

# SPL06-001

## Digital pressure sensor

Pb-free, halogen-free and RoHS compliant

# Restricted

## 1. Security warning

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## 2. Publication history

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|         |            |                                                                                                              |        |          |
|         |            |                                                                                                              |        |          |
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## 1. Introduction

The SPL06-001 is a miniaturized Digital Barometric Air Pressure Sensor with a high accuracy and a low current consumption. The SPL06-001 is both a pressure and a temperature sensor. The pressure sensor element is based on a capacitive sensing principle which guarantees a high precision during temperature changes. The small package makes the SPL06-001 ideal for mobile applications and wearable devices.

The SPL06-001's internal signal processor converts the output from the pressure and temperature sensor elements to 24-bit results. Each pressure sensor has been calibrated individually and contains calibration coefficients. The coefficients are used in the application to convert the measurement results to true pressure and temperature values.

The SPL06-001 has a FIFO that can store the latest 32 measurements. By using the FIFO, the host processor can remain in a sleep mode for a longer period of time between readouts. This can reduce the overall system power consumption. Sensor measurements and calibration coefficients are available through the serial I2C interface.

### Key features

- Pressure range: 300 ... 1100hPa (+9000m ... -500m relating to sea level)
- Temperature Range: -40...+85°C
- Supply voltage: 1.7 ... 3.6V (VDD), 1.2 ... 3.6V (VDDIO)
- Package: LGA package with metal lid  
Small footprint: 2.5mm x 2.0mm; Super-flat: 0.95mm height
- Relative accuracy:  $\pm 0.06\text{hPa}$ , equiv. to  $\pm 0.5\text{ m}$
- Absolute accuracy: typ.  $\pm 1\text{hPa}$  (300 ... 1100hPa)
- Temperature accuracy:  $\pm 0.5^\circ\text{C}$ .
- Pressure temperature sensitivity:  $< 0.5\text{Pa/K}$
- Measurement time: Typical: 28 ms. Minimum: 3 ms.
- Average current consumption: High precision: 60  $\mu\text{A}$ , Low power: 3  $\mu\text{A}$ , Standby:  $<1\text{ }\mu\text{A}$ .
- I2C and SPI interface, Embedded 24-bit ADC
- FIFO: Stores latest 32 pressure or temperature measurements.
- Pb-free, halogen-free and RoHS compliant
- MSL 1

### Typical applications

- Enhancement of GPS navigation (dead-reckoning, slope detection, etc.)
- In- and out-door navigation
- Leisure and sports
- Weather forecast
- Vertical velocity indication (rise/sink speed)

### Specific notes

Particles can influence the performance of the pressure sensor, we strongly recommend you to introduce special measures to avoid deposition of particles on the MEMS membrane or screen particles after assembly as the assembly process is considered to be the main root cause for particle generation.

## 2. Test condition

**Table 1: Test condition**

| Standard Conditions    | Temperature   | Humidity      | Air pressure     |
|------------------------|---------------|---------------|------------------|
| Environment conditions | -40°C...+85°C | 25%RH...75%RH | 300hPa...1100hPa |
| Basic test conditions  | +25°C         | 60%RH...70%RH | 300hPa...1100hPa |

## 3. Absolute maximum ratings

**Table 2: Absolute maximum ratings**

| Parameter              | Condition   | Min | Max   | Units |
|------------------------|-------------|-----|-------|-------|
| Storage temperature    |             | -40 | +125  | °C    |
| Supply Voltage         | All pins    |     | +4    | V     |
| Voltage at all IO Pins | All pins    |     | +4    | V     |
| ESD rating             | JESD22-A114 | -2  | +2    | kV    |
| Overpressure           |             |     | 10000 | hPa   |

## 4. Electrical characteristics

VDD = 1.8V, VDDIO=1.8V, T=25°C, unless otherwise noted. If not stated otherwise, the given values are  $\pm 3$ -Sigma values over temperature/voltage range in the given operation mode.

**Table 3: Operating conditions, output signal and mechanical characteristics**

| Parameter                                                                                                                                                                                                                                                                                | Symbol | Condition         |                | Min | Type | Max  | Units |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|-------------------|----------------|-----|------|------|-------|
| Operating temperature                                                                                                                                                                                                                                                                    | TA     | Operational       |                | -40 | 25   | 85   | °C    |
|                                                                                                                                                                                                                                                                                          |        | Full accuracy     |                | 0   | 25   | 65   | °C    |
| Operating Pressure                                                                                                                                                                                                                                                                       | P      |                   |                | 300 |      | 1100 | hPa   |
| Supply voltage                                                                                                                                                                                                                                                                           | VDD    |                   |                | 1.7 |      | 3.6  | V     |
| Interface supply voltage                                                                                                                                                                                                                                                                 | VDDIO  |                   |                | 1.2 |      | 3.6  | V     |
| ©Supply current (with 1 measurement per second.)                                                                                                                                                                                                                                         | Idd    | 1 Hz              | Low Power      |     | 3    | 5    | uA    |
|                                                                                                                                                                                                                                                                                          |        |                   | Standard       |     | 11   | 15   |       |
|                                                                                                                                                                                                                                                                                          |        |                   | High precision |     | 40   | 50   |       |
| Note: The current consumption depends on both pressure measurement precision and rate. Please refer to the <a href="#">Pressure Configuration (PRS_CFG)</a> register description for an overview of the current consumption in different combinations of measurement precision and rate. |        |                   |                |     |      |      |       |
| Peak current                                                                                                                                                                                                                                                                             | Ipeak  | During conversion |                |     | 400  | 500  | uA    |
| ©Standby current                                                                                                                                                                                                                                                                         | Iddsbm |                   |                |     |      | 1    | uA    |

|                              |         |                              |      |      |     |       |
|------------------------------|---------|------------------------------|------|------|-----|-------|
| Relative accuracy pressure   | P_R     | 950...1050hPa<br>+25...+40°C | -6   |      | 6   | Pa    |
|                              |         |                              | -0.5 |      | 0.5 | m     |
| © Absolute accuracy pressure | P_A     | 300...1100hPa<br>0...+65°C   | -1.0 |      | 1   | hPa   |
| Resolution of output data    |         | Pressure                     |      | 0.06 |     | Pa    |
|                              |         | Temperature                  |      | 0.01 |     | °C    |
| Noise in pressure            | P_Noise | Low Power mode               |      | 2    | 5   | PaRMS |
|                              |         | Standard mode                |      | 0.5  | 1.2 |       |
|                              |         | High precision mode          |      | 0.3  | 0.6 |       |

Note: Pressure noise is measured as the average standard deviation. Please refer to the [Pressure Configuration \(PRS\\_CFG\)](#) register description for all precision mode options.

|                                       |     |                        |      |      |     |      |
|---------------------------------------|-----|------------------------|------|------|-----|------|
| Offset temperature coefficient        | TCO | 1000hPa<br>+25...+40°C | -0.5 | ±0.2 | 0.5 | Pa/K |
|                                       |     |                        | -4.2 | ±1.7 | 4.2 | cm/K |
| Absolute accuracy temperature         |     | @+25°C                 | -0.5 |      | 0.5 | °C   |
|                                       |     | 0...+65°C              | -1   |      | 1   | °C   |
| Pressure/Temperature measurement rate | f   |                        | 1    |      | 128 | Hz   |
| Pressure measurement time             | t   | Low Power mode         |      | 5    | 8   | ms   |
|                                       |     | Standard mode          |      | 28   | 35  |      |
|                                       |     | High precision mode    |      | 105  | 115 |      |

Note: The pressure measurement time (and thus the maximum rate) depends on the pressure measurement precision. Please refer to the [Pressure Configuration \(PRS\\_CFG\)](#) register description for an overview of the possible combinations of measurement precision and rate.

|                                    |                  |                                                                                                              |       |  |       |       |
|------------------------------------|------------------|--------------------------------------------------------------------------------------------------------------|-------|--|-------|-------|
| Power supply rejection             | Ap_psr           | Measured with 217Hz square wave and broad band noise, 100mVpp                                                |       |  | 0.063 | PaRMS |
| Supply voltage ramp-up time        | tvddup           | Time for supply voltage to reach 90% of final value                                                          | 0.001 |  | 5     | ms    |
| Serial data clock                  | f <sub>I2C</sub> | For I2C                                                                                                      |       |  | 3.4   | MHz   |
|                                    | f <sub>SPI</sub> | For SPI                                                                                                      |       |  | 10    | MHz   |
| Long term stability                |                  | 12month                                                                                                      | -1    |  | 1     | hPa   |
| Time to sensor ready               | TSensor_rdy      | The SENSOR_RDY bit in the Measurement Configuration register will be set when the sensor is ready            |       |  | 12    | ms    |
| Time to coefficients are available | TCoef_rdy        | The COEF_RDY bit in the Measurement Configuration register will be set when the coefficients can be read out |       |  | 40    | ms    |

Note : © Key performance.

## 5. Operation

### 5.1 Operating Modes

The SPL06-001 supports 3 different modes of operation: Standby, Command, and Background mode.

- Standby Mode
  - Default mode after power on or reset. No measurements are performed.
  - All registers and compensation coefficients are accessible.
- Command Mode
  - One temperature or pressure measurement is performed according to the selected precision.
  - The sensor will return to Standby Mode when the measurement is finished, and the measurement result will be available in the data registers.
- Background Mode
  - Pressure and/or temperature measurements are performed continuously according to the selected measurement precision and rate. The temperature measurement is performed immediately after the pressure measurement.
  - The FIFO can be used to store 32 measurement results and minimize the number of times the sensor must be accessed to read out the results.

*Note: Operation mode and measurement type are set in the [Sensor Operating Mode and Status \(MEAS\\_CFG\)](#) register.*

### 5.2 Measurement Precision and Rate

Different applications require different measurement precision and measurement rates. Some applications, like weather stations, require lower precision and measurement rates than for instance indoor navigation and sports applications.

