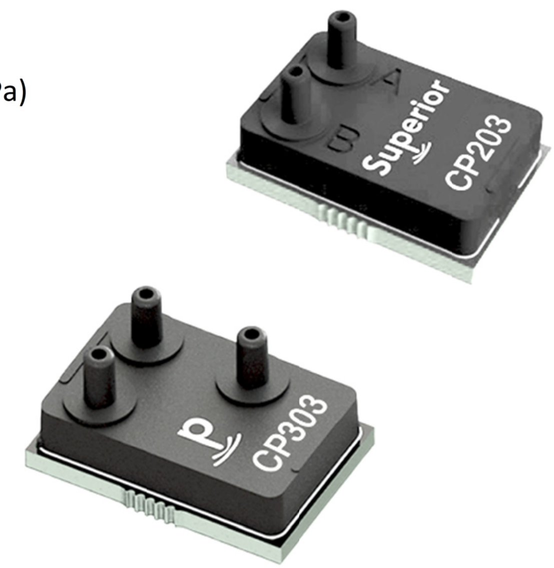
Superior SENSOR TECHNOLOGY

CP203/CP303

CP Series with Integrated Snore Detection
CPAP, BiPAP, APAP Applications

- CP Series Based Sensors with Snore Detection
- Highly integrated dual sensors with ADC and DSP
- Combined Differential and Gage Sensors in one device
- 4 Differential Pressure Ranges per device (±250 Pa to ±2.5 kPa)
- 4 Gage Pressure Ranges per device (±2 kPa to ±6 kPa)
- 16-bit resolution each channel range
- Ultra-low noise, 16.3-bit Effective Resolution
- Selectable Bandwidth Filter from 25Hz to 250Hz
- Very High Accuracy ±0.05% of Selected Range
- Excellent Long Term Stability
- Output Update Rate up to 500Hz
- Temperature Compensated 5°C to 50°C
- Supply Voltage Compensation
- Standard I^2C and SPI Interface
- Available in 3-port and 4-port configurations



Product Summary

Superior's CP Series sensor modules for PAP applications employ *NimbleSense*™, a proprietary architecture achieving very high dynamic range to create the industry's best performing pressure sensing for CPAP, BiPAP and APAP devices. Incorporating both differential and gage pressure sensors in the same package, the CP Series supports four programmable pressure, ranges for each embedded sensor. The differential pressure sensor can be user programmed from ±250 to 2.5 kPa (±1 to 10 inH_2O) full scale ranges while the gage pressure sensor is programmable from ±2k to 6k Pa (±8 to 24 inH_2O) full scale ranges.

The CP203 and CP303 dual pressure sensors offer snore detection functionality with the CP Series.

The CP203 and CP303 provide a new level of sensor integration into the PAP market by combining two advanced piezoresistive sensing elements with integrated amplification, ADC, DSP and processor intelligence to greatly simplify integration efforts. The CP Series leverages floating point technology to provide a highly precise digital output.

Industry leading accuracy – The CP203 and CP303 measure dry air and non-aggressive gas pressure with very high accuracy typically within 0.05% of the selected range and Total Error Band that is typically within 0.15% FSS.

Snore Detection – The CP203 and CP303 offer the ability to detect snoring, enabling the PAP machines to improve patient treatment.

Constructed with a high reliability plastic enclosure, the CP203 and CP303 provide the ideal combination of very high performance and reliability while ensuring customers have a high-volume, cost-effective solution optimized for PAP devices.

Table of Contents

1 Maximum Ratings

Parameter	Sym	Min	Max	Units
Supply Voltage	V_{DDM}	Gnd-0.3	4.0	V
Voltage on I/O Pins V_{DD} > 3.3V V_{DD} ≤ 3.3V	 V_{IOML} V_{IOMH}	 Gnd-0.3 Gnd-0.3	 5.8 V_{DD}+2.5	 V V
I/O Current	I_{IOM}	-25	25	mA

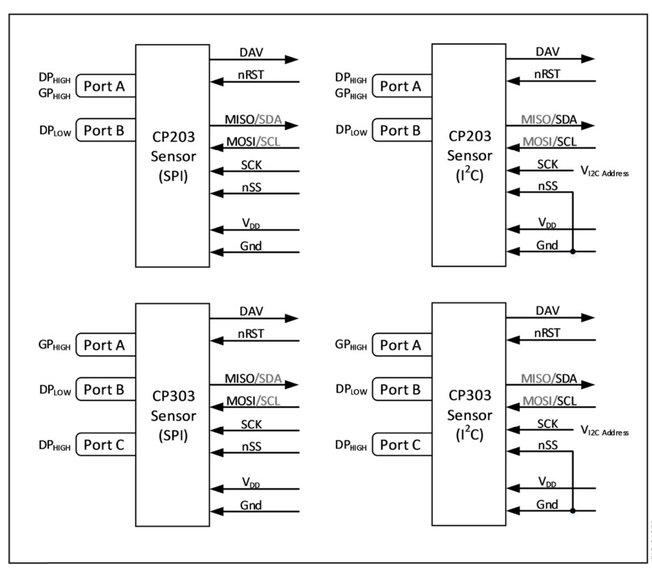
2 Suggested Operating Conditions

Parameter	Sym	Min	Max	Units
Supply Voltage	V_{DDOP}	2.8	3.5	V
Temperature	T_A	0	50	°C

3 Environmental

Parameter	Sym	Min	Max	Units
Temperature Range Compensated Operating Storage	 T_{CMP} T_{OP} T_{STG}	 5 -20 -40	 50 85 85	 °C °C °C
Humidity (Non-condensing)	RH_{OP}	0	95	% RH
Vibration (10Hz-2kHz)	G_{VIBE}	-	15	g
Shock (6 ms)	G_{SHOCK}	-	100	g
Life	CY_{LIFE}	100M	-	Pressure Cycles

4 Equivalent Circuit



5 Feature List

Parameter	Sym	DP Sensor	GP Sensor	Units	Notes
Selectable FS Pressure Ranges	P_{NUM}	4	4	Each	
Selectable FS Range Extents	P_{EXT}	±250 to ±2.5k (±1.0 to ±10)	±2.0 to ±6.0k (±8.0 to ±24)	Pa (inH_2O)	4
Selectable BW Filter Corners	BW_{NUM}	4	4	Each	
BW Corner Frequency Extents	f_{BWEXT}	25 to 250		Hz	
Selectable Snore Band Pass Ranges	SBP_{NUM}	8		Each	
Selectable Snore Low Pass Ranges	SLP_{NUM}	4		Each	
Common Mode Pressure	P_{CM}	125	125	kPa	1
Proof Pressure	P_{PROOF}	10	250	kPa	2
Burst Pressure	P_{BURST}	30	750	kPa	3

1) Pressure applied to both ports simultaneously without incurring part damage.
2) Pressure at which the sensor will not suffer permanent damage.
3) Pressure if exceeded could cause permanent damage to the sensor.
4) Full scale units are in Pa. Units of inH2O are approximate and for reference only.

6 Performance Characteristics

Note: Unless otherwise specified, characteristics specified with V_{DD} = 3.3V, T_A = 25C

Parameter	Sym	DP Sensor			GP Sensor			Units	Notes
		Min	Typ	Max	Min	Typ	Max		
Accuracy	P_{ACC}	-	0.05	0.1	-	0.05	0.1	% RNG	1
Total Error Band	TEB	-	0.1	0.3	-	0.15	0.5	% FSS	2, 3
Long Term Stability	LTS_{YR1}	-	0.1	0.25	-	0.15	0.4	% FSS/YR1	2, 7
Thermal Hysteresis	T_{HYS}	-	0.05	-	-	0.15	-	% FSS	2
Pressure Hysteresis	P_{HYS}	-	0.05	-	-	0.05	-	% RNG	1
Position Sensitivity	P_{PS}	-	2.0	-	-	2.0	-	Pa	
Supply Rejection	P_{SR}	-	0.0005	-	-	0.005	-	Pa/mV	
Resolution	RES	-	16	-	-	16	-	bit	4
System ENOB	ENOB	-	15.7	-	-	15.7	-	Bit	5
Data Update Rate	f_{UPDATE}	485	498	512	485	498	512	Hz	6

1) Percentage of the selected pressure range. For example, if you select 250 Pa pressure for the differential sensor in the CP device, typical accuracy will be 0.05% x 500 Pa {range of -250 Pa to +250 Pa} = 0.25 Pa.
2) Percent of the device's full span scale. For example, the differential sensor in the CP device has a full scale span of 5000 Pa {from -2500 Pa to +2500 Pa} with a typical TEB of 0.10% x 5000 Pa = 5 Pa.
3) Includes errors of offset, span, pressure non-linearity, hysteresis, and non-repeatability, and thermal effects on offset, span and hysteresis.
4) Each of programmable range has the specified resolution.
5) ENOB stated for f_{BW} set to 25 Hz.
6) The internal update rate is fixed and does not change with range or filter settings. Sampling at lower data rates are possible provided the Nyquist frequency is observed. It is suggested to sample at least 2x the set f_{BW} frequency.
7) YR1 is the first year. The most significant drift occurs during the first year and is lessened for each subsequent year. The drift is lessened over time in such a way that at YR10, the total typical drift is only twice that of YR1.

