

Installation Instructions for the TruStability® Board Mount Pressure Sensors

Issue F

50044171

HSC Series — High Accuracy, Compensated/Amplified

 ± 1.6 mbar to ± 10 bar $| \pm 160$ Pa to ± 1 MPa $| \pm 0.5$ inH₂O to ± 150 psi Digital or Analog Output

SSC Series—Standard Accuracy, Compensated/Amplified

 ± 1.6 mbar to ± 10 bar $|\pm 160$ Pa to ± 1 MPa $|\pm 0.5$ inH₂O to ± 150 psi Digital or Analog Output

GENERAL INFORMATION

Honeywell's TruStability® High Accuracy Silicon Ceramic (HSC) Series and Standard Accuracy Silicon Ceramic (SSC) Series are piezoresistive silicon pressure sensors offering a digital or analog output for reading pressure over the specified full scale pressure span and temperature range.

These sensors measure absolute, gage, or differential pressures. The absolute versions have an internal vacuum reference and an output value proportional to absolute pressure. Gage versions are referenced to atmospheric pressure and provide an output proportional to pressure variations from atmosphere. Differential versions allow measurement of pressure between the two pressure ports.

CAUTION

PRODUCT DAMAGE FOR SENSORS WITH LIQUID MEDIA OPTION (ONLY AVAILABLE 60 MBAR | 6 KPA | 1 PSI AND ABOVE)

- Ensure liquid media is applied to Port 1 only; Port 2 is not compatible with liquids.
- Ensure liquid media contains no particulates. All TruStability® sensors are dead-ended devices. Particulates can accumulate inside the sensor, causing damage or affecting sensor output.
- Recommend that the sensor be positioned with Port 1 facing downwards; any particulates in the system are less likely to enter and settle within the pressure sensor if it is in this position.
- Ensure liquid media does not create a residue when dried; build-up inside the sensor may affect sensor output.
 Rinsing of a dead-ended sensor is difficult and has limited effectiveness for removing residue.
- Ensure liquid media are compatible with wetted materials. Noncompatible liquid media will degrade sensor performance and may lead to sensor failure.

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

The HSC Series is calibrated over the temperature range of 0 $^{\circ}$ C to 50 $^{\circ}$ C [32 $^{\circ}$ F to 122 $^{\circ}$ F] while the SSC Series is calibrated over the temperature range of -20 $^{\circ}$ C to 85 $^{\circ}$ C [-4 $^{\circ}$ F to 185 $^{\circ}$ F].

The TruStability® pressure sensors are intended for use with non-corrosive, non-ionic gases, such as air and other dry gases. An available option extends the performance of these sensors to non-corrosive, non-ionic liquids for pressure ranges above $40 \text{ mbar} \mid 4 \text{ kPa} \mid 20 \text{ inH}_20$.

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}) ² :	-3.0	6.0	Vdc	
Storage temperature	-40 [-40]	85 [185]	°C [°F]	
Soldering time and temperature:				
lead solder temperature (SIP, DIP)	4 s max. at 250 °C [482 °F]			
peak reflow temperature (SMT)	15 s max. at 250 °C [482 °F]			

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

² Incorrect application of supply voltage or ground to the wrong pin may cause electrical failure.

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Table 2. Environmental Specifications

Characteristic	Parameter
Humidity:	
gases only (See "Options N and D" in Figures 5 and 6.)	0% to 95% RH, non-condensing
liquid media (See "Options T and V" in Figures 5 and 6.)	100% condensing or direct liquid media on Port 1
Vibration	MIL-STD-202G Method 204D, Condition B (15 g, 10 Hz to 2 Hz)
Shock	MIL-STD-202G, Method 213B, Condition C (100 g, 6 ms duration)
Life ¹	1 million pressure cycles minimum
Solder reflow	J-STD-020-D.1 Moisture Sensitivity Level 1
Solder reliow	(unlimited shelf life when stored at ≤30 °C/85 % RH)

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

Table 3. Wetted Materials¹

Component	Port 1 (Pressure Port)	Port 2 (Reference Port)
Ports and covers	high temperature polyamide	high temperature polyamide
Substrate	alumina ceramic	alumina ceramic
Adhesives	epoxy, silicone	epoxy, silicone
Electronic components	ceramic, silicon, glass, solder	silicon, glass, gold

¹Contact Honeywell Customer Service for detailed material information.

