ZXP6001DDA Differential Pressure Sensor Specification

(Version A1.2)

BeiJing Smart Sensor S&T Co., Ltd

ZXP6010 differential pressure sensor

Summary:

The ZXP6001DDA is the pressure sensor which measures differential pressures. It consists of a silicon micro-machined sensing element chip and a signal conditioning ASIC. The ASIC is equipped with a 24-bit resolution Σ-Δ ADC and outputs a highly precise pressure value as a digital value. The pressure sensor element and the ASIC are mounted inside a system-in-package and wire-bonded to appropriate contacts. The ZXP6001DDA provides digital output interface. It can achieve ESD robustness, fast response time, high accuracy and linearity as well as long-term stability. All measurement data is fully calibrated and temperature compensated. In addition, it allows for easy system integration.

ZXP6001DDA

Product features

- Pressure type: differential pressure
- Operating temperature: -40 ~ +125℃
- 1% maximum error over 0 ° C to 85 ° C
- Ideally suited for microprocessor-based or microcontroller based systems

- High reliability package
- SOP installation methods

Application field

- Medical applications: sleep respiration detection, CPAP (continuous positive airway pressure), ventilators, oxygenators, negative pressure wound treatment, airflow monitoring, etc.
- Industrial applications: fire residual pressure, airflow measurement, pressure switch, pneumatic gauge, safety cabinet, life science, gas flow meter, liquid level measurement, etc.
- Consumer electronics: wearable devices, white goods.

The performance parameters

Table 2 Performance parameters

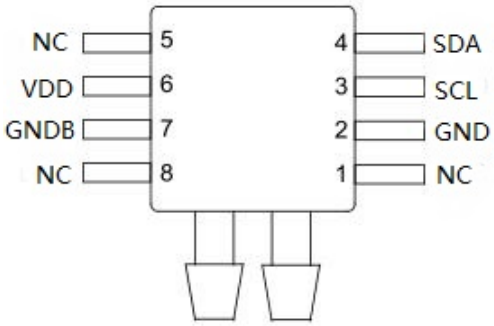
Characteristic	Minimum	Typical	Maximum	Units
Pressure range		-1~1		KPa
Supply voltage	1.8	3.3	3.6	V
Supply current	-	1.5	-	mA
Sleep current	-	100	-	uA
Accuracy	-1.5	-	1.5	%FS
Response time	1.54	2.5	42.18	ms
Operating Temperature	- 40	-	+ 125	℃
Storage Temperature	- 40	-	+ 125	℃

Note:

1. Work environment (V_S = 3.3Vdc, T_A = 25℃).

● Pin definition

ZXP6001DDA encapsulation:



Encapsulation figure

Pin No.	Pin Function	Instructions
2,7	GND	Power Ground
6	VDD	Supply Power
4	SDA	Data In/Out
3	SCL	Clock input for I²C
1,5,8	NC	empty

Encapsulation defined

● NORMAL REGISTERS

Addr.	Funciton	RW	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	Reset State
0x06	DATA_MSB	R	Data out<23:16>								0x00
0x07	DATA_CSB	R	Data out<15:8>								0x00
0x08	DATA_LSB	R	Temp out<7:0>								0x00
0x09	TEMP_MSB	R	Temp out<15:8>								0x00
0x0A	TEMP_LSB	R	Temp out<7:0>								0x00
0x30	CMD	RW	Sleep_time<3:0>				Sco	Measurement_ctrl<2:0>			0x00
0xA5	Sys_config	RW							Raw_data_on	DIAG_on	OTP

Reg0x06-Reg0x08

Data_out: 24 bits ADC output data when 'raw_data_on' = 0 with an LSB equals to (1/2^23)*VEXT. 24 bits calibrated data when 'raw_data_on' = 1.

Reg0x09-Reg0x0a

Temp_out: Temperature output with an LSB equals to (1/256) ° C

Reg0x30

Sleep_time<3:0>: 0000:0ms, 0001:62.5ms, 0010:125ms ... 1111: 1s, only active during sleep mode conversion.