The SPL06-001's measurement precision and rate (in background mode) can be configured to match the requirements of the application in which it is being used. This reduces current consumption of the sensor and the system.

In order to achieve a higher precision, the SPL06-001 will read the sensor multiple times (oversampling), and combine the readings into one result. This increases the current consumption and the measurement time, which again reduces the maximum measurement rate.

The measurement precision, rate and time is set in the [Pressure Configuration \(PRS\\_CFG\)](#) and [Temperature Configuration \(TMP\\_CFG\)](#) registers. The register descriptions contain information about the current consumption and the possible combinations of measurement precision, time, and rate.

Please note that the pressure sensor is temperature dependent. Temperature measurements must be

made together with the pressure measurements in order to compensate for the temperature dependency. This reduces the maximum pressure measurement rate, *since:  $Ratetemperature * Timetemperature + Ratepressure * Timepressure < 1 \text{ second}$* . Measurement Settings and Use Case Examples contains a table with examples of combinations of pressure and temperature precision and rates for different use cases.

## 5.3 Sensor Interface

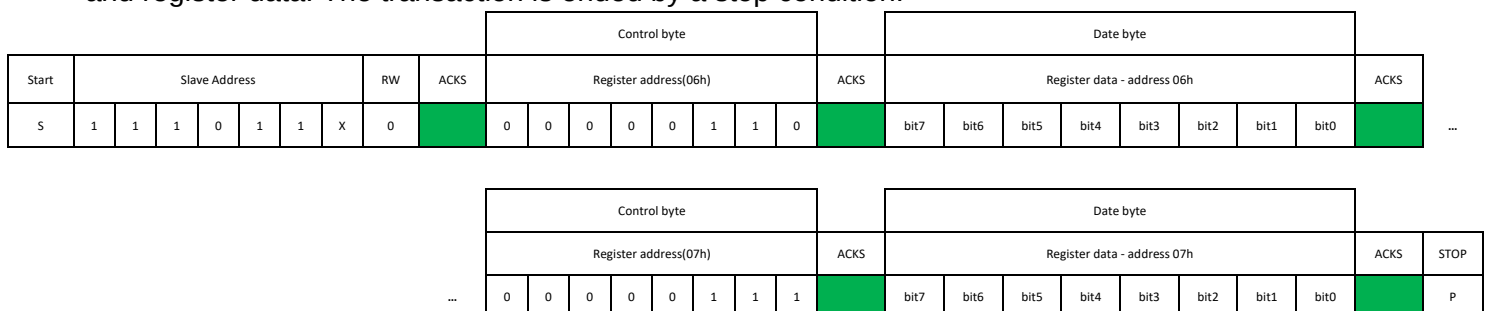
The SPL06-001 can be accessed as a slave device through either SPI 3-wire, SPI 4-wire, or I2C serial interface

### 5.3.1 I2C interface

- The sensor's default interface.
- The sensor's address is *0x77* (default) or *0x76* (if the SDO pin is pulled-down to GND)

#### I2C write

Writing is done by sending the slave address in write mode (RW='0'), resulting in slave address 111011X0 ('X' is determined by state of SDO pin). Then the master sends pairs of register addresses and register data. The transaction is ended by a stop condition.



#### I2C read

To be able to read registers, first the register address must be sent in write mode (slave address 111011X0). Then either a stop or a repeated start condition must be generated. After this the slave is addressed in read mode (RW='1') at address 111011X1, after which the slave sends out data from auto-incremented register addresses until a NOACKM and stop condition occurs.

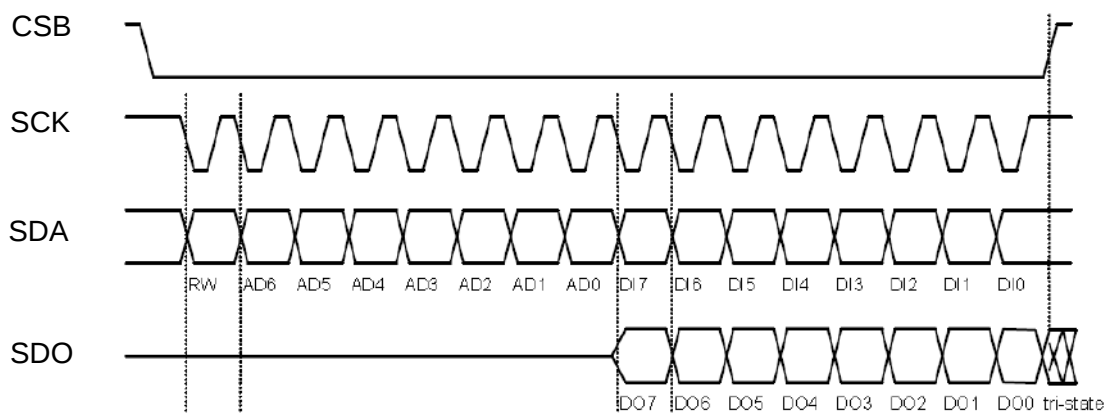


## 5.3.2 SPI interface

- The sensor will switch to SPI mode, if it detects an active low on the CSB pin. SPI 4-wire is the default SPI interface.

- To enable SPI 3-wire configuration, a bit must be set in the Interrupt and FIFO configuration (CFG\_REG) register after start up.

CSB is active low and has an integrated pull-up resistor. Data on SDA is latched by the device at SCK rising edge and SDO is changed at SCK falling edge. Communication starts when CSB goes to low and stops when CSB goes to high; during these transitions on CSB, SCK must be stable.



Mode 3(CPOL=1, CPHA=1)

In SPI mode, only 7 bits of the register addresses are used; the MSB of register address is not used and replaced by a read/write bit (RW='0' for write and RW='1' for read).

Example: address 0x10 for read access, the byte 0x90 is transferred, for write access, the byte 0x10 is transferred

### SPI write

Writing is done by lowering CSB and sending pairs control bytes and register data. The control bytes consist of the SPI register address (=full register address without bit 7) and the write command (bit7= RW='0'). Several pairs can be written without raising CSB. The transaction is ended by a raising CSB.

|       | Control byte |                        |   |   |   |   |   |   | Date byte |                             |      |      |      |      |      |      | Control byte |    |                        |   |   |   |   |   | Date byte |      |                             |      |      |      |      |      |       |  |      |
|-------|--------------|------------------------|---|---|---|---|---|---|-----------|-----------------------------|------|------|------|------|------|------|--------------|----|------------------------|---|---|---|---|---|-----------|------|-----------------------------|------|------|------|------|------|-------|--|------|
| Start | RW           | Register address (06h) |   |   |   |   |   |   |           | Register data - address 06h |      |      |      |      |      |      |              | RW | Register address (07h) |   |   |   |   |   |           |      | Register data - address 07h |      |      |      |      |      |       |  | Stop |
| CSB=0 | 0            | 0                      | 0 | 0 | 0 | 1 | 1 | 0 | bit7      | bit6                        | bit5 | bit4 | bit3 | bit2 | bit1 | bit0 | 0            | 0  | 0                      | 0 | 0 | 1 | 1 | 1 | bit7      | bit6 | bit5                        | bit4 | bit3 | bit2 | bit1 | bit0 | CSB=1 |  |      |

## SPI read

Reading is done by lowering CSB and first sending one control byte. The control bytes consist of the SPI register address (= full register address without bit 7) and the read command (bit7=RW='1'). After writing the control byte, data is sent out of the SDO pin (SDA in 3-wire mode); the register address is automatically incremented.

|       | Control byte |                       |   |   |   |   |   |   |  | Date byte |                             |      |      |      |      |      |      | Date byte |                             |      |      |      |      |      |      |       |      |
|-------|--------------|-----------------------|---|---|---|---|---|---|--|-----------|-----------------------------|------|------|------|------|------|------|-----------|-----------------------------|------|------|------|------|------|------|-------|------|
| Start | RW           | Register address(80h) |   |   |   |   |   |   |  |           | Register data - address 80h |      |      |      |      |      |      |           | Register data - address 81h |      |      |      |      |      |      |       | Stop |
| CSB=0 | 1            | 0                     | 0 | 0 | 0 | 1 | 1 | 0 |  | bit7      | bit6                        | bit5 | bit4 | bit3 | bit2 | bit1 | bit0 | bit7      | bit6                        | bit5 | bit4 | bit3 | bit2 | bit1 | bit0 | CSB=1 |      |

## 5.4 Interrupt

The SPL06-001 can generate an interrupt when a new measurement result is available and/or when the FIFO is full. The sensor uses the SDO pin for the interrupt signal, and interrupt is therefore not supported if the interface is 4-wire SPI.

The interrupt is enabled and configured in the [Interrupt and FIFO configuration \(CFG\\_REG\) register](#). The SDO pin serves as both interrupt and as the least significant bit in the device address. If the SDO pin is pulled low the interrupt polarity must be set to active high and vice versa.

The interrupt status can be read from the [Interrupt Status \(INT\\_STS\) register](#).

## 5.5 FIFO Operation

The SPL06-001 FIFO can store the last 32 measurements of pressure or temperature. This reduces the overall system power consumption when the host processor does not need to continuously pull data from the sensor but can go into standby mode for longer periods of time.

The FIFO will store any combination of temperature and pressure measurements since the measurement rate of temperature and pressure can be set up independently in Background Mode. The pressure rate can for instance be set 4 times higher than the temperature rate and thus only every fifth result will be a temperature result. The measurement type can be seen in the result data. The sensor will set the least significant bit to:

- '1' if the result is a pressure measurement.
- '0' if it is a temperature measurement.
- The sensor uses 24 bits to store the measurement result. Because this is more bits than is needed to cover the full dynamic range of the pressure sensor, using the least significant bit to label the measurement type will not affect the precision of the result.

