hybysens®

DS HPSD8000/A

Preliminary Data sheet

April, 2017

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 (3,3V - 5.5V), customized compensated pressure and temperature ranges, standard digital I²C, SPI or 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 stabilisation after soldering process. Pressure ports with their flexibility in different options can accept standard pneumatic tubes or can be customised for integration into end customer housings with straight pressure ports. Different pressure ranges are available for this group starting from 1mBar up to 7bar.

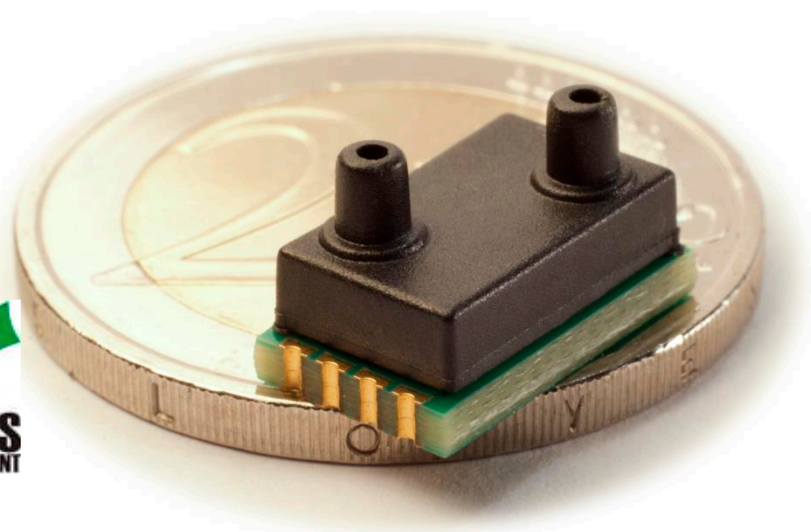
Features

- **Pressure ranges** from **0-1mbar to 0-7bar**
- **Single 3,3V or 5V** supply voltage
- **Standard 0,5V – 4,5V** voltage output
- **Digital I²C or SPI output** (pressure + temperature)
- Standard temperature compensated range **(0-70°C),** other possible
- **Operating** temperature range -25...+85 °C
- **Total pressure accuracy down to max 0,5%FS** (with all effects included).
- **Total temperature accuracy max 1°C** (within compensated temp. range).
- Adjustable output **resolution** (up to 15 bits) versus **sampling rate** (up to 3.9kHz)
- Alarm or PWM output
- **Outstanding offset stability.**
- **Small footprint**: 8mm x13mm
- **Low profile**: only 9 mm in height

Applications

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

RoHS COMPLIANT



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PART OF LAGERCRANTZ GROUP

Available types overview

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

Ultra low pressure range

Pressure range	1 mbar (100 Pa)	2.5 mbar (250 Pa)	5 mbar (500 Pa)
ID group	HPSD 8000-001M	HPSD 8000-2P5M	HPSD 8000-005M
Pressure types	differential/gage/ bidirectional differential	differential/gage/ bidirectional differential	differential/gage/ bidirectional differential
V_{OUT}	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	100 mbar
Burst pressure [2]	150 mbar	150 mbar	150 mbar

Low pressure range

Pressure range	10 mbar (0,15 psi)	20 mbar (0,3 psi)	50 mbar (0,8 psi)	100 mbar (1,5 psi)
ID group	HPSD 8000-010M	HPSD 8000-020M	HPSD 8000-050M	HPSD 8000-100M
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	200 mbar	500 mbar	1000 mbar
Burst pressure [2]	150 mbar	300 mbar	750 mbar	1500 mbar

High pressure range

Pressure range	350 mbar (5 psi)	1 bar (15 psi)	2 bar (30 psi)	4 bar (60 psi)	7 bar (100 psi)
ID group	HPSD 8000-350M	HPSD 8000-001B	HPSD 8000-002B	HPSD 8000-004B	HPSD 8000-007B
Pressure types	differential/ bidirectional differential	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	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]	1 bar	3 bar	6 bar	8 bar	14 bar
Burst pressure [2]	1,7 bar	5 bar	10 bar	12 bar	21 bar