Measurement_control<1:0>: 000b, indicate a single shot temperature signal conversion. 001b, indicate a single shot sensor signal conversion. 010b: indicate a combined conversion (once temperature conversion immediately

followed by once sensor signal conversion). 011b: indicate a sleep mode conversion (periodically perform once combined conversion with an interval time of ‘sleep_time’), 100b: OTP programming mode, enter this mode to when programming OTP banks.
Sco: 1, Start of conversion, automatically come back to 0 after conversion ends (except sleep mode conversion).

Reg0xA5

Raw_data_on: 0: output calibrated data, 1: output ADC raw data. (Only take effect in single shot sensor signal conversion and single shot temperature conversion)
Diag_on: 1, Enable diagnosis function.

● I²C INTERFACE

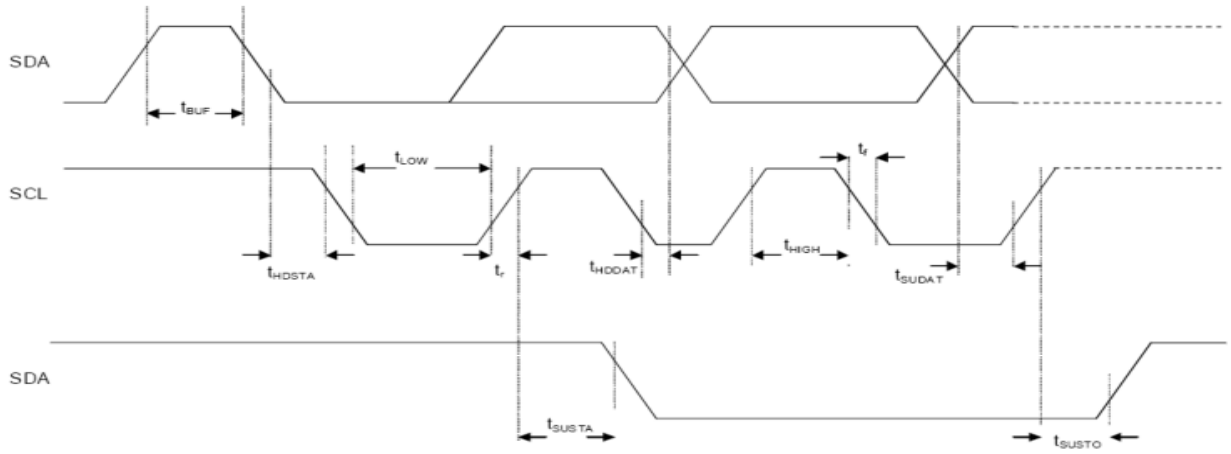
I²C bus uses SCL and SDA as signal lines. Both lines are connected to VDD externally via pull-up resistors so that they are pulled high when the bus is free. The I²C device address of ZXP6001DDA is shown below. The LSB bit of the 7bits device address is configured via SDO/ADDR pin.

Table I²C Address.

