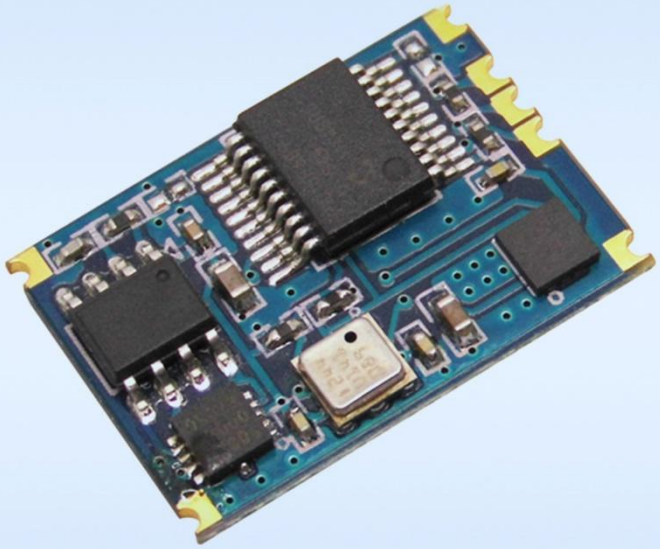
Product Specification



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Note: Revision History

Revision	Date	Comment
V1.0	2021-1-21	First release

1. Description:

SPC02 is a embedded module which have multi-function including Pressure, Altitude, Temperature, Electronic compass, weather station, 3D pedometer, and has very low power consumption. It can be used for various of handheld device and instrument This module use standard I2C interface to save more of your system resources and time.

2. Features:

- Highly integrated small size
- High accuracy of temperature +/- 0.5 degree
- High accuracy of pressure, +/- 1.5hpa
- High resolution of altitude +/- 0.2m
- High accuracy of compass +/- 3 degree
- High resolution of pedometer 1 step
- High algorithm which have been proven in more than 1 million products
- Very low current consumption
- Precision calibration algorithm for used in different environment
- 3D pedometer algorithm

3. Application:

- Phone, PDA
- Outdoor handheld devices
- Mine rescue
- Sports watch
- Radio
- Carabineer
- Travel 3D navigation, blind compensation
- LBS service

4. Electrical Specifications:

Parameter	Condition	performance			Unite
		Minimum	typical	Maximum	
Working voltage		2.4	3	3.6	v
Absolute pressure error			±1.5		hpa
Absolute pressure resolution			0.01		hpa
Relative pressure error			±0.12		hpa
Relative pressure resolution			0.01		hpa
Relative altitude error			±0.5		m
Relative altitude resolution			0.1		m

Absolute altitude error			±12		m
Absolute altitude resolution			0.1		m
Compass error	horizontally		±3		°
Compass Resolution			1		°
Temperature error	@25℃	-1.5	±0.5	1.5	℃
	0 ~ +65℃	-2	±1.0	2	℃
Temperature resolution			0.1		℃
Pedometer resolution			1		step
Pedometer error	Continuous walk in a constant speed		±3%		step
Power consumption	Sleep status		2		uA
	Working status		1.5		mA
Measuring range	Pressure	300		1100	hpa
	Height	-698		8943	m
	Compass	0		359	°
	Temperature	-40		85	℃
Operating temperature		-40		85	℃
Storage temperature		-40		85	℃

5. Working mode:

Initialization and power-saving mode

Initialization: After Power on , SPC02 initialized automacally.

Wake-up mode: Any command include wake up command (0x70) will wake up the SPC02

Sleep mode: the host send 0 x71 to SPC02, SPC02 enter into sleep mode automatically.

Altitude mode:

Read the altitude (Command: A0h)

Command	send	return	remark
Read height	0xA0	3 bytes	Signed byte. unit： m

Host send Altitude measurement command A0h toSPC02, SPC02 return 3 bytes of hexadecimal data.

Maximum bit of the first byte means the positive or negative of the altitude.

The rest 23bit is the altitude value multiplied 10,and unit is meter. For example, the return value is 80 10 00, the altitude value is: -1.6 m

the return value is 07 00 D1, the altitude value is: 200.1 meters

Pressure Mode:

Read pressure（Command: B0h）

Command	send	return	remark
Read pressure	0xB0	3 bytes	Unsigned byte

Host send "read pressure command B0h" to SPC02, SPC02 return 3 hexadecimal data .

Output data converter to the decimal, its range is (300hpa - 1100hpa)

For example, the return value is 01 87 81, the pressure value is: 1002.25hpa

Read weather forecast (Command：B3h)

Command	send	return	remark
Read pressure offset	0xB3	1 byte	

Host read the weather forecast value from SPC02 module, return single-byte.

1- Sunny 2- Cloudy 3- Rainy

Compass Mode:

Read compass（Command：B0h）

Command	send	return	remark
Read compass angle	0xC0	2 byte	Unsigned byte

Host send command C0h" to SPC02 module, SPC02 returns 2 byte of the angle value, the result is unsigned number, valid values is 0 ~ 359.

