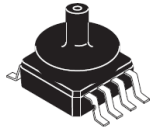
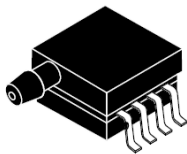


## 0 to 50 kPa, differential, and gauge pressure sensor

### Small outline package



**MP3V5050GC6U/6T1**  
Case 98ASB17757C



**MP3V5050GP**  
Case 98ASA99303D

### Features

- 2.5% maximum error over 0 °C to 85 °C
- Ideally suited for microprocessor or microcontroller-based systems
- Temperature compensated over -40 °C to +125 °C
- Patented silicon shear stress strain gauge
- Thermoplastic (PPS) surface mount package
- Multiple porting options for design flexibility
- Barbed side ports for robust tube connection

### Applications

- Pump/motor control
- Robotics
- Level detectors
- Medical diagnostics
- Pressure switching
- Blood pressure measurement

### Description

The MP3V5050 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.



## 1 Ordering information

**Table 1. Ordering information**

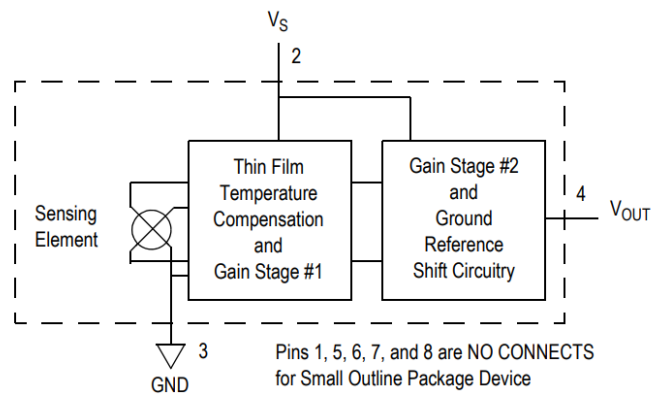
| Ordering information |          |             |            |        |      |               |              |          | Device marking |
|----------------------|----------|-------------|------------|--------|------|---------------|--------------|----------|----------------|
| Part number          | Shipping | Package     | # of Ports |        |      | Pressure Type |              |          |                |
|                      |          |             | None       | Single | Dual | Gauge         | Differential | Absolute |                |
| MP3V5050GP           | Tray     | 98ASA99303D |            | •      |      | •             |              |          | MP3V5050GP     |
| MP3V5050GC6U         | Rail     | 98ASB17757C |            | •      |      | •             |              |          | MP3V5050G      |
| MP3V5050GC6T1        | Reel     | 98ASB17757C |            | •      |      | •             |              |          | MP3V5050G      |

## 2 General Description

### Block diagram

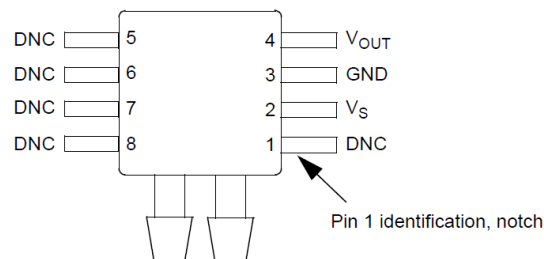
Figure 1 shows a block diagram of the internal circuitry integrated on a pressure sensor chip.

**Figure 1. Fully integrated pressure sensor block diagram**



### Pinout

**Figure 2. Device pinout (top view)**



**Table 2. Pin functions**

| Pin | Name             | Function                                                                   |
|-----|------------------|----------------------------------------------------------------------------|
| 1   | DNC              | Do not connect to external circuitry or ground. Pin 1 is denoted by notch. |
| 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. Maximum ratings<sup>(1)</sup>**

| Rating                     | Symbol           | Value       | Unit |
|----------------------------|------------------|-------------|------|
| Maximum pressure (P1 > P2) | P <sub>max</sub> | 200         | kPa  |
| Storage temperature        | T <sub>stg</sub> | -40 to +125 | °C   |
| Operating temperature      | T <sub>A</sub>   | -40 to +125 | °C   |

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

### 3.2 Operating characteristics

(V<sub>S</sub> = 3.0 V<sub>DC</sub>, T<sub>A</sub> = 25 °C unless otherwise noted, P1 > P2. Decoupling circuit shown in Figure 5 required to meet electrical specifications.)