7 Electrical Characteristics

7.1 Supply Characteristics

Parameter	Sym	CP203/CP303			Units	Notes
		Min	Typ	Max		
Supply Current	I_{DD}	-	6.5	7.0	mA	
Supply Capacitance	C_{DD}	-	10	-	uF	1

1) Supply capacitance is provided within the part however it is recommended to include a 0.1 uF decoupling cap near the supply pads.

7.2 Reset Characteristics

Parameter	Sym	Condition	CP203/CP303			Units	Notes
			Min	Typ	Max		
Power-On Reset Threshold	V_{PORR} V_{PORF}	Rising Voltage on V_{DD} Falling Voltage on V_{DD}	- 0.75	1.4 -	- 1.36	V V	
Interface Detect Delay	t_{IOD}	From POR or External Reset	-	-	40	ms	
First Response Settling Time	t_{FRD}	From POR or External Reset	-	-	60	ms	1
External Reset Low	t_{RSTL}		15	-	-	us	
Input High Voltage	V_{IH}		V_{DD}-0.6	-	-		2
Input Low Voltage	V_{IL}		-	-	0.6		2
Internal Pull-Up Current	I_{PU}	V_{IN} = 0V	-	-10	-30	uA	2
Input Capacitance	C_{IN}		-	7	-	pF	2

1) The filter settling time to ensure the first reading is completely settled.
2) Input nRST

7.3 DAV Characteristics

Parameter	Sym	Condition	CP203/CP303			Units	Notes
			Min	Typ	Max		
Output High Voltage	V_{OH}	I_O = -3 mA	V_{DD}-0.7	-	-	V	
Output Low Voltage	V_{OL}	I_O = 8 mA	-	-	0.6	V	

7.4 SPI Characteristics

Parameter	Sym	Condition	CP203/CP303			Units	Notes
			Min	Typ	Max		
Output High Voltage	V_{OH}	I_O = -3 mA	V_{DD}-0.7	-	-	V	1
Output Low Voltage	V_{OL}	I_O = 8 mA	-	-	0.6	V	1
Input High Voltage	V_{IH}		V_{DD}-0.6	-	-		2, 3
Input Low Voltage	V_{IL}		-	-	0.6		2, 3
Internal Pull-Up Current	I_{PU}	V_{IN} = 0V	-	-10	-30	uA	2, 3
Time nSS to First SCK Edge	t_{SC}		100	-	-	us	
Clock Cycle Time	t_{CC}		8	-	-	us	
Byte to Byte Cycle Time	t_{BC}		100	-	-	us	
Time Last Clock to nSS High	t_{CN}		20	-	-	us	
Cycle Time nSS	t_{CS}		8	-	-	us	
Input Capacitance	C_{IN}		-	7	-	pF	2

1) Output MOSI
2) Inputs MISO, SCK, nSS
3) Inputs are 5V compliant.

7.5 I²C Characteristics

Parameter	Sym	Condition	CP203/CP303			Units	Notes
			Min	Typ	Max		
SCL Clock Frequency	f_{SCL}		100	-	400	kHz	
Clock Stretch Time	t_{CKSTR}		-	15	100	us	
Input High Voltage	V_{IH}		V_{DD}-0.6	-	-		
Input Low Voltage	V_{IL}		-	-	0.6		
Output Low Voltage	V_{OL}	I_O = 8 mA	-	-	0.6	V	
Input Capacitance	C_{IO}		-	7	-	pF	

8 Materials

8.1 Wetted Materials

Parameter	Sym	CP203	CP303		Units	Notes
		$DP_{HIGH}/DP_{LOW}/GP_{HIGH}$	GP_{HIGH}/DP_{LOW}	DP_{HIGH}		
Wetted Materials	MAT_{WET}	Epoxy Nylon RTV Silicon Gold Aluminum	Epoxy Nylon RTV Silicon Gold Aluminum	Epoxy Nylon RTV Silicon		

8.2 Material Compliance

Parameter	Sym	CP203/CP303	Units	Notes
RoHS	REG_{RoHS}	RoHS Compliant		
REACH	REG_{REAC}	REACH Compliant		

9 System Overview

The CP Series pressure sensor is a fully integrated pressure acquisition system in a sensor module. The acquisition system includes anti-alias filters, data acquisition, sensor(s) compensation, bandwidth limiting and I/O functions. Refer to the figure below for the CP Series block diagram.

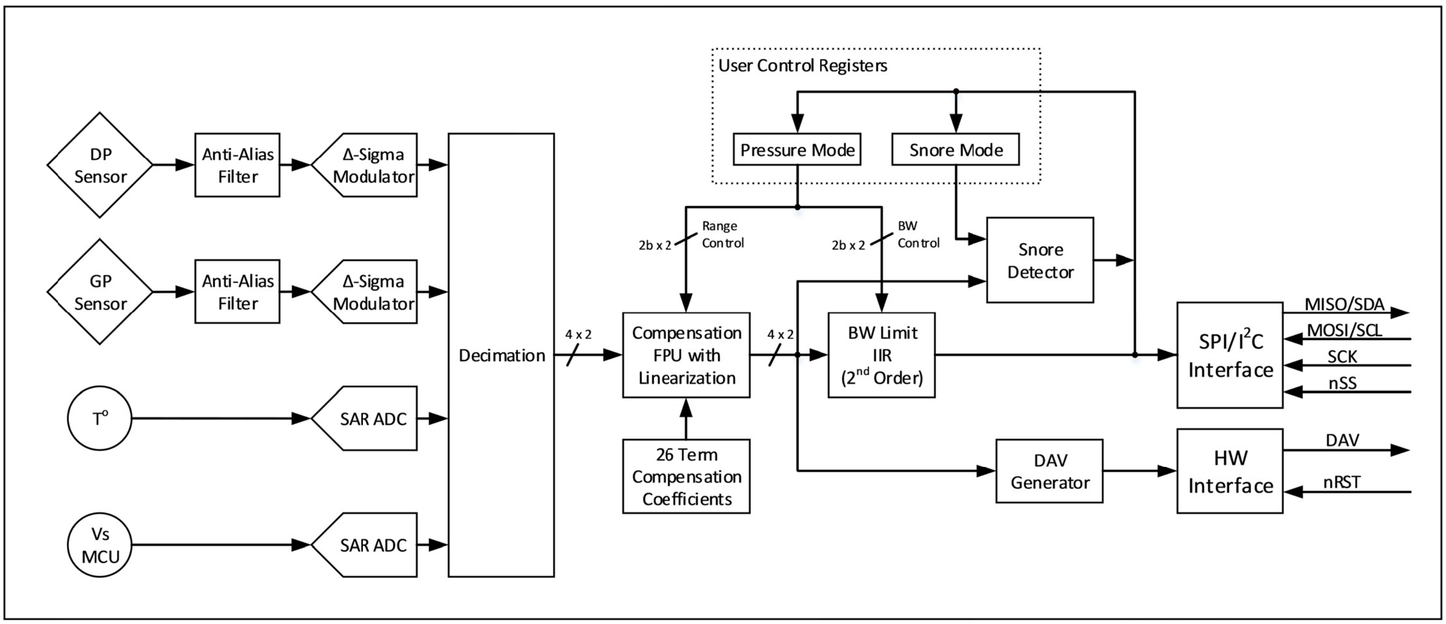


FIG-0177A

There are also two user controlled registers that tune the sensor to the specific user requirements. The first register is the Pressure Mode control register that determines the output pressure range and the corner frequency of the bandwidth limiting filter. The second is the Snore Mode control register which determines the details of the snore detector.

