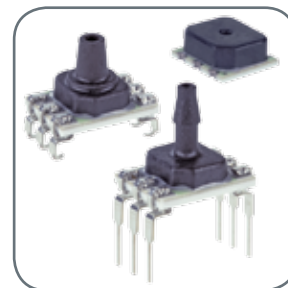




Basic Board Mount
Pressure Sensors
ABP Series—High Accuracy
Digital or Analog Output
Compensated/Amplified



60 mbar to 10 bar | 6 kPa to 1 MPa | 1 psi to 150 psi

Basic Amplified Board Mount Pressure Sensors

The Basic Amplified ABP Series is a piezoresistive silicon pressure sensor offering a ratiometric analog or digital output for reading pressure over the specified full scale pressure span and temperature range.

The ABP Series is fully calibrated and temperature compensated for sensor offset, sensitivity, temperature effects and accuracy errors (which include non-linearity, repeatability and hysteresis) using an on-board Application Specific Integrated Circuit (ASIC). Calibrated output values for pressure are updated at approximately 1 kHz for analog and 2 kHz for digital.

The ABP Series is calibrated over the temperature range of 0 °C to 50 °C [32 °F to 122 °F]. The sensor is characterized for operation from a single power supply of either 3.3 Vdc or 5.0 Vdc. These sensors measure gage and differential pressures.

The Basic Amplified pressure sensors are intended for use with non-corrosive, non-ionic gases, such as air and other dry gases. The following options extend the performance of these sensors to non-corrosive liquids.

- No silicone gel coating: The input port is limited to non-corrosive, non-ionic media such as dry air and gases and should not be exposed to condensation. The gases are limited to media that are compatible with high temperature polyamide, silicone, alumina ceramic, silicon, gold, and glass.
- Silicone gel coating: Uses the same materials in the wetted media path but is protected from condensation by a silicone-based gel coating; allows use in applications where condensation may occur.

All products are designed and manufactured according to ISO 9001 standards.

Features

- Proprietary Honeywell technology
- Protected by multiple global patents
- Industry-leading long-term stability: ± 0.25 %FSS
- Total Error Band (TEB): ± 1.5 %FSS
- Industry-leading accuracy: ± 0.25 %FSS BFSL
- High burst pressures
- Industry-leading flexibility
- Wide pressure range: 60 mbar to 10 bar | 6 kPa to 1 MPa | 1 psi to 150 psi
- Meets IPC/JEDEC J-STD-020D.1 Moisture Sensitivity Level 1 requirements
- Optional internal diagnostic functions
- Energy efficient
- Output: ratiometric analog; I²C- or SPI-compatible 14-bit digital output (min. 12-bit sensor resolution)
- Small size: As small as 8 mm x 7 mm
- REACH and RoHS compliant
- Sleep mode option (see [Technical Note](#))
- Temperature output option
- Liquid media option

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Potential Applications

MEDICAL

- CPAP
- Blood analysis
- Blood pressure monitoring
- Breast pumps
- Drug dosing
- Hospital beds
- Massage machines
- Oxygen concentrators
- Patient monitoring
- Sleep apnea equipment
- Urine analyzers
- Ventilators/portable ventilators
- Wound therapy

INDUSTRIAL

- Air brakes
- HVAC/transmitters
- Life sciences
- Material handling
- Pneumatic control
- Pneumatic regulator
- Process gas monitoring
- Valve positioning and positioners

COMMERCIAL

- Air beds
- Coffee makers
- Washing machines

STABILITY • ACCURACY • FLEXIBILITY • SMALL SIZE

General Specifications

Table 1. Absolute Maximum Ratings¹

Characteristic	Min.	Max.	Unit
Supply voltage (V_{supply})	-0.3	6.0	Vdc
Voltage on any pin	-0.3	$V_{\text{supply}} + 0.3$	V
Digital interface clock frequency:			
I ² C	100	400	kHz
SPI	50	800	
ESD susceptibility (human body model)	2	—	kV
Storage temperature	-40 [-40]	85 [185]	°C [°F]
Soldering time and temperature:			
lead solder temperature (DIP)		4 s max. at 250 °C [482 °F]	
peak reflow temperature (Leadless SMT, SMT)		15 s max. at 250 °C [482 °F]	

¹Absolute maximum ratings are the extreme limits the device will withstand without damage.

Table 2. Environmental Specifications

Characteristic	Parameter
Humidity (Gases only; see “Options N and D” in Figure 2.)	0% to 95% RH, non-condensing
Vibration	15 g, 10 Hz to 2 kHz
Shock	100 g, 6 ms duration
Life ¹	1 million pressure cycles minimum
Solder reflow	J-STD-020-D.1 Moisture Sensitivity Level 1 (unlimited shelf life when stored at ≤30 °C/85 % RH)

¹Life may vary depending on specific application in which the sensor is used.

Table 3. Wetted Materials¹

Component	Pressure Port	
	No Silicone Gel Coating Option	Silicone Gel Coating Option
Ports and covers	high temperature polyamide	
Substrate	alumina ceramic	not exposed; protected by silicone gel
Adhesives	epoxy, silicone	epoxy
Electronic components	ceramic, silicon, glass, solder, gold	not exposed; protected by silicone gel

¹Contact Honeywell Customer Service for detailed material information.

Table 4. Sensor Pressure Types

Pressure Type	Description
Gage	Output is proportional to the difference between applied pressure and atmospheric (ambient) pressure.
Differential	Output is proportional to the difference between the pressures applied to each port (Port 1 – Port 2).

