2SMPB-01-01

Absolute Pressure Sensor

High accuracy and small size absolute pressure sensor with low current consumption

- **Measure absolute pressure and temperature with high accuracy.**
- **Built in low noise 24 bits ADC.**
- **Digital control and output via I2C interface**
- **Automatically power down non working circuit to minimize current consumption**
- **Individual calibration parameters stored in OTP *.**

  * One Time Programmable Non Volatile Memory

RoHS compliant

Application Example

- Smart Phone
- Activity monitor
- Wearable device

Ordering Information

■ Standard Models with Surface Mounting Terminals

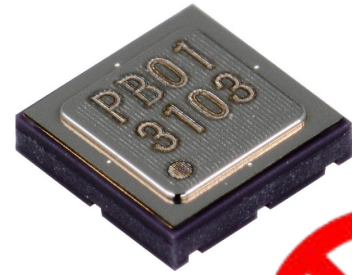| Structure	Packaging	Model	Minimum Order Quantity	Minimum Packing Unit
8-pin QFN	Tape and Reel	2SMPB-01-01-TR	1,000	1,000
	Embossed Carrier Tape	2SMPB-01-01	10	10

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Ratings, Specifications, and Function

■ Use conditions and recommended operating conditions

Type of Pressure	Absolute pressure
Medium	Air *
Operating Pressure Range	30 kPa to 110 kPa

* Never use corrosive gases.

■ Absolute Maximum Ratings

Item	Symbol	Rating	Unit	Remark
Power Supply Voltage	Vddmax	4.0	V	
Input Voltage (other than power)	Vmax	-0.2 to Vopr+0.2	V	
Maximum Pressure	Pmax	160	kPa	
Storage Temperature	Tstr	-40 to 85	°C	with no condensation or icing
Storage Humidity	Hstr	10 to 95	%RH	with no condensation

■ Operating Ratings

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Operating Voltage	Vopr	2.25	2.5	3.6	V	VDD
	Vddio	1.62	2.5	3.6	V	VDDIO
Operating Temperature	Topr	-40	-	85	°C	

■ Electrical Characteristics (At Ta = 25°C, VDD = 2.5 V, unless otherwise noted)

Item	Name	Min.	Typ.	Max.	Unit	Remarks
Average Current *	Ihp	-	9	-	µA	1 sample/s High accuracy mode
Current Consumption	Idd	-	500	610	µA	
Sleep Mode Current Consumption	Isleep	-	0.3	0.6	µA	
Measureable Pressure Range	Popr	30	-	110	kPa	
Absolute Pressure Accuracy *	Pabs1	-750	-	750	Pa	70 k to 110 kPa High accuracy mode
Relative Pressure Accuracy *	Prel1	-	6	-	Pa	70 k to 110 kPa High accuracy mode
rms Noise *	Pnois	-	2	-	Pa	70 k to 110 kPa High accuracy mode
Absolute Temperature Accuracy	Tabs	-2	-	2	°C	
Pressure Resolution *	Pres	-	0.06	-	Pa	High accuracy mode
Temperature Resolution *	Tres	-	0.0002	-	°C	High accuracy mode
Discharge time of VDD *	Toff	-	60	-	sec	Time@ VDD From 2.5 V to 0.01 V

* These characteristics are guaranteed by design.
Note: Above table shows the characteristics without mounting board.
       Please confirm performance of this sensors in your application and use your own judgment to determine the appropriateness of using them in such application.

■ I2C Characteristics (At Ta = 25°C, VDD = 2.5 V, unless otherwise noted)

Item	Name	Standard Mode		Fast Mode		Unit	Remark
		MIN.	MAX.	MIN.	MAX.		
SCLK Clock Frequency	fscl	-	100	-	400	kHz	
Digital Input L (I2C)	Vil2	-0.2	VDD×0.2	-0.2	VDD×0.2	V	
Digital Input H (I2C)	Vih2	VDD×0.8	VDD+0.2	VDD×0.8	VDD+0.2	V	
Digital Output L (I2C)	Vol2	0	0.4	0	0.4	V	
Pull-up Resister	Rpullup	2.2	10	2.2	10	kΩ	
Capacitive Load	Cb	-	400	-	400	pF	
Power On Supply Startup Waiting Time	Tpor	-	0.8	-	0.8	msec	
Power On Start Up Time	tstart	-	2	-	2	msec	
Pulse Width of Asynchronous Reset	trar	100	-	100	-	µsec	

Power On Reset
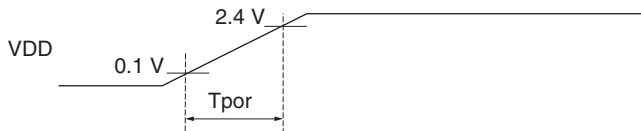
Note 1: When the power is turned on, please activate power on reset.
For more information, please refer to the section of "Power on Reset" (p. 8).
Note 2: About detailed I2C bus information, please refer to the I2C-bus specification and user manual presented by NXP.

■ Characteristics by Power Mode

Mode *1	Waiting Time [msec] *2	Average Current @1 sample/s [µA] *2	rms Noise [Pa] *2
Low power mode	7	4	6
Standard mode	9	5	3
High accuracy mode	17	9	2

*1.   Please see "I2C_SREQ: Sensor Request Register" (p. 13) for setting up power mode.
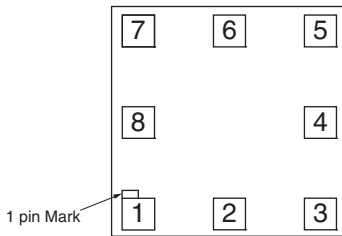*2.   Please see "Execute timing chart" (p. 6) for meaning of waiting time. These characteristics are guaranteed by design.
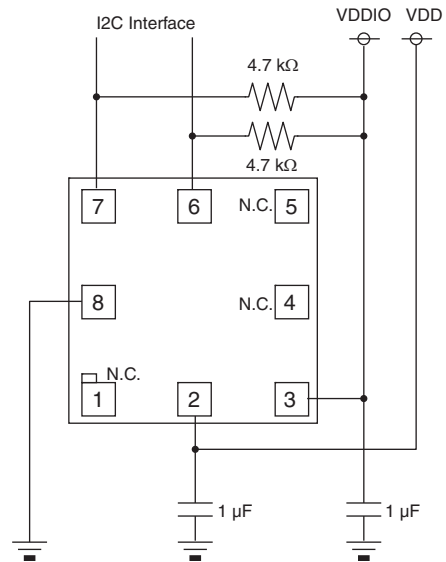
Connection