9.1 DAV Generator

The DAV signal can be used to synchronize the sensor internal data rate to the application. The internal sensor data update rate is 498 Hz. The Rate Control register will assert the Data Available pin (DAV) upon each internal data conversion completion. The DAV is reset upon each read of the pressure sensor. An internal model of the DAV behavior is illustrated in the figure to the right.

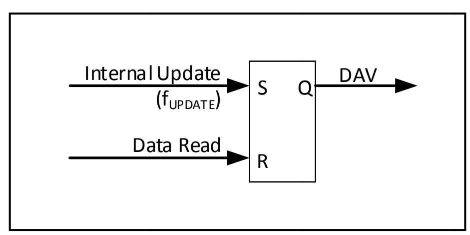
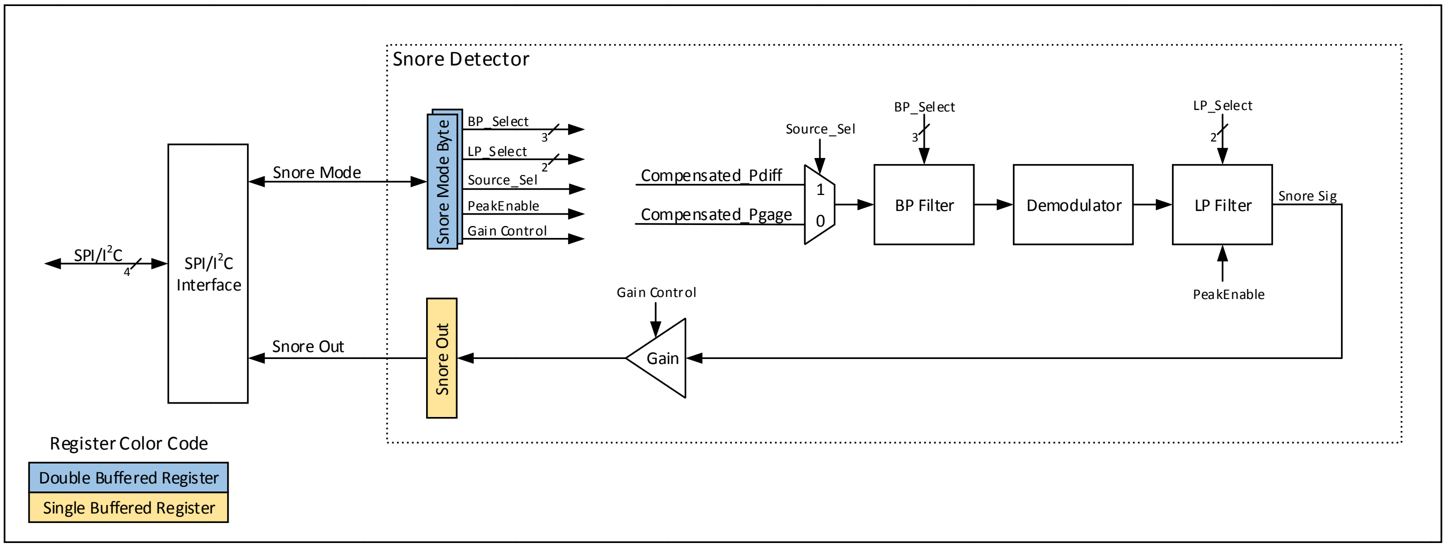


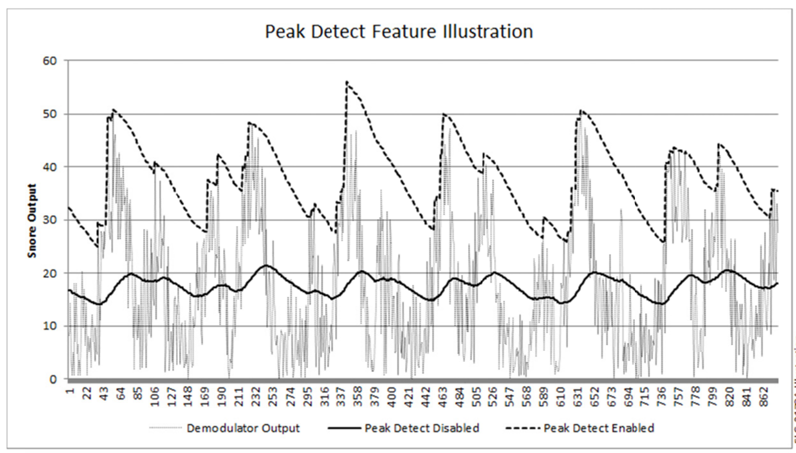
FIG-0012C

9.2 Snore Detector

The block diagram for the snore detector is shown in the figure below. It can be configured to use either the differential or gage sensor as the input for the snore signal generation. There are eight different band pass ranges that can be selected to suit the user desired band of interest for snore detection. A post-demodulation low pass filter is also provided with four selectable corner frequencies.



There is also a peak detection feature that can be enabled if desired. With the peak detect feature enabled, the snore output will track the output of the demodulator if the demodulated signal is greater than the LP filter output. The illustration to the right shows a demodulated output and the Low Pass filter output with and without the peak detection enabled. When enabled, the peak will generate a faster attack time for the snore detection output. The use of this feature will depend on the desired result in the application.



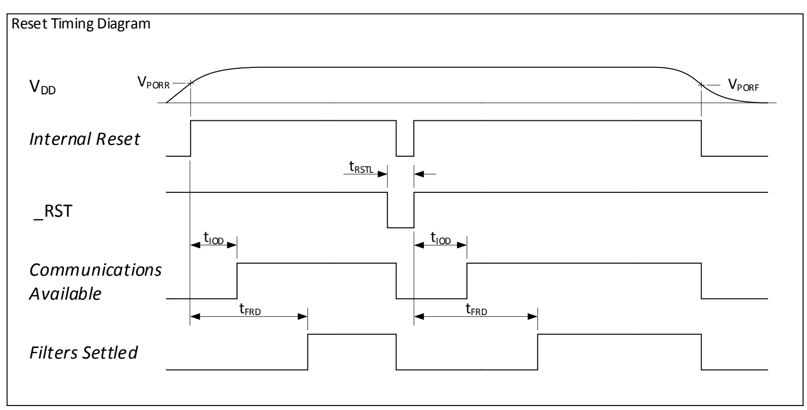
10 Interface

10.1 Reset

Reset timing is shown in the diagram on the right.

The communications method (SPI or I²C) is established during the time just after rest. During this time (t_{IOD}), no communications should take place.

Also, the internal filters are settling during the time t_{FRD} and data acquired during this time may not be fully settled.



10.2 DAV

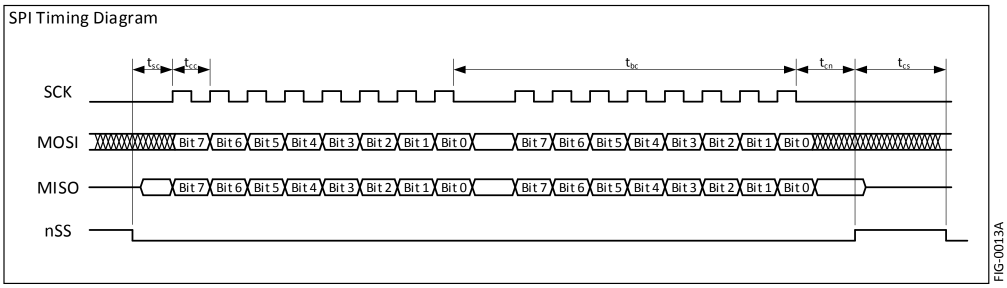
The DAV signal follows the output of the DAV generator. See Section 9.1 for the DAV generator behavior.

