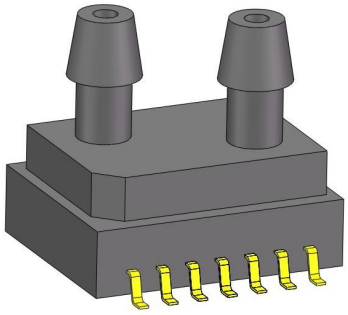
BANNING
PRESSURE SENSOR
BLWLP5xxxXD



BANNING

DESCRIPTION

BLWLP5xxxXD series integrated low pressure and high precision pressure sensor, the high performance MEMS pressure sensitive chip and special conditioning chip are packaged in the structure of dual gas nozzle SOP14, the two gas path structure of the pressure reference each other, reduce the impact of the environment on the output.

BLWLP5xxxXD adopts unique algorithm to realize multi-order temperature compensation for the sensor, and output in the form of digital IIC. Gauge pressure or differential pressure intake products are available.

CHARACTERISTICS

- Measuring range: -1kPa~1kPa, -2.5kPa~2.5kPa, -5.5kPa~5.5kPa, -10kPa~10kPa, -40 kPa~40kPa, etc
- Pressure type: gauge pressure, differential pressure
- Output form: IIC
- High accuracy
- Calibrated compensation

PREFORMANCE

Parameter	Minimum	Typical	Maximum	Unit	Note
Supply voltage	1.8	3.3	3.6	Vdc	
Working curren		1		mA	
Current of sleep		20		nA	
ADC		24		bit	
Accuracy (2)			±1	%FS	
Response time		5	30	ms	
Temperature of compensation	-20		80	℃	
Operating temperature	-40		85	℃	
Storage temperature	-40		120	℃	
Temperature output interval (3)	-40		85	℃	
Temperature accuracy (4)		1		℃	@-20~80℃

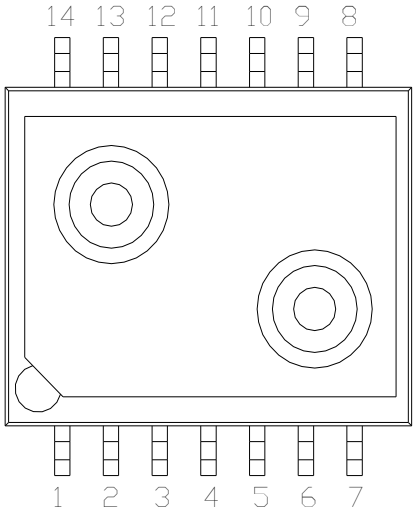
Unless otherwise specified, all values in this table are tested at 3.3Vdc voltage and 25℃ temperature

- (1) There are two forms of gauge pressure and differential pressure;
- (2) Accuracy refers to the output accuracy of the product within the compensation temperature range and under clean gas environment; The accuracy is determined by the linearity, repeatability and hysteresis of the product.
- (3) The temperature display range is -40~85℃ for conventional products, and -40~110℃ can be output under special requirements;
- (4) The detection accuracy of ambient temperature when the sensor is in a constant temperature field;

APPLICATION

- Industrial control
- Medical monitoring
- Household appliances
- Fitness equipment
- Automotive Applications

