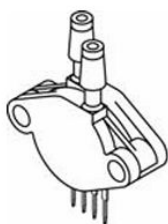


100 kPa on-chip temperature compensated and calibrated silicon pressure sensors



MPX2100AP
CASE 344B-01



MPX2100DP
CASE 344C-01

Features

- Temperature Compensated Over 0°C to +85°C
- Available in Absolute, Differential and Gauge Configurations
- Easy to Use Chip Carrier Package Options
- Ratiometric to Supply Voltage
- $\pm 0.25\%$ Linearity (MPX2100D Series)

Applications

- Pump/Motor Controllers
- Robotics
- Level Indicators
- Medical Diagnostics
- Pressure Switching
- Barometers

Description

The MPX2100 series devices silicon piezoresistive pressure sensors providing a highly accurate and linear voltage output directly proportional to the applied pressure. The sensor is a single, monolithic silicon diaphragm with the strain gauge and a thin-film resistor network integrated on-chip. The chip is laser trimmed for precise span and offset calibration and temperature compensation.

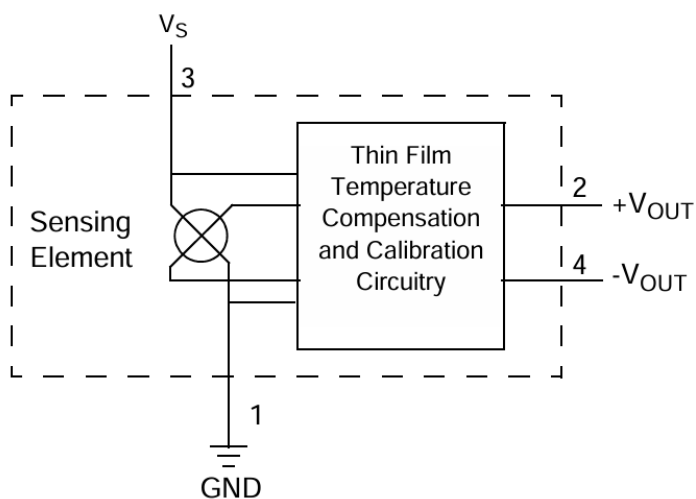
1 Ordering information

Table 1. Ordering information

Device Name	Package Options	Case No.	# of Ports				Pressure Type		Device Marking
			None	Single	Dual	Gauge	Differential	Absolute	
Unibody Package (MPX2100 Series)									
MPX2100AP	Tray	344B		•				•	MPX2100AP
MPX2100DP	Tray	344C			•		•		MPX2100DP

Figure 1 shows a block diagram of the internal circuitry on the stand-alone pressure sensor chip.

Figure 1. Temperature Compensated Pressure Sensor Schematic



2 Voltage output versus applied differential pressure

The differential voltage output of the sensor is directly proportional to the differential pressure applied.

The absolute sensor has a built-in reference vacuum. The output voltage will decrease as vacuum, relative to ambient, is drawn on the pressure (P1) side.

The output voltage of the differential or gauge sensor increases with increasing pressure applied to the pressure side (P1) relative to the vacuum side (P2). Similarly, output voltage increases as increasing vacuum is applied to the vacuum side (P2) relative to the pressure side (P1).

3 Operating characteristics

3.1 Operating characteristics

Table 2. ($V_S = 10 \text{ Vdc}$, $T_A = 25^\circ\text{C}$ unless otherwise noted, $P_1 > P_2$)