10.3 Communication Interface Selection

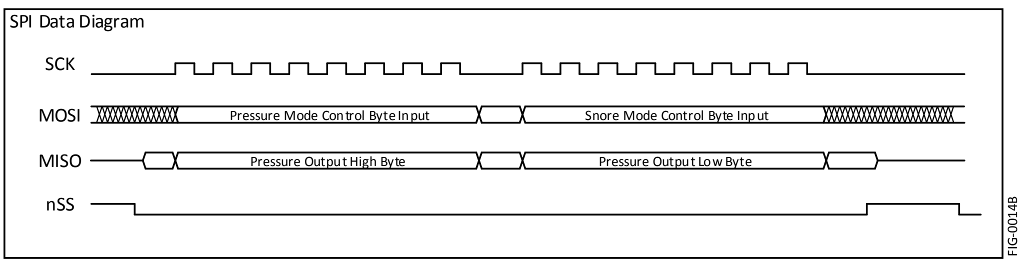
The communications interface is selected by interrogating the nSS pin after the internal power on reset delay. If nSS is high, the SPI interface will be selected otherwise (if low) the I^{2}C interface will be selected. Grounding the nSS pin is an acceptable method for selecting the I^{2}C interface.

10.4 SPI Interface

The SPI interface uses a minimum of 16-bit transfer for all communications. Data is MSB first for both MOSI and MISO data transfers. Refer to the figure below for specific timing requirements.



In the figure to the right, the data communication has been reduced to a simple 16 bit transfer model for reading the DP pressure output. The GP pressure sensor as well as snore data can be read via the extended data acquisition (Section 10.6). Each communication cycle consists of the master sending the Pressure Mode and Snore Mode data to be placed into the sensor Pressure Mode Register and Snore Mode Registers respectively. Simultaneously, the sensor sends the pressure data for the master to receive. Refer to the figure below for the data communication model of the sensor.



The requirement to send the Pressure Mode and Snore Mode bytes on each data read cycle is intentional. The purpose is to force the master to send specific data for each communication and prevent inadvertent data from being sent to the sensor. Since a SPI interface will generally re-circulate data through its shift register, the intention is to prevent the pressure output from the sensor from being re-circulated back to the sensor and potentially causing unintended corruption of data. Note: The first two bytes out are the DP pressure sensor. To receive the data from the GP and extended data, continue to read bytes from the sensor (see Section 10.6). Data sent to the sensor (MOSI), after the first two bytes of the transaction, is ignored.

10.5 I^{2}C Interface

The CP Series is compatible with the I^{2}C protocol. For detailed information regarding the I^{2}C protocol, please refer to the Philips I^{2}C Bus Specification, Version 2.

10.5.1 I²C Address

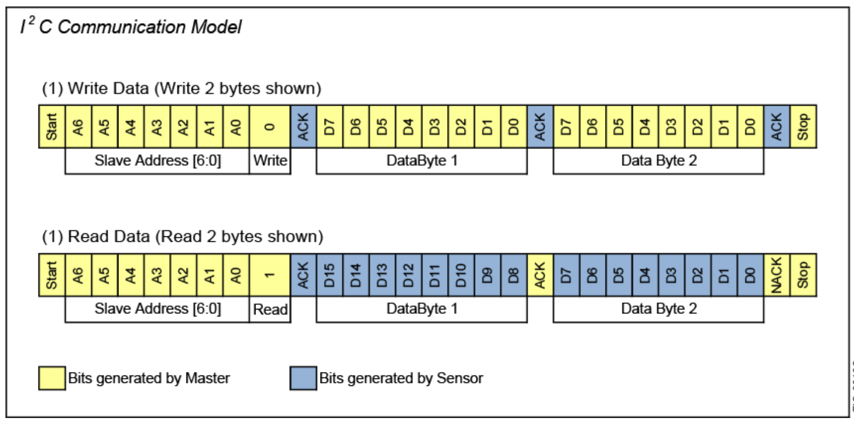
I2C Address Selection Table			
R1 (kΩ)	R2 (kΩ)	Address (decimal)	Address (hex)
120	5.6	49	0x31
120	12	48	0x30
120	27	47	0x2F
120	51	46	0x2E
120	100	45	0x2D
56	100	44	0x2C
30	100	43	0x2B
15	100	42	0x2A
5.6	100	41	0x29
0	NoPop	40	0x28

The I²C address is set to 0x28 by grounding the SCK line. Other I²C addresses can be established by applying a voltage to the SCK line by use of a resistor divider across the sensor supply voltage and ground. The suggested resistor values and the respective I²C address are shown in the table to the left.

Note: R1 is the lower resister of the divider where R2 is the upper resistor of the divider.

10.5.2 I²C Communications Model

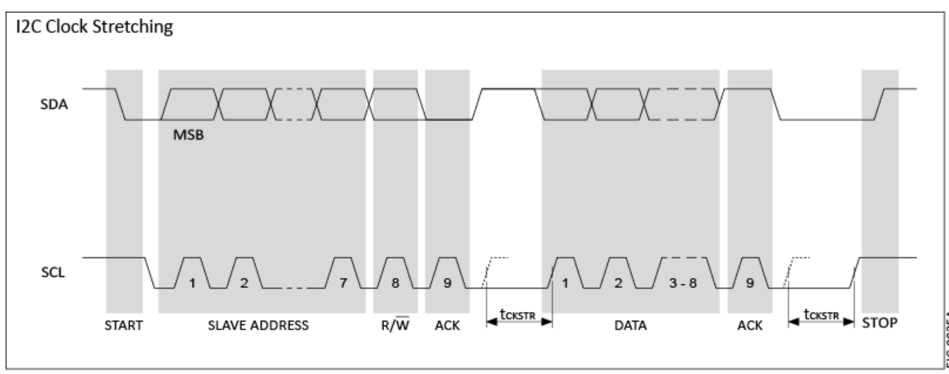
The sensor is configured as a slave device and as such, the communicating host must be configured as a master. There are two types of possible data transfers, data transfers from the master transmitter to an addressed sensor (WRITE), and data transfers from an addressed sensor to a master receiver (READ). The master device initiates both types of data transfers and provides the serial clock pulses on SCL.



The communications model for I²C is similar to that of SPI however, since I²C is a half-duplex protocol, the transfer of information to and from the sensor is separated into two separate communications. This is in contrast to the SPI interface where the transmitted and received data occurs simultaneously to and from the host. Refer to the figure to the right for the data communication model for the CP Series sensor.

10.5.3 I²C Clock Stretching

The figure to the right illustrates the I²C clock stretching by the sensor. At times, the sensor requires additional time to respond to the host and utilizes the clock stretching feature of the I²C protocol. This is accomplished by holding the SCL low after the ACK cycle of a data transfer. Refer to Section 7.5 for the clock stretching timing. Note, the maximum clock stretch time will generally only occur once during the three ACK cycles of a two byte transfer. That is, the balance of ACK's during a multi-byte transfer will generally include the typical clock stretching time.



10.5.4 I²C Bus Compatibility

The I²C specification allows any recessive voltage between 3.0 and 5.0 V. Different devices on the bus may operate at different voltage levels. However, the maximum voltage on any port pin must conform to the electrical characteristics specifications (See section 1). The bi-directional SCL (serial clock) and SDA (serial data) lines must be connected to a positive power supply voltage through a pull-up resistor or similar circuit. Every device connected to the bus must have an open-drain or open-collector output for both the SCL and SDA lines, so that both are pulled high (recessive state) when the bus is free.

10.6 Extending Data Acquisition

10.6.1 Available Data

Sections 10.4 and 10.5 show the reading of the first 16 bits of DP data. The full set of data that is available using either the SPI or I^2C interface is shown in the table below. The means to access this extended data is to continue reading data (either SPI or I^2C) beyond the first 16 bits of DP pressure information. The following table defines the order of the available data and respective format.