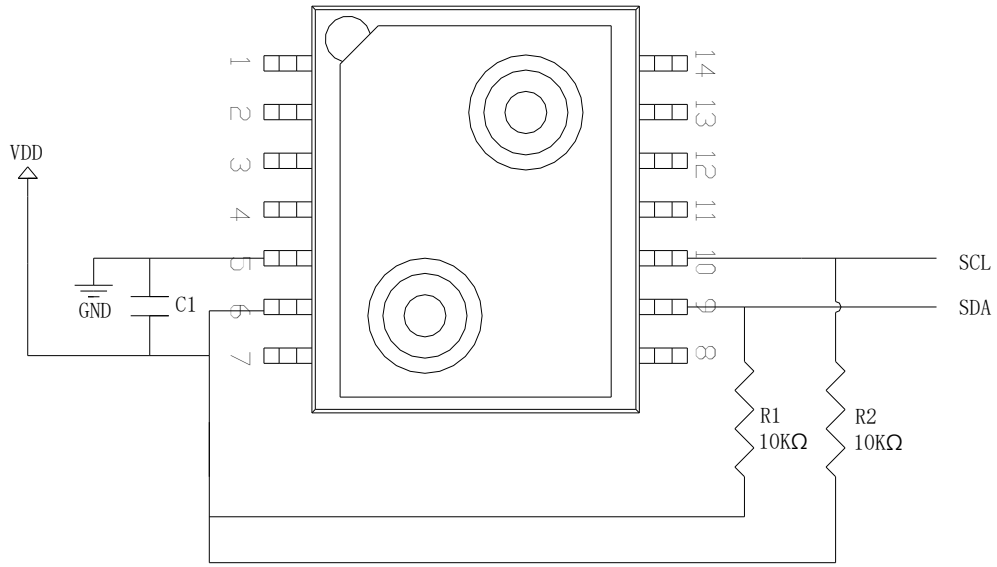
PIN DEFINITION



Pin Definition (face view)

Pin number	Pin definition	Instructions
5	GND	ground
6	VDD	power supply+
9	SDA	Output
10	SCL	clock
1,2,3,4,7,8, 11,12,13,14	NC	-

CIRCUIT



Points to note：

- (1) The four signal terminals (VDD/GND/SDA/SCL) must be powered on and powered off at the same time. Avoid incomplete data transmission that may cause the sensor to enter the BUSY state. If the sensor is BUSY, it does not process any new commands and the product output is abnormal.
- (2) If the filtering capacitor C1 is considered between VDD and GND, the capacitor value is less than or equal to 100nf.
- (3) Within 30ms after the sensor is powered off, MCU prohibits data communication with the sensor.

I²C INTERFACE

BLWLP5xxxXD chip address description

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

The address bit information of BLWLP5xxxXD is shown in Table A1~A7 are the address bits and W/R are the direction bits.

- Write register address command: 00000000 (0x00)
- Read register address command: 00000001 (0x01)

I²C COMMUNICATION

Parameter	Symbol	Condition	Minimum	Typical	Maximum	Unit
Frequency of clock	Fscl	Pull-up=10kΩ	0		400	KHz
The bus idle time before a new send starts	tBUF		1.5			μs
Initial signal holding time	tHD.STA		0.6			μs
Initial signal establishment time	tSU.STA		0.6			μs
Stop signal establishment time	tSU.STO		0.6			μs
Data entry hold time	tHD.DAT		100			ns
Data entry setup time	tSU.DAT		100			ns
Clock low level period	tLOW		1.5			ns
Clock high level cycle	tHIGH		0.6			ns
SDA and SCL rise time	tR		30		500	ns
SDA and SCL descent time	tF		30		500	ns

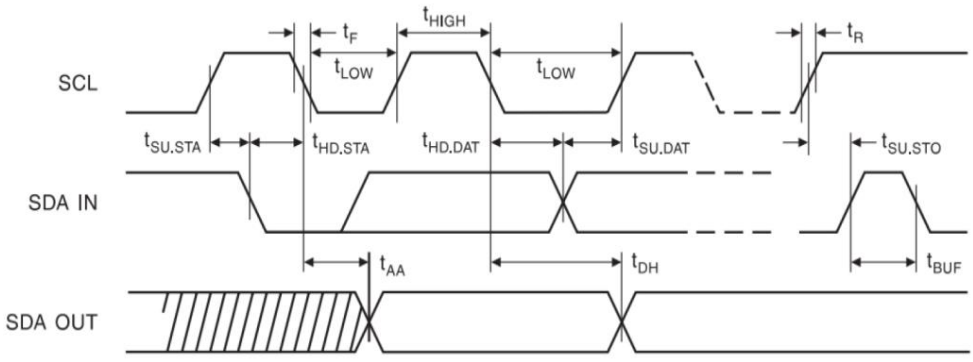


Figure 1.I²C communication sequence diagram

I²C Read and write sequence

The host must first send the address of the chip in order to communicate with it. The slave address byte consists of seven address bits and a direction bit that determines whether the slave is to accept or send. The I²C address of the chip is 0000000, the chip write address is 0x00, and the chip read address is 0x01.

