APR5852 Differential Pressure Sensor

Key Feature

- Measure range:-1~1kPa; -10kPa ~ 10kPa
- Suitable for non-corrosive gases
- 5V power supply
- Digital IIC, analog voltage dual output
- Multi-point pressure calibration, temperature compensation

Applications

APR5852 series products are widely used in consumer electronics, smart home appliances, medical, automotive, industrial automation, meteorology and other fields, such as: airflow monitors, HVAC, ventilation equipment, medical equipment (ventilators, monitors), tire pressure gauges, wind speed and leak detection products.

Product summary

The APR5852 series products are temperature-compensated silicon piezoresistive pressure sensors, equipped with a dedicated MCU chip and a silicon micro-structure pressure sensor chip, with a pin connector and a dual in-line package structure. They can be directly mounted on a standard PCB board for easy integration and replacement.

The pressure values measured by the APR5852 series products will be output in the form of analog voltage or standard IIC communication after conversion by the sensor and amplification by the circuit. It has excellent accuracy and long-term stability. Each sensor is strictly calibrated and tested before delivery.

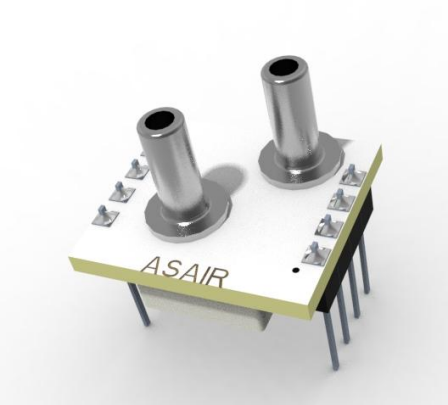


Figure 1. APR5852

1. Sensor specification

The APR5852 series has two ranges of -1~1kPa and -10~10kPa, and the corresponding models are APR5852010H and APR5852001H. Table 1 shows the performance parameters of APR5852. All parameters in the table are measured at room temperature of 25℃ and 5V DC constant voltage source.

Table 1. Sensor specifications

Parameters	MINI	TYPICAL	MAX	UNIT
Full scale output for negative pressure	-	0.5	-	V
Zero pressure standard output	-	2.5	-	V
Full scale output for positive pressure	-	4.5	-	V
Accuracy error	-2	-	2	%FS
Operating temperature	-30	25	100	℃
storage temperature	-30	25	125	℃
Supply voltage	4.75	5.0	5.25	V
Average operating current	-	-	4	mA
Over pressure	5X	-	-	%FS

Note: The application environment must not contain substances that may damage the sensor material. The sensor materials include borosilicate glass, silicon, alumina ceramics, RTV electronic silicone, gold, aluminum and nickel, etc.

2. Dimension

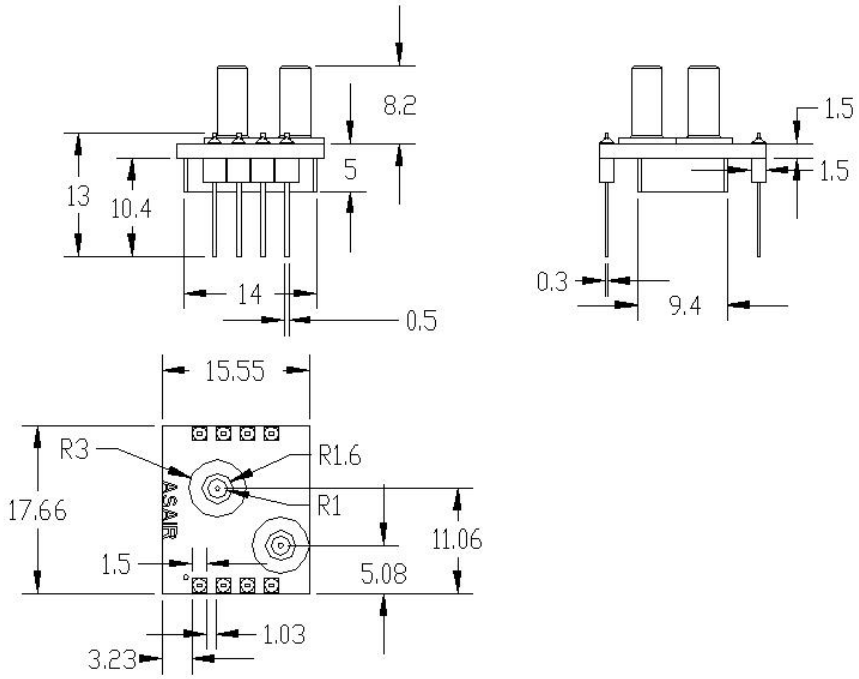


Figure 2. Dimension (unit:mm)

