MPC2520

Digital pressure sensor

Restricted

Security warning

Publication history

Version	Date	Description	Author	Approved
1.0	2015.3.25	New design	Tony	
2.0	2015.12.9	Specification improvement	Jason	

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1. Introduction

The MPC2520 is a new generation of high precision digital pressure sensor developed by MaierTek Inc. for consumer applications
The ultra-low power, low voltage electronics of the MPC2520 is optimized for use in mobile phones, wearables, GPS navigation devices and outdoor equipments.
With a low altitude noise of merely 4 cm at fast conversion time, the MPC2520 offers superior performance.
The I2C interface allows for easy system integration with microcontroller.

Key features

- Pressure range: 300 ... 1100Pa (+9000m ... -500m relating to sea level)
- Supply voltage: 1.8 ... 3.6V (VDD)
- Package: LGA package with metal lid
  Small footprint: 2mm x 2.5mm; Super-flat: 0.95mm height
- Low noise: 0.5Pa (4cm)
- Temperature measurement included
- I2C interface mainly, reserved SPI port
- Fully calibrated
- Pb-free, halogen-free and RoHS compliant,

Typical applications

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

2. Test condition

Table 1: Test condition

Standard Conditions	Temperature	Humidity	Air pressure
Environment conditions	-40℃-85℃	25%RH-85%RH	300hPa-1100hPa
Basic test conditions	25℃	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 pin	-0.3	+4.25	V
ESD rating	HBM,R=1.5kohm,C=100pF		±2	kV
Overpressure			10000	hPa

4. Electrical characteristics

If not stated otherwise, the given values are ±3-Sigma values over temperature/voltage range in the given operation mode. All values represent the new parts specification; the additional solder drift is shown separately.

Table 3: Operating conditions, output signal and mechanical characteristics

Parameter	Symbol	Condition	Min	Type	Max	Units
Operating temperature	TA	Operational	-40		85	°C
		Full accuracy	0		70	°C
Operating Pressure	P		300		1100	hPa
Supply voltage	Vdd	Ripple max.50mVpp	1.8		3.6	V
Supply current @25°C	Iddstd	Standard mode		3		μA
Peak current	Ipeak	During conversion		900	1500	μA
standby current	Iddsbm	@25°C		20	250	nA
Relative accuracy pressure		800-1100 hPa @ 25 °C		±0.06(1)		hPa
				±0.5		m
Absolute accuracy pressure		260- 1260 hPa @-20°C- +65 °C		±1(1)		hPa
Resolution of output data		Pressure		0.06		Pa
		Temperature		0.5		°C
Noise in pressure				0.01		PaRMS
Absolute accuracy temperature		@-20°C- +70 °C		±0.5		°C
Conversion time pressure	tc_p	Low Power Mode Standard mode High Precision Mode		5/28/105		ms
Conversion time temperature	tc_temp	Standard mode		5		ms
Serial data clock		For I2C		20		MHz
Solder drifts			-0.5(1)		2(1)	hPa

Long term stability		12month		±1(1)		hPa

1. It is target performance.

5. Operation

5.1 General description

The MPC2520 is designed to be connected directly to a microcontroller of a mobile device via the I2C or SPI bus. The pressure and temperature data has to be compensated by the calibration data of the MTP of the MPC2520.

5.2 General function and application schematics

The MPC2520 consists of a capacitive sensor, an analog to digital converter and a control unit with MTP and a serial I2C and SPI interfaces. The sensor delivers the uncompensated value of pressure and temperature. The MTP has stored several individual calibration data used to compensate offset, temperature dependence and other parameters of the sensor.

UP = pressure data (24 bit)
UT = temperature data (24 bit)