■ Block Diagram
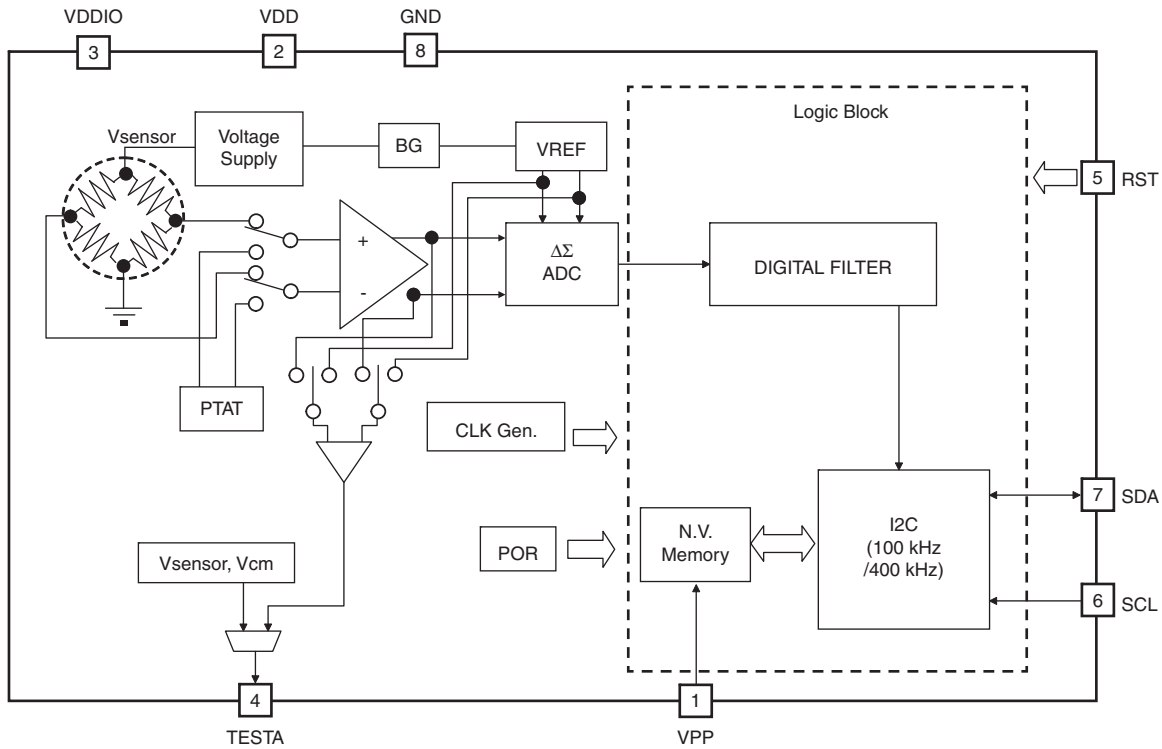
■ Pin Description and Layout (Top view)

Pin No.	Symbol	Description
1	VPP	OTP write enable *
2	VDD	Power
3	VDDIO	Digital I/O Power
4	TESTA	Analog out for test *
5	RST	Asynchronous reset
6	SCL	I2C clock
7	SDA	I2C data
8	GND	Ground

* These pins are for test purpose only.
  Please leave open (Non-connect) while operating.

■ Typical Connection
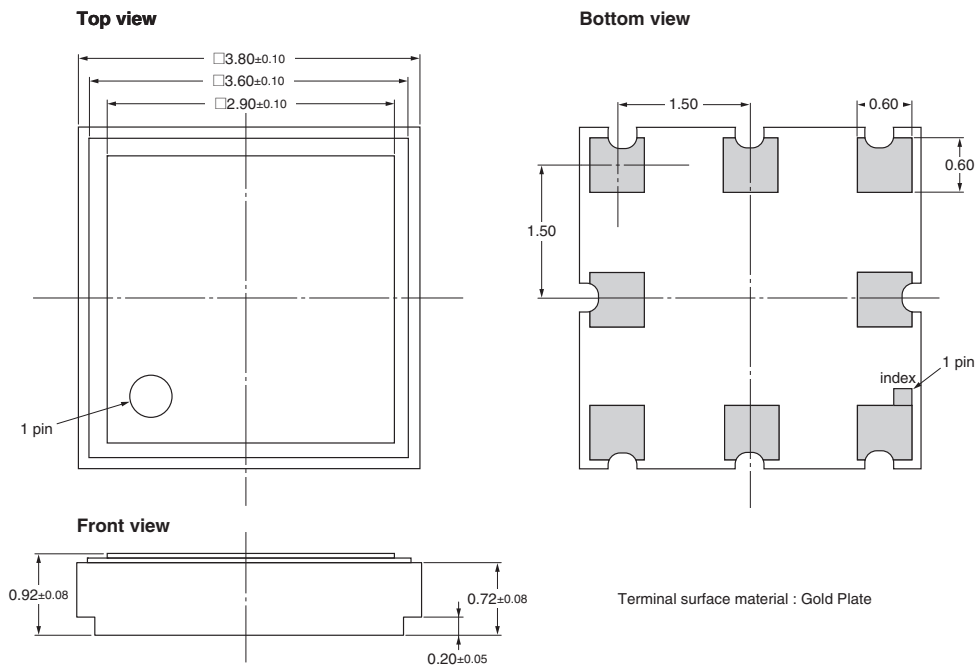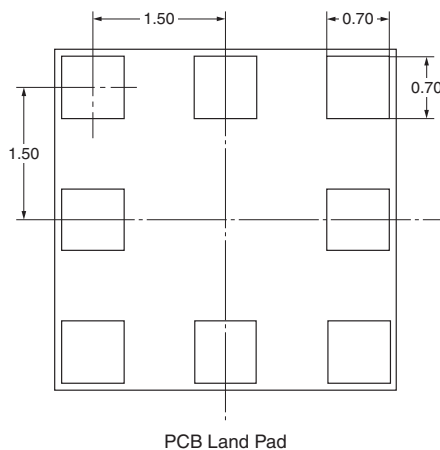
Pressure Sensor

Dimensions (Unit: mm)

■ Package

Package Type: QFN (Quad Flat No-lead package) 8 pin
Package Size: 3.8 mm × 3.8 mm × 1.0 mm (max.)

