DATASHEET

AS1318C SERIES

VERSION 3

AIoTSensing Inc.
Website: http://www.aiotsensing.com

History of Revision

Datasheet Rev.	Date	Note
01	Sep/22/2022	Released
02	Apr/23/2023	Added new “T” port configuration and “J” pin options
03	Apr/07/2024	Added ±125LD pressure range, Updated pictures of product

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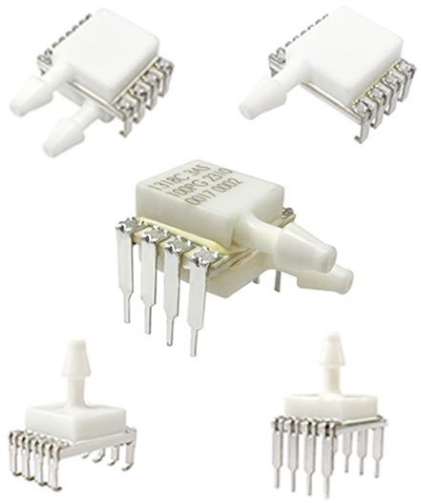


1. Features

- Pressure ranges from ±125 Pa to ±1 MPa; ±0.5 inH2O to ±150 psi; ±1.6 mbar to ±10 bar
- Absolute, Gage or Differential pressure type
- Total Error Band reach to ±1.0 %FSS
- Calibrated over temperature range of -10°C to 60°C
- 14-bit digital output for pressure and 11-bit digital output for temperature.
- Sample rate 2KHz
- I2C interface or SPI
- 3.3V or 5.0V power supply
- Package size is 12.5mm x9.9mm

2. Applications

- Medical Equipment
- Industrial Controls
- HVAC
- Environmental Controls
- Air flow

3. Descriptions

The AS1318C series are DIP and SMT package, ceramic substrate, PCB mounted pressure sensor family from AIoT Sensing. They offer state-of-the-art pressure transducer technology to produce a digital output, fully conditioned, multi-order pressure and temperature compensated outputs. All products are designed and manufactured according to ISO 9001 standard.

The AS1318C is fully calibrated and temperature compensated with a total error band (TEB) of less than 1.0% over the compensated pressure range. The sensor operates from single supply of either 3.3 or 5.0VDC and requires a single external component for proper operation. It provides low noise, 14-bit pressure data and 11-bit temperature data at sample rates exceeding 2kHz.The rugged ceramic transducer is available in side port, top port, and manifold mount and can measure absolute, gauge, differential, from -1000kpa to 1000kpa. The 1/8” barbed pressure ports mate securely with 3/32” ID tubing.

4. Standard Pressure Ranges

Table 4.1: ±125 Pa to ±1 MPa

Pressure Range	Pressure		Unit	Over Pressure	Burst Pressure	Common Mode Pressure	TEB (%FSS)
	Pmin	Pmax					
Absolute							
100KA	0	100	kPa	200	400	-	±1%
160KA	0	160	kPa	400	800	-	±1%
250KA	0	250	kPa	600	800	-	±1%
400KA	0	400	kPa	800	1600	-	±1%
600KA	0	600	kPa	1700	1700	-	±1%
001GA	0	1	MPa	1700	1700	-	±1%
Differential							
125LD	-125	125	Pa	67500	100000	345000	±3%
160LD	-160	160	Pa	67500	100000	345000	±2.5%
250LD	-250	250	Pa	67500	100000	345000	±2%
400LD	-400	400	Pa	67500	100000	345000	±1.5%
600LD	-600	600	Pa	67500	100000	345000	±1%
001KD	-1	1	kPa	75	125	545	±1%
1.6KD	-1.6	1.6	kPa	75	125	545	±1%
2.5KD	-2.5	2.5	kPa	85	135	1045	±1%
004KD	-4	4	kPa	85	135	1045	±1%
006KD	-6	6	kPa	85	100	1000	±1%
010KD	-10	10	kPa	140	250	1000	±1%
016KD	-16	16	kPa	140	250	1000	±1%
025KD	-25	25	kPa	140	250	1000	±1%
040KD	-40	40	kPa	200	400	1000	±1%
060KD	-60	60	kPa	200	400	1000	±1%
100KD	-100	100	kPa	400	800	1000	±1%
160KD	-160	160	kPa	800	1600	1000	±1%
250KD	-250	250	kPa	800	1600	1000	±1%
400KD	-400	400	kPa	1600	1700	1000	±1%
Gage							
250LG	0	250	Pa	67500	100000	345000	±3%
400LG	0	400	Pa	67500	100000	345000	±2%
600LG	0	600	Pa	67500	100000	345000	±2%
001KG	0	1	kPa	67.5	100	345	±1.5%
1.6KG	0	1.6	kPa	67.5	100	345	±1%
2.5KG	0	2.5	kPa	75	125	545	±1%
004KG	0	4	kPa	75	125	545	±1%

Continue table from above

006KG	0	6	kPa	85	100	545	±1%
010KG	0	10	kPa	85	100	1000	±1%
016KG	0	16	kPa	85	100	1000	±1%
025KG	0	25	kPa	140	250	1000	±1%
040KG	0	40	kPa	200	400	1000	±1%
060KG	0	60	kPa	200	400	1000	±1%
100KG	0	100	kPa	200	400	1000	±1%
160KG	0	160	kPa	400	800	1000	±1%
250KG	0	250	kPa	800	1600	1000	±1%
400KG	0	400	kPa	800	1600	1600	±1%
600KG	0	600	kPa	1700	1700	1700	±1%
001GG	0	1	MPa	1.7	1.7	1.7	±1%

Table 4.2: ±0.5 inH2O to ±150 psi

Pressure Range	Pressure		Unit	Over Pressure	Burst Pressure	Common Mode Pressure	TEB (%FSS)
	Pmin	Pmax					
Absolute							
015PA	0	15	psi	30	60	-	±1%
030PA	0	30	psi	60	120	-	±1%
060PA	0	60	psi	120	240	-	±1%
100PA	0	100	psi	250	250	-	±1%
150PA	0	150	psi	250	250	-	±1%
Differential							
0.5ND	-0.5	0.5	inH2O	270	415	1400	±3%
001ND	-1	1	inH2O	270	415	1400	±2%
002ND	-2	2	inH2O	270	415	1400	±1%
004ND	-4	4	inH2O	300	500	2200	±1%
005ND	-5	5	inH2O	300	500	2200	±1%
010ND	-10	10	inH2O	350	550	4200	±1%
020ND	-20	20	inH2O	350	550	4200	±1%
030ND	-30	30	inH2O	350	550	4200	±1%
001PD	-1	1	psi	10	15	150	±1%
005PD	-5	5	psi	30	40	150	±1%
015PD	-15	15	psi	60	120	150	±1%
030PD	-30	30	psi	120	240	150	±1%
060PD	-60	60	psi	250	250	250	±1%
Gage							
001NG	0	1	inH2O	270	415	1400	±3%
002NG	0	2	inH2O	270	415	1400	±2%

Continue table from above

004NG	0	4	inH2O	270	415	1400	±1.5%
005NG	0	5	inH2O	270	415	1400	±1%
010NG	0	10	inH2O	300	500	2200	±1%
020NG	0	20	inH2O	350	550	4200	±1%
030NG	0	30	inH2O	350	550	4200	±1%
001PG	0	1	psi	10	15	150	±1%
005PG	0	5	psi	30	40	150	±1%
015PG	0	15	psi	30	60	150	±1%
030PG	0	30	psi	60	120	150	±1%
060PG	0	60	psi	120	240	250	±1%
100PG	0	100	psi	250	250	250	±1%
150PG	0	150	psi	250	250	250	±1%