The FIFO can be enabled in the Interrupt and [FIFO configuration \(CFG\\_REG\) register](#). The data from the FIFO is read out from the [Pressure Data \(PRS\\_Bn\) registers](#) regardless of the next result in the

FIFO is a temperature or a pressure measurement.

When a measurement has been read out, the FIFO will auto increment and place the next result in the data register. A flag will be set in the *FIFO Status (FIFO\_STS) register* when the FIFO is empty and all following reads will return 0x800000.

If the FIFO runs full a flag will be set in the *FIFO Status (FIFO\_STS) register* and the sensor will generate an interrupt if this has been enabled in the Interrupt and *FIFO configuration (CFG\_REG) register*.

## 5.6 Calibration and Measurement Compensation

The SPL06-001 is a calibrated sensor and contains calibration coefficients. These are used in the application (for instance by the host processor) to compensate the measurement results for sensor non-linearity's.

The sections that follow, describe how to calculate the compensated results and convert them into Pa and °C values.

### 5.6.1 How to Calculate Compensated Pressure Values

1. Read the calibration coefficients (c00, c10, c20, c30, c01, c11, and c21) from the Calibration Coefficient register.

Note: The coefficients read from the coefficient register are 16 bit 2's complement numbers.

2. Choose scaling factors kT (for temperature) and kP (for pressure) based on the chosen precision rate. The scaling factors are listed in Table 4.

3. Read the pressure and temperature result from the registers or FIFO.

Note: The measurements read from the result registers (or FIFO) are 24 bit 2's complement numbers.

Depending on the chosen measurement rates, the temperature may not have been measured since the last pressure measurement.

4. Calculate scaled measurement results.

$$T_{raw\_sc} = T_{raw}/kT$$

$$P_{raw\_sc} = P_{raw}/kP$$

5. Calculate compensated measurement results.

$$P_{comp}(Pa) = c00 + P_{raw\_sc} * (c10 + P_{raw\_sc} * (c20 + P_{raw\_sc} * c30)) + T_{raw\_sc} * c01 + T_{raw\_sc} * P_{raw\_sc} * (c11 + P_{raw\_sc} * c21)$$

## 5.6.2 How to Calculate Compensated Temperature Values

1. Read the calibration coefficients ( c0 and c1 ) from the Calibration Coefficients (COEF) register.

Note: The coefficients read from the coefficient register are 12 bit 2's complement numbers.

2. Choose scaling factor kT (for temperature) based on the chosen precision rate. The scaling factors are listed in Table 4.

3. Read the temperature result from the temperature register or FIFO.

Note: The temperature measurements read from the temperature result register (or FIFO) are 24 bit 2's complement numbers.

4. Calculate scaled measurement results.

$$\text{Traw\_sc} = \text{Traw}/kT$$

5. Calculate compensated measurement results

$$\text{Tcomp } (^{\circ}\text{C}) = c0*0.5 + c1*\text{Traw\_sc}$$

## 5.6.3 Compensation Scale Factors

**Table 4 Compensation Scale Factors**

| Oversampling Rate         | Scale Factor (kP or kT) |
|---------------------------|-------------------------|
| 1 (single)                | 524288                  |
| 2 times (Low Power)       | 1572864                 |
| 4 times                   | 3670016                 |
| 8 times                   | 7864320                 |
| 16 times (Standard)       | 253952                  |
| 32 times                  | 516096                  |
| 64 times (High Precision) | 1040384                 |
| 128 times                 | 2088960                 |

## 6. Applications

### 6.1 Measurement Settings and Use Case Examples

**Table 5 Measurement Settings and Use Case Examples (TBD)**

| Use Case                                                   | Performance                            | Pressure Register Configuration<br>Address: 0x06 | Temperature Register Configuration<br>Address: 0x07 | Other                                                                         |
|------------------------------------------------------------|----------------------------------------|--------------------------------------------------|-----------------------------------------------------|-------------------------------------------------------------------------------|
| Weather Station<br>(Low power, Background mode)            | 5 Pa precision.<br>1 pr sec.<br>6 uA   | 0x01                                             | 0x80                                                | Start background measurements<br>(addr 0x08)                                  |
| Indoor navigation<br>(Standard precision, Background mode) | 10 cm precision.<br>2 pr sec.<br>30 uA | 0x14                                             | 0x80                                                | Enable P shift<br>(addr 0x09)<br>Start background measurements<br>(addr 0x08) |
| Sports (High precision, high rate, background mode)        | 5 cm precision<br>4 pr sec.<br>200 uA  | 0x26                                             | 0xA0                                                | Enable P shift<br>(addr 0x09)<br>Start background measurements<br>(addr 0x08) |

## 6.2 Application Circuit Example

The example application circuit example uses the I2C serial interface. The SDO pin can be used for interrupt or to set least significant bit of the device address.

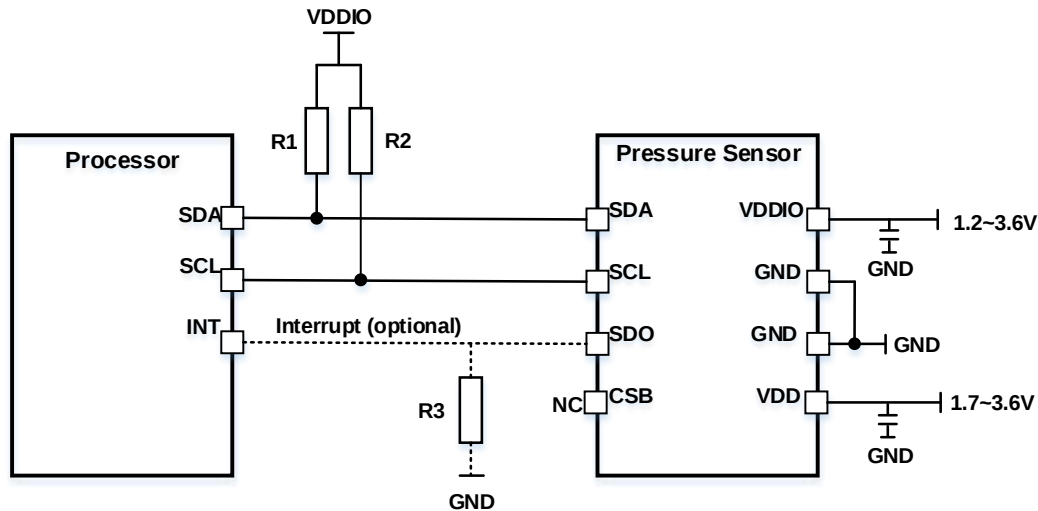


Figure 1: Typical application circuit

Table 6 Component Values

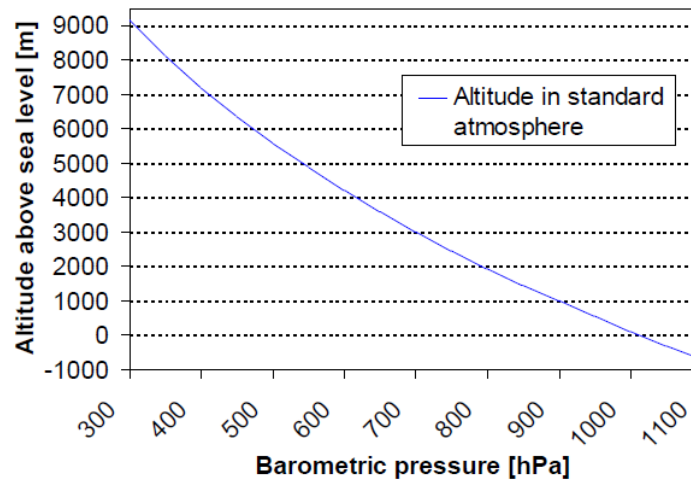
| Component                 | Symbol                          | Values |      |      | Unit | Note / Test Condition                                                              |
|---------------------------|---------------------------------|--------|------|------|------|------------------------------------------------------------------------------------|
|                           |                                 | Min.   | Typ. | Max. |      |                                                                                    |
| Pull-up/down Resistor     | R <sub>1</sub> , R <sub>2</sub> |        |      | 10   | KΩ   |                                                                                    |
|                           | R <sub>3</sub>                  |        |      | 100  | KΩ   | R <sub>3</sub> is optional and will set the address to 0x76 instead of 0x77.       |
| Supply Blocking Capacitor | C <sub>1</sub> , C <sub>2</sub> | 100    | 100  |      | nF   | The blocking capacitors should be placed as close to the package pins as possible. |

### 6.3 Calculating absolute altitude and calculating pressure at sea level

With the measured pressure  $P$  and the pressure at sea level  $P_0=1013.25\text{hPa}$ , the altitude in meters can be calculated with the international barometric formula:

$$\text{Altitude} = 44330 \times \left[ 1 - \left( \frac{P}{P_0} \right)^{\frac{1}{5.255}} \right]$$

Thus, a pressure change of  $\Delta p = 1\text{hPa}$  corresponds to  $8.43\text{m}$  at sea level.



**Figure 2: Transfer function: Altitude over sea level – Barometric pressure**

With the measured pressure  $p$  and the absolute altitude the pressure at sea level can be calculated:

$$P_0 = \frac{p}{\left( 1 - \frac{\text{altitude}}{44330} \right)^{5.255}}$$

Thus, a difference in altitude of  $\Delta \text{altitude} = 10\text{m}$  corresponds to  $1.2\text{hPa}$  pressure change at sea level.