■ Outline Dimension

Top view

□3.80±0.10
□3.60±0.10
□2.90±0.10

1 pin

Bottom view

1.50   0.60
0.60
1.50
1 pin
index

Front view

0.92±0.08   0.72±0.08
0.20±0.05

Terminal surface material : Gold Plate

■ Mounting PAD Dimensions (Top View) : recommended

1.50   0.70
0.70
1.50

PCB Land Pad

■ Marking structure

P B 0 1 (Type : Fixed)

× × × ×

→ Sequence number (from 0 to 9, from A to Z (without O, Q, I))

→ Week of manufacture (from 01 to 5*)

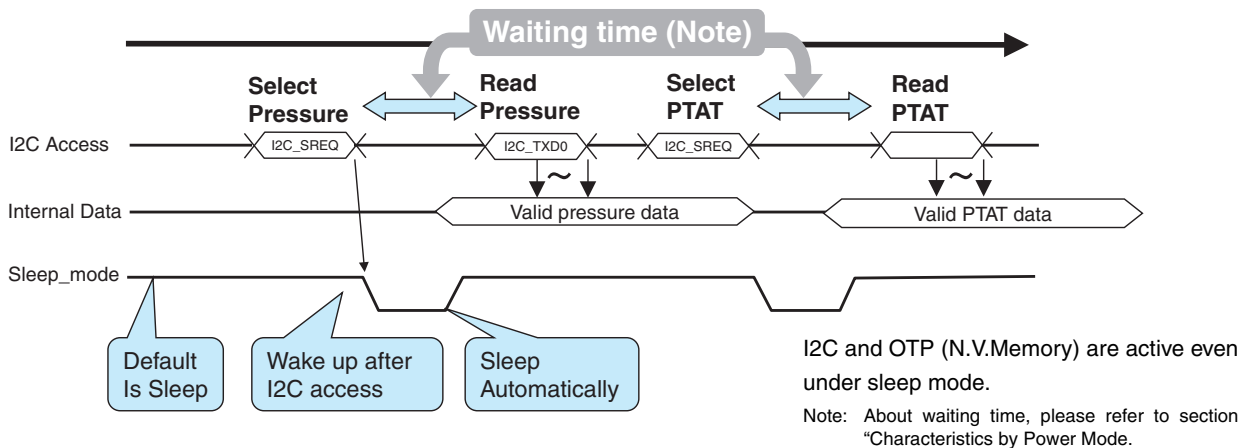→ Year of manufacture (One digit at the end of the year)

Pressure Sensor

Operations

■ Outline of Sensor Operation

This page describes the typical operation after power on.

1. Wait until OTP initialization. (waiting for OTP automatically initialize finish)
2. Start-up ADC by setting up I2C_SETUP register
   - Write 02h in I2C_SETUP register.
3. Access COE_* registers and get calibration parameters.
   - Write 25h in I2C_AADJ register to enable OTP read operation.
   - Access COE_* registers and get calibration data.
   - After completion of read operation, write 65h to I2C_AADJ register.
4. Set up I2C_SREQ register to enable temperature measurement.
5. Get temperature data from I2C_TXD0 register after waiting time.
6. Set up I2C_SREQ register to enable pressure measurement.
7. Get pressure data from I2C_TXD0 register after waiting time.
8. Correct measured data with calibration data got at step 3.
9. Repeat 6 to 8. May need step 4, 5, and 8 when ambient temperature is changed.

Execute timing chart

Default Is Sleep

Wake up after I2C access

Sleep Automatically

I2C and OTP (N.V.Memory) are active even under sleep mode.

Note: About waiting time, please refer to section "Characteristics by Power Mode."

■ Outline of Sleep Operation

Sleep operation of this sensor is controlled by start/stop internal clock.

- System will automatically stop clock and sleep after completion of analog to digital conversion.
- ADC and Digital Filter Block are powered down while sleeping.
- Other part such as OTP (N.V.Memory) and I2C continue working during sleep, then can communicate outside via I2C interface.
- ADC and Digital Filter Block can be awaken by I2C_SREQ bit 4 (ACTBIT) = "1".

Pressure Sensor

■ Compensation of pressure and temperature

```
                    ┌─────────────┐
                    │    START    │
                    └──────┬──────┘
                           │
                           ▼
              ┌────────────────────────┐        ▆▆▆▆▆  : Read Values through I2C I/F
              │ (1) Read Calibration Data │
              │    from N.V Memory        │        ▢▢▢▢▢  : Calculate outside MCU
              └────────────┬──────────────┘
                           │
                           ▼
              ┌────────────────────────┐
              │ (2) Read Uncompensated  │
              │    Temperature Value    │
              └────────────┬────────────┘
                           ▼
              ┌────────────────────────┐
              │ (3) Read Uncompensated  │
              │    Pressure Value       │
              └────────────┬────────────┘
                           ▼
              ┌────────────────────────┐
              │ (4) Compensate          │
              │    Temperature Value    │
              └────────────┬────────────┘
                           ▼
              ┌────────────────────────┐
              │ (5) Compensate          │
              │    Pressure Value       │
              └────────────┬────────────┘
```
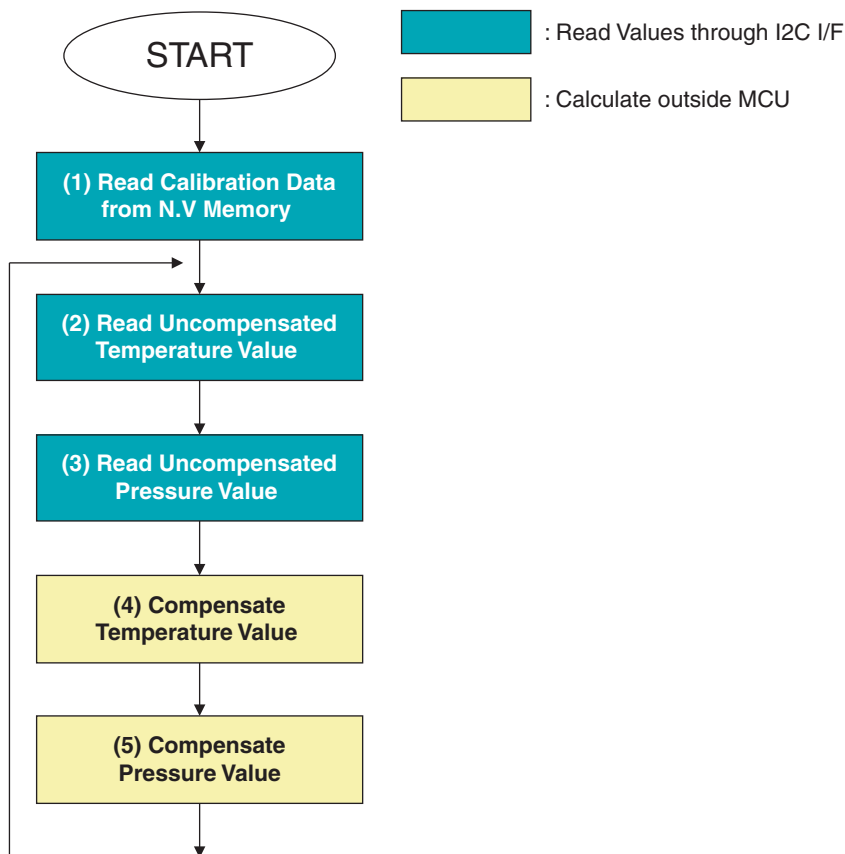
- Read calibration data which are contained in internal NVM through I2C.
  These coefficients are used at compensation calculation below step (4) or step (5).
- Read temperature data which are output by absolute pressure sensor through I2C.
  This temperature data is used at step (4) using coefficients of step (1) for compensation.
- Read pressure data which are output by absolute pressure sensor through I2C.
  This pressure data is used at step (5) using coefficients of step (1) for compensation.
- Using coefficients of step (1) and temperature data of step (2), the operator corrects temperature data by using following temperature compensation formula.