Table 4.3: ±1.6 mbar to ±10 bar

Pressure Range	Pressure		Unit	Over Pressure	Burst Pressure	Common Mode Pressure	TEB (%FSS)
	Pmin	Pmax					
Absolute							
01BA	0	1	bar	2	4	-	±1%
1.6BA	0	1.6	bar	4	8	-	±1%
2.5BA	0	2.5	bar	6	8	-	±1%
004BA	0	4	bar	8	16	-	±1%
006BA	0	6	bar	17	17	-	±1%
010BA	0	10	bar	17	17	-	±1%
Differential							
1.6MD	-1.6	1.6	mbar	675	1000	3450	±2.5%
2.5MD	-2.5	2.5	mbar	675	1000	3450	±2%
004MD	-4	4	mbar	675	1000	3450	±1.5%
006MD	-6	6	mbar	675	1000	3450	±1%
010MD	-10	10	mbar	750	1250	5450	±1%
016MD	-16	16	mbar	750	1250	5450	±1%
025MD	-25	25	mbar	850	1350	10450	±1%
040MD	-40	40	mbar	850	1350	10450	±1%
060MD	-60	60	mbar	850	1000	10000	±1%
100MD	-100	100	mbar	1400	2500	10000	±1%
160MD	-160	160	mbar	1400	2500	10000	±1%
250MD	-250	250	mbar	1400	2500	10000	±1%
400MD	-400	400	mbar	2000	4000	10000	±1%
600MD	-600	600	mbar	2000	4000	10000	±1%

Continue table from above

001BD	-1	1	bar	4	8	10	±1%
1.6BD	-1.6	1.6	bar	8	16	10	±1%
2.5BD	-2.5	2.5	bar	8	16	10	±1%
004BD	-4	4	bar	16	17	10	±1%
Gage							
2.5MG	0	2.5	mbar	675	1000	3450	±3%
004MG	0	4	mbar	675	1000	3450	±2%
006MG	0	6	mbar	675	1000	3450	±2%
010MG	0	10	mbar	675	1000	3450	±1.5%
016MG	0	16	mbar	675	1000	3450	±1%
025MG	0	25	mbar	750	1250	5450	±1%
040MG	0	40	mbar	750	1250	5450	±1%
060MG	0	60	mbar	850	1000	5450	±1%
100MG	0	100	mbar	850	1000	10000	±1%
160MG	0	160	mbar	850	1000	10000	±1%
250MG	0	250	mbar	1400	2500	10000	±1%
400MG	0	400	mbar	2000	4000	10000	±1%
600MG	0	600	mbar	2000	4000	10000	±1%
001BG	0	1	bar	2	4	10	±1%
1.6BG	0	1.6	bar	4	8	10	±1%
2.5BG	0	2.5	bar	8	16	10	±1%
004BG	0	4	bar	8	16	16	±1%
006BG	0	6	bar	17	17	17	±1%
010BG	0	10	bar	17	17	17	±1%

Overpressure: The maximum pressure which may safely be applied to the product for it to remain in specification once pressure is returned to the operating pressure range. Exposure to higher pressures may cause permanent damage to the product. Unless otherwise specified this applies to all available pressure ports at any temperature with the operating temperature range.

Burst pressure: The maximum pressure that may be applied to any port of the product without causing escape of pressure media. Product should not be expected to function after exposure to any pressure beyond the burst pressure.

Common mode pressure: The maximum pressure that can be applied simultaneously to both ports of a differential pressure sensor without causing changes in specified performance.

Total Error Band: The maximum deviation from the ideal transfer function over the entire compensated temperature and pressure range. Includes all errors due to offset, full scale span, pressure non-linearity, pressure hysteresis, repeatability, thermal effect on offset, thermal effect on span, and thermal hysteresis

5. Performance Characteristics（Compensation Temperature , from -10℃ to 60 ℃）

Parameter	Min	Typ	Max	Units	Notes
Pressure TEB		±1.0		%FSS	1
Pressure Accuracy		±0.25		%FSS	2
Temperature Accuray			1.5	˚C	3
Long term stability		±0.25		%FSS/yr	

Note:

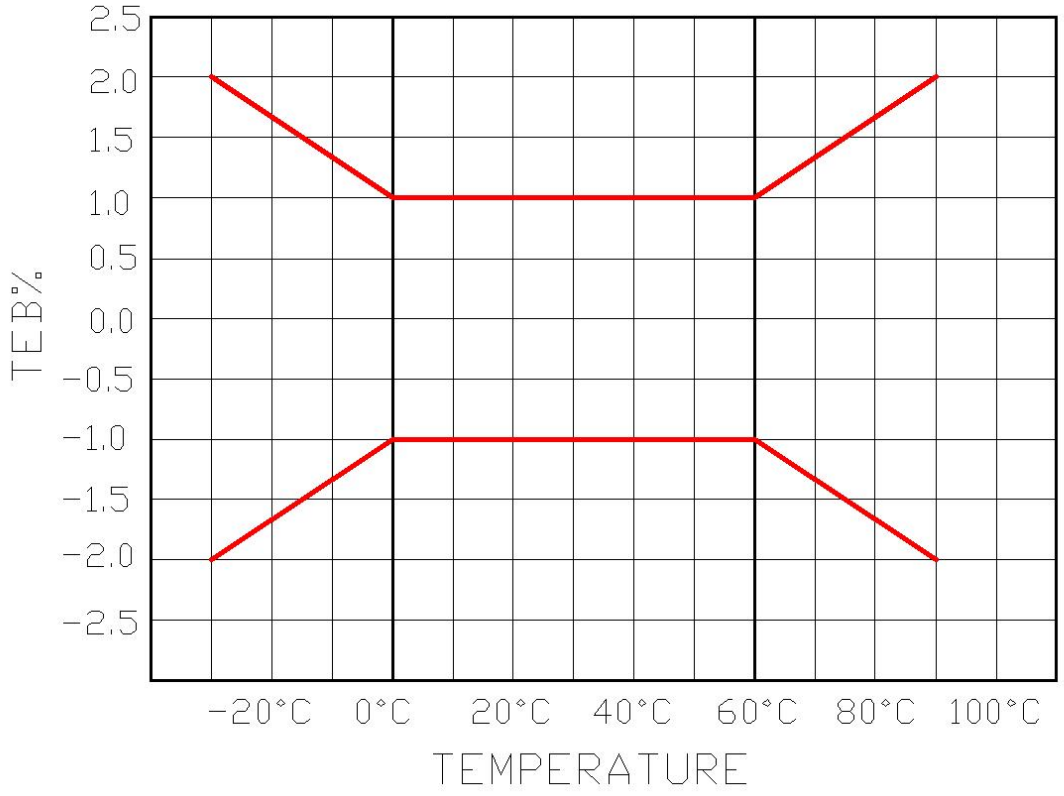
1.TEB values are valid only at the calibrated supply voltage

2.The maximum deviation from a best fit straight line (BFSL) fitted to the output measured over the pressure range at 25C. Includes all errors due to pressure non linearity, hysteresis, and non-repeatability.

3.The deviation from a best fit straight line (BFSL) fitted to the output measured over the compensated temperature range

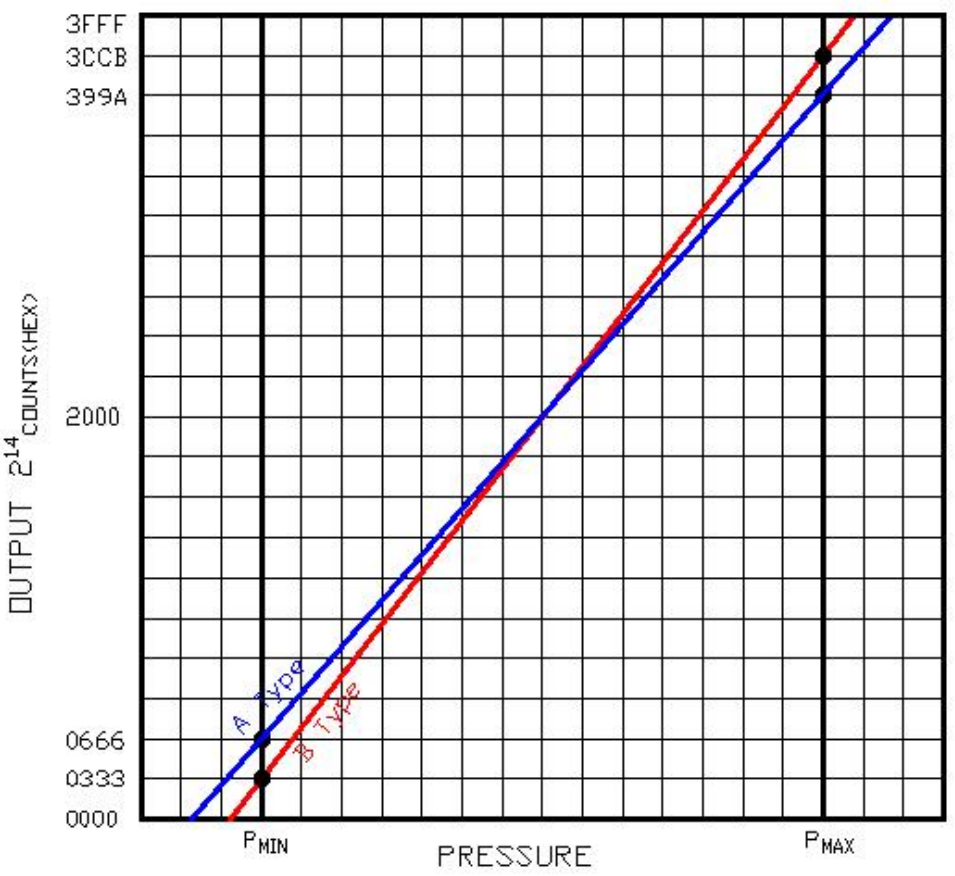
4.This product can be configured for custom OEM requirements, contact factory for lower power consumption or higher accuracy.