Performance characteristics

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

Parameter	Symbol	Min.	Type	Max.	Unit
Power supply					
Supply voltage	V_{CC}	4,75		5,25	V
Current consumption	I_{CC}		4	6,5	mA
Analog output (pressure) [3]					
Offset voltage [4]	V_O		0,50		V
Full scale output (FSO) [5]	V_{FS}		4,50		V
Full scale span (FSS) [6]	V_{FSO}		4,00		V
Offset voltage (bidirectional devices)	V_O		2,50		V
Digital output (pressure), 15 bits [3]					
Offset voltage [4]	V_O		3277		counts
Full scale output (FSO) [5]	V_{FS}		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	T_o		8192		counts
Temperature output @ 70°C	T_s		24576		counts
Accuracy (pressure) @ 25°C [8]					
Ultra low pressure (1 to 5 mbar)	E_a		0,5	±1,5	%FSO
Low pressure (10 to 100 mbar)	E_a		0,2	±0,5	%FSO
Standard pressure (all other)	E_a		0,1	±0,3	%FSO
Total accuracy (pressure) @ 0 to 70°C [9]					
Ultra low pressure (1 to 5 mbar)	E_{ta}		1	±2	%FSO
Low pressure (10 to 100 mbar)	E_{ta}		0,5	±1	%FSO
Standard pressure (all other)	E_{ta}		0,3	±0,5	%FSO
Resolution					
A/D converter	D_i			15	bit
D/A converter	D_O		11		bit
Response time	E_{rt}		1,5		ms
Repeatability [10]	E_r		±0,05		% FSO
Nonlinearity & pressure hysteresis (BFSL) [11]	E_l		±0,1	±0,3	% FSO
Load resistance	R_L	2		∞	k
Media compatibility		See spec. note [12], [13]			
Weight	W		3		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_{CC}, 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_{CC}. 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: clean, dry and noncorrosive gases to silicon, RTV, ceramics Al_2O_3, Pyrex, LCP plastics.
13) Media compatibility: on pressure port P2: noncorrosive gases or liquids to silicon, Pyrex, RTV, ceramics Al_2O_3, epoxy, FR4.

Ordering guide

Transducer type	Pressure range	Pressure type	Pressure direction	Pressure port
HPSD8000	001M	D	0	V
	002M	A	B	H
	005M			A
	010M			S
	050M			
	100M			
	350M			
	001B			
	002B			
	004B			
	007B			

Pressure range	
001M	1 mbar
2P5M	2.5 mbar
005M	5 mbar
010M	10 mbar
050M	50 mbar
100M	100 mbar
350M	350 mbar
001B	1 bar
002B	2 bar
004B	4 bar
007B	7 bar

Pressure type	
D	Differential
G	Gage
A	Absolute (for p≥1bar)

Pressure port	
V	Vertical
H	Horizontal
A	Axial
S	Straight vertical

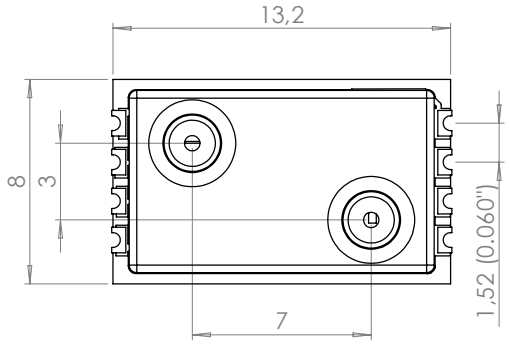
Pressure direction	
0	0 to pressure range
B	-press. range to +press. range (bidirectional)

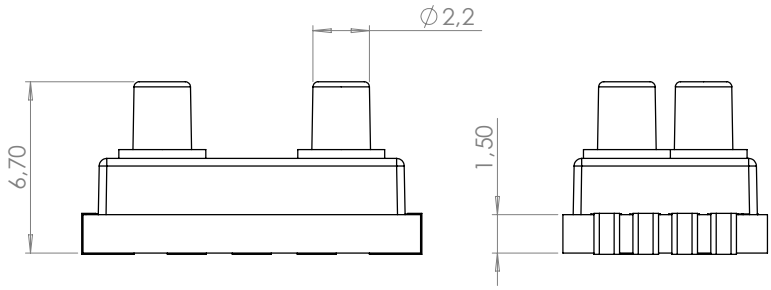
Pressure port	
P	Positive differential pressure on P1 (bottom die side)
N	Positive differential pressure on P2

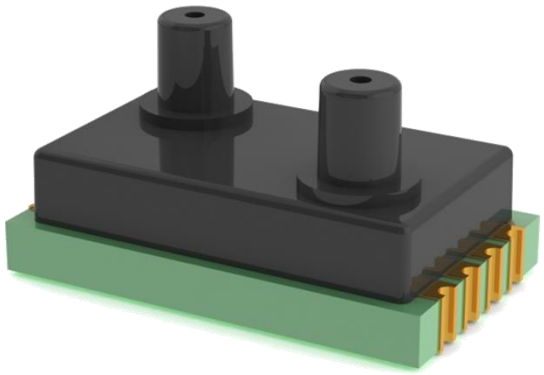
Other configurations possible on special request.