## 7. Register Map

**Table 7 Register Map**

| Register Name | Addr.     | bit7                         | bit6                | bit5        | bit4        | bit3               | bit2                 | bit1          | bit0           | Reset State |
|---------------|-----------|------------------------------|---------------------|-------------|-------------|--------------------|----------------------|---------------|----------------|-------------|
| PSR_B2        | 0x00      | PSR[23:16] (r)               |                     |             |             |                    |                      |               |                | 00h         |
| PSR_B1        | 0x01      | PSR[15:8](r)                 |                     |             |             |                    |                      |               |                | 00h         |
| PSR_B0        | 0x02      | PSR[7:0](r)                  |                     |             |             |                    |                      |               |                | 00h         |
| TMP_B2        | 0x03      | TMP[23:16] (r)               |                     |             |             |                    |                      |               |                | 00h         |
| TMP_B1        | 0x04      | TMP[15:8] (r)                |                     |             |             |                    |                      |               |                | 00h         |
| TMP_B0        | 0x05      | TMP[7:0] (r)                 |                     |             |             |                    |                      |               |                | 00h         |
| PRS_CFG       | 0x06      | -                            | PM_RATE [2:0] (rw)  |             |             | PM_PRC [3:0] (rw)  |                      |               | 00h            |             |
| TMP_CFG       | 0x07      | TMP_EXT (rw)                 | TMP_RATE [2:0] (rw) |             |             | -                  | TM_PRC [2:0] (rw)    |               |                | 00h         |
| MEAS_CFG      | 0x08      | COEF_RDY (r)                 | SENSOR_RDY (r)      | TMP_RDY (r) | PRS_RDY (r) | -                  | MEAS_CRTL [2:0] (rw) |               |                | 00h         |
| CFG_REG       | 0x09      | INT_HL (rw)                  | INT_SEL [2:0] (rw)  |             |             | TMP_SHIFT_EN (rw)  | PRS_SHIFT_EN (rw)    | FIFO_EN (rw)  | -              | 00h         |
| INT_STS       | 0x0A      | -                            | -                   | -           | -           | -                  | INT_FIFO_FULL        | INT_TMP (r)   | INT_PRS (r)    | 00h         |
| FIFO_STS      | 0x0B      | -                            | -                   | -           | -           | -                  | -                    | FIFO_FULL (r) | FIFO_EMPTY (r) | 00h         |
| RESET         | 0x0C      | FIFO_FLUSH (w)               | -                   | -           | -           | SOFT_RST [3:0] (w) |                      |               |                | 00h         |
| ID            | 0x0D      | PROD_ID [3:0] (r)            |                     |             |             | REV_ID [3:0] (r)   |                      |               |                | 00h         |
| COEF          | 0x10-0x21 | < see register description > |                     |             |             |                    |                      |               |                | XXh         |
| Reserved      | 0x22-0x27 | Reserved                     |                     |             |             |                    |                      |               |                | XXh         |

## 8. Register Description

### 8.1 Pressure Data (PRS\_Bn)

The Pressure Data registers contains the 24 bit (3 bytes) 2's complement pressure measurement value. If the FIFO is enabled, the register will contain the FIFO pressure and/or temperature results (please see [FIFO Operation](#)). Otherwise, the register contains the pressure measurement results and will not be cleared after read.

#### 8.1.1 PRS\_B2

The highest byte of the three bytes measured pressure value.

|                     |              |     |
|---------------------|--------------|-----|
| PRS_B2              | Address      | 00H |
| Pressure (MSB data) | Reset value: | 00H |
| 7                   | 6            | 5   |
| 4                   | 3            | 2   |
| 1                   | 0            |     |

| PRS23 | PRS22 | PRS21 | PRS20 | PRS19 | PRS18 | PRS17 | PRS16 |
|-------|-------|-------|-------|-------|-------|-------|-------|
| r     |       |       |       |       |       |       |       |

| Field      | Bits | Type | Description                                 |
|------------|------|------|---------------------------------------------|
| PRS[23:16] | 7:0  | r    | MSB of 24 bit 2's complement pressure data. |

#### 8.1.2 PRS\_B1

The middle byte of the three bytes measured pressure value.

|                     |              |     |
|---------------------|--------------|-----|
| PRS_B1              | Address      | 01H |
| Pressure (LSB data) | Reset value: | 00H |
| 7                   | 6            | 5   |
| 4                   | 3            | 2   |
| 1                   | 0            |     |

| PRS15 | PRS14 | PRS13 | PRS12 | PRS11 | PRS10 | PRS9 | PRS8- |
|-------|-------|-------|-------|-------|-------|------|-------|
| r     |       |       |       |       |       |      |       |

| Field     | Bits | Type | Description                                 |
|-----------|------|------|---------------------------------------------|
| PRS[15:8] | 7:0  | r    | LSB of 24 bit 2's complement pressure data. |

### 8.1.3 PRS\_B0

The lowest byte of the three bytes measured pressure value.

|                      |              |   |   |   |   |   |   |     |
|----------------------|--------------|---|---|---|---|---|---|-----|
| PRS_B0               | Address      |   |   |   |   |   |   | 02H |
| Pressure (XLSB data) | Reset value: |   |   |   |   |   |   | 00H |
| 7                    | 6            | 5 | 4 | 3 | 2 | 1 | 0 |     |

|      |      |      |      |      |      |      |      |
|------|------|------|------|------|------|------|------|
| PRS7 | PRS6 | PRS5 | PRS4 | PRS3 | PRS2 | PRS1 | PRS0 |
|------|------|------|------|------|------|------|------|

r

| Field    | Bits | Type | Description                                  |
|----------|------|------|----------------------------------------------|
| PRS[7:0] | 7:0  | r    | XLSB of 24 bit 2's complement pressure data. |

## 8.2 Temperature Data (TMP\_Tn)

The Temperature Data registers contain the 24 bit (3 bytes) 2's complement temperature measurement value (unless the FIFO is enabled, please see [FIFO Operation](#)) and will not be cleared after the read.

### 8.2.1 TMP\_B2

The highest byte of the three bytes measured temperature value.

|                        |              |     |
|------------------------|--------------|-----|
| TMP_B2                 | Address      | 03H |
| Temperature (MSB data) | Reset value: | 00H |

7 6 5 4 3 2 1 0

|       |       |       |       |       |       |       |       |
|-------|-------|-------|-------|-------|-------|-------|-------|
| TMP23 | TMP22 | TMP21 | TMP20 | TMP19 | TMP18 | TMP17 | TMP16 |
|-------|-------|-------|-------|-------|-------|-------|-------|

r

| Field      | Bits | Type | Description                                    |
|------------|------|------|------------------------------------------------|
| TMP[23:16] | 7:0  | r    | MSB of 24 bit 2's complement temperature data. |

### 8.2.2 TMP\_B1

The middle byte of the three bytes measured temperature value.

|                        |   |              |   |     |   |   |   |
|------------------------|---|--------------|---|-----|---|---|---|
| TMP_B1                 |   | Address      |   | 04H |   |   |   |
| Temperature (LSB data) |   | Reset value: |   | 00H |   |   |   |
| 7                      | 6 | 5            | 4 | 3   | 2 | 1 | 0 |

|       |       |       |       |       |       |      |      |
|-------|-------|-------|-------|-------|-------|------|------|
| TMP15 | TMP14 | TMP13 | TMP12 | TMP11 | TMP10 | TMP9 | TMP8 |
|-------|-------|-------|-------|-------|-------|------|------|

r

| Field     | Bits | Type | Description                                    |
|-----------|------|------|------------------------------------------------|
| TMP[15:8] | 7:0  | r    | LSB of 24 bit 2's complement temperature data. |

### 8.2.3 TMP\_B0

The lowest part of the three bytes measured temperature value.

|                         |   |              |   |     |   |   |   |
|-------------------------|---|--------------|---|-----|---|---|---|
| TMP_B0                  |   | Address      |   | 05H |   |   |   |
| Temperature (XLSB data) |   | Reset value: |   | 00H |   |   |   |
| 7                       | 6 | 5            | 4 | 3   | 2 | 1 | 0 |

|      |      |      |      |      |      |      |      |
|------|------|------|------|------|------|------|------|
| TMP7 | TMP6 | TMP5 | TMP4 | TMP3 | TMP2 | TMP1 | TMP0 |
|------|------|------|------|------|------|------|------|

r

| Field    | Bits | Type | Description                                     |
|----------|------|------|-------------------------------------------------|
| TMP[7:0] | 7:0  | r    | XLSB of 24 bit 2's complement temperature data. |

## 8.3 Pressure Configuration (PRS\_CFG)

Configuration of pressure measurement rate (PM\_RATE) and resolution (PM\_PRC).

|                                    |              |     |
|------------------------------------|--------------|-----|
| PRS_CFG                            | Address:     | 06H |
| Pressure measurement configuration | Reset value: | 00H |

|   |              |   |   |             |   |   |   |
|---|--------------|---|---|-------------|---|---|---|
| 7 | 6            | 5 | 4 | 3           | 2 | 1 | 0 |
| - | PM_RATE[2:0] |   |   | PM_PRC[3:0] |   |   |   |

-

rw

rw

| Field        | Bits | Type | Description                                                                                                                                                                                                                                                                                                                                                    |
|--------------|------|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| -            | 7    | -    | Reserved.                                                                                                                                                                                                                                                                                                                                                      |
| PM_RATE[2:0] | 6:4  | rw   | Pressure measurement rate:<br>000 - 1 measurements pr. sec.<br>001 - 2 measurements pr. sec.<br>010 - 4 measurements pr. sec.<br>011 - 8 measurements pr. sec.<br>100 - 16 measurements pr. sec.<br>101 - 32 measurements pr. sec.<br>110 - 64 measurements pr. sec.<br>111 - 128 measurements pr. sec.<br>Applicable for measurements in Background mode only |
| PM_PRC[3:0]  | 3:0  | rw   | Pressure oversampling rate:<br>0000 - Single.<br>0001 - 2 times (Low Power).<br>0010 - 4 times.<br>0011 - 8 times.<br>0100 *)- 16 times (Standard).<br>0101 *) - 32 times.<br>0110 *) - 64 times (High Precision).<br>0111 *) - 128 times.<br>1xxx - TBD                                                                                                       |

\*) Note: Use in combination with a bit shift. See [Interrupt and FIFO configuration \(CFG\\_REG\)](#) register