5. For errors beyond the compensated temperature range, see Extended Temperature Multiplier chart below.



6. Pressure and Temperature Transfer function

6.1 Pressure



A OUTPUT TYPE

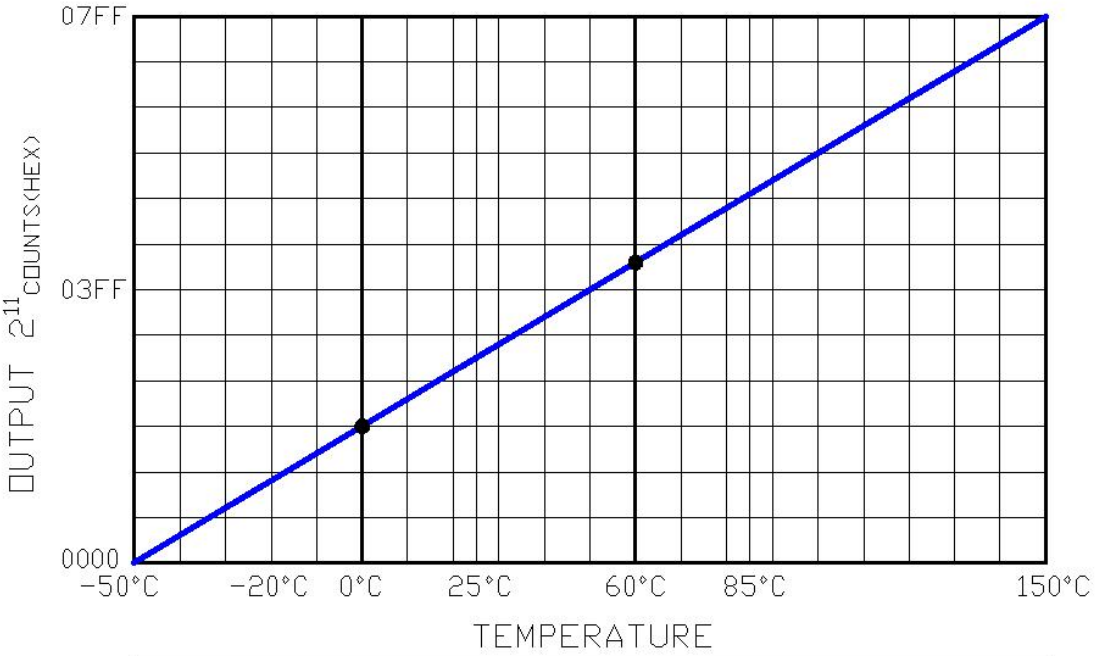
$$PRESSURE_{APPLIED} = \frac{(OUTPUT_{COUNTS(DEC)} - 1638) * (P_{MAX} - P_{MIN})}{80\% * (2^{14} - 1)} + P_{MIN}$$

B OUTPUT TYPE

$$PRESSURE_{APPLIED} = \frac{(OUTPUT_{COUNTS(DEC)} - 819) * (P_{MAX} - P_{MIN})}{90\% * (2^{14} - 1)} + P_{MIN}$$

Sensor Output at Significant Percentages				
% of Count	Output Type A	Output Type B	Digital Counts (decimal)	Digital Counts (hex)
0			0	0X0000
5		PMIN	819	0X0333
10	PMIN		1638	0X0666
50			8192	0X2000
90	PMAX		14746	0X399A
95		PMAX	15563	0X3CCB
100			16383	0X3FFF

6.2 Temperature



$$OUTPUT°C = \frac{OUTPUT_{COUNTS(DEC)} * 200°C}{2^{11} - 1} - 50°C$$

Temperature Output vs Counts		
OUTPUT (°C)	**Digital Count (decimal)**	**Digital Counts (hex)**
-50	0	0X0000
0	511	0X01FF
10	614	0X0266
25	767	0X02FF
60	1125	0X0465
85	1381	0X0565
150	2047	0X07FF

7. Block Diagram

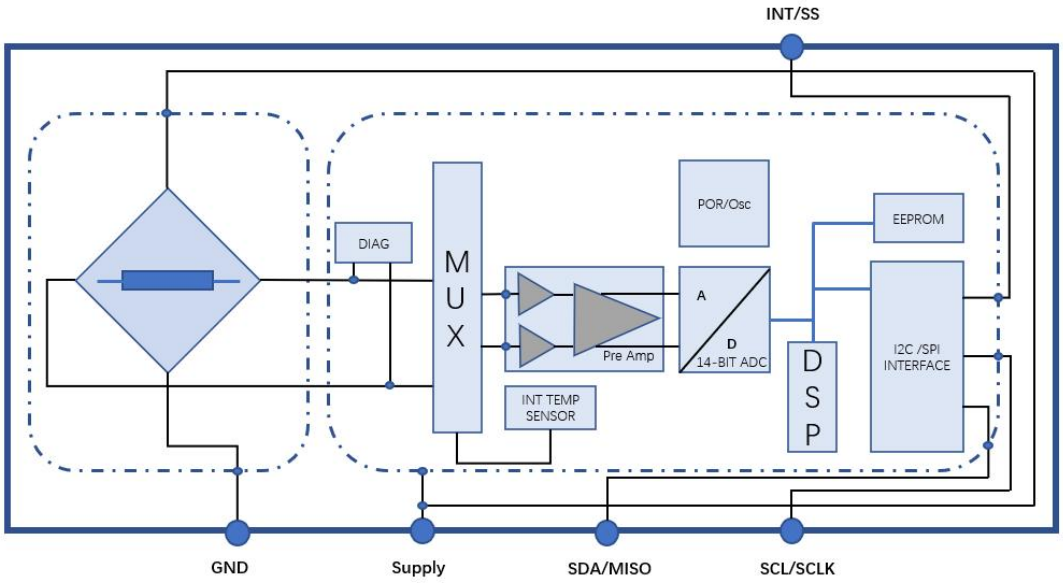


Figure 1: Functional Block Diagram

8. Specifications

8.1 Electronical and Environment Characteristics

Table 8.1: DC Characteristics @VDD=3.3V or 5V, T=25℃ unless otherwise specified

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Operation Supply Voltage	V_{DD}		2.7		5.5	V
Operation Temperature	T_{OP}		-20		85	℃
Compensated Temperature	Tco		0		60	℃
Load Resistance	R_L		10			k Ω
Supply Current	Idd			3.0		mA
Output Pressure Resolution					14	Bits
Output Temperature Resolution			8		11	Bits
Update time				0.5		mS
Startup time					8.4	mS
Serial Data Clock Frequency	f_{SCLK}	I^2C protocol		100	400	kHz
		SPI protocol			10	MHz
Digital Input High Voltage	V_{IH}		0.8		1	$\%V_{DD}$
Digital Input Low Voltage	V_{IL}		0		0.2	$\%V_{DD}$
Input Capacitance	C_{IN}			4.7		pF
Weight					3	grams
Media	Non-Corrosive Dry Gases compatible with Ceramic, Silicon, RTV, Gold, Aluminum and Epoxy.					

8.2 Absolute Maximum Rating

Table8.2: Absolute Maximum Rating

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Supply Voltage	V_{DD}		-0.3		6.0	V
Interface Voltage	V_{IF}		-0.3		VDD+0.3	V
Storage Temperature Range	T_{STG}		-40		125	℃
ESD Rating		Human body model	-2		+2	kV
Solder Temperature		250°C, 5 sec max.				

