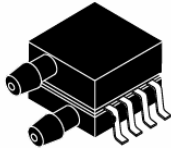




# MPXV5004DP, MPXV5004GC6 MPVZ5004G6, MPVZ5004GW7

Datasheet

0 to 3.92 kPa, differential and gauge, integrated pressure sensor



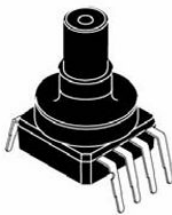
**MPXV5004DP**  
Case 98ASA99255D



**MPXV5004GC6T1/6U, MPVZ5004GC6U**  
Case 98ASB17757C



**MPVZ5004G6U/6T1**  
Case 98ASB17756C



**MPVZ5004GW7U**  
Case 98ASA10611D

## Features

- 1.5% maximum error for 0 to 100 mm H<sub>2</sub>O over +10 °C to +60 °C with autozero
- 2.5% maximum error for 100 to 400 mm H<sub>2</sub>O over +10 °C to +60 °C with autozero
- 6.25% maximum error for 0 to 400 mm H<sub>2</sub>O over 10 °C to +60 °C without autozero
- Temperature compensated over 10 °C to 60 °C
- Available in gauge surface mount (SMT) or through-hole (DIP) configurations
- Durable thermoplastic (PPS) package

## Applications

- Washing machine water level
- Ideally suited for microprocessor or microcontroller-based systems
- Appliance liquid level and pressure measurement
- Respiratory equipment

## Description

The MPxx5004 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 sensor combines a highly sensitive implanted strain gauge with 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

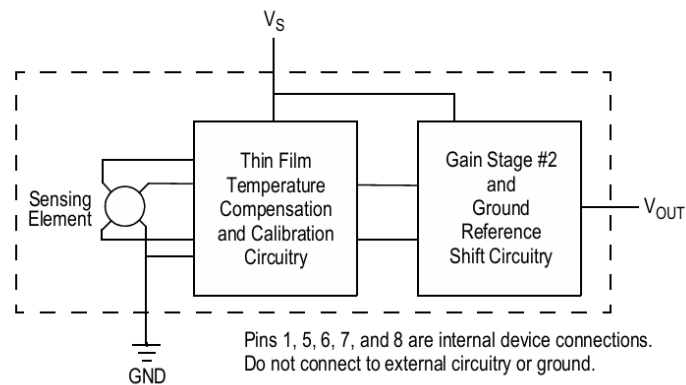
| Part number                                                   | Shipping | Package     | # of Ports |        |      |       | Pressure type |          | Device marking |
|---------------------------------------------------------------|----------|-------------|------------|--------|------|-------|---------------|----------|----------------|
|                                                               |          |             | None       | Single | Dual | Gauge | Differential  | Absolute |                |
| Small outline package (MPXV5004 series)                       |          |             |            |        |      |       |               |          |                |
| MPXV5004DP                                                    | Tray     | 98ASA99255D |            |        | •    |       | •             |          | MPXV5004DP     |
| MPXV5004GC6T1                                                 | Reel     | 98ASB17757C |            | •      |      | •     |               |          | MPXV5004G      |
| MPXV5004GC6U                                                  | Rail     | 98ASB17757C |            | •      |      | •     |               |          | MPXV5004G      |
| Small outline package (Media resistant gel) (MPVZ5004 series) |          |             |            |        |      |       |               |          |                |
| MPVZ5004G6T1                                                  | Reel     | 98ASB17756C | •          |        |      | •     |               |          | MPVZ5004G      |
| MPVZ5004G6U                                                   | Rail     | 98ASB17756C | •          |        |      | •     |               |          | MPVZ5004G      |
| MPVZ5004GW7U                                                  | Rail     | 98ASA10611D |            | •      |      | •     |               |          | MZ5004GW       |

## 2 General description

### 2.1 Block diagram

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

Figure 1. Integrated pressure sensor schematic



### 2.2 Pinout

Figure 2. Device pinout (top view)

