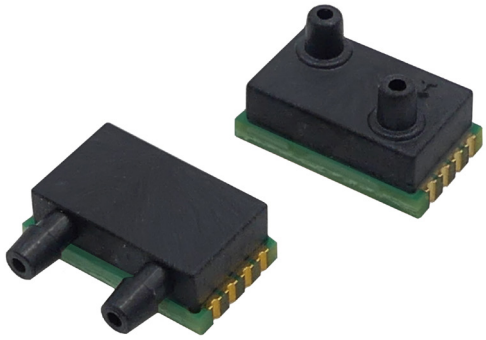
First Sensor

PRELIMINARY

HTD series – digital differential pressure sensors

The HTD differential pressure sensors are specially developed for pressure ranges from 1 mbar to 10 bar and demanding space constrictions. The sensors allow for flexible direct manifold assemblies and offer high performance and accuracy. A digital interface and analog voltage output provide OEMs maximum flexibility for any type of application.



Features

- Pressure ranges from 1 mbar to 10 bar
- Single 5 V or 3 V supply
- Max. output current 1 mA
- Digital SPI or I²C output
- Temperature compensated range 0...70 °C
- Operating temperature range -25...+85 °C
- Total pressure accuracy down to max. 0.5 %FS
- Temperature output, total accuracy max. 1 °C
- Adjustable output resolution (up to 15 bits) versus sampling rate (up to 3.9 kHz)
- 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	HTD...P	4.75	5.25	V_{CC}
	HTD...Q	2.70	3.3	
Output current			1	mA
Lead specifications	Average preheating temperature gradient		2.5	K/s
	Soak time		approx. 3	min.
	Time above 217 °C		50	s
	Time above 230 °C		40	
	Time above 250 °C		15	
	Peak temperature		260	°C
	Cooling temperature gradient		-3.5	K/s
Temperature ranges	Compensated	0	+70	°C
	Operating	-25	+85	
	Storage	-40	+125	
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	100 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
HTDB002...	2 bar	6 bar	10 bar
HTDB005...	5 bar	15 bar	25 bar
HTDB007..	7 bar	21 bar	25 bar
HTDB010...	10 bar	25 bar	25 bar

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.

First Sensor

PRELIMINARY

HTD series – digital differential pressure sensors

Performance characteristics

(T_A=25 °C)

Parameter		Min.	Typ.	Max.	Unit
Accuracy (@ 25 °C)[3]	**up to 5 mbar**		**±2**	**±4**	**%FSS**
	10 to 100 mbar		**±0.5**	**±1**	
	all others		**±0.1**	**±0.3**	
Total accuracy (0...70 °C)[4]	**up to 5 mbar**		**±2.5**	**±5**	
	10 to 100 mbar		**±0.75**	**±1.25**	
	all others		**±0.25**	**±0.5**	
Nonlinearity (BFSL)[5]			**±0.1**	**±0.3**	
Repeatability[6]	**up to 5 mbar**		**±0.1**		
	10 to 100 mbar		**±0.05**		
	all others		**±0.01**		
Position sensitivity	**up to 5 mbar**		**±0.6**		
	10 to 100 mbar		**±0.05**		
	all others		**±0.01**		
Long term drift (one year)	**up to 5 mbar**		**±0.5**		
	10 to 100 mbar		**±0.1**		
	all others		**±0.05**		
Response time @ 15 bit			**2.2**		**ms**
A/D resolution				**15**	**Bit**
D/A resolution			**11**		
Load resistance		**2**		**∞**	**kΩ**
Current consumption			**4**	**6.5**	**mA**

Specification notes

(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.

HTD series – digital differential pressure sensors

Performance characteristics – 5 V devices

(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.

PRELIMINARY

HTD series – digital differential pressure sensors

Performance characteristics – 3 V devices

(V_{CC}=3 V, T_A=25 °C)

Analog output[7]

Unidirectional pressure devices

Parameter	Min.	Typ.	Max.	Unit
Zero pressure offset		0.3		
Full scale span (FSS)[8]		2.4		V
Full scale output		2.7		

Bidirectional pressure devices

Parameter		Min.	Typ.	Max.	Unit
Zero pressure offset			1.5		
Full scale span (FSS)[8]			2.4		V
Output	at max. specified pressure		2.7		
	at min. specified pressure		0.3		

Digital output (15 bit)

Unidirectional pressure devices

Parameter	Min.	Typ.	Max.	Unit
Zero pressure offset		2731		
Full scale span (FSS)[8]		21845		Counts
Full scale output		24575		