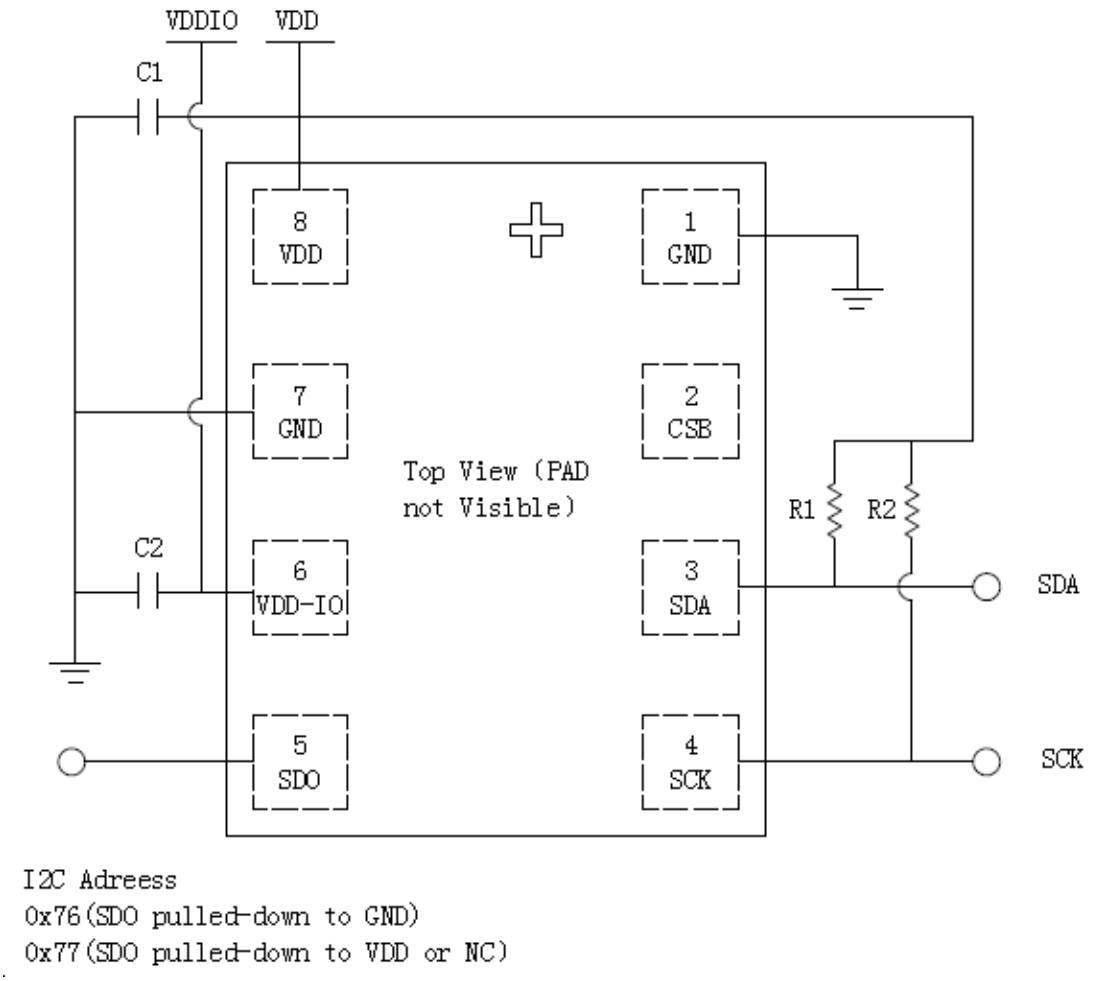


Figure 1: Typical application circuit

Component	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Pull-up/down Resistor	R_1, R_2	5		100	KΩ	R_2 is optional and will set the address to 0x76 instead of 0x77.
Supply Blocking Capacitor	C_1, C_2	100	100		nF	The blocking capacitors should be placed as close to the package pins as possible.

5.3 Measurement of pressure and temperature

The microcontroller sends a start sequence to start a pressure or temperature measurement. After converting time, the result value (UP or UT, respectively) can be read via the I2C interface. For calculating temperature in degree and pressure in hPa, the calibration data has to be used. These constants can be read out via the I2C interface at software initialization.

The sampling rate can be increased up to 128 samples per second for dynamic measurement. In this case, it is sufficient to measure the temperature only once per second and to use this value for all pressure measurements during the same period.

5.4 Calculating absolute altitude and calculating pressure at sea level

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

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

Thus, a pressure change of Δp = 1hPa corresponds to 8.43m at sea level.

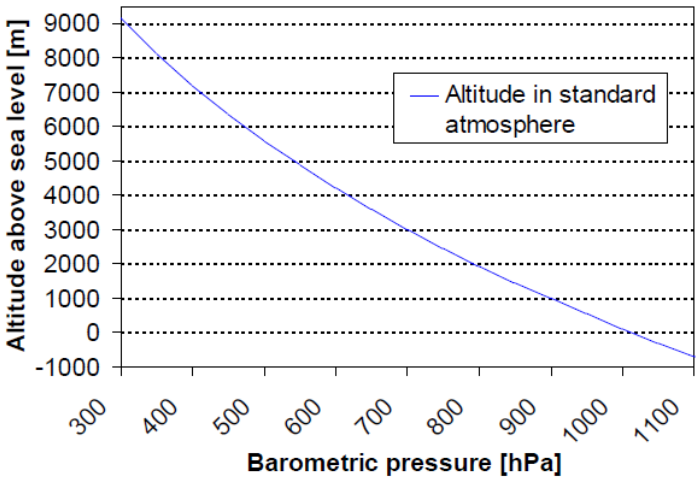


Figure 2: Transfer function: Altitude over sea level – Barometric pressure

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

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

Thus, a difference in altitude of Δ altitude = 10m corresponds to 1.2hPa pressure change at sea level.

5.5. I2C Interface

- I2C is a digital two wire interface
- Clock frequencies up to 3.4Mbit/sec.
- SCL and SDA needs a pull-up resistor, typ. 4.7kOhm to VDDIO (one resistor each for all the I2C bus)
- The I2C bus is used to control the sensor, to read calibration data from the MTP and to read the measurement data when A/D conversion is finished. SDA (serial data) and SCL (serial clock) have open-drain outputs.

In I^2C Mode, each command is started as shown in figure 3. Only the number of bytes that is needed for the command has to be sent. After the execution of a command (busy = 0) the expected data can be read as illustrated in figure 4. or if no data are returned by the command the next command can be sent. The status can be read at any time as described in figure 5.

