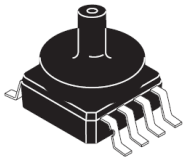
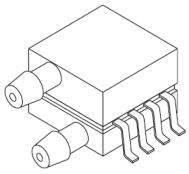
MP3V5010DP, MP3V5010GC6

Datasheet

Integrated silicon pressure sensor on-chip signal conditioned, temperature compensated and calibrated



MP3V5010GC6U/C6T1
CASE 482A-01



MP3V5010DP
CASE 1351-01

Features

- 5.0% Maximum Error Over 0° to 85°C
- Ideally Suited for Microprocessor or Microcontroller-Based Systems
- Temperature Compensated Over –40° to +125°C
- Thermoplastic (PPS) Surface Mount Package
- Patented Silicon Shear Stress Strain Gauge
- Available in Differential and Gauge Configurations

Application

- Hospital Beds
- HVAC
- Respiratory Systems
- Process Control

Description

The MP3V5010 series piezoresistive transducers are state-of-the-art monolithic silicon pressure sensors designed for a wide range of applications, but particularly those employing a microcontroller or microprocessor with A/D inputs. This 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

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	
Small Outline Package (MP3V5010 Series)									
MP3V5010GC6U	Rails	482A		•		•			MP3V5010G
MP3V5010GC6T1	Tape & Reel	482A		•		•			MP3V5010G
MP3V5010DP	Trays	1351			•		•		MP3V5010DP

2 Operating characteristics

Table 2. Table 1. Operating Characteristics (V_S = 3.0 Vdc, T_A = 25°C unless otherwise noted, P1 > P2. Decoupling circuit shown in Figure 3 required to meet specification.)

Characteristic		Symbol	Min	Typ	Max	Unit
Pressure Range(1)		P_{OP}	0	—	10	kPa
Supply Voltage(2)		V_S	2.7	3.0	3.3	Vdc
Supply Current		I_o	—	7.0	10	mAdc
Minimum Pressure Offset(3) @ V_S = 3.0 Volts	(0 to 85°C)	V_{off}	0.1	0.24	0.38	Vdc
Full Scale Output(4) @ V_S = 3.0 Volts	(0 to 85°C)	V_{FSO}	2.81	2.94	3.08	Vdc
Full Scale Span(5) @ V_S = 3.0 Volts	(0 to 85°C)	V_{FSS}	—	2.7	—	Vdc
Accuracy(6)	(0 to 85°C)	—	—	—	±5.0	%V_{FSS}
Sensitivity		V/P	—	270	—	mV/kPa
Response Time(7)		t_R	—	1.0	—	ms
Output Source Current at Full Scale Output		I_{O+}	—	0.1	—	mAdc
Warm-Up Time(8)		—	—	20	—	ms
Offset Stability(9)		—	—	±0.5	—	%V_{FSS}

1. 1.0 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.
6. Accuracy (error budget) consists of the following:
   Linearity: Output deviation from a straight line relationship with pressure 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 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.
   Variation from Nominal: The variation from nominal values, for Offset or Full Scale Span, as a percent of VFSS, at 25°C.
7. 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.
8. Warm-up Time is defined as the time required for the product to meet the specified output voltage after the Pressure has been stabilized.
9. Offset Stability is the product's output deviation when subjected to 1000 hours of Pulsed Pressure, Temperature Cycling with Bias Test.

3 Maximum ratings

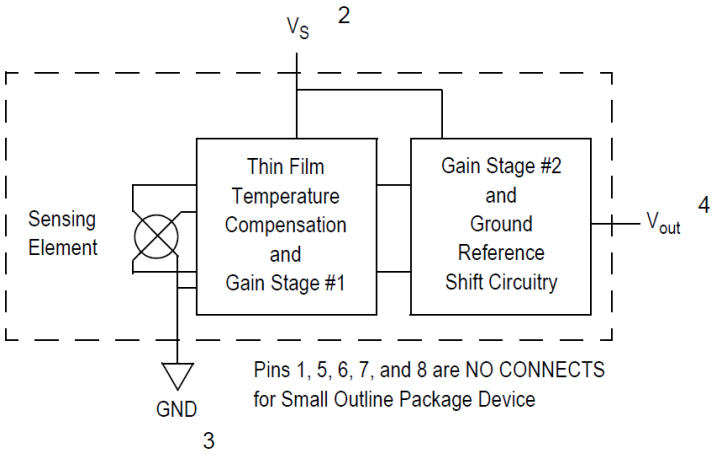
Table 3. Table 2. Maximum Ratings(1)

Rating	Symbol	Value	Unit
Maximum Pressure (P1 > P2)	P_{max}	75	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.

