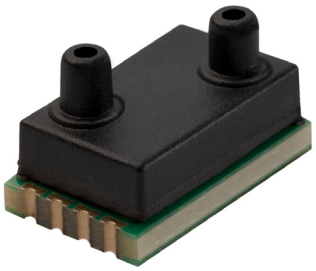
First Sensor

PRELIMINARY

HTD series – digital differential pressure sensors



The HTD differential pressure sensors are specially developed for low pressure ranges and demanding space constrictions. The sensors allow for flexible direct manifold assemblies and offer high performance and accuracy. A digital SPI interface and analog voltage output provide OEMs maximum flexibility for any type of application.

Features

- Pressure ranges from 1 mbar to 1 bar (up to 7 bar on request)
- Single 5 V supply (3.3 V on request)
- Standard 0.5 V ... 4.5 V voltage output
- Max. output current 1 mA
- Digital SPI output (pressure and temperature)
- Temperature compensated range 0...70 °C
- Operating temperature range -25...+85 °C
- Total pressure accuracy down to max. 0.5 %FS
- Total temperature accuracy max. 1 °C
- Adjustable output resolution (up to 15 bits) versus sampling rate (up to 3.9 kHz)
- I²C, 1-Wire, Alarm or PWM output on request
- Outstanding offset stability
- Small footprint, low profile
- Pressure ports for direct manifold assemblies

Certificates

- Quality Management System according to EN ISO 13485 and EN ISO 9001
- RoHS compliant

Media compatibility

Pressure port P1:
Non-corrosive gases compatible with silicon, RTV, ceramics Al_2O_3, Pyrex, LCP plastics.

Pressure port P2:
Non-corrosive gases compatible with silicon, RTV, ceramics Al_2O_3, Pyrex, epoxy, FR4.

Applications

Medical
- Ventilators
- Spirometers
- CPAP
- Sleep diagnostic equipment
- Nebulizers
- Oxygen conservers/concentrators
- Insufflators/endoscopy

Industrial
- HVAC
  - VAV
  - Filter monitoring
  - Burner control
- Fuel cells
- Gas leak detection
- Fume hood
- Instrumentation
- Security systems

First Sensor

PRELIMINARY

HTD series – digital differential pressure sensors

Maximum ratings

Parameter	Min.	Max.	Unit
Supply voltage	4.75	5.25	V_{CC}
Output current		1	mA
Temperature ranges			
Compensated	0	+70	°C
Operating	-25	+85	°C
Storage	-40	+125	°C
Clock frequency (SPI and I²C bus)		400	kHz

Pressure sensor characteristics

Part no.	Operating pressure	Over pressure (1)	Burst pressure (2)
HTDM001...	1 mbar	100 mbar	150 mbar
HTDM2x5...	2.5 mbar		
HTDM005...	5 mbar		
HTDM010...	10 mbar		
HTDM020...	20 mbar	200 mbar	300 mbar
HTDM050...	50 mbar	500 mbar	750 mbar
HTDM100...	100 mbar	1 bar	1.5 bar
HTDM350...	350 mbar	1 bar	1.7 bar
HTDB001...	1 bar	3 bar	5 bar

Performance characteristics

(V_{CC}=5 V, T_A=25 °C)

Parameter		Min.	Typ.	Max.	Unit
Accuracy (@ 25 °C)[3]	up to 5 mbar		0.5	±1.5	%FSO
	10 to 100 mbar		0.2	±0.5	
	all others		0.1	±0.3	
Total accuracy (0...70 °C)[4]	up to 5 mbar		1	±2	
	10 to 100 mbar		0.5	±1	
	all others		0.3	±0.5	
Nonlinearity & pressure hysteresis (BFSL)[5]			±0.1	±0.3	
Repeatability[6]			±0.05		
Position sensitivity	1 mbar		±0.25		
	all others		±0.05		
Response time @ 15 bit			2		ms
A/D resolution				15	Bit
D/A resolution			11		
Load resistance		2		∞	kΩ
Current consumption			4	6.5	mA

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, non-linearity, 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, non-linearity, 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...70 °C.

(5) Non-linearity is defined as the BFSL (best fit straight line) across entire pressure range.

(6) Repeatability is defined as typical deviation of the output signal after 10 pressure cycles.

First Sensor

PRELIMINARY

HTD series – digital differential pressure sensors

Performance characteristics

(V_{CC}=5 V, T_A=25 °C)

Analog output[7]

Unidirectional pressure devices

Parameter		Min.	Typ.	Max.	Unit
Zero pressure offset			0.5		V
Full scale span (FSS)[8]			4.0		
Full scale output			4.5		

Bidirectional pressure devices

Parameter		Min.	Typ.	Max.	Unit
Zero pressure offset			2.5		V
Full scale span (FSS)[8]			4.0		
Output	at max. specified pressure		4.5		
	at min. specified pressure		0.5		

Digital output (15 bit)

Unidirectional pressure devices

Parameter		Min.	Typ.	Max.	Unit
Zero pressure offset			3277		Counts
Full scale span (FSS)[8]			26214		
Full scale output			29491		

Bidirectional pressure devices

Parameter		Min.	Typ.	Max.	Unit
Zero pressure offset			16384		Counts
Full scale span (FSS)[8]			26214		
Output	at max. specified pressure		29491		
	at min. specified pressure		3277		

Temperature devices

Parameter		Min.	Typ.	Max.	Unit
Temperature output[9]	@ 0 °C		8192		Counts
	@ 70 °C		24576		

Specification notes

(7) Analog output signal is ratiometric to power supply Vcc, digital signal is not ratiometric to the power supply.

