DATASHEET
SPD006LIhyb Pressure Sensor

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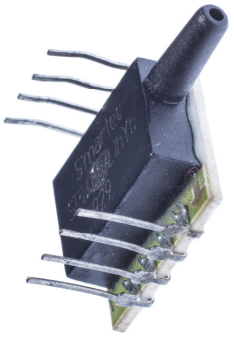
LIMITED PRESSURE RANGE ABSOLUTE SENSOR WITH I²C OUTPUT (600 – 1025 mBar)



This Smartec absolute pressure sensor has an I²C output. The sensor is compensated for offset, sensitivity, temperature drift and nonlinearity.

The sensor has a range of 600 – 1025 mBar FS. Other pressure ranges can be delivered on request (0.3 – 100 PSI).

Electrical Characteristics

Performance Characteristic at Vcc =5V excitation @ 25 °C.

Parameter	Min	Typ	Max	Units.
Supply Voltage	2.75	5.00	5.25	V
Supply Current	-	3		mA
Pressure range (fs)	600		1025	mBar
Resolution		14		Bits
Accuracy 1)		1.8		%FS
Zero output(600 mBar)		0666		Hex
Full Scale		3999		Hex
Pressure overload			3x	rating
Temp compensation	0		50	°C
Operating Temp range	-20		125	°C
Storage temperature	-40		125	°C

1) all errors included; values + 1 LSB

- It is advised to place a 100nF capacitor between Vcc and Gnd
- Wetted materials are: Pyrex glass, RTV, Ceramic, Nickel and Silicon

smartec
www.smartec-sensors.com

I²C Protocol

For I²C communication a data line (SDA) and a clock line (SCL) are required. (SCL frequency 100 – 400 KHz)
The I²C protocol used is defined as follows :

Idle period

During inactivity of the bus, SDA and SCL are pulled-up to supply voltage Vcc.

Start condition

A high to low transition on SDA while SCL is at high level indicates a start condition. Any command has to be initiated by a start condition sent by a master. A master can only generate a start condition.

Stop condition

A low to high transition on SDA while SCL is at high level indicates a stop condition. A command has to be closed by a stop condition to start processing the command routine inside the IC.

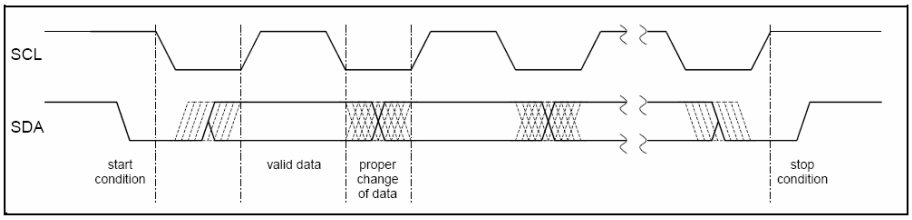


Fig. 1: Principles of I²C protocol

Data

Data is transmitted in Bytes (8 Bits) starting with the most significant bit (MSB). Each byte transmitted is followed by an acknowledge bit.

Transmitted bits are valid if after a start condition. SDA keeps at constant level during high period of SCL. The SDA level has to change only when clock signal at SCL is low.

Acknowledge

Acknowledge after transmitted byte is obligatory. The master must generate an acknowledge related clock pulse. The receiver pulls-down the SDA line during acknowledge clock pulse. If no acknowledge is generated by the receiver, a transmitting slave will set inactive.

A transmitting master can abort the transmission by generating a stop condition and may repeat the command.

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A receiving master must signal the end of transfer to the transmitting slave by not generating an acknowledge related clock pulse at SCL.

The ASIC of transducer as a slave changes to inactive interface mode during processing Internal command routines started by a previously sent command.

Addressing

In the start condition, the master sends the address byte containing a 7-bit address followed by a data direction bit (R/W). A '0' indicates a transmission from master to slave (WRITE) a '1' indicates a data request (READ).

The addressed slave answers with an acknowledge, all other slaves connected with the I²C bus ignore this communication.

The default sensor slave address is 0x78 (7bit). Programmed at factory during production, it is possible to allocate and activate an additional slave address to every single device. In this case the device recognizes communication on both addresses, on the general one and on the activated one.

Read operation

After a data request from master to slave by sending an address-byte including a set data direction bit, the slave answers by sending data from the activated interface output registers. The master must generate the transmission clock on SCL, the acknowledge pulses after each data byte (except after the last one) and finally the stop condition.

A data request is answered by the interface module itself and does consequently not interrupt the current process of the internal micro-controller. The data in the activated registers is sent continuously until a stop condition is detected, after transmitting all available data the slave starts repeating the data.

During running measurement cycle, data is updated with most actual results.

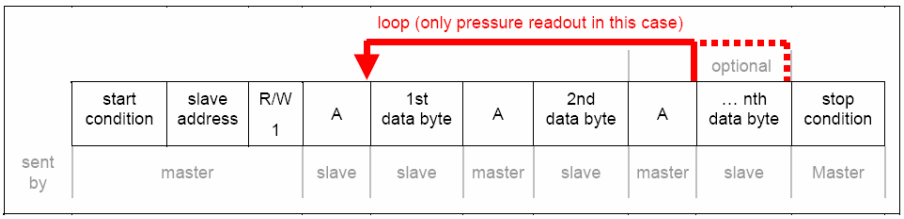

Fig. 2: Read operation - data request I²C

Note：nth data byte is the last required data byte; readout can be processed in loop without resend initialization by master.

From 14 bits incoming data to pressure value

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The digital SPD series pressure sensors are calibrated to a straight line transfer function between the incoming pressure and the outgoing digital word. Below is explained how the pressure can be derived from the 14-bits data word. The pressure is presented as a 12-bits digital word. The digital word is between 0 and 3FFF in Hexadecimal or from 0 to 16383 in decimal. For the ease of calculation we use only the decimal presentation.
In general the upper 10% and the lower 10% of the numeric range of the 14 bits are outside the pressure range. This is done to detect wrong function of the sensors. So when the decimal value is lower than 1638 or higher than 14,745 the sensor is out of range.

The SPD006LIhyb a 600 to +1025 mbar absolute sensor

The span is 425 mbar. This is 80% of the digital scale, so 425 mm over 13.107 dec points on the output, which means 13,107/425 per mbar = 30.84 for each mbar. The binary offset at 600 mbar is again 10% of the binary range is 1,638 dec.

This means the relation between the decimal output and the pressure can be derived as:

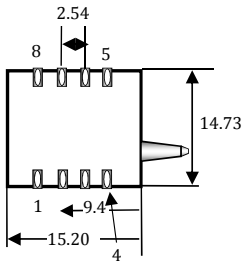
$$\text{Output (dec)} = (\text{Pressure(mbar)}-600) \times 30.84 + 1{,}638$$

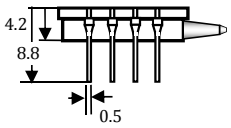
or

$$\text{Pressure (mbar)} = \frac{\text{Output (dec)} - 1{,}638}{30.84} + 600$$

Dimensions

(all sizes in mm)





All sizes in mm (not to scale)

Pin description

1	**NC**
2	**Vcc**
3	**NC**
4	**Vcc**
5	**SDA**
6	**SCL**
7	**NC**
8	**GND**

Use of NC pins will cause malfunction
Connect between Vcc and Gnd a capacitor of 100 nF.

Ordering Code:

SPD006LIhyb 600-1025 mBar absolute pressure sensor with I^2C output

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