Operating Specifications

Table 5. Operating Specifications

Characteristic	Analog			Digital			Unit
	Min.	Typ.	Max.	Min.	Typ.	Max.	
Supply voltage (V_{supply}) ^{1, 2, 3}							
3.3 Vdc	3.0	3.3	3.6	3.0	3.3	3.6	Vdc
5.0 Vdc	4.75	5.0	5.25	4.75	5.0	5.25	
Supply current:							
3.3 Vdc	—	2.1	2.8	—	3.1	3.9	mA
5.0 Vdc	—	2.7	3.8	—	3.7	4.6	mA
sleep mode option	—	—	—	—	1	10	μA
Operating temperature range ⁴	-40 [-40]	—	85 [185]	-40 [-40]	—	85 [185]	°C [°F]
Compensated temperature range ⁵	0 [-32]	—	50 [122]	0 [-32]	—	50 [122]	°C [°F]
Temperature output option ⁶	—	—	—	—	1.5	—	°C
Startup time (power up to data ready)	—	—	5	—	—	3	ms
Response time	—	1	—	—	0.46	—	ms
Clipping limit:							
upper	—	—	97.5	—	—	—	%Vsupply
lower	2.5	—	—	—	—	—	
SPI/I ² C voltage level:							
low	—	—	—	—	—	20	%Vsupply
high	—	—	—	80	—	—	
Pull up on SDA/MISO, SCL/SCLK, SS	—	—	—	1	—	—	kOhm
Accuracy ⁷	—	—	±0.25	—	—	±0.25	%FSS BFSL ⁸
Output resolution	0.03	—	—	—	—	—	%FSS bits
	—	—	—	12	—	—	

¹Sensors are either 3.3 Vdc or 5.0 Vdc based on the catalog listing selected.

²Ratiometricity of the sensor (the ability of the device output to scale to the supply voltage) is achieved within the specified operating voltage.

³The sensor is not reverse polarity protected. Incorrect application of supply voltage or ground to the wrong pin may cause electrical failure.

⁴Operating temperature range: The temperature range over which the sensor will produce an output proportional to pressure.

⁵Compensated temperature range: The temperature range over which the sensor will produce an output proportional to pressure within the specified performance limits.

⁶Temperature Output Option: Continuous operation in Sleep Mode only may provide different results.

⁷Accuracy: The maximum deviation in output from a Best Fit Straight Line (BFSL) fitted to the output measured over the pressure range at 25 °C [77 °F]. Includes all errors due to pressure non-linearity, pressure hysteresis, and non-repeatability.

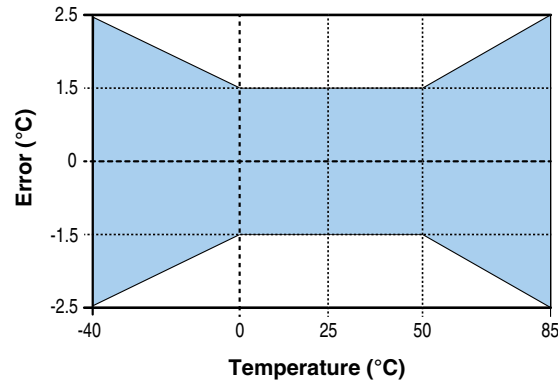
⁸Full Scale Span (FSS): The algebraic difference between the output signal measured at the maximum (Pmax.) and minimum (Pmin.) limits of the pressure range. (See Figure 3 for ranges.)

Table 6. Sensor Output at Significant Percentages (Digital Versions Only)

% Output	Digital Counts	
	decimal	hex
0	0	0x0000
10	1638	0x0666
50	8192	0x2000
90	14746	0x399A
100	16383	0x3FFF

Transfer Function Limits

Figure 1. Temperature Output Option Temperature Error^{1,2}

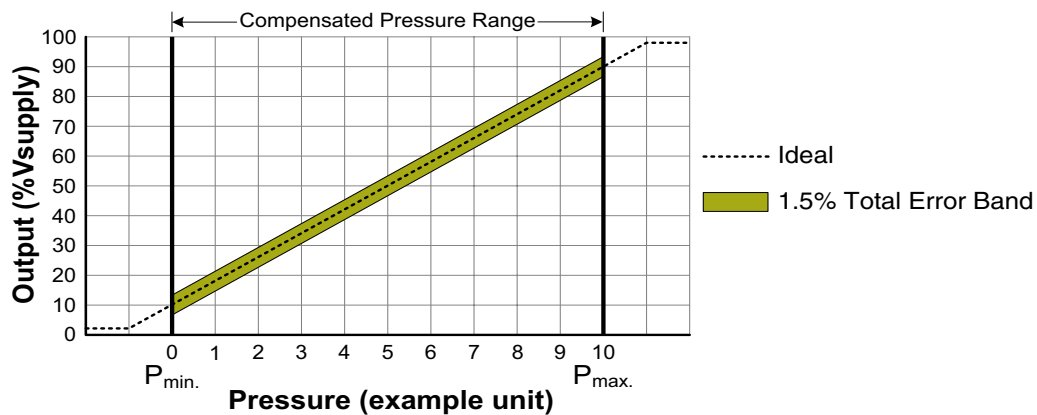


¹Operating temperature range: The temperature range over which the sensor will produce an output proportional to pressure.

²Compensated temperature range: The temperature range over which the sensor will produce an output proportional to pressure within the specified performance limits.

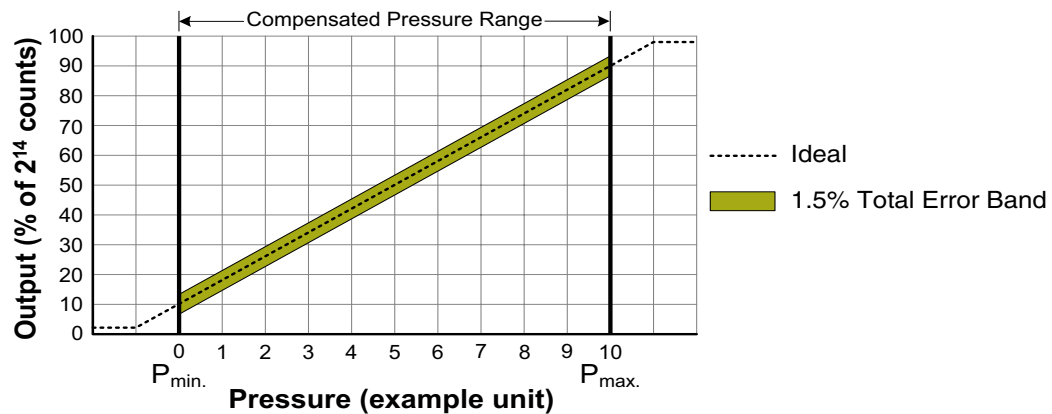
Figure 2. Transfer Function Limits¹

Analog Versions



$$\text{Output (V)} = \frac{0.8 \times V_{\text{supply}}}{P_{\text{max.}} - P_{\text{min.}}} \times (\text{Pressure}_{\text{applied}} - P_{\text{min.}}) + 0.10 \times V_{\text{supply}}$$

Digital Versions



$$\text{Output (\% of } 2^{14} \text{ counts)} = \frac{80\%}{P_{\text{max.}} - P_{\text{min.}}} \times (\text{Pressure}_{\text{applied}} - P_{\text{min.}}) + 10\%$$

¹Transfer Function "A" is shown. See Figure 3 for other available transfer function options.

