Preliminary Datasheet

HPSD 8100 Miniature Pressure Transducer

General description

Pressure transducer **HPSD 8100** is a pressure and temperature sensing device specially developed for **low-power** apps with ultra-low pressure ranges and demanding space constrictions. High performance and accuracy combined with a special digital signal interface including **24 bit ΔΣ ADC** enables use of this transducer in many pressure measurement applications. **Calibration coefficients** are stored into **internal EEPROM** for signal calculation which is then performed **using external microcontroller** through **I²C or SPI interface**. Standard 2nd order temperature and pressure compensation provides 0,75% FS total error over 0°C to 70°C temperature range. Low power supply voltage (1.71V to 5.5V), customized compensated temperature range, standard I²C interface and **extremely low power consumption** provides OEM users maximum freedom for any type of application with dry air or non-corrosive gases or liquids. Family HPSD 8100 provides easy integration using small, reflow mountable SMD package with footprint pads on short edges leaving enough room for easier routing for the end application. Pressure ports with their flexibility in different options can accept standard pneumatic tubes or can be customized. Different pressure ranges are available for this group starting from 1 mbar up to 10 bar.

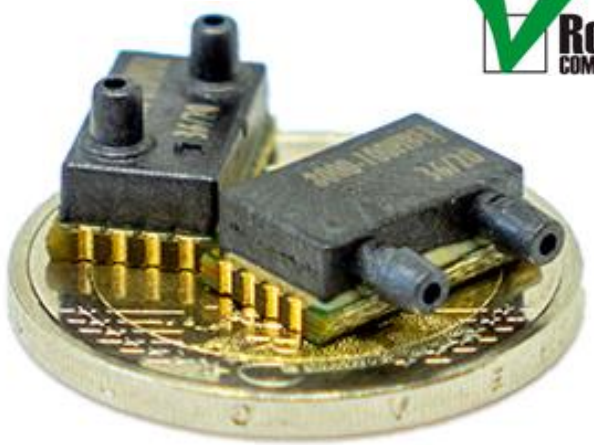
Applications

- **Sleep Apnea, CPAP**
- **Ventilators** / Respirators
- **HVAC**
- Medical instrumentation
- Air/gas flow monitoring
- Sport equipment
- Process control
- Leak detection
- Consumer devices

Features

- **Pressure ranges** from **0-1 mbar to 0-10 bar**
- **Single 5 V or 3 V** supply voltage (**1.71-5.5 supply voltage range**)
- **Digital I²C or SPI output** (pressure + temperature)
- Standard temperature compensated range **(0-70 °C),** other possible
- **Operating** temperature range -40 ... +85 °C
- **Total pressure accuracy down to max 0,75 %FS** (with all effects included).
- **Total temperature accuracy typ. 0,5 °C** (within compensated temp. range).
- **Resolution** up to **19bits (ENOB**).
- **Extremely low power consumption** down to <1uA (average in active mode).
- Adjustable output **resolution** (up to 15 bits)
- **Outstanding offset stability.**
- **Small footprint**: 8 mm x13 mm
- **Low profile**: only 9 mm in height
- Selection for a digital infinite impulse response (**IIR**) type low pass filter option

RoHS COMPLIANT



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Available types overview

T_{AMB}=25°C, V_S = 5V unless otherwise noted.

Ultra low pressure range

Pressure range	1 mbar (100 Pa)	2,5 mbar (250 Pa)	5 mbar (500 Pa)	10 mbar (1000 Pa)
ID group	HPSD 8100-001M	HPSD 8100-2P5M	HPSD 8100-005M	HPSD 8100-010M
Pressure types	differential/ bidirectional differential	differential/ bidirectional differential	differential/ bidirectional differential	differential/ bidirectional differential
Temperature ranges	Operating: -25 to 85°C, Compensated: 0 to 70 °C, Storage : -40 to 125 °C			
Over pressure [1]	100 mbar	100 mbar	150 mbar	150 mbar
Burst pressure [2]	150 mbar	150 mbar	200 mbar	200 mbar

Low pressure range

Pressure range	20 mbar (0.3 psi)	50 mbar (0.8 psi)	100 mbar (1.5 psi)	350 mbar (5 psi)
ID group	HPSD 8100-020M	HPSD 8100-050M	HPSD 8100-100M	HPSD 8100- 350M
Pressure types	differential/ bidirectional differential	differential/ bidirectional differential	differential/ bidirectional differential	differential/ bidirectional differential
Temperature ranges	Operating: -25 to 85°C, Compensated: 0 to 70°C, Storage : -40 to 125°C			
Over pressure [1]	200 mbar	500 mbar	1000 mbar	1 bar
Burst pressure [2]	300 mbar	750 mbar	1500 mbar	1.7 bar