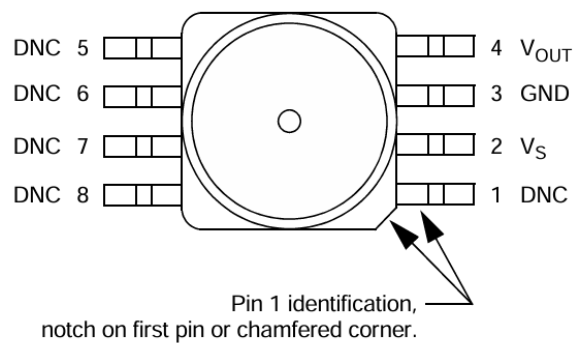


Table 1. Pin functions



Table 2. Pin functions

| Pin | Name             | Function                                                                                                       |
|-----|------------------|----------------------------------------------------------------------------------------------------------------|
| 1   | DNC              | Do not connect to external circuitry or ground. Pin 1 is notated by the notch in the lead or chamfered corner. |
| 2   | V <sub>S</sub>   | Voltage supply                                                                                                 |
| 3   | GND              | Ground                                                                                                         |
| 4   | V <sub>OUT</sub> | Output voltage                                                                                                 |
| 5   | DNC              | Do not connect to external circuitry or ground.                                                                |
| 6   | DNC              | Do not connect to external circuitry or ground.                                                                |
| 7   | DNC              | Do not connect to external circuitry or ground.                                                                |
| 8   | DNC              | Do not connect to external circuitry or ground.                                                                |

## 3 Mechanical and electrical specifications

### 3.1 Maximum ratings

**Table 3. Table 2. Maximum ratings<sup>(1)</sup>**

| Rating                     | Symbol           | Value       | Unit |
|----------------------------|------------------|-------------|------|
| Maximum pressure (P1 > P2) | P <sub>MAX</sub> | 16          | kPa  |
| Storage temperature        | T <sub>STG</sub> | −30 to +100 | °C   |
| Operating temperature      | T <sub>A</sub>   | 0 to +85    | °C   |

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

### 3.2 Operating characteristics

**Table 4. Table 3. Operating characteristics (V<sub>S</sub> = 5.0 V<sub>DC</sub>, T<sub>A</sub> = 25 °C unless otherwise noted, P1 > P2)**

| Characteristic                                                      | Symbol                                                                                        | Min  | Typ  | Max      | Units                              |
|---------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|------|------|----------|------------------------------------|
| Pressure range                                                      | P <sub>OP</sub>                                                                               | 0    | —    | 3.92 400 | kPa mm H <sub>2</sub> O            |
| Supply voltage <sup>(1)</sup>                                       | V <sub>S</sub>                                                                                | 4.75 | 5.0  | 5.25     | V <sub>DC</sub>                    |
| Supply current                                                      | I <sub>S</sub>                                                                                | —    | —    | 10       | mAdc                               |
| Span @ 306 mm H <sub>2</sub> O (3 kPa) <sup>(2)</sup>               | V <sub>FSS</sub>                                                                              | —    | 3.0  | —        | V                                  |
| Full-scale span @ 400 mm H <sub>2</sub> O (3.92 kPa) <sup>(2)</sup> |                                                                                               | —    | 3.92 | —        |                                    |
| Offset <sup>(3)</sup>                                               | V <sub>OFF</sub>                                                                              | 0.75 | 1.0  | 1.25     | V                                  |
| Sensitivity                                                         | V/P                                                                                           | —    | 1.0  | —        | V/kPa                              |
| Accuracy <sup>(4)</sup> <sup>(5)</sup>                              | 0 to 100 mm H <sub>2</sub> O (10 °C to 60 °C)                                                 | —    | —    | ±1.5     | %V <sub>FSS</sub> with autozero    |
|                                                                     | 100 to 400 mm H <sub>2</sub> O (10 °C to 60 °C) 0 to 400 mm H <sub>2</sub> O (10 °C to 60 °C) | —    | —    | ±2.5     | %V <sub>FSS</sub> with autozero    |
|                                                                     |                                                                                               | —    | —    | ±6.25    | %V <sub>FSS</sub> without autozero |