Nomenclature and Order Guide

Figure 3. Nomenclature and Order Guide

For example, **ABPDNNN150PGAA3** defines an ABP Series Amplified Basic Pressure Sensor, DIP package, NN pressure port, dry gases only, no diagnostics, 150 psi gage pressure range, analog output type, 10% to 90% of Vsupply (analog), 2¹⁴ counts (digital) transfer function, no temperature output, no sleep mode, 3.3 Vdc supply voltage.

Product Series

ABP Amplified Basic

Package

D DIP (Dual Inline Pin)

M SMT (Surface Mount Technology)

L Leadless SMT

Pressure Port

DIP	SMT	Leadless SMT
NN No port 	NN No port 	NN No port
AN Single axial barbed port 	AN Single axial barbed port 	AN Single axial barbed port
LN Single axial barbless port 	LN Single axial barbless port 	LN Single axial barbless port
JN Single radial barbless port 	JN Single radial barbless port 	—
JJ Dual radial barbless ports, same side 	JJ Dual radial barbless ports, same side 	—
RN Single radial barbed port 	RN Single radial barbed port 	—
RR Dual radial barbed ports, same side 	RR Dual radial barbed ports, same side 	—

Option

N Dry gases only, no diagnostics

D Dry gases only, diagnostics on

T Silicone gel coating, no diagnostics

V Silicone gel coating, diagnostics on

Supply Voltage

3	3.3 Vdc
5	5.0 Vdc

Transfer Function¹

A 10% to 90% of Vsupply (analog), 2¹⁴ counts (digital) no temperature output, no sleep mode

D 10% to 90% of 2¹⁴ counts (digital only) temperature output enabled, sleep mode enabled

S 10% to 90% of 2¹⁴ counts (digital only) no temperature output, sleep mode enabled

T 10% to 90% of 2¹⁴ counts (digital only) temperature output enabled, no sleep mode

Output Type

A Analog	4 I ² C, Address 0x48
S SPI	5 I ² C, Address 0x58
0 I ² C, Address 0x08	6 I ² C, Address 0x68
1 I ² C, Address 0x18	7 I ² C, Address 0x78
2 I ² C, Address 0x28	8 I ² C, Address 0x88
3 I ² C, Address 0x38	9 I ² C, Address 0x98

Pressure Range^{2,3}

60 mbar to 10 bar <i>Differential</i>		6 kPa to 1 MPa <i>Differential</i>		1 psi to 150 psi <i>Differential</i>	
060MD ±60 mbar	006KD ±6 kPa	001PD ±1 psi			
100MD ±100 mbar	010KD ±10 kPa	005PD ±5 psi			
160MD ±160 mbar	016KD ±16 kPa	015PD ±15 psi			
250MD ±250 mbar	025KD ±25 kPa	030PD ±30 psi			
400MD ±400 mbar	040KD ±40 kPa	060PD ±60 psi			
600MD ±600 mbar	060KD ±60 kPa				
001BD ±1 bar	100KD ±100 kPa				
1.6BD ±1.6 bar	160KD ±160 kPa				
2.5BD ±2.5 bar	250KD ±250 kPa				
004BD ±4 bar	400KD ±400 kPa				

<i>Gage</i>		<i>Gage</i>		<i>Gage</i>	
060MG 0 mbar to 60 mbar	006KG 0 kPa to 6 kPa	001PG 0 psi to 1 psi			
100MG 0 mbar to 100 mbar	010KG 0 kPa to 10 kPa	005PG 0 psi to 5 psi			
160MG 0 mbar to 160 mbar	016KG 0 kPa to 16 kPa	015PG 0 psi to 15 psi			
250MG 0 mbar to 250 mbar	025KG 0 kPa to 25 kPa	030PG 0 psi to 30 psi			
400MG 0 bar to 400 mbar	040KG 0 kPa to 40 kPa	060PG 0 psi to 60 psi			
600MG 0 bar to 600 mbar	060KG 0 kPa to 60 kPa	100PG 0 psi to 100 psi			
001BG 0 bar to 1 bar	100KG 0 kPa to 100 kPa	150PG 0 psi to 150 psi			
1.6BG 0 bar to 1.6 bar	160KG 0 kPa to 160 kPa				
2.5BG 0 bar to 2.5 bar	250KG 0 kPa to 250 kPa				
004BG 0 bar to 4 bar	400KG 0 kPa to 400 kPa				
006BG 0 bar to 6 bar	600KG 0 kPa to 600 kPa				
010BG 0 bar to 10 bar	001GG 0 kPa to 1 MPa				

¹ The transfer function limits define the output of the sensor at a given pressure input. By specifying Pmin. and Pmax., the output at Pmin. and Pmax., the complete transfer function of the sensor is defined. See the graphical representations of the transfer function in Figure 2 of the product datasheet.

² Custom pressure ranges are available. Contact Honeywell Customer Service for more information.

³ See the explanation of sensor pressure types in Table 4 of the product datasheet.