3. Gas pipe connection method

APR5852 has two air connection pipes, namely pipe A and pipe B. As shown in Figure 2, the air connection pipe near the "ASAIR" logo is pipe A, and the other one is pipe B. If air is only taken in from pipe A, a positive pressure value can be obtained, and if air is only taken in from pipe B, a negative pressure value can be obtained. If pipes AB are connected to the air connection pipes at the same time, the differential pressure value at both ends of AB can be obtained.

4. Electrical connections and pinouts

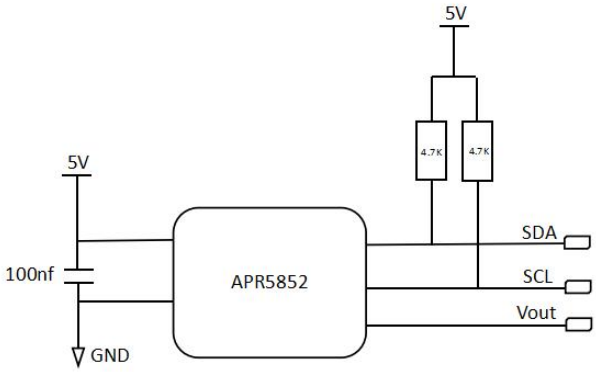
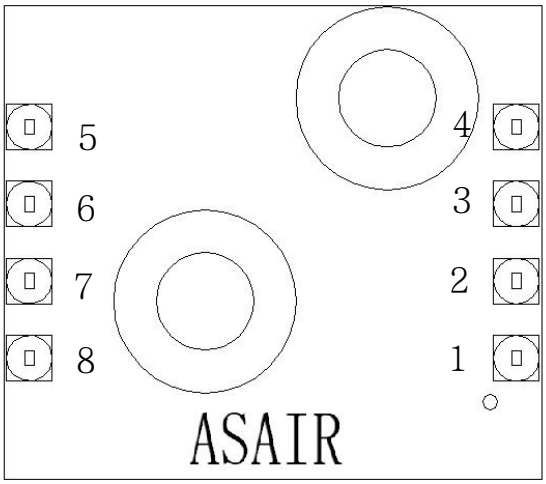


