

INSTALLATION INSTRUCTIONS FOR THE BASIC AMPLIFIED BOARD MOUNT PRESSURE SENSORS, ABP SERIES

32305127

Issue D

GENERAL SPECIFICATIONS

The ABP Series are piezoresistive silicon pressure sensors offering a ratiometric analog or digital output for reading pressure over the specified full scale pressure span and temperature range. They are 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. All products are designed and manufactured according to ISO 9001 standards.

- Dry gases option: The input port is limited to non-corrosive, non-ionic media (e.g., dry air, gases) and should not be exposed to condensation. The gases are limited to media compatible with high temperature polyamide, silicone, alumina ceramic, silicon, gold, and glass.

- Liquid media option: Includes an additional silicone-based gel coating to protect the electronics under port P1, which enables use with non-corrosive liquids (e.g. water and saline) and in applications where condensation can occur. Since port P2 is designed for use with non-corrosive liquids, this option is often suitable for wet-wet differential sensing.

CLEANING

CAUTION

IMPROPER CLEANING

Avoid cleaning the sensor; however, if it must be cleaned ensure cleaning fluids, such as appropriate alcohols or fluorinated solvents, are used based on the type of contaminants to be removed. Do not immerse the sensor.

Failure to comply with these instructions may result in product damage.

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:	
all external surfaces	0 %RH to 95 %RH, non-condensing
internal surfaces of Liquid Media Option (T, V, F, G)	0 %RH to 100 %RH, condensing
internal surfaces of Dry Gases Option (N, D)	0 %RH 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 $\leq 30^{\circ}\text{C}/85\% \text{RH}$)

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

TABLE 3. WETTED MATERIALS¹

COMPONENT	PRESSURE PORT 1 (P1)		PRESSURE PORT 2 (P2)
	DRY GAS OPTION	LIQUID MEDIA OPTION	
Ports and covers	high temperature polyamide		
Substrate	alumina ceramic	—	alumina ceramic
Adhesives	epoxy, silicone	epoxy, silicone gel	epoxy, silicone
Electronic components	silicon, glass, solder, gold, aluminum	304 SST	silicon

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).

TABLE 5. OPERATING SPECIFICATIONS

CHARACTERISTIC	ANALOG			DIGITAL			UNIT
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	
Supply voltage (V _{supply}): ^{1,2,3} 3.3 Vdc 5.0 Vdc	3.0 4.75	3.3 5.0	3.6 5.25	3.0 4.75	3.3 5.0	3.6 5.25	Vdc
Supply current: 3.3 Vdc 5.0 Vdc sleep mode option	— — —	2.1 2.7 —	2.8 3.8 —	— — —	3.1 3.7 1	3.9 4.6 10	mA mA uA
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	—	—	—	—	±4	—	°C
Startup time (power up to data ready)	—	—	5	—	—	3	ms
Response time	—	1	—	—	0.46	—	ms
Clipping limit: upper lower	— 2.5	— —	97.5 —	— —	— —	— —	%Vsupply
I ² C/SPI voltage level: low high	— —	— —	— —	— 80	— —	20 —	%Vsupply
Pull up on SDA/MISO, SCL/SCLK, SS	—	—	—	1	—	—	kOhm
Total Error Band ⁷	—	—	±1.5	—	—	±1.5	%FSS ⁸
Accuracy ⁹	—	—	±0.25	—	—	±0.25	%FSS BFSL
Long term stability (1000 hr, 25°C [77°F])	—	—	±0.25	—	—	±0.25	%FSS
Output resolution	0.03 —	— —	— —	— 12	— —	— —	%FSS bits

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: Typical temperature output error over the compensated temperature range of 0°C to 50°C. Operation in Sleep Mode may affect temperature output error depending on duty cycle.

⁷Total 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.

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

⁹Accuracy: 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.

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

TABLE 7. PRESSURE RANGE SPECIFICATIONS

PRESSURE RANGE	PRESSURE RANGE		UNIT	OVERPRESSURE ¹		BURST PRESSURE ²		COMMON MODE PRESSURE ³
	PMIN.	PMAX.		PORT 1 (P1)	PORT 2 (P2)	PORT 1 (P1)	PORT 2 (P2)	
1 psi to 150 psi								
Differential								
060MD	-60	60	mbar	2000	850	3500	1000	10000
100MD	-100	100	mbar	4000	1400	7000	2500	10000
160MD	-160	160	mbar	4000	1400	7000	2500	10000
250MD	-250	250	mbar	10000	2000	19000	4000	10000
400MD	-400	400	mbar	10000	2000	19000	4000	10000
600MD	-600	600	mbar	17000	2000	19000	4000	10000
001BD	-1	1	bar	17	4	19	8	17
1.6BD	-1.6	1.6	bar	17	8	19	16	17
2.5BD	-2.5	2.5	bar	17	8	19	16	17
004BD	-4.0	4.0	bar	17	16	19	19	17
Gage								
060MG	0	60	mbar	2000	—	3500	—	5500
100MG	0	100	mbar	2000	—	3500	—	10000
160MG	0	160	mbar	2000	—	3500	—	10000
250MG	0	250	mbar	4000	—	7000	—	10000
400MG	0	400	mbar	10000	—	19000	—	10000
600MG	0	600	mbar	10000	—	19000	—	10000
001BG	0	1	bar	17	—	19	—	17
1.6BG	0	1.6	bar	17	—	19	—	17
2.5BG	0	2.5	bar	17	—	19	—	17
004BG	0	4	bar	17	—	19	—	17
006BG	0	6	bar	17	—	19	—	17
010BG	0	10	bar	17	—	19	—	17
6 kPa to 1 MPa								
Differential								
006KD	-6	6	kPa	200	85	350	100	1000
010KD	-10	10	kPa	400	140	700	250	1000
016KD	-16	16	kPa	400	140	700	250	1000
025KD	-25	25	kPa	1000	200	1900	400	1000
040KD	-40	40	kPa	1000	200	1900	400	1000
060KD	-60	60	kPa	1700	200	1900	400	1000
100KD	-100	100	kPa	1700	400	1900	800	1700
160KD	-160	160	kPa	1700	800	1900	1600	1700
250KD	-250	250	kPa	1700	800	1900	1600	1700
400KD	-400	400	kPa	1700	1600	1900	1900	1700
Gage								
006KG	0	6	kPa	200	—	350	—	550
010KG	0	10	kPa	200	—	350	—	1000
016KG	0	16	kPa	200	—	350	—	1000
025KG	0	25	kPa	400	—	700	—	1000
040KG	0	40	kPa	1000	—	1900	—	1000
060KG	0	60	kPa	1000	—	1900	—	1000
100KG	0	100	kPa	1700	—	1900	—	1700
160KG	0	160	kPa	1700	—	1900	—	1700
250KG	0	250	kPa	1700	—	1900	—	1700
400KG	0	400	kPa	1700	—	1900	—	1700
600KG	0	600	kPa	1700	—	1900	—	1700
001GG	0	1	MPa	1.7	—	1.9	—	1.7

