

April 1997-4

DESCRIPTION

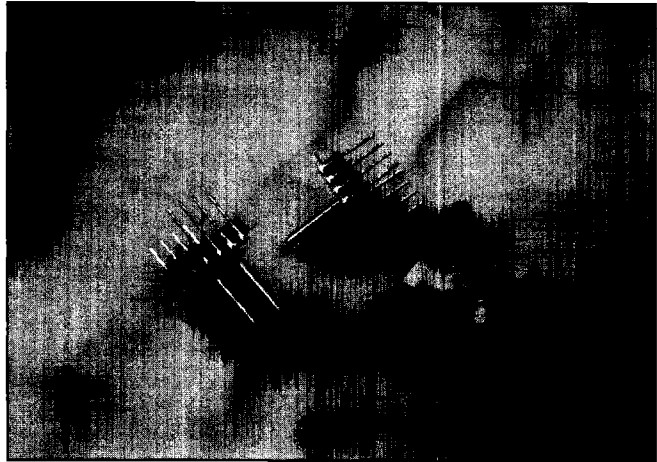
The SM-5600 Series of OEM pressure sensors are fully calibrated, temperature compensated pressure sensors in dual in-line packages for printed circuit board mounting. These sensors offer improved performance as well as the option for either constant current or constant voltage excitation. Ultra-low pressure ranges are also available, resulting in the broadest selection of standard pressure ranges in the industry.

The SM-5600 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 Models SM-5611 and SM-5651, 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. In the Models SM-5612 and SM-5652, a constant voltage supply can be used and the normalized output span of each sensor can then be easily amplified.

The Models SM-5611 and SM-5651 are designed for constant current excitation.

The Models SM-5612 and SM-5652 are designed for constant voltage excitation.

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



FEATURES

- Constant Voltage and Constant Current Versions
- Easy to Use Dual-in-line Package (DIP)
- Wide 0-60°C Compensated Temperature Range
- Span Calibration to $\pm 1\%$ for Standard Pressure; $\pm 2\%$ for Low Pressure
- Zero Offset Calibration
- Low Cost
- High Performance, Stable, Silicon Chip and Package
- Gage, Differential and Absolute Pressure Configurations
- 0.15, 0.3, 0.8, 1.5, 3, 5, 15, 30, 60, 100 psi Ranges Available

APPLICATIONS

- Medical Instrumentation
- Respirators
- Air Flow Monitoring
- Process Control
- Leak Detection
- Pneumatic Controls
- Altimeters

EXAR S013*

SM-5611/5651

SM-5612/5652



CHARACTERISTICS

Supply Current = 1.5 mA and T = 25°C, unless otherwise specified.

Parameter	SM-5611			SM-5612			Units
	0	1.5	3	0	1.5	3	
Excitation Current	0	1.5	3	0	1.5	3	V
Full Scale Output Span ¹	75	100	150	25	50	75	mV
Zero Pressure Output ²			2			2	±mV
Linearity ^{3,4}			0.1			0.3	±%FS
Pressure Hysteresis ⁴			0.1			0.3	±%FS
Input Resistance	2.5		6.0	2.5		6.0	kΩ
Output Resistance	2.5		6.0	2.5		6.0	kΩ
Temperature Coefficient – Span ^{2,4,5}			0.5			0.65	±%FS
Temperature Coefficient – Zero ^{2,4,5,6}			0.5			1.0	±%FS
Thermal Hysteresis – Zero ⁵		0.1			0.1		±%FS
Supply Current		1.5	2.0		1.5	2.0	mA
Response Time (10% to 90%) ⁷		1.0			1.0		msec
Sensitivity Matching ⁸			1.0			2.0	±%
Pressure Overload ⁹			3X			3X	Rated
Operating Temperature Range	-40		125	-40		125	°C
Compensated Temperature Range	0		60	0		60	°C
Storage Temperature Range	-55		150	-55		150	°C
Media ¹⁰							
Weight		3			3		grams