- Device is ratiometric within this specified excitation range.
- Span is defined as the algebraic difference between the output voltage at specified pressure and the output voltage at the minimum rated pressure.
- Offset (V<sub>off</sub>) 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 endpoint 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 over the temperature range of 10°C to 60°C, relative to 25°C.
  - TcOffset: Output deviation with minimum rated pressure applied, over the temperature range of 10°C to 60°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



5. Autozero at factory installation: Due to the sensitivity of the MPxx5004G, external mechanical stresses and mounting position can affect the zero pressure output reading. Autozeroing is defined as storing the zero pressure output reading and subtracting this from the device's output during normal operations. Reference AN1636 for specific information. The specified accuracy assumes a maximum temperature change of  $\pm 5^{\circ}\text{C}$  between autozero and measurement.

## 4 On-chip temperature compensation and calibration

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.

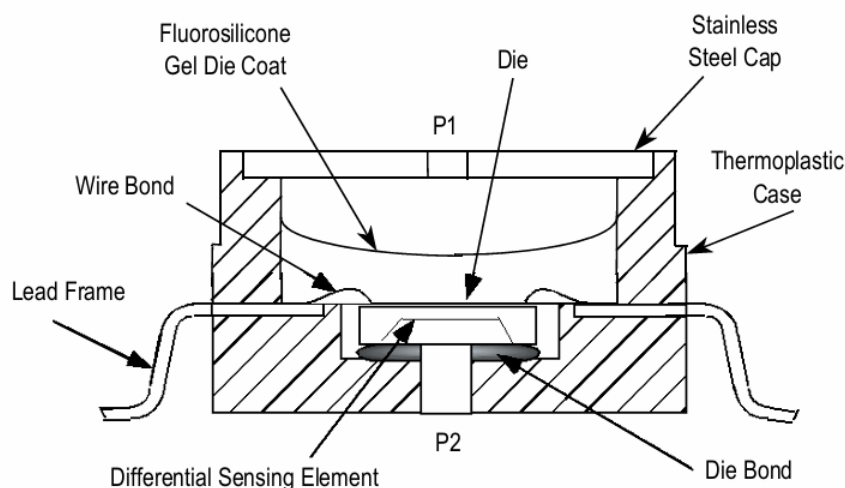
Figure 3 illustrates the gauge configuration in the basic chip carrier (case 98ASB17756C). A fluorosilicone gel isolates the die surface and wire bonds from the environment, while allowing the pressure signal to be transmitted to the silicon diaphragm.

The MPxx5004 series sensor operating characteristics are based on use of dry air as pressure media. Media, other than dry air, may have adverse effects on sensor performance and long-term reliability. Internal reliability and qualification test for dry air, and other media, are available from the factory. Contact the factory for information regarding media tolerance in your application.

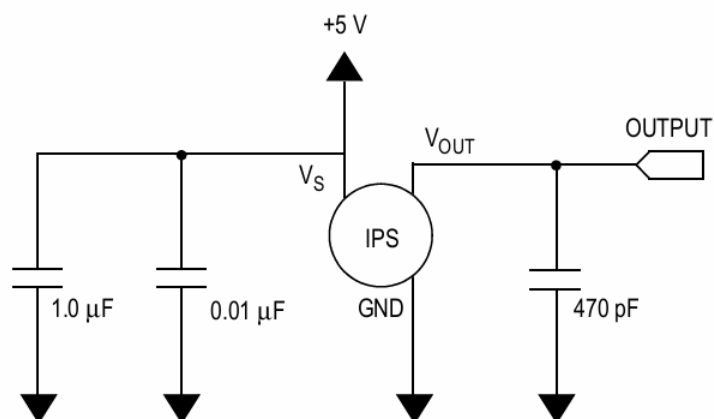
Figure 4 shows the recommended decoupling circuit for interfacing the output of the MPxx5004 to the A/D input of the microprocessor or microcontroller. Proper decoupling of the power supply is recommended.