TABLE 7. PRESSURE RANGE SPECIFICATIONS, CONTINUED

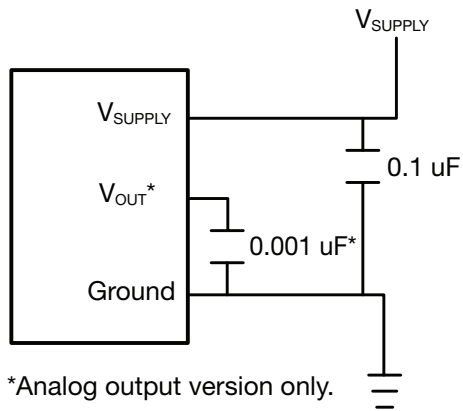
PRESSURE RANGE	PRESSURE RANGE		UNIT	OVERPRESSURE ¹		BURST PRESSURE ²		COMMON MODE PRESSURE ³
	PMIN.	PMAX.		PORT 1 (P1)	PORT 2 (P2)	PORT 1 (P1)	PORT 2 (P2)	
1 psi to 150 psi								
Differential								
001PD	-1	1	psi	30	10	50	15	150
005PD	-5	5	psi	150	30	275	40	150
015PD	-15	15	psi	250	60	275	120	250
030PD	-30	30	psi	250	120	275	240	250
060PD	-60	60	psi	250	250	275	275	250
Gage								
001PG	0	1	psi	30	—	50	—	150
005PG	0	5	psi	150	—	275	—	150
015PG	0	15	psi	250	—	275	—	250
030PG	0	30	psi	250	—	275	—	250
060PG	0	60	psi	250	—	275	—	250
100PG	0	100	psi	250	—	275	—	250
150PG	0	150	psi	250	—	275	—	250

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 the specified port (P1 or P2) 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.

FIGURE 1. RECOMMENDED FILTER CAP



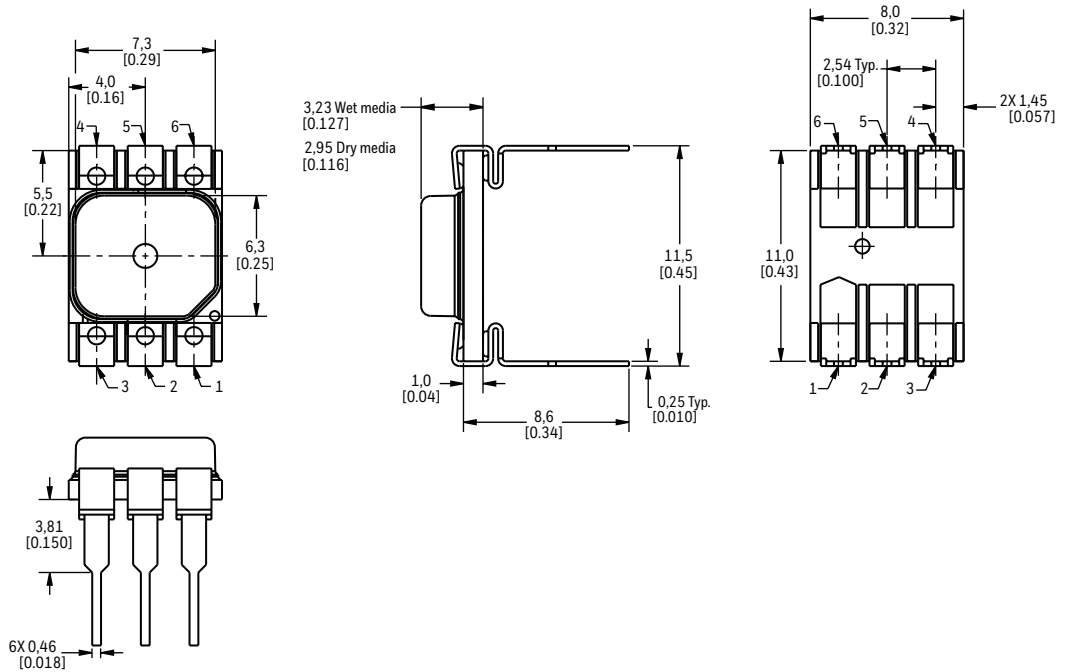
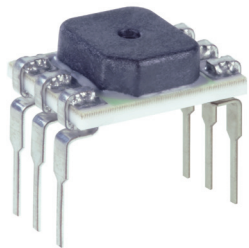
*Analog output version only.