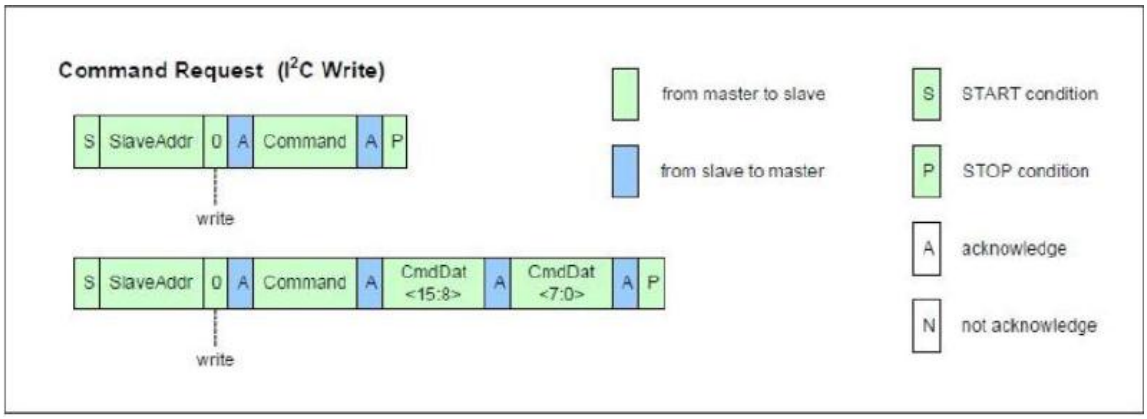


Figure 3 I2C Command Request

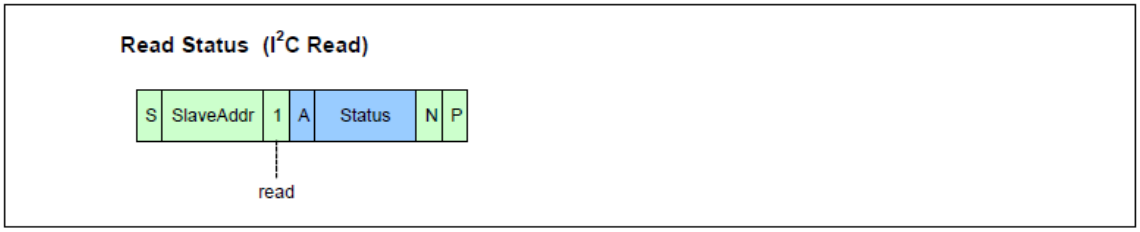


Figure 4 I2C Read Status

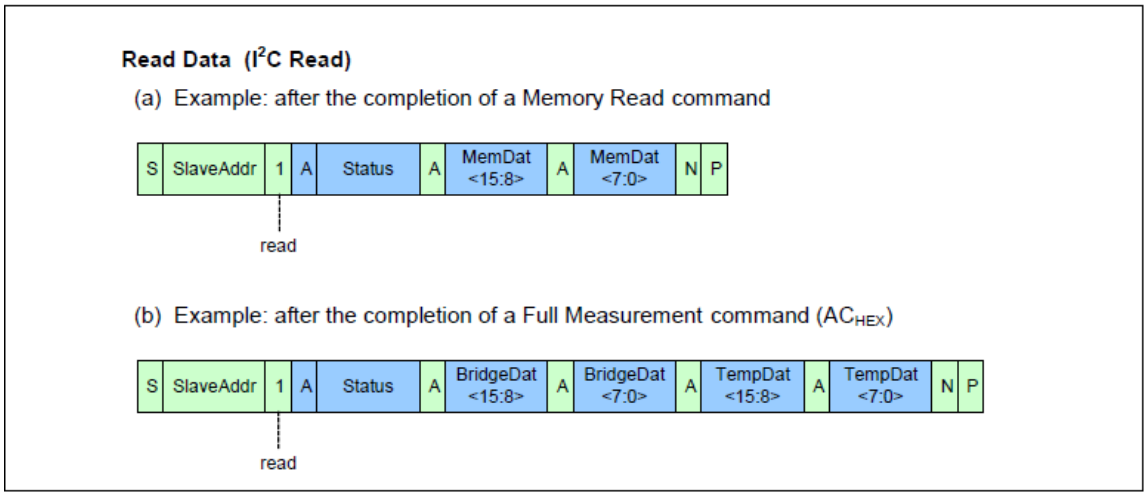


Figure 5 I2C Read Data

All mandatory I²C-bus protocol features are implemented. Optional features like clock stretching, 10-bit slave address, etc., are not supported by the MPC2520 interface.
In I²C-High Speed Mode, a command consists of a fixed length of three bytes.
The I2C commands supported by the MPC2520 are listed in Table 4 .
The commands to read an address in the user memory is the same as its address.

6 Calibration and Measurement Compensation

The MPC2520 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 ℃ values.

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.

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

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 and 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.

