Honeywell

TruStability® Silicon Pressure Sensors: SSC Series-Standard Accuracy

±2% Total Error Band, Amplified Compensated Analog Output, 1 psi to 150 psi (60 mbar to 10 bar)



DESCRIPTION

The TruStability® Standard Accuracy Silicon Ceramic (SSC) Series is a piezoresistive silicon pressure sensor offering a ratiometric analog output for reading pressure over the specified full scale pressure span and temperature range.

The SSC Series is fully calibrated and temperature compensated for sensor offset, sensitivity, temperature effects, and non-linearity using an on-board Application Specific Integrated Circuit (ASIC). Calibrated output values for pressure are updated at approximately 1 kHz.

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 sensor is characterized for operation from a single power supply of either 3.3 Vdc or 5.0 Vdc.

These sensors measure absolute, differential, and gage pressures. The absolute versions have an internal vacuum reference and an output value proportional to absolute pressure. Differential versions allow application of pressure to either side of the sensing diaphragm. Gage versions are referenced to atmospheric pressure and provide an output proportional to pressure variations from atmosphere.

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.

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

FEATURES

- Industry-leading long-term stability
- Extremely tight accuracy of ±0.25% FSS BFSL (Full Scale Span Best Fit Straight Line)
- Total error band of ±2% full scale span maximum
- Modular and flexible design offers customers a variety of package styles and options, all with the same industryleading performance specifications
- Miniature 10 mm x 10 mm [0.39 in x 0.39 in] package
- Low operating voltage
- Extremely low power consumption
- Ratiometric analog output
- High resolution (min. 0.03 %FSS)

- Precision ASIC conditioning and temperature compensated over -20 °C to 85 °C [-4 °F to 185 °F] temperature range
- RoHS compliant
- · Virtually insensitive to mounting orientation
- Internal diagnostic functions increase system reliability
- Also available with I²C or SPI digital output
- Absolute, differential and gage types
- Pressure ranges from 1 psi to 150 psi (60 mbar to 10 bar)
- Custom calibration available
- Various pressure port options
- Liquid media option

POTENTIAL APPLICATIONS

Medical:

- Airflow monitors
- Anesthesia machines
- Blood analysis machines
- Gas chromatography
- Gas flow instrumentation
- Kidney dialysis machines
- Oxygen concentrators
- Pneumatic controls
- Respiratory machines
- Sleep apnea equipment
- Ventilators

• Industrial:

- Barometry
- Flow calibrators
- Gas chromatography
- Gas flow instrumentation
- HVAC
- Life sciences
- Pneumatic controls

Table 1. Absolute Maximum Ratings¹

Parameter	Min.	Max.	Unit
Supply voltage (V _{supply})	-0.3	6.0	Vdc
Voltage on any pin	-0.3	V _{supply} + 0.3	V
ESD susceptibility (human body model)	3	-	kV
Storage temperature	-40 [-40]	85 [185]	°C [°F]
Soldering time and temperature:			

Lead solder (SIP, DIP)

Peak reflow (SMT)

4 s max. at 250 °C [482 °F]

15 s max. at 250 °C [482 °F]

Table 2. Operating Specifications

Parameter	Min.	Тур.	Max.	Unit
Supply voltage (V _{supply}) ² :				
3.3 Vdc	3.0	3.3 ³	3.6	Vdc
5.0 Vdc	4.75	5.0 ³	5.25	Vuc
Sensors are either 3.3 Vdc or 5.0 Vdc based on listing selected.				
Supply current:				
3.3 Vdc supply	-	1.6	2.1	mA
5.0 Vdc supply	-	2	3	
Compensated temperature range ⁴	-20 [-4]	-	85 [185]	°C [°F]
Operating temperature range⁵	-40 [-40]	-	85 [185]	°C [°F]
Startup time (power up to data ready)	-	-	5	ms
Response time	-	1	-	ms
Upper output clipping limit	-	-	97.5	%V _{supply}
Lower output clipping limit	2.5	-	-	%V _{supply}
Accuracy ⁶	-	-	±0.25	%FSS BFSL
Total error band ⁷	-	-	±2	%FSS ⁸
Output resolution	0.03	-	-	%FSS ⁸

Table 3. Environmental Specifications

Parameter	Characteristic
Humidity:	
Dry gases only (See "Options N and D" in Figure 1.)	0% to 95% RH, non-condensing
Liquid media (See "Options T and V" in Figure 1.)	100% condensing or direct liquid media on Port 1
Vibration	MIL-STD-202F, Curve AK (20.7 g random)
Shock	MIL-STD-202F, Method 213B, Condition F
Life ⁹	1 million cycles minimum
Solder reflow	J-STD-020-C

Table 4. Wetted Materials¹⁰

Parameter	Port 1 (Pressure Port)	Port 2 (Reference Port)
Covers	high temperature polyamide	high temperature polyamide
Substrate	alumina ceramic	alumina ceramic
Adhesives	epoxy, silicone	epoxy, silicone
Electronic components	ceramic, glass, solder, silicon	silicon, glass, gold, solder

Notes:

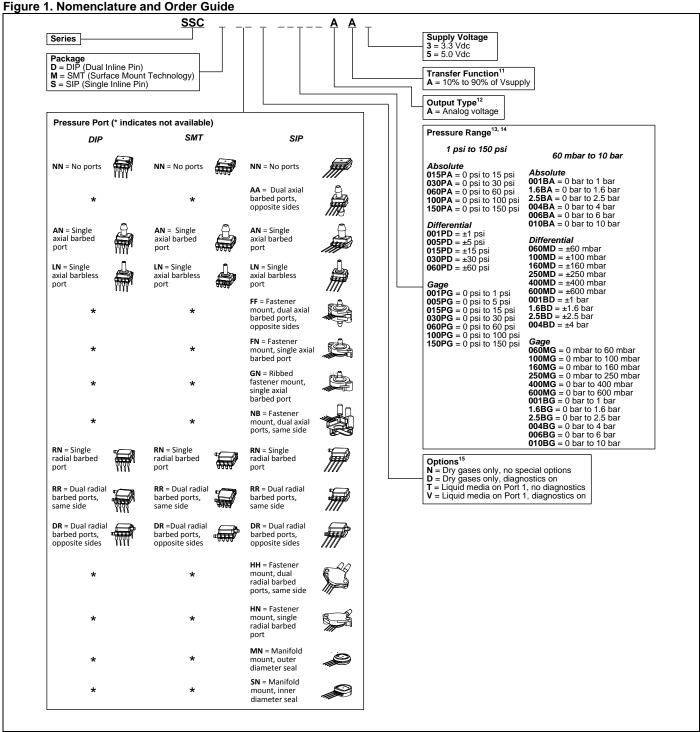
- Absolute maximum ratings are the extreme limits the device will withstand without damage.
- 2. Ratiometricity of the sensor (the ability of the device to scale to the supply voltage) is achieved within the specified operating voltage for each option.
- 3. The sensor is not reverse polarity protected. Incorrect application of supply voltage or ground to the wrong pin may cause electrical failure.
- 4. The compensated temperature range is the temperature range over which the sensor will produce an output proportional to pressure within the specified performance limits.
- 5. The operating temperature range is the temperature range over which the sensor will produce an output proportional to pressure but may not remain within the specified performance limits.
- 6. Accuracy: 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.
- 7. 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.
- 8. Full Scale Span (FSS) is the algebraic difference between the output signal measured at the maximum (Pmax.) and minimum (Pmin.) limits of the pressure range. (See Figure 1 for ranges.)
- 9. Life may vary depending on specific application in which sensor is utilized.
- 10. Contact Honeywell Customer Service for detailed material information.

CAUTION

PRODUCT DAMAGE

- 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. Non-compatible liquid media will degrade sensor performance and
 may lead to sensor failure.

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



Notes:

- 11. 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 Figure 2 for a graphical representation of the transfer function. Other transfer functions are available. Contact Honeywell Customer Service for more information.
- 12. Digital outputs (SPI or I²C) are also available. Contact Honeywell Customer Service for more information.
- 13. Custom pressure ranges are available. Contact Honeywell Customer Service for more information.
- 14. See Table 5 for an explanation of sensor pressure types.
- 15. See CAUTION on previous page.



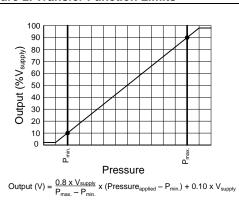


Figure 3. Completed Catalog Listing Example



SSCSANN100PGAA3

SIP package, AN pressure port, no diagnostics, 100 psi gage, analog output, 10% to 90% calibration at 3.3 Vdc.

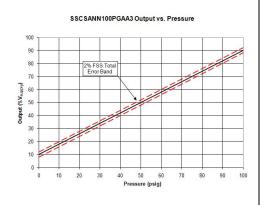


Table 5. Pressure Types

Pressure Type	Description
Absolute	Output is proportional to the difference between applied pressure and a built-in reference to vacuum.
Absolute	P _{min.} is set at absolute zero pressure (full vacuum).
Differential	Output is proportional to the difference between the pressures applied to each port. (Port 1 – Port 2)
Dilleterillai	50% point of transfer function set at Port 1 = Port 2.
Cogo	Output is proportional to the difference between applied pressure and atmospheric (ambient)
Gage	pressure. Pmin. is set at atmospheric pressure.