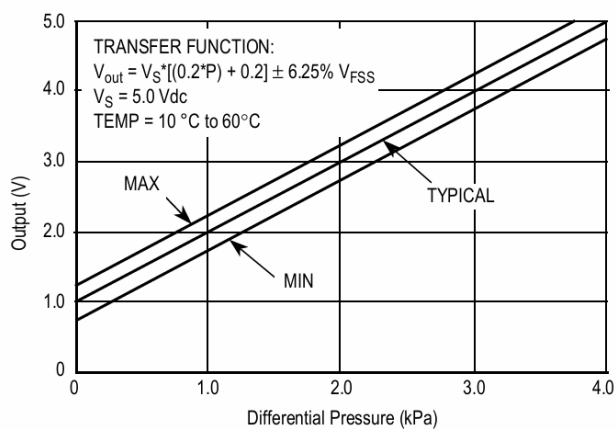
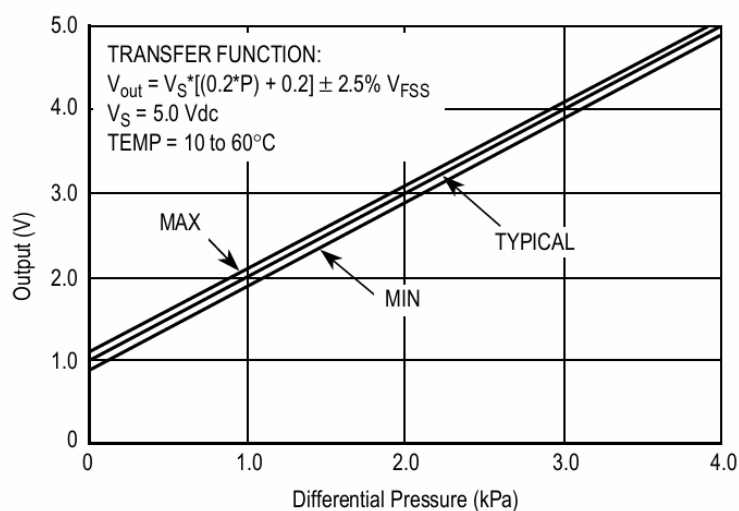
Typical, minimum and maximum output curves are shown for operation over a temperature range of 10 °C to 60 °C using the decoupling circuit shown in Figure 4. The output will saturate outside of the specified pressure range.

**Figure 3. Cross-sectional diagram (not to scale)**



**Figure 4. Recommended power supply decoupling and output filtering (For additional output filtering, please refer to AN1646.)**



**Figure 5. Output vs. pressure differential at  $\pm 6.25\%$  VFSS (without autozero, Table 3, note 5)**

**Figure 6. Output vs. pressure differential at  $\pm 2.5\%$  VFSS (with autozero, Table 3, note 5)**




## 5 Package information

### 5.1 Pressure (P1) / Vacuum (P2) side identification

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 silicone gel which isolates the die from the environment.

This pressure sensor is designed to operate with positive differential pressure applied,  $P_1 > P_2$ .

The pressure (P1) side may be identified by using the table below.

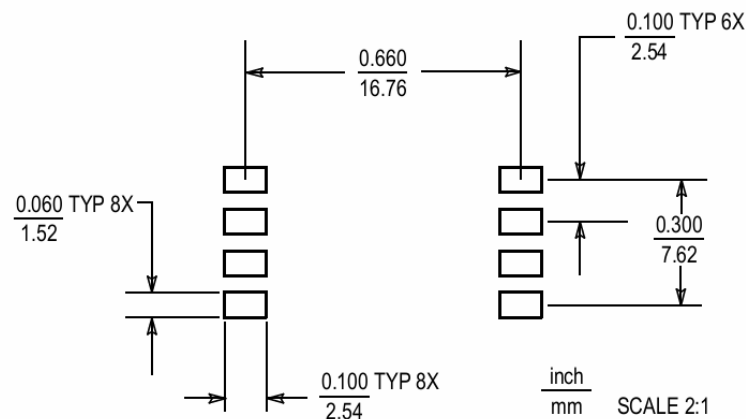
**Table 5. Pressure (P1) / Vacuum (P2) side identification table**

| Part number      | Case number | Pressure (P1) side identifier |
|------------------|-------------|-------------------------------|
| MPXV5004DP       | 98ASA99255D | Side with part marking        |
| MPXV5004GC6U/6T1 | 98ASB17757C | Side with port attached       |
| MPVZ5004G6U/6T1  | 98ASB17756C | Stainless steel cap           |
| MPVZ5004GW7U     | 98ASA10611D | Vertical port attached        |

