SIGNAL-CONDITIONED ULTRA-LOW PRESSURE SENSOR

PRESSURE SENSORS

Product Number: SM5852-015W

HIGHLIGHTS

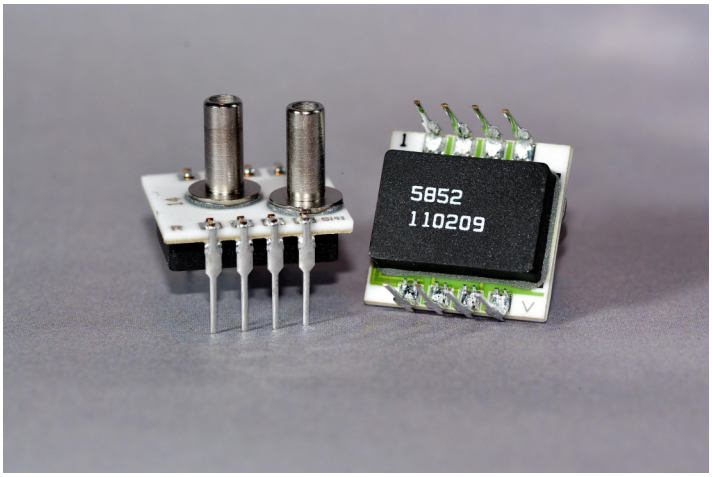
- Pressure Calibrated, and Temperature Compensated Outputs
- Both Amplified Analog and I2C Digital Interface
- Dual Axial Tubes for Differential and Gauge Applications
- Rugged and Highly Stable Ceramic Dual In-line Package (DIP)
- Unique Ultra Low Pressure Die Enables Full Scale (FS) Pressure Range of 0.05 PSI (1.5 inH2O)

TYPICAL APPLICATIONS

- Medical Respiratory
- Heating, Ventilation, and Air Conditioning (HVAC)
- Gas Flow
- Liquid Level Measurement
- Pneumatic Control
- Spray Dispensers

TECHNICAL FEATURES

- Amplified, Calibrated, Fully Signal-conditioned FS Output Span of 4.0 VDC
- Multi-Order Correction for Pressure Non-Linearity and Temperature Coefficient of Span and Offset
- Ratiometric Output with Supply Voltage
- Gauge Measurements with Single-ended Configuration
- Compensated Temperature Range from 10 to 60^{O}C
- RoHS & REACH Compliant



DESCRIPTION

The Silicon Microstructures SM5852 Series of OEM pressure sensors combines state-of-the-art pressure sensor technology with CMOS mixed signal processing technology to produce an amplified, fully conditioned, multi-order pressure and temperature compensated sensor in a dual in-line package (DIP) configuration.

Combining the pressure sensor with a custom signal conditioning ASIC in a single package simplifies the use of advanced silicon micromachined pressure sensors. The pressure sensor can be mounted directly to a standard printed circuit board and an amplified, high-level, calibrated pressure signal can be acquired from the digital interface or analog output. This eliminates the need for additional circuitry, such as a compensation network or micro-controller containing a custom correction algorithm.

The SM5852 Series pressure sensors are based on SMI's highly stable, piezoresistive pressure sensor chips mounted on a ceramic substrate.

The model SM5852-015W is designed for operating pressure ranges of 0-0.05 PSI (0-1.5 inH_2O).

TÜV MANAGEMENT SERVICE ISO / TS 16949

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ABSOLUTE MAXIMUM RATING TABLE FOR SM5852

All parameters are specifed at VSUPPLY = 5.00 V DC supply at room temperature, unless otherwise noted.

No.	Characteristic	Symbol	Minimum	Typical	Maximum	Units
1	Excitation Voltage[a, b]	V_{SUPPLY}	4.75	5.00	5.25	V
2	Current Consumption[c]	I_{SUPPLY}		7	10	mA
3	Proof Pressure[d]	p_{PROOF}	10x			p_{RANGE}
4	Burst Pressure[d]	p_{BURST}	15x			p_{RANGE}
5	Operating Temperature[e]	T_{OP}	-10		+80	°C
6	Storage Temperature[e]	T_{STG}	-40		+150	°C
7	Media Compatibility[e, f]					

OPERATING CHARACTERISTICS FOR SM5852 - SPECIFICATIONS

All parameters are specifed at VSUPPLY = 5.00 V DC supply at room temperature, unless otherwise noted.

