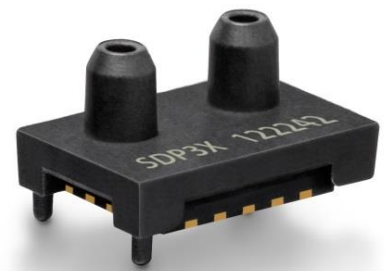


Datasheet SDP3x-Analog

Differential Pressure Sensor with Analog Output

- Smallest size enables portable applications
- Reflow solderable – Pick & Place
- Configurable analog output
- Calibrated and temperature compensated
- Excellent repeatability, no drift



Product Summary

The SDP3x sensor family is Sensirion's series of small differential pressure sensors designed for high-volume applications where size is a key requirement. It builds on the next generation CMOSens® sensor chip that is at the heart of Sensirion's new differential pressure and flow sensing platform.

The analog SDP3x sensors offer a calibrated and temperature compensated analog voltage output. The output signal is configurable: different measurement speeds, output curves and temperature compensations can be selected – even dynamically during operation mode.

Benefits of Sensirion's CMOSens® Technology

- High reliability and long-term stability
- Best signal to noise ratio
- Industry-proven technology with a track record of more than 15 years
- Designed for mass production
- High process capability

Content

| | |
|-------------------------------------|---|
| 1. Sensor Performance | 2 |
| 2. Specifications..... | 3 |
| 3. Pin Assignment..... | 4 |
| 4. Package Outline..... | 6 |
| 5. Soldering..... | 7 |
| 6. Shipping Package..... | 8 |
| 7. Ordering Information | 8 |
| Revision History..... | 8 |
| Important Notices | 9 |
| Headquarters and Subsidiaries | 9 |

1. Sensor Performance

1.1 Differential Pressure Specification¹

| Parameter | Configuration | SDP36 | SDP37 |
|---|---------------|---|---|
| Measurement range ² | Linear | - 50 to 500 Pa (-0.2 to 2 inH ₂ O) | - 12.5 to 125 Pa (-0.05 to 0.5 inH ₂ O) |
| | Square Root | - 500 to 500 Pa (- 2 to 2 inH ₂ O) | - 125 to 125 Pa (- 0.5 to 0.5 inH ₂ O) |
| Zero point accuracy ^{3,4,5} | | 0.1 Pa ⁵ | 0.08 Pa ⁵ |
| Span accuracy ^{3,4,5} | | 3% of reading ⁵ | 3% of reading ⁵ |
| Zero point repeatability ^{4,5} | | 0.03 Pa ⁵ | 0.025 Pa ⁵ |
| Span repeatability ^{4,5} | | 0.5% of reading ⁵ | 0.5% of reading ⁵ |
| Span shift due to temperature variation | | < 0.5% of reading per 10°C | < 0.5% of reading per 10°C |
| Offset stability | | < 0.01 Pa/year | < 0.01 Pa/year |
| Response time (τ ₆₃) | Slow | < 9 ms | |
| | Fast | < 5 ms | |
| Internal digital resolution | | 16 bit | |
| Calibrated for | | Air, N ₂ | |
| Media compatibility | | Air, N ₂ , O ₂ , non-condensing | |
| Calibrated temperature range | | -40 °C to +85 °C | |

¹ Unless otherwise noted, all sensor specifications are valid at 25°C with VDD = 3.3 V and absolute pressure = 966 mbar.

² For other pressure ranges contact Sensirion

³ Includes repeatability

⁴ Total accuracy/repeatability is a sum of zero-point and span accuracy/repeatability.

⁵ Output voltage integral non linearity and output voltage noise are not included and defined later in chapter 2.1. Note that the effect of output voltage integral non linearity and output voltage noise on accuracy is highly dependent on the output configuration (linear or square root).