Data	Bytes	Format	Interpretation	Example
Pressure (DP)	1-2	2 byte, Signed Int	See Section 10.8	See Section 10.8
Pressure (GP)	3-4	2 byte, Signed Int	See Section 10.8	See Section 10.8
Snore Output	5	1 byte, Unsigned	Unsigned snore energy magnitude	0x2C = Snore magnitude 44
Used Pressure Mode Byte	6	1 byte, Unsigned	Mode byte used to compute this transaction	69H = DP(FS = 500Pa, BW = 100Hz) GP(FS = 4 kPa, BW = 50Hz)
Used Snore Mode Byte	7	1 byte, Unsigned	Snore Mode byte used to compute this transaction	0x1A = (Source = Gage, Peak disabled, LP Freq = 2 Hz, Gain = High, BP Freq = 20 Hz to 250 Hz)
Temperature	8-9	2 byte, Signed Int	Fixed Decimal [8.8 bits], Upper 8 bits integer, lower 8 bits fractional. Temperature in °C	1880H (18.80H) = 24.5°C
Model	10-15	6 byte, ASCII, null terminated	Right reading ASCII with null termination	43H,50H,32H,30H,33H,00H = CP203
Serial Number	16-19	4 byte, Hex	Unique 4 byte serial for each part	2FD627A4H
Build Number	20-25	6 byte, ASCII, null terminated	Right reading ASCII with null termination	30H,31H,38H,37H,42H,00H = 0187B

10.6.2 Extending SPI Data Read

Extending the data read using the SPI interface is the same as shown in Section 10.4 with exception that the master continues to read during the same nSS sequence to read the remaining 23 bytes of the available data. Any portion of the remaining bytes can be read during the transfer. That is, for example, 5 bytes could be read to acquire the DP pressure and GP pressure and snore output. When reading beyond the first two bytes (SPI mode), only the first two bytes sent to the sensor (User Mode and Snore Mode) are used to set the internal registers. The subsequent bytes (bytes 3 through 25) are ignored. Data read following all 25 bytes is undefined.

10.6.3 Extending I^2C Data Read

Reading the extended data via the I^2C interface is similar to using the SPI interface where the master can simply continue reading the sensor during the pressure reading transfer. The master continues Ack'ing until the number of desired bytes are read.

10.7 Control Registers

10.7.1 Pressure Mode Control Register

Default Value: 0xBB

Details of the Mode Control register are illustrated in the figure to the right.

Bits 0-1 control the DP output pressure range.

Bits 2-3 control the DP BW Limit Filter.

Bits 4-5 control the GP output pressure range.

Bits 6-7 control the GP BW Limit Filter.

It should also be noted that upon changing the Mode Control value, there is a one cycle latency before the new Mode Control value becomes valid. That is, the data of the communication cycle following a change to the Mode Control register will not reflect the change. It is not until the second communication cycle that the change in the Mode Control register will be reflected in the output data.

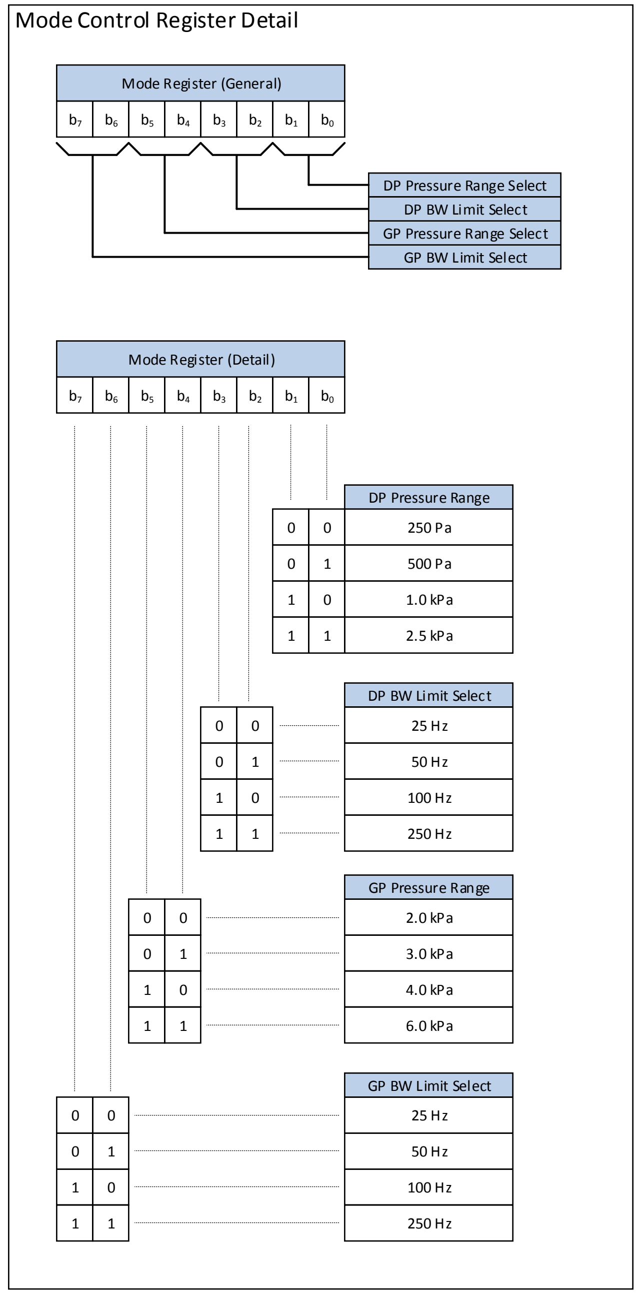


FIG-0094A

10.7.2 Snore Mode Control Register

10.7.3 Default Value: 0x1A

Refer the figure to the right for the snore mode byte bit definitions.

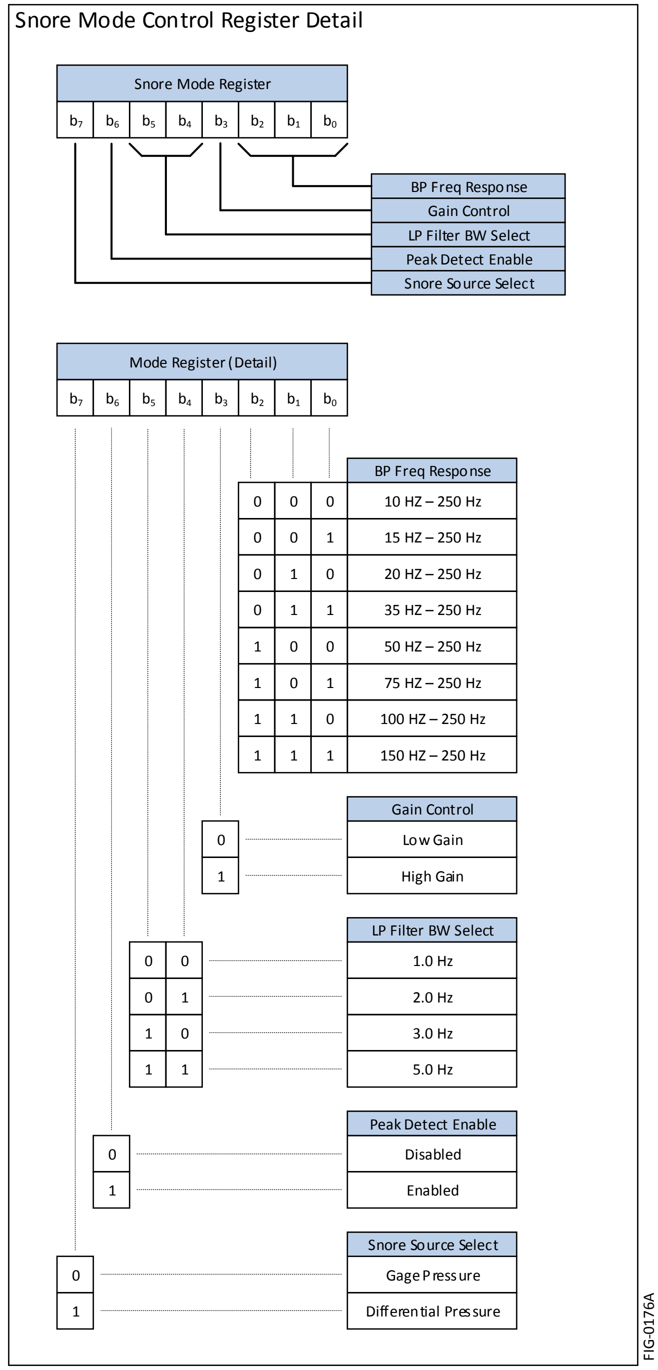
<u>Bits 0-2</u> Controls the band pass filter selection