Table 4. HSC Series and SSC Series Analog Operating Specifications

Characteristic	Min.	Тур.	Max.	Unit
Supply voltage (V _{supply}) ^{1, 2, 3} :				
pressure ranges ≥60 mbar 6 kPa 1 psi:				
3.3 Vdc	3.0	3.3	3.6	
5.0 Vdc	4.75	5.0	5.25	Vdc
pressure ranges ≤40 mbar 4 kPa 20 inH₂O:				
3.3 Vdc	3.27	3.3	3.33	
5.0 Vdc	4.95	5.0	5.05	
Supply current:				
3.3 Vdc	_	2.1	2.8	mA
5.0 Vdc	_	2.7	3.5	
Operating temperature range4:				
HSC	-20 [-4]	_	85 [185]	°C [°F]
SSC	-40 [-40]	_	85 [185]	
Compensated temperature range⁵:				
HSC	0 [-32]	_	50 [122]	°C [°F]
SSC	-20 [-4]	_	85 [185]	
Startup time (power up to data ready)	_	_	5	ms
Response time	_	1	_	ms
Clipping limit:				
upper	_	_	97.5	%Vsupply
lower	2.5	_	_	
Accuracy ⁶	_	_	±0.25	%FSS BFSL8
Output resolution	0.03	_	_	%FSS
Orientation sensitivity (±1 g): ^{7,9}				
pressure ranges ≤40 mbar 4 kPa 20 inH₂O:	_	±0.1	_	%FSS
pressure ranges ≤2.5 mbar 250 Pa 1 inH ₂ O:	_	±0.2	_	

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

⁶Accuracy: 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.

Orientation sensitivity: The maximum change in offset of the sensor due to a change in position or orientation relative to Earth's gravitational

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 Figures 5 and 6 for ranges.)

⁹Insignificant for pressure ranges above 40 mbar | 4 kPa | 20 inH₂O.

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Table 5. HSC Series and SSC Series Digital Operating Specifications

Characteristic	Min.	Тур.	Max.	Unit
Supply voltage (V _{supply}) ^{1, 2, 3} :				
pressure ranges ≥60 mbar 6 kPa 1 psi:				
3.3 Vdc	3.0	3.3	3.6	
5.0 Vdc	4.75	5.0	5.25	Vdc
pressure ranges ≤40 mbar 4 kPa 20 inH ₂ O:				
3.3 Vdc	3.27	3.3	3.33	
5.0 Vdc	4.95	5.0	5.05	
Supply current:				
3.3 Vdc	_	3.1	3.9	mA
5.0 Vdc	_	3.7	4.6	
Operating temperature range ⁴ :				
HSC	-20 [-4]	_	85 [185]	°C [°F]
SSC	-40 [-40]	_	85 [185]	
Compensated temperature range ⁵ :				
HSC	0 [-32]	_	50 [122]	°C [°F]
SSC	-20 [-4]	_	85 [185]	
Startup time (power up to data ready)	_	_	3	ms
Response time	_	0.46	_	ms
SPI/I ² C voltage level:				
low	_	_	20	%Vsupply
high	80	_	_	
Pull up on SDA/MISO, SCL/SCLK, SS	1	_	_	kOhm
Accuracy ⁶	_	_	±0.25	%FSS BFSL ⁸
Output resolution	12	_	_	bits
Orientation sensitivity (±1 g):7,9				
pressure ranges ≤40 mbar 4 kPa 20 inH₂O:	_	±0.1	_	%FSS
pressure ranges ≤2.5 mbar 250 Pa 1 inH ₂ O:	_	±0.2	_	

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.

⁶Accuracy: 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.

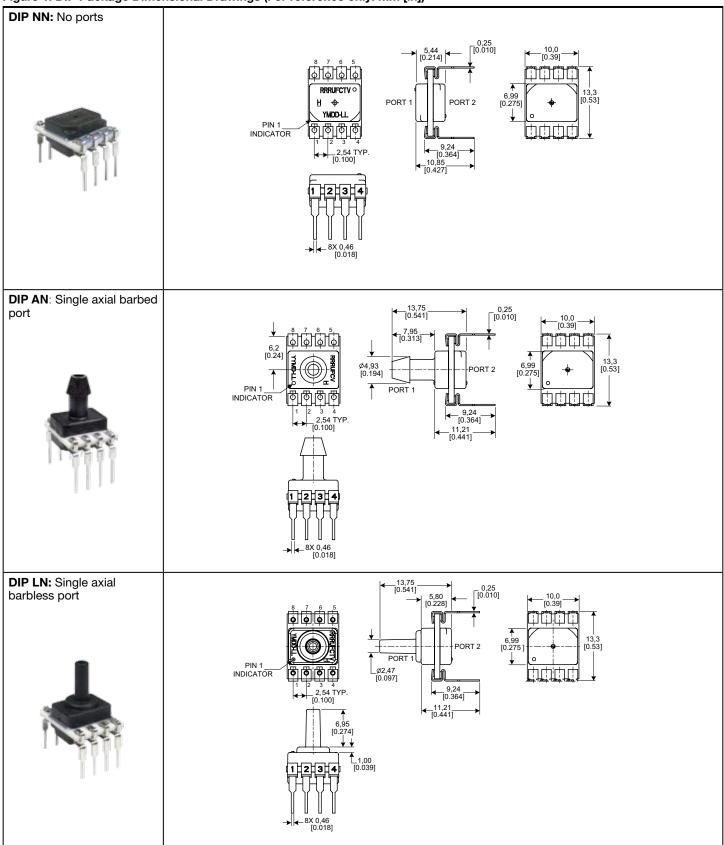
⁷Orientation sensitivity: The maximum change in offset of the sensor due to a change in position or orientation relative to Earth's gravitational field.