Notes

- Output span of unamplified sensor.
- Compensation resistors are an integral part of the sensor package; no additional external resistors are required. Pins 7 and 8 must be kept open. Models SM-5611 and SM-5651 are interchangeable only when used with a gain stage as shown in *Figure 1*.
- Best Fit Straight Line (BFSL) linearity. For the 0.3 psi range of the Model SM-5651, the linearity is ±0.5%FS. For the 0.15 psi range, the linearity is ±1.0%FS.
- FS denotes full scale output.
- Measured over compensated temperature range.
- For 0.15 psi range, TC-zero is ±2.5%FS.
- For a zero-to-full scale pressure step change.
- Sensitivity matching relates to the interchangeability of the span when used with the gain set resistor in the circuit shown in *Figure 1*. The specification applies to the accuracy of the thick film resistor where $GSR = \text{Gain Set Resistor } R_s = \text{Span} \cdot 200,000 / (3.012 \cdot \text{Span})$. For all ranges except 0.15 psi range of the Model SM-5651, the sensitivity matching is ±2.0%. For 0.15 psi range, the sensitivity matching is ±5.0%FS.
- For Model SM-5611: 3X or 225 psi, whichever is less. For Model SM-5651: 3X or 5 psi, whichever is greater.
- Clean, dry gasses, compatible with wetted materials. Wetted materials include Pyrex glass, silicon, alumina ceramic, epoxy, RTV, gold, aluminum, and nickel.

CHARACTERISTICS

Supply Voltage = 10.0 VDC and T = 25°C, unless otherwise specified.

Parameter	SM-5611			SM-5651			Units
	Min	Typ	Max	Min	Typ	Max	
Excitation Voltage	0	10	20	0	10	20	V
Full Scale Output Span ¹	39.5	40.0	40.5	24.5	25.0	25.5	mV
Zero Pressure Output ²			2			2	±mV
Linearity ^{3,4}			0.1			0.3	±%FS
Pressure Hysteresis ⁴			0.1			0.3	±%FS
Input Resistance	4		26	4		26	kΩ
Output Resistance	2.5		6.0	2.5		6.0	kΩ
Temperature Coefficient -- Span ^{2,4,5}			0.5			0.65	±%FS
Temperature Coefficient -- Zero ^{2,4,5,6}			0.5			1.0	±%FS
Thermal Hysteresis -- Zero ⁵		0.1			0.1		±%FS
Response Time (10% to 90%) ⁷		1.0			1.0		msec
Pressure Overload ⁸			3X			3X	Rated
Operating Temperature Range	-40		125	-40		125	°C
Compensated Temperature Range	0		60	0		60	°C
Storage Temperature Range	-55		150	-55		150	°C
Media ¹⁰							
Weight		3			3		grams

Notes

- ¹ Output span of unamplified sensor. For 0.15 psi range, span is 23.75mV (min) to 26.25mV (max).
- ² Compensation resistors are an integral part of the sensor package; no additional external resistors are required. Pins 5, 6, 7 and 8 must be kept open. Models SM-5612 and SM-5652 are interchangeable only when used with a gain stage as shown in *Figure 2*.
- ³ Best Fit Straight Line (BFSL) linearity. For the 0.3 psi range of the Model SM-5652, the linearity is ±0.5%FS. For the 0.15 psi range, the linearity is ±1.0%FS.
- ⁴ FS denotes full scale output.
- ⁵ Measured over compensated temperature range.
- ⁶ For 0.15 psi range, TC-zero is ±2.5%FS.
- ⁷ For a zero-to-full scale pressure step change.
- ⁸ For Model SM-5612: 3X or 225 psi, whichever is less. For Model SM-5652: 3X or 5 psi, whichever is greater.
- ⁹ For the Model SM-5612, the resistor value is 3.3kΩ and the amplifier output is 3.08V. For the Model SM-5652, the resistor value is 1.5kΩ and the amplifier output is 3.36V.
- ¹⁰ Clean, dry gasses, compatible with wetted materials. Wetted materials include Pyrex glass, silicon, alumina ceramic, epoxy, RTV, gold, aluminum, and nickel.