### 5.2 Minimum recommended footprint for surface mounted applications

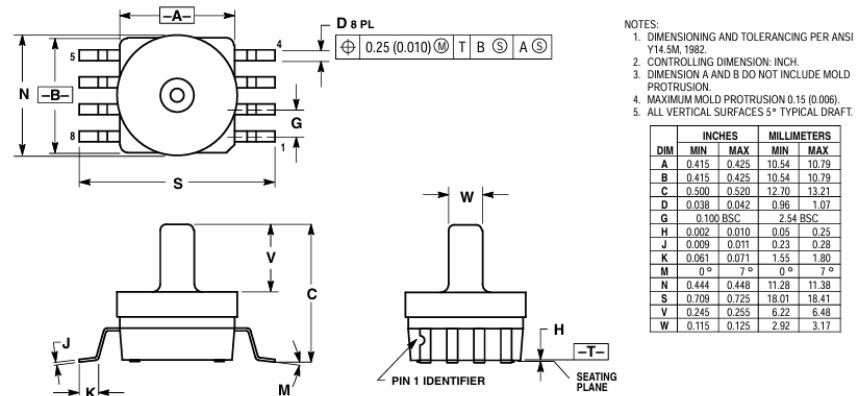
Surface mount board layout is a critical portion of the total design. The footprint for the surface mount packages must be the correct size to ensure proper solder connection interface between the board and the package. With the correct footprint, the packages will self align when subjected to a solder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

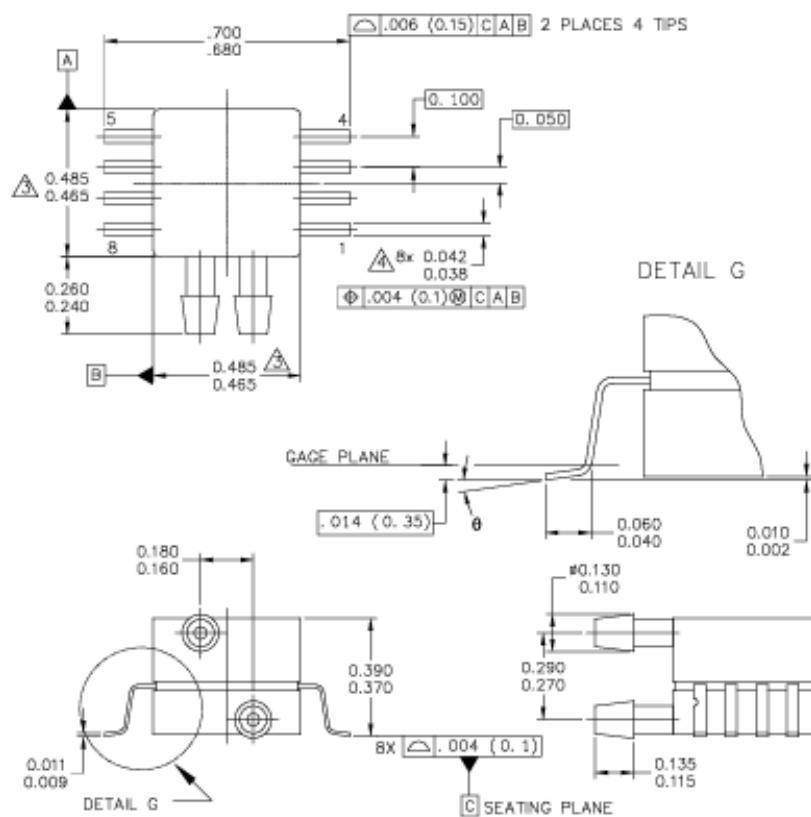
**Figure 7. SOP footprint (case 98ASB17756C)**