2. Specifications

2.1 Electrical Specifications

| Parameter | Symbol | Condition | Min. | Typ. | Max. | Units | Comments |
|---|-------------------|-----------|-----------------|------|------|-----------------|----------|
| Supply | | | | | | | |
| Supply Voltage | V _{DD} | | 2.7 | 3.3 | 5.5 | V | |
| Power-up/down level | V _{POR} | | 2.3 | 2.5 | 2.7 | V | |
| Supply current | I _{DD} | | | 3.8 | 5.5 | mA | |
| Ratiometric analog voltage output | | | | | | | |
| Output range | | | 10% | | 90% | V _{DD} | |
| Resistive load to GND | | | 10 ¹ | 100 | | kOhm | |
| Resistive load to VDD | | | 1000 | | | kOhm | |
| Capacitive load | C _{load} | | | | 100 | nF | |
| Output voltage Integral Non Linearity (INL) | | | | | 5 | mV | |
| Output voltage noise (RMS) | | | | 0.5 | | mV | |

2.2 Timing Specifications

| Parameter | Symbol | Condition | Min. | Typ. | Max. | Units | Comments |
|---------------|-----------------|-----------|------|------|------|-------|------------------------------------|
| Power-up time | t _{PU} | | | | 25 | ms | Time to first reliable measurement |

2.3 Mechanical Specifications

| Parameter | Symbol | Condition | Min. | Typ. | Max. | Units | Comments |
|-------------------------------------|--------------------|-----------|------|------|------|-------|----------|
| Allowable overpressure ² | P _{max} | | | 1 | | bar | |
| Rated burst pressure | P _{burst} | | 3 | | | bar | |
| Weight | W | | | | 0.2 | g | |

2.4 Materials

| | |
|------------------|--|
| Parameter | |
| Wetted materials | glass (silicon nitride, silicon oxide), LCP, green epoxy-based mold compound, epoxy-based resins |
| REACH, RoHS | REACH and RoHS compliant |

2.5 Absolute Maximum Ratings

| Parameter | Rating | Units |
|--|------------------------------|-------|
| Supply Voltage V _{DD} | -0.3 to 5.5 | V |
| Max Voltage on pins (Inputs) | -0.3 to V _{DD} +0.3 | V |
| Input current on any pin | ±70 | mA |
| Operating temperature range ³ | -40 to +85 | °C |
| Storage temperature range ⁴ | -40 to +85 | °C |
| Max. humidity for long term exposure | 40°C dew point | |
| ESD HBM (human body model) | 2 | kV |

¹ For a resistive load to GND less than 100kOhm a 1nF capacitor to GND on the AOUT is recommended

² Allowable overpressure during operation. Refer to the SDP selection guide for pressure dependency of the measured signal. Fast absolute pressure changes on both ports can result in dynamic effects on the sensor signal. For higher overpressures or continuous high overpressures contact Sensirion.

³ For Air and N₂. Long term exposure to high temperatures and (high concentrations of) O₂ can reduce the product lifetime

⁴ For long term storage in Tape and Reel refer to the SDP3x handling instructions

3. Pin Assignment

The SDP3x consists of a QFN package with a plastic cap covering the top and providing the pneumatic connections to the sensor. Table 1 shows the pin assignments of the SDP3x-Analog sensor.

| Pin no. | Name | Description |
|---------|------|--|
| 1 | GND | Connect to ground |
| 2 | GND | Connect to ground |
| 3 | GND | Connect to ground |
| 4 | BWS | Bandwidth selection input |
| 5 | TCS | Temperature compensation selection input |
| 6 | GND | Connect to ground |
| 7 | VDD | VDD Supply |
| 8 | OCS | Output curve selection input |
| 9 | AOut | Ratiometric analog voltage output |
| 10 | GND | Connect to ground |
| 11 | GND | Connect to ground |
| 12-16 | - | Reserved. Do not connect |