<u>Bits 3</u> Gain control

<u>Bits 4-5</u> Controls the low pass filter corner frequency

<u>Bit 6</u> Enables the peak detector

<u>Bit 7</u> Selects the source sensor for snore detection



10.8 Computing Pressure

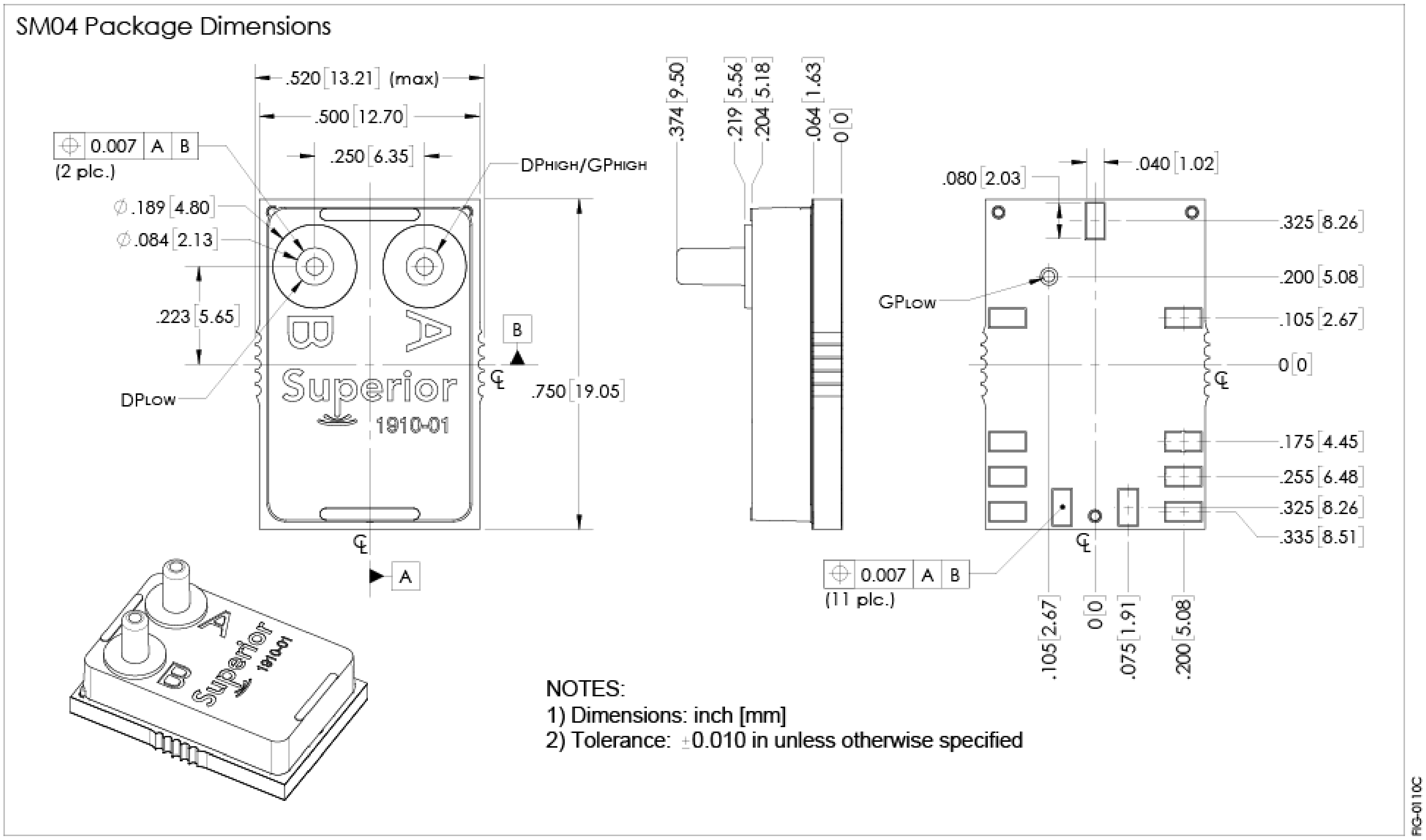
The pressure data is in the form of 16-bit signed integer sent in high byte then low byte order. This is a differential output by definition and the data range is $\pm 2^{15}$. There is a 10% margin in the output scaling and the selected full scale will reside in the 90% band of the total available output data range. Refer to Equation 1 (below) for the general model for computing the output pressure. As an example, if the sensor output is 3,647 counts and the selected pressure range is 500 Pa, then the output pressure is 61.832 Pa. Conversely, for a -3,647 count with the selected pressure range of 500 Pa, the computed output pressure is -61.832 Pa. Refer to Example 1 (below) for the specific example computation.

$$Eq\ 1: P_{Pa} = \frac{Out_{DIGITAL}}{90\% * 2^{15}} * Range_{SELECTED}$$

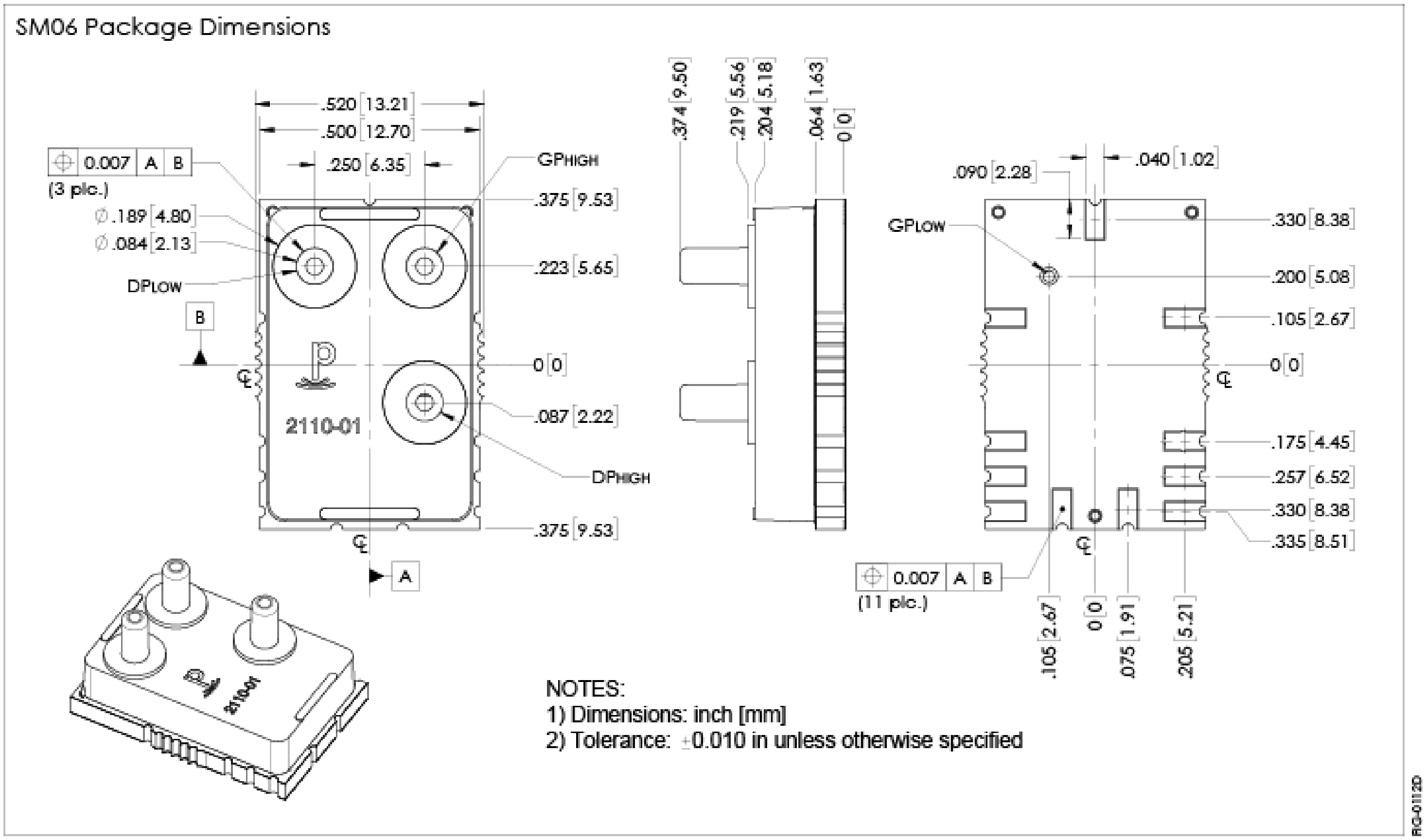
$$Example\ 1: P_{Pa} = \frac{3{,}647}{90\% * 2^{15}} * 500\ Pa = 61.832\ Pa$$