High pressure range

Pressure range	1 bar (15 psi)	2 bar (30 psi)	5 bar (70 psi)	10 bar (150 psi)
ID group	HPSD 8100- 001B	HPSD 8100-050M	HPSD 8100-100M	HPSD 8100- 001B
Pressure types	differential/ bidirectional differential absolute	differential/ bidirectional differential absolute	differential/ bidirectional differential absolute	differential/ bidirectional differential absolute
Temperature ranges	Operating: -25 to 85°C, Compensated: 0 to 70°C, Storage : -40 to 125°C			
Over pressure [1]	3 bar	6 bar	15 bar	25 bar
Burst pressure [2]	5 bar	10 bar	25 bar	25 bar

Performance characteristics

T_{AMB}=25°C, unless otherwise noted.

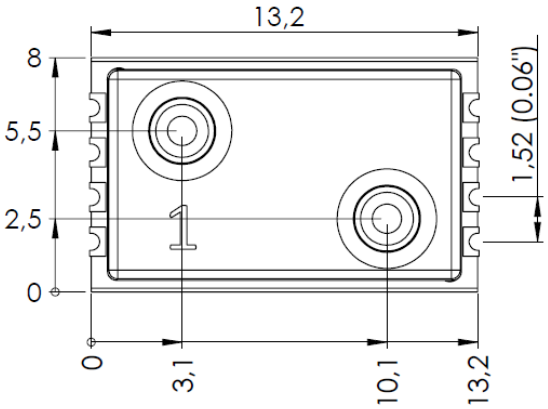
Parameter	Symbol	Min.	Typ.	Max.	Unit
Power supply					
Calibrated supply voltage 5 V	V_S	1,71	3 (5)	5,55	V
Accuracy (pressure) @ 25 °C [3]					
Ultra low pressure (1 to 5 mbar)	E_p		±1	±2,5	%FSO
Low pressure (10 to 100 mbar)	E_p		±0,5	±1	%FSO
Standard pressure (all other)	E_p		±0,1	±0,5	%FSO
Total accuracy (pressure) @ 0 to 70 °C [4]					
Ultra low pressure (1 to 5 mbar)	E_{tp}		±1,5	±4	%FSO
Low pressure (10 to 100 mbar)	E_{tp}		±0,75	±1,5	%FSO
Standard pressure (all other)	E_{tp}		±0,25	±0,75	%FSO
Accuracy (temperature) @ 0 to 70 °C	E_{tt}		±1	±2	°C
Resolution @OSR setting (pressure) [5]					
OSRx = 1/4	R		TBD		bit
OSRx = 1			TBD		
OSRx = 4			TBD		
OSRx = 16			16,5		
Single A/D conversion time @OSR setting (x=p/T) [6]					
OSRx = 1/4	R		1.04		ms
OSRx = 1			2.58		
OSRx = 4			8.72		
OSRx = 16			33,30		
Current consumption @OSR setting (x=p or T) [7]					
OSRx = 1/4	R		TBD		uA
OSRx = 1			TBD		
OSRx = 4			TBD		
OSRx = 16			20		
Repeatability [8]	E_r		±0,05		% FSO
Nonlinearity & pressure hysteresis (BFSL) [9]	E_l		±0,1	±0,3	% FSO
Media compatibility			See spec. note [10], [11]		
Position sensitivity [12]			±0,05		%FSO
Weight	W		0,6		g

Specification notes

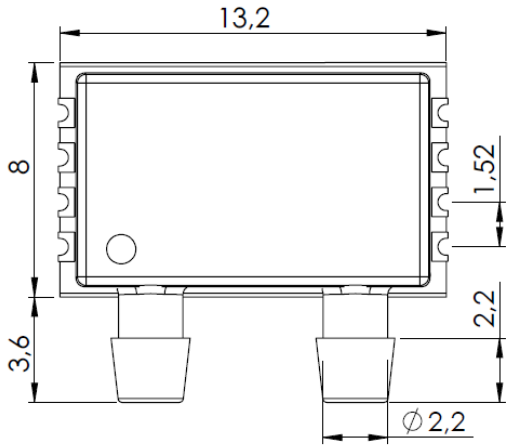
1) Over pressure is the maximum pressure which may be applied without causing damage to the sensing element.
2) Burst pressure is the maximum pressure which may be applied without causing leakage damage to the sensing element.
3) Accuracy includes all effects (offset, span, nonlinearity, pressure hysteresis and repeatability) at room temperature and represents maximum deviation of transducer signal from ideal characteristic.
4) Total accuracy includes all effects (offset, span, nonlinearity, pressure hysteresis and repeatability) included with all temperature effects of offset and span. It describes overall error and represents maximum deviation of transducer signal from ideal characteristic in compensated temperature range from 0 to 70°C.
5) Pressure resolution @ 24bit ΔΣ ADC OSR setting, calculated ENOB based on measured RMS noise voltage at the input.
6) Response time @ 24bit ΔΣ ADC OSR setting, single temperature and single pressure conversion time (no averaging).
7) Average ADC current consumption for pressure & temperature measurement (incl. sensor) @ 24bit ΔΣ ADC OSR setting
8) Repeatability is defined as typical deviation of the output signal after 10 pressure cycles.
9) Nonlinearity is defined as the BFSL (best fit straight line) across entire pressure range.
10) Media compatibility on pressure port P1: noncorrosive gases to silicon, RTV, ceramics Al_2O_3, Pyrex, LCP plastics.
11) Media compatibility on pressure port P2: noncorrosive gases to silicon, Pyrex, RTV, ceramics Al_2O_3, epoxy, FR4.
12) Position sensitivity: typ. ±0,25%FS for 0-1mbar devices.

