Economical Digital Air Pressure Sensor WF183DE

Main Features

- Digital pressure and temperature direct reading
- Operating Voltage:2.4V~5.5V
- Pressure range:0~1500kPa(Absolute pressure)
- Internal Complement Algorithm
- Factory calibration free
- High precision
- Working current: 1.5mA
- Standby power consumption:2uA
- Operating Temperature: -40~+125℃ Communication
- interface: IIC, UART, OWI, choose one
- size:3.8 x 3.6 x 0.8 mm

Typical Applications

- Handheld tire pressure gauge, TPMS
- Weather forecast
- Industrial Pressure and Temperature Sensor Systems
- Sports Watches
- Electronic cigarettes

Product Description

WF183DEIt is an economical digital pressure and temperature sensor, which contains aMEMSpressure sensor and a high-resolutiontwenty four Position Σ ADCandDSP.WF183DEProvides high accuracy calibrated pressure and temperature digital outputs through a variety of communication interfaces.

The product has been calibrated for pressure and temperature before leaving the factory, so it can be plugged and played without the need for customers to calibrate it.

A variety of communication interfaces are available, convenientMCUModel selection reduces the customer's overall machine cost.

WF183DEWaterproof level reachesIP 6 5, meeting most waterproof product requirements.

1. Block Diagram

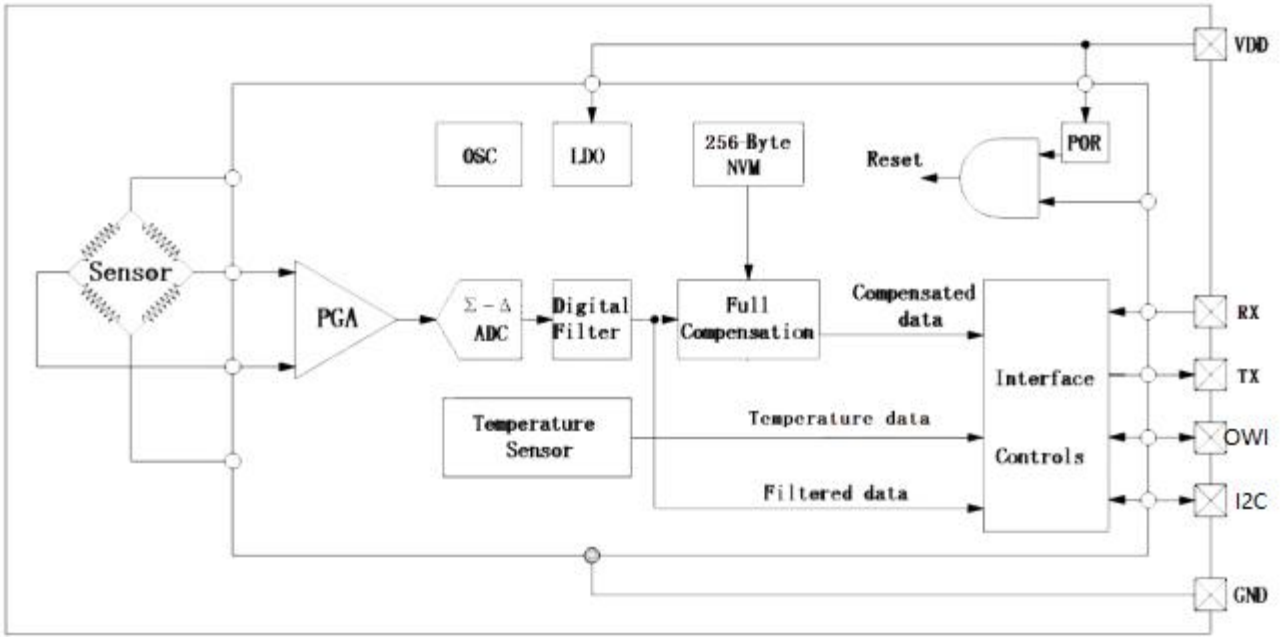


Figure 1: Internal block diagram

2. Pin configuration

Foot position	name	direction	Function
1	SCL	enter	IIC clock input
2	GND	enter	Power supply ground
3	VDD	enter	Power supply positive
4	VS	Output	External capacitor (required)
5	RX	enter	Serial data input
6	TX	Output	Serial data output
7	OWI	Input/Output	Single-wire communication
8	SDA	Input/Output	IIC data port