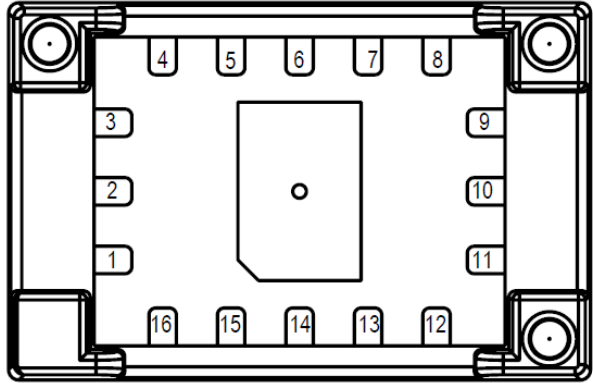
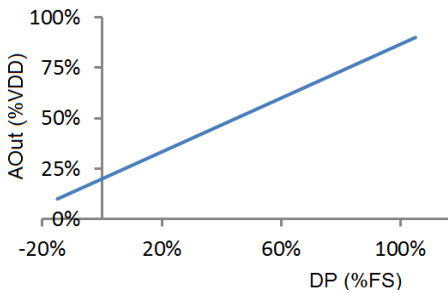
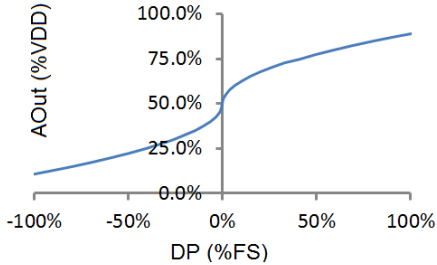


Table 1: SDP3x-Analog pin assignment (bottom view).

3.1 Power Pins (VDD, GND)

The power supply pins must be decoupled with a 100 nF capacitor that shall be placed as close to the sensor as possible.

3.2 OCS: Output Curve Selection Input

| Config. | Polarity | Description | Conversion to physical values AOut[V], VDD[V], Differential Pressure (DP) [Pa] | |
|-------------|------------|---|---|--|
| Linear | Low (GND) | Analog output is configured as a linear output. The sensor is not fully bi-directional in this configuration: -10% full-scale to 100% full scale.  | SDP36 (500Pa) | $DP = \frac{750 \cdot AOut}{VDD} - 150$ |
| | | | SDP37 (125Pa) | $DP = \frac{190 \cdot AOut}{VDD} - 38$ |
| Square Root | High (VDD) | Analog output is a fully bi-directional output with square root conversion. The benefits are that the bidirectional output has a more stable zero point and higher sensitivity at lower pressures  | SDP36 (500Pa) | $DP = \text{sign}\left(\frac{AOut}{VDD} - 0.5\right) \cdot \left(\frac{AOut}{VDD \cdot 0.4} - 1.25\right)^2 \cdot 525$ |
| | | | SDP37 (125Pa) | $DP = \text{sign}\left(\frac{AOut}{VDD} - 0.5\right) \cdot \left(\frac{AOut}{VDD \cdot 0.4} - 1.25\right)^2 \cdot 133$ |

3.3 TCS: Temperature Compensation Selection Input

| Configuration | Polarity | Description |
|--|------------|---|
| Temperature compensation for mass flow | Low (GND) | In this configuration temperature compensation is optimized for applications where mass flow measurements in bypass are performed |
| Temperature compensation for differential pressure | High (VDD) | In this configuration the analog output signal is temperature compensated for differential pressure. This configuration is recommended for applications where real differential pressure measurements are required. |

For more information about temperature compensation for differential pressure sensors, for example volume flow measurements in bypass, refer to the selection guide in the differential pressure download center on our website.

3.4 BWS: Bandwidth Selection Input

| Configuration | Polarity | Description |
|---------------|------------|---|
| Fast | Low (GND) | In this configuration the chip will output the differential pressure value on the analog output with the highest possible bandwidth and lowest latency. This configuration is recommended to be used in use cases where small changes need to be detected as quickly as possible. The response time in this configuration is less than 5ms |
| Slow | High (VDD) | In this configuration extra averaging is in place in order to achieve an excellent signal to noise ratio. The response time in this configuration is less than 9ms |

3.5 AOut Pin

The AOut pin gives out an analog ratiometric voltage, representing the measured differential pressure value. Please note the resistive and capacitive loads as mentioned in section 2.1.