For example, the return value is 01 23, the angle value is: 291 degree

Calibration of the Compass (Command：B3h)

Command	send	return	remark
Compass calibration begin	0xE0	None	

Host send command 0XEO to SPC02, SPC02 start calibration automatically, users need to rotate SPC02 1 circles per 1 second, and remain horizontal during the process of rotation, It will take around 8s, SPC02 will finished the calibration and back to normal mode automatically.

Temperature Mode: temperature measurement (Command：0x80)

Command	send	return	remark
Read temperature	0x80	2byte	Signed byte. unit：℃

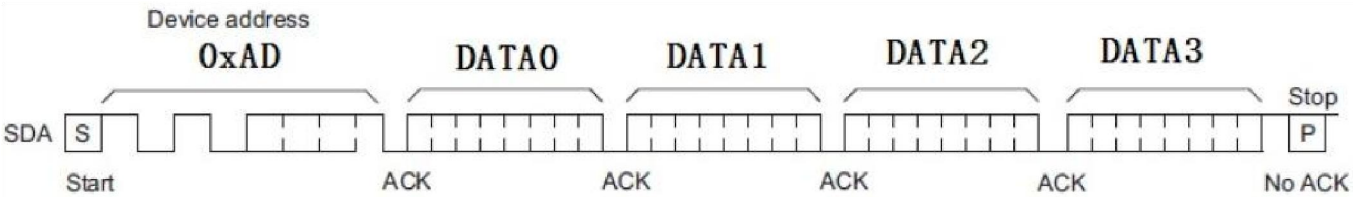
Host send command 0x80 to SPC02, SPC02 returns 2 signed hexadecimal byte. The maximum bit is the sign bit, the rest 15 bit is the temperature value by multiplied 10.

For example, the return value is 80 12, the temperature value is: -1.8 c degrees

the return value is 01 17, the temperature value is: 27.9 c degrees Working mode:

1) **Normal work**

When detected step action, module will enter normal working mode, users can read the step value by IIC interface. The IIC communication protocol is as below:



DATA0：step lower byte DATA1：step high byte

DATA2：= DATA0 + DATA1 DATA3：= DATA2

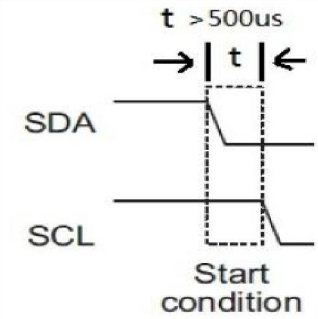
When the steps overflow（0xFFFF）, it count from 0.

The steps will be cleared when DATA3 is read.

Note: All the bytes are hexadecimal

2) **Sleeping mode**

The chipset will enter normal working mode when step action is detected, and enter sleeping mode if no step action is detected for 20s. In sleep mode the G sensor doesn't work, the MCU will enter deep sleeping mode and the whole is in low power consumption.



Note: This module can be wake up by IIC interface. There are some limitations when the module is wake up by IIC interface. For the first "start" command of the IIC protocol, the SCL will have to hold at least 500us to wake up MCU. The maximum IIC clock is 100KHz.

Also: STEP_OUT: The chipset can output the pulse for each step action, the high level of the pulse signal is around 50ms.

6. Pedometer Mode:

Read current steps(Command： 0x90)

command	send	return	remarks
Read step	0x90	xx xx xx	Unsigned byte, unit: step

Host send command 0x90 to SPC02, SPC02 returns 3 signed hexadecimal byte. It is the current actual steps.

For example, the return value is 050414, the step value is: 328724 steps

Clear current steps (Command： 0x90)

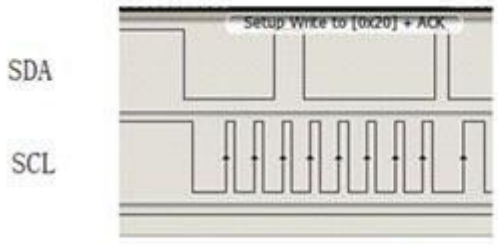
command	send	return	remarks
Clear steps	0x91	no	

Host send command clean steps to SPC02, that is to zero clearing current steps.

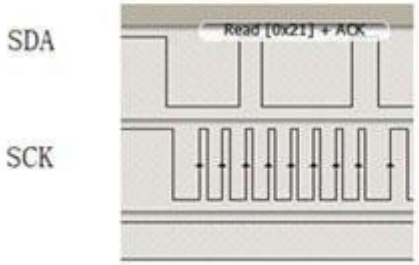
7. I2C communication sequence is introduced as follows:

SPC02 module Writing operation address is 0 x20, reading operation address is 0 x21.

Note: There is pull-up resistors on the module, customer not need add pull resistors out side of the module.