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

Figure 1. Integrated Pressure Sensor Schematic



4 On-chip temperature compensation, calibration and signal conditioning

The performance over temperature is achieved by integrating the shear-stress strain gauge, temperature compensation, calibration and signal conditioning circuitry onto a single monolithic chip.

Figure 2 illustrates the Differential or Gauge configuration in the basic chip carrier (Case 482). 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 MP3V5010 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 shows the recommended decoupling circuit for interfacing the integrated sensor to the A/D input of a microprocessor or microcontroller. Proper decoupling of the power supply is recommended.

Figure 4 shows the sensor output signal relative to 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 3. The output will saturate outside of the specified pressure range

Figure 2. Cross-Sectional Diagram SOP (not to scale)

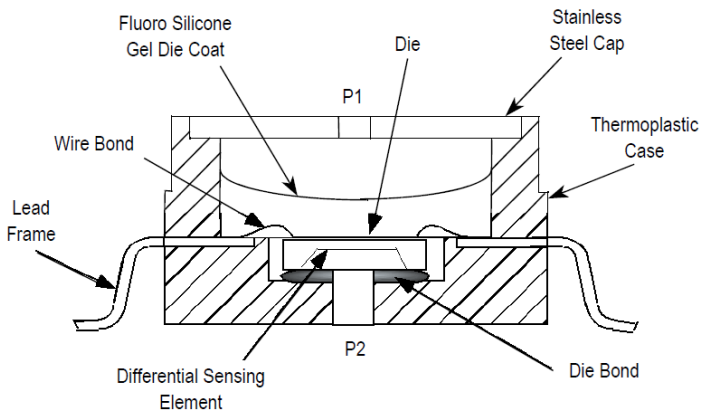


Figure 3. Recommended Power Supply Decoupling and Output Filtering (For additional output filtering, please refer to Application Note AN1646)

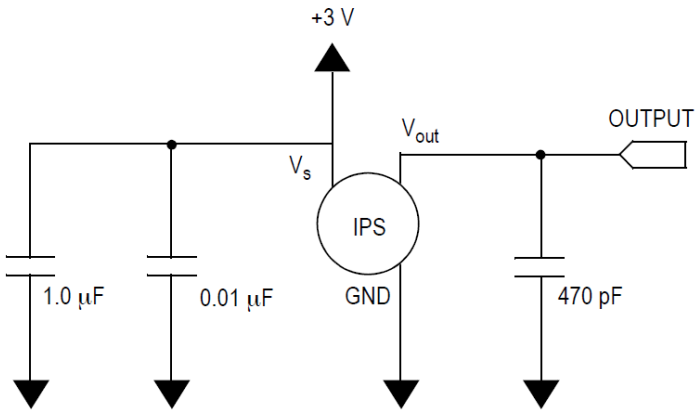


Figure 4. Output versus Pressure Differential

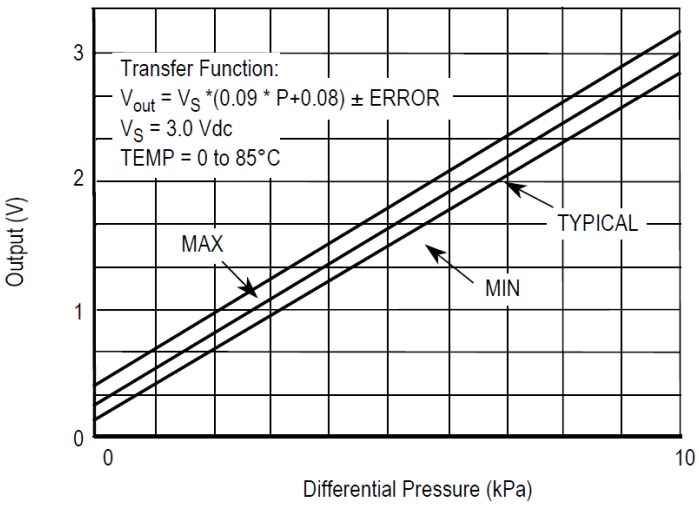
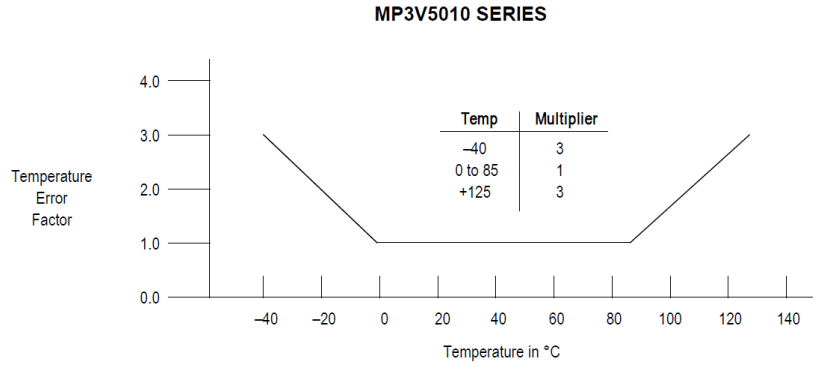


