Datasheet

HPSD 8000 Miniature Pressure Transducer

General description

Pressure transducer HPSD8000 is a pressure and temperature sensing device specially developed for ultra-low pressure ranges and demanding space constrictions. High performance and accuracy enables use of this transducer in many applications including differential pressure measurements. Standard 2nd order temperature and pressure compensation provides 0,5% FS total error over 0°C to 70°C temperature range. Single power supply (2.7V – 5,5V), customized compensated pressure and temperature ranges, standard digital I²C, SPI, one wire interfaces or analog voltage output provides OEM users maximum freedom for any type of application with dry air or non-corrosive gases or liquids. Family HPSD 8000 provides easy integration using small SMD package with footprint pads on short edges leaving enough room for easier routing for the end application. SMD housing is reflow mountable with fast stabilization after soldering process. Pressure ports with their flexibility in different options can accept standard pneumatic tubes or can be customized for integration into end customer housings with straight pressure ports. Different pressure ranges are available for this group starting from 1 mbar up to 10 bar.

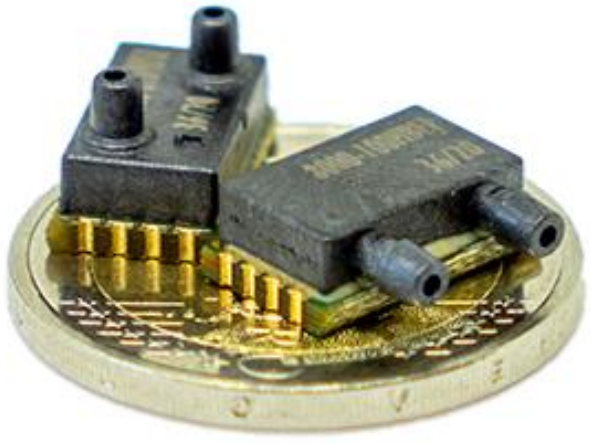
Applications

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

Features

- **Pressure ranges** from **0-1 mbar to 0-10 bar**
- **Single 5 V or 3 V** supply voltage
- **Standard 0.5 V – 4.5 V** or **0.3 to 2.7V** voltage output
- **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).
- Adjustable output **resolution** (up to 15 bits)
- **Outstanding offset stability.**
- **Small footprint**: 8 mm x13 mm
- **Low profile**: only 9 mm in height

RoHS COMPLIANT



HYB emotional electronics
Hyb d.o.o., Levičnikova 34, 8310 Šentjernej, Slovenija
T: +386 (0)7 39 34 800 / F: +386 (0)7 39 34 849 / hybysens@hyb.si, www.hyb.si

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 8000-001M	HPSD 8000-2P5M	HPSD 8000-005M	HPSD 8000-010M
Pressure types	differential/ bidirectional differential	differential/ bidirectional differential	differential/ bidirectional differential	differential/ bidirectional differential
V_{OUT}	0,5 to 4,5 V	0,5 to 4,5 V	0,5 to 4,5 V	0,5 to 4,5 V
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 8000-020M	HPSD 8000-050M	HPSD 8000-100M	HPSD 8000- 350M
Pressure types	differential/ bidirectional differential	differential/ bidirectional differential	differential/ bidirectional differential	differential/ bidirectional differential
V_{OUT}	0.5 to 4.5 V	0.5 to 4.5 V	0.5 to 4.5 V	0.5 to 4.5 V
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 8000- 001B	HPSD 8000-050M	HPSD 8000-100M	HPSD 8000- 001B
Pressure types	differential/ bidirectional differential absolute	differential/ bidirectional differential absolute	differential/ bidirectional differential absolute	differential/ bidirectional differential absolute
V_{OUT}	0,5 to 4,5 V	0,5 to 4,5 V	0,5 to 4,5 V	0,5 to 4,5 V
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.