Figure 1. Timing diagram of register configuration for the host write chip. In Figure 3, (a) is the time sequence diagram required for reading the chip, and (b) the time sequence diagram for reading the pressure and temperature data of the chip. SlaveAddr: address of the slave and Command: address of the control command.

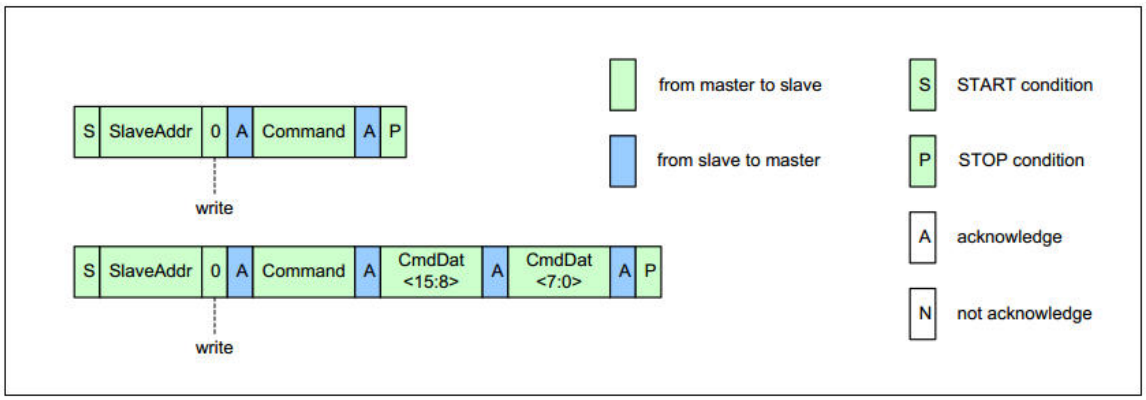


Figure 2. I²C command request

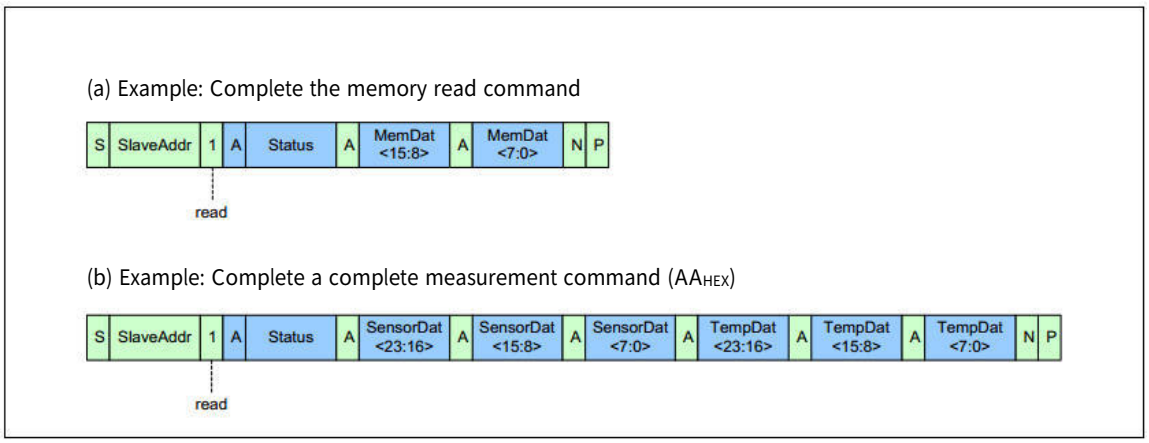


Figure 3. I²C reads data

OUTPUT DESCRIPTION

Pressure register

The pressure register is a 24-bit register stored in binary form, and the pressure result is an 18-bit value. The pressure is calculated by the following formula:

$$\mathbf{P(pa)} = \left(\frac{\mathbf{PMAX - PMIN}}{\mathbf{2^{18}}}\right) * \mathbf{P1 + PMIN}$$

