

COMPENSATED AND CALIBRATED LOW PRESSURE SENSOR



**SILICON
MICROSTRUCTURES**
INCORPORATED
Member of the ELMOS Group

Product Number: SM5651

HIGHLIGHTS

- Low pressures for sensitive applications
- Constant current driven
- Dual inline package (DIP)
- Fully temperature compensated and calibrated
- Primary pressure port on back-side of sensor die, protecting front-side of sensor
- Span calibration using integrated resistor and external op-amps

TYPICAL APPLICATIONS

- Medical equipment
- Respiration
- HVAC
- Level detection
- Flow measurement
- Industrial control

TECHNICAL FEATURES

- 0.15, 0.3, 1.5 PSI / 1.0, 2.1, 10.3 kPa
- Easy-to-use dual inline package (DIP)
- Zero offset calibration
- High-performance, stable packaged silicon chip
- Wide 0-60°C compensated temperature range



DESCRIPTION

The SM5600 Series of OEM pressure sensors are laser trimmed, temperature-compensated, low-pressure sensors in dual in-line packages for printed circuit board mounting. These sensors offer improved performance as well as the option for constant current excitation. With the ability to detect pressure ranges as low as 0.15 PSI full scale, the SM5651 is ideal for applications requiring extreme sensitivity, from respiration to air filter obstructions.

The SM5600 Series pressure sensors are constructed by attaching a highly stable piezoresistive pressure sensor chip to a ceramic substrate. Thick film resistors on the ceramic are laser trimmed during manufacturing to provide zero offset calibration, temperature compensation for zero offset, and temperature compensation for sensitivity. In the SM5651 an additional resistor is trimmed to normalize the output of an external differential amplifier to provide span calibration when the sensor is driven by a constant current supply.

Various pressure port configurations are available for flexibility in matching this product to specific applications.



Product Number: SM5651

ABSOLUTE MAXIMUM RATING TABLE FOR SM5651

All parameters are specified with excitation current = 1.5mA at room temperature, unless otherwise noted.

| No. | Characteristic | Symbol | Minimum | Typical | Maximum | Units |
|-----|--|--------------|---------|---------|---------|-------------|
| 1 | Excitation Current | I_{SUPPLY} | 0 | 1.5 | 3.0 | mA |
| 2 | Proof Pressure ^(d) | P_{PROOF} | 10x | | | P_{RANGE} |
| 3 | Burst Pressure ^(d) | P_{BURST} | 15x | | | P_{RANGE} |
| 4 | Operating Temperature ^(d) | T_{OP} | -40 | | +125 | °C |
| 5 | Storage Temperature ^(d) | T_{STG} | -40 | | +125 | °C |
| 6 | Media Compatibility ^{(d) (f)} | | | | | |

OPERATING CHARACTERISTICS FOR SM5651 - SPECIFICATIONS

All parameters are specified with excitation current = 1.5mA at room temperature, unless otherwise noted.

| No. | Characteristic | Symbol | Minimum | Typical | Maximum | Units |
|-----|---|-------------|---------|---------|---------|-------|
| 7 | Span (FS p_{RANGE}) ^{(a),(b)} | V_{SPAN} | 25.0 | 45.0 | 75.0 | mV |
| 8 | Zero Offset | V_{ZERO} | -2.0 | +0.2 | +2.0 | mV |
| 9 | Pressure Hysteresis ^(d) | H_{PZERO} | -0.30 | 0.05 | 0.30 | %FS |
| 10 | Resistance Input | R_B | 1.8 | 3.0 | 3.8 | kΩ |
| 11 | Resistance Output | $R_{B,OUT}$ | 2.7 | 3.3 | 3.8 | kΩ |
| 12 | Compensated Temp. Range ^(c) | T_{COMP} | 0 | | 60 | °C |