Bidirectional pressure devices

Parameter		Min.	Typ.	Max.	Unit
Zero pressure offset			13653		
Full scale span (FSS)[8]			21845		Counts
Output	at max. specified pressure		24575		
	at min. specified pressure		2731		

Temperature devices

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

Specification notes

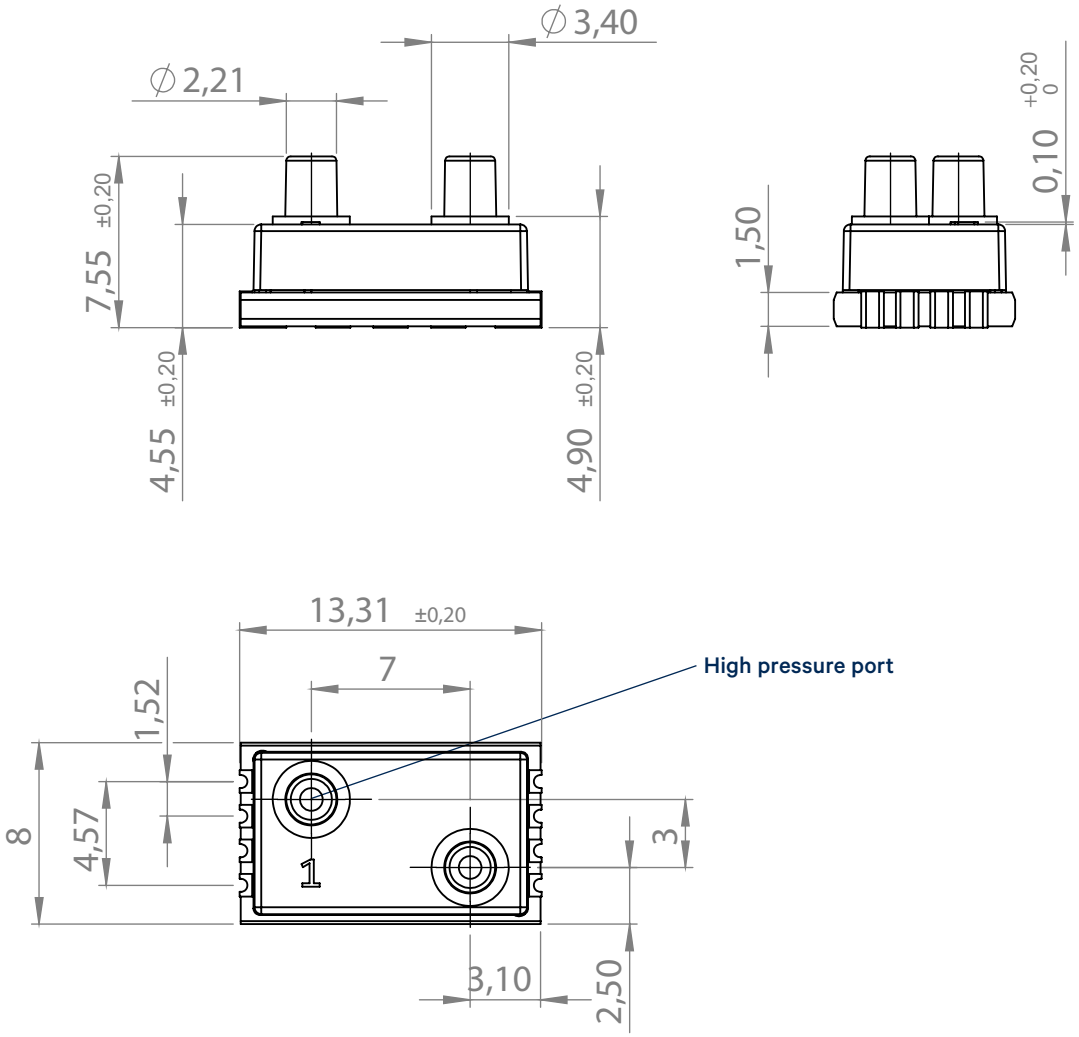
(7) Analog output signal is ratiometric to power supply Vcc, digital signal is not ratiometric to the power supply.

(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.