COMMON CATALOG LISTINGS

ABPLLND060MGAA3	ABPMAND001PG2A3
ABPLLNN600MGAA3	ABPLANN001PG2A5
ABPMANN005PGAA3	ABPDANT005PGAA5
ABPMANN004BGAA5	ABPDANT015PGAA5
ABPMLNN001PGAA3	ABPLLNT010BGAA5
ABPMANN030PG2A3	ABPDJTT001PGAA5
ABPDLNN100MG2A3	ABPDRRT005PG2A5
ABPDANN005PG2A3	ABPMJTT015PGAA5

Pressure Range Specifications

Table 7. Pressure Range Specifications

Pressure Range (see Figure 3)	Pressure Range		Unit	Overpressure ¹	Burst Pressure ²	Common Mode Pressure ³	Total Error Band ⁴ (%FSS)	Long-term Stability 1000 hr, 25 °C (%FSS)
	Pmin.	Pmax.						
60 mbar to 10 bar								
Differential								
060MD	-60	60	mbar	850	1000	10000	±1.5	±0.25
100MD	-100	100	mbar	1400	2500	10000	±1.5	±0.25
160MD	-160	160	mbar	1400	2500	10000	±1.5	±0.25
250MD	-250	250	mbar	1400	2500	10000	±1.5	±0.25
400MD	-400	400	mbar	2000	4000	10000	±1.5	±0.25
600MD	-600	600	mbar	2000	4000	10000	±1.5	±0.25
001BD	-1	1	bar	4	8	10	±1.5	±0.25
1.6BD	-1.6	1.6	bar	8	16	10	±1.5	±0.25
2.5BD	-2.5	2.5	bar	8	16	10	±1.5	±0.25
004BD	-4.0	4.0	bar	16	17	10	±1.5	±0.25
Gage								
060MG	0	60	mbar	850	1000	5450	±1.5	±0.25
100MG	0	100	mbar	850	1000	10000	±1.5	±0.25
160MG	0	160	mbar	850	1000	10000	±1.5	±0.25
250MG	0	250	mbar	1400	2500	10000	±1.5	±0.25
400MG	0	400	mbar	2000	4000	10000	±1.5	±0.25
600MG	0	600	mbar	2000	4000	10000	±1.5	±0.25
001BG	0	1	bar	2	4	10	±1.5	±0.25
1.6BG	0	1.6	bar	4	8	10	±1.5	±0.25
2.5BG	0	2.5	bar	8	16	10	±1.5	±0.25
004BG	0	4	bar	8	16	16	±1.5	±0.25
006BG	0	6	bar	17	17	17	±1.5	±0.25
010BG	0	10	bar	17	17	17	±1.5	±0.25
6 kPa to 1 MPa								
Differential								
006KD	-6	6	kPa	85	100	1000	±1.5	±0.25
010KD	-10	10	kPa	140	250	1000	±1.5	±0.25
016KD	-16	16	kPa	140	250	1000	±1.5	±0.25
025KD	-25	25	kPa	140	250	1000	±1.5	±0.25
040KD	-40	40	kPa	200	400	1000	±1.5	±0.25
060KD	-60	60	kPa	200	400	1000	±1.5	±0.25
100KD	-100	100	kPa	400	800	1000	±1.5	±0.25
160KD	-160	160	kPa	800	1600	1000	±1.5	±0.25
250KD	-250	250	kPa	800	1600	1000	±1.5	±0.25
400KD	-400	400	kPa	1600	1700	1000	±1.5	±0.25
Gage								
006KG	0	6	kPa	85	100	545	±1.5	±0.25
010KG	0	10	kPa	85	100	1000	±1.5	±0.25
016KG	0	16	kPa	85	100	1000	±1.5	±0.25
025KG	0	25	kPa	140	250	1000	±1.5	±0.25
040KG	0	40	kPa	200	400	1000	±1.5	±0.25
060KG	0	60	kPa	200	400	1000	±1.5	±0.25
100KG	0	100	kPa	200	400	1000	±1.5	±0.25
160KG	0	160	kPa	400	800	1000	±1.5	±0.25
250KG	0	250	kPa	800	1600	1000	±1.5	±0.25
400KG	0	400	kPa	800	1600	1600	±1.5	±0.25
600KG	0	600	kPa	1700	1700	1700	±1.5	±0.25
001GG	0	1	MPa	1.7	1.7	1.7	±1.5	±0.25

¹Overpressure: 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.

²Burst 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.

³Common mode pressure: The maximum pressure that can be applied simultaneously to both ports of a differential pressure sensor without causing changes in specified performance.

⁴Total 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.

Pressure Range Specifications

PCB Pad Layouts

Table 7. Pressure Range Specifications (continued)

Pressure Range (see Figure 3)	Pressure Range		Unit	Overpressure ¹	Burst Pressure ²	Common Mode Pressure ³	Total Error Band ⁴ (%FSS)	Long-term Stability 1000 hr, 25 °C (%FSS)
	Pmin.	Pmax.						
1 psi to 150 psi								
Differential								
001PD	-1	1	psi	10	15	150	±1.5%	±0.25%
005PD	-5	5	psi	30	40	150	±1.5%	±0.25%
015PD	-15	15	psi	60	120	150	±1.5%	±0.25%
030PD	-30	30	psi	120	240	150	±1.5%	±0.25%
060PD	-60	60	psi	250	250	250	±1.5%	±0.25%
Gage								
001PG	0	1	psi	10	15	150	±1.5%	±0.25%
005PG	0	5	psi	30	40	150	±1.5%	±0.25%
015PG	0	15	psi	30	60	150	±1.5%	±0.25%
030PG	0	30	psi	60	120	150	±1.5%	±0.25%
060PG	0	60	psi	120	240	250	±1.5%	±0.25%
100PG	0	100	psi	250	250	250	±1.5%	±0.25%
150PG	0	150	psi	250	250	250	±1.5%	±0.25%

¹Overpressure: 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.

²Burst 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.