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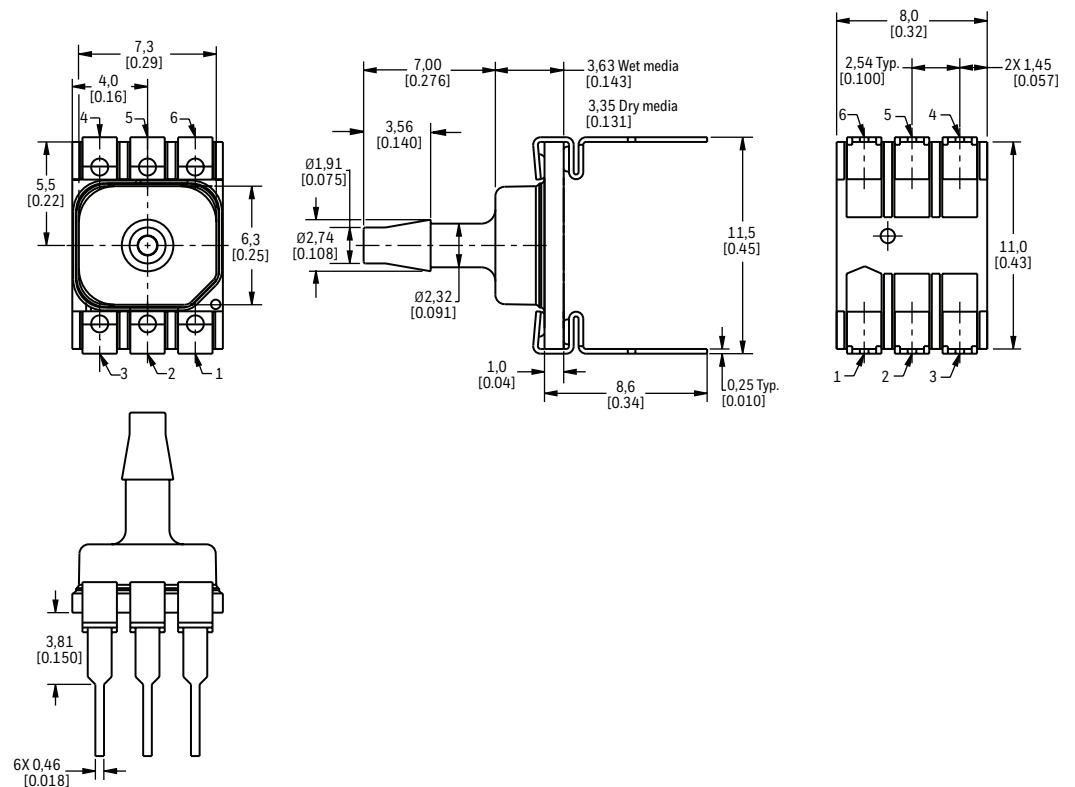
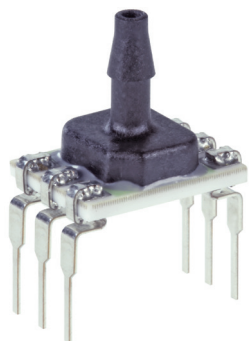
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FIGURE 2. DIP PACKAGE DIMENSIONAL DRAWINGS (FOR REFERENCE ONLY: MM [IN].)