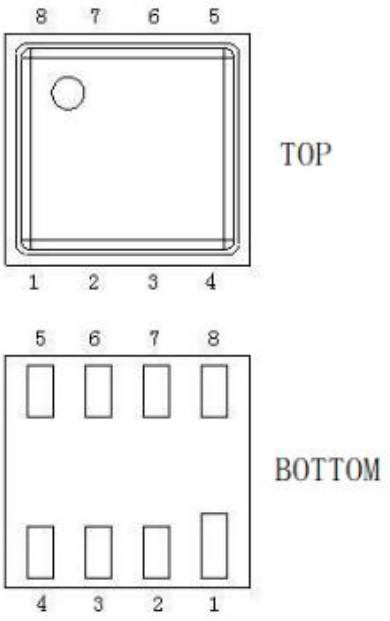


Figure 2: Pinout

3. Electrical characteristics

3.1 Limit parameters

parameter	symbol	state	Minimum	maximum	unit
Overpressure	P_{MAX}			2X	2times
Supply voltage	V_{DD}		- 0.2	5.5	V
Interface voltage	V_{IF}		- 0.3	V_{DD}+0.3	V
Operating range temperature	T_{OP}		- 40	125	℃
Storage temperature range	T_{STG}		- 50	150	℃
Maximum soldering temperature	T_{MS}	longest40Second		250	℃

3.2 Electrical parameters

parameter	symbol	Environmental conditions	Minimum	standard	maximum	unit
Peak current	I_{PEAK}	During the conversion		1.5		mA
Quiescent Current	I_{STB}			2	3.5	uA
Serial communication baud rate				9600		Hz
Digital input high voltage	V_{IH}		0.8			V
Digital input low voltage	V_{IL}				0.2	V
Digital output high voltage	V_{OH}	I_O= 0.5 mA	0.9			V
Digital output low voltage	V_{OL}	I_O= 0.5 mA			0.1	V
IIC Clock	F				400	kHz

3.3 Pressure and temperature parameters

parameter	symbol	condition	Minimum	standard	maximum	unit
Pressure measurement range	P_{FS}		0		1500	kPa
Absolute pressure accuracy		10°C to80°C Standard atmospheric pressure		1.5		kPa
		- 20°C to125°C Standard atmospheric pressure		3.5		kPa
Relative pressure accuracy		exist25°C		0.5		kPa
		from0°C to70°C		1.5		kPa
Maximum error (voltage effect)		Voltage 2.4Varrive5.5 V			2.5	kPa
Pressure/Altitude Resolution		Pressure Mode		0.01		kPa
Over reflow drift		After reflow		0.5		kPa
Long-term drift		go through1Years later		1.5		kPa
Reflow Oven Profile		IPC/JEDEC J-STD-020C		0.5		kPa

4.UART communication mode

Serial port configuration

Baud rate	Start position	Data bits	Stop bits	Check digit
9600	1	8	1	NO

Serial port command format

Start sign	Data length	Control instructions	Check digit
0x55	1byte	1byte	1byte

Serial port control instruction set

Control instructions	Command word	Function	Remark
CMD_CAL_T	0x0E	Get real-time temperature	Calculate the current temperature once and return it. Be sure to read the temperature before reading the pressure.
CMD_CAL_T1	0x27	Get high-precision temperature	Calculates high-precision temperature and returns it, suitable for measuring in temperature fluctuations
CMD_CAL_P1	0x0D	Get real-time air pressure	Calculate the current air pressure and return it
CMD_CAL_P2	0x26	Obtain high-precision air pressure	Calculates high-precision air pressure and returns it, suitable for measuring in situations where air pressure fluctuates
CMD_CAL_P3	0X3C	Get forecast air pressure	Calculates and returns the predicted air pressure, suitable for measuring in situations where air pressure fluctuates

Serial port return value format

Start sign	Data length	Data Types	Return data	Check digit
0xAA	1 byte	1 byte	n byte	1byte

Serial port return value data type

Value return data type	Type word	Return to content	Return content format
RET_T	0x0A	Temperature value	S16
RET_P1	0x09	Air pressure value	U32
RET_P2	0x18	Air pressure value	U32
RET_P3	0x3C	Air pressure value	U32

