Freescale Semiconductor

MPX4080D
Rev 4, 1/2009

Integrated Silicon Pressure Sensor On-Chip Signal Conditioned, Temperature Compensated and Calibrated

MPX4080D Series

0 to 80 kPa (0 to 11.6 psi)
0.6 to 4.9 V Output

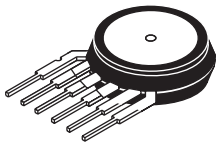
The MPX4080D series piezoresistive transducer is a state-of-the-art monolithic silicon pressure sensor designed for a wide range of applications, but particularly those employing a microcontroller or microprocessor with A/D inputs. This patented, single element transducer combines advanced micromachining techniques, thin-film metallization, and bipolar processing to provide an accurate, high level analog output signal that is proportional to the applied pressure.

Features

- 3.0% Maximum Error over 0° to 85°C
- Ideally suited for Microprocessor or Microcontroller-Based Systems
- Temperature Compensated from -40° to 105°C
- Easy-to-Use, Durable Epoxy Unibody Package

ORDERING INFORMATION									
Device Name	Package Options	Case No.	# of Ports			Pressure Type			Device Marking
			None	Single	Dual	Gauge	Differential	Absolute	
MPX4080D	Tray	867	•				•		MPX4080D

UNIBODY PACKAGE



MPX4080D
CASE 867-08

freescale™ semiconductor

Operating Characteristics

Table 1. Operating Characteristics (V_S = 5.1 Vdc, T_A = 25°C unless otherwise noted, P1 > P2. Decoupling circuit shown in Figure 4 required to meet electrical specifications.)

Characteristic	Symbol	Min	Typ	Max	Unit
Pressure Range(1)	P_{OP}	0	—	80	kPa
Supply Voltage(2)	V_S	4.85	5.1	5.35	Vdc
Supply Current	I_o	—	7.0	10	mAdc
Minimum Pressure Offset(3)(0 to 85°C) @ V_S = 5.1 V	V_{off}	0.478	0.575	0.672	Vdc
Full Scale Output(4)(0 to 85°C) @ V_S = 5.1 V	V_{FSO}	4.772	4.900	5.020	Vdc
Full Scale Span(5)(0 to 85°C) @ V_S = 5.1 V	V_{FSS}	—	4.325	—	Vdc
Accuracy	—	—	—	3.0	$\%V_{FSS}$
Sensitivity	V/P	—	54	—	mV/kPa

1. 1 kPa (kiloPascal) equals 0.145 psi.
2. Device is ratiometric within this specified excitation range.
3. Offset (V_{off}) is defined as the output voltage at the minimum rated pressure.
4. Full Scale Output (V_{FSO}) is defined as the output voltage at the maximum or full rated pressure.
5. Full Scale Span (V_{FSS}) is defined as the algebraic difference between the output voltage at full rated pressure and the output voltage at the minimum rated pressure.

Maximum Ratings

Table 2. Maximum Ratings (1)

Rating	Symbol	Value	Unit
Maximum Pressure (P1 > P2)	P_{max}	400	kPa
Operating Temperature	T_A	-40 to +105	°C
Storage Temperature	T_{stg}	-40 to +125	°C

1. Exposure beyond the specified limits may cause permanent damage or degradation to the device.

Figure 1 shows a block diagram of the internal circuitry integrated on a pressure sensor chip.

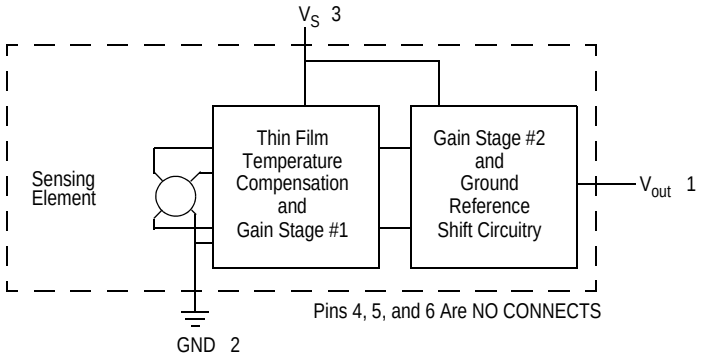


Figure 1. Fully Integrated Pressure Sensor Schematic

On-Chip Temperature Compensation and Calibration

Figure 2 shows the sensor output signal relative to differential pressure input. Typical, minimum, and maximum output curves are shown for operation over a temperature range of 0° to 85°C using the decoupling circuit shown in Figure 4. The output will saturate outside of the specified pressure range.