T_{raw_sc} = T_{raw}/kT

5. Calculate compensated measurement results

T_{comp} (℃) = c0*0.5 + c1*T_{raw_sc}

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

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)								00_h
PSR_B1	0x01	PSR[15:8](r)								00_h
PSR_B0	0x02	PSR[7:0](r)								00_h
TMP_B2	0x03	TMP[23:16] (r)								00_h
TMP_B1	0x04	TMP[15:8] (r)								00_h
TMP_B0	0x05	TMP[7:0] (r)								00_h
PRS_CFG	0x06	-	PM_RATE [2:0] (rw)			PM_PRC [3:0] (rw)				00_h
TMP_CFG	0x07	TMP _ EXT (rw)	TMP_RATE [2:0] (rw)			TM_PRC [3:0] (rw)				00_h
MEAS_CFG	0x08	COEF_ RDY (r)	SENSOR _RDY (r)	TMP_ RDY (r)	PRS_ RDY (r)	-	MEAS_CRTL [2:0] (rw)			00_h
CFG_REG	0x09	INT_ HL (rw)	INT_ SEL [2:0] (rw)			TMP_ SHIFT_ EN (rw)	PRS_ SHIFT_ EN (rw)	FIFO_ EN (rw)	SPI_ MOD E	00_h
INT_STS	0x0A	-	-	-	-	-	INT_ FIFO_ FULL (r)	INT_ TMP(r)	INT_ PRS(r)	00_h
FIFO_STS	0x0B	-	-	-	-	-	-	FIFO_ FULL(r)	FIFO_ EMPTY(r)	00_h
RESET	0x0C	FIFO_ FLUSH (w)	-	-	-	SOFT_RST [3:0] (w)				00_h
ID	0x0D	PROD_ID [3:0] (r)				REV_ID [3:0] (r)				00_h
COEF	0x10- 0x21	< see register description >								XX_h
Reserved	0x22- 0x27	Reserved								XX_h
COEF_SRCE	0x28	TMP_C OEF_S RCE (r)	Reserved							XX_h

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: 00_H

Pressure (MSB data) Reset value: 00_H

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: 01_H

Pressure (LSB data) Reset value: 00_H

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: 02_H

Pressure (XLSB data) Reset value: 00_H

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: 03_H

Temperature (MSB data) Reset value: 00_H

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: 04_H

Temperature (LSB data) Reset value: 00_H

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: 05_H

Temperature (XLSB data) Reset value: 00_H

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: 06_H

Pressure measurement configuration Reset value: 00_H

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: 000 - 1 measurements pr. sec. 001 - 2 measurements pr. sec. 10 - 4 measurements pr. sec. 11 - 8 measurements pr. sec. 100 - 16 measurements pr. sec. 101 - 32 measurements pr. sec. 110 - 64 measurements pr. sec. 111 - 128 measurements pr. sec. *Applicable for measurements in Background mode only*

PM_PRC[3:0]	3:0	rw	Pressure oversampling rate: 0000 - Single. 0001 - 2 times (Low Power). 0010 - 4 times. 0011 - 8 times. 0100 *)- 16 times (Standard). 0101 *) - 32 times. 0110 *) - 64 times (High Precision). 0111 *) - 128 times. 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 (PRC[3:0])	Single (0000)	2 times (0001)	4 times (0010)	8 times (0011)	16 times (0100)	32 times (0101)	64 times (0110)	128 times (0111)
Measurement time (ms)	3.6	5.2	8.4	14.8	27.6	53.2	104.4	206.8
Precision (Pa_{RMS})	5		2.5		1.2	0.9	0.5	

Table 9 Estimated current consumption (uA)

Oversampling (PRC[3:0]) Measurements pr sec. (PM_RATE([2:0])	Single (0000)	2 times (0001)	4 times (0010)	8 times (0011)	16 times (0100)	32 times (0101)	64 times (0110)	128 times (0111)
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 Measurement Rate * Current Consumption of 1 measurement per. sec.*							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 $Rate_{temperature}$ *x Measurement* $Time_{temperature}$ + $Rate_{pressure}$ *x Measurement* $Time_{pressure}$

< 1 second.

8.4 Temperature Configuration (TMP_CFG)

Configuration of temperature measurement rate (TMP_RATE) and resolution (TMP_PRC).

TMP_CFG Address: 07_H

Temperature measurement configuration Reset value: 00_H

7	6	5	4	3	2	1	0
TMP_EXT	TMP_RATE[2:0]			-	TMP_PRC[3:0]		
rw	rw			-	rw		

Field	Bits	Type	Description
TMP_EXT	7	rw	Temperature measurement 0 - Internal sensor (in ASIC) 1 - External sensor (in pressure sensor MEMS element) *Note: Please use the **external sensor setting**.*
TMP_RATE[2:0]	6:4	rw	Temperature measurement rate: 000 - 1 measurement pr. sec. 001 - 2 measurements pr. sec. 10 - 4 measurements pr. sec. 11 - 8 measurements pr. sec. 100 - 16 measurements pr. sec. 101 - 32 measurements pr. sec. 110 - 64 measurements pr. sec. 111 - 128 measurements pr. sec. *Applicable for measurements in Background mode only*
TMP_PRC[3:0]	2:0	rw	Temperature oversampling (precision): 000 - single. (Default) - Measurement time 3.6 ms. *Note: Following are optional, and may not be relevant:* 001 - 2 times. 10 - 4 times. 11 - 8 times. 100 - 16 times. 101 - 32 times. 110 - 64 times.. 111 - 128 times. 1xxx - TBD.