11 Mechanical

11.1 Package Dimensions (CP203-SM04)

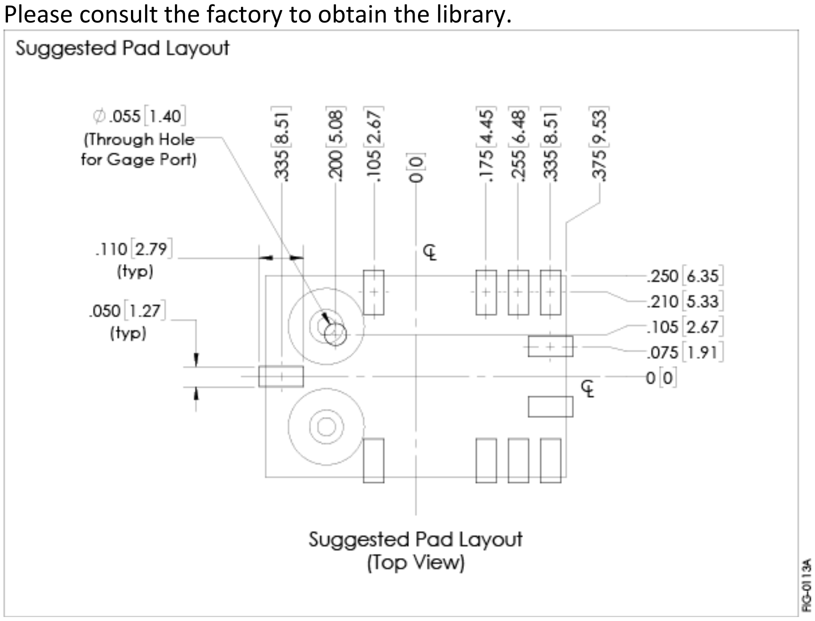


11.2 Package Dimensions (CP303-SM06)



11.3 Suggested Pad Layout (CP203/CP303)

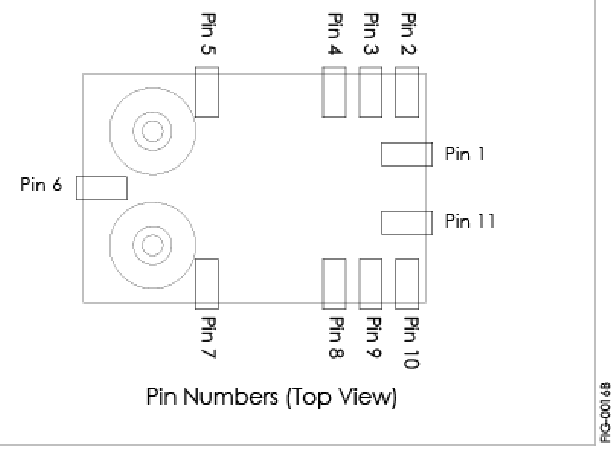
The suggested pad layout is shown in the figure below. An Eagle PCB symbol library is available with the shown pad dimensions. Please consult the factory to obtain the library.



11.4 Pinout (CP203/CP303)

Pin	Sym	SPI	I^2C
1	nSS	Slave Select (active low)	Tie to Ground
2	MOSI/SCL	MOSI	SCL
3	MISO/SDA	MISO	SDA
4	SCK	Serial Clock	See Section 10.5.1
5	DNC	Do Not Connect	
6	DNC	Do Not Connect	
7	DNC	Do Not Connect	
8	Gnd	Ground	
9	V_{DD}	Sensor Supply	
10	nRST	Reset (active low)	
11	DAV	Data Available	

Package Pinout



Pin Numbers (Top View)

12 Manufacturing

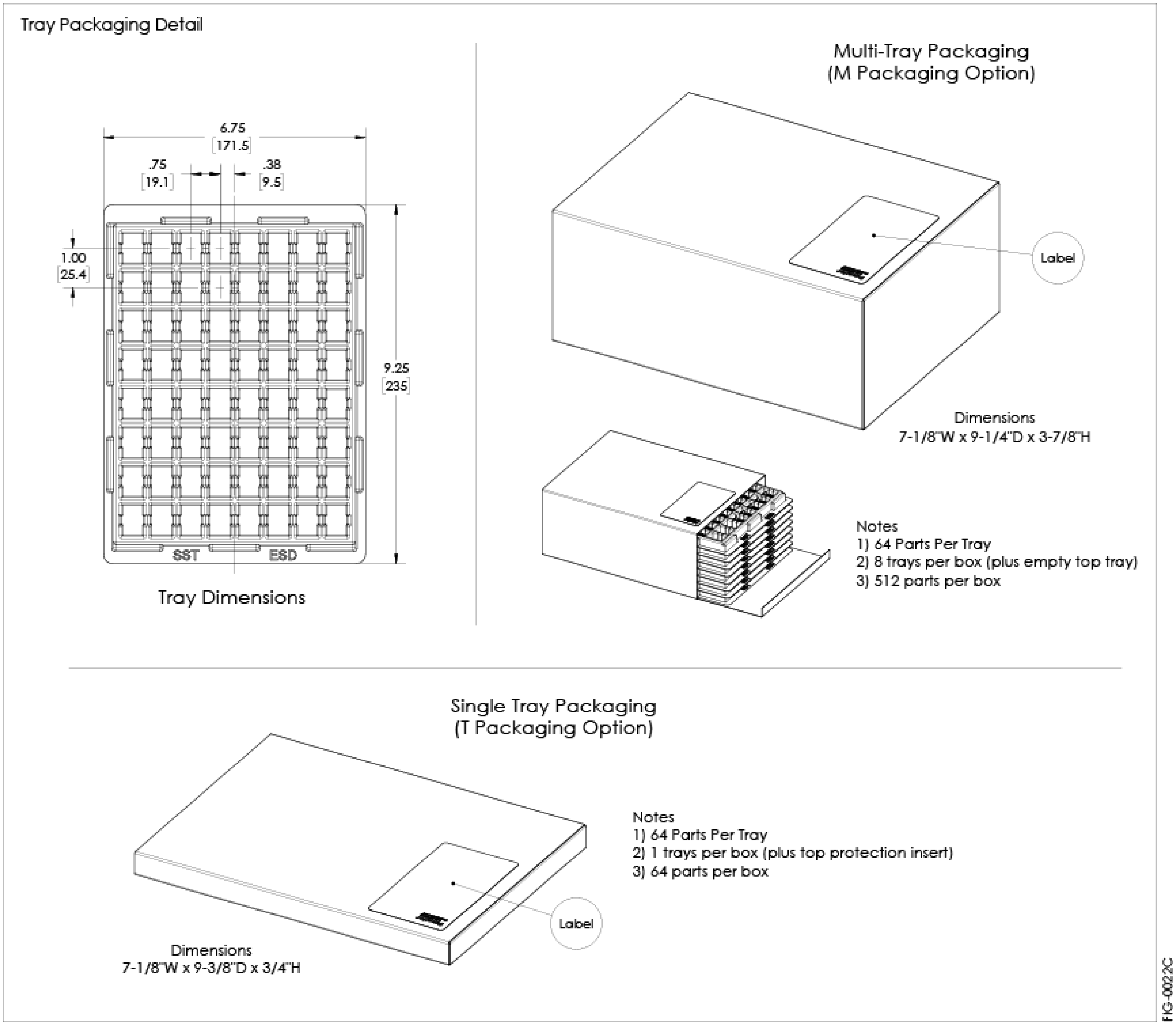
For additional pressure sensor handling and assembly instructions, please see application note AN-0010.