$$Tr = (Dt - ca) \times ba0$$
$$\quad = (Dt - ca) \times ba \times 2^{-19}$$

    Tr: Calculation result [1/256°C]

    Dt: 2SMPB-01 digital output of temperature (internal) [digit]

    ba: 2SMPB-01 calibration coefficient (16 bits read value of COE_PTAT2 Reg)

    ca: 2SMPB-01 calibration coefficient (24 bits read value of COE_PTAT3 Reg and COE_CEX Reg)

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Pressure Sensor

• Using coefficients of step (1) and pressure data of step (3), the operator corrects pressure data by using following pressure compensation formula.

$$Pl = (Dp - cp) \times bp0$$
$$= (Dp - cp) \times bp \times 2^{-19}$$

Pl: Calculation result. This result is a relative value from 90 kPa. [Pa]

Dp: 2SMPB-01 digital output of pressure [digit]

bp: 2SMPB-01 calibration coefficient (16 bits read value of COE_PR2 Reg)

cp: 2SMPB-01 calibration coefficient (24 bits read value of COE_PR3 Reg and COE_CEX Reg)

The next by using the result data of step (4), the operator corrects pressure data temperature compensation.

$Ta \geqq 25$ [°C]

$$Po = Pl + 90000 + (Pl + 90000)(ct0 + bt0 \times Tr) - 90000$$
$$= Pl + 90000 + (Pl + 90000)(ct \times 2^{-18} + bt \times 2^{-31} \times Tr) - 90000$$

$Ta < 25$ [°C]

$$Po = Pl + 90000 + (Pl + 90000)(ct20 + bt20 \times Tr) - 90000$$
$$= Pl + 90000 + (Pl + 90000)(ct2 \times 2^{-18} + bt2 \times 2^{-31} \times Tr) - 90000$$

Note: Temperature calibration of the pressure is calculated after converting to absolute pressure value because Pl is a relative value from 90 [kPa].

Po: Final compensated result. This result is a relative value from 90 kPa. [Pa]

bt: 2SMPB-01 calibration coefficient (16 bits read value of COE_TEMP2 Reg)

ct: 2SMPB-01 calibration coefficient (16 bits read value of COE_TEMP3 Reg)

bt2:   2SMPB-01 calibration coefficient (16 bits read value of COE_TEMP22 Reg)

ct2:   2SMPB-01 calibration coefficient (16 bits read value of COE_TEMP23 Reg)

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Pressure Sensor

■ Power on Reset

Power-on reset circuit of 2SMPB-01 is using the CR delay. Therefore power-on reset is not working properly on below situations.

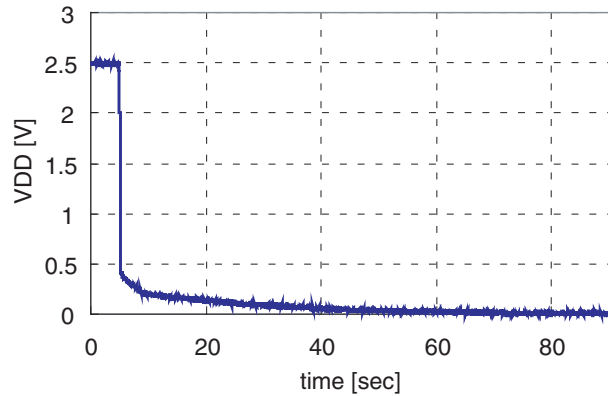At the time of the following circumstances when power is switched on again:

- The potential of the VDD pin is not 0 volt.
- The instantaneous voltage drop occurs in the VDD pin.

Circuit diagram of a power-on reset and discharge characteristics of the VDD pin are as follow.
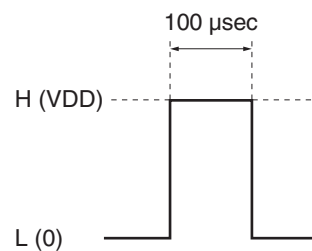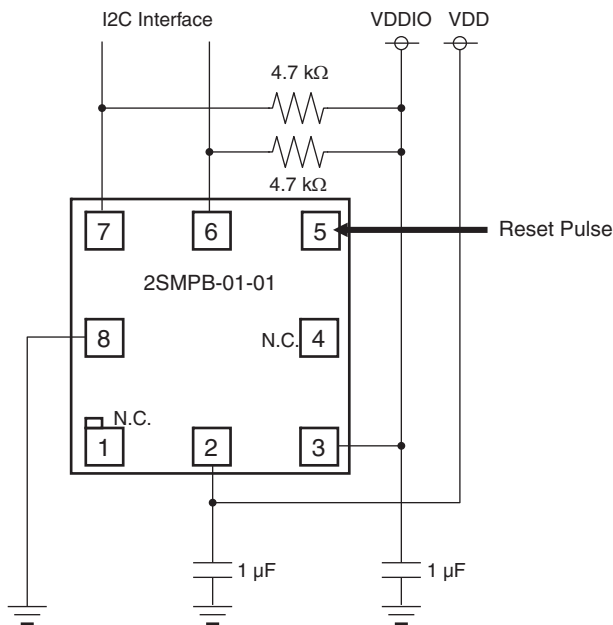
Power On Reset Circuit
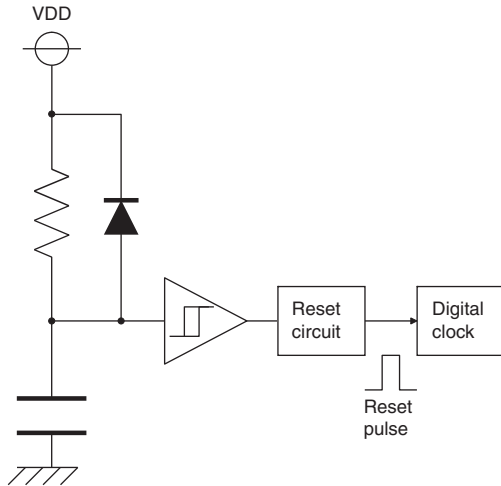
Discharge characteristic of VDD Terminal (VDD Terminal OPEN at OFF)

When the power is turned on, the power-on reset should be activated. If the power-on reset is not working properly, it can be returned to normal operation by executing reset using the asynchronous reset pin, hardware reset or software reset.