- P -- product pressure output value, unit pa;
- P1 -- IIC data of the pressure at the pressure point;
- Pmax -- the upper pressure limit of the product, unit pa;
- Pmin -- Lower pressure limit of the product, unit pa;

Name	Bit	Describe
Pressure	[23:10] pressure	Pressure detection (read only)
	[09:00] reserve	Reserved, always 0 (read only)

Table 1. describes the pressure registers

Type	PMIN（pa）	PMAX（pa）
BLWLP5001GD	-500	+1500
BLWLP5001DD	-1500	+1500
BLWLP5002GD	-500	+2600
BLWLP5002DD	-2600	+2600
BLWLP5006GD	-500	+6000
BLWLP5006DD	-6000	+6000
BLWLP5010GD	-500	+10500
BLWLP5010DD	-10500	+10500
BLWLP5020GD	-500	+20500
BLWLP5020DD	-20500	+20500
BLWLP5040GD	-1000	+41000
BLWLP5040DD	-41000	+41000

Table 2. Product model and parameter mapping table

TEMPERATURE REGISTER

The temperature is calculated by the following formula：

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

- T -- product temperature output value, unit °C;
- T1 -- IIC data of the temperature at this temperature point;

Name	Bit	Describe
Temperature	[23:08] temperature	temperature detection (read only)
	[07:00] reserve	temperature, always 0 (read only)