Gauge & Single-ended[h] Pressure Sensors

No.	Characteristic	Symbol	Minimum	Typical	Maximum	Units
8	Span (FS p_{RANGE})[a, b, d, h]	V_{SPAN}	3.92	4.00	4.08	V
9	Zero Offset[i, j]	V_{ZERO}	0.42	0.50	0.58	V
10	Total Accuracy[e,k]	ACC_{RSS}			1.5	%FS
11	Pressure Response Time[e, l]	t_{RESP}		2		ms
12	Warm-up Deviation[e, m]	ACC_{WUD}		0.4		%FS
13	Linearity[n]	NL	-1.0		1.0	%FS
14	Compensated Temp. Range	T_{COMP}	10		60	°C

Differential[b] Pressure Sensors

No.	Characteristic	Symbol	Minimum	Typical	Maximum	Units
15	Span (FS p_{RANGE})[a, b, d, h]	V_{SPAN}	1.96	2.00	2.04	V
16	Zero Offset[i, j]	V_{ZERO}	2.44	2.50	2.56	V
17	Total Accuracy[e, k, o]	ACC_{RSS}			1.5	%FS
18	Pressure Response Time[e, l]	t_{RESP}		2		ms
19	Warm-up Deviation[e, m]	ACC_{WUD}		0.4		%FS
20	Linearity[n]	NL	-1.0		1.0	%FS
21	Compensated Temp. Range	T_{COMP}	10		60	°C

Digital Interface Information

For digital interface guidelines and recommendations, please refer to Application Note: AN01 – 10.

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NOTES:

(a) Specified parameter values will not be met when supply voltage is not 5.00 V.

(b) A 100 nF filter capacitor (capacitor type: X7R or X2Y) must be placed between VDD and GND in a maximum distance of 5 mm. See wiring diagram for optimal signal conditioning of the pressure device.

(c) Operating values for the current consumption. The current draw may be higher upon power-up of the device.

(d) The output voltage value will saturate at about 4.75 V for applied pressure above the rated full-scale.

(e) Tested on a sample basis.

(f) Clean, dry gas compatible with wetted materials. Wetted materials include Pyrex glass, silicon, alumina ceramic, epoxy, RTV, gold, aluminum, and nickel.

(g) Single-ended parts (pressure type - S) have 2 ports and are for higher gain differential applications, where the differential pressure is always positive.

(h) Full-scale (FS) is defined as zero pressure to rated pressure; differential parts can be used ±FS. Gauge zero output is 0.5 V, typical, and full-scale output is typically 4.5 V. Span is the difference between full-scale output and zero output, (typical 4 V). For differential parts, the negative full-scale is typically at 0.5 V, zero is typically 2.5 V, and positive (topside) full-scale is 4.5 volts, typical, to give a span of ±2.0 V, typical.

(i) Due to the sensitivity of the SM5852 series, external mechanical stresses and mounting position can affect the zero pressure output reading.

(j) The output offset voltage value will saturate at about 0.25 V for applied pressure below the pressure-type related minimum pressure value.

(k) For compensated parts the calibration accuracy is defined as the largest deviation of the actual sensor output (at any given temperature or pressure) from an ideally, linear and temperature-independent behaving sensor. The given value applies to the compensated temperature range.

(l) The pressure response time is the amount of time, which the ASIC needs to update the pressure values within the internal registers.

(m) The warm-up deviation is the deviation from the total accuracy (l) of the output values upon each biasing of the device at supply voltage over a period of the first 60 seconds.

(n) The non-linearity calculation uses the “best-fit-straight-line” (BFSL) approach.

(o) Total accuracy is calculated as percentage of total output.

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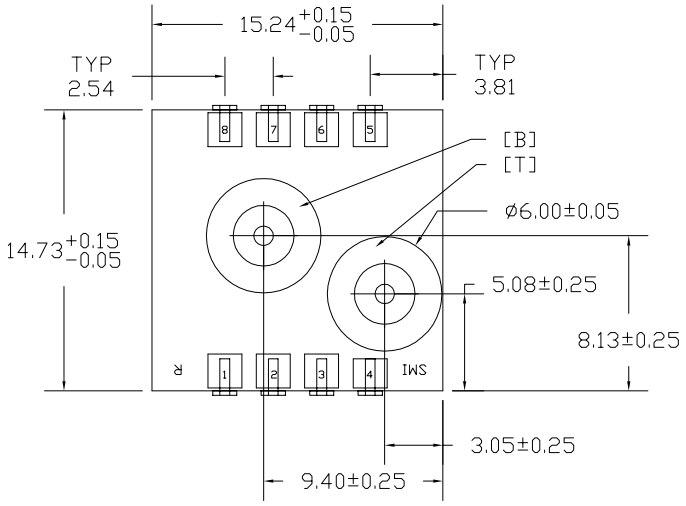
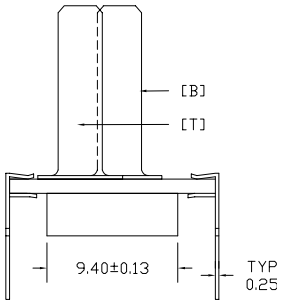
Product Number: SM5852-015W

Package Dimensions & Pin-Out



Top View

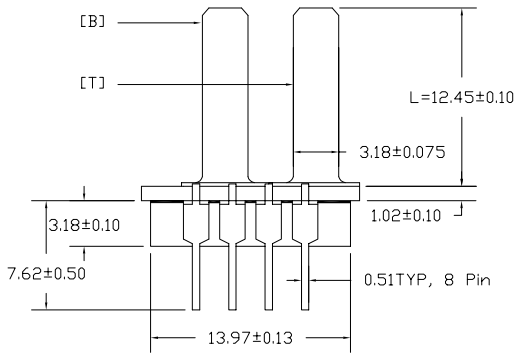


PIN	DESCRIPTION
1	NC
2	GND
3	NC
4	SDA
5	SCL
6	NC
7	VDD
8	ANALOG OUT

All dimensions are shown in millimeters

NOTES:

- Do not connect to NC pins.
- External connections to NC pins will cause part malfunction.
- Tolerance on all dimensions ±0.13 mm unless otherwise specified.
- [B] is tube connected to bottom side of sensor die.
- [T] is tube connected to top side of sensor die.
- Tube [T] is used for positive differential pressure.