Example of reset using the asynchronous reset pin

Note: Please fix the No.5 pin into Low during normal operation.

Examples of the reset pulse
(reset at the potential of High)
Pulse width : 100 µsec. or more

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Pressure Sensor

Example of the software reset

No.	Register	Operation	Write address	I2C Order MCU Operation	Explanation
1	0x05	Read		(search slave address of module by I2C_FIND0) Note: Refer to the next section of sequence for searching the slave address	Run for the searched slave address below. The searched slave address is shown as Y.
2	0x03	Write	0x10	Write 0x10 to slave address Y, resister address 0x03	Single operation Setting low power mode for for clear early
3				Waiting 20 msec or more	
4	0x05	Read		Find the slave address of the module using the I2C_FIND0 register Note: For details, see sequence for searching the slave address in next section	Run for the slave address that searched, slave address is Y
5	0x04	Write	0x50	Write 0x50 to slave address Y, resister address 0x04	To ASIC forced mode of operation (internal clock starts oscillating) => It is required for writing to 0x07 address
6	0x0A	Write	0x02	Write 0x02 to slave address Y, resister address 0x0A	Normal initialization of Setup register
7	0x0C	Write	0x00	Write 0x00 to slave address Y, resister address 0x0C	Normal initialization of IOTEST register
8	0x08	Write	0x25	Write 0x25 to slave address Y, resister address 0x08	Change AADJ resister, transision to OTP read mode
9				Waiting 10 msec or more	Waiting of transission to OTP read mode (Waiting time can afford)
10	0x09	Write	0x22	Write 0x22 to slave address Y, resister address 0x09	Normal initialization of WAKEUP register
11	0x30	Read		Read 16 bit from slave address Y, resister address 0x30, and save as Z upper 8 bits.	Trimming value of W/T results acquisition Note: It is required OTP read mode on 8 Address of Z are 0x01, 0x02, 0x03...0x0F.
12	0x07	Write		Write Z to slave address Y, resister adress 0x07	In particular, run the I2C communication less than 100 kHz. Henceforth, slave address return 0x70.
13	0x04	Write	0x10	Write 0x10 to slave address 0x70, resister address 0x04	Normal initialization of MODESEL register ASIC ; sleep mode, DSP ; nomal mode
14	0x08	Write	0x65	Write 0x65 to slave address 0x70, resister address 0x08	Normal initialization of AADJ register
15	0x03	Write	0x16	Write 0x16 to slave address 0x70, resister address 0x03	Single operation on high accuracy mode
16				Waiting 20 msec or more	
17				Reset program of absolute pressure sensor module termination	

Sequence for searching the slave address

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Pressure Sensor
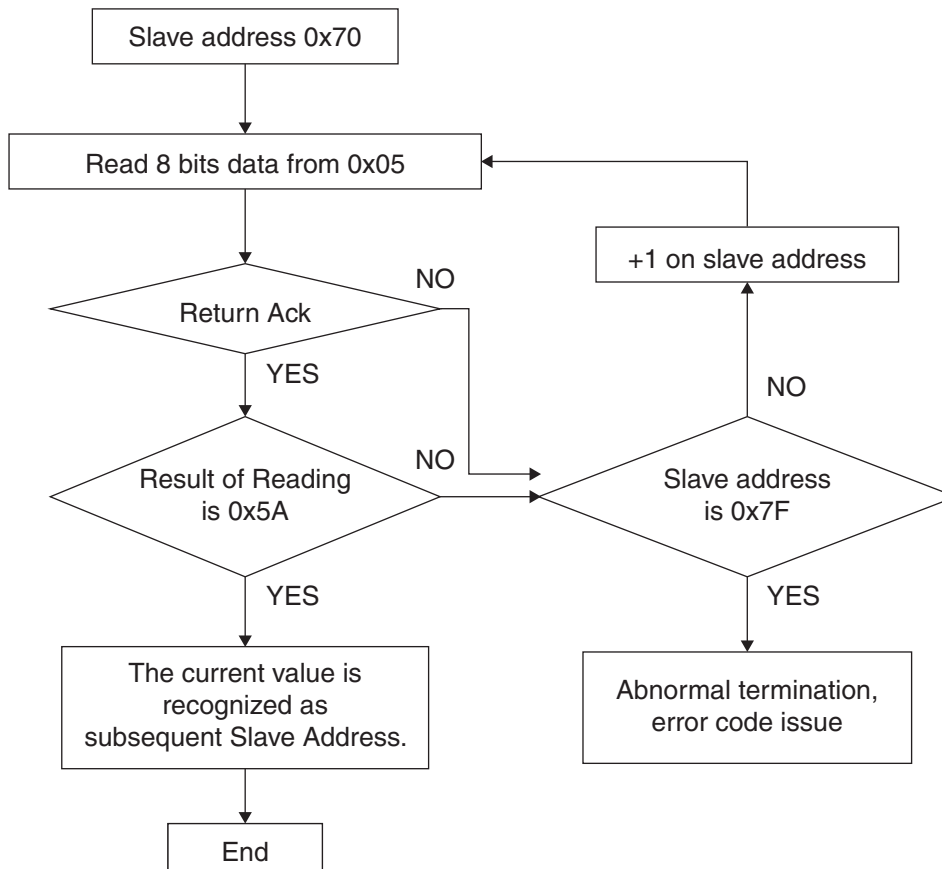
I2C Protocol

■ About I2C Slave Address

The 2SMPB-01-01 module I2C slave address is shown below.