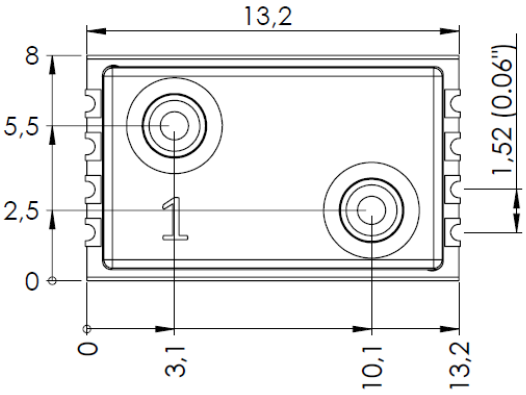
Parameter	Symbol	Min.	Typ.	Max.	Unit
Power supply					
Supply voltage 5 V	V_S	4,75	5	5,25	V
Supply voltage 3 V	V_S	2,70	3	3,30	V
Current consumption	I_{CC}		4	6,5	mA
Analog output (pressure) @ 5 V [3]					
Offset voltage [4]	V_O		0,50		V
Full scale output (FSO) [5]	V_{FSO}		4,50		V
Full scale span (FSS) [6]	V_{FSS}		4,00		V
Offset voltage (bidirectional devices)	V_{OB}		2,50		V
Analog output (pressure) @ 3 V [3]					
Offset voltage [4]	V_O		0,30		V
Full scale output (FSO) [5]	V_{FSO}		2,70		V
Full scale span (FSS) [6]	V_{FSS}		2,40		V
Offset voltage (bidirectional devices)	V_{OB}		1,50		V
Digital output (pressure), 15 bits [3]					
Offset voltage [4]	V_O		3277		counts
Full scale output (FSO) [5]	V_{FSS}		29491		counts
Full scale span (FSS) [6]	V_{FSO}		26214		counts
Offset voltage (bidirectional devices)	V_O		16384		counts
Digital output (temperature), 15 bits [7]					
Temperature output @ 0 °C	To		8192		counts
Temperature output @ 70 °C	Ts		24576		counts
Accuracy (pressure) @ 25 °C [8]					
Ultra low pressure (1 to 5 mbar)	Ea		±1	±2,5	%FSO
Low pressure (10 to 100 mbar)	Ea		±0,5	±1	%FSO
Standard pressure (all other)	Ea		±0,1	±0,5	%FSO
Total accuracy (pressure) @ 0 to 70 °C [9]					
Ultra low pressure (1 to 5 mbar)	Eta		±1,5	±4	%FSO
Low pressure (10 to 100 mbar)	Eta		±0,75	±1,5	%FSO
Standard pressure (all other)	Eta		±0,25	±0,75	%FSO
Resolution					
A/D converter	D_i			15	bit
D/A converter	DO		11		bit
Response time	Ert		1,5		ms
Repeatability [10]	Er		±0,05		% FSO
Nonlinearity & pressure hysteresis (BFSL) [11]	El		±0,1	±0,3	% FSO
Load resistance	R_L	2		∞	k
Media compatibility		See spec. note [12], [13]			
Position sensitivity [14]			±0,05		%FSO
Weight	W		0,6		g

Specification notes

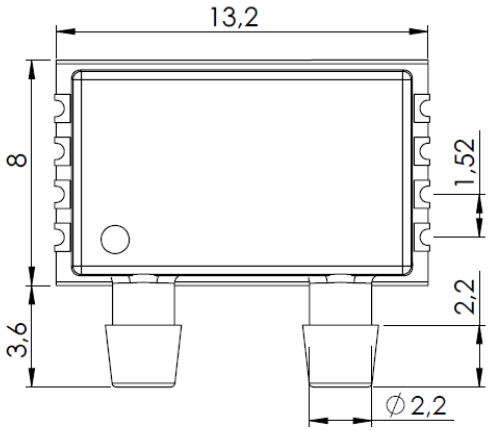
1) Over pressure is the maximum pressure which may be applied without causing damage to the sensing element.
2) Burst pressure is the maximum pressure which may be applied without causing leakage damage to the sensing element.
3) Analog output signal is ratiometric to power supply V_S, digital signal is not ratiometric to the power supply.
4) Offset voltage is the voltage output at zero pressure.
5) Full scale output is the voltage output at full pressure range.
6) Full scale span is the algebraic difference between the output at full scale pressure range and offset.
7) Digital output signal (temperature) is not ratiometric to power supply V_S. Temperature data are read directly on the sensing element.
8) Accuracy includes all effects (offset, span, nonlinearity, pressure hysteresis and repeatability) at room temperature and represents.
   maximum deviation of transducer signal from ideal characteristic.
9) 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.
10) Repeatability is defined as typical deviation of the output signal after 10 pressure cycles.
11) Nonlinearity is defined as the BFSL (best fit straight line) across entire pressure range.
12) Media compatibility on pressure port P1: noncorrosive gases to silicon, RTV, ceramics Al_2O_3, Pyrex, LCP plastics.
13) Media compatibility on pressure port P2: noncorrosive gases to silicon, Pyrex, RTV, ceramics Al_2O_3, epoxy, FR4.
14) Position sensitivity: typ. ±0,25%FS for 1mbar devices.

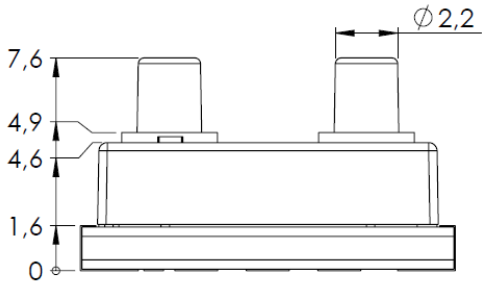
Outline dimensions

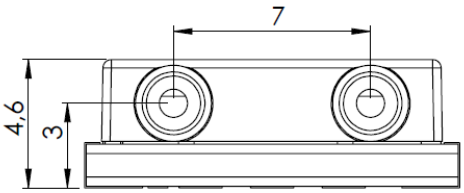
Straight vertical (manifold) pressure port
(HPSD 8000-xxxx-x-x-x-**S**):