Characteristics		Symbol	Min	Typ	Max	Unit
Pressure Range ⁽¹⁾		P_{OP}	0	—	100	kPa
Supply Voltage ⁽²⁾		V_S	—	10	16	Vdc
Supply Current		I_o	—	6.0	—	mAdc
Full Scale Span ⁽³⁾		V_{FSS}	38.5	40	41.5	mV
Offset ⁽⁴⁾	MPX2100D Series MPX2100A Series	V_{off}	-1.0 -2.0	— —	1.0 2.0	mV
Sensitivity		$\Delta V/\Delta P$	—	0.4	—	mV/kPa
Linearity ⁽⁵⁾	MPX2100D Series MPX2100A Series	— —	-0.25 -1.0	— —	0.25 1.0	% V_{FSS}
Pressure Hysteresis ⁽⁵⁾ (0 to 100 kPa)		—	—	± 0.1	—	% V_{FSS}
Temperature Hysteresis ⁽⁵⁾ (-40°C to $+125^\circ\text{C}$)		—	—	± 0.5	—	% V_{FSS}
Temperature Effect on Full Scale Span ⁽⁵⁾		TCV_{FSS}	-1.0	—	1.0	% V_{FSS}
Temperature Effect on Offset ⁽⁵⁾		TCV_{off}	-1.0	—	1.0	mV
Input Impedance		Z_{in}	1000	—	2500	Ω
Output Impedance		Z_{out}	1400	—	3000	Ω
Response Time ⁽⁶⁾ (10% to 90%)		t_R	—	1.0	—	ms
Warm-Up		—	—	20	—	ms
Offset Stability ⁽⁷⁾		—	—	± 0.5	—	% V_{FSS}

- 1.0 kPa (kiloPascal) equals 0.145 psi.
- Device is ratiometric within this specified excitation range. Operating the device above the specified excitation range may induce additional error due to device self-heating.
- 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.
- Offset (V_{off}) is defined as the output voltage at the minimum rated pressure.
- Accuracy (error budget) consists of the following:
 Linearity: Output deviation from a straight line relationship with pressure, using end point method, over the specified pressure range
 Temperature Hysteresis: Output deviation at any temperature within the operating temperature range, after the temperature is cycled to and from the minimum or maximum operating temperature points, with zero differential pressure applied
 Pressure Hysteresis: Output deviation at any pressure within the specified range, when this pressure is cycled to and from the minimum or maximum rated pressure, at 25°C .
 TcSpan: Output deviation at full rated pressure over the temperature range of 0 to 85°C , relative to 25°C .
 TcOffset: Output deviation with minimum rated pressure applied, over the temperature range of 0 to 85°C , relative to 25°C
 .
- Response Time is defined as the time for the incremental change in the output to go from 10% to 90% of its final value when subjected to a specified step change in pressure.



7. Offset stability is the product's output deviation when subjected to 1000 hours of Pulsed Pressure, Temperature Cycling with Bias Test.

4 Maximum ratings

4.1 Maximum Ratings

Table 3. Table 2. Maximum Ratings⁽¹⁾

Rating	Symbol	Value	Unit
Maximum Pressure ($P_1 > P_2$)	$P_{\max}$	400	kPa
Storage Temperature	T_{stg}	-40 to +125	°C
Operating Temperature	T_A	-40 to +125	°C

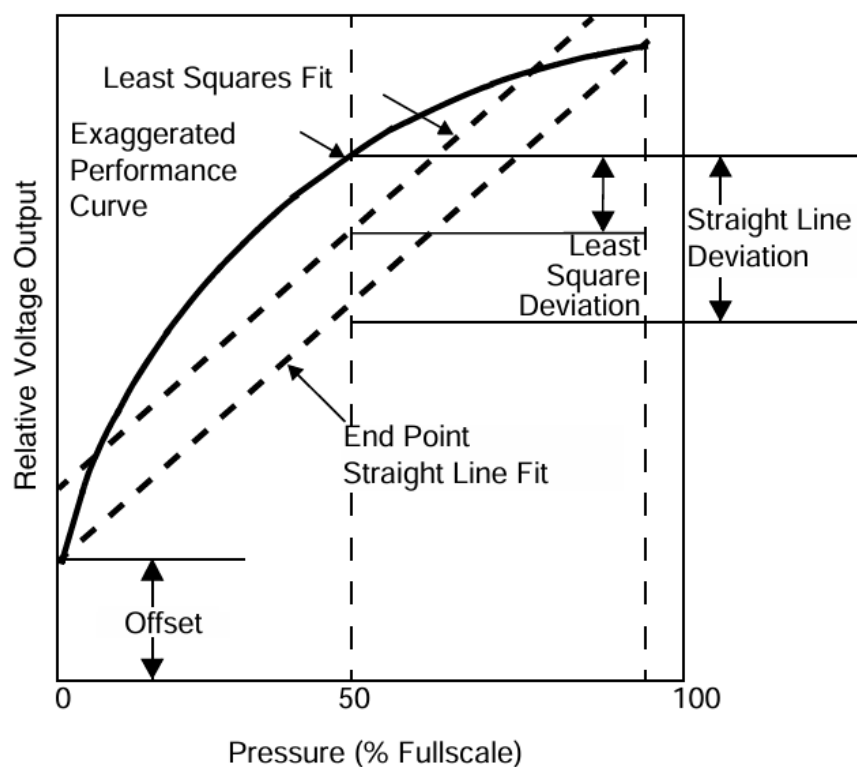
1. Exposure beyond the specified limits may cause permanent damage or degradation to the device.