Bit	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
	Add [6]	Add [5]	Add [4]	Add [3]	Add [2]	Add [1]	Add [0]	R/W
Value	1	1	1	0	0	0	0	1 / 0

Write Access : Please set LSB of slave address as "0", and this byte is E0h (1110_0000b). (70h << 1 + WR (0))

Read Access : Please set LSB of slave address as "1", and this byte is E1h (1110_0001b). (70h << 1 + RD (1))
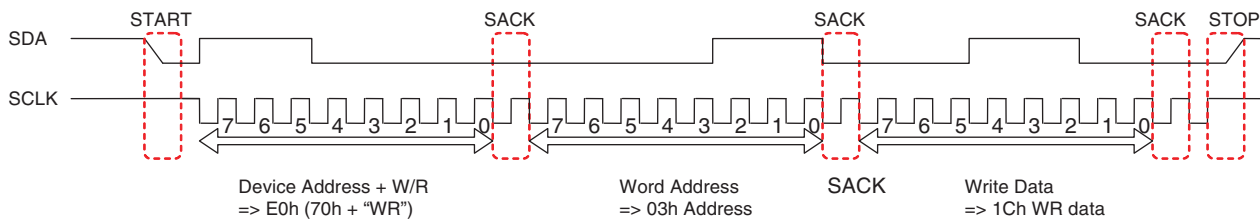
■ I2C Access Protocol Examples

Symbol

- START : START condition
- STOP : STOP condition
- Re-START : Re-START condition for Read
- SACK : Acknowledge by Slave
- MACK : Acknowledge by Master
- MNACK : Not Acknowledge by Master

(1) Register Write Access Protocol

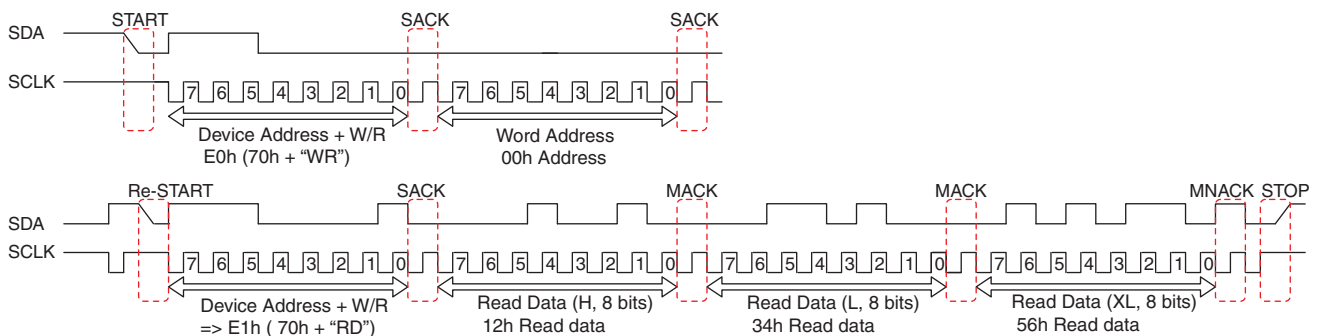**(Application: Addresses other than OTP Registers (20h - 34h))**

Example: Write data (8 bits) to address (03h)

(2) Register Read Access Protocol

(Application: Pressure/Temperature Data Register = I2C_TXD0)

Example: Read pressure data (24 bits) from I2C_TXD0=address (00h).

Pressure/Temperature data consists of 24 bits and output as three blocks of 8 bits.

Data will be output as H, L and XL order and each 8 bits also output as MSB first.
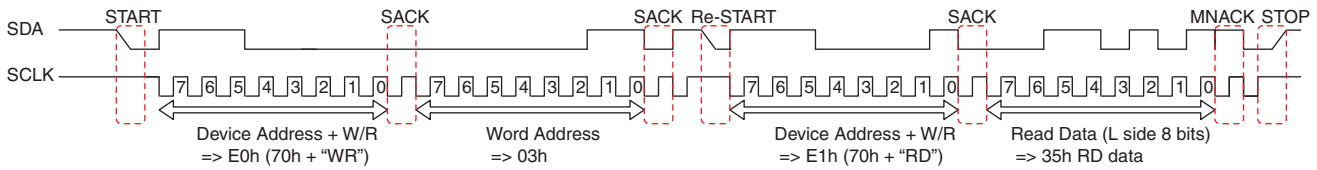
24 bits data format is below.

Bit	Bit23	...	Bit16	Bit15	...	Bit8	Bit7	...	bit0
Data		Read Data H			Read Data L			Read Data XL	

In order to read only data (L) or data (XL), use next protocol (3).

(3) Register Read Access Protocol
(Application: Addresses other than OTP Registers (20h - 34h), I2C_TXD0.)
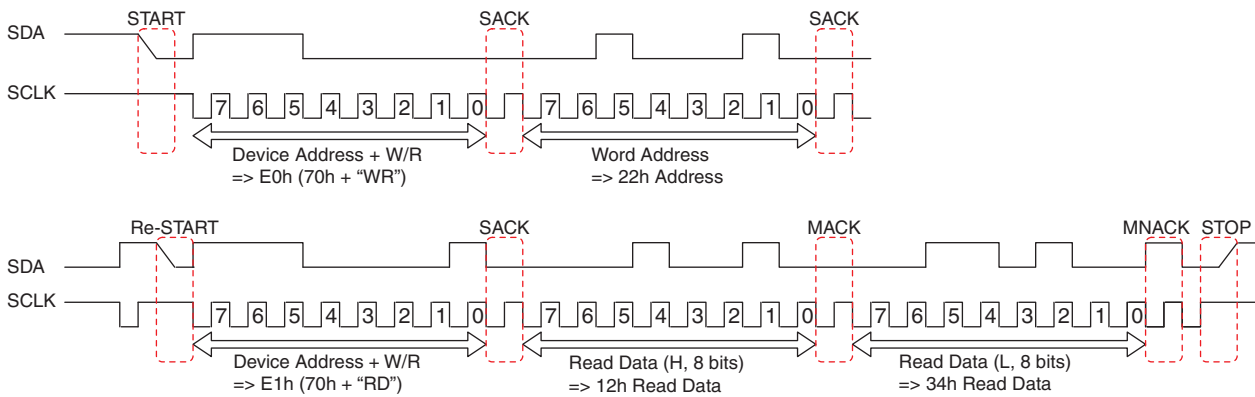
Example: Read data (8 bits) from I2C_SREQ = address (03h)

Each 8 bits data will be output as MSB first.

(4) Register Read Access Protocol
(Application: OTP Registers (20h - 34h))

Example: Read calibration data (16 bits) from COE_PR2 = address (22h).

Set VBGACT bit "L" of I2C_AADJ before this operation.
Each 8 bits data will be output as MSB first.