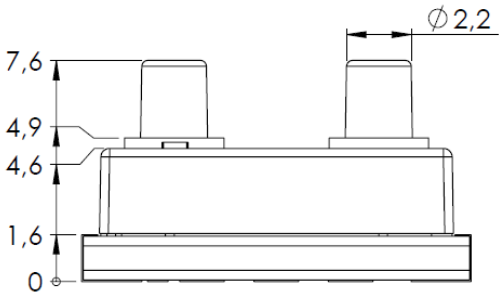
Outline dimensions

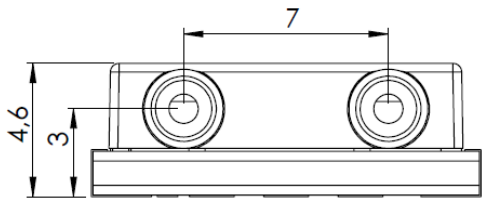
Straight vertical (manifold) pressure port
(HPSD 8100-xxxx-x-x-x-**S**):

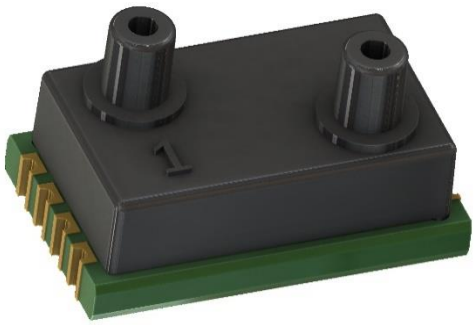


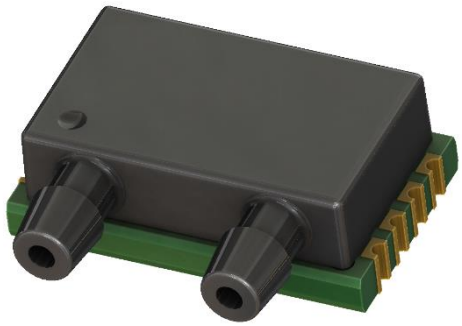
Horizontal pressure port
(HPSD 8100-xxxx-x-x-x-**H**):