Formulas for converting AOut [V] to differential pressure [Pa] can be found in section 3.2.

3.6 Die Pad (Center Pad)

The die pad or center pad is visible from below and located in the center of the package. It is internally connected to GND and therefore there are no electrical constraints on connecting or not connecting the die pad to GND. For mechanical stability it is recommended to solder the center pad to the PCB.

The hole in the middle of the die pad must stay open during and after soldering.

4. Package Outline

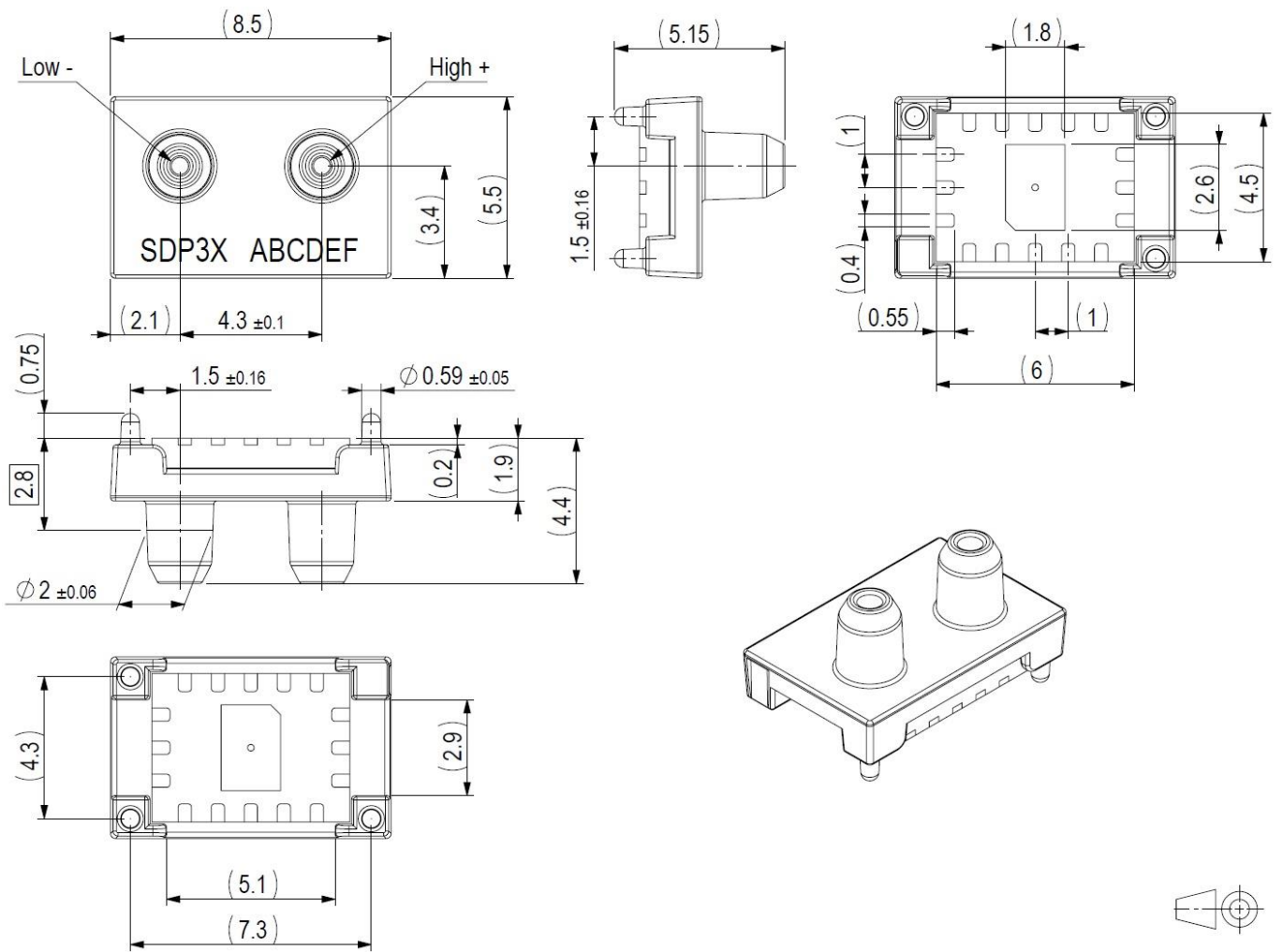
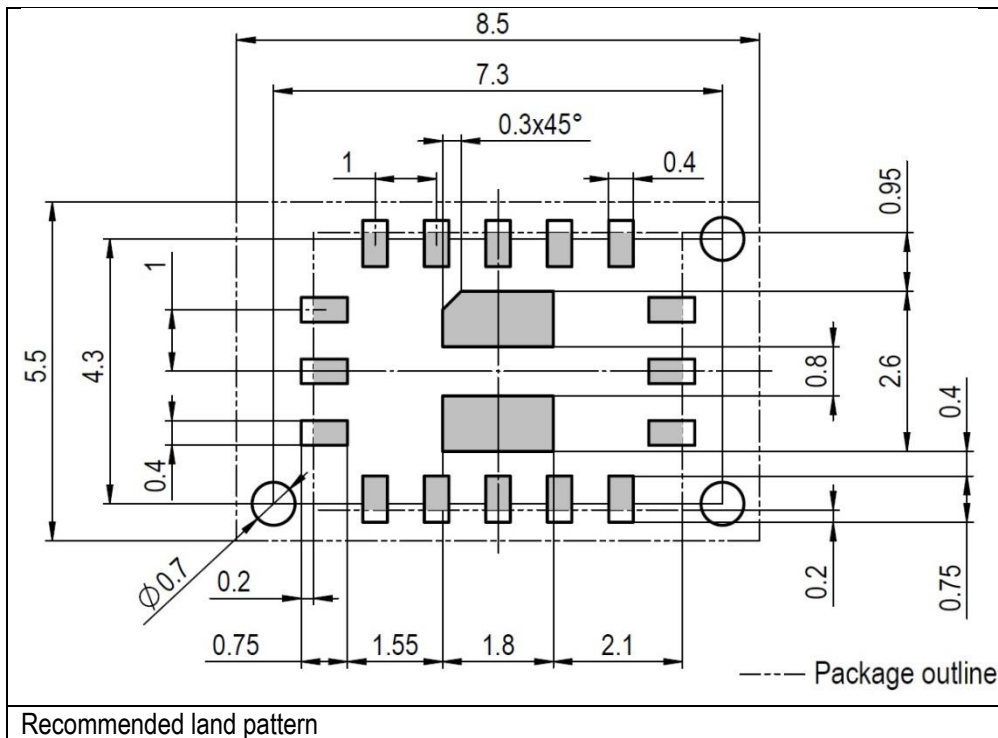
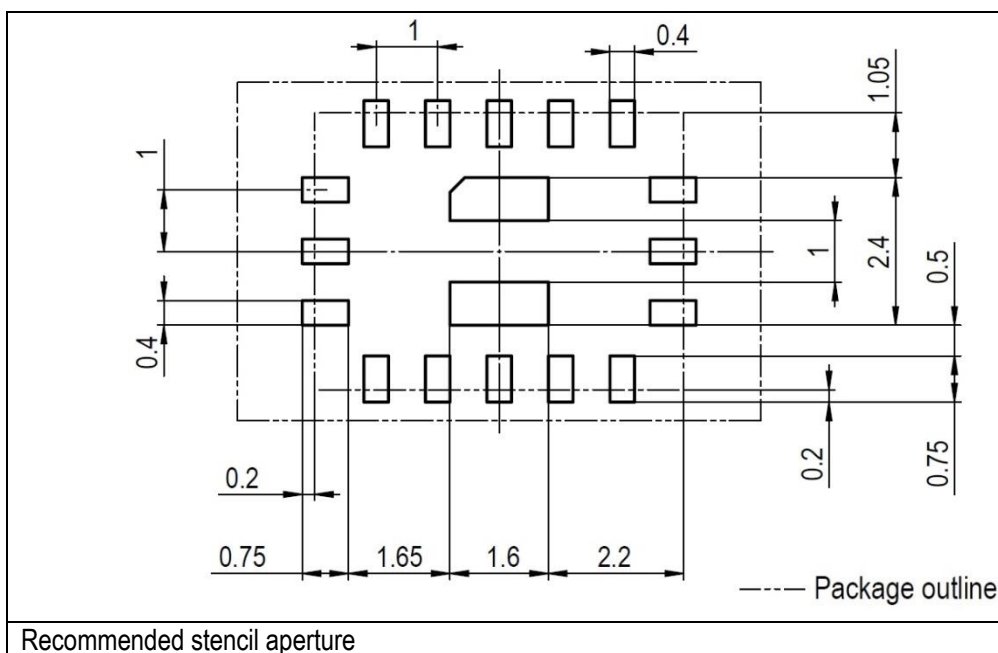