8.5 Sensor Operating Mode and Status (MEAS_CFG)

Setup measurement mode.

MEAS_CFG Address: 08_H

Measurement configuration Reset value: 00_H

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: 0 - Coefficients are not available yet. 1 - Coefficients are available.
SENSOR_RDY	6	r	The pressure sensor is running through self initialization after start-up. 0 - Sensor initialization not complete 1 - Sensor initialization complete It is recommend not to start measurements until the sensor has completed the self initialization.
TMP_RDY	5	r	Temperature measurement ready 1 - New temperature measurement is ready. Cleared when temperature measurement is read.
PRS_RDY	4	r	Pressure measurement ready 1 - New pressure measurement is ready. Cleared when procurement measurement is read.
-	3	-	Reserved.

MEAS_CTRL	2:0	rw	Set measurement mode and type: *Standby Mode* 1 - Idle / Stop background measurement *Command Mode* 2 - Pressure measurement 010 - Temperature measurement 011 - na. 100 - na. *Background Mode* 101 - Continuous pressure measurement 110 - Continuous temperature measurement 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:	09_H
Configuration register	Reset value:	00_H

7	6	5	4	3	2	1	0
INT_HL	INT_FIFO	INT_PRS	INT_TMP	T_SHIFT	P_SHIFT	FIFO_EN	SPI_MODE
rw	rw	rw	rw	rw	rw	rw	rw

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

SPI_MODE	0	rw	Set SPI mode: 0 - 4-wire interface. 1 - 3-wire interface.

8.7 Interrupt Status (INT_STS)

Interrupt status register. The register is cleared on read.

INT_STS Address: $0A_H$

Interrupt status Reset value: 00_H

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 0 - Interrupt not active 1 - Interrupt active
INT_TMP	1	r	Status of temperature measurement interrupt 0 - Interrupt not active 1 - Interrupt active
INT_PRS	0	r	Status of pressure measurement interrupt 0 - Interrupt not active 1 - Interrupt active

8.8 FIFO Status (FIFO_STS)

FIFO status register

FIFO_STS Address: $0B_H$

FIFO status register Reset value: 00_H

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

Field	Bits	Type	Description
-	7:2	-	Reserved.

FIFO_FULL	1	r	0 - The FIFO is not full 1 - The FIFO is full
FIFO_EMPTY	0	r	0 - The FIFO is not empty 1 - The FIFO is empty

8.9 Soft Reset and FIFO flush (RESET)

Flush FIFO or generate soft reset.

RESET Address: $0C_H$

FIFO flush and soft reset Reset value: 00_H

7	6	5	4	3	2	1	0
FIFO_FLUSH	-			SOFT_RST			
w	-			w			

Field	Bits	Type	Description
FIFO_FLUSH	7	w	FIFO flush 1 - Empty FIFO 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 though the same sequences as in power-on reset.

8.10 Product and Revision ID (ID)

Product and Revision ID.

ID Address: $0D_H$

Product and revision ID Reset value: $0x00_H$

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

Picture shows the device in top view. Device pins are shown here transparently only for orientation purposes.

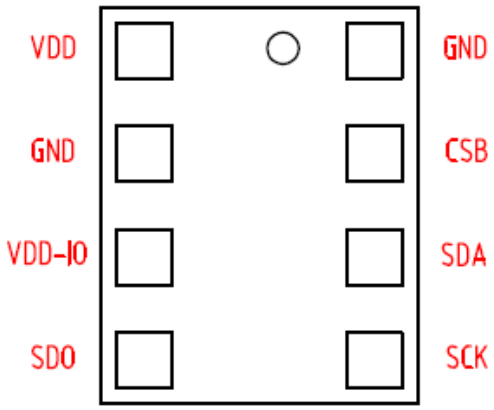


Figure 6: Layout pin configuration MPC2520

Table 5: Pin configuration of MPC2520

Pin No.	Name	Function
1	GND	Ground
2	CSB	Chip select
3	SDA	Data
4	SCK	Clock
5	SDO	NC
6	VDDIO	NC
7	GND	Ground
8	VDD	Power supply

9.2 Outline dimensions

The sensor housing is a 7Pin LGA package with metal lid. Its dimensions are 2mm (±0.1 mm) x 2.5mm (±0.1 mm) x 0.95mm (±0.05mm).