Stresses above those listed as "absolute maximum ratings" may cause permanent damage to the device. This is a stress rating only and functional operation of the device under these conditions is not implied. Exposure to maximum rating conditions for extended periods may affect device reliability.

9. Function Descriptions

9.1 General Description

The AS1318C series consists of a piezo-resistive sensor and a sensor interface I^2C. The main function of the I^2C is to convert the uncompensated analogue output voltage from the piezo-resistive pressure sensor to a 14-bit digital value, as well as providing a 11-bit digital value for the temperature of the sensor, and compensates them by a patented algorithm. The fully-compensated values can be read out by external MCU.

9.2 Factory Calibration

Every sensor is individually factory calibrated for sensitivity and offset for both of the temperature and pressure measurements; further calibrations are not necessary to be done by the user.

9.3 Sensor Output Conversion

The sensor is programmed for the fastest update rate, conversions will continue to happen after the power-up sequence. Customer just needs to read sensor without other operations

9.4 Serial Interface

The AS1318C provides I^2C or SPI interface for serial communication.

10. I²C Interface

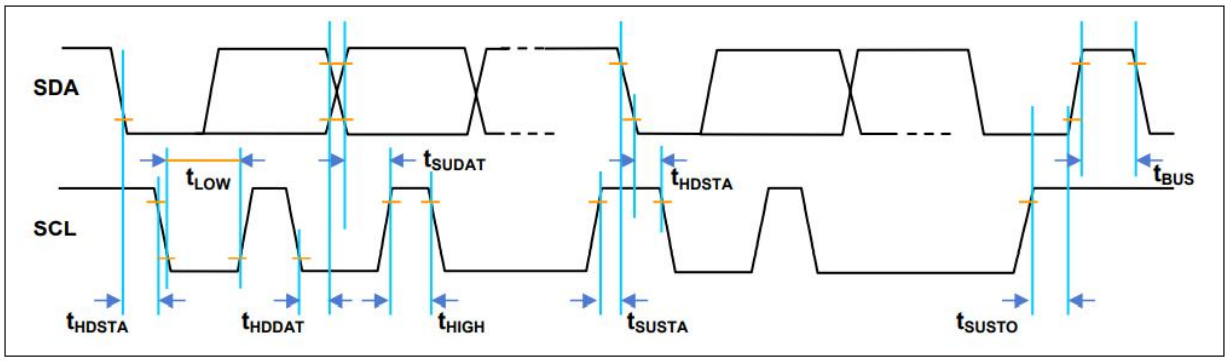
The sensor can communicate via an addressable two-wire (I²C) interface. The INT/SS pin operates as an interrupt. The INT pin rises when new output data is ready and falls when the next communication occurs.

10.1. I²C Timing Parameters

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS
SCL clock frequency	f_{SCL}	100		400	kHz
Start condition hold time relative to SCL edge	t_{HDSTA}	0.1			µs
Minimum SCL clock low width [1)]	t_{LOW}	0.6			µs
Minimum SCL clock high width [1)]	t_{HIGH}	0.6			µs
Start condition setup time relative to SCL edge	t_{SUSTA}	0.1			µs
Data hold time on SDA relative to SCL edge	t_{HDDAT}	0			µs
Data setup time on SDA relative to SCL edge	t_{SUDAT}	0.1			µs
Stop condition setup time on SCL	t_{SUSTO}	0.1			µs
Bus free time between stop condition and start condition	t_{BUS}	2			µs

1) Combined low and high widths must equal or exceed minimum SCLK period.

10.2. I²C Timing Diagram



Note: There are three differences in the sensor protocol compared with the original I²C protocol:

• Sending a start-stop condition without any transitions on the CLK line (no clock pulses in between) creates a communication error for the next communication, even if the next start condition is correct and the clock pulse is applied. An additional start condition must be sent, which results in restoration of proper communication.

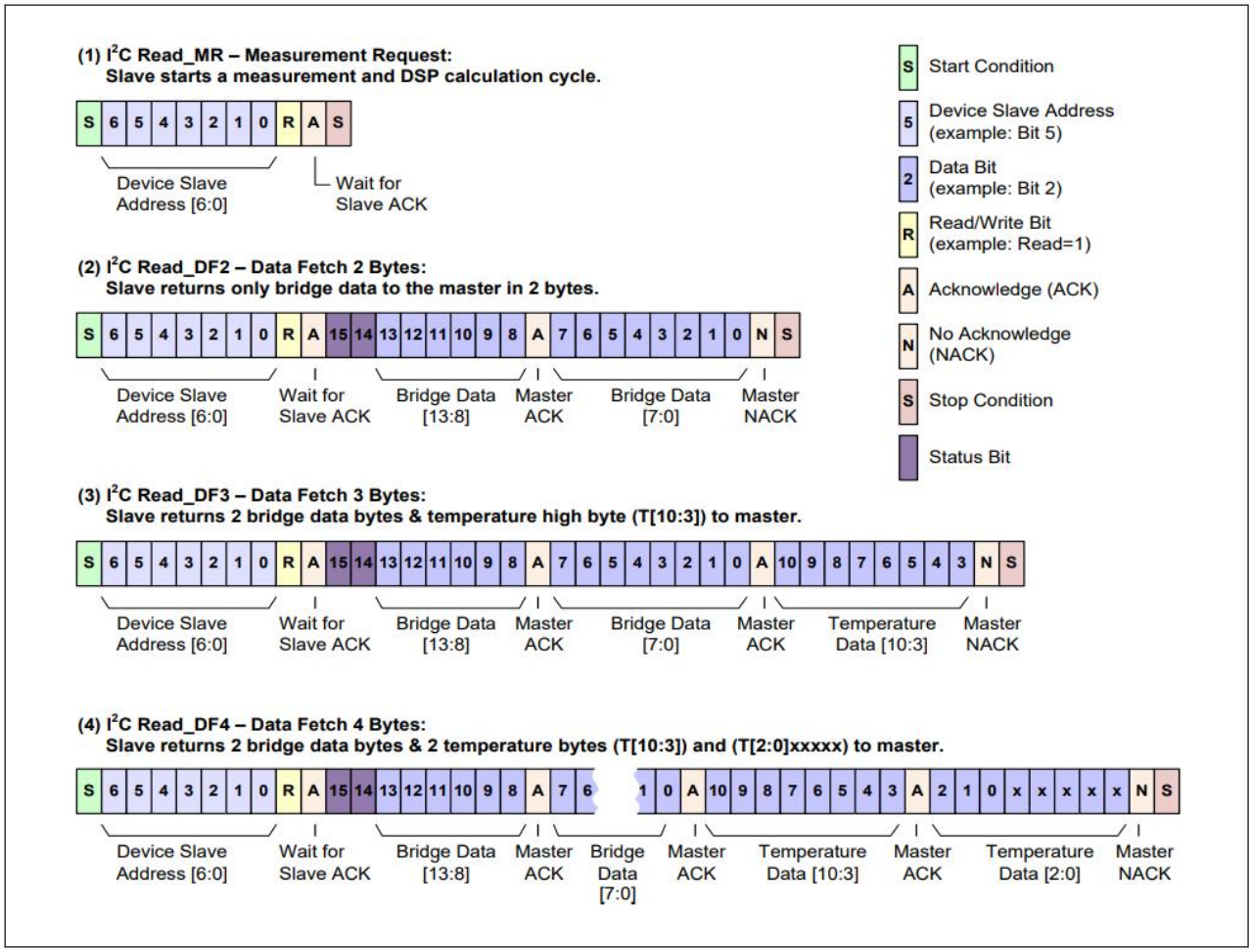
• The restart condition—a falling SDA edge during data transmission when the CLK clock line is still high—creates the same situation. The next communication fails, and an additional start condition must be sent for correct communication.

• A falling SDA edge is not allowed between the start condition and the first rising SCL edge. If using an I²C address with the first bit 0, SDA must be held low from the start condition through the first bit.

10.3. I²C Read Operations

For read operations, the I²C master command starts with the 7bit slave address with the 8th bit =1 (READ). The sensor as the slave sends an acknowledge (ACK) indicating success. The sensor has four I²C read commands: Read_MR, Read_DF2, Read_DF3, and Read_DF4. Figure as below shows the structure of the measurement packet for three of the four I²C read commands.

