

P381 Gauge/Differential Specification

Rev 1.1

02/15/05

Physical Configuration:

Fully Active Half Bridge
Pb/Sn Solderable Metallization

Absolute Maximum Ratings:

Parameter	Minimum	Maximum	Units
Operating Pressure	-50	300	mmHg
Over Pressure ¹		4000	mmHg
Burst Pressure	5000		mmHg
Excitation	2	10	Volts ²
Operating Temperature	15	40	°C
Storage Temperature	-25	70	°C
Physical Dimensions ³			
Length	875	885	μm
Width	375	385	μm
Thickness	170	180	μm
Solderability Shelf Life	2		Yr.



Actual P381 Photomicrograph

¹ Built-in Overpressure Stop with touchdown occurring at approximately 2.5X maximum Operating Pressure.

² AC or DC excitation is allowed since the parasitic diode formed by the P-Type sensing elements in the N-Type substrate is not reverse biased as in most applications.

³ Post Saw Dimensions

**Electrical Specifications:**

Parameter	Minimum	Typical	Maximum	Units
Gauge Resistance (25°C)	600	800	1000	Ω
Resistor Matching ⁴ (25°C)	-40	± 10	40	Ω
Full Scale ⁵ ΔR ⁶	$4.6 \pm 20\%$	$6.1 \pm 20\%$	$7.6 \pm 20\%$	Ω
Full Scale Span ^{2, 7}	12.5	17.5	22.5	mV
Offset Voltage ⁸	-20	± 5	20	mV
Sensitivity ⁹	10	17.5	25	$\mu V / V / mmHg$
Pressure Nonlinearity ¹⁰	0	± 0.1	0.25	%FSS
TCOffset ¹¹	-20	± 5	20	$\mu V / ^\circ C$
TCSpan	-1000	-700	-400	ppm / $^\circ C$
TCSNL ¹²	-1.0	± 0.25	1.0	%FSS
TCR ¹³	1500	2000	2500	ppm / $^\circ C$
TCRNL ¹⁴	-1.0	± 0.8	1.0	%FSS
Pressure Hysteresis ¹⁵	-0.67	± 0.1	0.67	%FSS
Offset Thermal Hysteresis ¹⁶	-0.3	± 0.1	0.3	%FSS
Noise ¹⁷	-0.17	± 0.1	0.17	%FSS
Temperature Sense Resistor ¹⁸	10	12.5	15	k Ω

⁴ Mismatch between the Center and Edge resistances in Ω at 25°C.

⁵ At Reference Conditions of 5V Excitation, and 25°C.

⁶ The specified ΔR 's are intended to correspond to the nominal gauge resistance, with larger gauge values requiring larger ΔR 's in order to maintain the sensitivity of the device in the range of 10-15 $\mu V / V / mmHg$. See Graph 1 for a more detailed explanation of this Specification.

⁷ Based on Completion of the half Bridge into a Full Bridge using two inactive 800 Ω Resistors. (See Fig. 4)

⁸ Based on worst Case 600 Ω Fully Active Half Bridge with 800 Ω Inactive Half Bridge Completion and 5VDC Excitation.

⁹ Calculated based on Bridge Completion with 800 Ω fixed Resistors (See Fig. 4)

¹⁰ Terminal Based Nonlinearity.

¹¹ Change in Offset voltage over temperature, due to changes in residual stresses over temperature.

¹² Terminal based nonlinearity in TCS curve over operating temperature range.

¹³ Based on Linear Slope from Cold to Hot Normalized to Reference Room Temperature (25°C).

