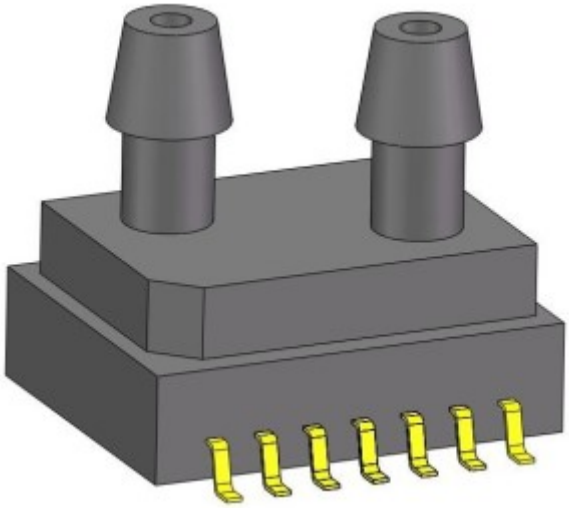
LWLP5000-5XD

General Description

LWLP5000-5XD, integrated ultra-low pressure high-resolution differential pressure sensor, encapsulates a high-performance MEMS pressure chip and a special conditioning chip inside. It will give you a comparative measurement between two points to reduce the effect of environment on the output. LWLP5000-5XD adopts a unique multi-stage temperature-compensation algorithm and digital I2C output, providing products with gauge or differential pressure air-intake mode.



Benefits and Features

Range: ±500Pa
Types of pressure measurements: Differential pressure
Communication: I2C
High Precision
Calibrated Compensation

Applications

industrial Control
Fitness Equipment
Medical Monitoring
Automotive Applications
Household Appliances

1. Performance parameters

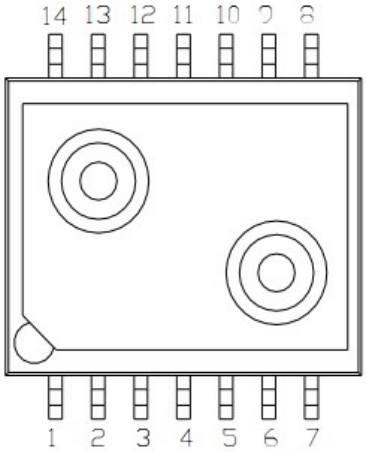
PARAMETER	MIN	TYP	MAX	UNITS	FUNCTION
Range	-500		500	Pa	
Supply Voltage	1.8	3.3	3.6	V	
Supply Current	1			mA	
Sleep Current	20			nA	
ADC	24			bit	
Accuracy (1)	±1.5			%FS	
A response Time		5	30	ms	
Temperature Compensation	-5		65	℃	
Ambient Temperature for Operation	-40		85	℃	
Temperature Output Range	-40		85	℃	
Temperature Accuracy (2)		1		℃	@-5~65℃
If not specified, all data in this table are tested under the conditions of voltage 3.3Vdc and temperature 25℃					

Note(s):

1. Accuracy refers to the output accuracy of the product in a clean gas environment within the compensation temperature range; the accuracy is determined by the linearity, repeatability, and hysteresis of the product.;