Figure 3. Electrical connections



PIN	Description
1	NC
3	NC
4	SDA
5	SCL
6	NC
7	VDD
8	Vout

Figure 4. Pin definition

5. Voltage output curve and calculation

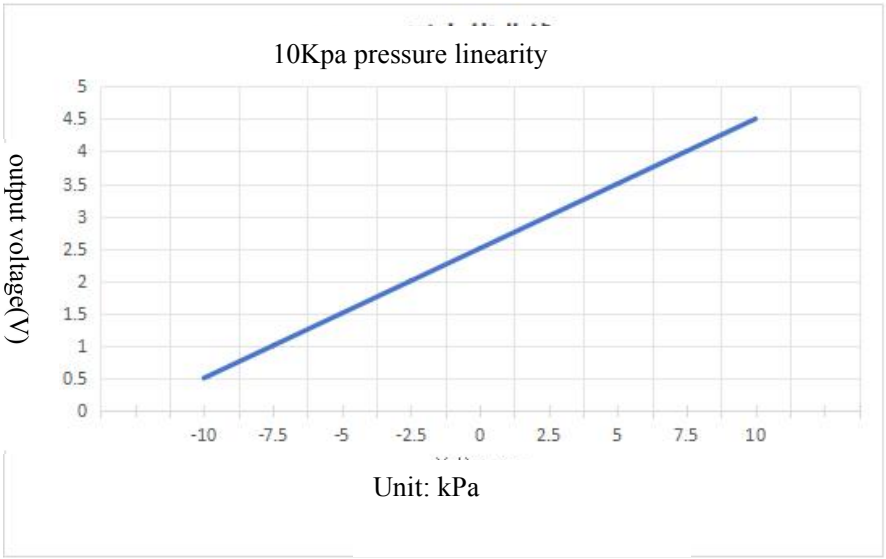


Figure 5.APR5852010H output linearity

●APR5852010H standard pressure calculation

$$\Delta P=P_A-P_B=\frac{\frac{V_{OUT}}{5}-0.5}{0.4}\times 10$$

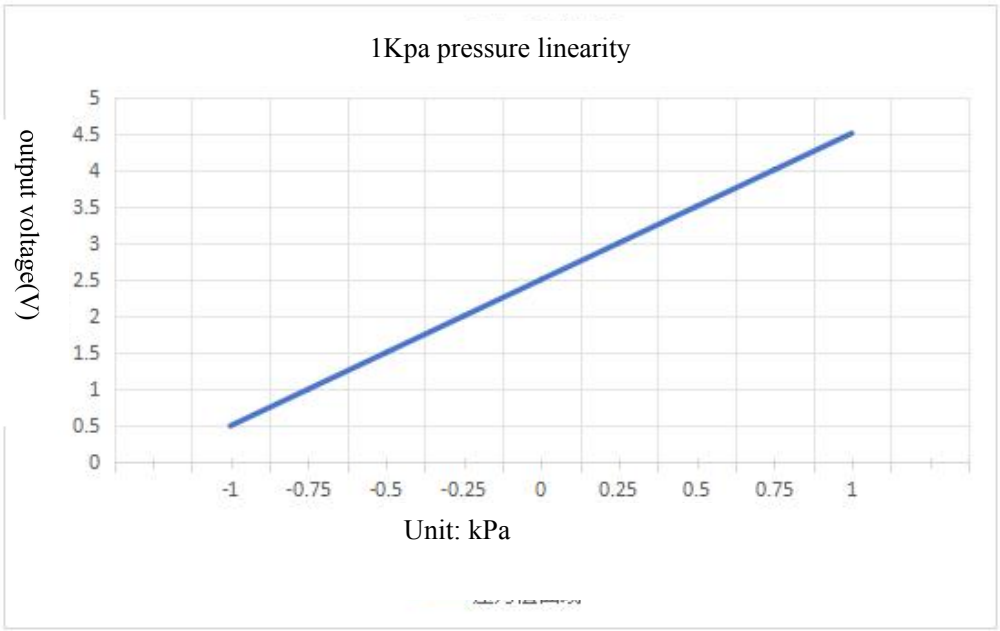


Figure 6.APR5852001H output linearity

●APR5852001H standard pressure calculation

$$\Delta P=P_A-P_B=\frac{\frac{V_{OUT}}{5}-0.5}{0.4}\times 1$$

6. Sensor communication

APR5852 uses the standard I²C protocol for communication, with a maximum communication rate of 100kHz.