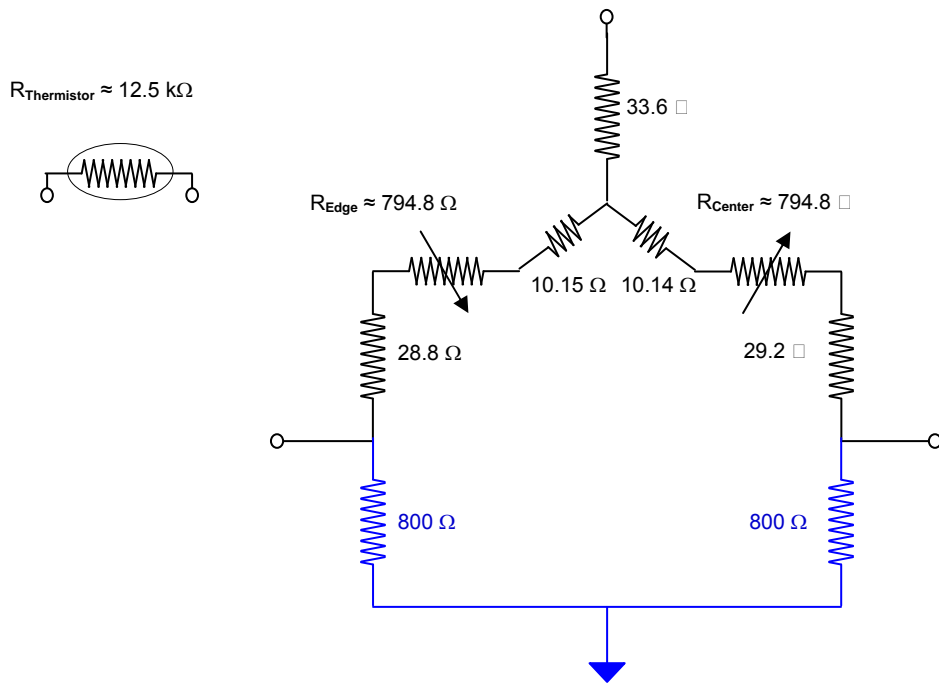
¹⁴ Terminal based nonlinearity in TCR curve over operating temperature range.

¹⁵ Measured as the difference (in %FSS) from the initial Offset and the Offset after pressurizing to -50 mmHg then 100 mmHg then returning back to 0 mmHg. The Pressure Hysteresis is the difference between the initial Offset and the Offset after all pressure excursions and returning to 0.

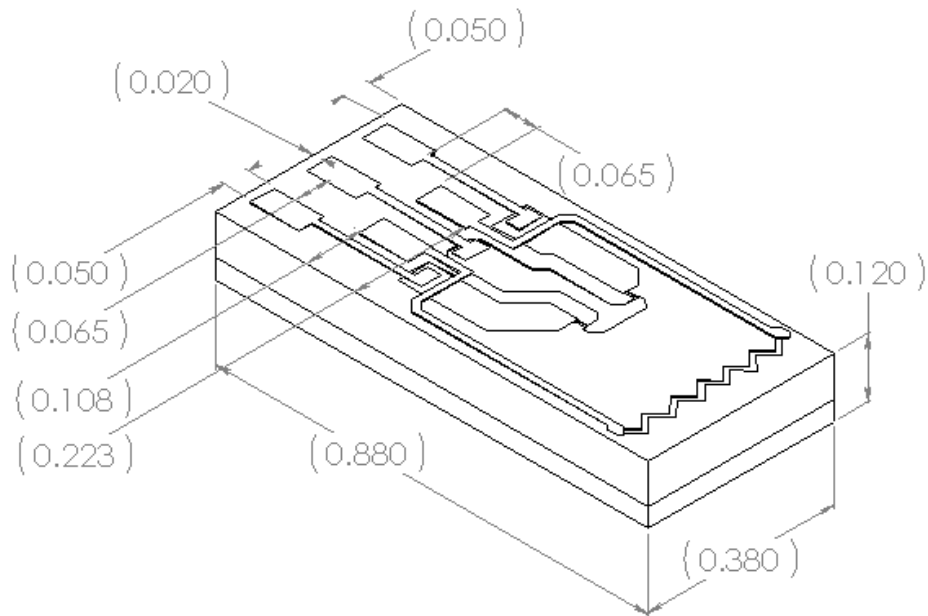
¹⁶ Measured as the difference in initial Offset, and Final Offset after thermal cycling from 25°C to 15°C to 25°C to 40 $^\circ C$ and finally returning to 25°C. The Offset Thermal Hysteresis is the difference in Offset (in %FSS) between the initial and final 25°C Offsets.

¹⁷ V_{p-p} , Measured in controlled Noise environment with no pressure applied.

¹⁸ Integral Thermistor for temperature measurement at the Pressure Sensor with the same TCR.



Half Bridge (with Parasitic Resistances), and 800 Ω Completion Resistors
(Typical Values indicated)



Isometric View with pad Locations