DIP NN: No port



DIP AN: Single axial
barbed port

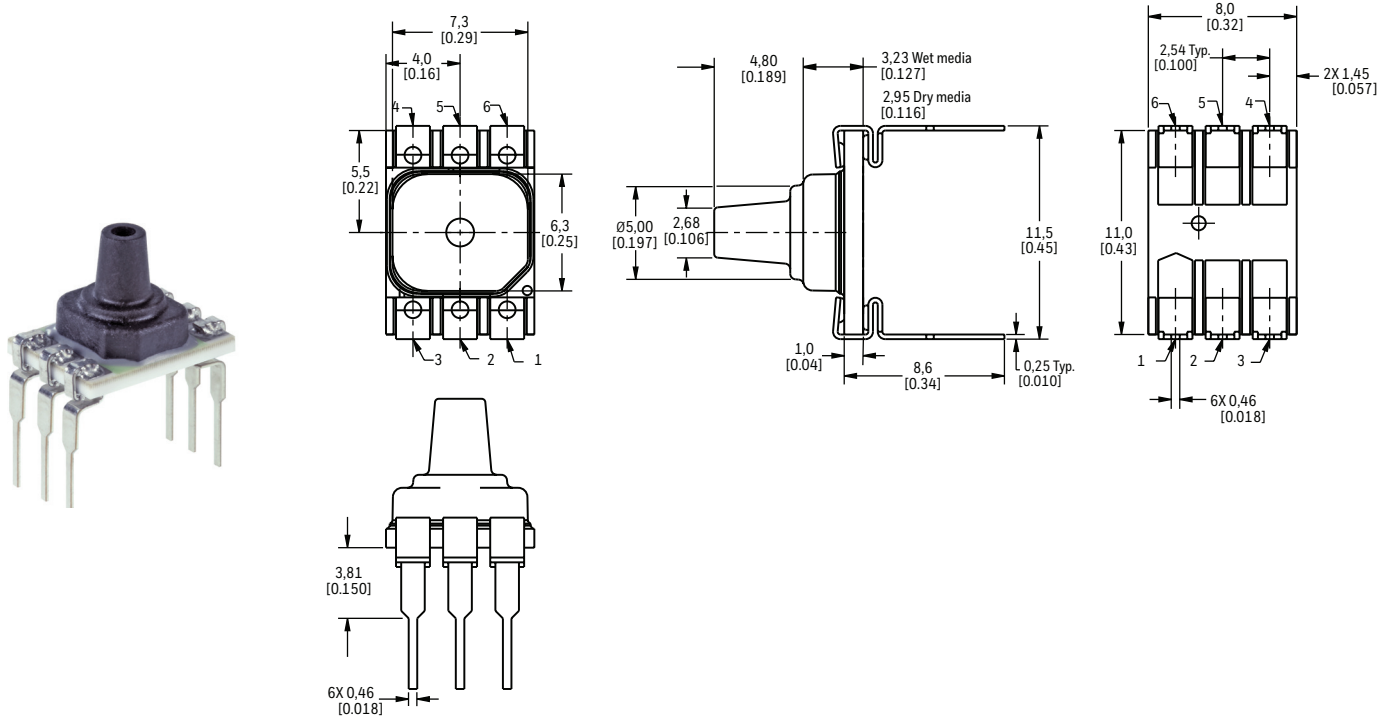


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FIGURE 2. DIP PACKAGE DIMENSIONAL DRAWINGS (CONTINUED)

DIP LN: Single axial
barbless port



DIP JN: Single radial
barbless port

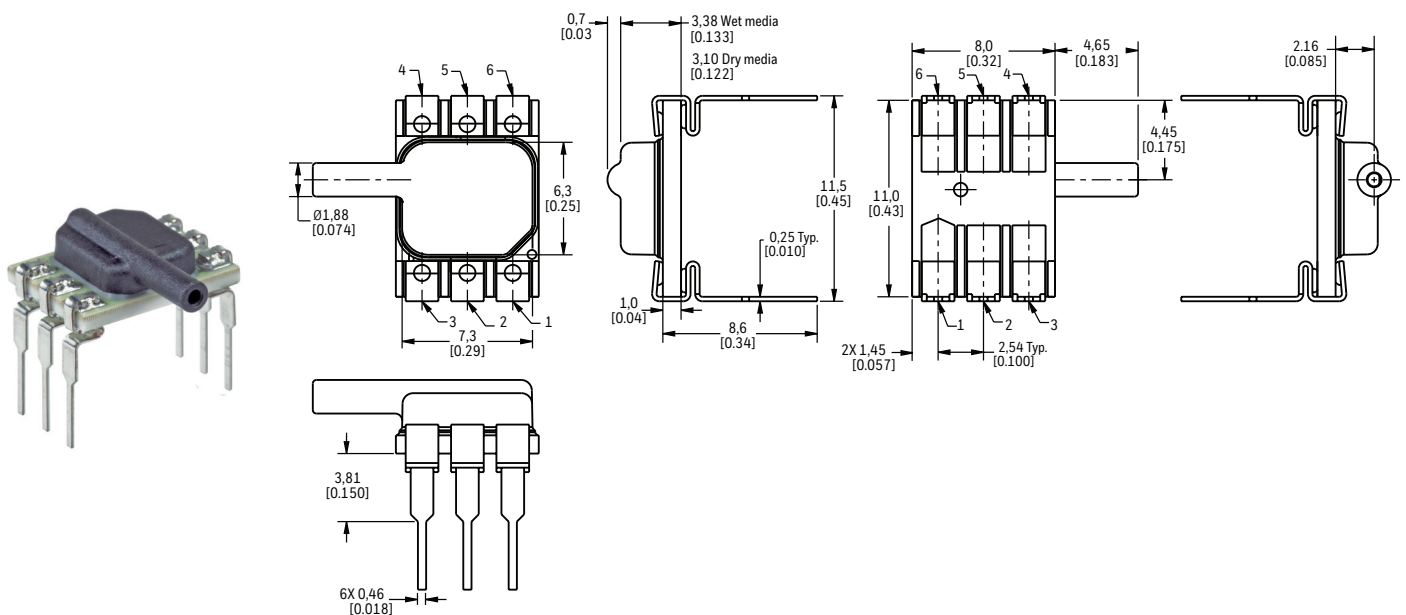
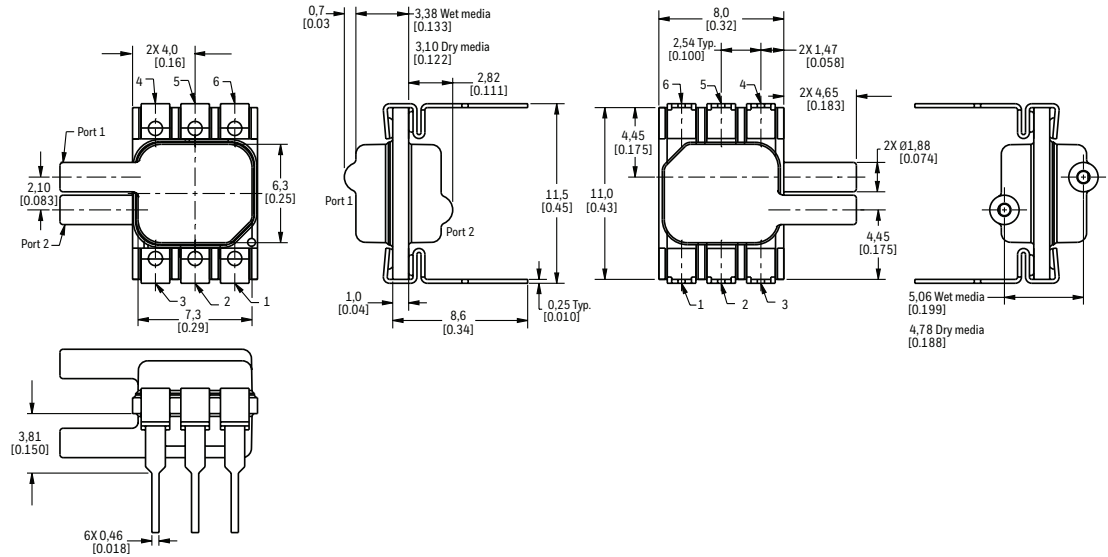
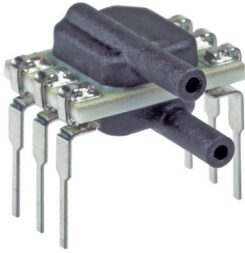
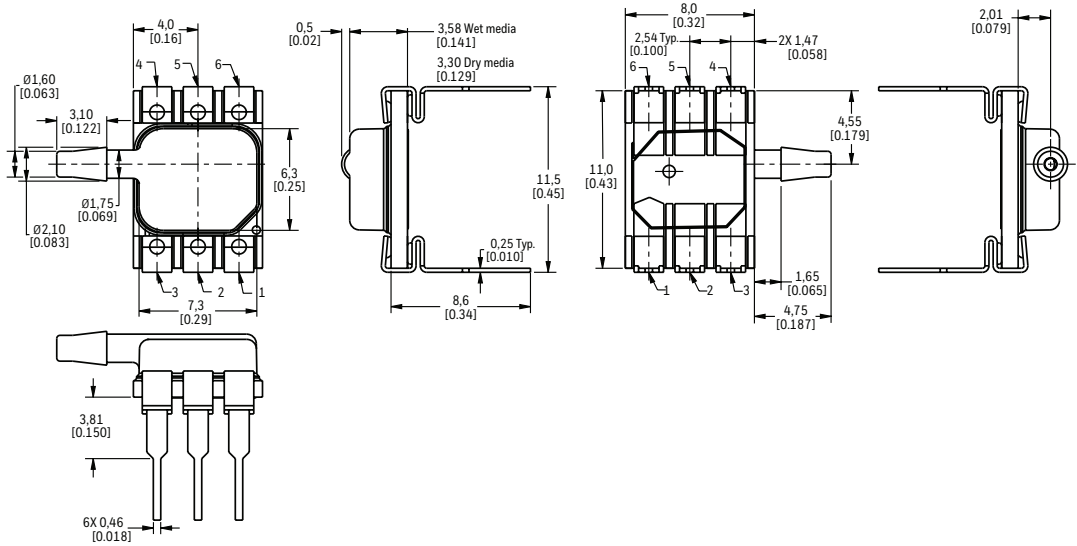
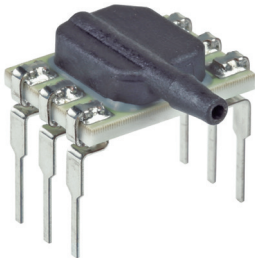