Figure 3 illustrates the differential sensing chip in the basic chip carrier (Case 867). A fluorosilicone gel isolates the die surface and wire bonds from the environment, while allowing the pressure signal to be transmitted to the sensor diaphragm.

The MPX4080D pressure sensor operating characteristics, internal reliability, and qualification tests are based on use of dry air as the pressure media. Media, other than dry air, may have adverse effects on sensor performance and long-term reliability. Contact the factory for information regarding media compatibility in your application.

Figure 4 shows the recommended decoupling circuit for interfacing the output of the integrated sensor to the A/D input of a microprocessor or microcontroller. Proper decoupling of the power supply is recommended.

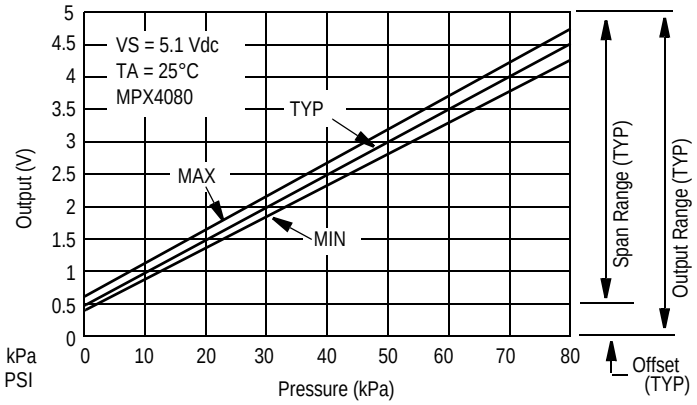


Figure 2. Output versus Pressure Differential

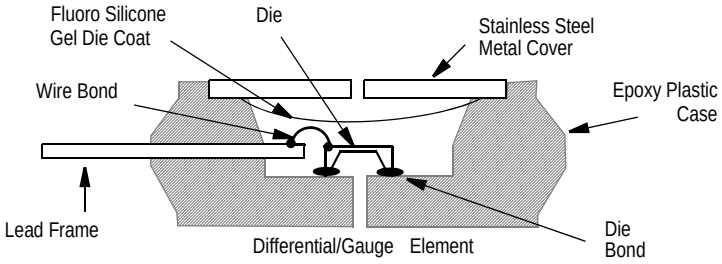


Figure 3. Cross-Sectional Diagrams (not to scale)

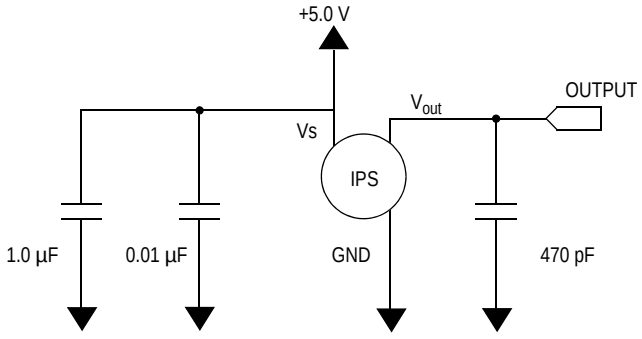


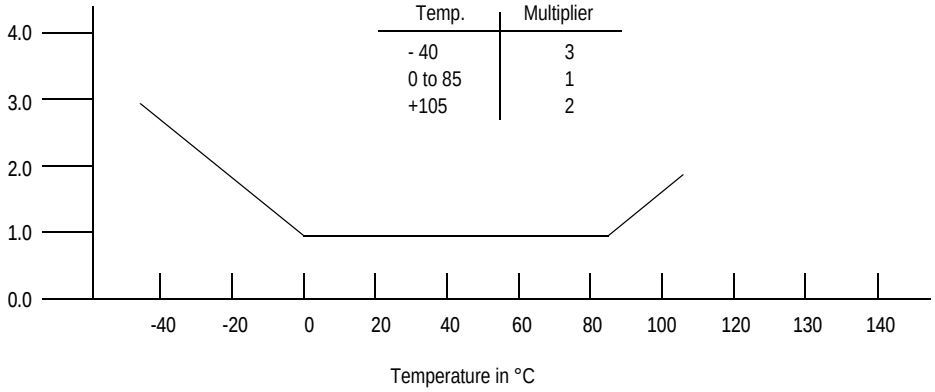
Figure 4. Recommended Power Supply Decoupling and Output Filter
(For additional output filtering information, refer to Application Note AN1646.)