SM-5611/5651

SM-5612/5652

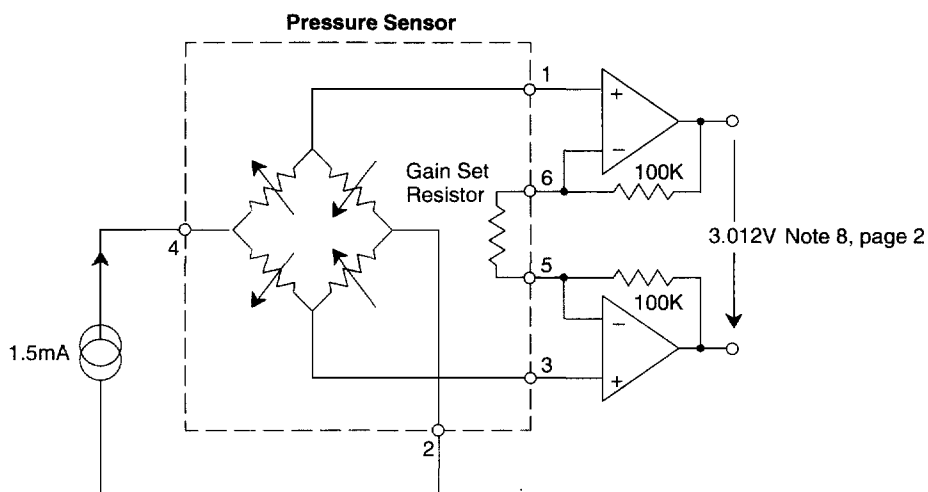


Figure 1. SM-5611 and SM-5651

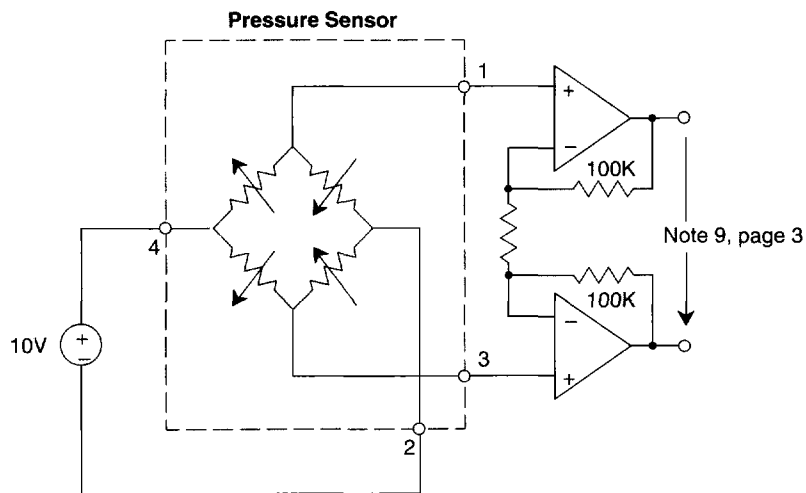
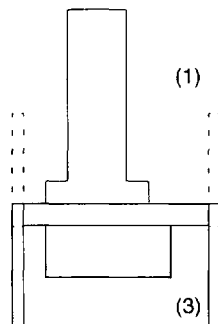
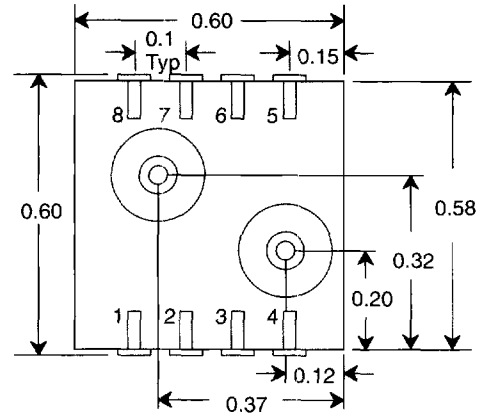
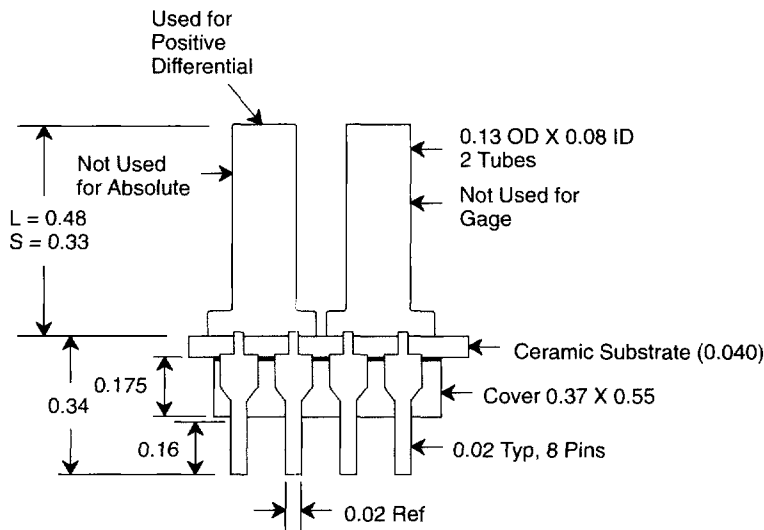