5 LINEARITY

Linearity refers to how well a transducer's output follows the equation: $V_{out} = V_{off} + \text{sensitivity} \times P$ over the operating pressure range. There are two basic methods for calculating nonlinearity: (1) end point straight line fit (see Figure 2) or (2) a least squares best line fit. While a least squares fit gives the "best case" linearity error (lower numerical value), the calculations required are burdensome.

Conversely, an end point fit will give the "worst case" error (often more desirable in error budget calculations) and the calculations are more straightforward for the user. Motorola's specified pressure sensor linearities are based on the end point straight line method measured at the midrange pressure.

Figure 2. Linearity Specification Comparison



6 On-chip temperature compensation and calibration

Figure 3 shows the output characteristics of the MPX2100 series at 25°C. The output is directly proportional to the differential pressure and is essentially a straight line. The effects of temperature on Full-Scale Span and Offset are very small and are shown under Operating Characteristics. Figure 4 illustrates the absolute sensing configuration (right) and the differential or gauge configuration in the basic chip carrier (Case 344). A silicone gel isolates the die surface and wire bonds from the environment, while allowing the pressure signal to be transmitted to the silicon diaphragm. The MPX2100 series pressure sensor operating characteristics and 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 3. Output versus Pressure Differential

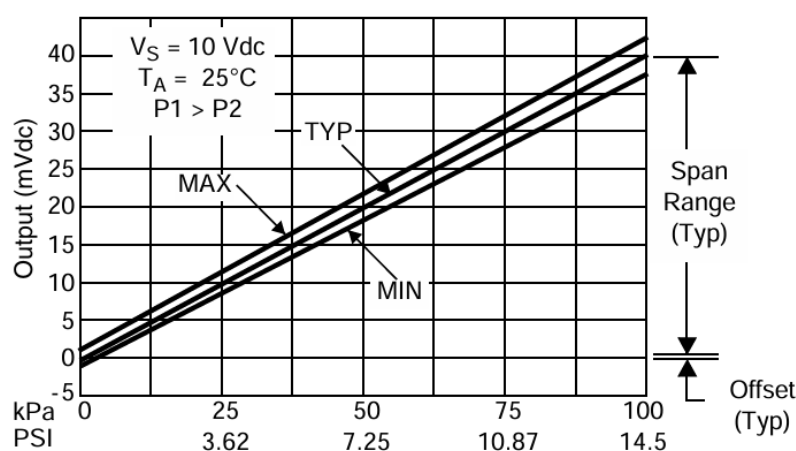
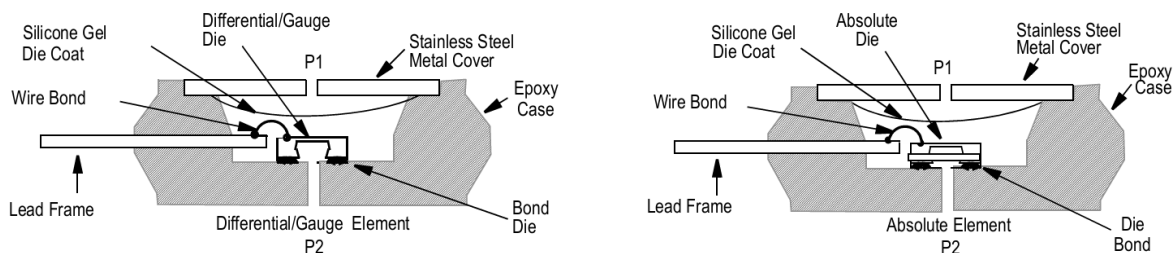