**Table 4. Operating characteristics**

| Characteristic                                                                         | Symbol           | Min   | Typ  | Max   | Unit              |
|----------------------------------------------------------------------------------------|------------------|-------|------|-------|-------------------|
| Pressure range <sup>(1)</sup>                                                          | P <sub>OP</sub>  | 0     | —    | 50    | kPa               |
| Supply voltage <sup>(2)</sup>                                                          | V <sub>S</sub>   | 2.7   | 3.0  | 3.3   | V <sub>DC</sub>   |
| Supply current                                                                         | I <sub>O</sub>   | —     | 7.0  | 10    | mAdc              |
| Minimum pressure offset <sup>(3)</sup> (0 °C to 85 °C)<br>@ V <sub>S</sub> = 3.0 Volts | V <sub>OFF</sub> | 0.053 | 0.12 | 0.188 | V <sub>DC</sub>   |
| Full-scale output <sup>(4)</sup> (0 °C to 85 °C)<br>@ V <sub>S</sub> = 3.0 Volts       | V <sub>FSO</sub> | 2.752 | 2.8  | 2.888 | V <sub>DC</sub>   |
| Full-scale span <sup>(5)</sup> (0 °C to 85 °C)<br>@ V <sub>S</sub> = 3.0 Volts         | V <sub>FSS</sub> | —     | 2.7  | —     | V <sub>DC</sub>   |
| Accuracy <sup>(6)</sup> (0 °C to 85 °C)                                                | —                | —     | —    | ±2.5  | %V <sub>FSS</sub> |
| Sensitivity                                                                            | V/P              | —     | 54   | —     | mV/kPa            |
| Response time <sup>(7)</sup>                                                           | t <sub>R</sub>   | —     | 1.0  | —     | ms                |
| Output source current at full-scale output                                             | I <sub>O+</sub>  | —     | 0.1  | —     | mAdc              |
| Warm-up time <sup>(8)</sup>                                                            | —                | —     | 20   | —     | ms                |
| Offset stability <sup>(9)</sup>                                                        | —                | —     | ±0.5 | —     | %V <sub>FSS</sub> |

- 1.0 kPa (kilopascal) equals 0.145 psi.
- Device is ratiometric within this specified excitation range.
- Offset (V<sub>off</sub>) is defined as the output voltage at the minimum rated pressure.
- Full-scale Output (V<sub>FSO</sub>) is defined as the output voltage at the maximum or full-rated pressure.
- Full-scale Span (V<sub>FSS</sub>) 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 °C to 85 °C, relative to 25 °C.
  - TcOffset: Output deviation with minimum pressure applied, over the temperature range of 0 °C 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  $V_{FSS}$  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.

## 4 On-chip Temperature Compensation and Calibration

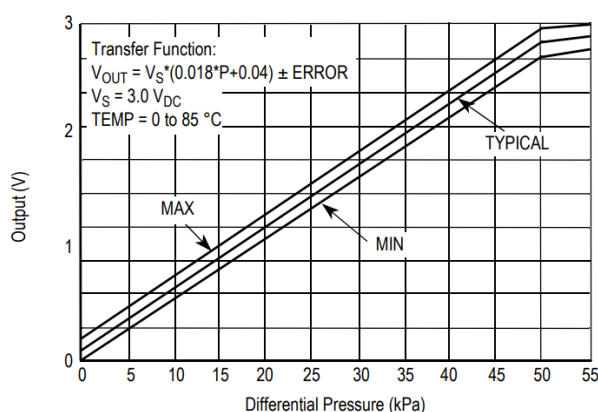
The MP3V5050 series pressure sensor operating characteristics, and internal reliability and qualification tests are based on use of dry air as the pressure media. Media, other than dry air, may have adverse effects on sensor performance and long-term reliability. Contact the factory for information regarding media compatibility in your application.

Figure 3 shows the sensor output signal relative to pressure input. Typical, minimum, and maximum output curves are shown for operation over a temperature range of 0 °C to 85 °C using the decoupling circuit shown in Figure 5. The output will saturate outside of the specified pressure range.