0.15 PSI / 1.0 kPa

| No. | Characteristic | Symbol | Minimum | Typical | Maximum | Units |
|-----|---|--------|---------|---------|---------|-------|
| 13 | Thermal Accuracy - Span ^(c) | TAS | -2.0 | 0.2 | 2.0 | %FS |
| 14 | Thermal Accuracy - Zero Offset ^(c) | TAZ | -2.0 | 0.2 | 2.0 | %FS |
| 15 | Temperature Hysteresis ^(d) | H_T | -0.65 | 0.05 | 0.65 | %FS |
| 16 | Linearity ^(d) | NL | -2.50 | 0.05 | 2.50 | %FS |
| 17 | Repeatability ^(d) | REP | -0.30 | 0.05 | 0.30 | %FS |
| 18 | Sensitivity Matching ^{(a),(b),(d),(e)} | S_M | -2.00 | -0.20 | 2.00 | %FS |

0.3 PSI / 2.1 kPa

| No. | Characteristic | Symbol | Minimum | Typical | Maximum | Units |
|-----|---|--------|---------|---------|---------|-------|
| 19 | Thermal Accuracy - Span ^(c) | TAS | -0.75 | 0.2 | 0.75 | %FS |
| 20 | Thermal Accuracy - Zero Offset ^(c) | TAZ | -1.0 | 0.2 | 1.0 | %FS |
| 21 | Temperature Hysteresis ^(d) | H_T | -0.45 | 0.05 | 0.45 | %FS |
| 22 | Linearity ^(d) | NL | -0.50 | 0.05 | 0.50 | %FS |
| 23 | Repeatability ^(d) | REP | -0.30 | 0.05 | 0.30 | %FS |
| 24 | Sensitivity Matching ^{(a),(b),(d),(e)} | S_M | -2.00 | -0.20 | 2.00 | %FS |

NOTES:

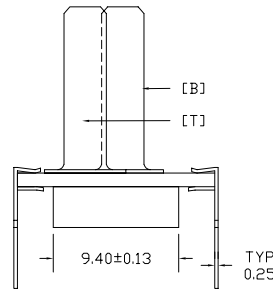
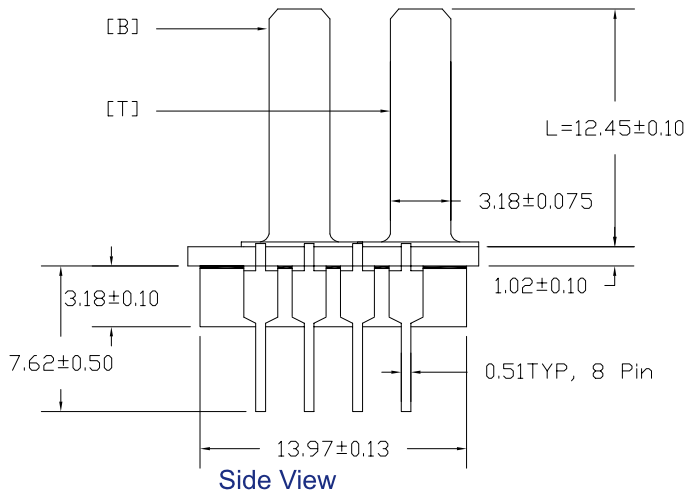
- (a) Positive Pressure is defined as entry on the bottom side of the die; gain, during factory calibration, is set using negative pressure.
- (b) Values given for top side.
- (c) Measured over a temperature range of 22°C to 58°C.
- (d) Tested on a sample basis.
- (e) Sensitivity Matching is measured by the part-to-part matching of span.
- (f) Clean, dry gas compatible with wetted materials. Wetted materials include Pyrex glass, silicon, alumina ceramic, epoxy, RTV, gold, aluminum, and nickel.

QUALIFICATION STANDARDS

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

Product Number: SM5651

Package Dimensions & Pin-Out



| PIN | DESCRIPTION |
|-----|------------------|
| 1 | Sig- |
| 2 | lexc- |
| 3 | Sig+ |
| 4 | lexc+ |
| 5 | Gainset Resistor |
| 6 | Gainset Resistor |
| 7 | NC |
| 8 | NC |

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 [B] is used for positive differential pressure.