12.1 Reflow Soldering and Handling Conditions

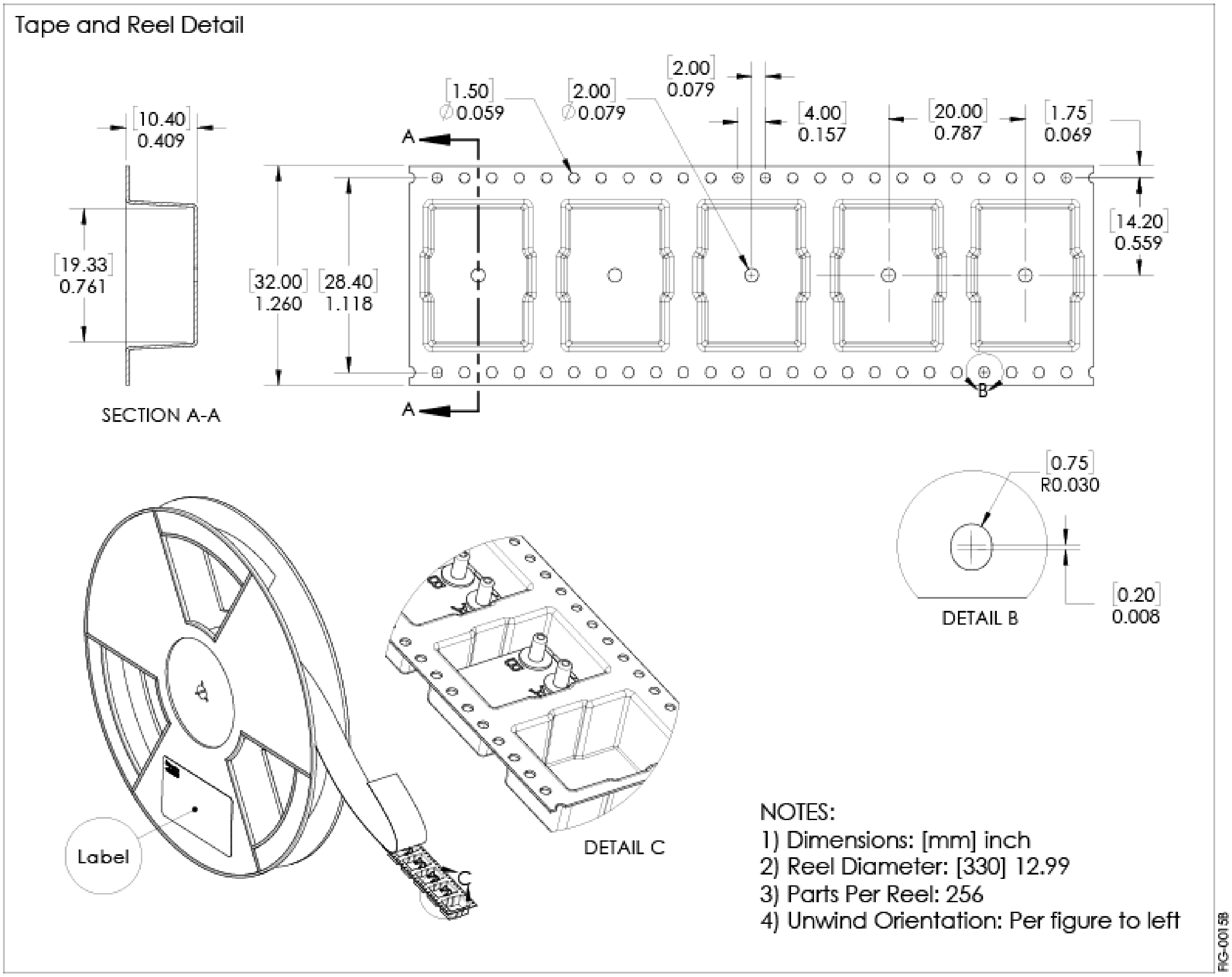
Parameter	Sym	Val	Units
Soldering Specifications (Max)			
Preheat Ramp Rate	t_{PHRR}	3	°C/s
Soak Time	t_{SOAK}	3	min
Time Above 217C	t_{GT217}	50	s
Time Above 230C	t_{GT230}	40	s
Time Above 250C	t_{GT250}	15	s
Peak Temperature	t_{PT}	255	°C
Cooling Ramp Rate	t_{CRR}	-4	°C/s
Weight	W_{PRT}	3.5	gm
Moisture Sensitivity	MSL	3	
ESD (Human Body Model)	ESD	2	kV

13 Packaging and Labeling

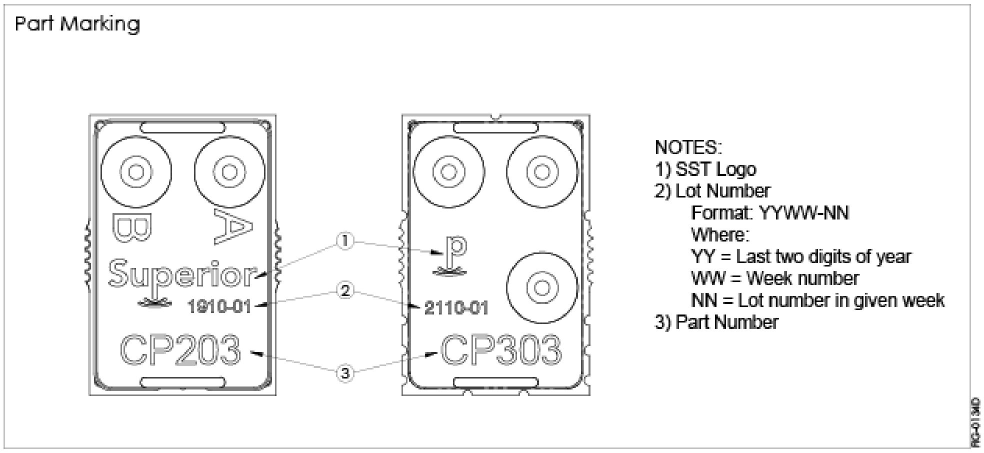
13.1 Tray Packaging



13.2 Tape and Reel



13.3 Part Identification



13.4 Packaging Labels

Packaging labels are provided with barcode Code 128 symbology. The provided fields are Company Name, Part Number, Quantity, Packaging ID, Date Code, MSL Level and Country of Origin. The Packaging ID traces back to the Lot Number (or Lot Numbers) contained in the package. The purpose is to eliminate multiple labels (one for each included Lot Number) in the event of multiple Lot Numbers within a single package. This is for ease of customer tracking and maintenance. The Packaging ID is a 24-bit value printed in hexadecimal format. The data code is the code for when the materials were packaged into the reel or Q-reel etc. The date code format is YYWW.

14 Ordering Information

Part Number	Part Package	Packaging	Packaging Qty	Order Number
CP203-SM04	SM04	Tape and Reel Multi-Tray Single Tray Quarter Reel Cut Tape	256 512 64 64 1-63	CP203-SM04-R CP203-SM04-M CP203-SM04-T CP203-SM04-Q CP203-SM04-C
CP303-SM06	SM06	Tape and Reel Multi-Tray Single Tray Quarter Reel Cut Tape	256 512 64 64 1-63	CP303-SM06-R CP303-SM06-M CP303-SM06-T CP303-SM06-Q CP303-SM06-C

15 Revisions

Rev	Change Description(s)	Date	By
A	Initial Release	04/29/25	T.S./A.G.

16 Warranty

Superior Sensor Technology and its subsidiaries warrant goods of its manufacture as being free of defective materials and faulty workmanship during the applicable warranty period. In all cases, Superior Sensor Technology's standard product warranty applies; please refer to your order acknowledgement or consult your local sales office for specific warranty details.

If warranted goods are returned to Superior Sensor Technology during the period of coverage, Superior Sensor Technology will repair or replace, at its option, without charge those items that Superior Sensor Technology, in its sole discretion, finds defective. **The foregoing is buyer's sole remedy and is in lieu of all other warranties, expressed or implied. In no event shall Superior Sensor Technology be liable for consequential, special, or indirect damages.**

While Superior Sensor Technology may provide application assistance personally, through literature or the Superior Sensor Technology web site, it is buyer's sole responsibility to determine the suitability of the product in their application. Superior Sensor Technology assumes no liability for applications assistance or customer product design.

Superior Sensor Technology reserves the right to make corrections, modifications, enhancements, improvements and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete.

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