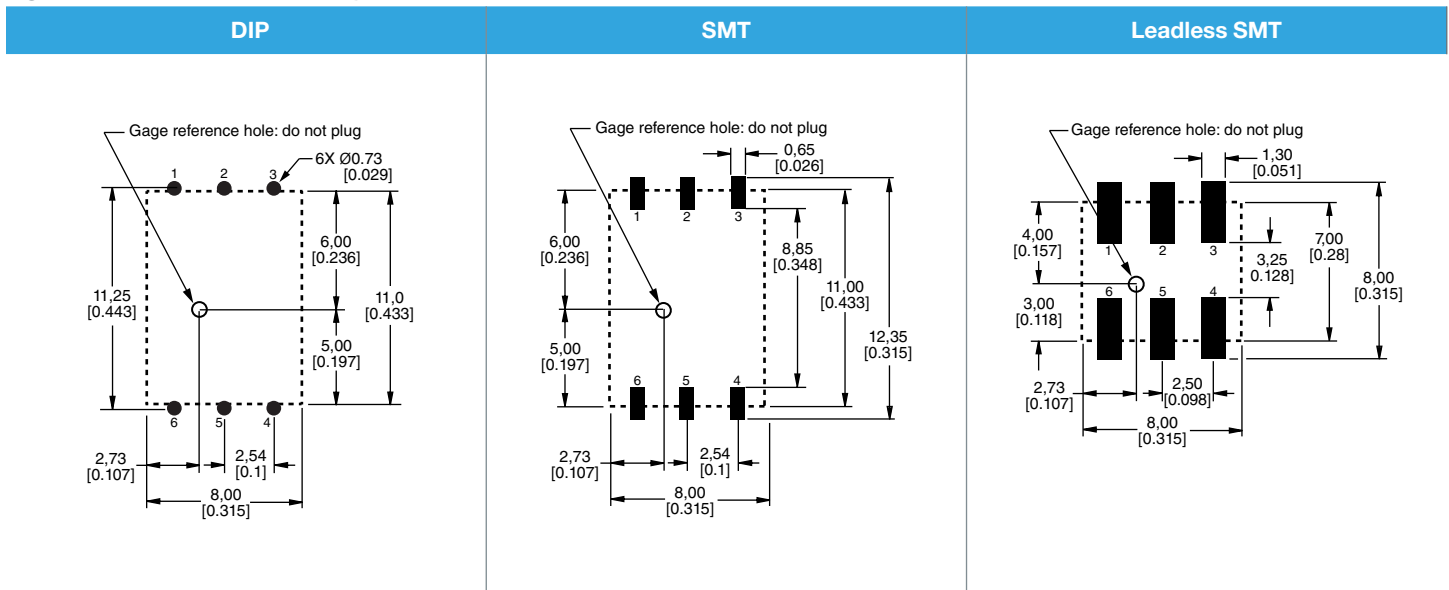
³Common mode pressure: The maximum pressure that can be applied simultaneously to both ports of a differential pressure sensor without causing changes in specified performance.

⁴Total 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.

Table 8. Pinouts

Output Type	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6
Digital (I ² C, SPI)	GND	V _{DD}	SS/INT	NC	SDA	SCL
Analog	GND	NC	V _{out}	NC	NC	V _{DD}

Figure 4. Recommended PCB Layouts

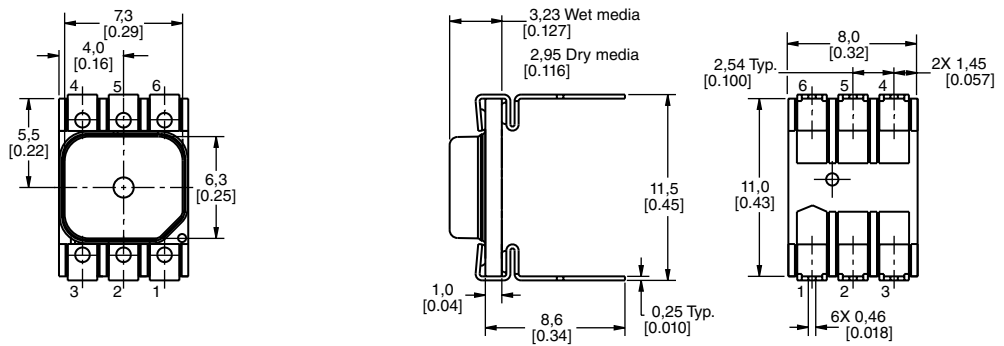


Dimensional Drawings

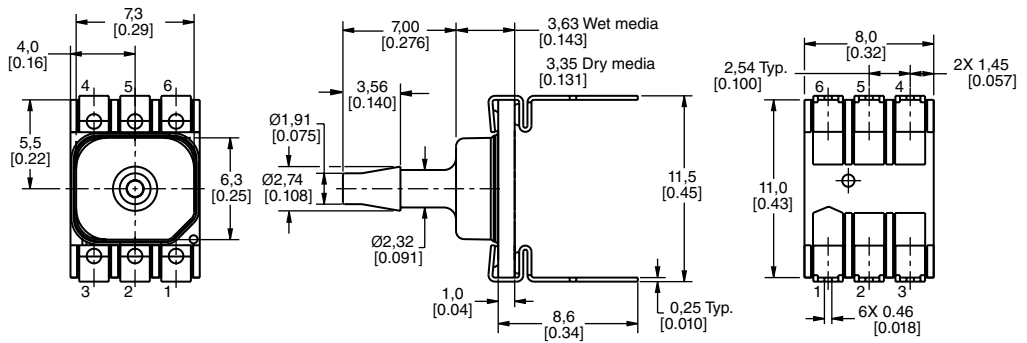
DIP Packages

Figure 5. DIP Package Dimensional Drawings (For reference only: mm [in.]