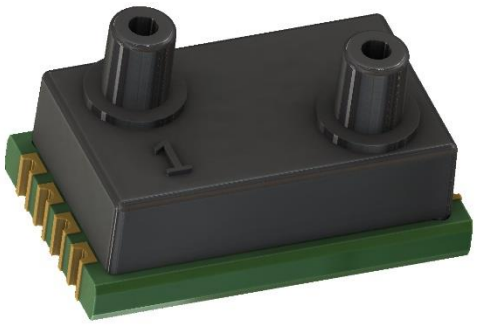


Horizontal pressure port
(HPSD 8000-xxxx-x-x-x-**H**):









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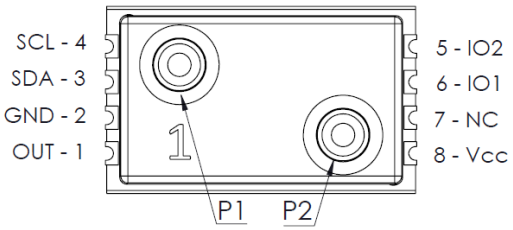
Pinout

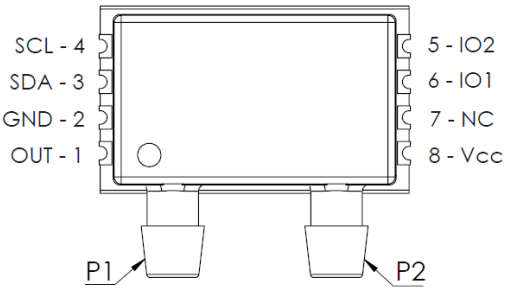
Vertical pressure port:

Top view

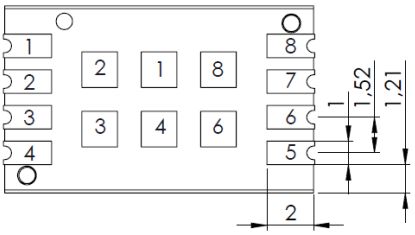


Horizontal pressure port:

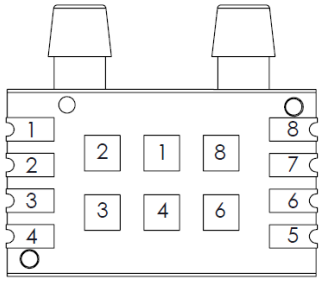
Top view



Bottom view

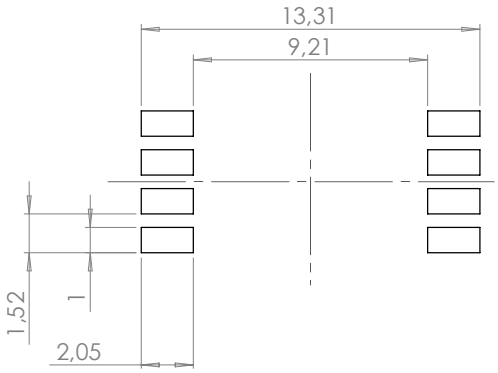


Bottom view

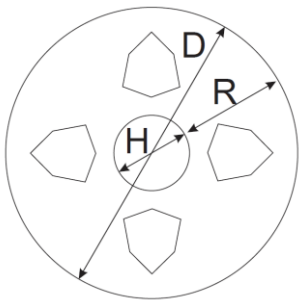


Pin assignment with alternate functions		
Pin	**Name**	**Function**
1	Out	Analog output or PWM2 output or one-wire interface I/O
2	GND	Ground
3	SDA	I²C data I/O or SPI data in (MOSI)
4	SCL	I²C clock or SPI clock (SCK)
5	IO2	SPI slave select (SS) or ALARM2
6	IO1	SPI data out (MISO) or ALARM1 or PWM1 Output
7	NC	Not connected
8	Vcc	Positive power supply

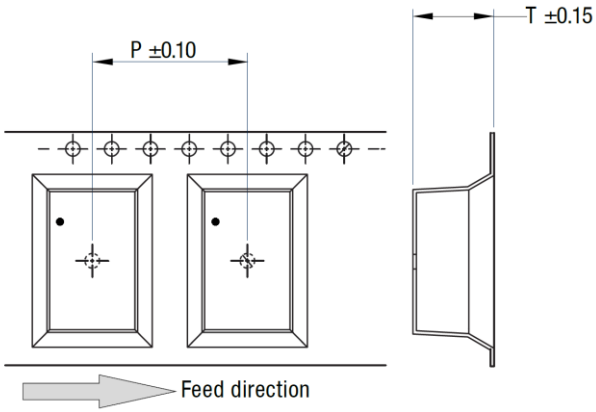
Recommended soldering footprint



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

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Ordering guide

Transducer type	Pressure range	Pressure type/ direction	Package type	Output configuration
HPSD 8000	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	I^2C , 5V
R	I^2C, 3,3V
J	I^2C, 3V
P	SPI, 5V
Y	SPI, 3,3V
Q	SPI, 3V

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

Other configurations possible on special request!

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