Figure 1: SDP3x. All dimensions in mm.

5. Soldering



The solder mask is understood to be the insulating layer on top of the PCB covering the copper traces. It is recommended to design the land pattern as a Non-Solder Mask Defined (NSMD) type.



The sensor must enter the reflow process only once and with a minimal temperature and exposure time. When both sides of the PCB are reflow soldered or multiple reflow runs are required, the sensor must be soldered in the last soldering run. In any case the temperature should not exceed 260°C; temperatures above 200°C should be limited in time to a maximum of 150 seconds.

Ensure that the ports of the sensor are well protected during assembly and soldering so that no dust, solder flux or other liquids can enter the flow channel. In no case, a board wash shall be applied. It is strongly recommended to use "no-clean" solder paste.

It is important to note that the diced edge or side faces of the I/O pads may oxidize over time, therefore a solder fillet may or may not form. Hence there is no guarantee for solder joint fillet heights of any kind.

Refer to the SDP3x handling instructions on our website for more details.

6. Shipping Package

SDP3x are provided in tape & reel shipment packaging. Standard packaging size is 1500 or 250 units per reel. The drawing of the packaging tapes with sensor orientation is shown in *Figure 2*.

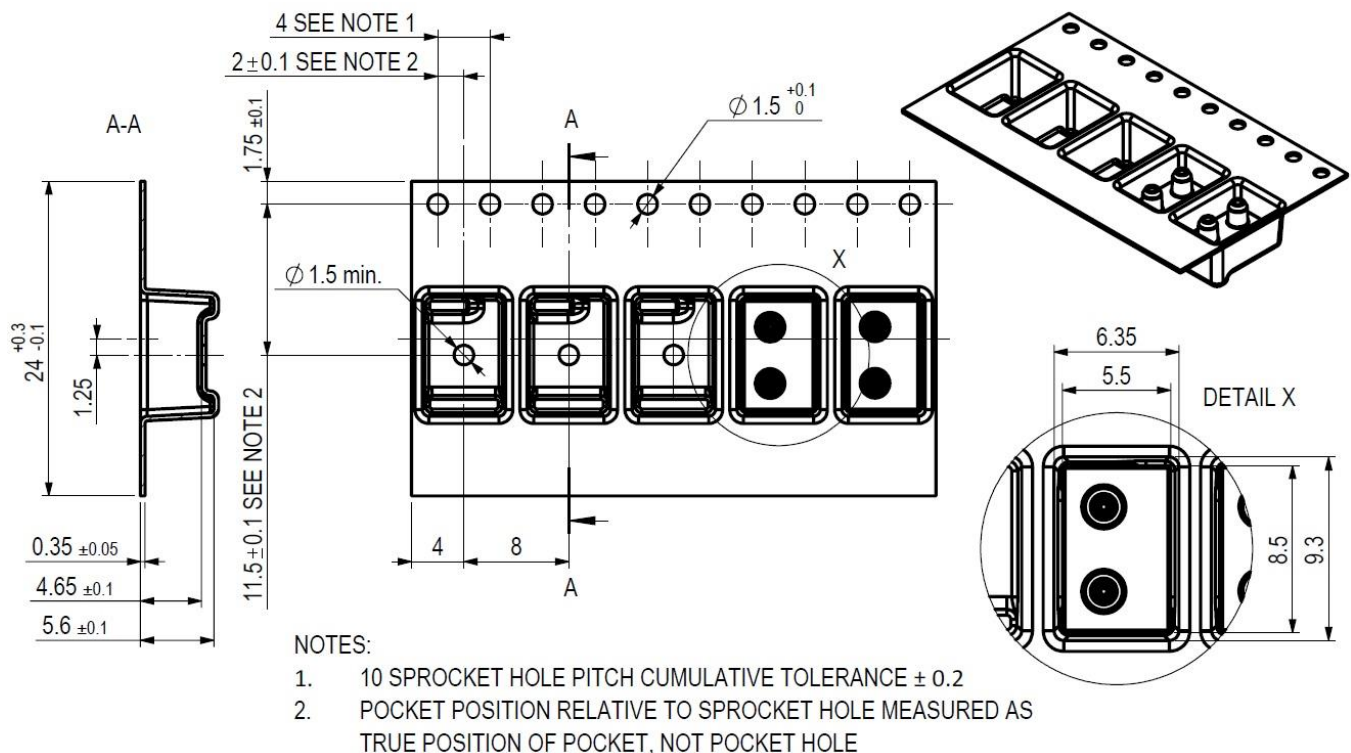


Figure 2: Packaging tape and sensor orientation. Header tape is to the right and trailer tape to the left on this drawing

7. Ordering Information

Use the part names and product numbers shown in the following table when ordering SDP3x differential pressure sensor. For the latest product information and local distributors, visit www.sensirion.com.

| Part name | Description / Output | Product number | Packaging | Tape & Reel size |
|-----------|----------------------|----------------|--|------------------|
| SDP36 | Analog, 500Pa | 1-101471-02 | Tape & Reel (QFN Quad 2 configuration) | 1500 |
| | | 1-101571-02 | Tape & Reel (QFN Quad 2 configuration) | 250 |
| SDP37 | Analog, 125Pa | 1-101497-02 | Tape & Reel (QFN Quad 2 configuration) | 1500 |
| | | 1-101572-02 | Tape & Reel (QFN Quad 2 configuration) | 250 |

Revision History

| Date | Author | Version | Changes |
|------------|--------|---------|---|