The Structure of the measurement packet



Note: For sensors that do not offer the optional compensated temperature output, the sensor will still output the third and fourth bytes of data, but the information contained in these bytes is non-corrected data, and should not be used.

11. SPI Interface

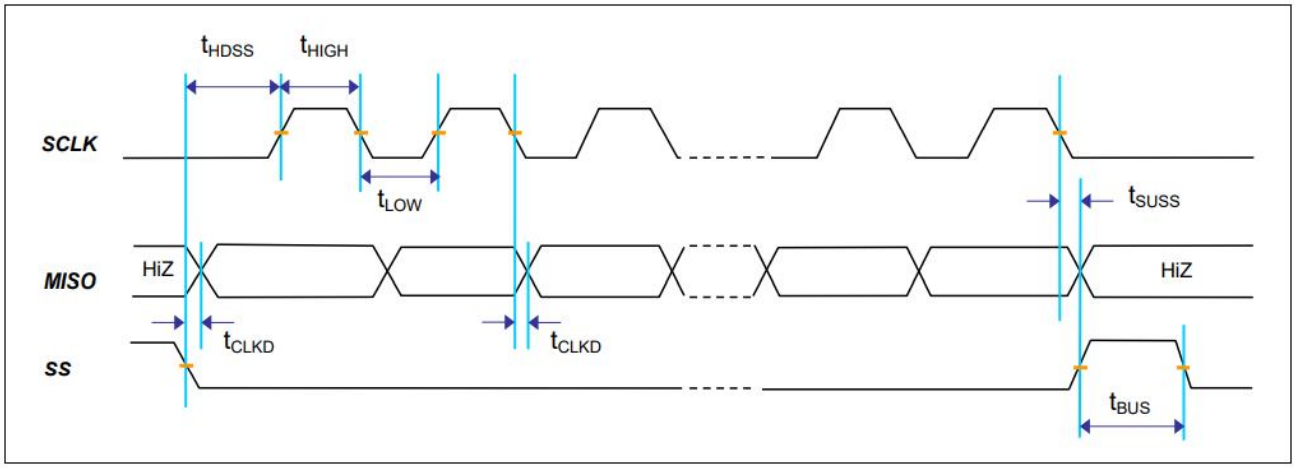
SPI is available only as half duplex (read-only from the sensor). it does not support receiving commands. SPI speeds of up to 200kHz can be supported in 1MHz Mode, and up to 800kHz can be supported in 4MHz Mode. See the SPI timing diagram and Table for definitions of the parameters shown in the timing diagram

11.1. SPI Timing Parameters

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS
SCLK clock frequency (4MHz clock)	f_{SCL}	50		800	kHz
SCLK clock frequency (1MHz clock)	f_{SCL}	50		200	kHz
SS drop to first clock edge	t_{HDSS}	2.5			µs
Minimum SCLK clock low width [1)]	t_{LOW}	0.6			µs
Minimum SCLK clock high width [1)]	t_{HIGH}	0.6			µs
Clock edge to data transition	t_{CLKD}	0		0.1	µs
Rise of SS relative to last clock edge	t_{SUSS}	0.1			µs
Bus free time between rise and fall of SS	t_{BUS}	2			µs

1) Combined low and high widths must equal or exceed minimum SCLK period.

11.2. SPI Timing Diagram



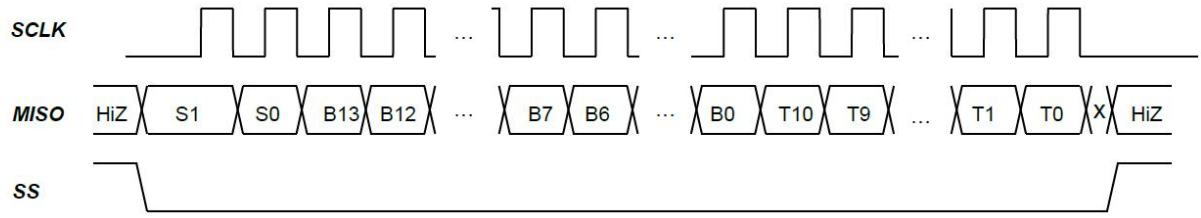
Note:

- The SPI interface of sensor is for falling-edge MISO change.

11.3. SPI Read Operations

For simplifying explanations and illustrations, only falling edge SPI polarity will be discussed in the following sections. The SPI interface will have data change after the falling edge of SCLK. The master should sample MISO on the rise of SCLK. The entire output packet is 4 bytes (32 bits). The high bridge data byte comes first, followed by the low bridge data byte. Then 11 bits of corrected temperature (T[10:0]) are sent: first the T[10:3] byte and then the {T[2:0],xxxxx} byte. The last 5 bits of the final byte are undetermined and should be masked off in the application. If the user only requires the corrected bridge value, the read can be terminated after the 2nd byte. If the corrected temperature is also required but only at an 8-bit resolution, the read can be terminated after the 3rd byte is read.

SPI Output Packet with Falling Edge SPI_Polarity



Packet = [{S(1:0),B(13:8)}, {B(7:0)}, {T(10:3)},{T(2:0),xxxxx}] Where
S(1:0) = Status bits of packet (normal, command, busy, diagnostic)
B(13:8) = Upper 6 bits of 14-bit bridge data.
B(7:0) = Lower 8 bits of 14-bit bridge data.
T(10:3) = Corrected temperature data (if application does not require corrected temperature, terminate read early)
T(2:0),xxxxx =. Remaining bits of corrected temperature data for full 11-bit resolution

12. Status Bits

AS1318C digital output pressure sensors offer both standard and optional diagnostics to ensure robust system operation in critical applications. The diagnostic states are indicated by the first two Most Significant Bits of Data Byte 1.

Table12: Diagnostic Conditions indicated by Status Bits

Status Bits		Definition
S1	S0	
0	0	Normal Operation, Valid data
0	1	Sensor in command mode [1]
1	0	Stale data: data that has already been fetched since the last measurement cycle, or data fetched before the first measurement has been completed
1	1	Diagnostic condition occurs

Note: 1 Command mode is used for programming the sensor. The mode should not be seen during normal operation.

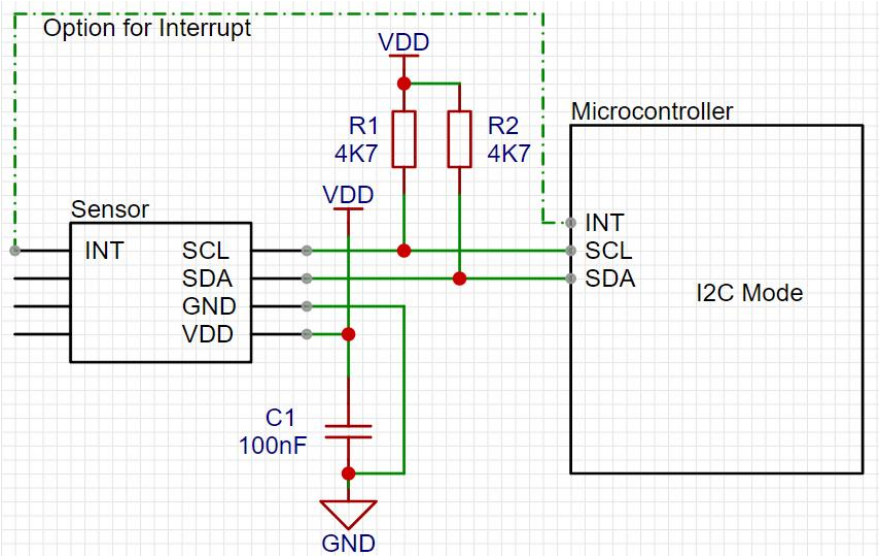
Standard diagnostics for AS1318C digital output pressure sensors consist of an EEPROM (Electrically Erasable Programmable Read-Only Memory) signature used to validate the EEPROM contents during startup. In the event that any EEPROM contents change after calibration, a diagnostic condition will be flagged.
Optional diagnostics for AS1318C digital output pressure sensors consist of:

- Loss of sensor element connection
- Short circuit of sensor element

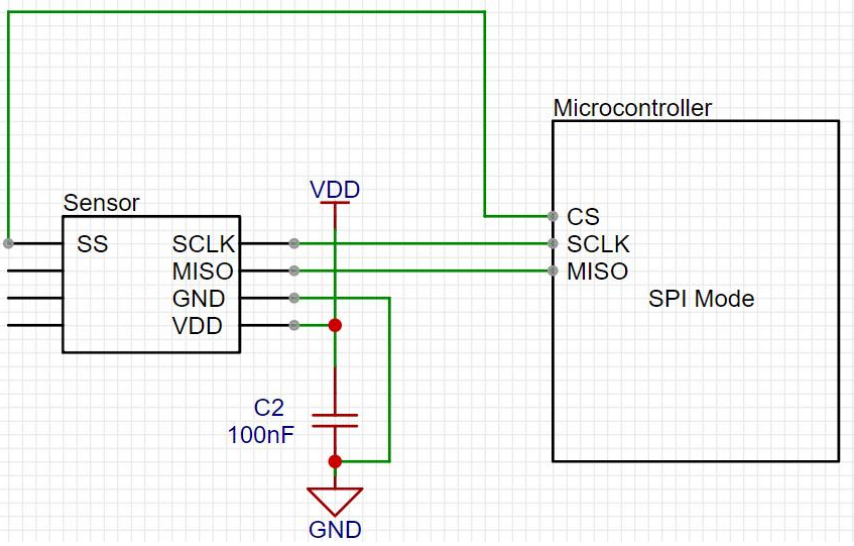
When the two status bits are “11”, one of the mentioned as above diagnostic faults is indicated.
When the status bits read “10”, “stale” data is indicated, this means that the data that already exists in the sensor’s output buffer has already been fetched by the master, and has not yet been updated with the next data from the current measurement cycle. This can happen when the master polls the data quicker than the sensor can update the output buffer.
(Please contact AS1318C Customer Service with questions regarding the availability of optional Pressure Sensor diagnostics.)

13. Application Information

13.1 I²C Interface Circuit



13.2 SPI Interface Circuit



13.3 Pin Configuration and Description & Port definition

Table13-1: Pin definition

Pin	Name	Type	Function
1	GND	G	Power Ground
2	VDD	P	Positive supply voltage
3	SDA/MISO	I/O	Serial data input/output, I^2C mode (SDA), SPI mode (MISO)
4	SCL/SCLK	I/O	Serial data clock, I^2C mode (SCL), SPI mode (SCLK)
5	INT/SS	I/O	I^2C mode Interrupt (INT), SPI mode Chip Selection (SS)
6	NC	NC	No Connection
7	NC	NC	No Connection
8	NC	NC	No Connection

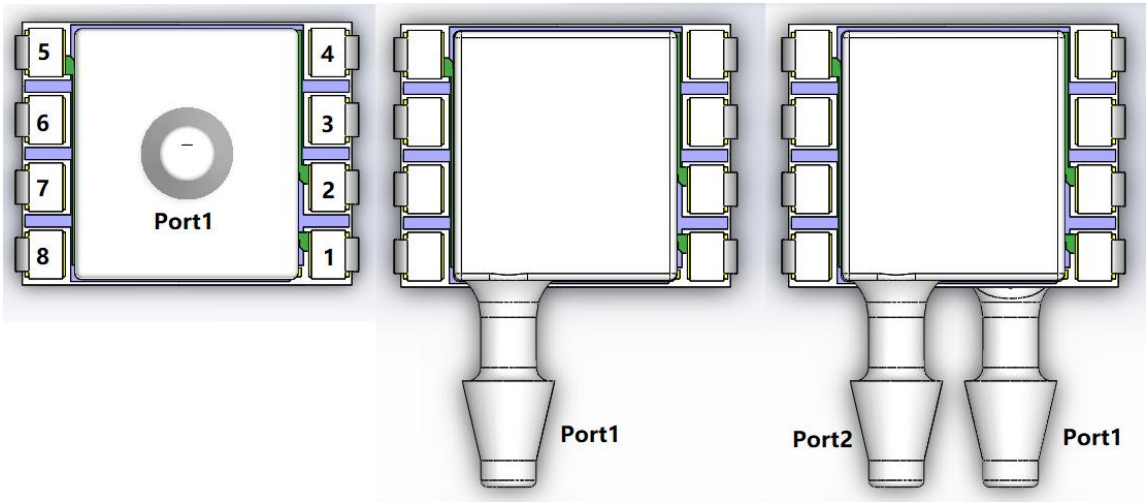


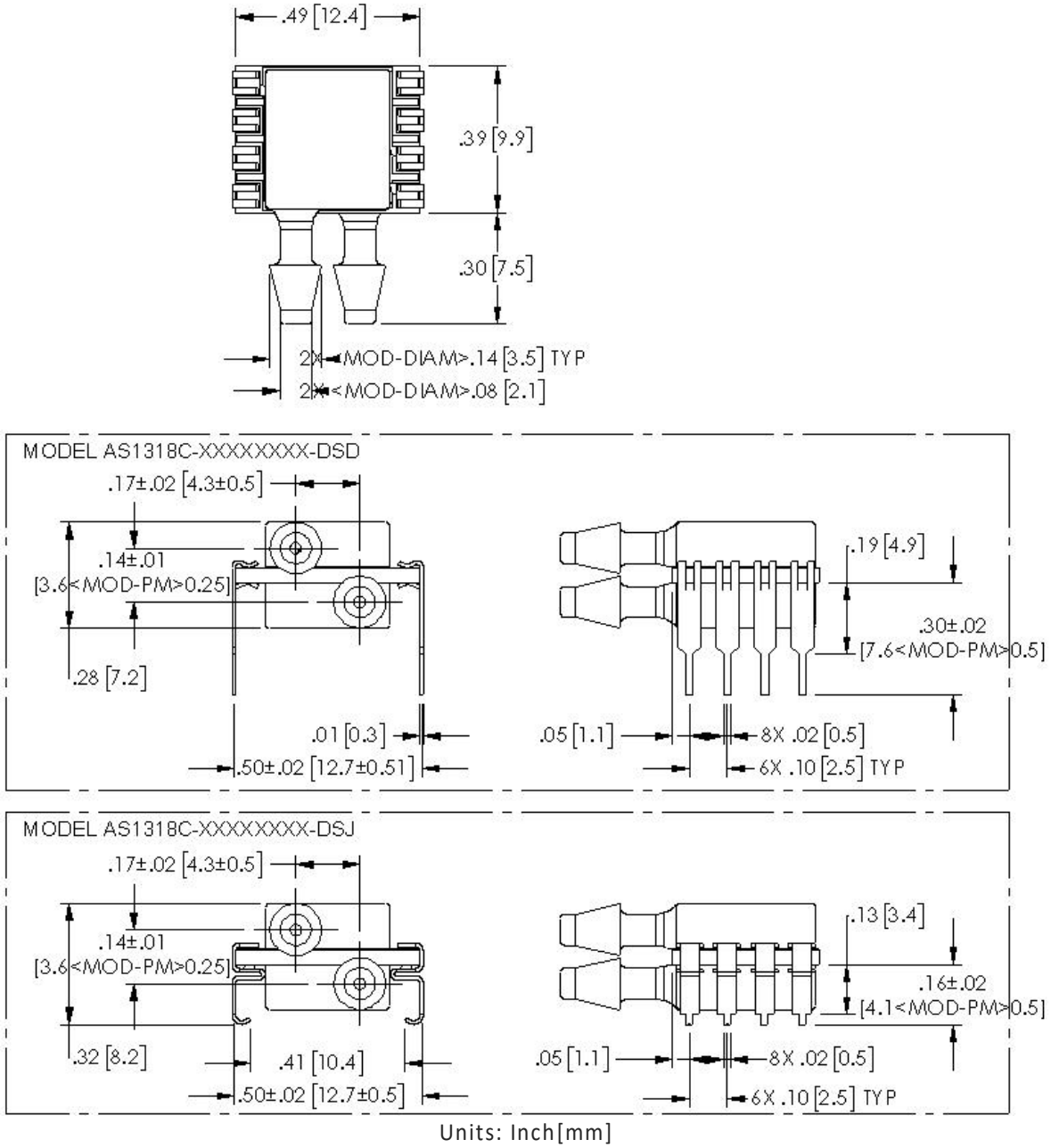
Table13-2: Port definition for Standard pressure ranges

Pressure Type	P_{MIN}	P_{MAX}	Description
Absolute	0	+P $_{Range}$	Output is proportional to the difference between 0 (P_{MIN}) and pressure applied to Port 1.
Differential/ Bidirectional	-P $_{Range}$	+P $_{Range}$	Output is proportional to the difference between Port 1 and Port 2. Output swings positive when Port 1> Port 2. Output is 50% of total counts when Port 1=Port 2.
Gage	0	+P $_{Range}$	Output is proportional to the difference between 0psiG (P_{MIN}) and Port 1. Output swings positive when Port 1> Port 2.