**Table 8 Pressure measurement time (ms) and precision (PaRMS)**

| Oversampling<br>(PRC[3:0]) | Single<br>(0000) | 2<br>times<br>(0001) | 4<br>times<br>(0010) | 8<br>times<br>(0011) | 16<br>times<br>(0100) | 32<br>times<br>(0101) | 64<br>times<br>(0110) | 128<br>times<br>(0111) |
|----------------------------|------------------|----------------------|----------------------|----------------------|-----------------------|-----------------------|-----------------------|------------------------|
| Measurement<br>time (ms)   | 3.6              | 5.2                  | 8.4                  | 14.8                 | 27.6                  | 53.2                  | 104.4                 | 206.8                  |
| Precision<br>(PaRMS)       | 5                |                      | 2.5                  |                      | 1.2                   | 0.9                   | 0.5                   |                        |

**Table 9 Estimated current consumption (uA)**

| Oversampling<br>(PRC[3:0])             | Single<br>(0000)                                                                                                  | 2<br>times<br>(0001) | 4<br>times<br>(0010) | 8<br>times<br>(0011) | 16<br>times<br>(0100) | 32<br>times<br>(0101) | 64<br>times<br>(0110) | 128<br>times<br>(0111) |
|----------------------------------------|-------------------------------------------------------------------------------------------------------------------|----------------------|----------------------|----------------------|-----------------------|-----------------------|-----------------------|------------------------|
| Measurements pr<br>sec.(PM_RATE([2:0]) |                                                                                                                   |                      |                      |                      |                       |                       |                       |                        |
| 1 (000)                                | 2.1                                                                                                               | 2.7                  | 3.8                  | 6.1                  | 11                    | 20                    | 38                    | 75                     |
| 2 (001)                                |                                                                                                                   |                      |                      |                      |                       |                       |                       |                        |
| 4 (010)                                |                                                                                                                   |                      |                      |                      |                       |                       |                       |                        |
| 8 (011)                                | Note: The current consumption can be calculated as the<br>Measurement Rate * Current Consumption of 1 measurement |                      |                      |                      |                       |                       |                       | n.a.                   |
| 16 (100)                               |                                                                                                                   |                      |                      |                      |                       |                       | n.a.                  | n.a.                   |
| 32 (101)                               |                                                                                                                   |                      |                      |                      |                       | n.a.                  | n.a.                  | n.a.                   |
| 64 (110)                               |                                                                                                                   |                      |                      |                      | n.a.                  | n.a.                  | n.a.                  | n.a.                   |
| 128 (111)                              |                                                                                                                   |                      | n.a.                 | n.a.                 | n.a.                  | n.a.                  | n.a.                  | n.a.                   |

*Note: The table shows the possible combinations of Pressure Measurement Rate and oversampling when no temperature measurements are performed. When temperature measurements are performed the possible combinations are limited to  $\text{Rate}_{\text{temperature}} \times \text{Measurement Time}_{\text{temperature}} + \text{Rate}_{\text{pressure}} \times \text{Measurement Time}_{\text{pressure}} < 1 \text{ second}$ .*

## 8.4 Temperature Configuration (TMP\_CFG)

Configuration of temperature measurement rate (TMP\_RATE) and resolution (TMP\_PRC).

|                                       |   |              |   |     |   |   |   |
|---------------------------------------|---|--------------|---|-----|---|---|---|
| TMP_CFG                               |   | Address:     |   | 07H |   |   |   |
| Temperature measurement configuration |   | Reset value: |   | 00H |   |   |   |
| 7                                     | 6 | 5            | 4 | 3   | 2 | 1 | 0 |

|        |               |   |              |
|--------|---------------|---|--------------|
| TMP_EX | TMP_RATE[2:0] | - | TMP_PRC[2:0] |
| rw     | rw            | - | rw           |

| Field   | Bits | Type | Description                                                                                                                                                                         |
|---------|------|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| TMP_EXT | 7    | rw   | Temperature measurement<br>0 - Internal sensor (in ASIC)<br>1 - External sensor (in pressure sensor MEMS element)<br>Note: Please use the <a href="#">external sensor setting</a> . |

|               |     |    |                                                                                                                                                                                                                                                                                                                                                                  |
|---------------|-----|----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| TMP_RATE[2:0] | 6:4 | rw | Temperature measurement rate:<br>000 - 1 measurement pr. sec.<br>001 - 2 measurements pr. sec.<br>010 - 4 measurements pr. sec.<br>011 - 8 measurements pr. sec.<br>100 - 16 measurements pr. sec.<br>101 - 32 measurements pr. sec.<br>110 - 64 measurements pr. sec.<br>111 - 128 measurements pr. sec.<br>Applicable for measurements in Background mode only |
| -             | 3   | -  | Reserved.                                                                                                                                                                                                                                                                                                                                                        |
| TMP_PRC[2:0]  | 2:0 | rw | Temperature oversampling (precision):<br>000 - single. (Default) - Measurement time 3.6 ms.<br>Note: Following are optional, and may not be relevant:<br>001 - 2 times.<br>010 - 4 times.<br>011 - 8 times.<br>100 - 16 times.<br>101 - 32 times.<br>110 - 64 times..<br>111 - 128 times.                                                                        |

## 8.5 Sensor Operating Mode and Status (MEAS\_CFG)

Setup measurement mode.

|                           |              |   |   |   |   |   |   |     |
|---------------------------|--------------|---|---|---|---|---|---|-----|
| MEAS_CFG                  | Address      |   |   |   |   |   |   | 08H |
| Measurement configuration | Reset value: |   |   |   |   |   |   | 00H |
| 7                         | 6            | 5 | 4 | 3 | 2 | 1 | 0 |     |

| COEF_RDY | SENSOR_RDY | TMP_RDY | PRS_RDY                                                                                                                                                | - | MEAS_CTRL |
|----------|------------|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------|---|-----------|
| r        | r          | r       | r                                                                                                                                                      | - | rw        |
| Field    | Bits       | Type    | Description                                                                                                                                            |   |           |
| COEF_RDY | 7          | r       | Coefficients will be read to the Coefficients Registers after start- up:<br>0 - Coefficients are not available yet.<br>1 - Coefficients are available. |   |           |

|            |     |    |                                                                                                                                                                                                                                                                                                                                                                      |
|------------|-----|----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SENSOR_RDY | 6   | r  | The pressure sensor is running through self-initialization after start-up.<br>0 - Sensor initialization not complete<br>1 - Sensor initialization complete<br>It is recommend not to start measurements until the sensor has completed the self-initialization.                                                                                                      |
| TMP_RDY    | 5   | r  | Temperature measurement ready<br>1 - New temperature measurement is ready.<br>Cleared when temperature measurement is read.                                                                                                                                                                                                                                          |
| PRS_RDY    | 4   | r  | Pressure measurement ready<br>1 - New pressure measurement is ready.<br>Cleared when procurement measurement is read.                                                                                                                                                                                                                                                |
| -          | 3   | -  | Reserved.                                                                                                                                                                                                                                                                                                                                                            |
| MEAS_CTRL  | 2:0 | rw | Set measurement mode and type:<br>Standby Mode<br>000 - Idle / Stop background measurement<br>Command Mode<br>001 - Pressure measurement<br>010 - Temperature measurement<br>011 - na.<br>100 - na.<br>Background Mode<br>101 - Continuous pressure measurement<br>110 - Continuous temperature measurement<br>111 - Continuous pressure and temperature measurement |

## 8.6 Interrupt and FIFO configuration (CFG\_REG)

Configuration of interrupts, measurement data shift, and FIFO enable.

|                        |              |         |         |         |         |         |     |
|------------------------|--------------|---------|---------|---------|---------|---------|-----|
| CFG_REG                | Address      |         |         |         |         |         | 09H |
| Configuration register | Reset value: |         |         |         |         |         | 00H |
| 7                      | 6            | 5       | 4       | 3       | 2       | 1       | 0   |
| INT_HL                 | INT_FIFO     | INT_PRS | INT_TMP | T_SHIFT | P_SHIFT | FIFO_EN | -   |
| rw                     | rw           | rw      | rw      | rw      | rw      | rw      | -   |

| Field    | Bits | Type | Description                                                                                                                                                   |
|----------|------|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| INT_HL   | 7    | rw   | Interrupt (on SDO pin) active level:<br>0 - Active low.<br>1 - Active high.                                                                                   |
| INT_FIFO | 6    | rw   | Generate interrupt when the FIFO is full:<br>0 - Disable.<br>1 - Enable.                                                                                      |
| INT_PRS  | 5    | rw   | Generate interrupt when a pressure measurement is ready:<br>0 - Disable.<br>1 - Enable.                                                                       |
| INT_TMP  | 4    | rw   | Generate interrupt when a temperature measurement is ready:<br>0 - Disable.<br>1 - Enable.                                                                    |
| T_SHIFT  | 3    | rw   | Temperature result bit-shift<br>0 - no shift.<br>1 - shift result right in data register.<br>Note: Must be set to '1' when the oversampling rate is >8 times. |
| P_SHIFT  | 2    | rw   | Pressure result bit-shift<br>0 - no shift.<br>1 - shift result right in data register.<br>Note: Must be set to '1' when the oversampling rate is >8 times.    |
| FIFO_EN  | 1    | rw   | Enable the FIFO:<br>0 - Disable.<br>1 - Enable.                                                                                                               |
| SPI_MODE | 0    | rw   | Set SPI mode:<br>0-4-wire interface.<br>1-3-wire interface.                                                                                                   |

## 8.7 Interrupt Status (INT\_STS)

Interrupt status register. The register is cleared on read.