| 14.12.2017 | ANB | V1 | Released. Chip revision update. Product numbers updated. Voltage range extended. Operating temperature extended. TCS now available. |
| | | | |

Important Notices

Warning, personal injury

Do not use this product as safety or emergency stop devices or in any other application where failure of the product could result in personal injury (including death). Do not use this product for applications other than its intended and authorized use. Before installing, handling, using or servicing this product, please consult the datasheet and application notes. Failure to comply with these instructions could result in death or serious injury.

If the Buyer shall purchase or use SENSIRION products for any unintended or unauthorized application, Buyer shall defend, indemnify and hold harmless SENSIRION and its officers, employees, subsidiaries, affiliates and distributors against all claims, costs, damages and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if SENSIRION shall be allegedly negligent with respect to the design or the manufacture of the product.

ESD Precautions

The inherent design of this component causes it to be sensitive to electrostatic discharge (ESD). To prevent ESD-induced damage and/or degradation, take customary and statutory ESD precautions when handling this product.

See application note "Handling Instructions" for more information.

Warranty

SENSIRION warrants solely to the original purchaser of this product for a period of 12 months (one year) from the date of delivery that this product shall be of the quality, material and workmanship defined in SENSIRION's published specifications of the product. Within such period, if proven to be defective, SENSIRION shall repair and/or replace this product, in SENSIRION's discretion, free of charge to the Buyer, provided that:

- notice in writing describing the defects shall be given to SENSIRION within fourteen (14) days after their appearance;

- such defects shall be found, to SENSIRION's reasonable satisfaction, to have arisen from SENSIRION's faulty design, material, or workmanship;
- the defective product shall be returned to SENSIRION's factory at the Buyer's expense; and
- the warranty period for any repaired or replaced product shall be limited to the unexpired portion of the original period.