Outline dimensions and pinout

Straight vertical pressure port (HPSD8000-xxxx-x-x-**S**)







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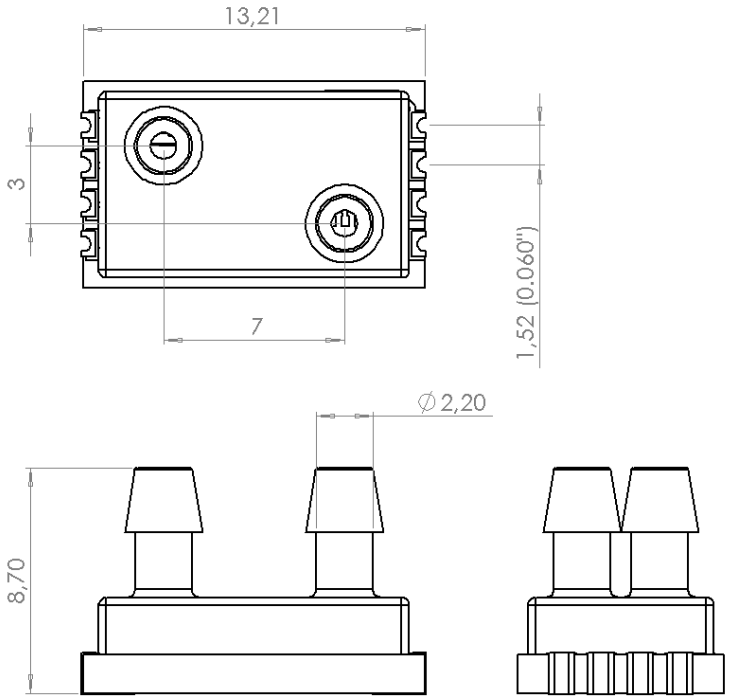
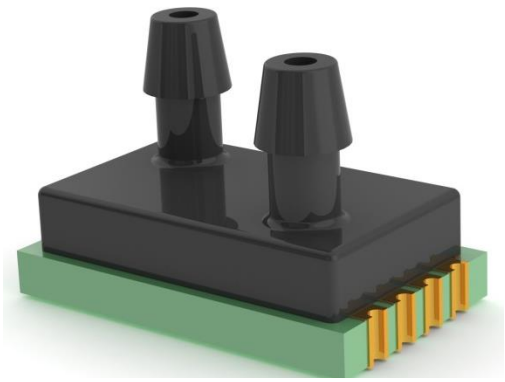
Vertical pressure port (HPSD8000-xxxx-x-x-**V**)





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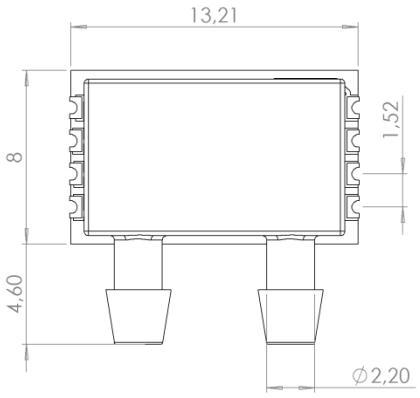
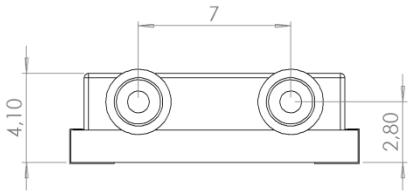
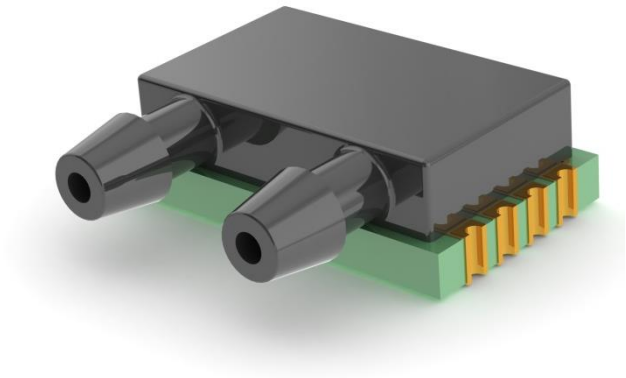
Horizontal pressure port (HPSD8000-xxxx-x-x-**H**)