## 6 Package dimensions

Figure 8. Case 98ASB17757C, small outline package, through-hole



**Figure 9. Case 98ASA99255D, small outline package, surface mount**


|                                                         |                           |                            |
|---------------------------------------------------------|---------------------------|----------------------------|
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| TITLE:<br><br>8 LD SNSR, DUAL PORT                      | DOCUMENT NO: 98ASA99255D  | REV: A                     |
|                                                         | CASE NUMBER: 1351-01      | 27 JUL 2005                |
|                                                         | STANDARD: NON-JEDEC       |                            |



Figure 10. Case 98ASA99255D, small outline package, surface mount

## NOTES:

1. CONTROLLING DIMENSION: INCH

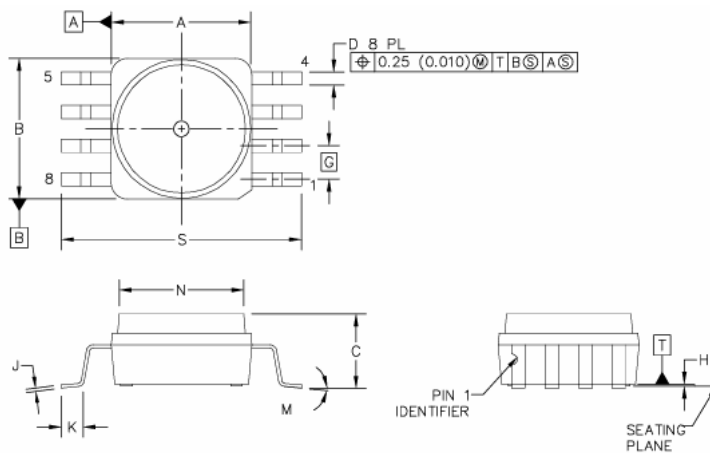
2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M-1994.

3. DIMENSIONS DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS.  
MOLD FLASH AND PROTRUSIONS SHALL NOT EXCEED .006 PER SIDE.

4. DIMENSION DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR  
PROTRUSION SHALL BE .008 MAXIMUM.

|                                                        |                          |                            |             |
|--------------------------------------------------------|--------------------------|----------------------------|-------------|
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| TITLE:<br><br>8 LD SNSR, DUAL PORT                     | DOCUMENT NO: 98ASA99255D |                            | REV: A      |
|                                                        | CASE NUMBER: 1351-01     |                            | 27 JUL 2005 |
|                                                        | STANDARD: NON-JEDEC      |                            |             |

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**Figure 11. Case 98ASB17756C, small outline package, surface mount**


| DIM | MILLIMETERS |       | INCHES |       |
|-----|-------------|-------|--------|-------|
|     | MIN         | MAX   | MIN    | MAX   |
| A   | 10.54       | 10.79 | 0.415  | 0.425 |
| B   | 10.54       | 10.79 | 0.415  | 0.425 |
| C   | 5.38        | 5.84  | 0.212  | 0.230 |
| D   | 0.96        | 1.07  | 0.038  | 0.042 |
| G   | 2.54        | BSC   | 0.100  | BSC   |
| H   | 0.05        | 0.25  | 0.002  | 0.010 |
| J   | 0.23        | 0.28  | 0.009  | 0.011 |
| K   | 1.55        | 1.80  | 0.061  | 0.071 |
| M   | 0°          | 7°    | 0°     | 7°    |
| N   | 10.29       | 10.54 | 0.405  | 0.415 |
| S   | 18.01       | 18.41 | 0.709  | 0.725 |