Check digit description

CRC format: CRC-8/MAXIM x8+x5+x4+1

Example:

```
u8 Cal_uart_buf_CRC(u8 *arr, u8 len)
    {
        u8 crc=0;
        u8 i=0;
while(len--)
        {
        crc ^= *arr++;


    for(i = 0;i < 8;i++)
        {
        if(crc & 0x01) crc = (crc >> 1) ^ 0x8c; else crc
        >>= 1;
        }
      }
return crc;
    }
```

Other notes

The operation process of converting the current pressure is: first obtain the temperature, then obtain the pressure. Since the converted pressure needs to be compensated according to the current temperature, it is necessary to collect the conversion temperature first. Send the obtained temperature to convert the current temperature.

In normal mode: the serial port automatically enters standby mode after receiving no signal for about 3 seconds

Example

1. Get real-time temperature value (CMD_CAL_T)

TX: 55 04 0E 6A,

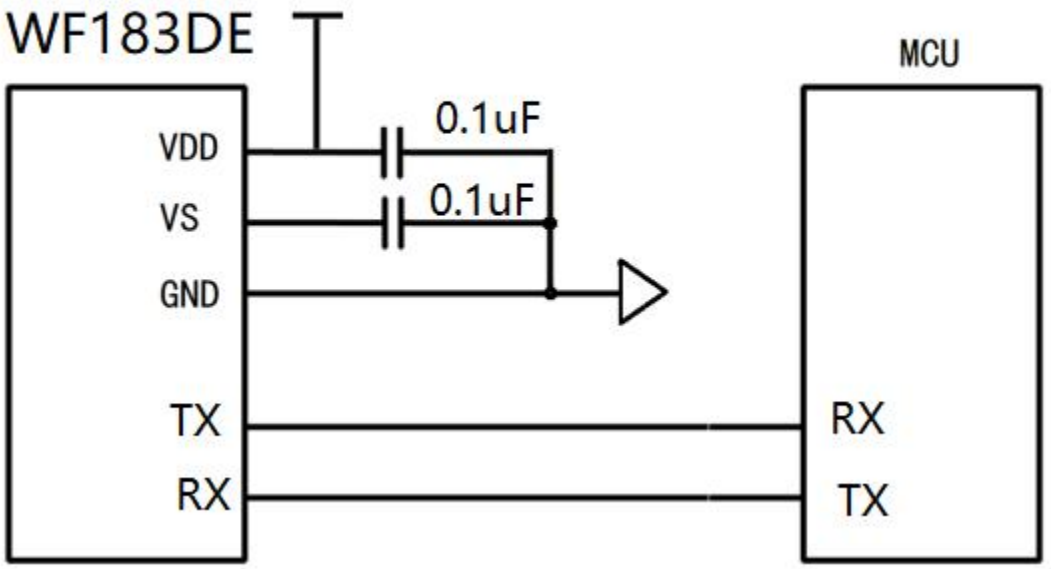
RX: AA 06 0A 02 01 22 Return result (s16) 0x0102 =258 258/10= 25.8 °C

2. Get real-time pressure value (CMD_CAL_P1)

TX: 55 04 0D 88

RX: AA 08 09 A0 86 01 00 7F Return result (u32): 0x0186A0 = 100000 100000/1000 = 100kPa

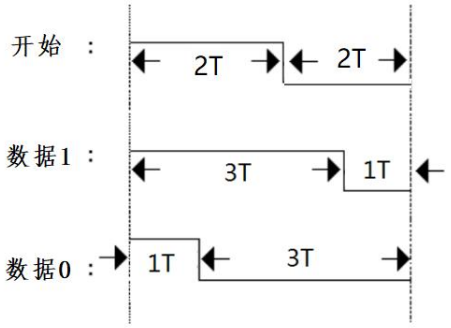
UART Application Circuit



5. OWI communication mode

When the sensor is in standby mode, the single bus is in input state (internally pulled up), and the MCU pulls it down0.2mS ,Then it enters the input state and waits for the sensor to send pressure data. After the sensor data is sent, it returns to the input state.