FIGURE 2. DIP PACKAGE DIMENSIONAL DRAWINGS (CONTINUED)

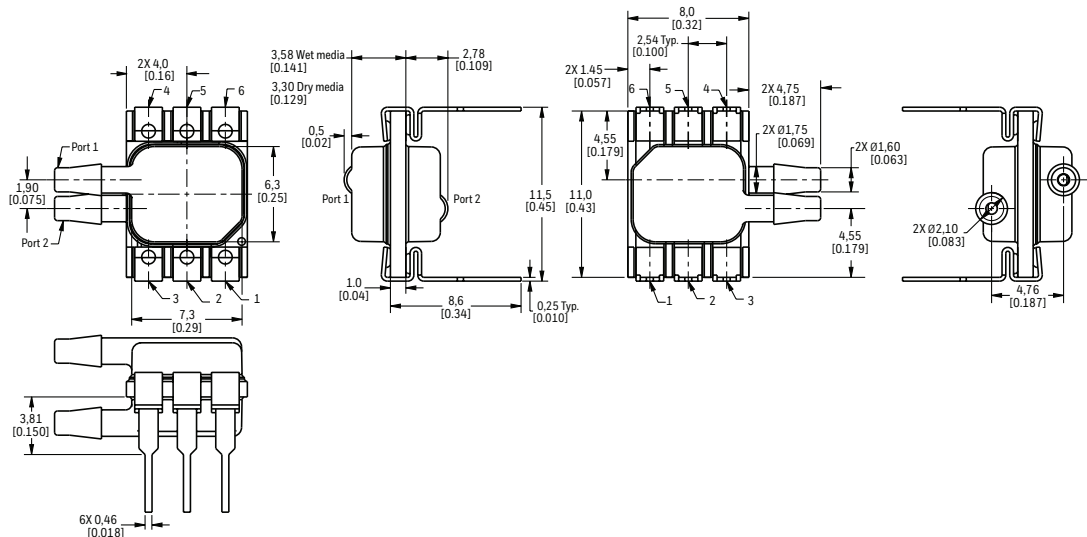
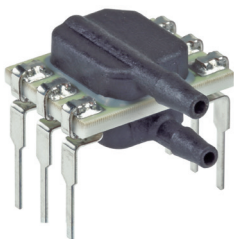
DIP JJ: Dual radial barless ports, same side