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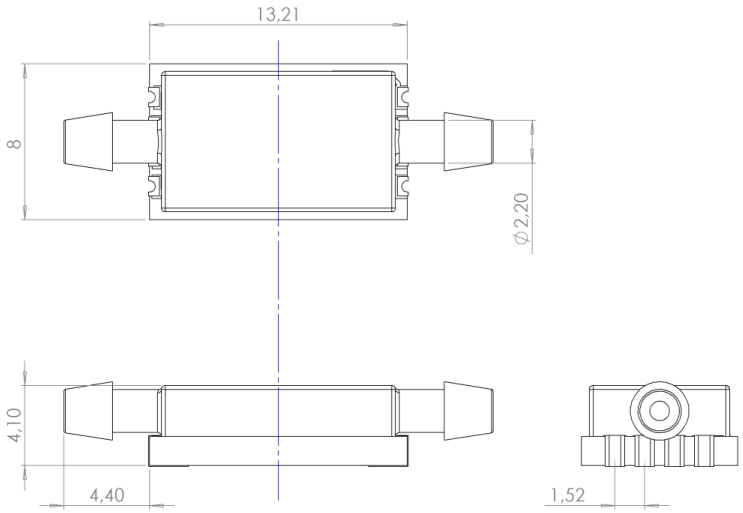
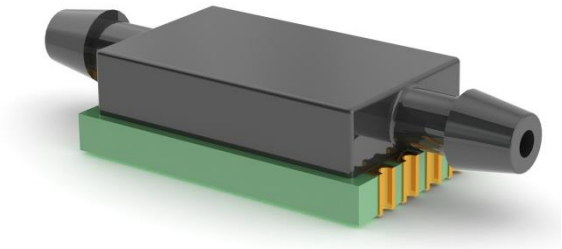
Axial pressure port (HPSD8000-xxxx-x-x-**A**)





Additional support available

- **3D models**
- **PCB footprints**
- **Schematic symbols**
- **Application support**

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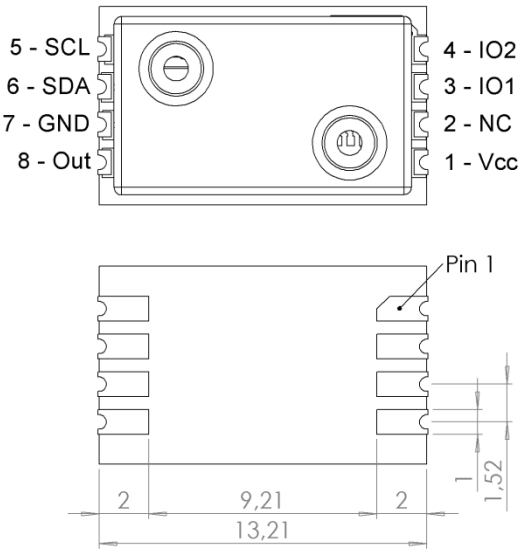
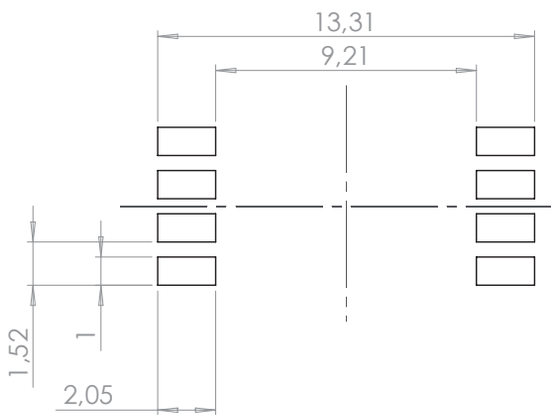
Pinout



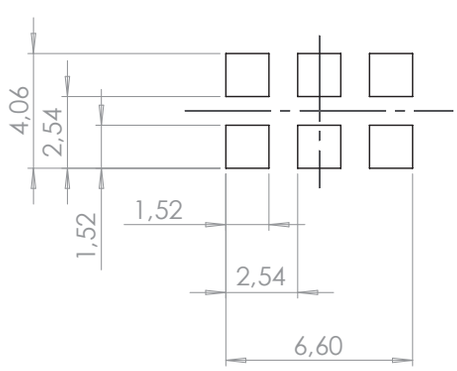
Pin assignment with alternate functions		
Pin	**Name**	**Function**
1	Vcc	Positive power supply
2	NC	Not connected
3	IO1	SPI data out or ALARM1 or PWM1 Output
4	IO2	SPI slave select or ALARM2
5	SCL	I^2C clock or SPI clock
6	SDA	Data I/O for I2C or data IN for SPI
7	GND	Ground
8	Out	Analog output or PWM2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

Soldering footprints

- **Edge pins**



- **Leadless Grid Array**



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