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 Figures 5 and 6 for ranges.)

⁹Insignificant for pressure ranges above 40 mbar | 4 kPa | 20 inH₂O.

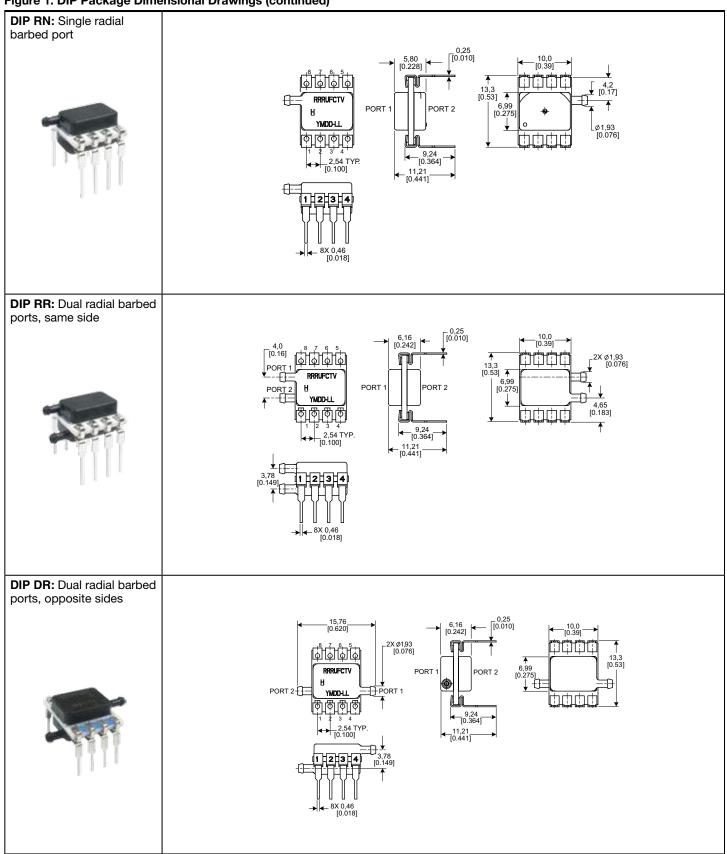
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Figure 1. DIP Package Dimensional Drawings (For reference only: mm [in])



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Figure 1. DIP Package Dimensional Drawings (continued)



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Figure 1. DIP Package Dimensional Drawings (continued)

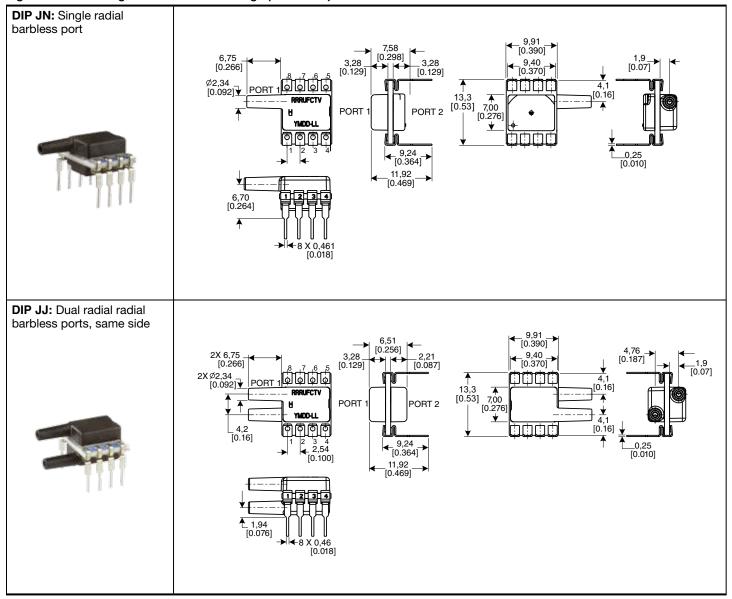
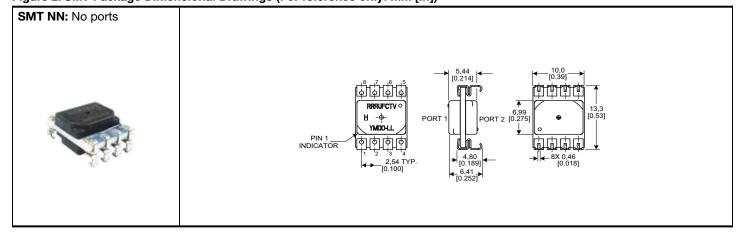