Communication timing (1T is 25uS)

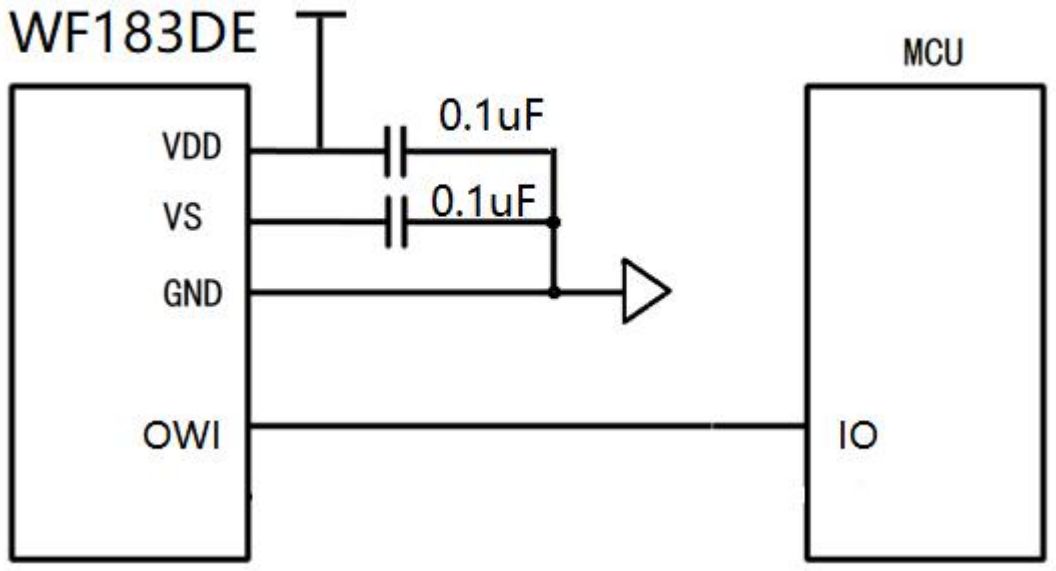


Start sign	Air pressure high byte	Parity bit	Start sign	Air pressure low byte	Parity bit	Start sign	Check Byte	Parity bit
Start	1 byte	1 bit	Start	1 byte	1 bit	Start	1 byte	1 bit
start	Pressure<15:8>	Even number = 0 Odd = 1	start	Pressure<7:0>	Even number = 0 Odd = 1	start	Pressure<15:8>+Pressure<7:0> The sum of the lower8Bit Data	Even number = 0 Odd = 1

For example:

High Byte<15:8>:0x01
Low Byte< 7:0>：0x2C
Check byte：0x2D
Air pressure: 0x12C = 300KPA

OWI Application Circuit



6.IIC communication mode

Slave device address: 0xDA

A7	A6	A5	A4	A3	A2	A1	Write/Read
1	1	0	1	1	0	1	0/1

register

address	describe	Read/Write	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	Default value
0x0A	Order	Write only	0000				0110(pressure)/0100(temperature)				0x00
0x0B	High pressure	Read-only	Pressure value<31:24>								0x00
0x0C	High pressure	Read-only	Pressure value<23:16>								0x00
0x0D	Low pressure	Read-only	Pressure value<15:8>								0x00
0x0E	Low pressure	Read-only	Pressure value<7:0>								0x00
0x0F	High temperature	Read-only	Temperature value<15:8>								0x00
0x10	Low temperature	Read-only	Temperature value<7:0>								0x00
0x13	state	Read-only	reserve							1Finish	0x00

Timing

Write Command	start	Slave Device Address	0	answer	Register Address	answer	Order	answer	stop
pressure	start	0xDA		Ack	0x0A	Ack	0x06	Ack	stop
temperature	start	0xDA		Ack	0x0A	Ack	0x04	Ack	stop

Check Status	start	Slave Device Address	0	answer	Register Address	answer	start	Slave Device Address	1	answer	Read Data	No answer	stop
	start	0xDA		Ack	0x13	Ack	start	0xDB		Ack	<7:0>	Nack	stop

Read Data	start	Slave Device Address	0	answer	register	answer	start	Slave Device Address	1	answer	Read Data	answer	Read Data	answer	Read Data	answer	Read Data	answer	Read Data	No answer	stop
temperature	start	0xDA		Ack	0x0F	Ack	start	0xDB		Ack	<15:8>	Ack	<7:0>							Nack	stop
pressure	start	0xDA		Ack	0x0B	Ack	start	0xDB		Ack	<31:24>	Ack	<23:16>	Ack	<15:8>	Ack	<7:0>			Nack	stop