HTD series – digital differential pressure sensors

Dimensional drawing[10]



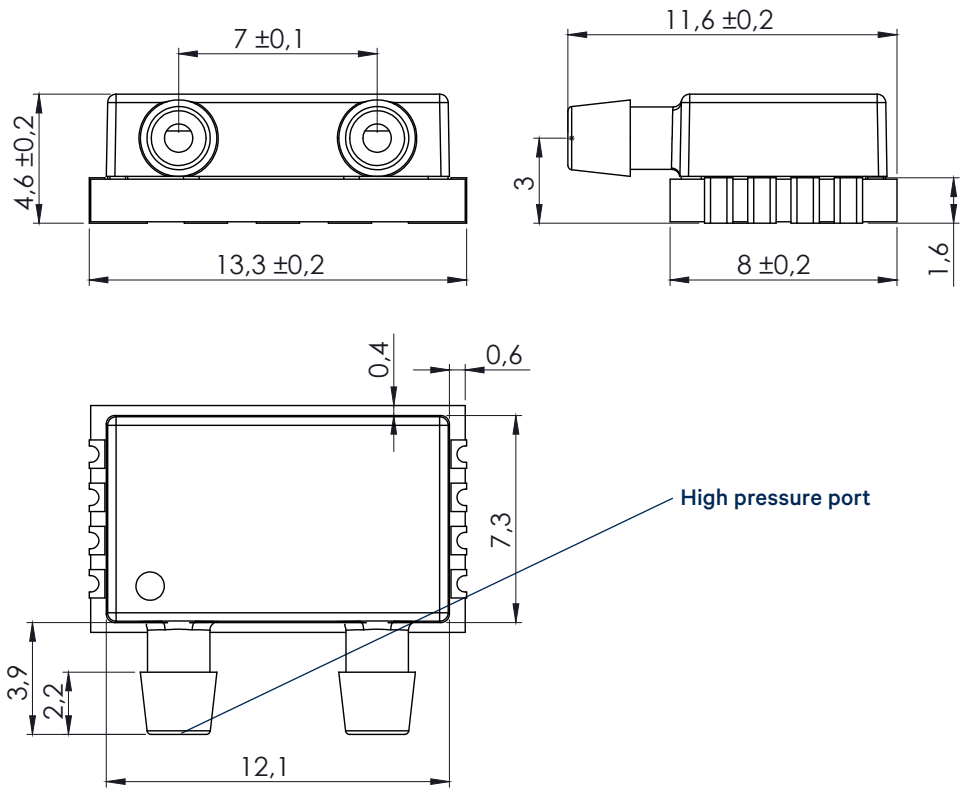
dimensions in mm

Specification notes

(10) General tolerances for mechanical parts: DIN ISO 2768
Tolerances and acceptance conditions for plastic molded parts: DIN 16742

HTD series – digital differential pressure sensors

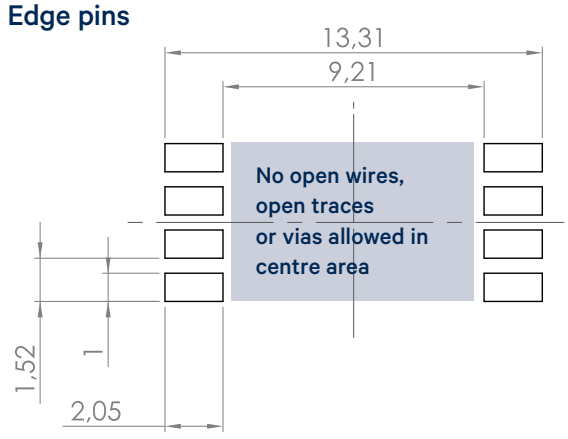
Dimensional drawing[10]



dimensions in mm

Soldering footprints

Edge pins



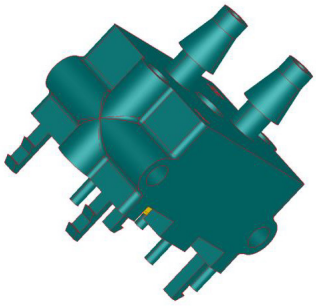
dimensions in mm

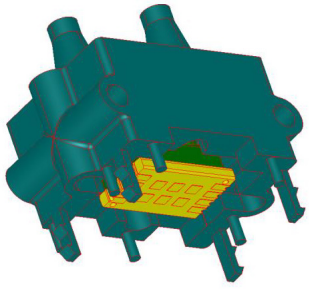
Specification notes

(10) General tolerances for mechanical parts: DIN ISO 2768
Tolerances and acceptance conditions for plastic molded parts: DIN 16742