Pin Configuration

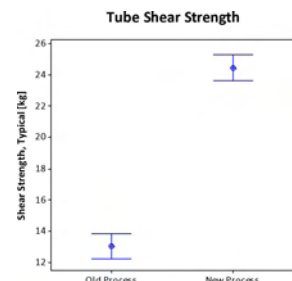
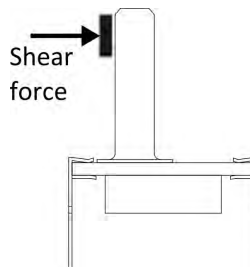
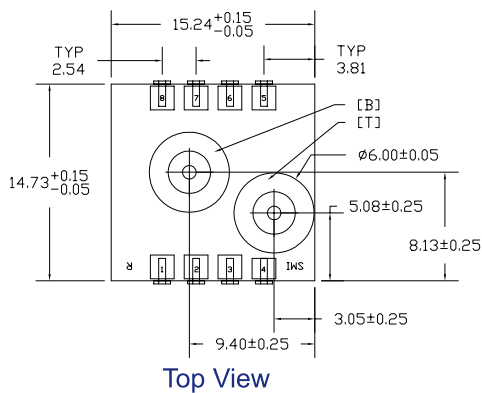
- Pins opposite direction of tube

Tube Length

- L: Long (12.45 mm \pm 0.10 mm)
- S: Short (8.25 mm \pm 0.10 mm)

Pressure Type

- D: Differential (2 Tubes)



Ordering information

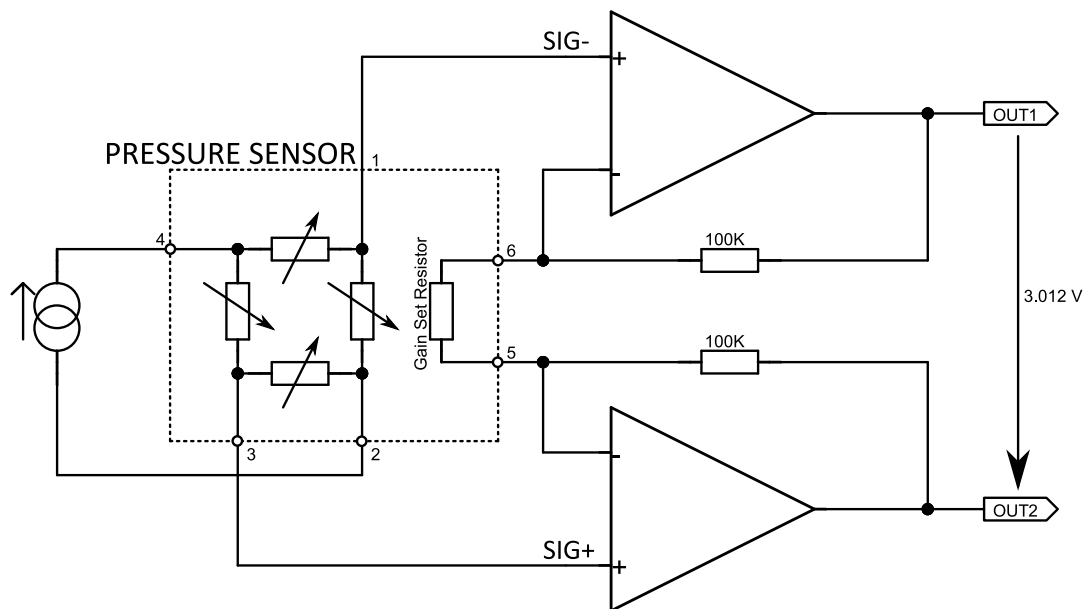
| Order Code | Pressure Type | Full-Scale Pressure Range | Tube Length |
|-----------------|---------------|---------------------------|-------------|
| 5651-001-D-3-LR | Differential | 0.15 PSI / 1.0 kPa | Long |
| 5651-001-D-3-SR | Differential | 0.15 PSI / 1.0 kPa | Short |
| 5651-003-D-3-SR | Differential | 0.3 PSI / 2.1 kPa | Short |
| 5651-015-D-3-SR | Differential | 1.5 PSI / 10.3 kPa | Short |

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

Product Number: SM5651

Wiring Diagrams

Typical Circuit Configuration for SM5651



Product Number: SM5651

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