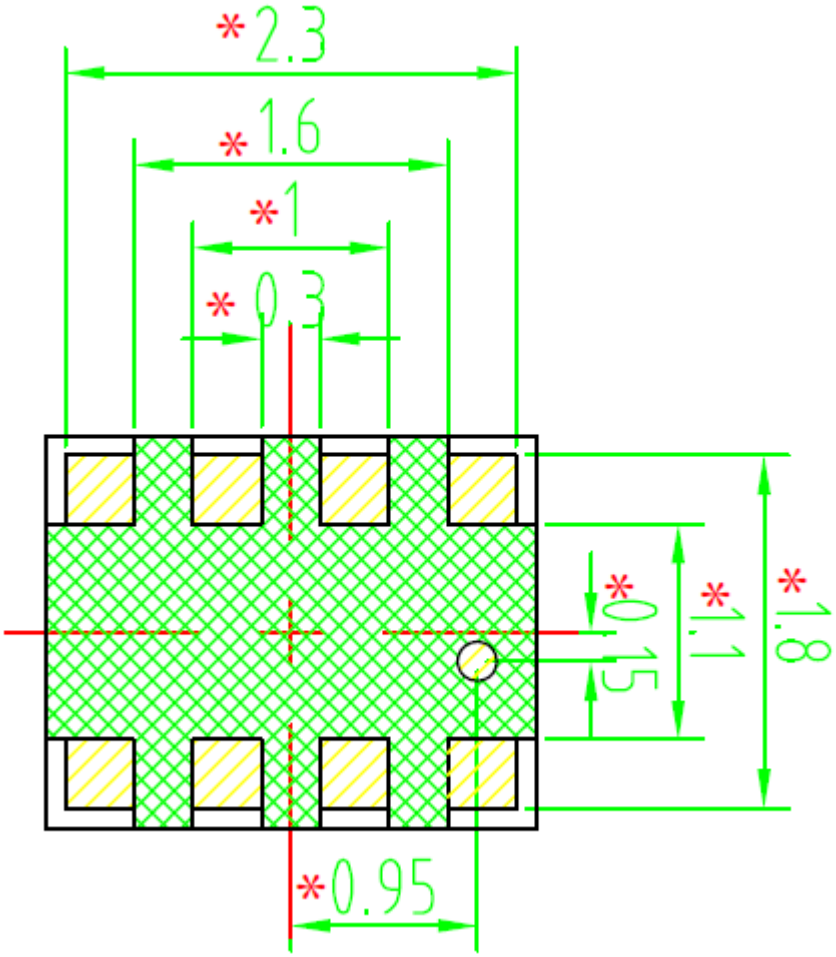


Figure 7: Bottom view of MPC2520

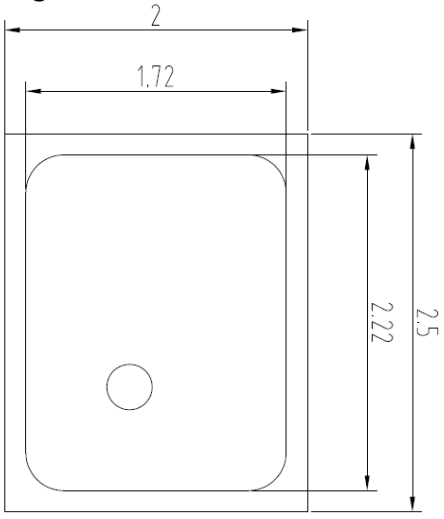


Figure 8: Top view of MPC2520

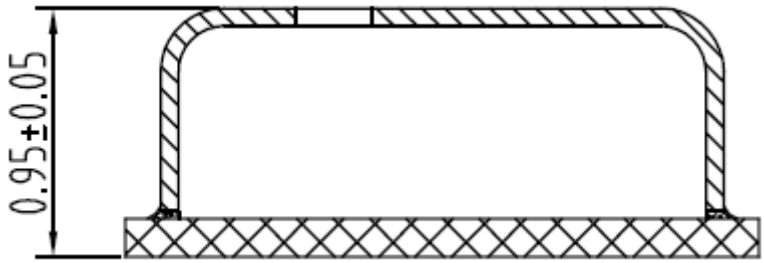


Figure 9: Side view of MPC2520

10. Storage and transportation

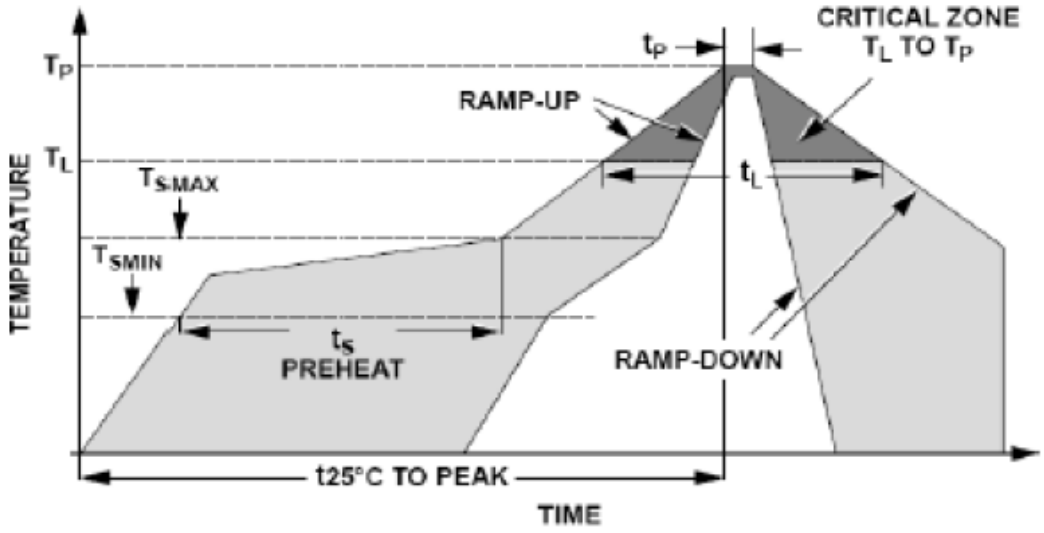
- Keep in warehouse with less than 75% humidity and without sudden temperature change, acid air, any other harmful air or strong magnetic field.
- The MEMS pressure sensor with normal pack can be transported by ordinary conveyances. Please protect products against moist, shock, sunburn and pressure during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