2. Accuracy also means the temperature detection accuracy of the sensor at constant temperature condition;

2. Pin Description



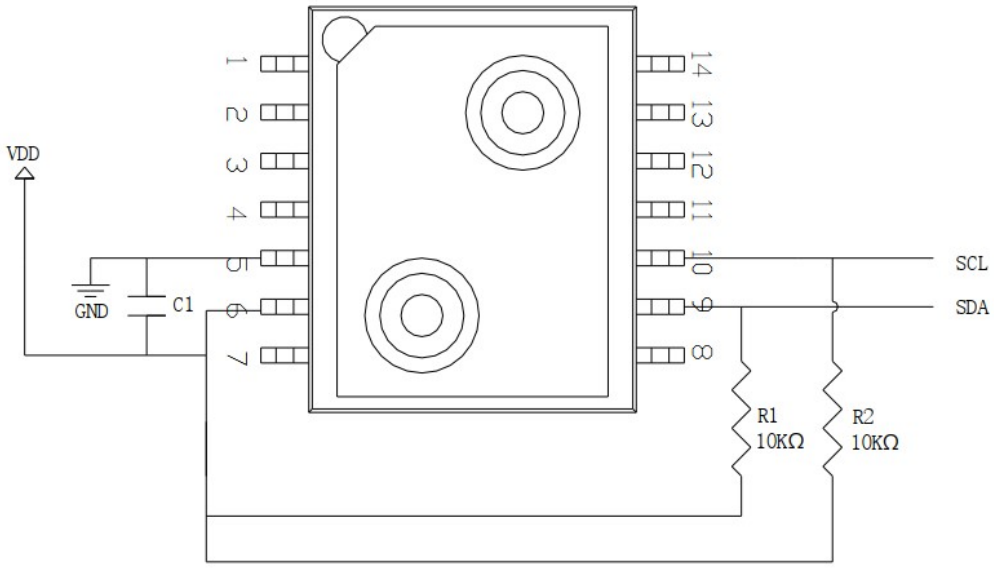
Pin Description（Front View）

Pin Description

PIN	NAME	FUNCTION
5	GND	GND
6	VDD	Power
9	SDA	I2C Data
10	SCL	I2C Clock
1,2,3,4,7,8, 11,12,13,14	NC	NULL

3. Functional Description

3.1 Typical Circuit



Note 1: VDD/GND/SDA/SCL must be powered on and down at the same time to avoid incomplete data transmission that may cause the sensor to enter the BUSY mode. Once the sensor is in the BUSY mode, it will not process any new commands and the product output will be abnormal.

Note 2: The filter capacitor C1 between VDD and GND cannot be used; if used,

C1≤100nf.

Note 3: The MCU is prohibited to communicate data with the sensor within 30ms of the sensor's power off.

3.2 I2C Port

3.2.1 LWLP5000-5XD Address Description

LWLP5000-5XD I2C Address

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

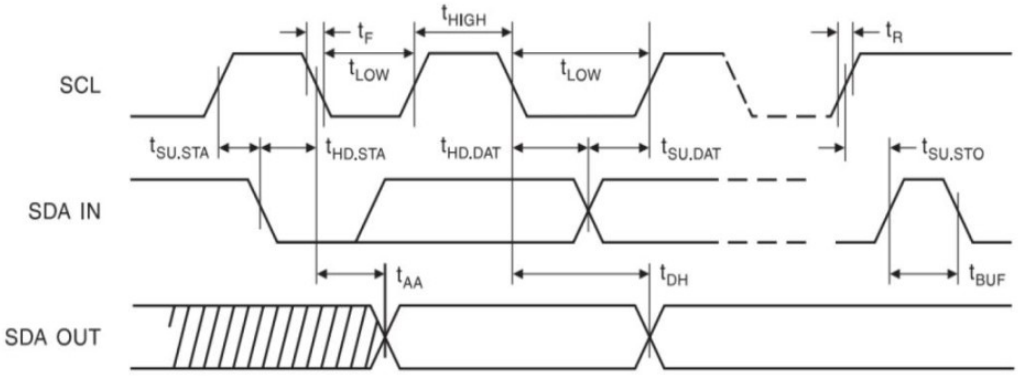
A1~A7 are address bits, W/R is read/write bit.

Write register address command: 00000000（0x00）

Read register address command: 00000001（0x01）

3.2.2 I2C Timing Characteristics

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
SCL Clock Frequency	Fscl	Pull-up=10kΩ	0		400	KHz
Bus Free Time Between STOP and START Conditions	tBUF		1.5			μs
Hold Time (Repeated) START Condition	tHD.STA		0.6			μs
START Setup Time	tSU.STA		0.6			μs
Setup Time for STOP Condition	tSU.STO		0.6			μs
Data Hold Time	tHD.DAT		100			ns
Data Setup Time	tSU.DAT		100			ns
Low Period of SCL Clock	tLOW		1.5			μs
High Period of SCL Clock	tHIGH		0.6			μs
Rise Time of Both SDA and SCL Signals	tR		30		500	ns
Fall Time of Both SDA and SCL Signals	tF		30		500	ns