Figure 5. Transfer Function

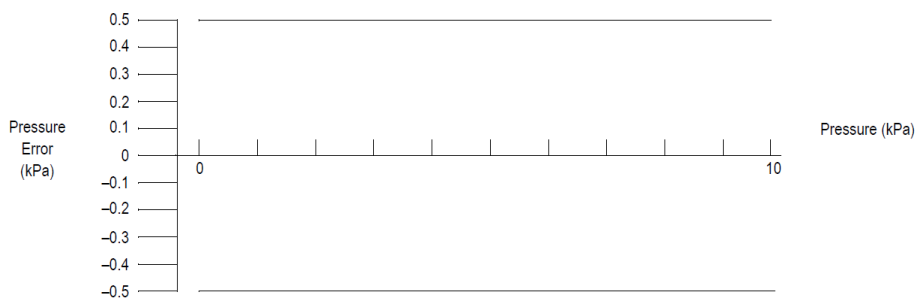
Nominal Transfer Value: $V_{out} = V_S$ x (0.09 x P + 0.08)
± (Pressure Error x Temp. Factor x 0.09 x V_S)
V_S = 3.0 V ± 0.30 Vdc

Figure 6. Temperature Error Band



NOTE: The Temperature Multiplier is a linear response from 0° to –40°C and from 85° to 125°C.

Figure 7. Pressure Error Band



Pressure	Error (Max)
0 to 10 (kPa)	±0.5 (kPa)

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

Freescale 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 fluoro silicone gel which protects the die from harsh media. The pressure sensor is designed to operate with positive differential pressure applied, P1 > P2.

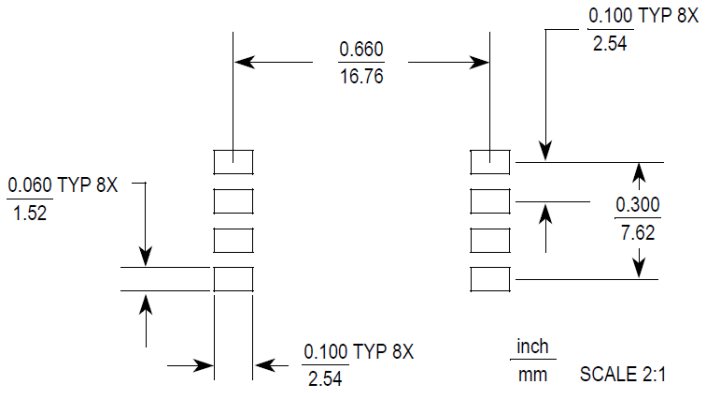
The Pressure (P1) side may be identified by using the following table

Part Number	Case Type	Pressure (P1) Side Identifier
MP3V5010GC6U/C6T1	482A	Side with Port Attached
MP3V5010DP	1351	Side with Part Marking

6 Minimum recommended footprint for surface mounted applications

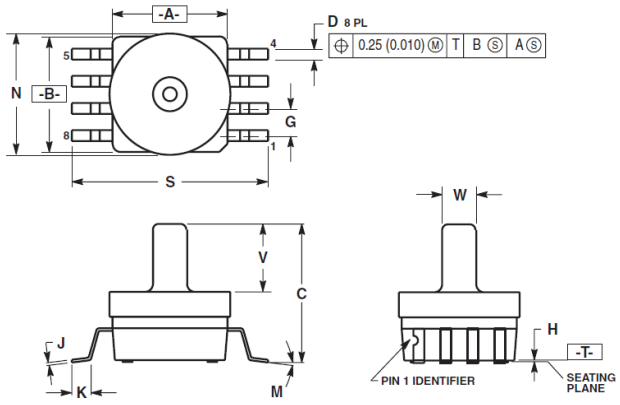
Surface mount board layout is a critical portion of the total design. The footprint for the surface mount packages must be the correct size to ensure proper solder connection interface between the board and the package. With the correct footprint, the packages will self align when subjected to a solder reflow process. It is always recommended to design boards with a solder mask layer to avoid bridging and shorting between solder pads