Figure 2. SMT Package Dimensional Drawings (For reference only: mm [in])



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Figure 2. SMT Package Dimensional Drawings (continued)

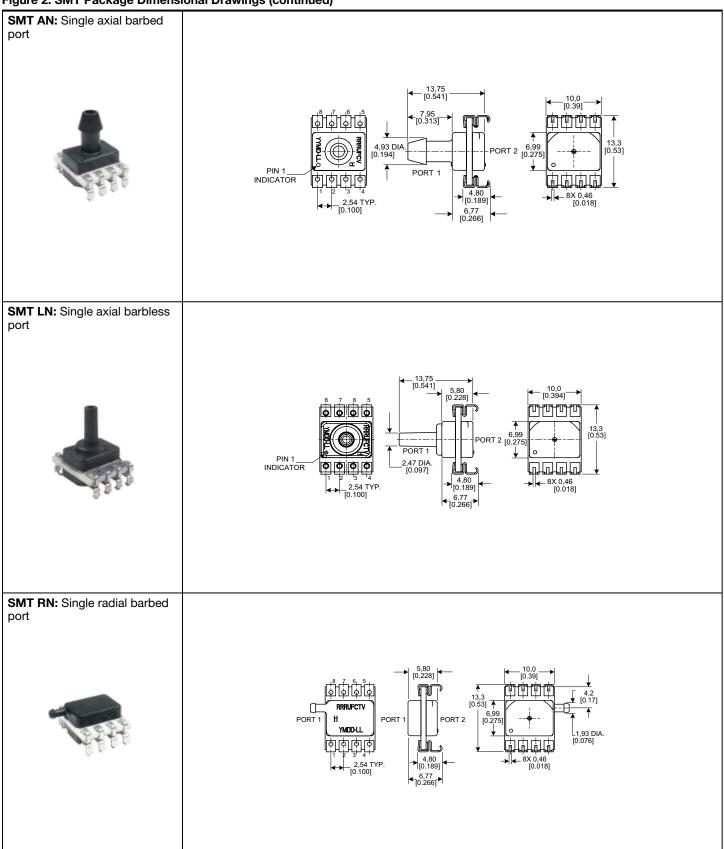
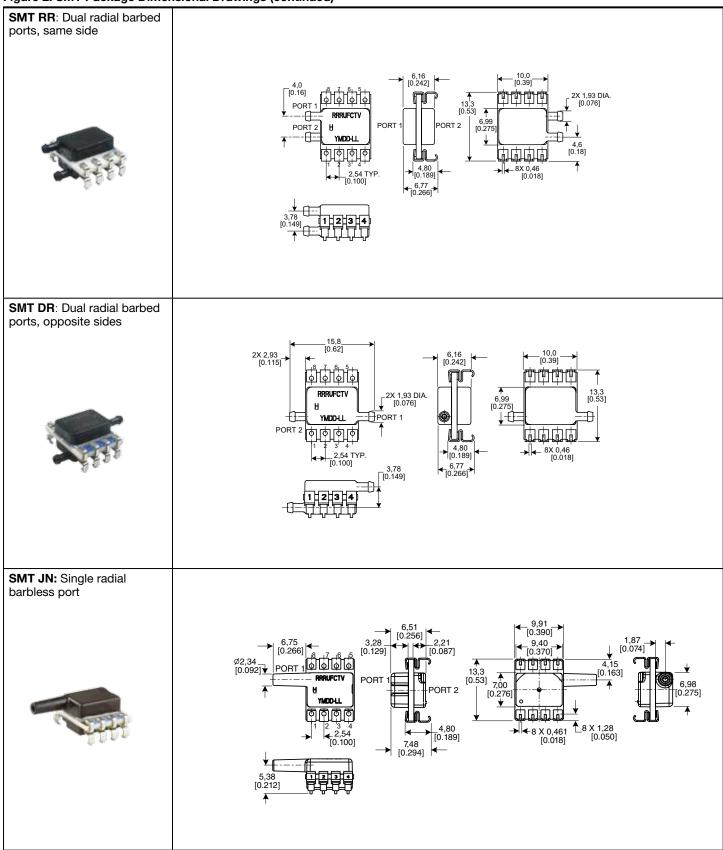


Figure 2. SMT Package Dimensional Drawings (continued)



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Figure 2. SMT Package Dimensional Drawings (continued)