Data conversion example

Temperature: 0xOF= Ox01 ,0x10=0x02 ;

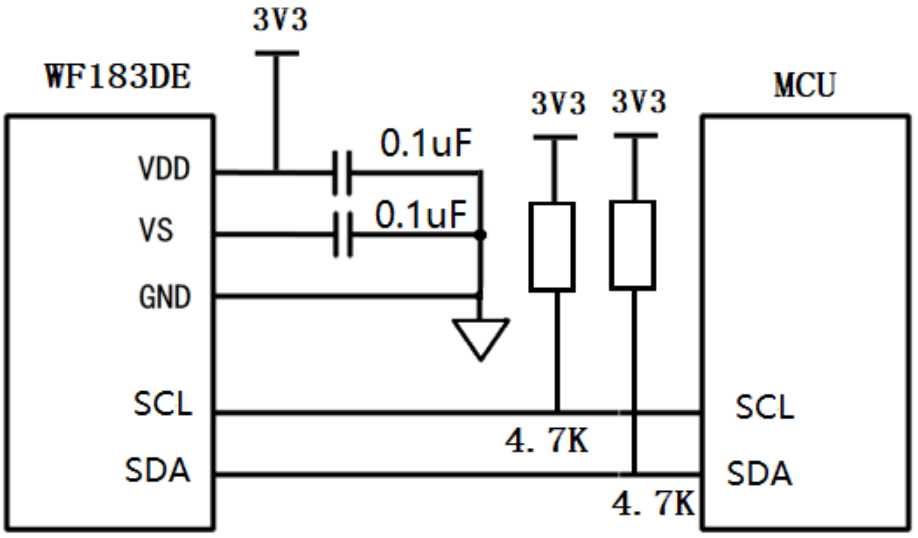
0x0102=258; 258/10= 25.8 °C

Pressure: 0xOB= Ox00 ,0xOC=0x1,0xOD=0x86,0xOE=0xA0 ;

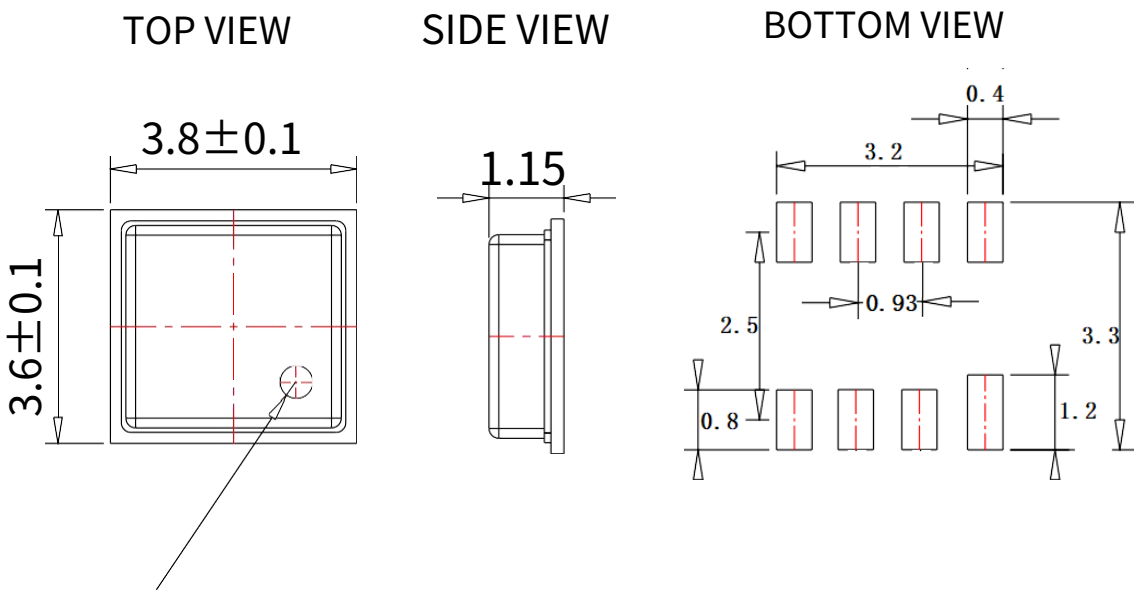
0x186A0=100000; 100000/1000= 100 kPa

Note: Be sure to measure the temperature before measuring the pressure.