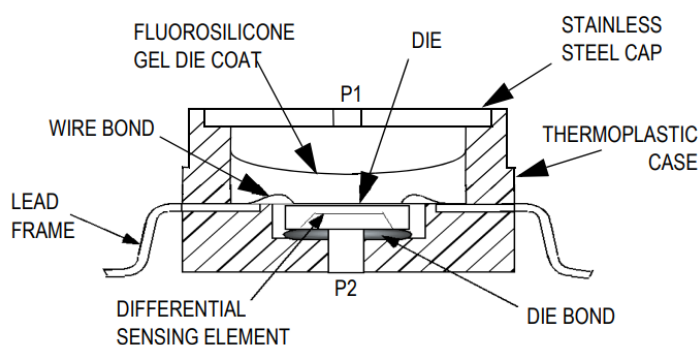
Figure 4 illustrates the Differential/Gauge Sensing Chip in the basic chip carrier (case 98ASB17757C). A fluorosilicone gel isolates the die surface and wire bonds from the environment, while allowing the pressure signal to be transmitted to the sensor diaphragm.

Figure 5 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.

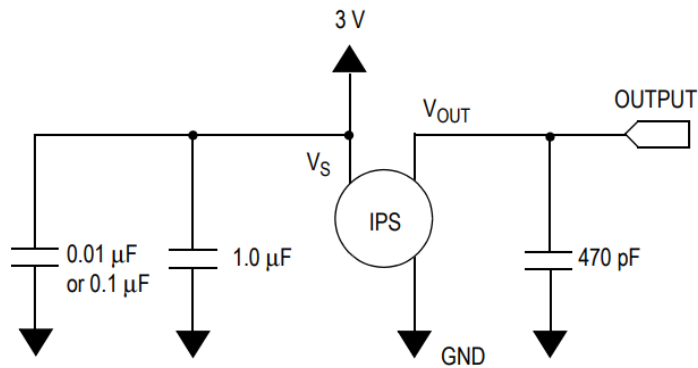
**Figure 3. Output versus Pressure differential**



**Figure 4. Cross-sectional diagram SOP (not to scale)**



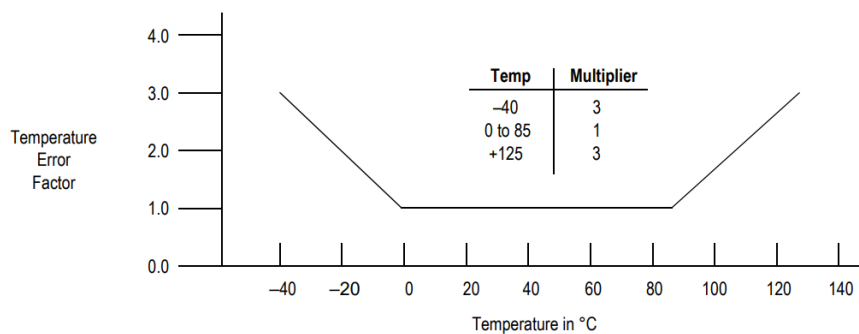
**Figure 5. Recommended power supply decoupling and output filtering (for additional output filtering, please refer to Application Note AN1646)**



**Figure 6. Transfer function**

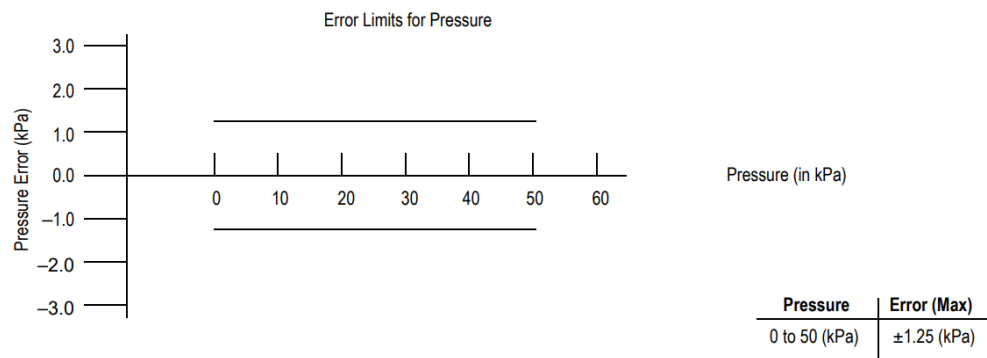
**Nominal Transfer Value:**  $V_{OUT} = V_S (P \times 0.018 + 0.04)$   
 $\pm (\text{Pressure Error} \times \text{Temp. Factor} \times 0.018 \times V_S)$   
 $V_S = 3.0 \text{ V} \pm 0.30 \text{ V}_{DC}$

