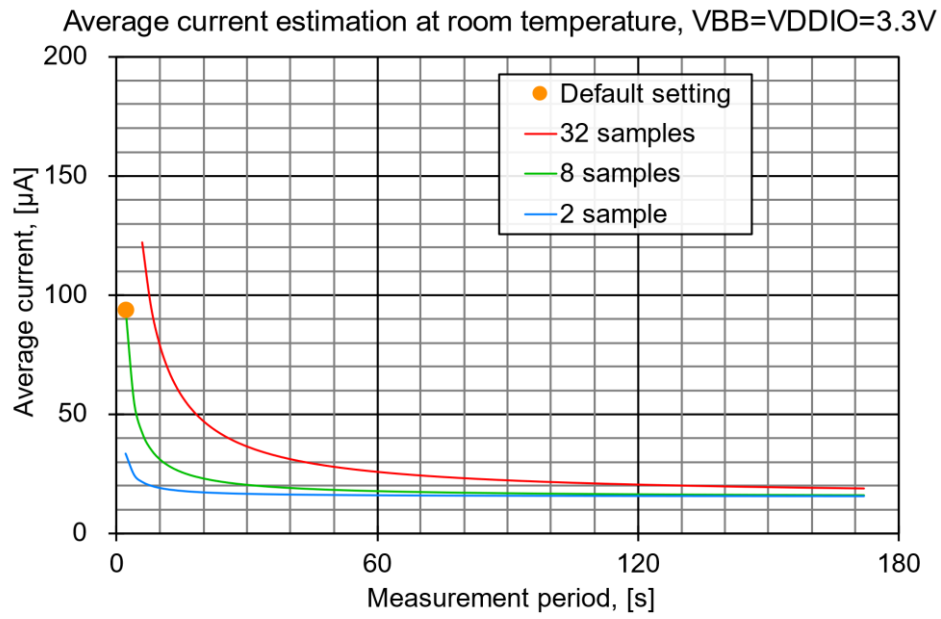


Figure 4 Average current

Measurement mode

The Senseair Sunlight supports two modes of operation for measurement of R32 concentration: Continuous measurement mode and Single measurement mode. The default operation mode for Senseair Sunlight is Continuous measurement mode.

- 1) In Continuous measurement mode, the sensor measures at regular intervals (measurement period, default setting 2 s). 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.

Communication

Refer to "Modbus on Senseair Sunrise and Sunlight" (TDE5514) and "I2C on Senseair Sunrise and Sunlight" (TDE5531).

Dimensions

Refer to drawing 740-00600.

Maintenance

Senseair Sunlight has a built-in self-correcting ABC algorithm. ABC period is adjustable by host and comes default with ABC ON and an ABC period of 720h.
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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