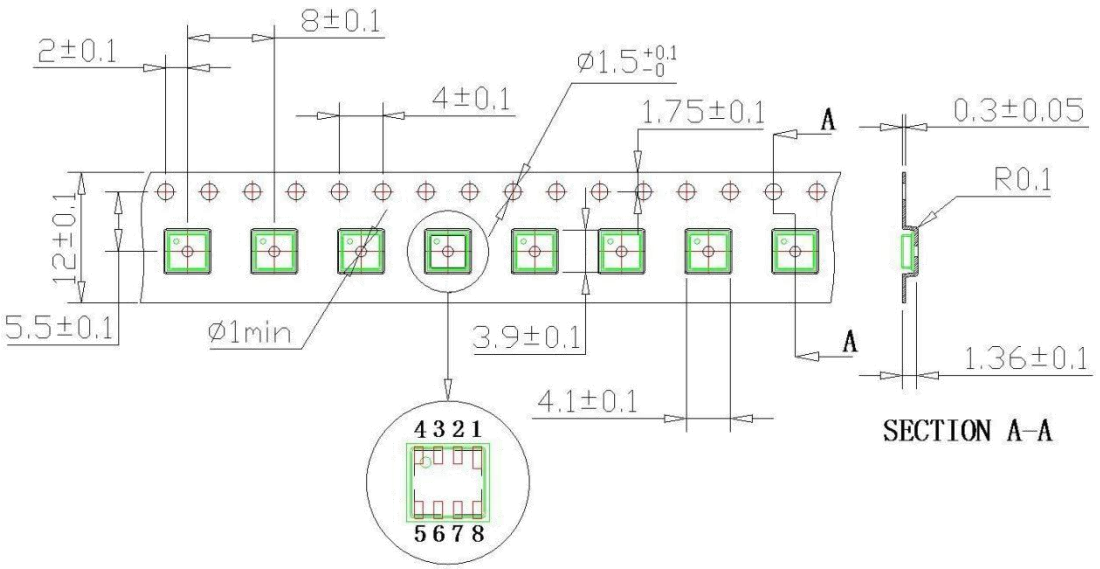
IIC Application Circuit



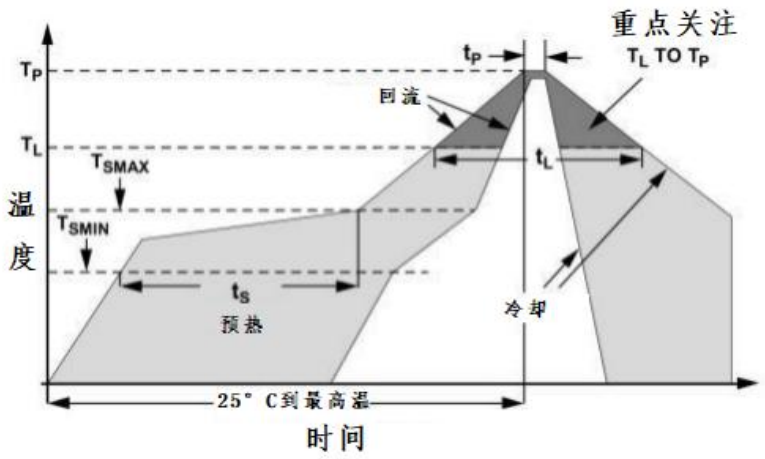
7. Package (LGA8)



8. Packaging instructions



9. Reflow soldering recommendations



stage	Guidance Value (Lead-free)
Heating rate TsMax to TP	Less than or equal to3°C/Second
Preheating minimum temperature TsMin	150°C
Preheating maximum temperature TsMax	200°C
Warm-up time Ts (TsMin to TsMax)	60 to 180 seconds
Minimum reflow temperature TL	217°C
Reflow time t_L	60 to 150 seconds
Maximum reflow temperatureT_P	250°C
Maximum temperature timet_P	20 to 40 seconds
Cooling rate	Less than or equal to4°C/Second
25°CTime to maximum temperature	longest8minute