Table 6. Pressure Range Specifications for 1 psi to 150 psi

	Pressur	e Range	Over-	Burst	Common Mode	Long-term Stability (1000 hr, 25 °C [77 °F])	
Order Code	P _{min} .	P _{max} .	pressure ¹⁶	Pressure ¹⁷	Pressure ¹⁸		
			Absolute				
015PA	0 psi	15 psi	30 psi	60 psi	NA	±0.25% FSS	
030PA	0 psi	30 psi	60 psi	120 psi	NA	±0.25% FSS	
060PA	0 psi	60 psi	120 psi	240 psi	NA	±0.25% FSS	
100PA	0 psi	100 psi	250 psi	250 psi	NA	±0.25% FSS	
150PA	0 psi	150 psi	250 psi	250 psi	NA	±0.25% FSS	
			Differential				
001PD	-1 psi	1 psi	10 psi	10 psi	150 psi	±0.35% FSS	
005PD	-5 psi	5 psi	30 psi	40 psi	150 psi	±0.35% FSS	
015PD	-15 psi	15 psi	30 psi	60 psi	150 psi	±0.25% FSS	
030PD	-30 psi	30 psi	60 psi	120 psi	150 psi	±0.25% FSS	
060PD	-60 psi	60 psi	120 psi	240 psi	250 psi	±0.25% FSS	
			Gage				
001PG	0 psi	1 psi	10 psi	10 psi	150 psi	±0.35% FSS	
005PG	0 psi	5 psi	30 psi	40 psi	150 psi	±0.35% FSS	
015PG	0 psi	15 psi	30 psi	60 psi	150 psi	±0.25% FSS	
030PG	0 psi	30 psi	60 psi	120 psi	150 psi	±0.25% FSS	
060PG	0 psi	60 psi	120 psi	240 psi	250 psi	±0.25% FSS	
100PG	0 psi	100 psi	250 psi	250 psi	250 psi	±0.25% FSS	
150PG	0 psi	150 psi	250 psi	250 psi	250 psi	±0.25% FSS	

Table 7. Pressure Range Specifications for 60 mbar to 10 bar

	Pressur	e Range	Over-	Over- Burst Common Mo	Common Mode	Long-term Stability	
Order Code	P _{min.} P _{max.} pressure ¹⁶ Pressure ¹⁷			Pressure ¹⁸	(1000 hr, 25 °C [77 °F])		
			Absolute				
001BA	0 bar	1 bar	2 bar	4 bar	NA	±0.25% FSS	
1.6BA	0 bar	1.6 bar	4 bar	8 bar	NA	±0.25% FSS	
2.5BA	0 bar	2.5 bar	6 bar	8 bar	NA	±0.25% FSS	
004BA	0 bar	4 bar	8 bar	16 bar	NA	±0.25% FSS	
006BA	0 bar	6 bar	17 bar	17 bar	NA	±0.25% FSS	
010BA	0 bar	10 bar	17 bar	17 bar	NA	±0.25% FSS	
			Differential				
060MD	-60 mbar	60 mbar	500 mbar	700 mbar	10 bar	±0.35% FSS	
100MD	-100 mbar	100 mbar	500 mbar	700 mbar	10 bar	±0.35% FSS	
160MD	-160 mbar	160 mbar	500 mbar	700 mbar	10 bar	±0.35% FSS	
250MD	-250 mbar	250 mbar	1.4 bar	2.5 bar	10 bar	±0.35% FSS	
400MD	-400 mbar	400 mbar	1.4 bar	2.5 bar	10 bar	±0.35% FSS	
600MD	-600 mbar	600 mbar	2 bar	4 bar	10 bar	±0.25% FSS	
001BD	-1 bar	1 bar	2 bar	4 bar	10 bar	±0.25% FSS	
1.6BD	-1.6 bar	1.6 bar	4 bar	8 bar	10 bar	±0.25% FSS	
2.5BD	-2.5 bar	2.5 bar	6 bar	8 bar	10 bar	±0.25% FSS	
004BD	-4 bar	4 bar	8 bar	16 bar	10 bar	±0.25% FSS	
			Gage		•		
060MG	0 mbar	60 mbar	500 mbar	700 mbar	3.5 bar	±0.35% FSS	
100MG	0 mbar	100 mbar	500 mbar	700 mbar	10 bar	±0.35% FSS	
160MG	0 mbar	160 mbar	500 mbar	700 mbar	10 bar	±0.35% FSS	
250MG	0 mbar	250 mbar	1.4 bar	2.5 bar	10 bar	±0.35% FSS	
400MG	0 mbar	400 mbar	1.4 bar	2.5 bar	10 bar	±0.35% FSS	
600MG	0 mbar	600 mbar	2 bar	4 bar	10 bar	±0.35% FSS	
001BG	0 bar	1 bar	2 bar	4 bar	10 bar	±0.25% FSS	
1.6BG	0 bar	1.6 bar	4 bar	8 bar	10 bar	±0.25% FSS	
2.5BG	0 bar	2.5 bar	6 bar	8 bar	10 bar	±0.25% FSS	
004BG	0 bar	4 bar	8 bar	16 bar	16 bar	±0.25% FSS	
006BG	0 bar	6 bar	17 bar	17 bar	17 bar	±0.25% FSS	
010BG	0 bar	10 bar	17 bar	17 bar	17 bar	±0.25% FSS	
Notes:					1		

Notes:

Table 8. Pinout for DIP and SMT Packages

Output Type	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8
analog	NC	Vsupply	OUTPUT+	GND	NC	NC	NC	NC

Table 9. Pinout for SIP Package

Output Type	Pin 1	Pin 2	Pin 3	Pin 4
analog	NC	Vsupply	OUTPUT+	GND

^{16.} 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.

^{17.} 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.

^{18.} 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.