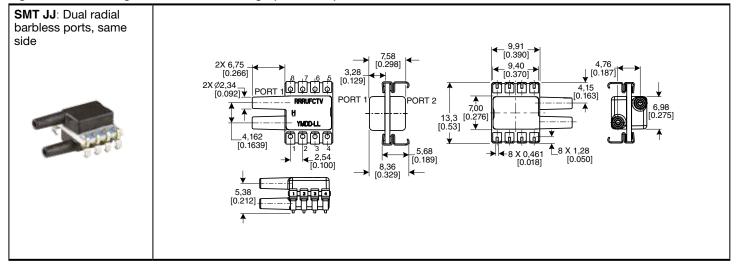
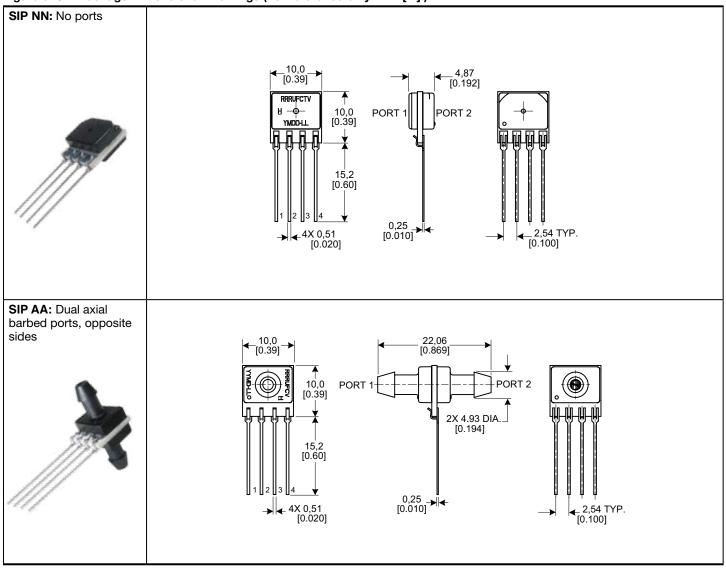
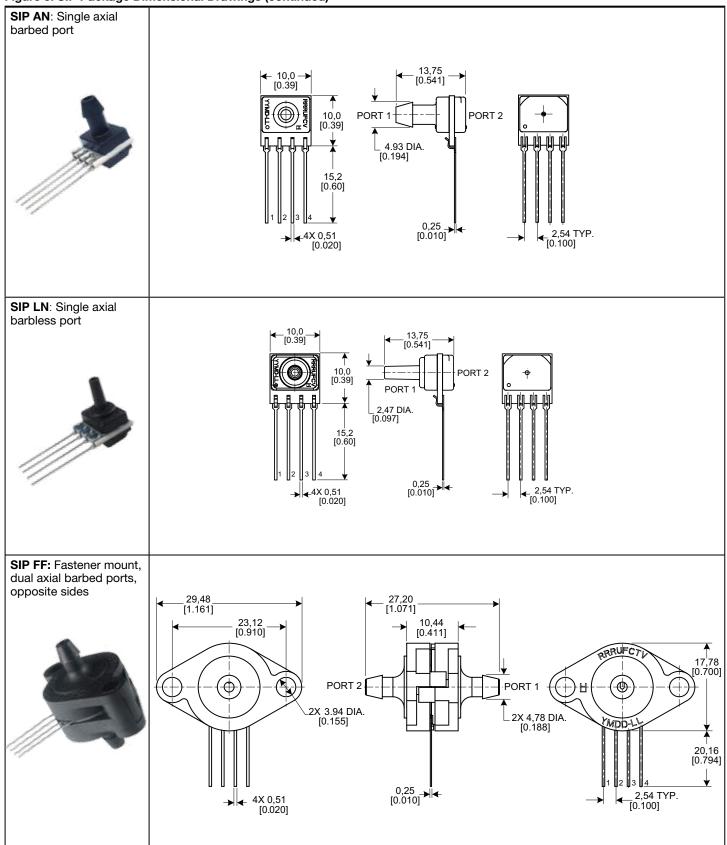


Figure 3. SIP Package Dimensional Drawings (For reference only: mm [in].)