Table 3. Description of the temperature register

BLWLP5xxxXD chip read and write operations

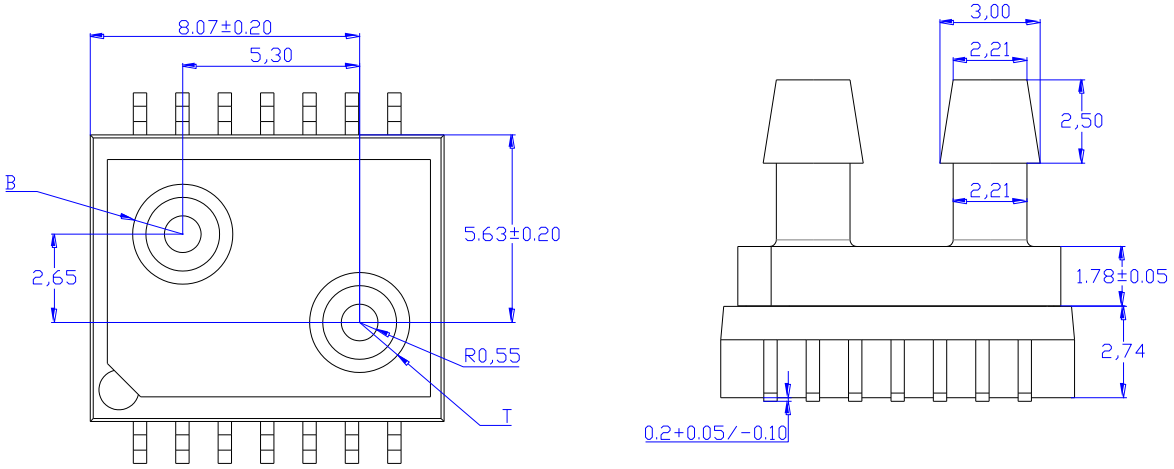
（1）Configuration register

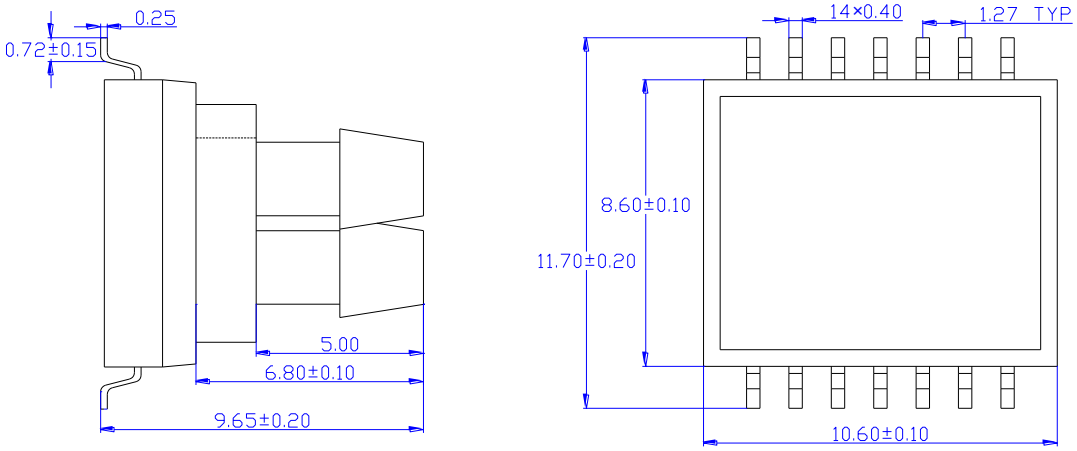
- Start I²C;
- Send write register address command 0x00, wait for a response;
- Write the configuration register address 0XAA to the chip and wait for the response;
- Send the two-byte parameters 0X00 and 0X80 to the chip and wait for a response.
- Turn off I²C communication, delay (≥30), chip acquisition conversion data.

（2）Write the address of the data and ask the chip for data

- Start I²C;
- Send the read register address command 0x01 and wait for the response.
- Receiving chip output data state, read three bytes of pressure data, three bytes of temperature data;
- Disable I²C communication.
- Save and process data.

DIMENSIONS（mm）



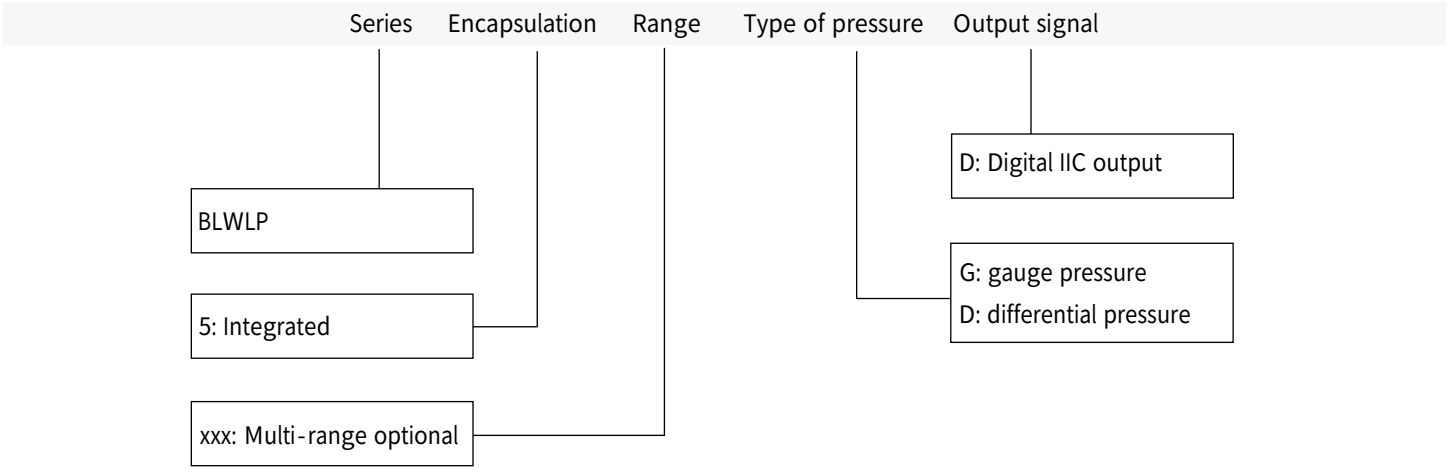


Description：

- (1) The unit of all dimensions is mm, the tolerance position is not marked, the dimensional tolerance is ±0.05mm,
- (2) B is the air pipe connected to the bottom of the sensor, and T is the air pipe connected to the top of the sensor.

  The top trachea T is defined as a high pressure interface.