A7	A6	A5	A4	A3	A2	A1	W/R
1	1	0	1	1	0	SDO/ADDR	0/1

Table Electrical specification of the I²C interface pins

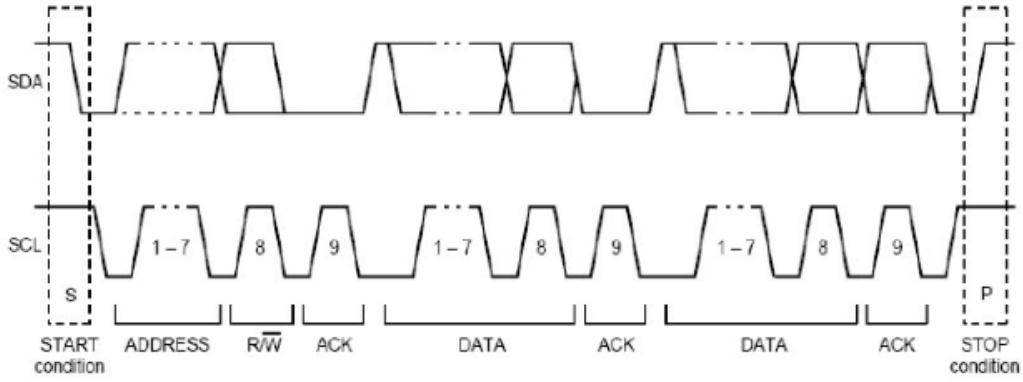
Parameter	Symbol	Condition	Min	Max	Unit
Clock frequency	F_{scl}			400	KHz
Time before a new transmission can start	t_{BUF}		1.3		us
Hold time for a start	t_{HDSTA}		0.6		us
Setup Time for a	t_{SUSTA}		0.6		us
Setup Time for a stop	t_{SUSTO}		0.6		us
SDA hold time	t_{HDDAT}		0.0		us
SDA setup time	t_{SUDAT}		0.1		us
SCL low pulse	t_{LOW}		1.3		us
SCL high pulse	t_{HIGH}		0.6		us



I²C Timing Diagram

The I²C interface protocol has special bus signal conditions. Start (S), stop (P) and binary data conditions are shown below. At start condition, SCL is high and SDA has a falling edge. Then the slave address is sent. After the 7 address bits, the direction control bit R/W selects the read or write operation. When a slave device recognizes that it is being addressed, it should acknowledge by pulling SDA low in the ninth SCL (ACK) cycle. At stop condition, SCL is also high, but SDA has a rising edge. Data must be

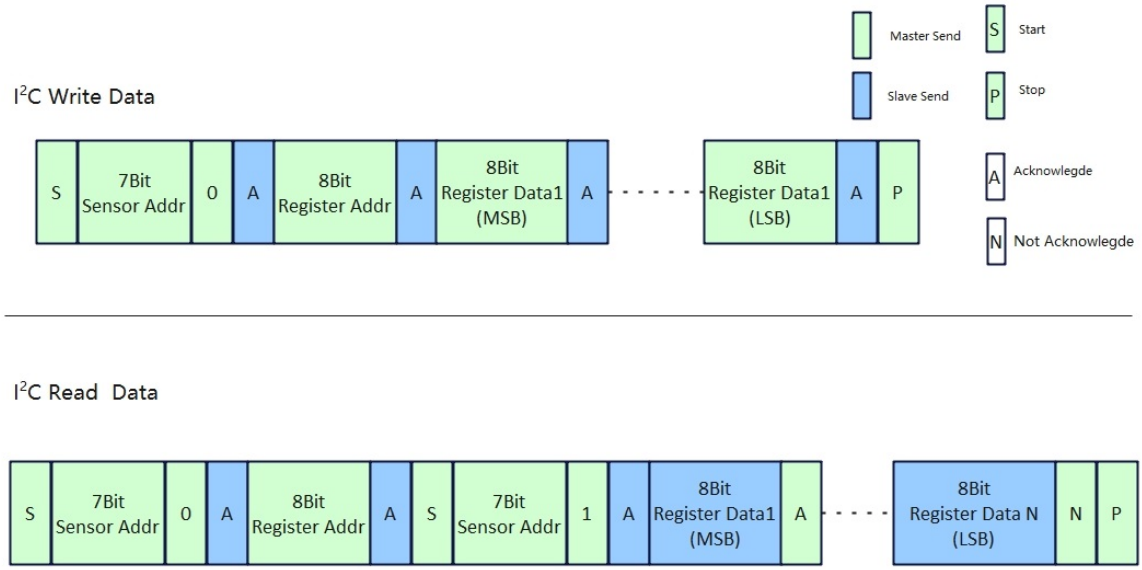
held stable at SDA when SCL is high. Data can change value at SDA only when SCL is low.



I^2C Protocol

- Sensor communication

Data transfers use the I^2C-bus data transfer formats to achieve the sensor register read and write protocols shown in Figure When reading from or writing to the sensor, the master first performs a 1 byte data write to send the required register address to the sensor. The master then performs either an n byte data read or write to transfer the data, MSB first, from or to the addressed register.