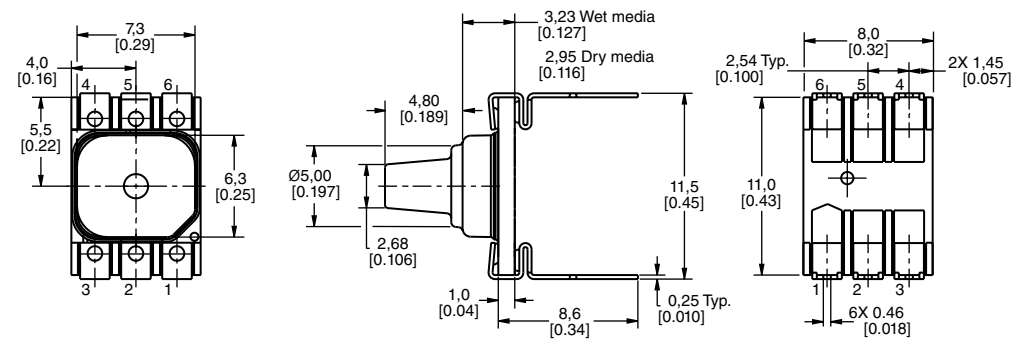
DIP NN: No port



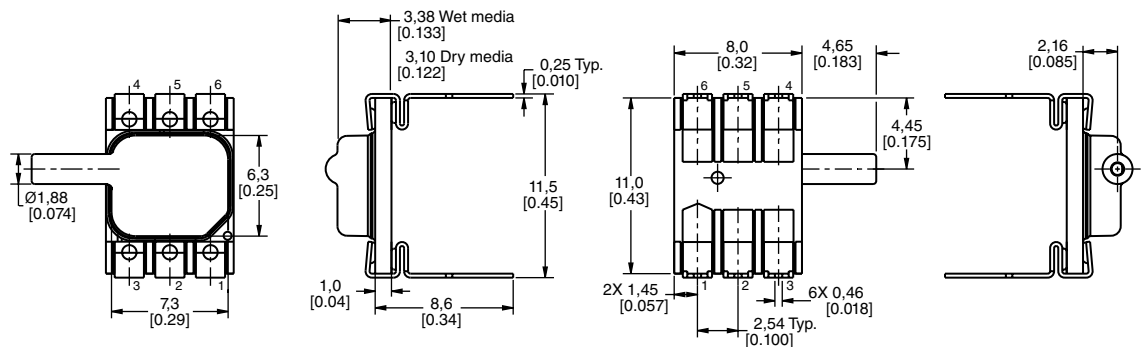
DIP AN: Single axial barbed port



DIP LN: Single axial barbless port



DIP JN: Single radial barbless port

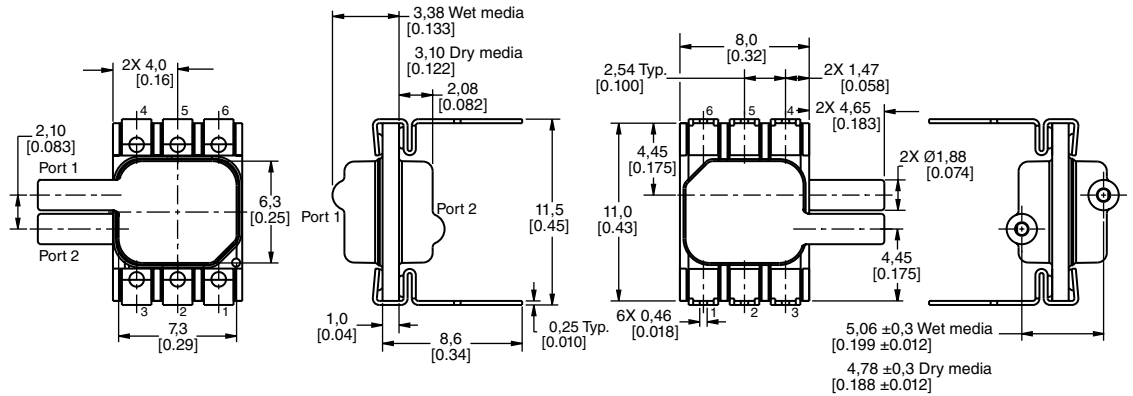


Dimensional Drawings

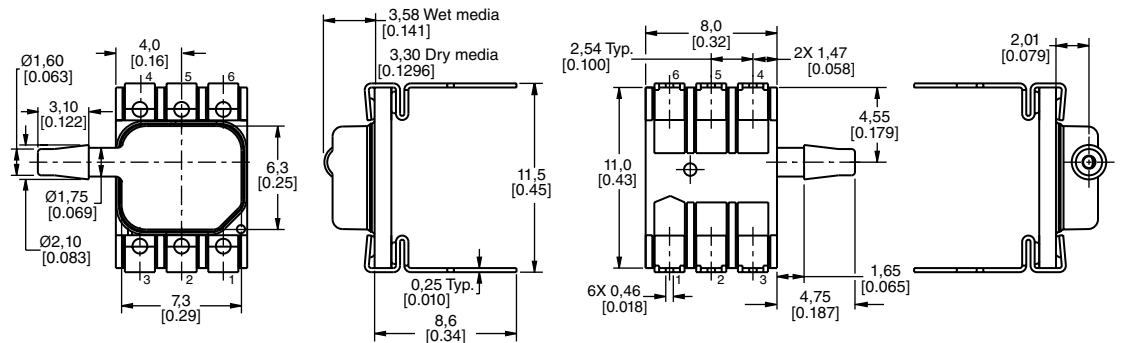
DIP Packages

Figure 5. DIP Package Dimensional Drawings (continued)

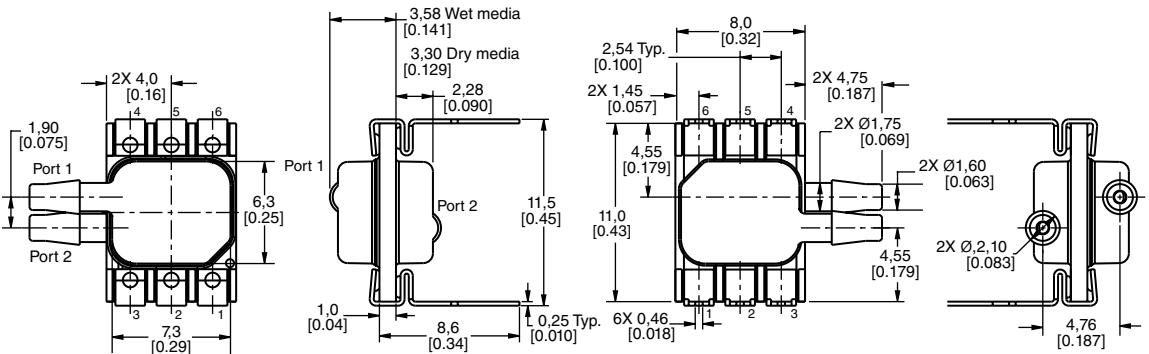
DIP JJ: Dual radial barbless ports, same side



DIP RN: Single radial barbed port



DIP RR: Dual radial barbed ports, same side

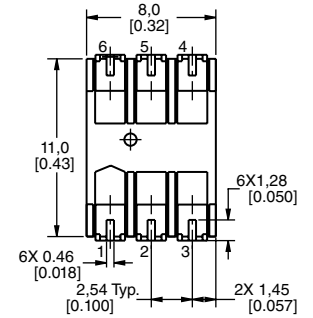
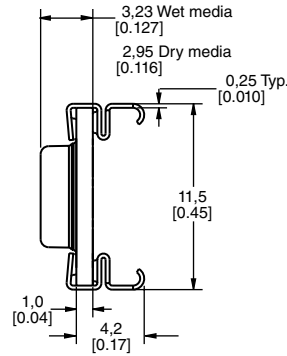
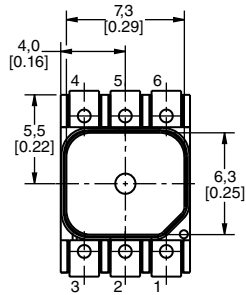