Figure 8. Small Outline Package Footprint



7 PACKAGE DIMENSION

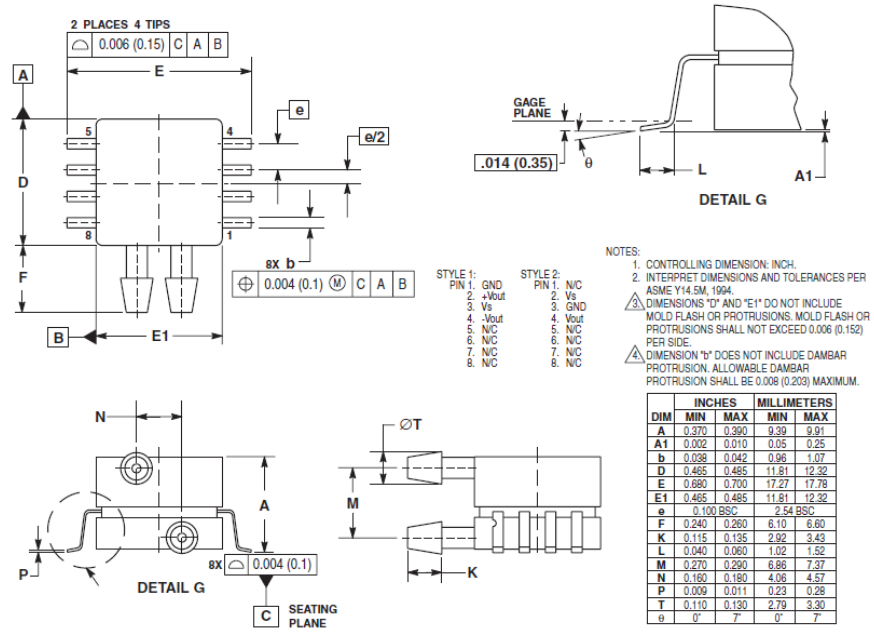
Figure 9. CASE 482A-01 ISSUE A SMALL OUTLINE PACKAGE



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006).
5. ALL VERTICAL SURFACES 5° TYPICAL DRAFT.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.415	0.425	10.54	10.79
B	0.415	0.425	10.54	10.79
C	0.500	0.520	12.70	13.21
D	0.038	0.042	0.96	1.07
G	0.100 BSC		2.54 BSC	
H	0.002	0.010	0.05	0.25
J	0.009	0.011	0.23	0.28
K	0.061	0.071	1.55	1.80
M	0°	7°	0°	7°
N	0.444	0.448	11.28	11.38
S	0.709	0.725	18.01	18.41
V	0.245	0.255	6.22	6.48
W	0.115	0.125	2.92	3.17

Figure 10. CASE 1351-01 ISSUE O SMALL OUTLINE PACKAGE



STYLE 1: PIN 1. GND, 2. +Vout, 3. Vs, 4. -Vout, 5. N/C, 6. N/C, 7. N/C, 8. N/C

STYLE 2: PIN 1. N/C, 2. Vs, 3. GND, 4. Vout, 5. N/C, 6. N/C, 7. N/C, 8. N/C

NOTES:
1. CONTROLLING DIMENSION: INCH.
2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.
3. DIMENSIONS "D" AND "E1" DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS. MOLD FLASH OR PROTRUSIONS SHALL NOT EXCEED 0.006 (0.152) PER SIDE.
4. DIMENSION "b" DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.008 (0.203) MAXIMUM.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.370	0.390	9.39	9.91
A1	0.002	0.010	0.05	0.25
b	0.038	0.042	0.96	1.07
D	0.465	0.485	11.81	12.32
E	0.680	0.700	17.27	17.78
E1	0.465	0.485	11.81	12.32
e	0.100 BSC		2.54 BSC	
F	0.240	0.260	6.10	6.60
K	0.115	0.135	2.92	3.43
L	0.040	0.060	1.02	1.52
M	0.270	0.290	6.86	7.37
N	0.160	0.180	4.06	4.57
P	0.009	0.011	0.23	0.28
T	0.110	0.130	2.79	3.30
θ	0°	7°	0°	7°

Revision history

Table 4. **Document revision history**

Date	Revision	Changes
19-May-2026	1	Initial release from ST, rebranded NXP document

Contents

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