11. Soldering recommendation

Standard Reflow sodering condition

Reference	J-STD-020-C,J-STD-033		
Maximum Peak Temperature	280℃		
Mositure sensitivity level	MSL 3		
Bake condition		Exposure Time>72hours	Exposure Time<72hours
	Bake @125℃	9 hours	7 hours
	Bake @90℃,<5% RH	33 hours	23 hours
	Bake @40℃, <5% RH	13 days	9 days

Recommended Solder Reflow

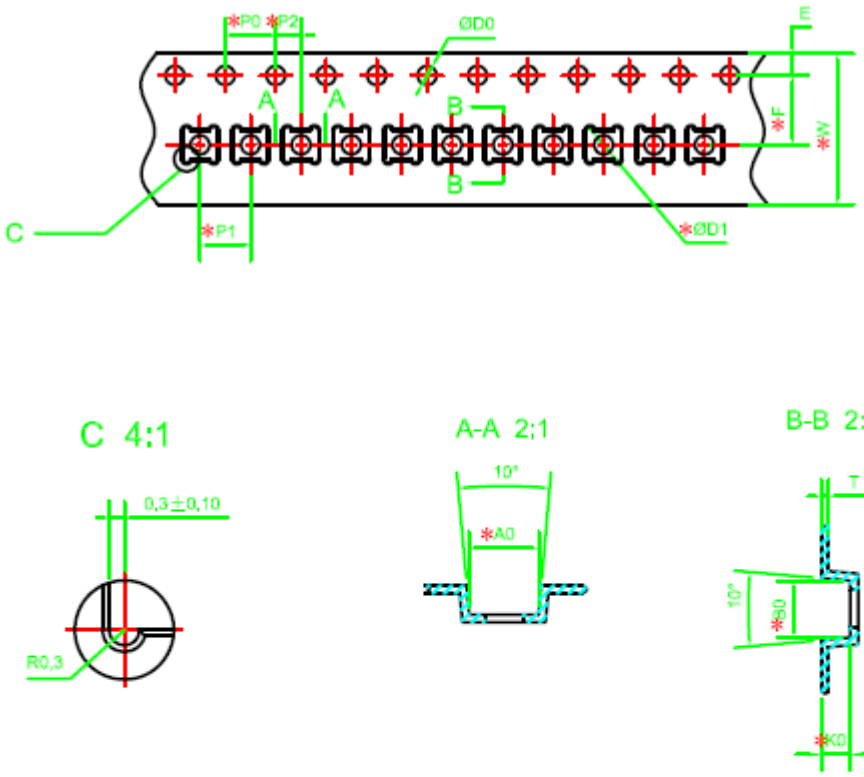


Profile Feature	Pb-Free Assembly
Average ramp-up rate(Tsmax to Tp)	3℃/seconds max.
Preheat -Temperature Min.(Tsmin) -Temperature Max.(Tsmax) -Time(Tsmin to Tsmax)(Ts)	 150℃ 200℃ 60～80seconds
Time maintained above: -Temperature(T_L) -Time(t_L)	 217℃ 60～150seconds
Peak temperature(Tp)	260℃

Time within 5℃ of actual peak temperature(Tp)2	20～40seconds
Ramp-down rate	4℃/seconds max.
Time 25℃ to peak temperature	8 minutes max.

12. Package Specifications

Carrier Tape Information [Unit: mm]



ITEM	*W	E	*F	*ØD0	ØD1
DIM(mm)	12.00±0.30	1.75±0.10	5.50±0.10	$1.50^{+0.10}_{0}$	$1.50^{+0.10}_{0}$
ITEM	*P0	*10P0	*P1	*A0	*B0
DIM(mm)	4.00±0.10	40.00±0.20	4.00±0.10	2.75±0.05	2.25±0.05
ITEM	*K0	*P2	T		
DIM(mm)	1.15±0.05	2.00±0.10	0.30±0.05		