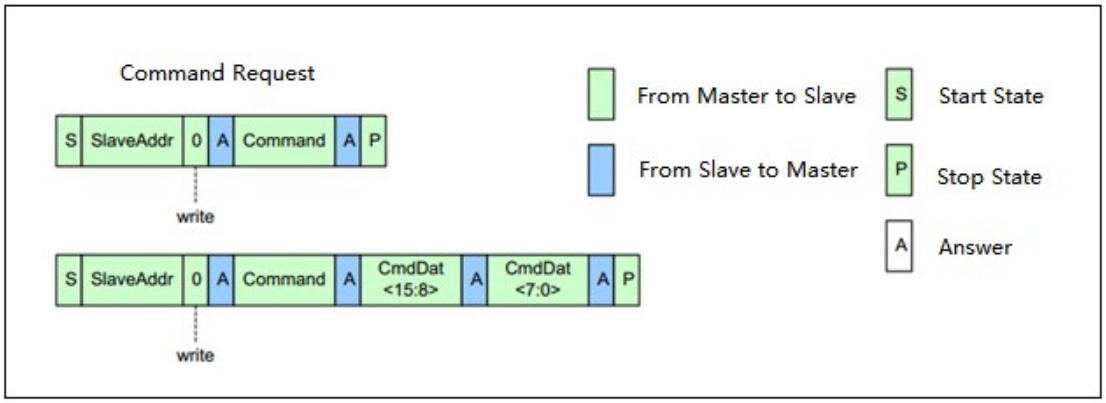


Data Transfer on I2C Serial Bus

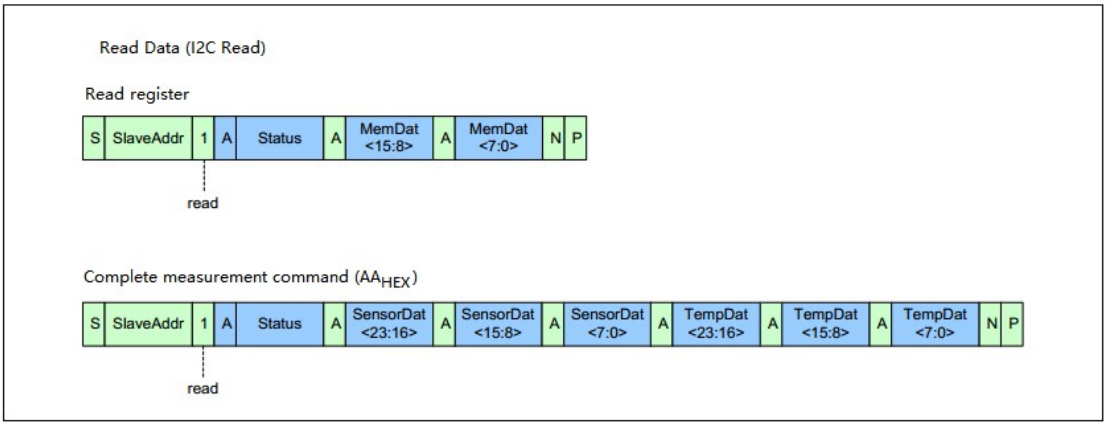
3.2.3 I2C Reading and Writing Timing

The host needs to send the chip address first before communicating with the chip. The slave address byte consists of 7 address bits and a direction bit. The

read/write bit determines whether the slave will receive or send. The I2C address of the chip is 0000000, the writing address of the chip is 0x00, and the reading address of the chip is 0x01.



The following figure shows the timing chart of the host write chip register configuration.



3.2.4 Pressure Register

The pressure is calculated as follows:

$$\mathbf{P(pa)} = \left(\frac{\mathbf{Pmax} - \mathbf{Pmin}}{\mathbf{2^{14}}}\right) * \mathbf{P1} + \mathbf{Pmin}$$

P — Product pressure output value, unit: pa;

P1 — I2C data of the pressure at the pressure point;

Pmax — The upper limit of the product pressure, unit: pa;

Pmin — The lower limit of the product pressure, unit: pa;

Description of Pressure Registers

Name	Bit(s)	Description
Pressure	[23:10] pressure	Read Only
	[09:00] Reserved	0(Read Only)

3.2.5 Temperature Register

The temperature is calculated as follows:

$$\mathbf{T(℃) = \left(\frac{85 + 40}{2^{16}}\right) * T1 - 40}$$

T — Product temperature output value, with ℃ as its unit;

T1 — IIC data of the temperature at this temperature point;

Description of Temperature Registers

Name	Bit(s)	Description
Temperature	[23:08] Temperature	Read Only
	[07:00] Reserved	0(Read Only)

3.2.6 LWLP5000-5XD Chip Reading and Writing Operation

(1) Register Configuration

a. Enable I2C;

b. Send the write register command 0x00 and wait for a response;

c. Write the configuration register address 0XAA to the chip and wait for a response;

d. Send configuration parameters 0X00, 0X80 to the chip and wait for a response;

e. Disable I2C communication, delay (≥30ms), the chip collects and converts data.