INT\_STS Address 0AH  
Interrupt status Reset 00H

|   |   |   |   |   |               |         |         |
|---|---|---|---|---|---------------|---------|---------|
| 7 | 6 | 5 | 4 | 3 | 2             | 1       | 0       |
| - |   |   |   |   | INT_FIFO_FULL | INT_TMP | INT_PRS |
| - |   |   |   |   | r             | r       | r       |

| Field         | Bits | Type | Description                                                                                     |
|---------------|------|------|-------------------------------------------------------------------------------------------------|
| -             | 7:3  | -    | Reserved.                                                                                       |
| INT_FIFO_FULL | 2    | r    | Status of FIFO interrupt<br>0 - Interrupt not active<br>1 - Interrupt active                    |
| INT_TMP       | 1    | r    | Status of temperature measurement interrupt<br>0 - Interrupt not active<br>1 - Interrupt active |
| INT_PRS       | 0    | r    | Status of pressure measurement interrupt<br>0 - Interrupt not active<br>1 - Interrupt active    |

## 8.8 FIFO Status (FIFO\_STS)

FIFO status register

FIFO\_STS Address 0BH  
FIFO status register Reset value: 00H

|   |   |   |   |   |           |            |   |
|---|---|---|---|---|-----------|------------|---|
| 7 | 6 | 5 | 4 | 3 | 2         | 1          | 0 |
| - |   |   |   |   | FIFO_FULL | FIFO_EMPTY |   |
| - |   |   |   |   | L         | Y          |   |
| - |   |   |   |   | r         | r          |   |

| Field     | Bits | Type | Description                                      |
|-----------|------|------|--------------------------------------------------|
| -         | 7:2  | -    | Reserved.                                        |
| FIFO_FULL | 1    | r    | 0 - The FIFO is not full<br>1 - The FIFO is full |

|            |   |   |                                                    |
|------------|---|---|----------------------------------------------------|
| FIFO_EMPTY | 0 | r | 0 - The FIFO is not empty<br>1 - The FIFO is empty |
|------------|---|---|----------------------------------------------------|

## 8.9 Soft Reset and FIFO flush (RESET)

Flush FIFO or generate soft reset.

RESET Address: 0CH

FIFO flush and soft reset Reset value: 00H

|            |   |   |   |   |   |   |   |
|------------|---|---|---|---|---|---|---|
| 7          | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| FIFO_FLUSH | - | - | - | - | - | - | - |
| W          | - | - | - | - | - | W | - |

| Field      | Bits | Type | Description                                                                                                   |
|------------|------|------|---------------------------------------------------------------------------------------------------------------|
| FIFO_FLUSH | 7    | w    | FIFO flush<br>1 - Empty FIFO<br>After reading out all data from the FIFO, write '1' to clear all old data.    |
| -          | 6:4  | -    | Reserved.                                                                                                     |
| SOFT_RST   | 3:0  | w    | Write '1001' to generate a soft reset. A soft reset will run through the same sequences as in power-on reset. |

## 8.10 Product and Revision ID (ID)

Product and Revision ID.

ID Address 0DH

Product and revision ID Reset value: 0x10H

|         |   |   |   |        |   |   |   |
|---------|---|---|---|--------|---|---|---|
| 7       | 6 | 5 | 4 | 3      | 2 | 1 | 0 |
| PROD_ID |   |   |   | REV_ID |   |   |   |
| r       |   |   |   | r      |   |   |   |

| Field   | Bits | Type | Description |
|---------|------|------|-------------|
| PROD_ID | 7:4  | r    | Product ID  |
| REV_ID  | 3:0  | r    | Revision ID |

## 8.11 Calibration Coefficients (COEF)

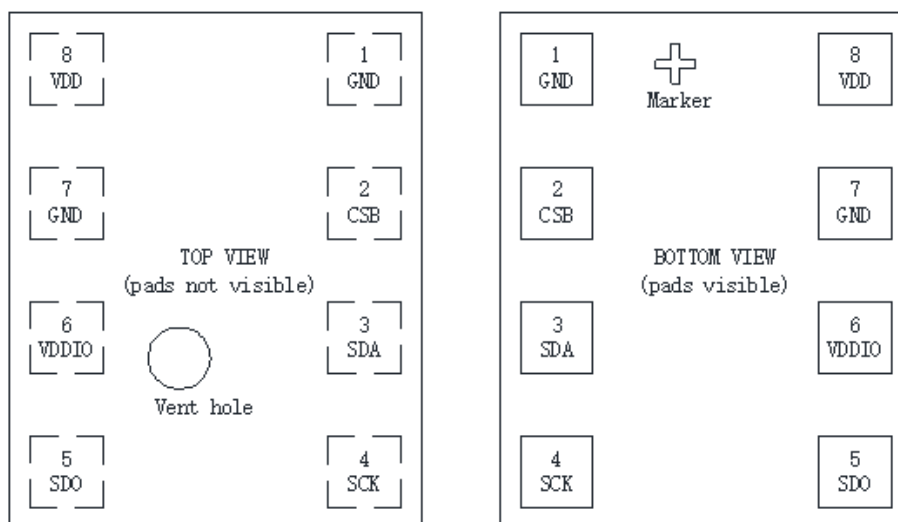
The Calibration Coefficients register contains the 2's complement coefficients that are used to calculate the compensated pressure and temperature values.

**Table 10 Calibration Coefficients**

| Coefficient | Addr. | bit7        | bit6 | bit5 | bit4 | bit3        | bit2 | bit1 | bit0 |
|-------------|-------|-------------|------|------|------|-------------|------|------|------|
| c0          | 0x10  | c0 [11:4]   |      |      |      |             |      |      |      |
| c0/c1       | 0x11  | c0 [3:0]    |      |      |      | c1 [11:8]   |      |      |      |
| c1          | 0x12  | c1[7:0]     |      |      |      |             |      |      |      |
| c00         | 0x13  | c00 [19:12] |      |      |      |             |      |      |      |
| c00         | 0x14  | c00 [11:4]  |      |      |      |             |      |      |      |
| c00/c10     | 0x15  | c00 [3:0]   |      |      |      | c10 [19:16] |      |      |      |
| c10         | 0x16  | c10 [15:8]  |      |      |      |             |      |      |      |
| c10         | 0x17  | c10 [7:0]   |      |      |      |             |      |      |      |
| c01         | 0x18  | c01 [15:8]  |      |      |      |             |      |      |      |
| c01         | 0x19  | c01 [7:0]   |      |      |      |             |      |      |      |
| c11         | 0x1A  | c11 [15:8]  |      |      |      |             |      |      |      |
| c11         | 0x1B  | c11 [7:0]   |      |      |      |             |      |      |      |
| c20         | 0x1C  | c20 [15:8]  |      |      |      |             |      |      |      |
| c20         | 0x1D  | c20 [7:0]   |      |      |      |             |      |      |      |
| c21         | 0x1E  | c21 [15:8]  |      |      |      |             |      |      |      |
| c21         | 0x1F  | c21 [7:0]   |      |      |      |             |      |      |      |
| c30         | 0x20  | c30 [15:8]  |      |      |      |             |      |      |      |
| c30         | 0x21  | c30 [7:0]   |      |      |      |             |      |      |      |

## 9. Mechanical characteristics

### 9.1 Pin configuration



**Figure 3: Layout pin configuration SPL06-001**

**Table 11: Pin configuration of SPL06-001**

| Pin | Name  | SPI 3-wire                                                  | SPI 3-wire with interrupt | SPI 4-wire               | I2C                                                | I2C with interrupt                                            |
|-----|-------|-------------------------------------------------------------|---------------------------|--------------------------|----------------------------------------------------|---------------------------------------------------------------|
| 1   | GND   | Ground                                                      |                           |                          |                                                    |                                                               |
| 2   | CSB   | Chip select – active low                                    | Chip select – active low  | Chip select – active low | Not used - open (internal pull-up) or tie to VDDIO | Not used - open (internal pull-up) or tie to VDDIO            |
| 3   | SDA   | Serial data in/out                                          | Serial data in/out        | Serial data in           | Serial data in/out                                 | Serial data in/out                                            |
| 4   | SCK   | Serial Clock                                                |                           |                          |                                                    |                                                               |
| 5   | SDO   | Not used                                                    | Interrupt                 | Serial data out          | Least significant bit in the device address        | Interrupt pin and least significant bit in the device address |
| 6   | VDDIO | Digital supply voltage for digital blocks and I/O interface |                           |                          |                                                    |                                                               |
| 7   | GND   | Ground                                                      |                           |                          |                                                    |                                                               |
| 8   | VDD   | Supply voltage for analog blocks                            |                           |                          |                                                    |                                                               |

## 9.2 Outline dimensions

The sensor housing is an 8Pin LGA package with metal lid. Its dimensions are 2.5mm ( $\pm 0.1$  mm)  $\text{L} \times$  2.0mm ( $\pm 0.1$  mm)  $\text{W} \times$  0.95mm ( $\pm 0.05$ mm)  $\text{H}$ , undeclared tolerance ( $\pm 0.1$ mm).

