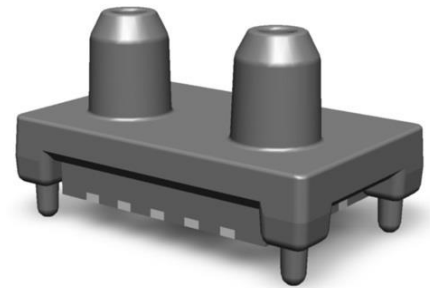


Preliminary Datasheet SDP3x-Analog

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

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1. Sensor Performance

1.1 Differential Pressure Specification¹

Parameter	Configuration	SDP36
Measurement range ²	Linear	- 50 to + 500 Pa (-0.2 to 2.0 in. H ₂ O)
	Root Square	- 500 to + 500 Pa (± 2.0 in. H ₂ O)
Zero point accuracy ^{3,4}		0.1 Pa
Span accuracy ^{3,4}		3% of reading
Zero point repeatability ^{3,4}		0.03 Pa
Span repeatability ^{3,4}		0.5% of reading
Span shift due to temperature variation		< 0.5% of reading per 10°C
Offset stability		< 0.01 Pa/year
Span stability		< 0.2 %/year
Response time (T 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		-20 °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 Other pressure ranges expected Q2/Q3 2016 or contact Sensirion

³ Includes repeatability

⁴ Total accuracy/repeatability is a sum of zero-point and span accuracy/repeatability. Output voltage integral linearity and output voltage noise must also be considered.

2. Specifications

2.1 Electrical Specifications

Parameter	Symbol	Condition	Min.	Typ.	Max.	Units	Comments
Supply							
Supply Voltage	V_{DD}		3.0	3.3	3.6	V	For 5V supply contact Sensirion
Power-up/down level	V_{POR}		2.3	2.5	2.7	V	
VDD ramp up slew	$V_{DD, ramp}$		0.2			V/ms	Minimum voltage ramp up slew when powering up SDP3x
Supply current	I_{DD}			3.8	5.5	mA	
Ratiometric analog voltage output							
Output range			0.1		0.9	V_{DD}	
Resistive load to GND			10			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	P_{max}				0.25	bar	
Rated burst pressure	P_{burst}		1			bar	
Weight	W				1.5	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 4.5	V
Max Voltage on pins (Inputs)	-0.3 to $V_{DD}+0.3$	V
Input current on any pin	± 70	mA
Operating temperature range	-20 to +85	°C
Storage temperature range	-40 to +85	°C
Max. humidity for long term exposure	40°C dew point	
ESD HBM (human body model)	2	kV

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. The pin assignments of the SDP3x-Analog can be found in Table 1.

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 Expected Q3 2016
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

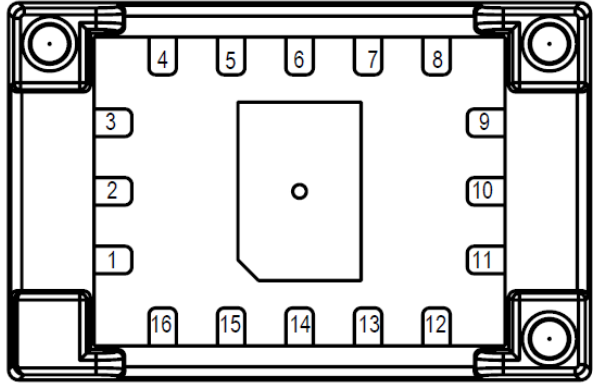
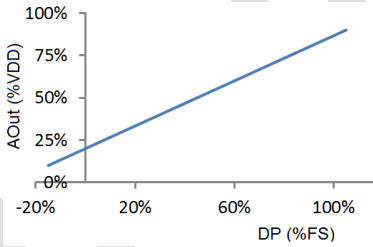
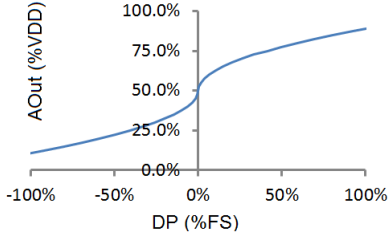


Table 1: SDP3x-Analog pin assignment (bottom view).