Figure 7: Carrier Tape （1）

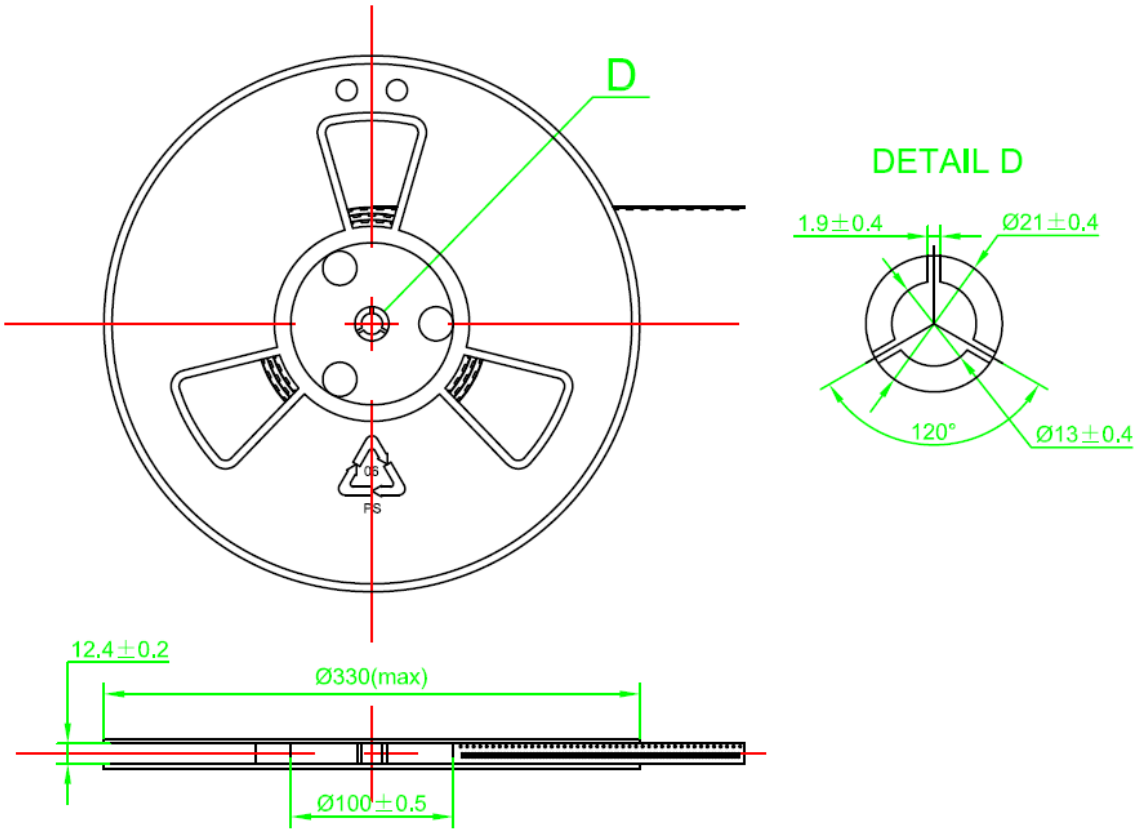
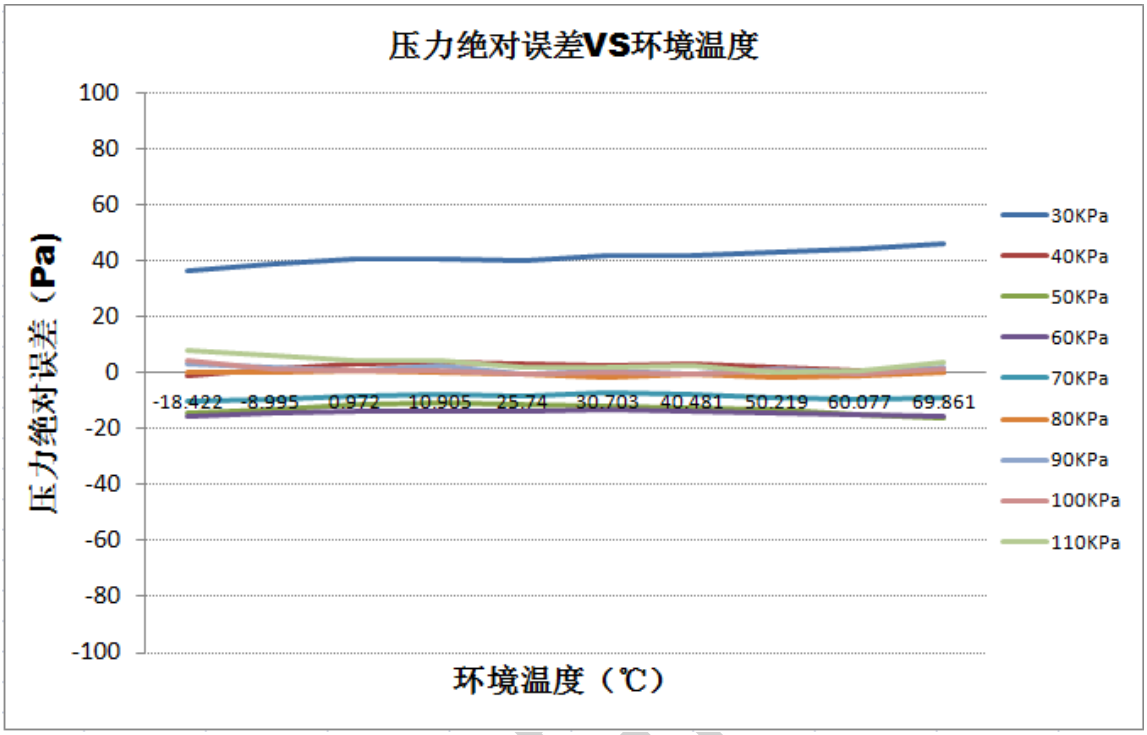


Figure 8: Carrier Tape （2）

Appendix 1:

Temperature Dependency Accuracy Curve as the following:



Temperature Dependency Accuracy Curve