■ I2C Register

Register Name	Address	Bits	R/W	Default	Contents
I2C_TXD0	00h	8 bits	R/-	00h	Data Register MSB (24-17 bits)
I2C_TXD1	01h	8 bits	R/-	00h	Data Resister LSB (16-9 bits)
I2C_TXD2	02h	8 bits	R/-	00h	Data Resister XLSB (8-1 bits)
I2C_SREQ	03h	8 bits	R/W	00h	Sense Request
I2C_AADJ	08h	8 bits	R/W	65h	OTP Read Register
I2C_SETUP	0Ah	8 bits	R/W	00h	Setup Register
COE_PR2	22h	16 bits	R/-	00h	Pressure Linearity Calib.2: 1st Coefficient
COE_PR3	24h	16 bits	R/-	00h	Pressure Linearity Calib.3: offset
COE_TEMP2	26h	16 bits	R/-	00h	Temp Calibration 2: 1st Coefficient
COE_TEMP3	28h	16 bits	R/-	00h	Temp Calibration 3: offset
COE_TEMP22	2Ah	16 bits	R/-	00h	Temp Calibration 2-2: 1st Coefficient-2
COE_TEMP23	2Ch	16 bits	R/-	00h	Temp Calibration 2-3: offset-2
COE_PTAT2	2Eh	16 bits	R/-	00h	PTAT Linearity Calib.2: 1st Coefficient
COE_PTAT3	32h	16 bits	R/-	00h	PTAT Linearity Calib.3: offset
COE_CEX	34h	16 bits	R/-	00h	Pressure & PTAT Linearity extend bits Bit [15:8] => COE_PR3 extend bit [23:16] Bit [7:0] => COE_PTAT3 extend bit [23:16]

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ressure Sensor

I2C_TXDx: **Sensor Data TXD0 (Address = 00h), TXD1 (Address = 01h) or TXD2 (Address = 02h)**

Bit	bit23	bit22	bit21	...	bit2	bit1	bit0
R/W	R/-	R/-	R/-	...	R/-	R/-	R/-
Initial	0	0	0	...	0	0	0

ADC output is stored with 22 to 24bit accuracy which depend on power mode.

Data can be retrieved as 24 bits by one operation. If data consists of less than 24 bits, additional "0" will be filled as shown in the table below. The data are read out in an unsigned.

I2C_TXD0 address can be accessed by memory map method.

Bit	23	22	21	...	3	2	1	0
22 bits data (Low power mode)	valid	valid	valid	...	valid	valid	0	0
24 bits data (Standard & High Accuracy mode)	valid	valid	valid	...	valid	valid	valid	valid

I2C_SREQ: **Sensor Request Register (Address = 03h)**

Bit	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
R/W	Resv	Resv	R/-	-/W	R/W	R/W	R/W	R/W
Initial	0	0	0	0	0	0	0	0

Bit7	Reserved	Reserved. Set "0" when write register I2C_SREQ
Bit6	Reserved	Reserved. Set "0" when write register I2C_SREQ

Bit5	Sleep state (SLEEPST)	Indicate operation mode while reading.
		  1: sleep mode
		  0: operating mode
		Set "0" when write register I2C_SREQ

Bit4	Wake up request (ACTREQ)	Control sleep mode.
		Set "1" when write register I2C_SREQ.
		  1: Awaken the system
		  0: Not awaken the system

Bit3 to 1	Mode select	Select measurement mode. "0_0_0" Low power mode "0_1_0" Standard mode "0_1_1" High accuracy mode

Bit0	Sensor select (PTATSEL)	Sensor Input Select
		  1: PTAT
		  0: Pressure (Default)

Note: Proper operation will not be assured with bit combination not specified above.

I2C AADJ: **OTP Read Register (Address = 08h)**

Bit	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
R/W	Resv	R/W	Resv	Resv	Resv	Resv	Resv	Resv
Initial	0	1	1	0	0	1	0	1

Bit7	Reserved	Reserved. Set "0" when write register I2C_ADDJ
Bit6	OTP Read Mode (VBGACT)	0: OTP Read Enabled 1: OTP Read Disabled (Default)
Bit5 to 4	Reserved	Reserved. Set "1_0" when write register I2C_ADDJ.
Bit3 to 2	Reserved	Reserved. Set "0_1" when write register I2C_ADDJ.
Bit1 to 0	Reserved	Reserved. Set "0_1" when write register I2C_ADDJ.

Note: Proper operation will not be assured with bit combination not specified above.

I2C_SETUP: Set Up Register (Address = 0Ah)

Bit	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
R/W	Resv	Resv	Resv	Resv	Resv	Resv	R/W	R/W
Initial	0	0	0	0	0	0	1	0

bit7 to 2	Reserved	Reserved. Set "0" when write register I2C_SETUP
bit1 to 0	Setup	ADC Power Up Mode "1_0": Start ADC Setup (Default) "0_0"/"0_1"/"1_1": Please DO NOT USE

Note 1:   This set-up is required to start ADC operation.
Note 2:   Proper operation will not be assured with bit combination not specified above.

COE_PR*:   Calibration Data Register for Pressure Linearity (OTP Register) (Address = 22h to 24h)

Bit	bit15	bit14	bit13	...	bit3	bit2	bit1	bit0
R/W	R/-	R/-	R/-	...	R/-	R/-	R/-	R/-
Initial	0	0	0	...	0	0	0	0

Read only. Calibration data is stored.

The data are read out in an unsigned.

I2C_AADJ bit6 (VBGACT bit) should be set to "0" to enable read operation of these OTP registers.

COE_TEMP*:   Calibration Data Register for Temperature Correction of Pressure (OTP Register) (Address = 26h to 2Ah)

Bit	bit15	bit14	bit13	...	bit3	bit2	bit1	bit0
R/W	R/-	R/-	R/-	...	R/-	R/-	R/-	R/-
Initial	0	0	0	...	0	0	0	0

Read only. Calibration data is stored.

The data are read out in an unsigned.

I2C_AADJ bit6 (VBGACT bit) should be set to "0" to enable read operation of these OTP registers.

COE_PTAT*:   Calibration Data Register for PTAT Linearity (OTP Register) (Address = 2Ch to 32h)

Bit	bit15	bit14	bit13	...	bit3	bit2	bit1	bit0
R/W	R/-	R/-	R/-	...	R/-	R/-	R/-	R/-
Initial	0	0	0	...	0	0	0	0

Read only. Calibration data is stored.

The data are read out in an unsigned.

I2C_AADJ bit6 (VBGACT bit) should be set to "0" to enable read operation of these OTP registers.