(8) Full Scale Span (FSS) is the algebraic difference between the output signal for the highest and lowest specified pressure.

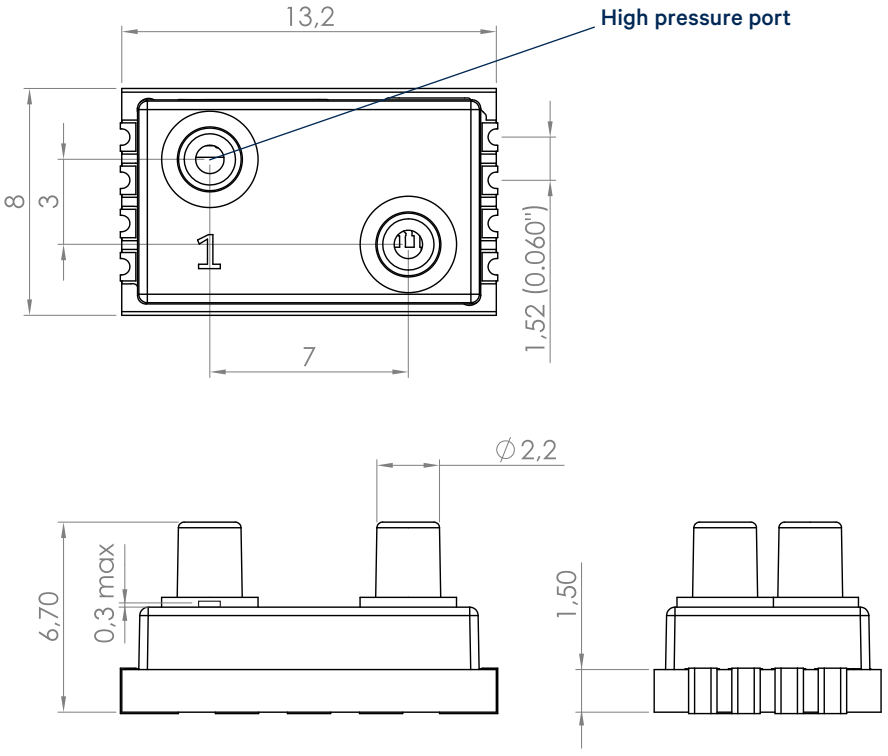
(9) Digital output signal (temperature) is not ratiometric to power supply Vcc. Temperature data are read directly on the sensing element.

First Sensor

PRELIMINARY

HTD series – digital differential pressure sensors

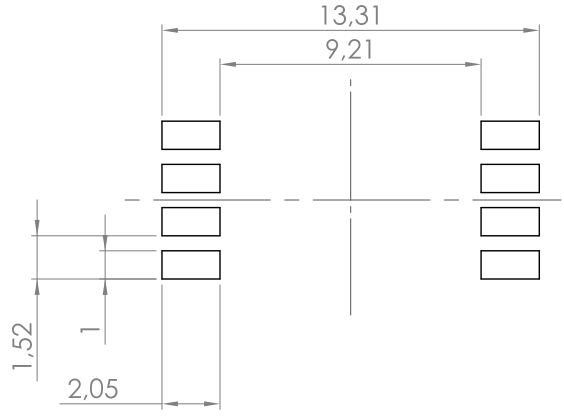
Dimensional drawing



dimensions in mm

Soldering footprints

Edge pins



No open wires allowed in centre area

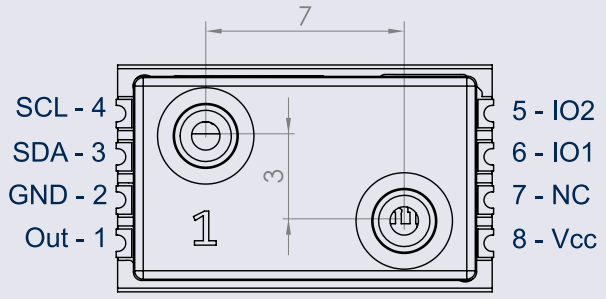
dimensions in mm

First Sensor

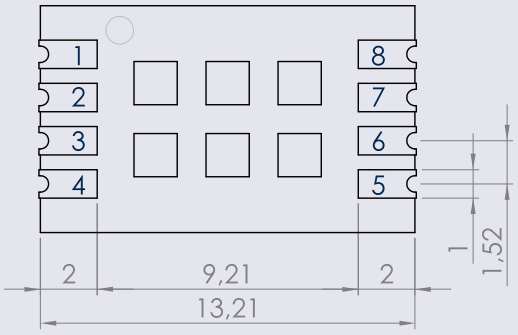
PRELIMINARY

HTD series – digital differential pressure sensors

Electrical connection



Bottom view



dimensions in mm

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

Ordering information

Series	Pressure range		Calibration		Housing	Grade
HTD	M001	1 mbar	B	Bidirectional	S [SMD, 2 ports, axial, same side, straight port]	P [Prime, 15 bit, compensated]
	M2x5	2.5 mbar	U	Unidirectional		
	M005	5 mbar				
	M010	10 mbar				
	M020	20 mbar				
	M050	50 mbar				
	M100	100 mbar				
	M350	350 mbar				
	B001	1 bar				

Order code example: HTDM100BSP

Options such as pressure ranges up to 7 bar, 3.3 V supply and I²C, 1-Wire, Alarm or PWM output are available on request. MPQ applies. Please contact First Sensor.