HTD series – digital differential pressure sensors

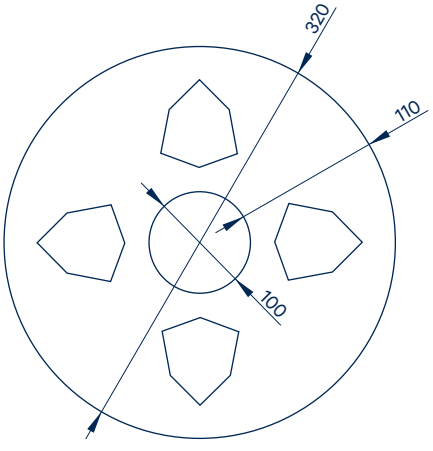
Custom adaptor

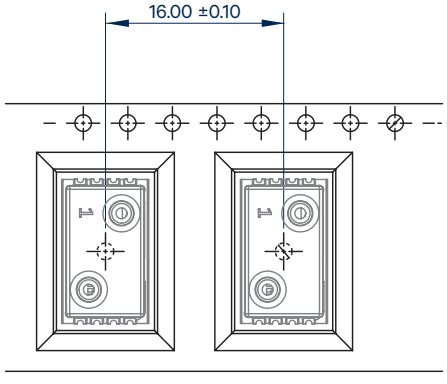


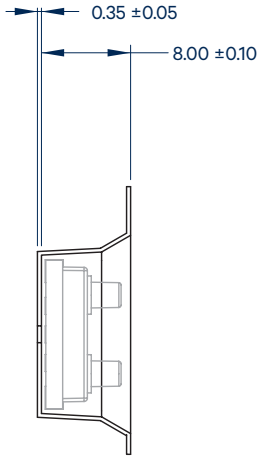


Tape and reel packaging

13 inch reel, 500 pcs/reel







Feed direction

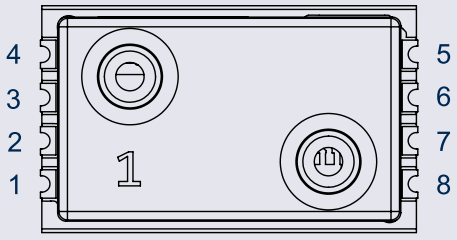
dimensions in mm

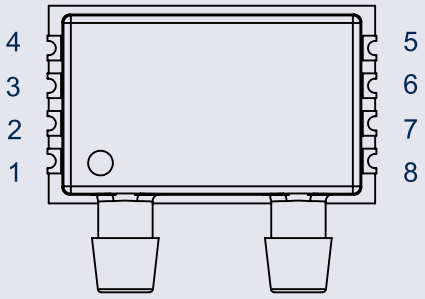
First Sensor

PRELIMINARY

HTD series – digital differential pressure sensors

Electrical connection





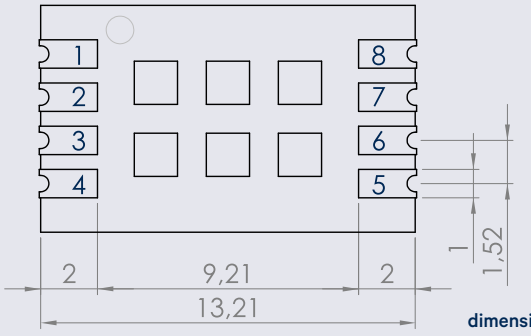
SPI bus

Pin	Name	Function
1	Vout	Analog output
2	GND	Ground
3	MOSI	Data IN for SPI
4	CLK	SPI clock
5	SS	SPI slave select
6	MISO	SPI data out
7	NC	Not connected
8	+Vs	Positive power supply

I²C bus

Pin	Name	Function
1	Vout	Analog output
2	GND	Ground
3	SDA	Data I/O
4	SCL	I²C clock
5	I/C*	Internal connection
6	I/C*	Internal connection
7	NC	Not connected
8	+Vs	Positive power supply

Bottom view



dimensions in mm

Note: Do not connect leadless grid array in centre area.

Ordering information

Series	Pressure range		Calibration		Housing		Grade			Option
HTD	M001	1 mbar	B*	Bidirectional	S	SMD, 2 ports, axial, straight port	P	SPI, 15 bit, 5 V	-	T* [Tape and Reel]
	M2x5	2.5 mbar	U	Unidirectional	E	SMD, 2 ports, horizontal, barbed port	Q	SPI, 15 bit, 3 V		* MOQ 500 pcs.
	M005	5 mbar	* only up to 1 bar				H	I²C, 15 bit, 5 V		
	M010	10 mbar					J	I²C, 15 bit, 3 V		
	M020	20 mbar								
	M050	50 mbar								
	M100	100 mbar								
	M350	350 mbar								
	B001	1 bar								
	B002	2 bar								
	B005	5 bar								
	B007	7 bar								
	B010	10 bar								

Order code example: HTDM100BSP