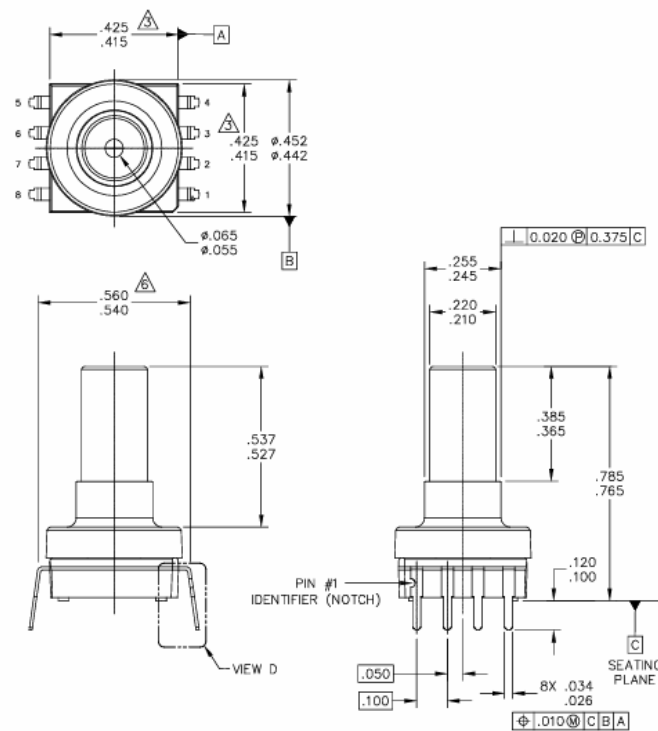
**NOTES:**

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994
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.

|                                                         |  |                          |                            |
|---------------------------------------------------------|--|--------------------------|----------------------------|
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| TITLE:<br><br>8 LD SENSOR SOP                           |  | DOCUMENT NO: 98ASB17756C | REV: A                     |
|                                                         |  | STANDARD: NON-JEDEC      |                            |
|                                                         |  |                          | 10 JAN 2013                |



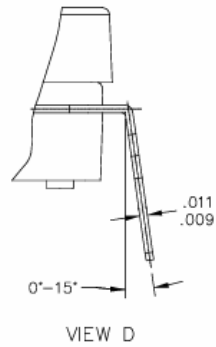
Figure 12. Case 98ASA10611D, small outline package



|                                                         |                          |                    |                            |
|---------------------------------------------------------|--------------------------|--------------------|----------------------------|
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| TITLE:<br>SO, 8 I/O, .420 X .420 PKG,<br>.100 IN PITCH  | DOCUMENT NO: 98ASA10611D |                    | REV: D                     |
|                                                         | CASE NUMBER: 1560-03     |                    | 25 FEB 2009                |
|                                                         | STANDARD: NON-JEDEC      |                    |                            |



Figure 13. Case 98ASA10611D, small outline package



|                                                         |                          |                            |  |
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| TITLE:<br>SO, 8 I/O, .420 X .420 PKG,<br>.100 IN PITCH  | DOCUMENT NO: 98ASA10611D | REV: D                     |  |
|                                                         | CASE NUMBER: 1560-03     | 25 FEB 2009                |  |
|                                                         | STANDARD: NON-JEDEC      |                            |  |

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Figure 14. Case 98ASA10611D, small outline package

NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M — 1994.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSIONS DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION IS .006.
5. ALL VERTICAL SURFACES 5° TYPICAL DRAFT.
6. DIMENSION TO CENTER OF LEAD WHEN FORMED PARALLEL.

|                                                            |  |                          |  |                            |  |
|------------------------------------------------------------|--|--------------------------|--|----------------------------|--|
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| TITLE:<br><br>SO, 8 I/O, .420 X .420 PKG,<br>.100 IN PITCH |  | DOCUMENT NO: 98ASA10611D |  | REV: D                     |  |
|                                                            |  | CASE NUMBER: 1560-03     |  | 25 FEB 2009                |  |
|                                                            |  | STANDARD: NON-JEDEC      |  |                            |  |





## Revision history

Table 6. Document revision history

| Date        | Revision | Changes                                         |
|-------------|----------|-------------------------------------------------|
| 22-Jul-2026 | 1        | Initial release from ST, rebranded NXP document |



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