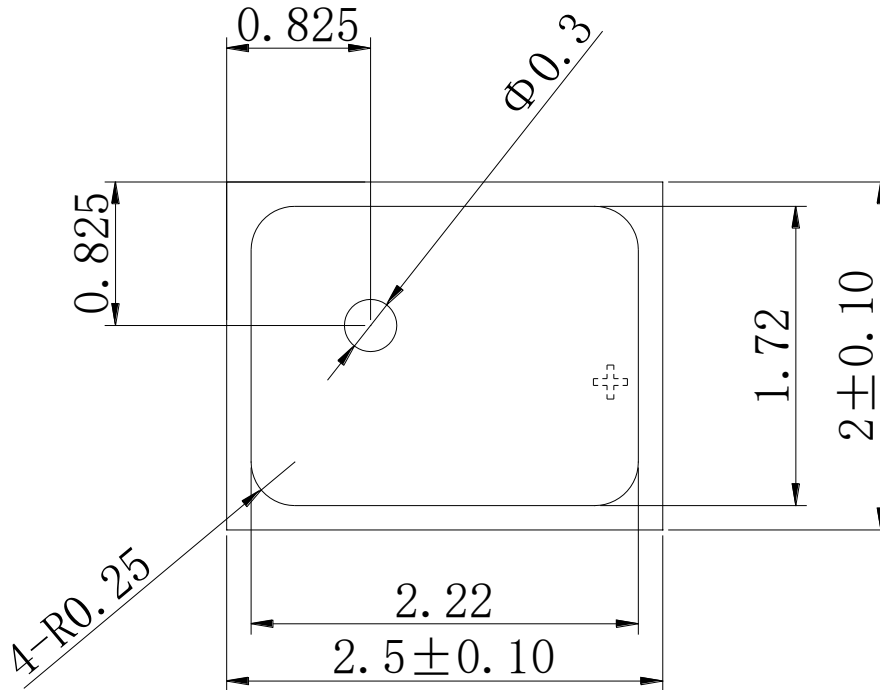


Figure 4: Top view of SPL06-001

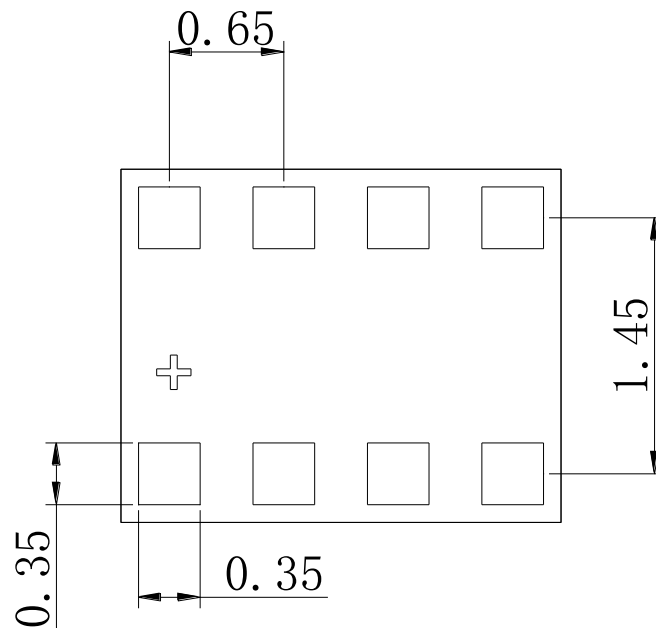


Figure 5: Bottom view of SPL06-001

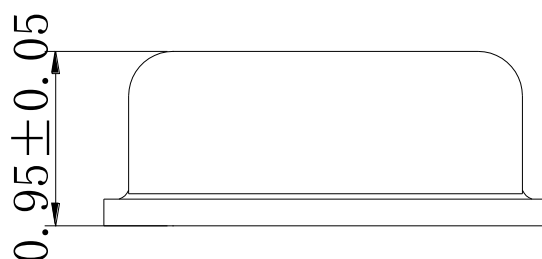
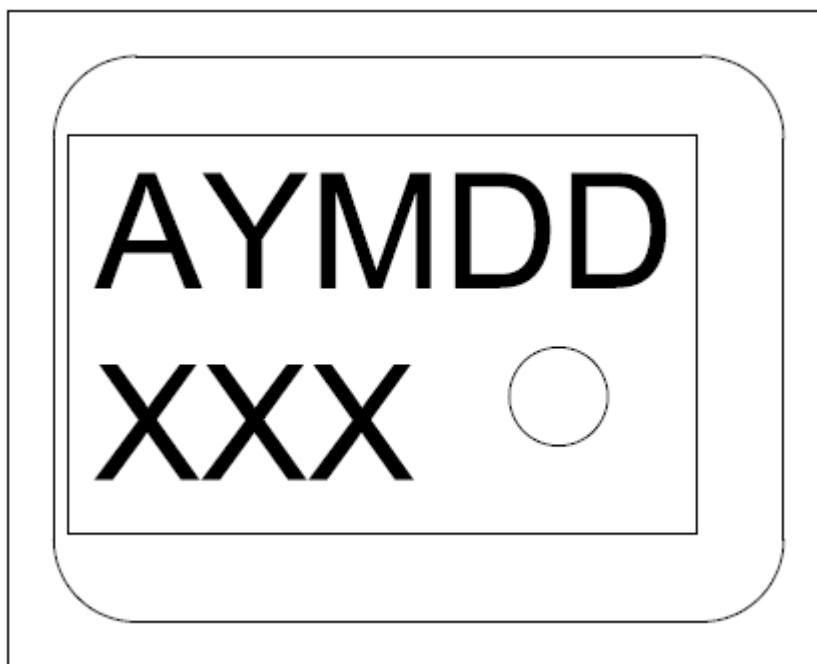


Figure 6: Side view of SPL06-001

## 9.3 Marking instructions



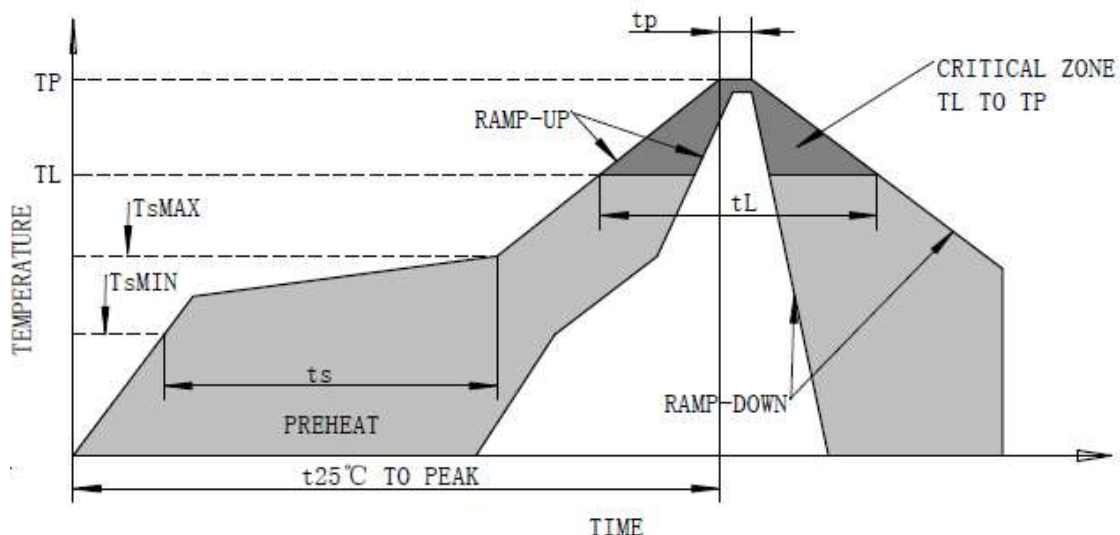
| Symbol | Meaning       | Introductions                                                        |
|--------|---------------|----------------------------------------------------------------------|
| A      | ID            | SPL06-001                                                            |
| Y      | Year          | One number, such as "5" on behalf of 2015                            |
| M      | Month         | One number, A ~ L for 1 ~ 12 month, such as "E" on behalf of May     |
| DD     | Day           | Two numbers 01 ~ 31, such as "19" on behalf of the 19th              |
| XXX    | Serial number | Three numbers 001-999, each batch of products occupy a serial number |

## 10. Storage and transportation

- Keep in warehouse with less than 75% humidity and without sudden temperature change, acid air, any other harmful air or strong magnetic field.
- The MEMS pressure sensor with normal pack can be transported by ordinary conveyances. Please protect products against moist, shock, sunburn and pressure during transportation.
- Storage Temperature Range:  $-40^{\circ}\text{C} \sim +125^{\circ}\text{C}$
- Operating Temperature Range:  $-40^{\circ}\text{C} \sim +85^{\circ}\text{C}$

## 11. Soldering recommendation

Recommended Solder Reflow



| Profile Feature                                 | Pb-Free Assembly |
|-------------------------------------------------|------------------|
| Average ramp-up rate(TsMAX to TP)               | 3°C/seconds max. |
| Preheat                                         |                  |
| -Temperature Min.(TsMIN)                        | 150°C            |
| -Temperature Max.(TsMAX)                        | 200°C            |
| -Time(TsMIN to TsMAX)(Ts)                       | 60~80seconds     |
| Time maintained above:                          |                  |
| -Temperature(TL)                                | 217°C            |
| -Time(tL)                                       | 60~150seconds    |
| Peak temperature(TP)                            | 260°C            |
| Time within 5°C of actual peak temperature(TP)2 | 20~40seconds     |
| Ramp-down rate                                  | 4°C/seconds max. |
| Time 25°C to peak temperature                   | 8 minutes max.   |

## 12. Package Specifications

Carrier Tape Information [Unit: mm]

Quantity per reel: 10kpcs.