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Figure 3. SIP Package Dimensional Drawings (continued)



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Figure 3. SIP Package Dimensional Drawings (continued)

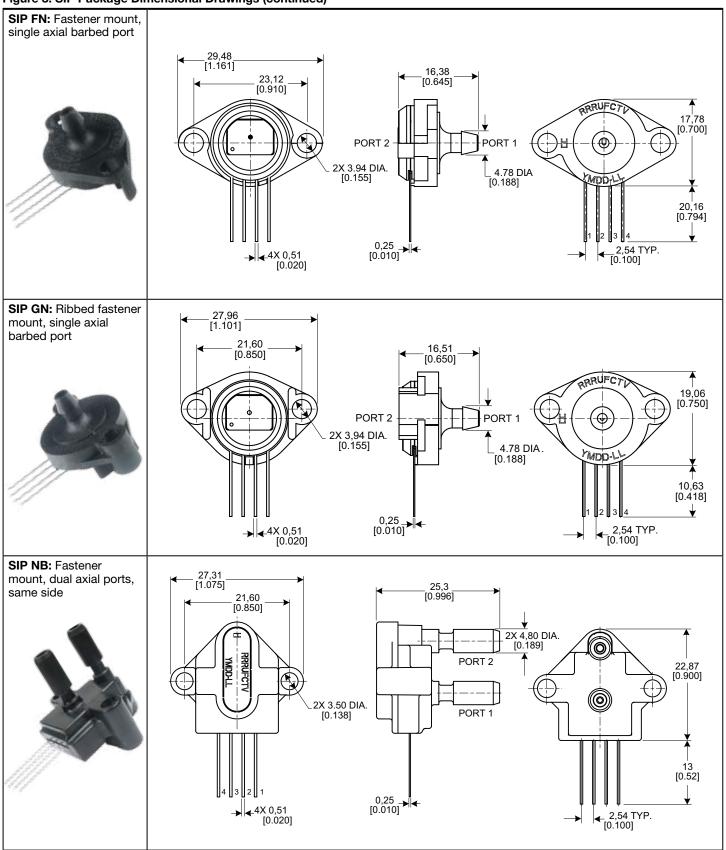
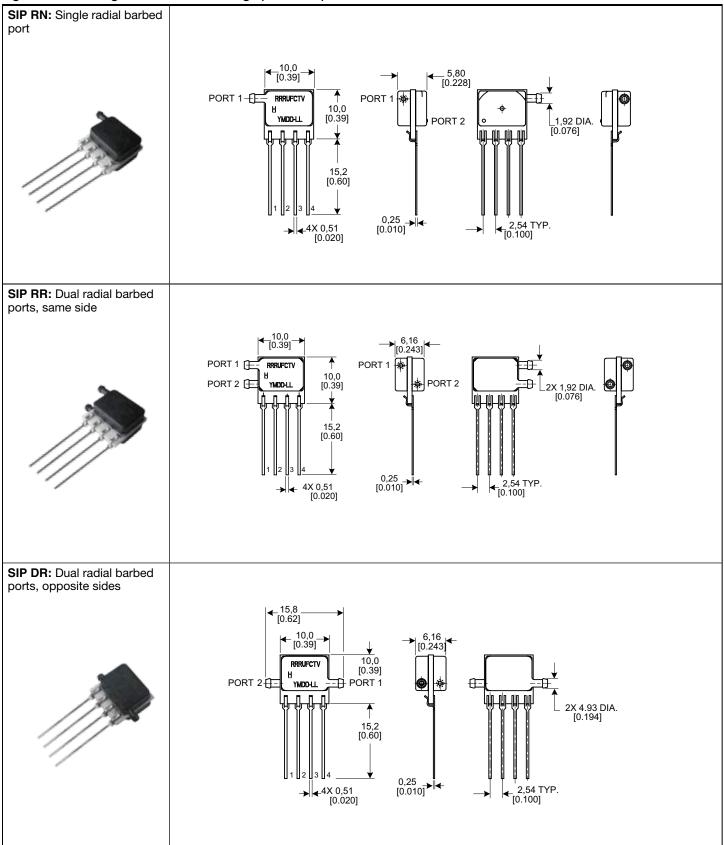
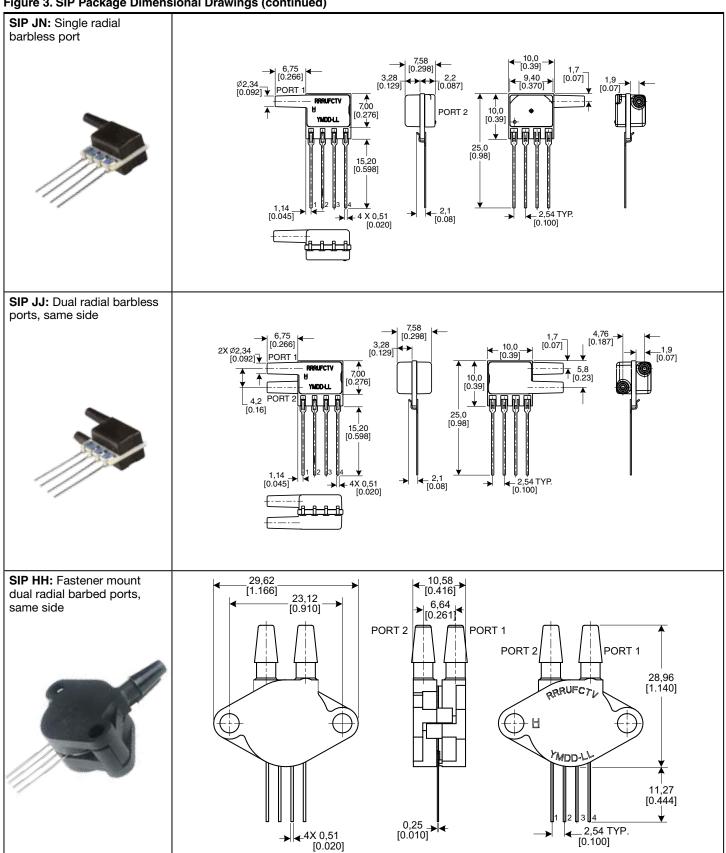