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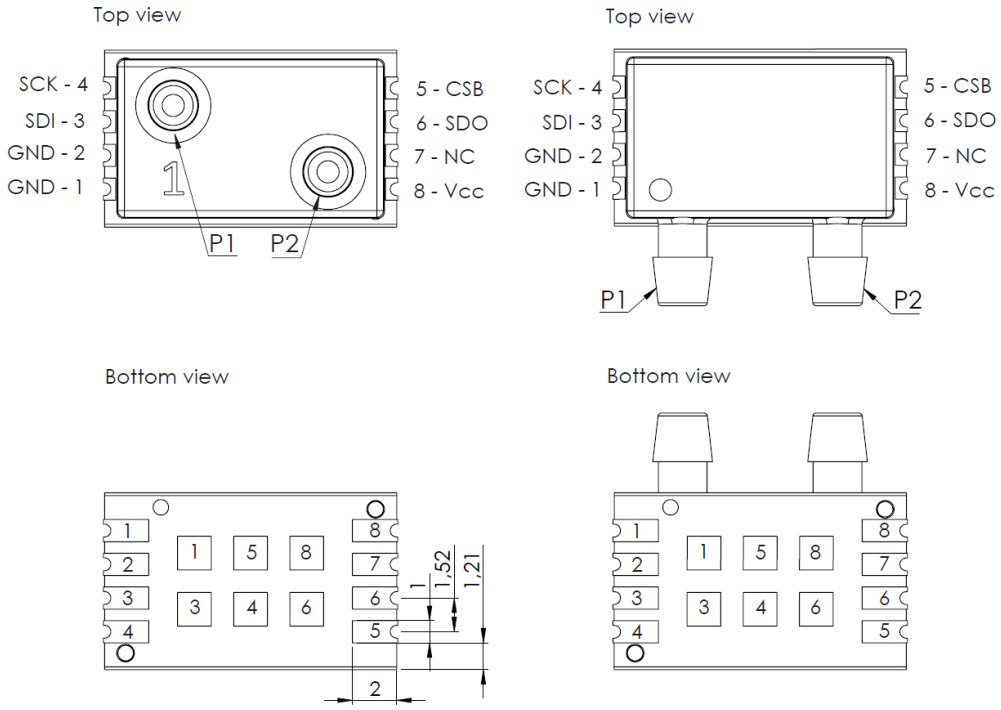
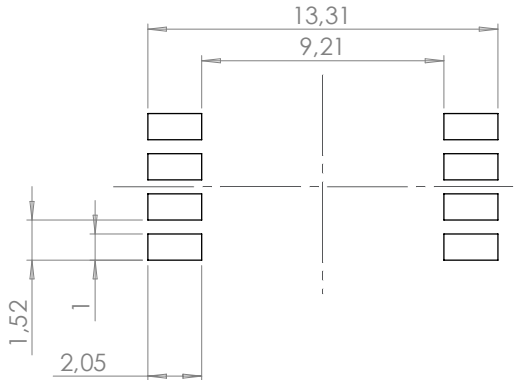
Pinout

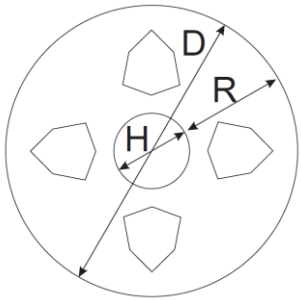


Pin assignment with alternate functions		
Pin	**Name**	**Function**
1	GND	Ground
2	GND	Ground
3	SDI	Data input/output in I^2C Data input in 4-wire SPI / Data input/output in 3-wire SPI
4	SCK	Serial bus clock input in I^2C and SPI
5	CSB	Bus mode select / chip select with pull-up CSB=VDDIO: I2C mode / chip not selected CSB=GND: SPI mode / chip selected
6	SDO	Data output in 4-wire SPI mode Test input/output in test mode
7	NC	Not connected
8	Vcc	Positive power supply

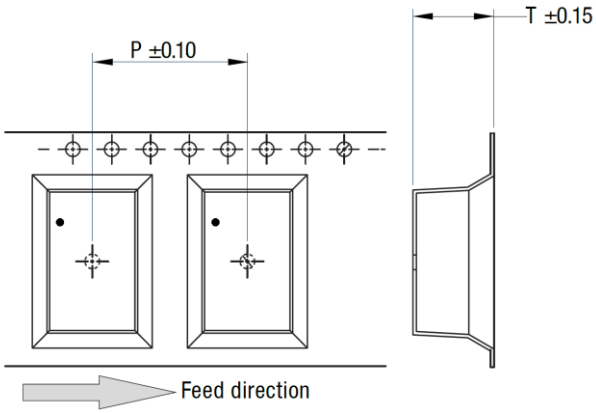
Recommended soldering footprint



Tape and reel packaging



Reel	7"	13"
H (mm)	60	100
R(mm)	59	110
D (mm)	179	330
Pcs / reel	**125**	**500**



Measure	Vertical port	Horizontal port
P (mm)	16	20
T (mm)	8,35	5,35

Ordering guide

Transducer type	Pressure range	Pressure type/ direction	Package type	Output configuration
HPSD 8100	001M	U	S	H
	2P5M	B	E	J
	005M	A		P
	010M			Q
	020M			
	050M			
	100M			
	350M			
	001B			
	002B			
	005B			
	010B			

Pressure range	
001M	1 mbar
2P5M	2,5 mbar
005M	5 mbar
010M	10 mbar
020M	20 mbar
050M	50 mbar
100M	100 mbar
350M	350 mbar
001B	1 bar
002B	2 bar
005B	5 bar
010B	10 bar

Pressure type / direction	
U	Unidirectional differential (positive press. on P1)
B	Bidirectional differential (positive press. on P1)
A	Absolute (pressure on P1)

Output configuration	
H	I2C, 5V
J	I2C, 3V
P	SPI, 5V
Q	SPI, 3V

Package type	
S	Straight vertical (manifold)
E	Horizontal (barbed)

Other configurations possible on special request!

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