(2) Write and read data address, ask for data from the chip

a. Enable I2C;

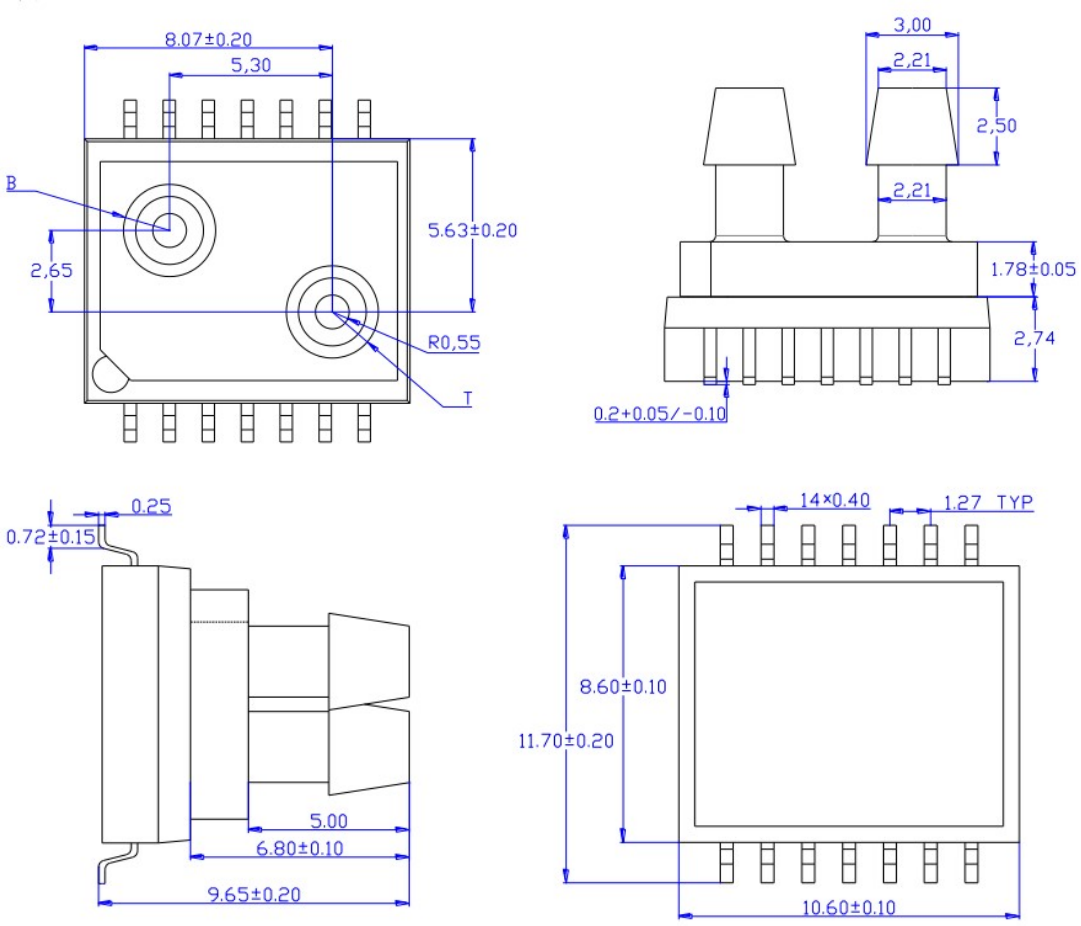
b. Send the read register command 0x01 and wait for a response;

c. Receive chip output data status, read three bytes of pressure data and three bytes of temperature data (The pressure precedes the temperature);

d. Disable I2C communication;

e. Save and process data.

3. Dimension（**mm**）



NOTE 1: All dimensions are in mm, the tolerance position is not marked, dimension tolerance is ±0.05mm.

NOTE 2: Connect B to the pipe on the bottom of the sensor, T to the top. The top pipe T is defined as high pressure connection.

4.2 Air Circuit Requirements

For LWLP5000-5XD series of products, it is recommended to use silicone hose as intake pipe. Rigid PVC and other materials are not suggested.