**Figure 7. Temperature error band**



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

**Figure 8. Pressure error band**

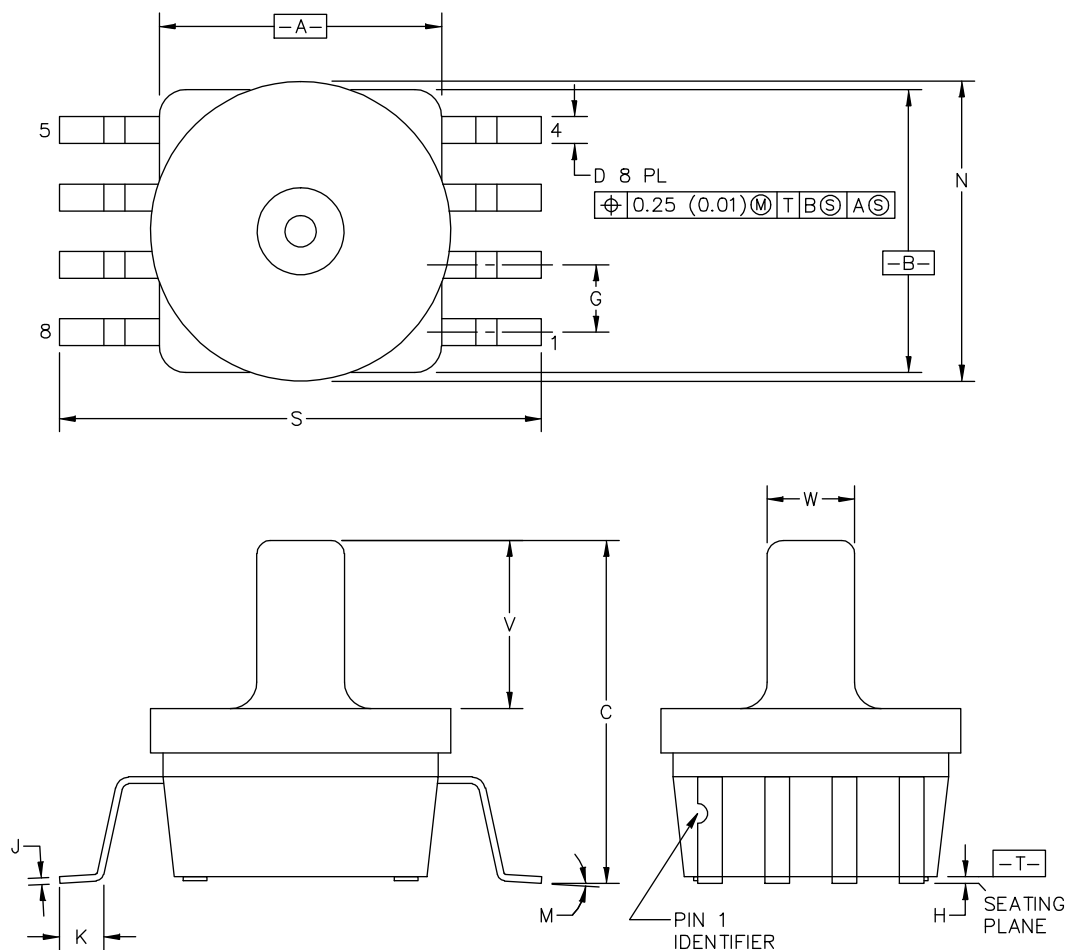




## 5.3 Package dimensions

Note: Trademark property of NXP, used by STMicroelectronics under license

Figure 10. Case 98ASB17757C, small outline package



|                                                                            |                          |                            |
|----------------------------------------------------------------------------|--------------------------|----------------------------|
| © NXP SEMICONDUCTORS N.V.<br>ALL RIGHTS RESERVED                           | MECHANICAL OUTLINE       | PRINT VERSION NOT TO SCALE |
| TITLE: SENSOR UNIBODY,<br>11.33 X 11.33 X 12.955 PKG,<br>2.54 PITCH, 8 I/O | DOCUMENT NO: 98ASB17757C | REV: C                     |
|                                                                            | STANDARD: NON-JEDEC      |                            |
|                                                                            | SOT1854-1                | 13 JUL 2017                |