COE_CEX: Calibration Data Register for Extend Bits for PR3 & PTAT3 (OTP Register) (Address = 34h)

Bit	bit15	bit14	bit13	...	bit3	bit2	bit1	bit0
R/W	R/-	R/-	R/-	...	R/-	R/-	R/-	R/-
Initial	0	0	0	...	0	0	0	0

Read only. Calibration data is stored.

The data are read out in an unsigned.

Bit15 to 8: These bits are extend bits of COE_PR3 register.

Bit7 to 0: These bits are extend bits of COE_PTAT3 register.

I2C_AADJ bit6 (VBGACT bit) should be set to "0" to enable read operation of these OTP registers.

This announcement is based on product catalogue information previously shown before its discontinuation
Product information of the existing product may be different from the previous version

Packaging

Model	Packaging	Minimum Order Quantity	Minimum Packing Unit
2SMPB-01-01-TR	Tape and Reel	1,000	1,000
2SMPB-01-01	Embossed Carrier Tape	10	10

■ 2SMPB-01-01-TR / Tape and Reel

Configuration of shipment

Packaging	Embossed Carrier Tape
Quantity	SPQ 1,000 pcs Max. 5,000 pcs/reel 1 reel / 1 Interior box
Reel model	EIAJ reel (330 mm dia.)
Insert method	see below

**Taping**
Emboss pitch 4 mm type & tape width 12 mm type

Trailer (no Sensor)
500 - 550 mm

Embossed Carrier Tape
Sensor housing unit

Leader (no Sensor)
540 - 590 mm

Core side of the reel

540 mm - 550 mm
(The same dimensions as the embossed carrier tape)

Cover Tape

540nm or more

Cover Tape (no Sensor)

Cover Tape (no Sensor)

Core side of the reel

1 pin mark in the upper left

Direction to pull out

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Product information of the existing product may be different from the previous version

Individual packaging

No.	Item
(1)	EIAJ reel
(2)	Desiccant
(3)	Reel band
(4)	Identification tag
(5)	Humidity indicator
(6)	Aluminum bag
(7)	Individual packing box

■ 2SMPB-01-01 / Embossed Carrier Tape

Taping
To ensure the reel for small shipment, the tape will be cut into multiple units of 10 pieces length.

Embossed Carrier Tape

Sensor housing unit (10 pcs) × n

Cover Tape
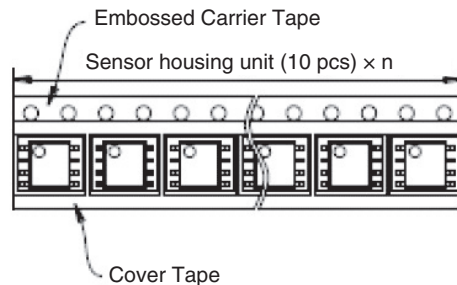
Individual packing box
These are chosen the packaging box following two patterns.
- Packing small reel cut type in the box with air cap.
- Packing the reel cut products shaped ring in the box with air cap.

2SMPB-01-01

Recommended Soldering Method

■ Soldering method

air reflow (Max. 2 times)

■ Condition of Temperature

Max. 260°C, within 10 seconds

■ Recommended Soldering Method

Temperature profile conditions of reflow soldering should be set as shown in the below table, and then confirm that actual conditions coincide with the conditions shown in the table.
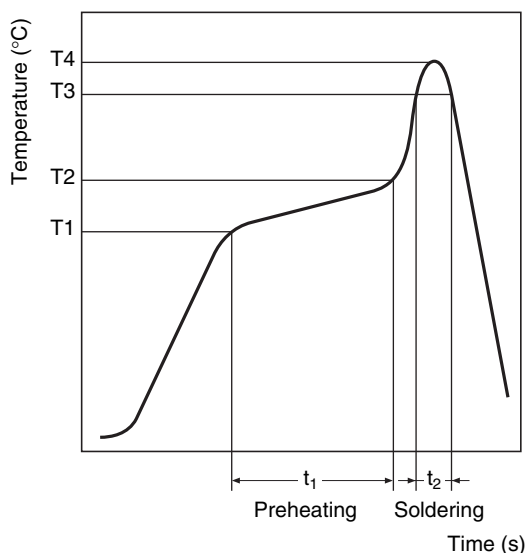
Item	Preheating (T1 to T2, t1)	Soldering (T3, t2)	Peak value (T4)
Terminal	150°C to 180°C 120 s max.	230°C min. 30 s max.	250°C max.
Upper surface of case	-	-	255°C max.

- We recommend a thickness of 150 to 200 μm for the solder cream.
- Since the pressure sensor chip is exposed to atmosphere, cleaning fluid shall not be allowed to enter inside the sensor's case.
- We recommend that the recommended mounting PAD dimensions should be used for the land pattern.

Pressure Sensor

Safety Precautions

Precautions for Correct Use

Handling

(1) Only air can be used as pressure media on the product directly. It is prohibited to use pressure media including corrosive gases (e.g. organic solvents gases, sulfur dioxide and hydrogen sulfide gases), fluid and any other foreign materials.

(2) The product are not water proof. The product shall be kept dry in use including the sensor port.

(3) The product shall not be used under dew-condensing conditions. Frozen fluid on sensor chips may cause fluctuation of sensor output and other troubles.

(4) The product shall be used within rated pressure. Usage at pressure out of the range may cause breakage.

(5) The product may be damaged by static electricity. Charged materials (e.g. a workbench and a floor) and workers should provide measures against static electricity, including ground connection.

(6) Overpowering pins may deform terminals and detract solder abilities of sensor terminals. The product shall not be dropped and handled roughly.

(7) The product shall not be used under dusty or damp condition.

(8) Please connect the sensor terminals according to the connection diagram.

(9) The product shall not be used under high-frequency vibration including ultrasonic wave.

(10) This product uses the elastic adhesive for bonding the lid, so do not add excessive stress to the lid.

(11) If you use other conditions described in this document, please check yourself in advance.

Environmental conditions for transport and storage

(1) The product shall not be kept with corrosive gases (e.g. organic solvents gases, sulfur dioxide and hydrogen sulfide gases).

(2) The product are not water proof. The product shall be kept dry during storage.

(3) By condition of the place and storage period, there are cases that strength of outer boxes may be degraded. Please use the product in order.

(4) For this product, please keep away from direct sunlight or ultraviolet rays.

(5) The product shall be kept in appropriate conditions of temperature and humidity.

(6) Sometimes the color of terminals of the product may change depending on the conditions. It is not covered under warranty.

(7) The product shall not be kept under dusty or damp condition.

Note: Specifications in this document are subject to change without notice.

Note: Do not use this document to operate the Unit.

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