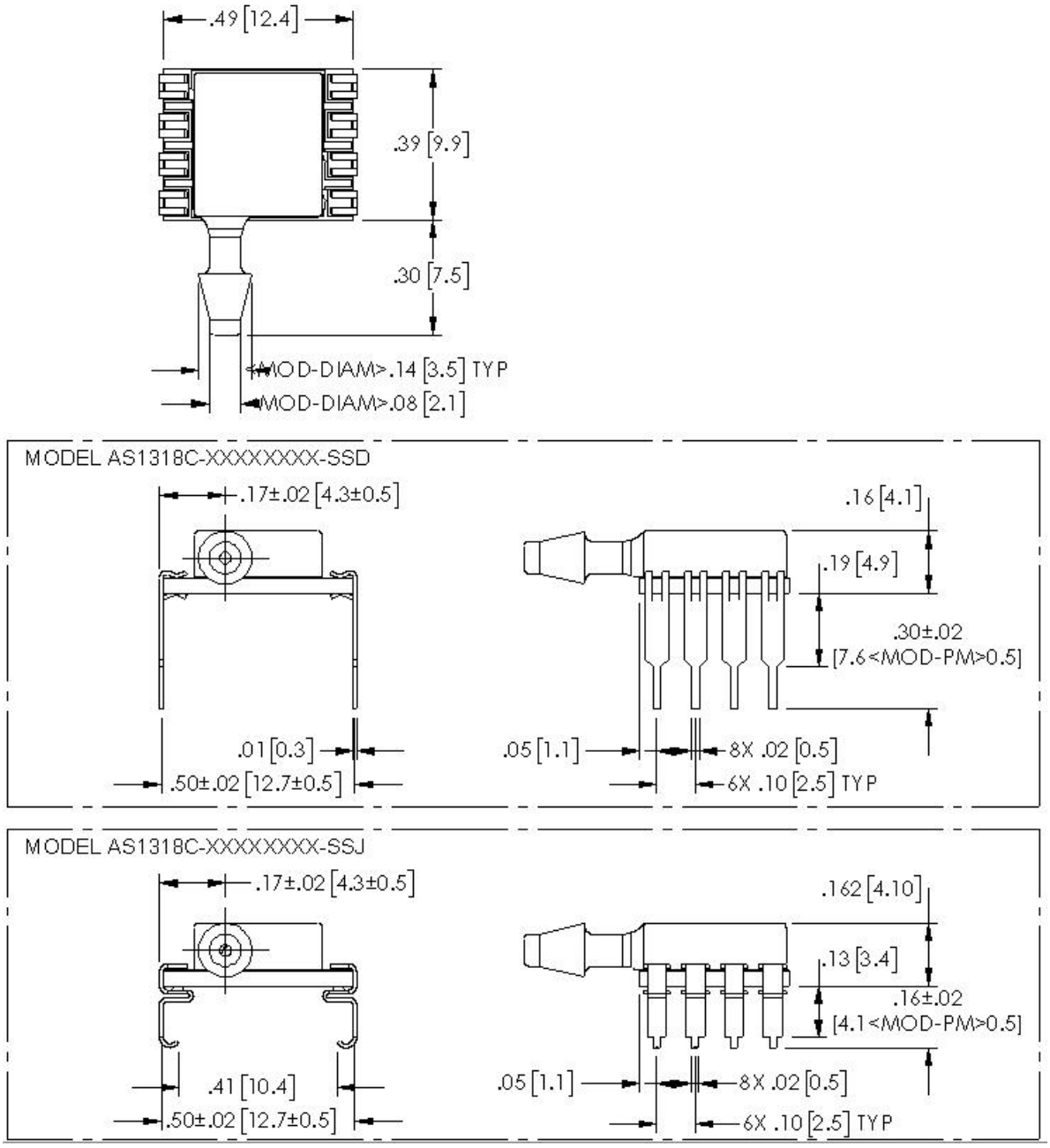
Table13-3: Wetted Material by Port option

Style	Port	Ceramic	Si	Gold	Al	RTV	Epoxy
Double Port	Port1	●	●			●	●
	Port2	●	●	●	●	●	●
Single Port	Port1	●	●	●	●	●	●

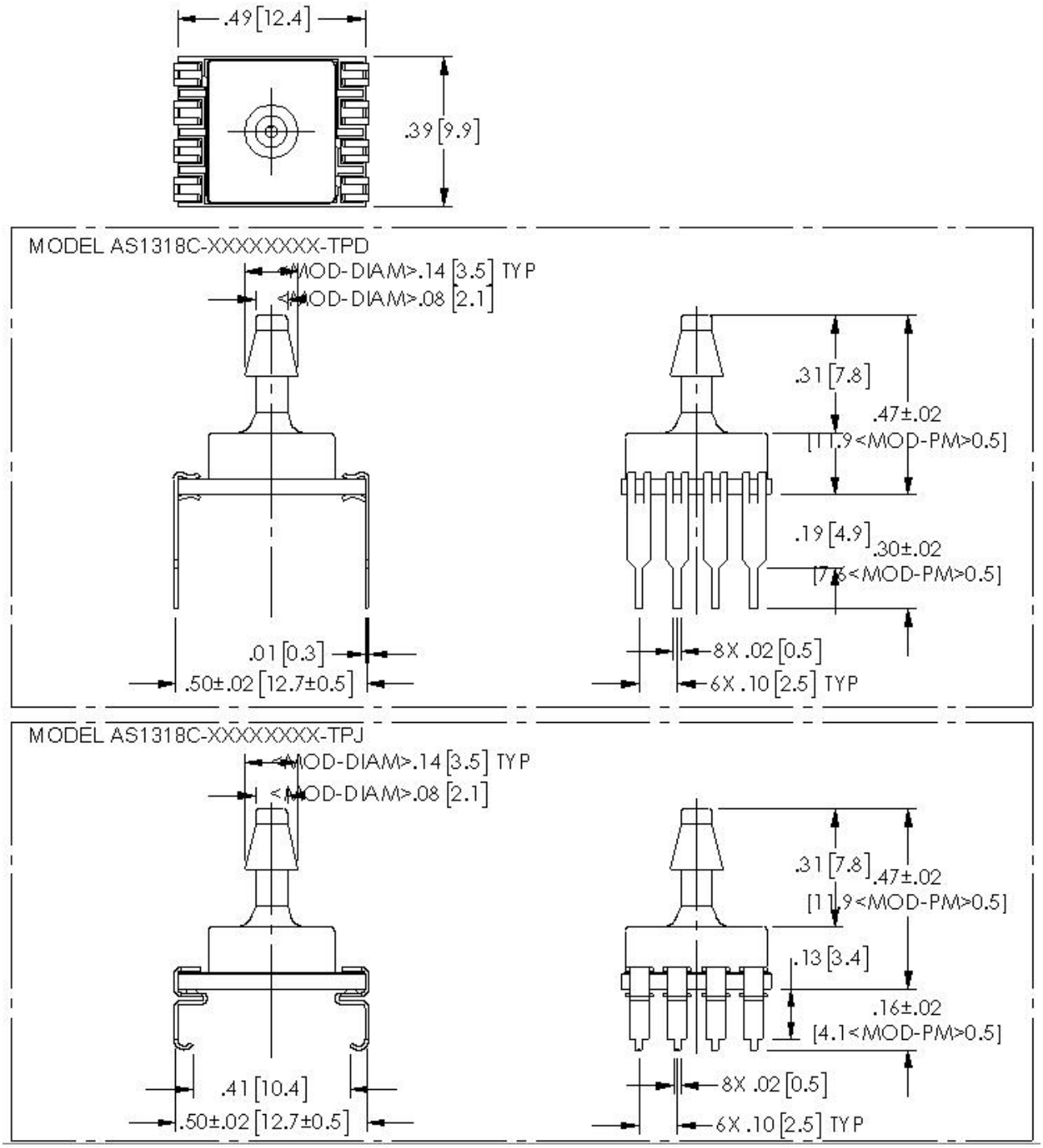
14. Package outline information



Units: Inch[mm]