This warranty does not apply to any equipment which has not been installed and used within the specifications recommended by SENSIRION for the intended and proper use of the equipment. EXCEPT FOR THE WARRANTIES EXPRESSLY SET FORTH HEREIN, SENSIRION MAKES NO WARRANTIES, EITHER EXPRESS OR IMPLIED, WITH RESPECT TO THE PRODUCT. ANY AND ALL WARRANTIES, INCLUDING WITHOUT LIMITATION, WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, ARE EXPRESSLY EXCLUDED AND DECLINED.

SENSIRION is only liable for defects of this product arising under the conditions of operation provided for in the datasheet and proper use of the goods. SENSIRION explicitly disclaims all warranties, express or implied, for any period during which the goods are operated or stored not in accordance with the technical specifications.

SENSIRION does not assume any liability arising out of any application or use of any product or circuit and specifically disclaims any and all liability, including without limitation consequential or incidental damages. All operating parameters, including without limitation recommended parameters, must be validated for each customer's applications by customer's technical experts. Recommended parameters can and do vary in different applications.

SENSIRION reserves the right, without further notice, (i) to change the product specifications and/or the information in this document and (ii) to improve reliability, functions and design of this product.

Copyright © 2016-2017, SENSIRION.
CMOSens® is a trademark of Sensirion
All rights reserved

Headquarters and Subsidiaries

Sensirion AG

Laubisruetistr. 50
CH-8712 Staefa ZH
Switzerland

phone: +41 44 306 40 00
fax: +41 44 306 40 30
info@sensirion.com
www.sensirion.com

Sensirion Taiwan Co. Ltd

phone: +886 3 5506701
info@sensirion.com
www.sensirion.com

Sensirion Inc., USA

phone: +1 312 690 5858
info-us@sensirion.com
www.sensirion.com

Sensirion Japan Co. Ltd.

phone: +81 3 3444 4940
info-jp@sensirion.com
www.sensirion.co.jp

Sensirion Korea Co. Ltd.

phone: +82 31 337 7700~3
info-kr@sensirion.com
www.sensirion.co.kr

Sensirion China Co. Ltd.

phone: +86 755 8252 1501
info-cn@sensirion.com
www.sensirion.com.cn

To find your local representative, please visit www.sensirion.com/distributors

Компания «Life Electronics» занимается поставками электронных компонентов импортного и отечественного производства от производителей и со складов крупных дистрибьюторов Европы, Америки и Азии.

С конца 2013 года компания активно расширяет линейку поставок компонентов по направлению коаксиальный кабель, кварцевые генераторы и конденсаторы (керамические, пленочные, электролитические), за счёт заключения дистрибьюторских договоров

Мы предлагаем:

- Конкурентоспособные цены и скидки постоянным клиентам.
- Специальные условия для постоянных клиентов.
- Подбор аналогов.
- Поставку компонентов в любых объемах, удовлетворяющих вашим потребностям.
- Приемлемые сроки поставки, возможна ускоренная поставка.
- Доставку товара в любую точку России и стран СНГ.
- Комплексную поставку.
- Работу по проектам и поставку образцов.
- Формирование склада под заказчика.
- Сертификаты соответствия на поставляемую продукцию (по желанию клиента).
- Тестирование поставляемой продукции.
- Поставку компонентов, требующих военную и космическую приемку.
- Входной контроль качества.
- Наличие сертификата ISO.

В составе нашей компании организован Конструкторский отдел, призванный помогать разработчикам, и инженерам.

Конструкторский отдел помогает осуществить:

- Регистрацию проекта у производителя компонентов.
- Техническую поддержку проекта.
- Защиту от снятия компонента с производства.
- Оценку стоимости проекта по компонентам.
- Изготовление тестовой платы монтаж и пусконаладочные работы.



Тел: +7 (812) 336 43 04 (многоканальный)

Email: org@lifeelectronics.ru