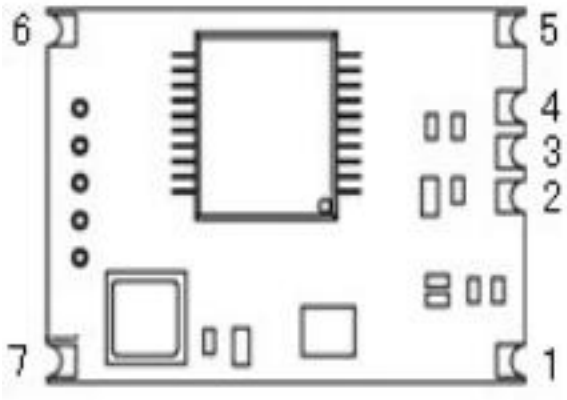


I2C writing schematic



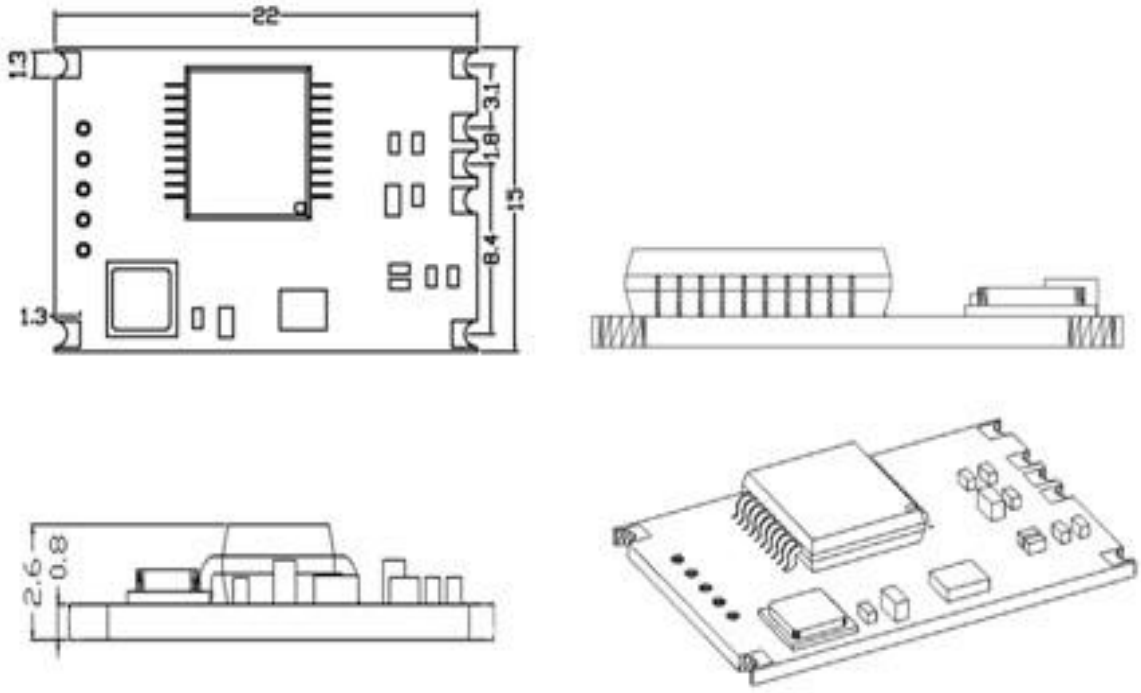
I2C reading schematic

8. Pinout:



Pin number	Pin name	function
1	GND	GROUND
2	SDA	I2C Serial bus data
3	SCK	I2C Serial bus clock
4	VCC	Power supply
5	GND	Ground
6	GND	Ground
7	GND	Ground

9. Machine Dimension:



Notes:

Notes for temperature measurement:

A) The module should be under the environment more than five minutes when measured in vitro certain environment temperature.

Notes for pressure measurement:

A) Avoid to blocking the pressure measuring hole, otherwise it will affect the accuracy of pressure value.

Notes for altitude measurement:

Altitude measurement is based on the pressure of the atmosphere; the accuracy of altitude reference pressure influences the related altitude measurement directly.

Notes for compass function using:

A) During the measuring, the module need to keep horizontal; otherwise it will affect the accuracy of measurement.

B) During the measuring, it should avoid strong magnetic or big metal in the environment.

C) It need do the calibration when environment changed.

D) Avoid using the speaker at the same time if the device has it.

Notes for pedometer function using:

A) When you suddenly stop in the process of walking, and begin to walk, then the effective steps start updating after ten steps from the second walking.

Other parts:

A) Normal working current is about 1.5mA, standby current is about 8uA;

B) If you want to use the weather forecast function, you can't turn off the power supply of the module;

C) The I2C transmission rate is roughly 5 KHZ. If the rate is too high, it may fail to communication;

D) For programming using guide, please check "Program Guide" and Timing Diagram.