DIP RN: Single radial barbed port



DIP RR: Dual radial barbed ports, same side

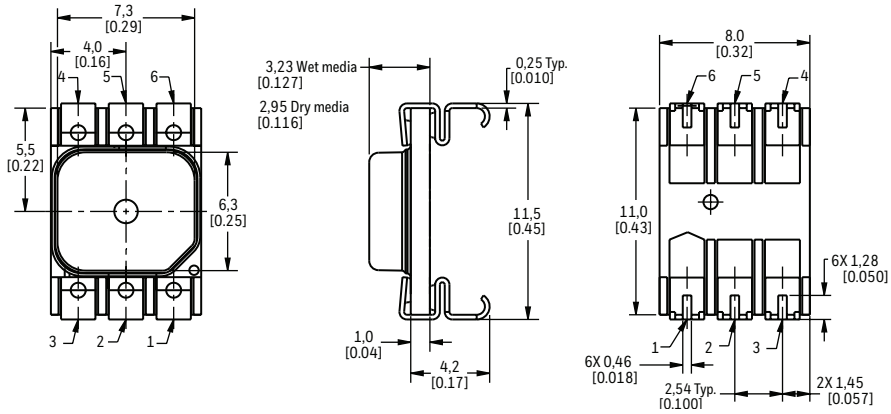
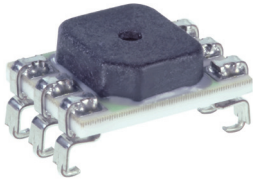


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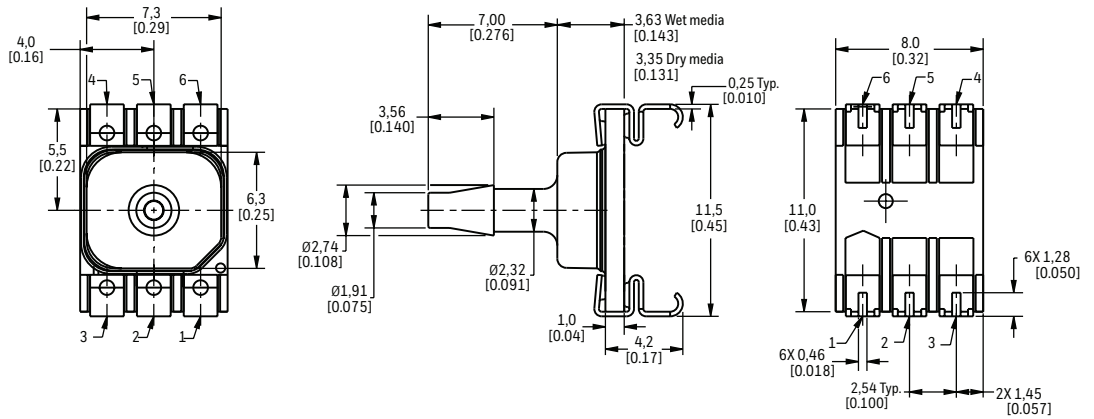
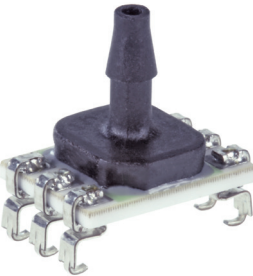
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FIGURE 3. SMT PACKAGE DIMENSIONAL DRAWINGS (FOR REFERENCE ONLY: MM [IN.])

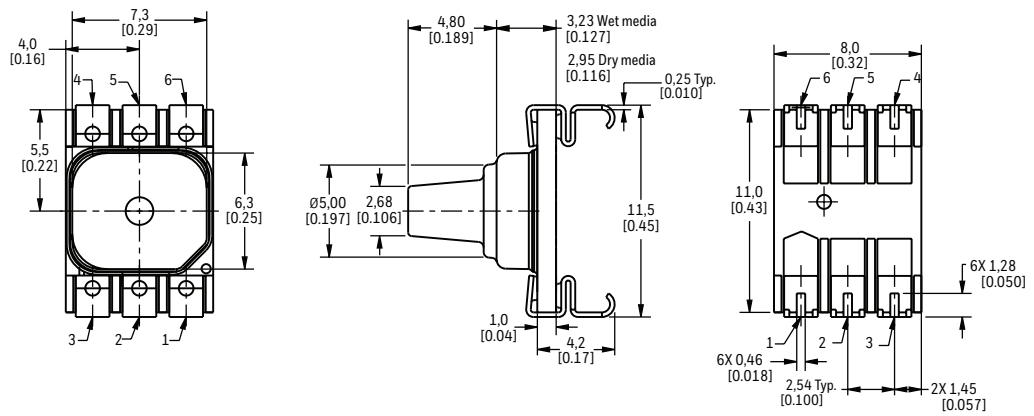
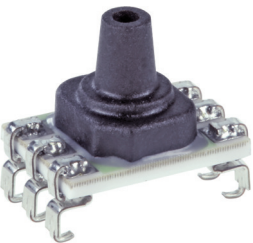
SMT NN: No port



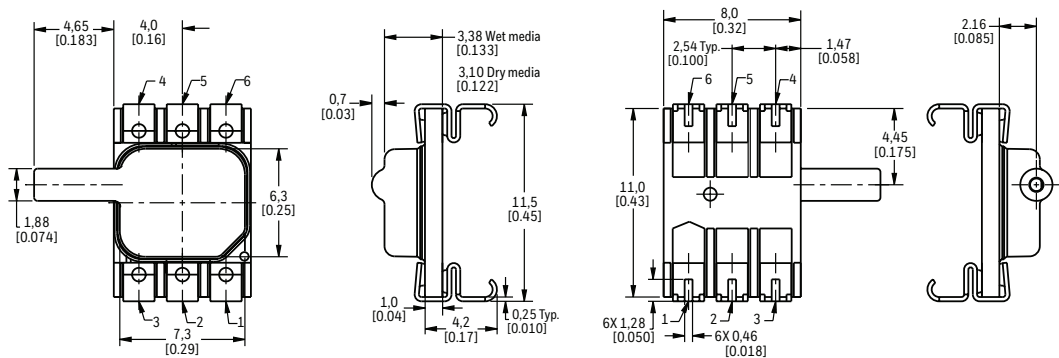
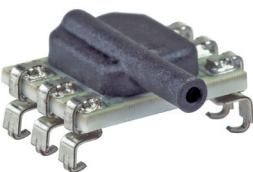
SMT AN: Single axial
barbed port