Dimensional Drawings

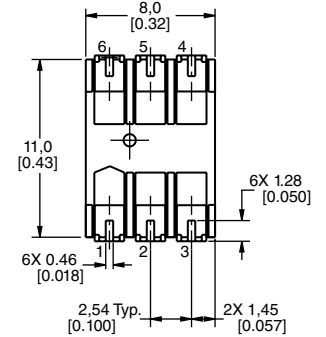
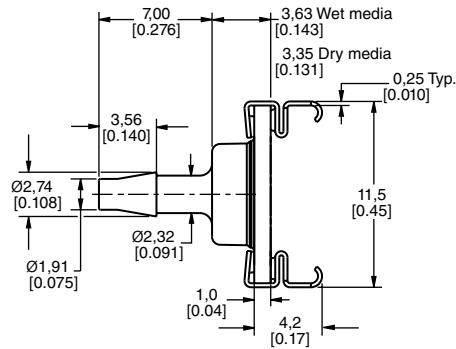
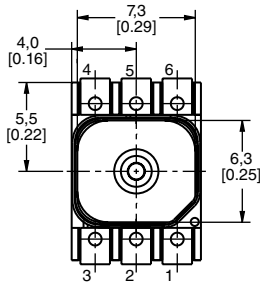
SMT Packages

Figure 6. SMT Package Dimensional Drawings (For reference only: mm [in.])

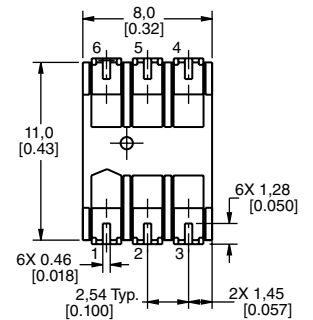
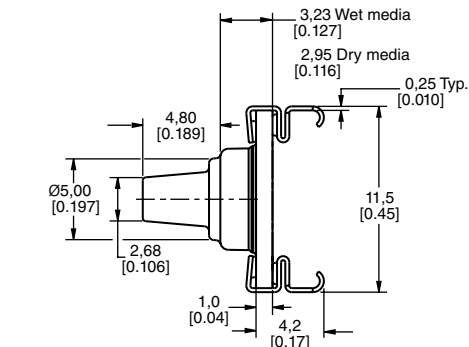
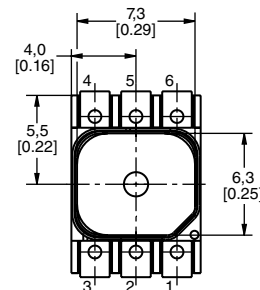
SMT NN: No port



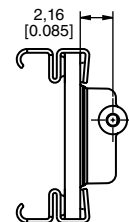
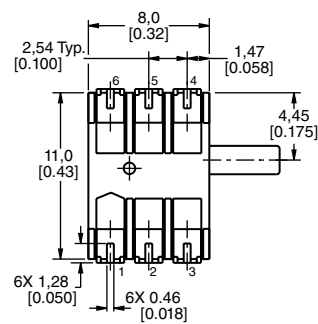
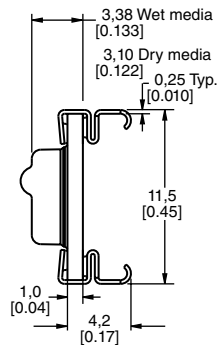
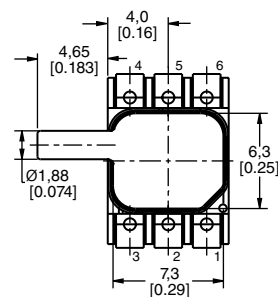
SMT AN: Single axial barbed port



SMT LN: Single axial barbless port



SMT JN: Single radial barbless port

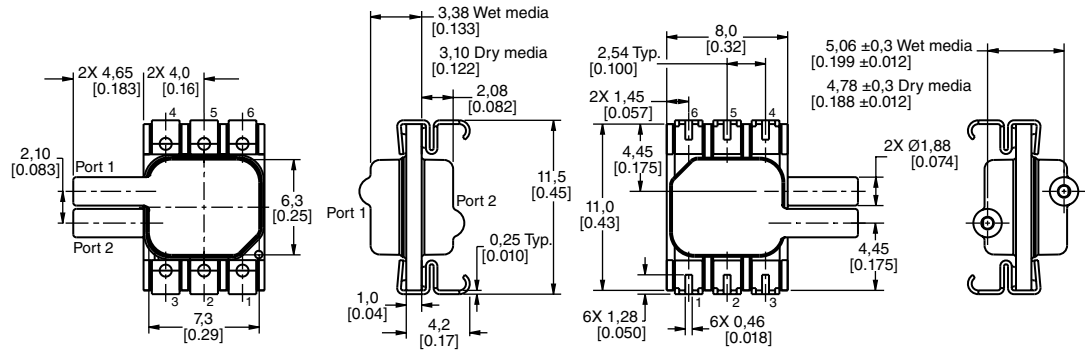


Dimensional Drawings

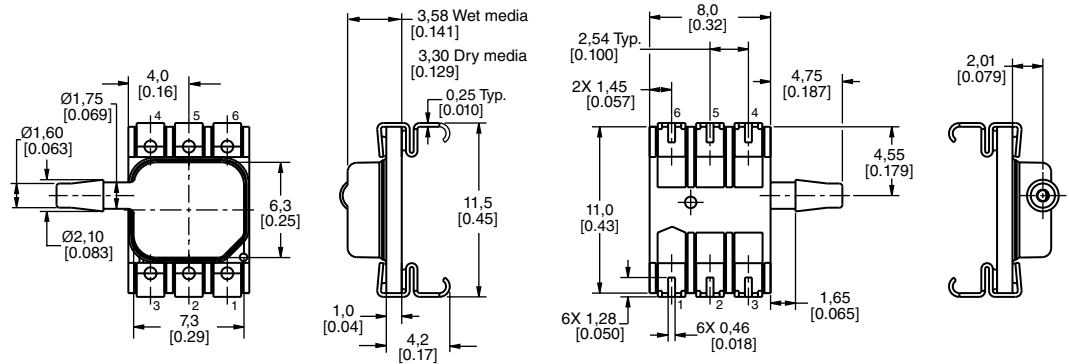
SMT Packages

Figure 6. SMT Package Dimensional Drawings (continued)