Figure 3. SIP Package Dimensional Drawings (continued)



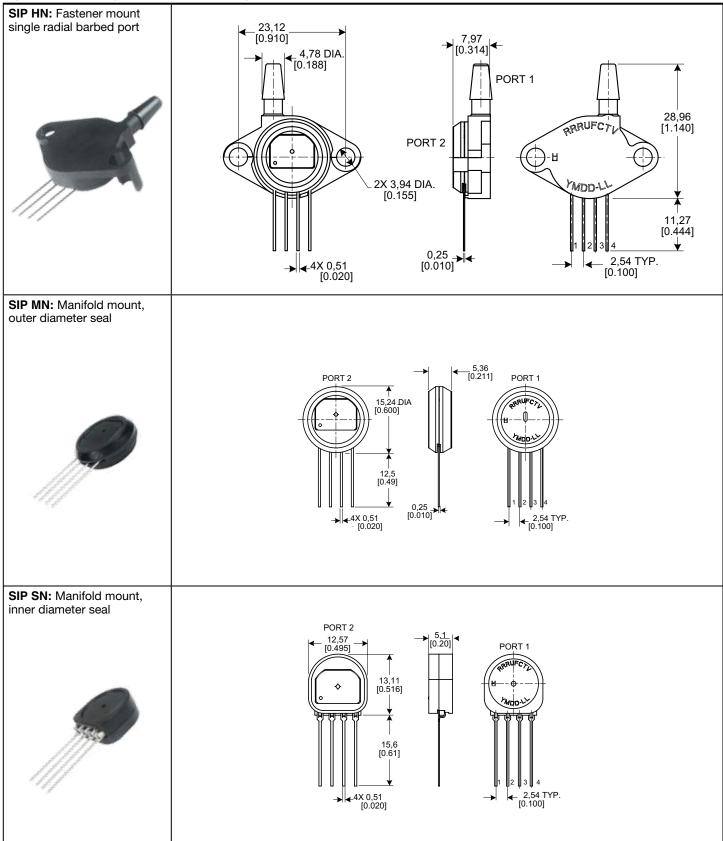
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Figure 3. SIP Package Dimensional Drawings (continued)



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Figure 3. SIP Package Dimensional Drawings (continued)



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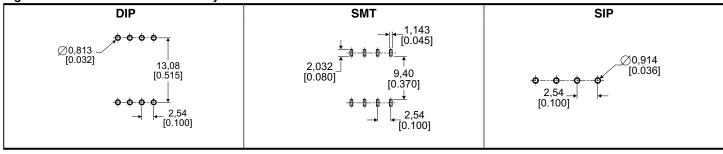
Table 6. Pinouts for DIP and SMT Packages

Output Type	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8
I ² C	GND	Vsupply	SDA	SCL	NC	NC	NC	NC
SPI	GND	Vsupply	MISO	SCLK	SS	NC	NC	NC
Analog	NC	Vsupply	Vout	GND	NC	NC	NC	NC

Table 7. Pinouts for SIP Packages

Output Type	Pin 1	Pin 2	Pin 3	Pin 4
l ² C	GND	Vsupply	SDA	SCL
Analog	NC	Vsupply	Vout	GND