Transfer Function (MPX4080D)

Nominal Transfer Value: $V_{out} = V_S (P \times 0.01059 + 0.11280)$
$\pm$ (Pressure Error x Temp. Mult. x 0.01059 x V_S)
$V_S = 5.1\ V \pm 0.25\ V_{DC}$

Temperature Error Multiplier

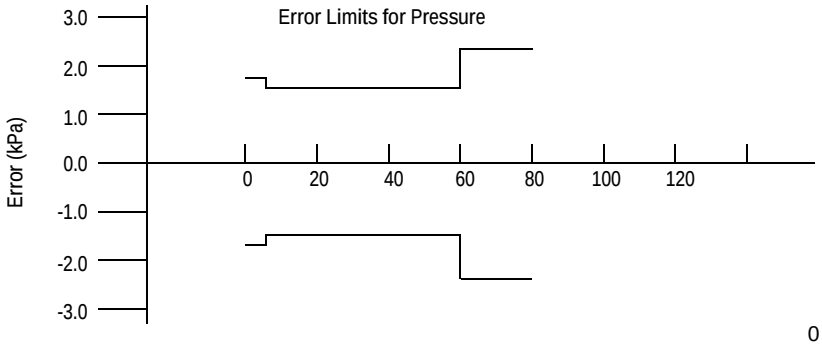
MPX4080D



Temp.	Multiplier
- 40	3
0 to 85	1
+105	2

NOTE: The Temperature Multiplier is a linear response from 0° to -40°C and from 85° to 105°C.

Pressure Error Band



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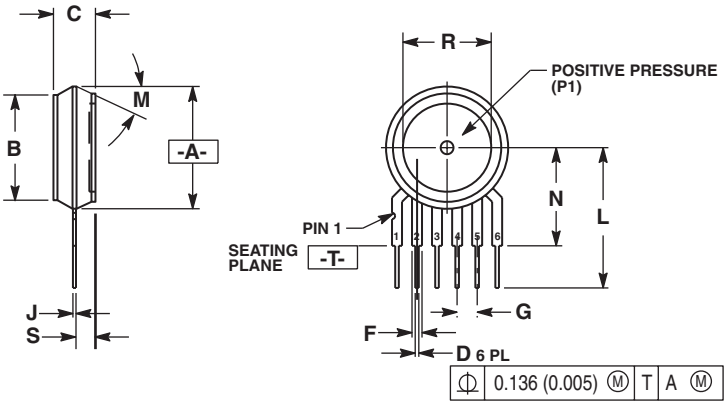
Pressure	Error (max)
0 to 6 kPa	± 1.8 kPa
0 to 60 kPa	± 1.5 kPa
60 to 80 kPa	± 2.3 kPa

PRESSURE (P1)/VACUUM (P2) SIDE IDENTIFICATION TABLE

The two sides of the pressure sensor are designated as the Pressure (P1) side and the Vacuum (P2) side. The Pressure (P1) side is the side containing fluorosilicone gel which protects the die from harsh media. The pressure sensor is designed to operate with positive differential pressure applied, P1 > P2.

The Pressure (P1) side is identified by the stainless steel cap.

PACKAGE DIMENSIONS



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION -A- IS INCLUSIVE OF THE MOLD STOP RING. MOLD STOP RING NOT TO EXCEED 16.00 (0.630).

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.595	0.630	15.11	16.00
B	0.514	0.534	13.06	13.56
C	0.200	0.220	5.08	5.59
D	0.027	0.033	0.68	0.84
F	0.048	0.064	1.22	1.63
G	0.100 BSC		2.54 BSC	
J	0.014	0.016	0.36	0.40
L	0.695	0.725	17.65	18.42
M	30° NOM		30° NOM	
N	0.475	0.495	12.07	12.57
R	0.430	0.450	10.92	11.43
S	0.090	0.105	2.29	2.66

STYLE 1:
PIN 1. VOUT
2. GROUND
3. VCC
4. V1
5. V2
6. VEX

CASE 867-08
ISSUE N
BASIC ELEMENT

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