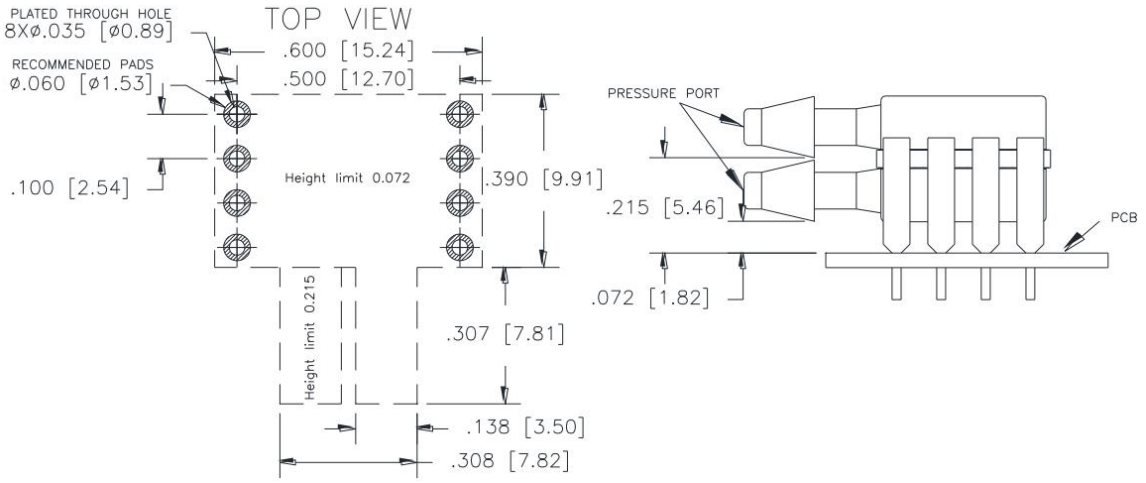
Units: Inch[mm]



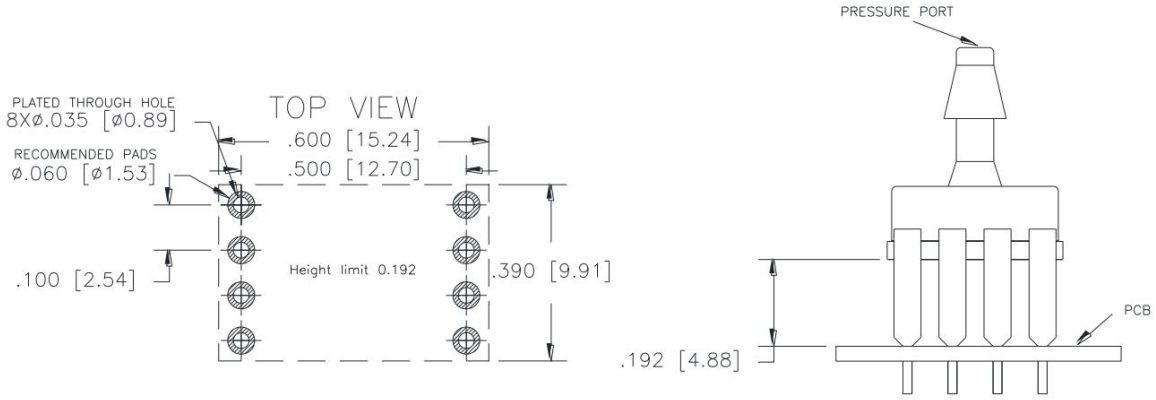
Units: Inch[mm]

15. Recommend footprint

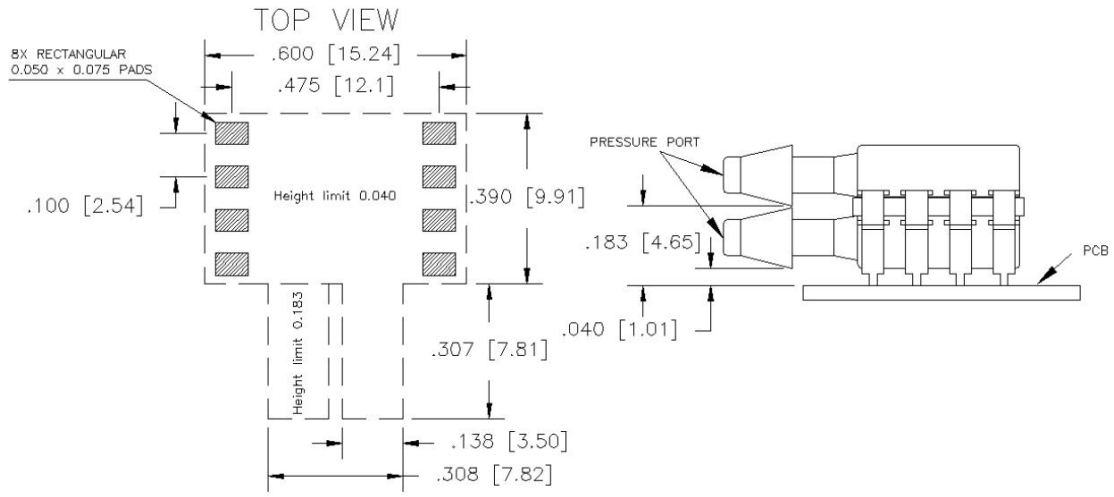
Units: Inch[mm]



DIP Pin Style with DS or SS Port



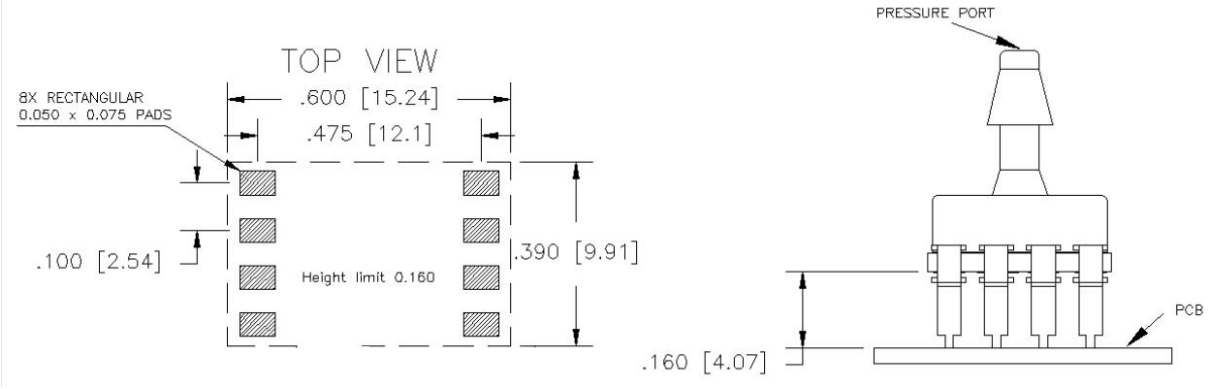
DIP Pin Style with Top Port



J Pin Style with DS or SS Port

15. Recommend footprint

J Pin



Style with Top Port

16.How to Order

Refer to Table 16 for standard part numbers offered which includes the pressure range and package.
Example P/N with options: **AS1318C-004NG3AI-DSD**
Table 16 - Part Numbering Scheme:

AS1318C	-	004NG	3	A	I	-	DS	D

Product Series	-	Range & Unit	Supply Voltage	Output%	Interface	-	Port type	Pin Style
			3: 3.3V 5: 5.0V	A: 10% - 90% B: 5% - 95%	I: I2C Addr. 0x28H S: SPI 1: I2C Addr. 0x36H 2: I2C Addr. 0X51H 3: ……		DS: Double side TP: Top Port SS: Single Side	D: DIP J: SMT

17.Legal Disclaimer

1)For the export of products which are controlled items subject to foreign and domestic export laws and regulations, you must obtain approval and/or follow the formalities of such laws and regulations.

2)Products must not be used for military and/or antisocial purposes such as terrorism, and shall not be supplied to any party intending to use the products for such purposes.

3)Unless provided otherwise, the products have been designed and manufactured for application to equipment and devices which are sold to end-users in the market.

4)Before using products, which were not specifically designed for use in automotive applications, please contact an AIOT sales representative.

5)This specification is subject to change without notice.

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