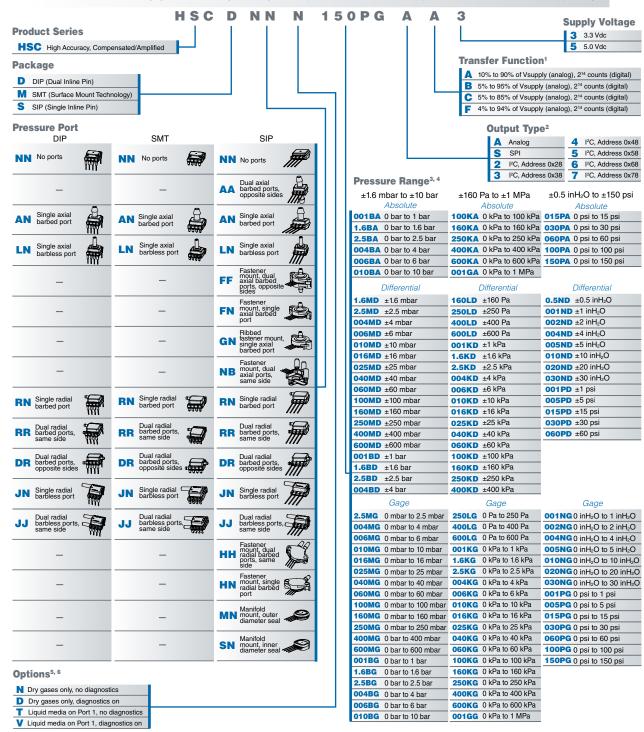
Figure 4. Recommended PCB Pad Layouts



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Figure 5. HSC Series Nomenclature and Order Guide

For example, HSCDNNN150PGAA3 defines an HSC Series TruStability® Pressure Sensor, DIP package, NN pressure port, no special options, 150 psi gage pressure range, analog output type, 10% to 90% of Vsupply transfer function, 3.3 Vdc supply voltage.



¹The 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 the product datasheet, Figure 2. For other available transfer functions contact Honeywell Customer Service. ²SPI output function is not available in SIP package.

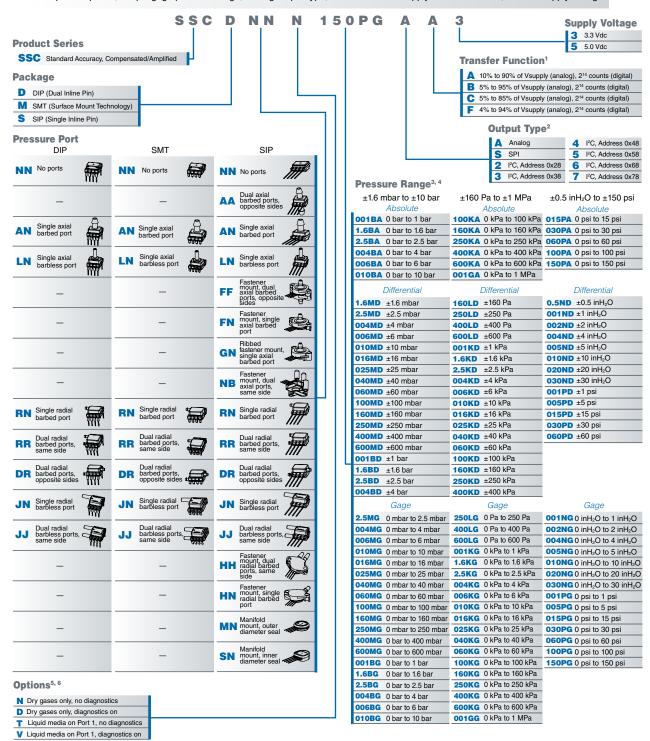
³Custom pressure ranges are available. Contact Honeywell Customer Service for more information.

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

Options T and V are only available on pressure ranges +60 mbar to +10 bar | +6 kPa to +1 MPa | +1 psi to +150 psi.

Figure 6. SSC Series Nomenclature and Order Guide

For example, SSCDNNN150PGAA3 defines an SSC Series TruStability® Pressure Sensor, DIP package, NN pressure port, no special options,150 psi gage pressure range, analog output type, 10% to 90% of Vsupply transfer function, 3.3 Vdc supply voltage.



¹The 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 the product datasheet, Flgure 2. For other available transfer functions contact Honeywell Customer Service ²SPI output function is not avilable in SIP package.

Custom pressure ranges are available. Contact Honeywell Customer Service for more information See the explanation of sensor pressure types in the product datasheet, Table 4.

⁵See the CAUTION in this document.

⁶Options T and V are only available on pressure ranges ±60 mbar to ±10 bar I ±6 kPa to ±1 MPa I ±1 psi to ±150 psi.

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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

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Honeywell's standard product warranty applies unless agreed to otherwise by Honeywell in writing; please refer to your order acknowledgement 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 it finds defective. The foregoing is buyer's sole remedy and is in lieu of all 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 we provide application assistance personally, through our literature and the Honeywell web site, it is up to the customer to determine the suitability of the product in the application.

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E-mail: info.sc@honeywell.com Internet: sensing.honeywell.com

Phone and Fax:

Asia Pacific +65 6355-2828

+65 6445-3033 Fax

Europe +44 (0) 1698 481481

+44 (0) 1698 481676 Fax

Latin America +1-305-805-8188

+1-305-883-8257 Fax

USA/Canada +1-800-537-6945

+1-815-235-6545 Fax

+1-815-235-6847



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