Side View

Pin Configuration
* Pins opposite direction of tube

Tube Length
L: Long (12.45 mm ± 0.10 mm)

Pressure Type
D: Differential (2 Tubes)

Ordering information

Order Code	Pressure Type	Full-Scale Pressure Range	Tube Length
5852-015W-D-3-LR	Differential	0.05 PSI / 1.5 inH_2O	Long

For samples, please contact sales@si-micro.com

QUALIFICATION STANDARDS

→ For qualification specifications, please contact Sales at sales@si-micro.com

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Wiring Diagrams

VDD The optimum operation value for the power supply is 5.00 V.

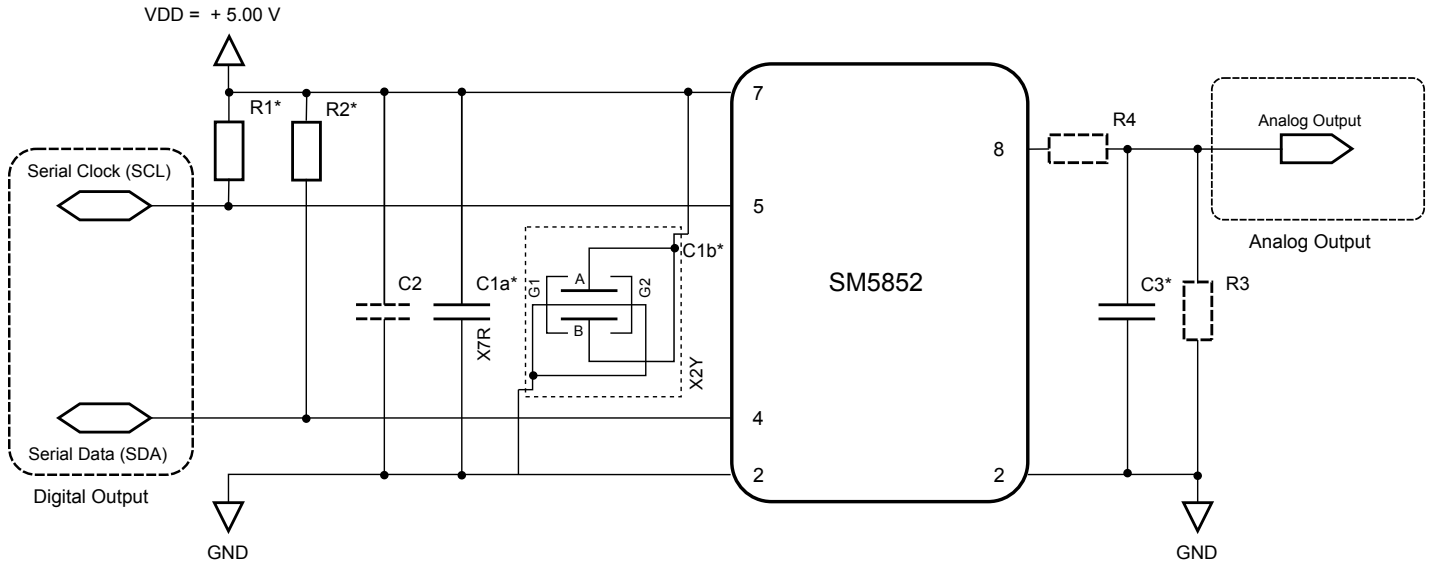
R1/R2 Pull-up resistors for the digital data lines. Recommended resistor values are 10 to 100 kOhm.

C1a/C1b Buffer capacitor. For best performance of the sensor output signals it is obligatory to use a 100 nF buffer capacitor between the supply pins VDD and GND of the sensor device. SMI recommends high quality capacitors, such as X7R or X2Y. The maximum distance between the package supply pins and this capacitor should be no more than 5 mm. Usually this buffer capacitor is sufficient, but in connection with a poor power supply and to reduce power consumption a reload capacitor (C2) of min. 1 µF is advised. In this case, SMI recommends using ceramic capacitors of 47 µF.

C3 Capacitive load of the analog output. The capacitive load should be between 15 nF to 33 nF (recommended: 22 nF) with a resistor (optional: R3) of min. 3 kOhm. For a chosen lower capacitive load of 1 nF to 15 nF the resistor value should be at least 6.8 kOhm.

R4 Optional resistor for low-pass filtering (in lieu of R3) of the analog output. The recommended resistor value is: 4.7 kOhm

* Obligatory components for best performance of pressure sensor device.



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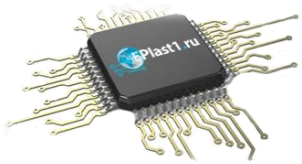

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