SMT LN: Single axial
barbless port



SMT JN: Single radial
barbless port

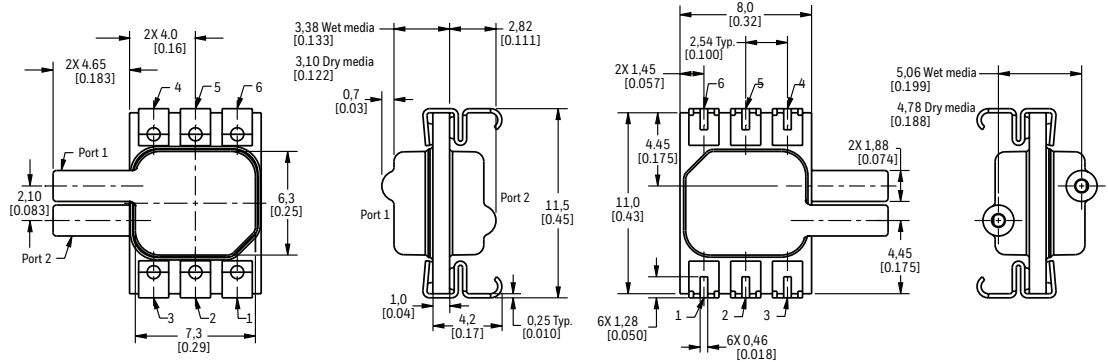
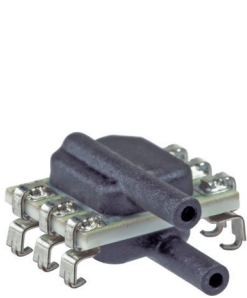


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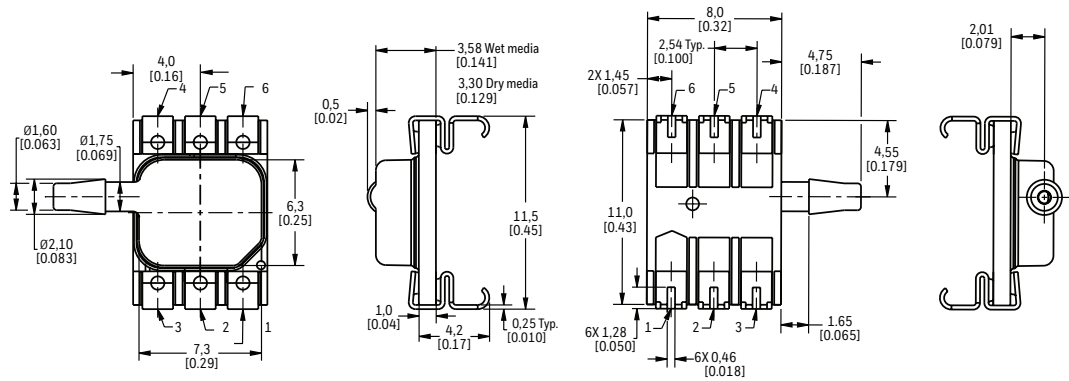
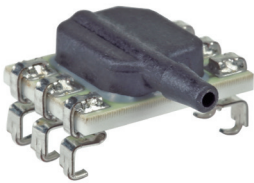
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FIGURE 3. SMT PACKAGE DIMENSIONAL DRAWINGS (CONTINUED)

SMT JJ: Dual radial barless ports, same side



SMT RN: Single radial barbed port



SMT RR: Dual radial barbed ports, both sides

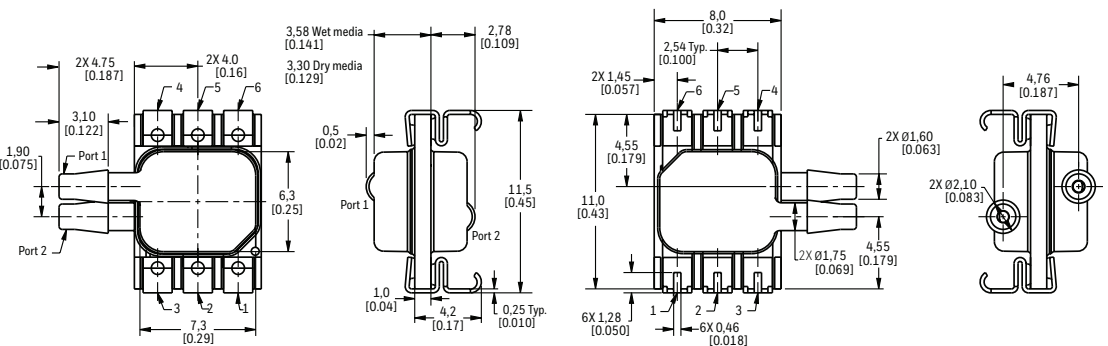
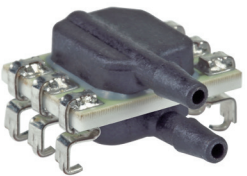
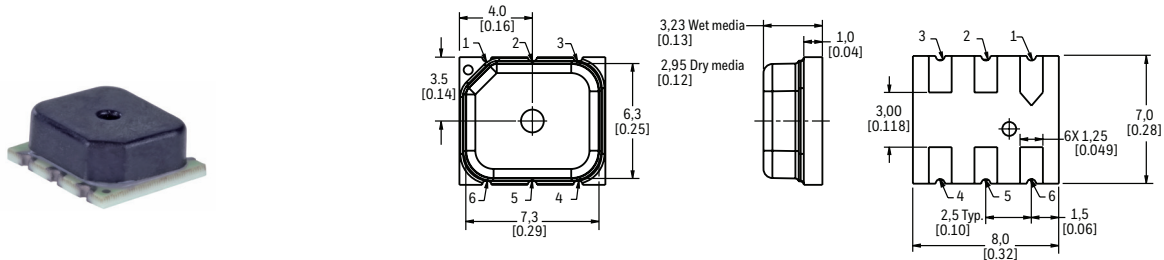
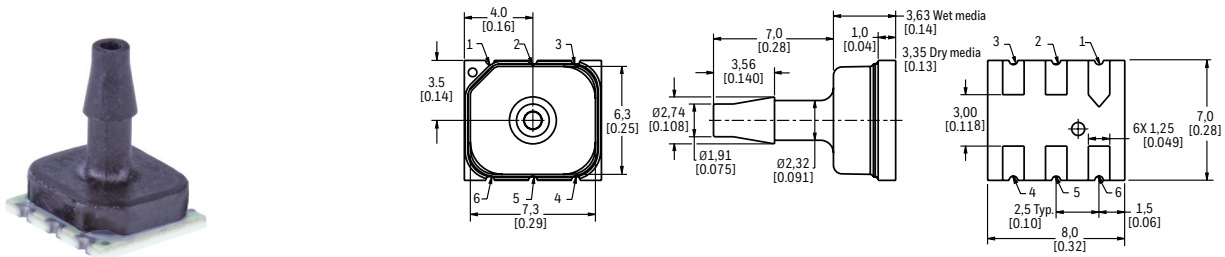