6.1 Sensor I²C communication protocol timing and command format

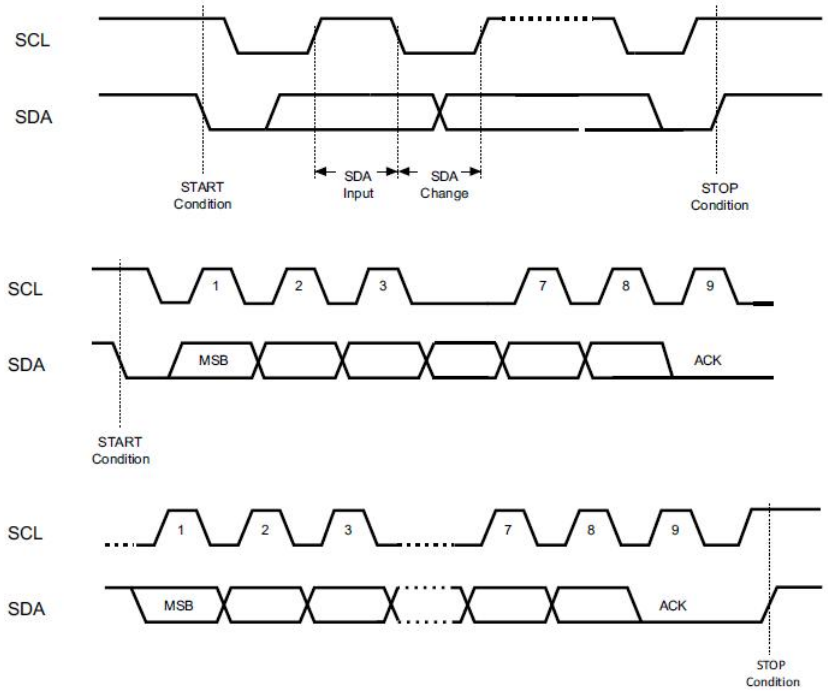


Figure 7. I²C Bus Timing Diagram

6.1.1 Host write command

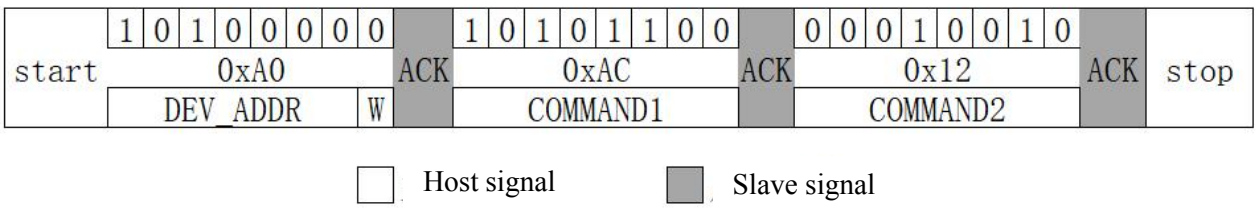


Figure 8. Timing diagram of writing module data

6.1.2 Host read command

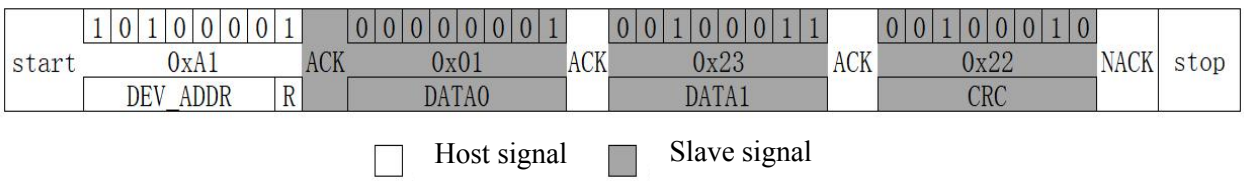


Figure 9. Timing diagram of reading module data

Note: According to the I²C transmission protocol: the high bit of the data byte comes first, and the low bit comes last.

The descriptions of the symbols in Figures 8 and 9 are shown in Table 5.

Table 2. Timing diagram symbol description

Item	Description
start	Start signal
stop	Stop signal
ACK	Response signal
NACK	Non response signal
DEV_ADDR	Device address
W	Write signal
R	Read signal
COMMAND1/COMMAND2	Measure command
DATA0/DATA1	Read data
CRC	DATA0 and DATA1 result

6.2 Sensor reading process and pressure value conversion

6.2.1 Reading process

1. Send a measurement command (0xAC 0x12) before reading each data;
2. Wait for 80ms, and after the product measurement is completed, read three bytes of data;
3. Calculate the CRC check value to verify the correctness of the data.

6.2.2 Pressure value conversion

The pressure value consists of the high eight bits of DATA0 and the low eight bits of DATA1, which is the pressure value magnified 100 times, in kPa. The code example is as follows:

```
unsigned short int kPa;
kPa= (DATA0 << 8)| DATA1;
printf("%0.1f\t",(float)((signed short int)Pa /100.0));
```

Example: 1. When the pressure is positive, the hexadecimal 0x0123 = 291; 291/100 = 2.91 (kPa);
2. When the pressure is negative, the highest hexadecimal bit is the sign bit 0xFEDD&0x7FFF=0x7EDD=32477,
32477- 32768 = -291/100=-2.91 (kPa).

This product is a general electronic device. When using the product, it may cause malfunction and failure due to external interference and surge. Therefore, please confirm the performance and quality under actual use.
To be safe, please design the device for safety (installation of protection circuits such as fuses and circuit breakers, multiple devices, etc.) so that even if a malfunction occurs, it will not harm life, body, property, etc.

- To prevent injuries and accidents, please be sure to comply with the following matters.
  The driving current and voltage should be used below the rated value.
- Please connect according to the terminal connection diagram. In particular, reverse connection of the power supply may cause accidents due to circuit damage such as heating, smoke, and fire, so please be careful.
- To ensure safety, especially for important uses, please be sure to consider the configuration of double safety circuits, etc.
- Do not apply pressure above the rated value. In addition, be careful not to put foreign objects into the air hole, otherwise it will damage the product or cause an accident when foreign objects are blown out.
- Since the front end of the product is sharp, be careful not to hurt when using it.

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