Figure 2. SM-5612 and SM-5652

CONNECTIONS/DIMENSIONS



(1), (3) Pin Configuration

Notes

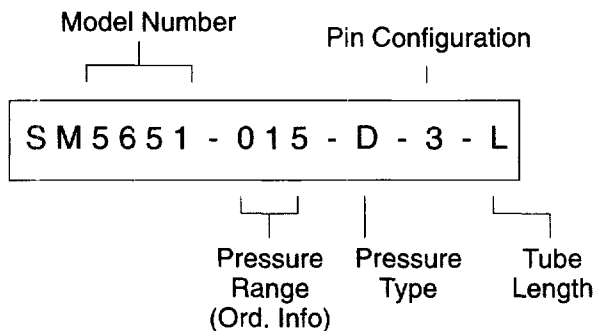
- 1) Soldering of lead pins: 250°C for 5 seconds maximum.
- 2) All dimensions are in inches.

SM-5611/5651

SM-5612/5652



ORDERING INFORMATION



Pin Configuration

- 1: Pins same direction as tube
- 3: Pins opposite direction of tube

Tube Length

- L: Long (0.480" \pm 0.005)
- S: Short (0.330" \pm 0.005)
- N: No Tube

Pressure Type:

- A: Absolute (1 Tube)
- D: Differential (2 Tubes)
- G: Gage (1 Tube)

Standard Pressure Range Model SM-5611 and SM-5612

Ord. Info	psi	BAR	kPa	mmHg	in H ₂ O	mmH ₂ O
005	5	0.345	34.47	258.6	138.4	3515.4
015	15	1.034	103.42	775.7	415.2	10546.1
030	30	2.068	206.84	1551.5	830.4	21092.2
060	60	4.137	413.68	3102.9	1660.8	42184.3
100	100	6.895	689.47	5171.5	2768	70307.2

Low Pressure Range Model SM-5651 and SM-5652

Ord. Info	psi	BAR	kPa	mmHg	in H ₂ O	mmH ₂ O
001	0.15	0.010	1.03	7.8	4.152	105.5
003	0.3	0.021	2.07	15.5	8.304	210.9
008	0.8	0.055	5.52	41.4	22.144	562.5
015	1.5	0.103	10.34	77.6	41.52	1024.6
030	3.0	0.207	20.68	155.1	83.04	2109.2

Note

Low Pressure Devices are not available as absolute sensors.

Special Configurations are available. Contact EXAR Corporation for more information.

Notes

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