Typical I²C-bus data transfers

● Reading the pressure and temperature

The sensor directly provide compensated pressure and temperature data via the **Reg0x06-Reg0x08** and **Reg0x09-Reg0x0a** registers avoiding the need for the user

to undertake any additional calculations.

The following steps should be used to read the pressure and temperature data:

1、Read the pressure data

a. Initiate a data update.

Write 0x11 to **Reg0xA5**, output calibrated data.

Write 0x09 to **Reg0x30**, Start one time sensor signal conversion.

b. Check the status of the new data available flag.

Reg0x30 Sco: 1, Start of conversion, automatically come back to 0 after conversion ends (except sleep mode conversion).

c. Get the compensated pressure data.

Read **Reg0x06-Reg0x08.**

d. 24 bit ADC data to pressure

P=ADC data/2^n, Then 2^(23-(n+1))<FullScale<2^(23-n), The unit of FullScale is Pa.

2、Read the temperature data

a. Initiate a data update.

Write 0x11 to **Reg0xA5**, output calibrated data.

Write 0x08 to **Reg0x30**, Start one time temperature signal conversion.

b. Check the status of the new data available flag.

Reg0x30 Sco: 1, Start of conversion, automatically come back to 0 after conversion ends (except sleep mode conversion).

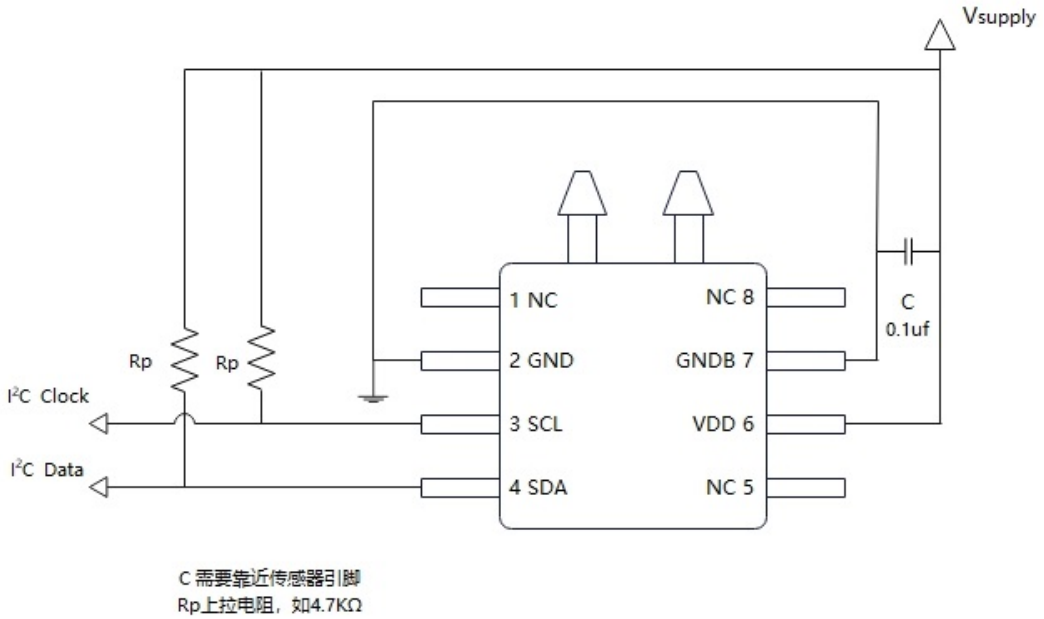
c. Get the compensated temperature data.

Read **Reg0x09-Reg0x0A.**

d. 16 bit ADC data to temperature

T=ADC data/256 , The unit of temperature is ℃.