SELECTION



FOR EXAMPLE： BLWLP5040GN

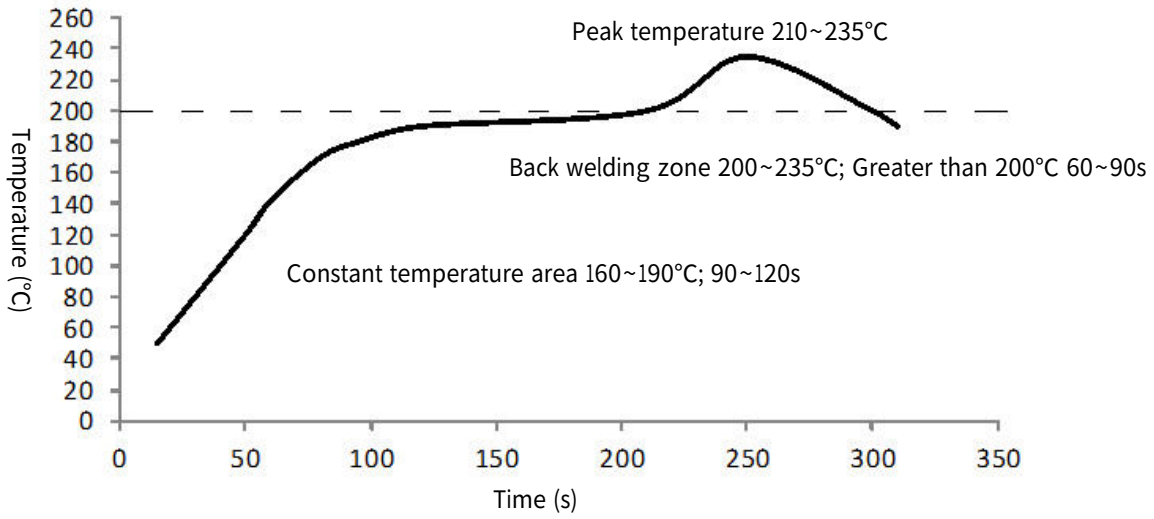
The series is BLWLP, encapsulation form is integrated，range is 0～40kPa, pressure type is gauge pressure, output signal is digital IIC output.

Type	P_B (Kpa)	PMAX (pa)
BLWLP5001GD	0	0 ~ +1
BLWLP5001DD	-1 ~ 1	-1 ~ +1
BLWLP5002GD	0	0 ~ +2.5
BLWLP5002DD	-2.5 ~ +2.5	-2.5 ~ +2.5
BLWLP5006GD	0	0 ~ +5.5
BLWLP5006DD	-5.5 ~ +5.5	-5.5 ~ +5.5
BLWLP5010GD	0	0 ~ +10
BLWLP5010DD	-10 ~ +10	-10 ~ +10
BLWLP5020GD	0	0 ~ +20
BLWLP5020DD	-20 ~ +20	-20 ~ +20
BLWLP5040GD	0	0 ~ +40
BLWLP5040DD	-40 ~ +40	-40 ~ +40

PRECAUTIONS FOR USE

Requirements for reflow welding

The maximum welding temperature of BLWLP5xxxXD series is not higher than 235°C, which can be set by referring to Figure.



Gas path requirements

It is recommended to use silicone hose as the air inlet pipe for BLWLP5xxxXD series products. Rigid PVC pipes are not recommended.

DISCLAIMER

⚠ Warning

LIFE OR PROPERTY RISK

- Please ensure that this product has been designed as part of whole system and already considered related risks, make sure the product has the correct ratings and is designed based on the entire system. It must not be used when applications related to serious life or property damage risks.

Failure to follow this instruction can result in death or serious injury.

⚠ Warning

PERSONAL INJURY

- DO NOT USE these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury.

Failure to follow this instruction can result in death or serious injury.

⚠ Warning

MISUSE OF DOCUMENTATION

- The information presented in this product sheet is for reference only. Do not use this document as a product installation guide.
- Complete installation, operation, and maintenance information is provided in the instructions supplied with each product.

Failure to follow this instruction can result in death or serious injury.

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