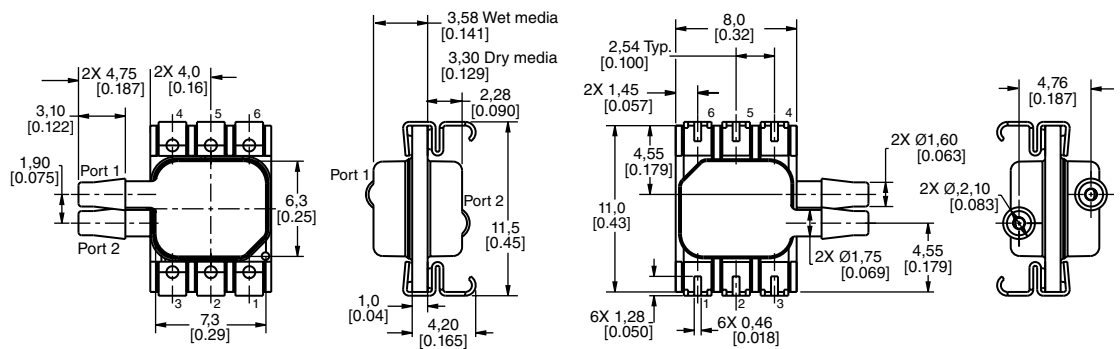
SMT JJ: Dual radial barless ports, same side



SMT RN: Single radial barbed port



SMT RR: Dual radial barbed ports, both sides

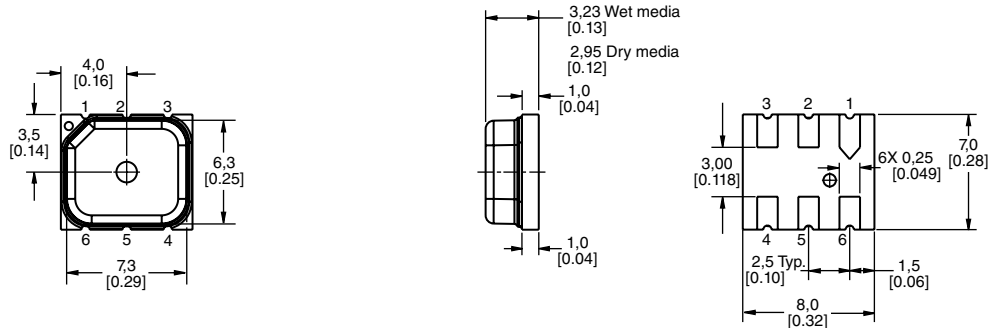


Dimensional Drawings

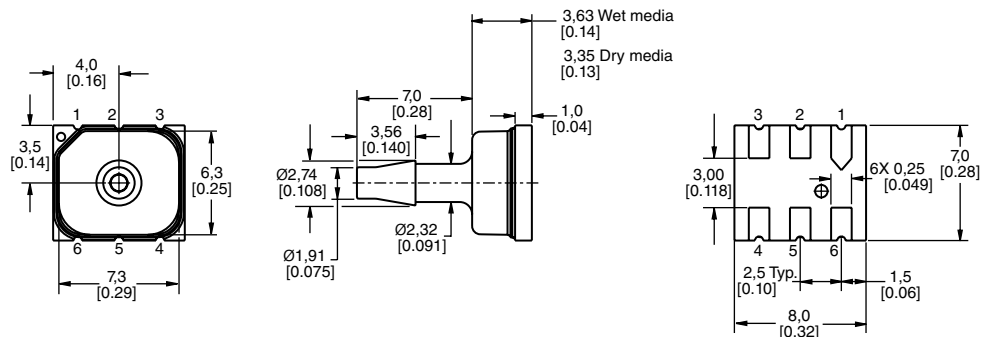
Leadless SMT Packages

Figure 7. Leadless SMT Package Dimensional Drawings (For reference only: mm [in.])

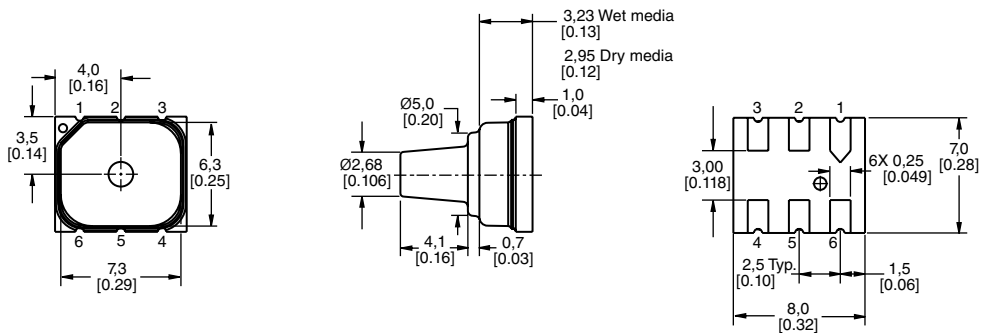
Leadless SMT AN: No port



Leadless SMT AN: Single axial barbed port



Leadless SMT AN: Single axial barbless port



ADDITIONAL INFORMATION

The following associated literature is available at sensing.honeywell.com:

- Product Line Guide
- Product Range Guide
- Product Nomenclature Tree
- Installation Instructions
- Application Information
- Technical Notes:
 - I²C Communications with Honeywell Digital Output Pressure Sensors
 - SPI Communications with Honeywell Digital Output Pressure Sensors
 - Sleep Mode with Honeywell Digital Output Pressure Sensors

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Failure to comply with these instructions could result in death or serious injury.

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