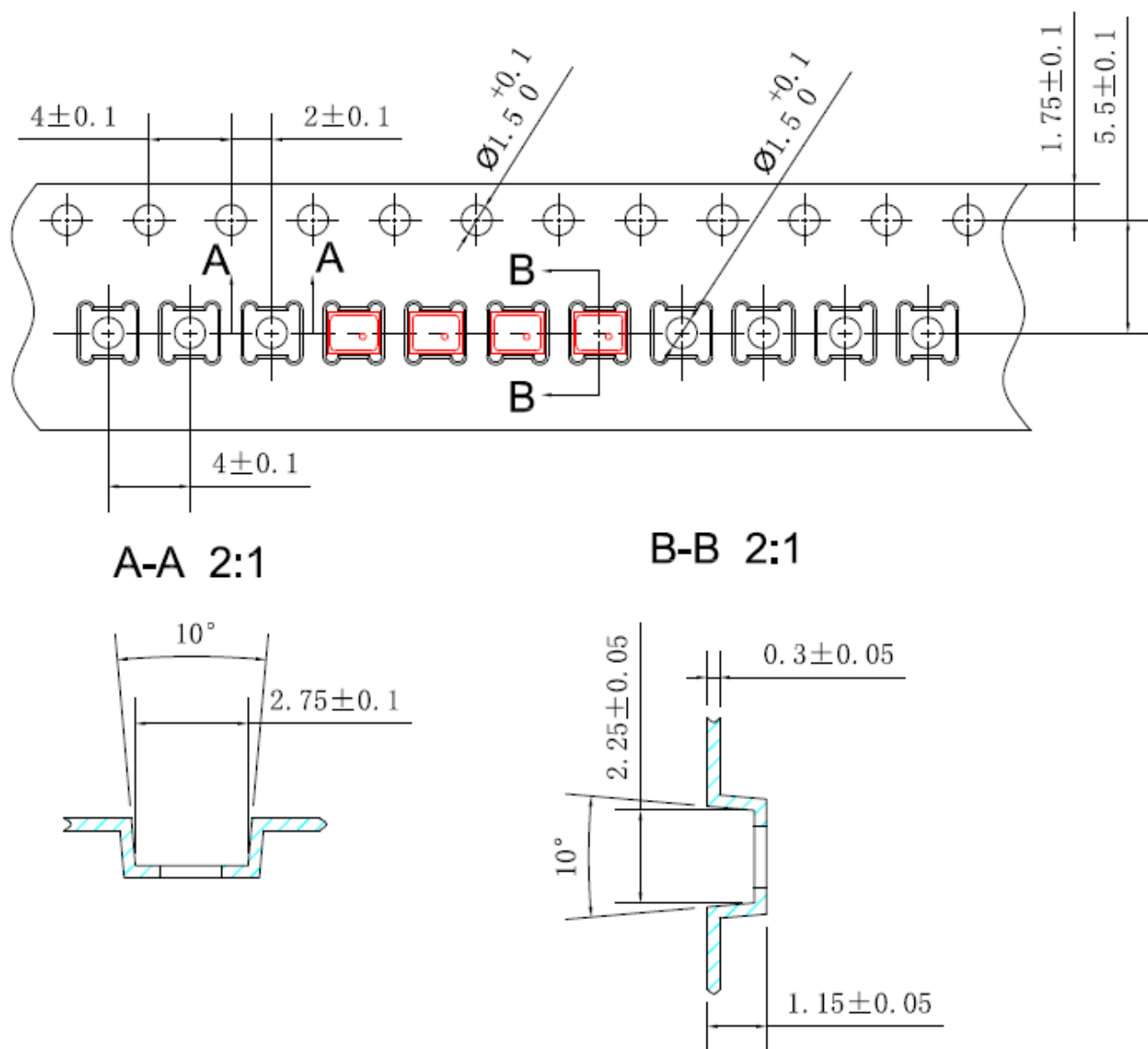


Figure 7: Carrier Tape (1)

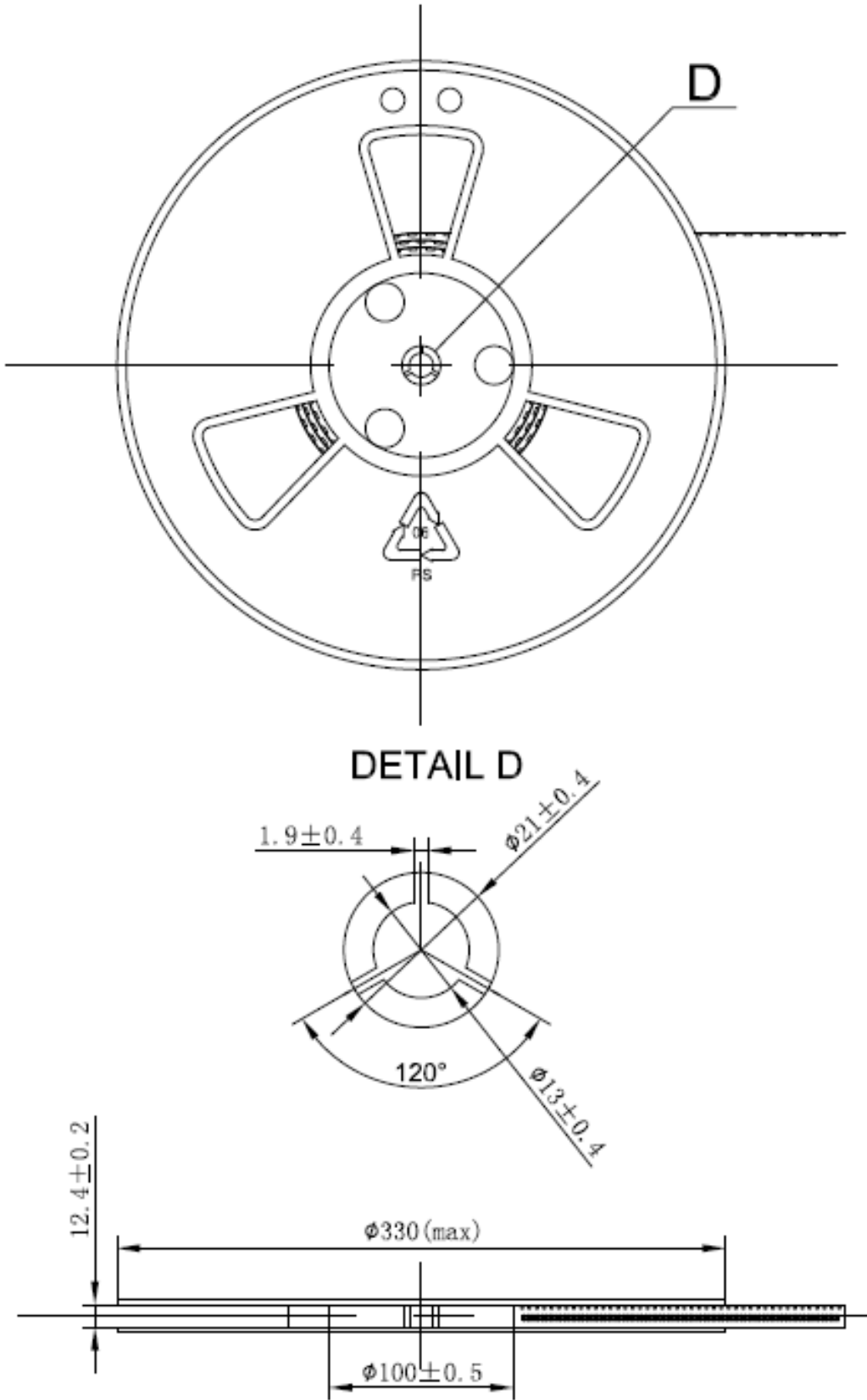
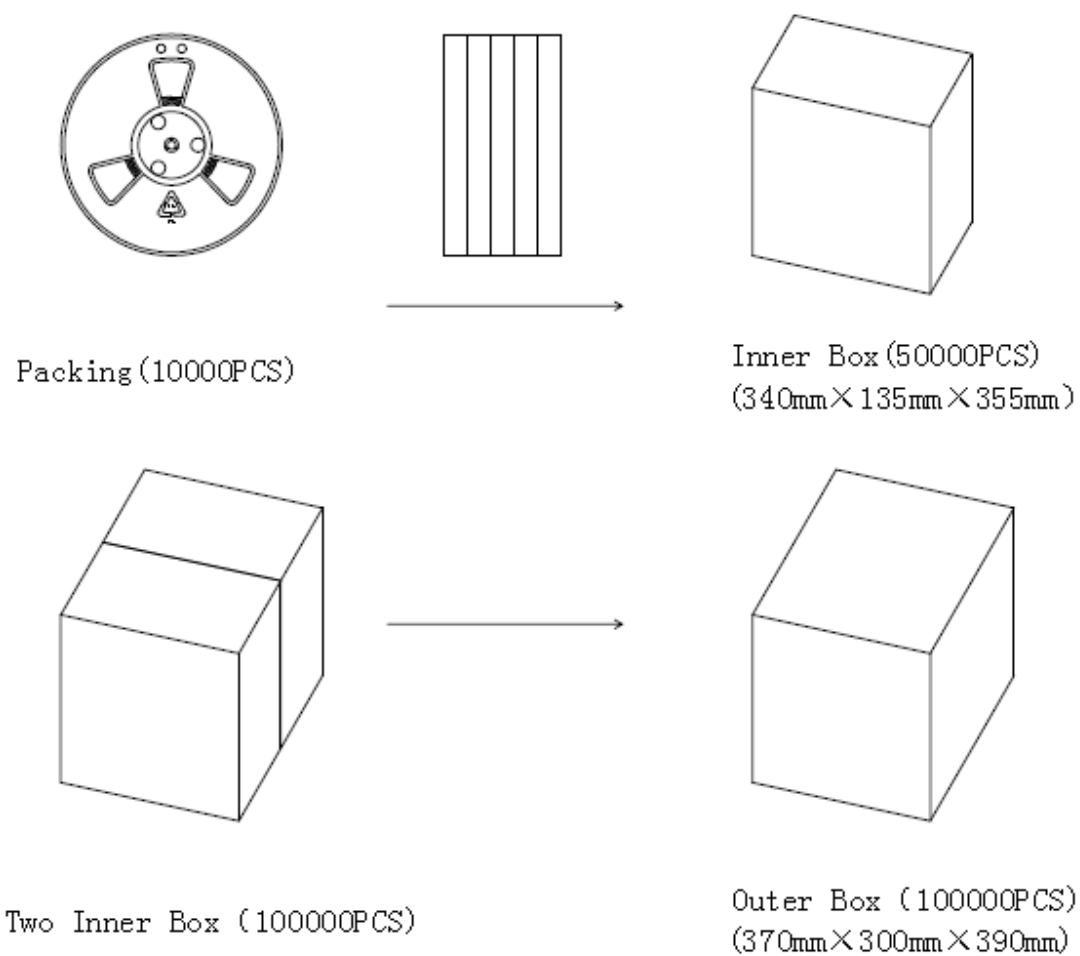


Figure 8: Carrier Tape (2)



**Figure 9: Packing Box**