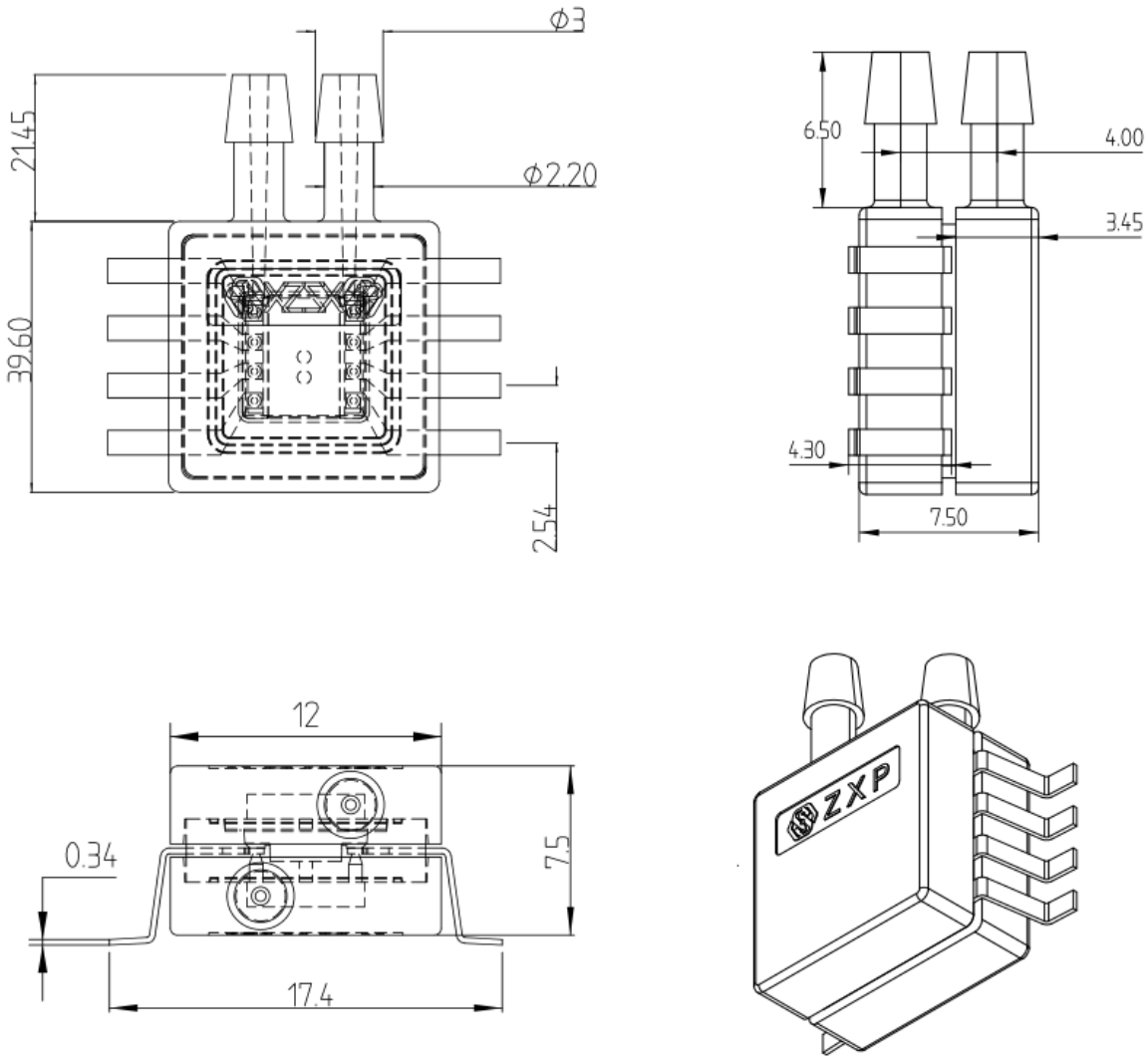
● Typical Applications Circuit



I²C Application Circuit

● Package Dimensions

Unit:mm



Description:

All dimensions are in mm. The tolerance position is not marked, and the dimensional tolerance is ±0.13mm.

● Ordering information

Product model	Minimum pressure	Maximum pressure	Pressure type	Output type	Encapsulation type	Packaging form
ZXP6001DDA	0 KPa	1KPa	Differential pressure	I^2C	Vertical bilateral air column	-