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)	<p>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.</p> 	$DP = \frac{750 \cdot AOut}{VDD} - 150$
Root square	High (VDD)	<p>Analog output is a fully bi-directional output with root square conversion. The benefits are that the bidirectional output has a more stable zero point and higher sensitivity at lower pressures</p> 	$DP = \text{sign}\left(\frac{AOut}{VDD} - 0.5\right) \cdot \left(\frac{AOut}{VDD \cdot 0.4} - 1.25\right)^2 \cdot 525$

3.3 TCS: Temperature compensation selection input

This function is expected in Q3 2016. Until this time only temperature compensation for mass flow is available.

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, please 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 2.5.

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 soldering.

4. Package outline

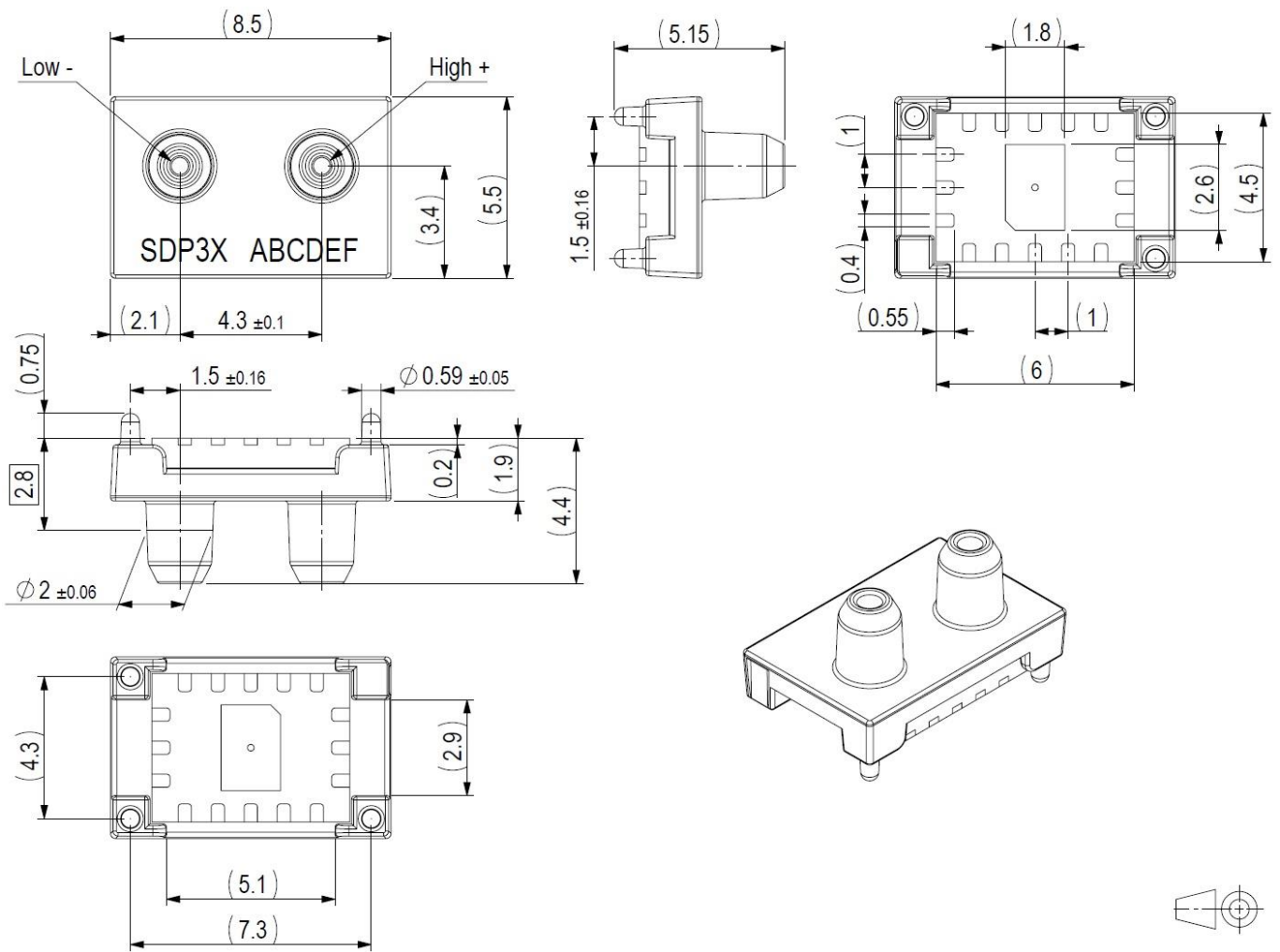
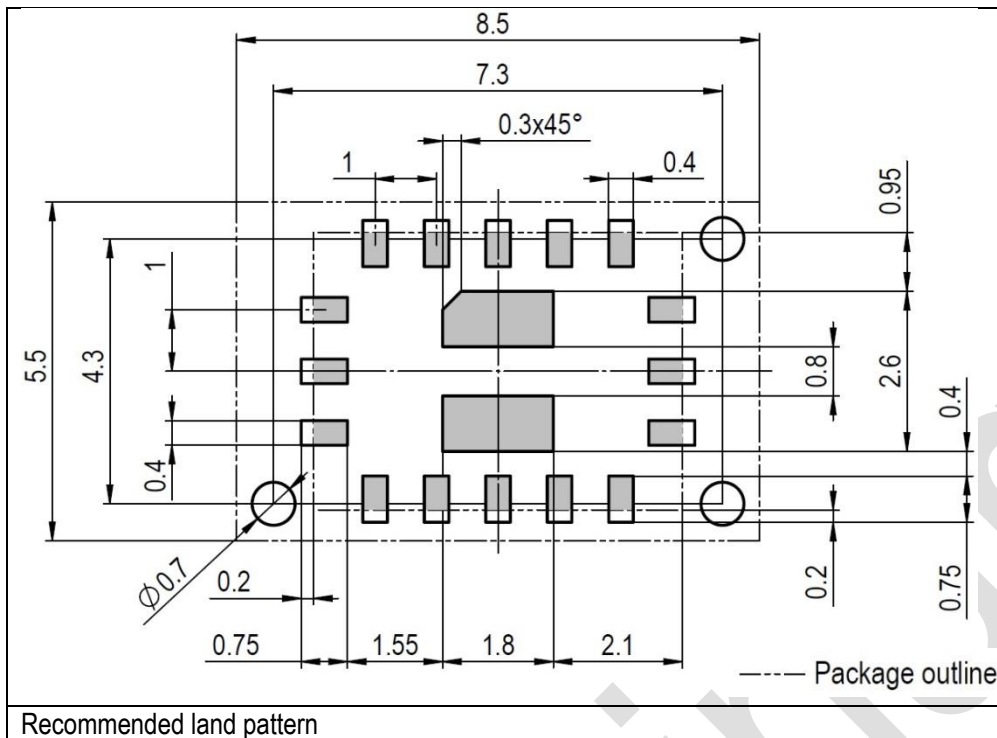
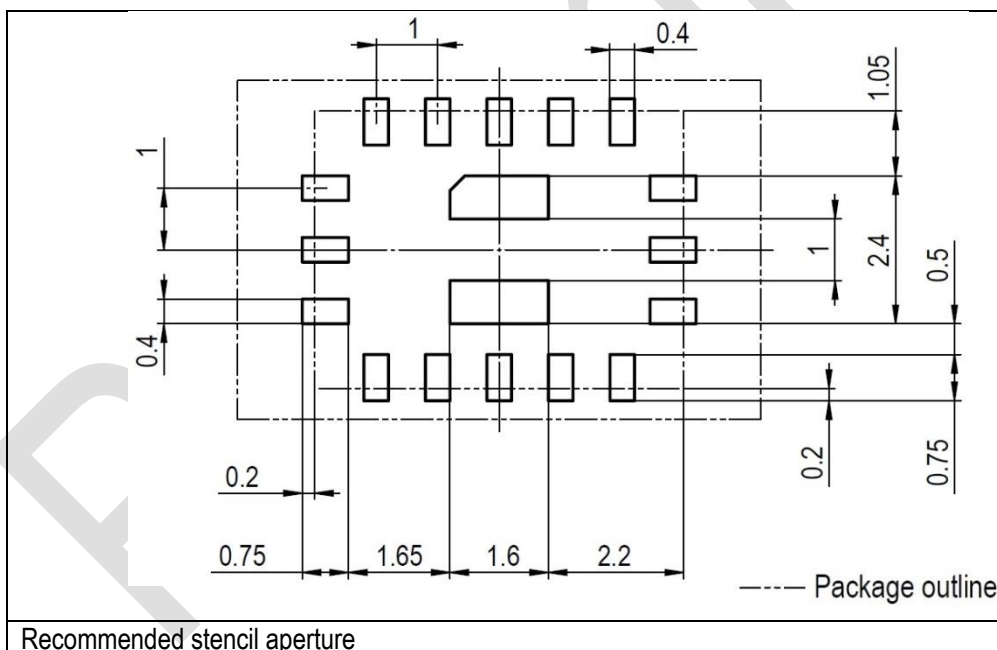


Figure 1: SDP3x. All dimensions in mm.