FIGURE 4. LEADLESS SMT PACKAGE DIMENSIONAL DRAWINGS (FOR REFERENCE ONLY: MM [IN.])

Leadless SMT NN: No port



Leadless SMT AN: Single axial barbed port



Leadless SMT LN: Single axial barbless port

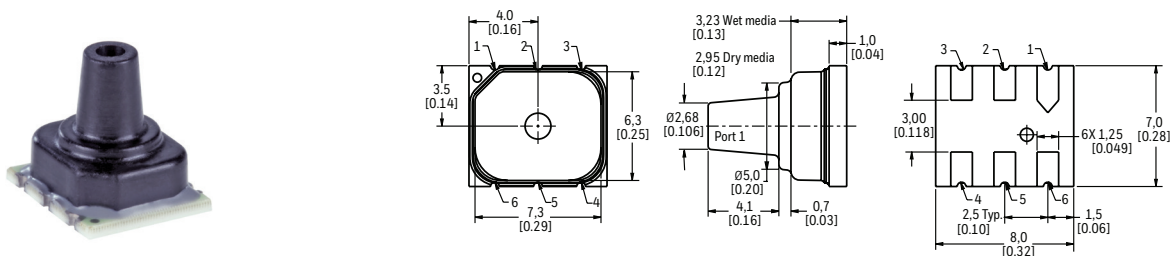
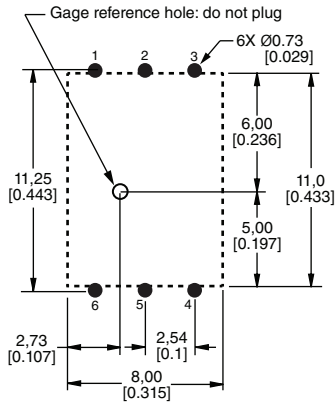


TABLE 8. PINOUTS

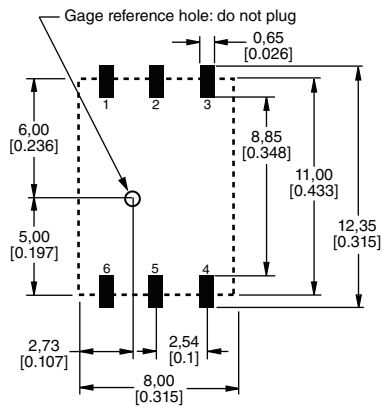
OUTPUT TYPE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6
I ² C	GND	V _{supply}	INT	NC	SDA	SCL
SPI	GND	V _{supply}	SS	NC	MISO	SCLK
analog	GND	NC	V _{out}	NC	NC	V _{supply}

FIGURE 5. RECOMMENDED PCB LAYOUTS

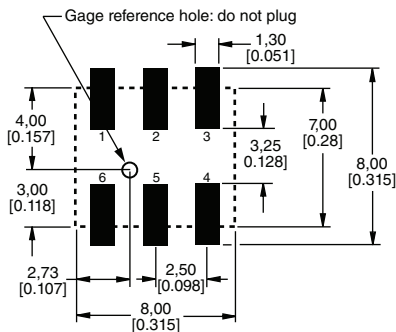
DIP



SMT



Leadless SMT



**⚠ WARNING
PERSONAL INJURY**

DO NOT USE these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury.

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

Warranty/Remedy

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship during the applicable warranty period. Honeywell's standard product warranty applies unless agreed to otherwise by Honeywell in writing; please refer to your order acknowledgment or consult your local sales office for specific warranty details. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace, at its option, without charge those items that Honeywell, in its sole discretion, finds defective. **The foregoing is buyer's sole remedy and is in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose. In no event shall Honeywell be liable for consequential, special, or indirect damages.**

While Honeywell may provide application assistance personally, through our literature and the Honeywell web site, it is buyer's sole responsibility to determine the suitability of the product in the application.

Specifications may change without notice. The information we supply is believed to be accurate and reliable as of this writing. However, Honeywell assumes no responsibility for its use.

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