Figure 4. Cross-Sectional Diagram (not to scale)





7 Pressure (p1) / vacuum (p2) side identification table

ST designates the two sides of the pressure sensor as the Pressure (P1) side and the Vacuum (P2) side. The Pressure (P1) side is the side containing the silicone gel which isolates the die. The differential or gauge sensor is designed to operate with positive differential pressure applied, $P1 > P2$. The absolute sensor is designed for vacuum applied to P1 side. The Pressure (P1) side may be identified by using the table below:

Part Number	Case Type	Pressure (P1) Side Identifier
MPX2100DP	344C	Side with Part Marking
MPX2100AP	344B	Side with Port Attached

8 PACKAGE DIMENSIONS

Figure 5. CASE 344B-01 ISSUE B UNIBODY PACKAGE

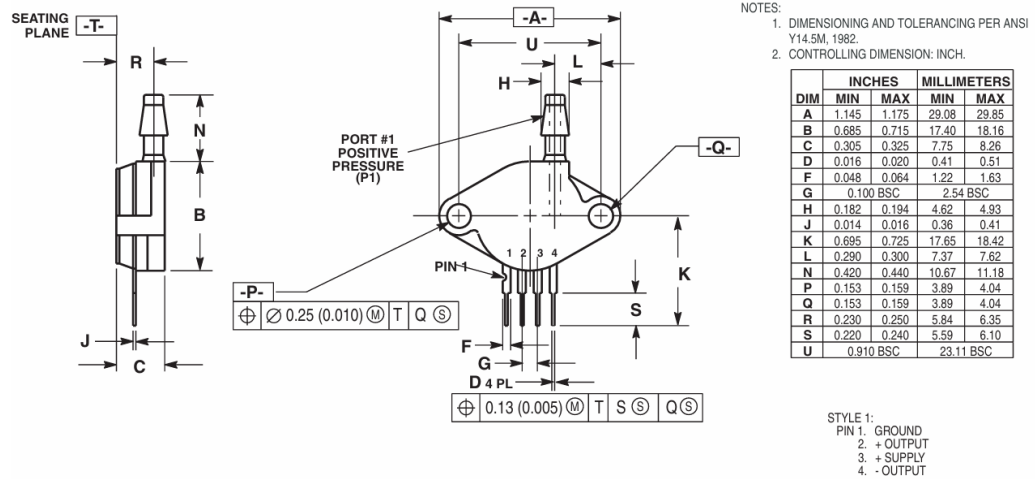
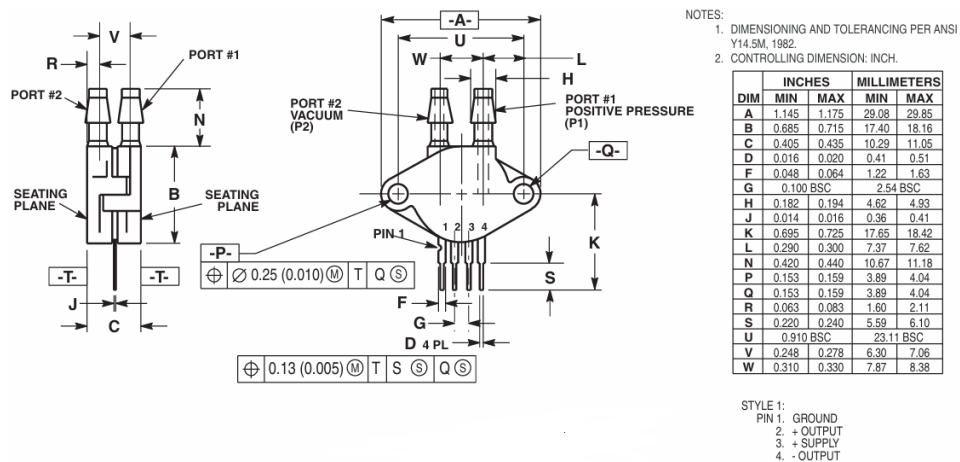


Figure 6. CASE 344C-01 ISSUE B UNIBODY PACKAGE



Revision history

Table 4. Document revision history

Date	Revision	Changes
20-Jul-2026	1	Initial release from ST, rebranded NXP document



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