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, 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 255°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. Therefore 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.

6. Shipping Package

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

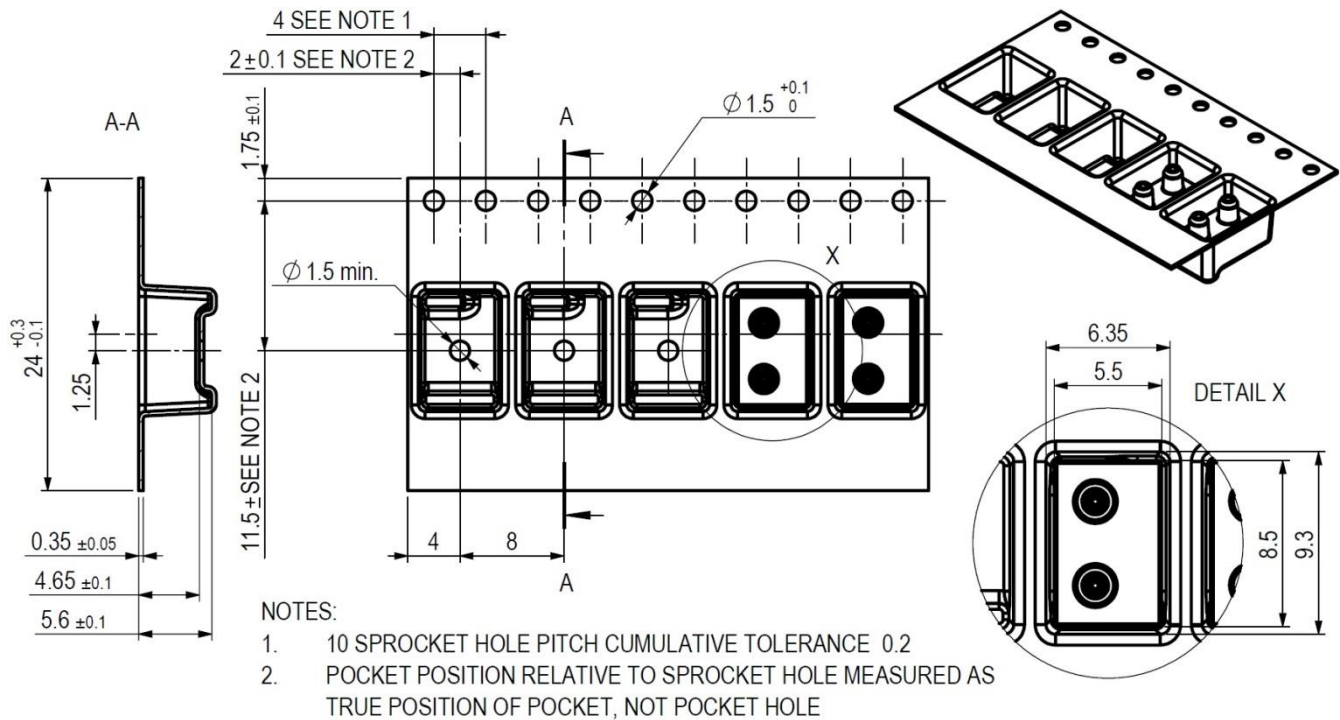


Figure 2: Sketch of packaging tape and sensor orientation. Header tape is to the right and trailer tape to the left on this sketch

7. Ordering Information

Use the part names and item 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	1-101471-01	Tape & Reel (QFN Quad 2 configuration)	1500

Revision history

Date	Author	Version	Changes
21.12.2015	ANB	V0.1	First Draft
31.01.2016	ANB	V0.2	First preliminary version
02.02.2016	ANB	V0.3	Minor updates