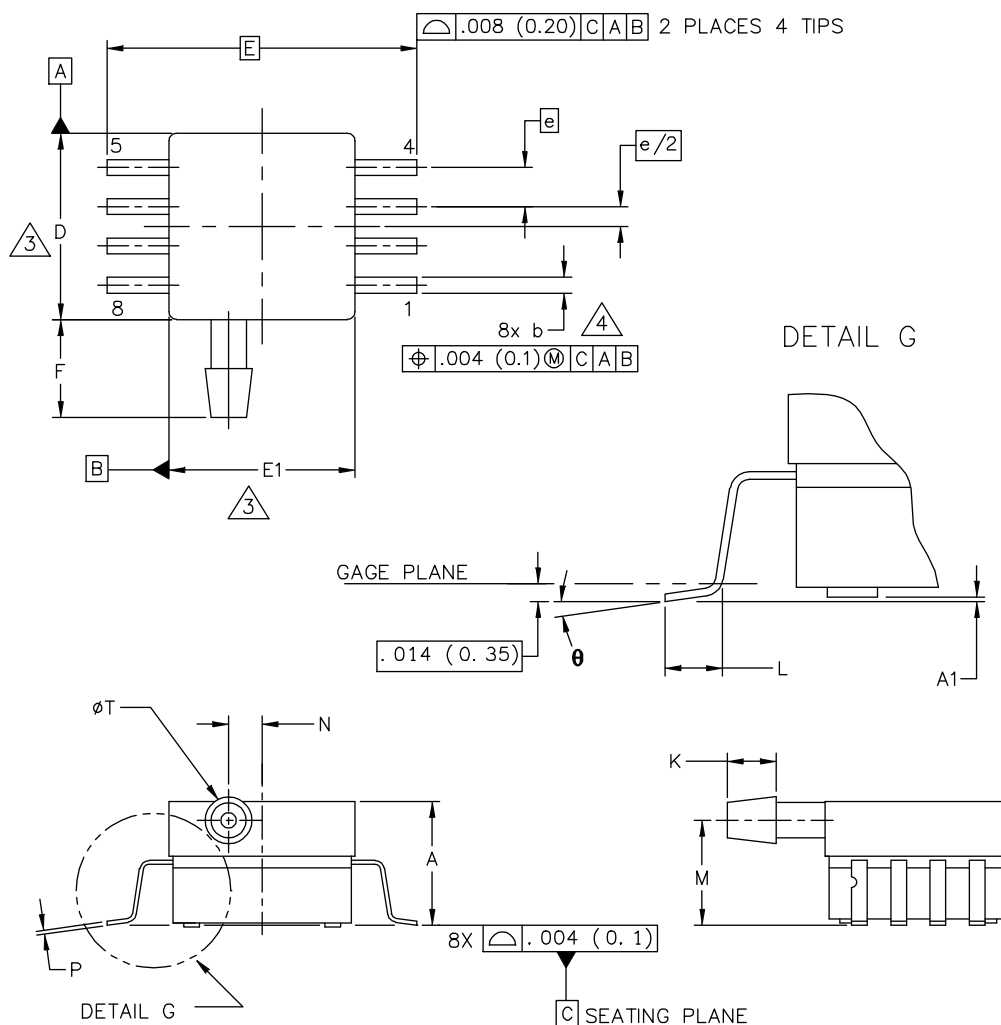
**Figure 11. Case 98ASB17757C, small outline package**

## NOTES:

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

| DIM                                                                        | INCHES |       | MILLIMETERS                     |       |                            |
|----------------------------------------------------------------------------|--------|-------|---------------------------------|-------|----------------------------|
|                                                                            | 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  |                            |
| © NXP SEMICONDUCTORS N.V.<br>ALL RIGHTS RESERVED                           |        |       | MECHANICAL OUTLINE              |       | PRINT VERSION NOT TO SCALE |
| TITLE: SENSOR UNIBODY,<br>11.33 X 11.33 X 12.955 PKG,<br>2.54 PITCH, 8 I/O |        |       | DOCUMENT NO: 98ASB17757C REV: C |       |                            |
|                                                                            |        |       | STANDARD: NON-JEDEC             |       |                            |
|                                                                            |        |       | SOT1854-1 13 JUL 2017           |       |                            |

**Figure 12. Case 98ASA99303D, small outline package**



|                                                  |                                      |                            |
|--------------------------------------------------|--------------------------------------|----------------------------|
| © NXP SEMICONDUCTORS N.V.<br>ALL RIGHTS RESERVED | MECHANICAL OUTLINE                   | PRINT VERSION NOT TO SCALE |
| TITLE:<br><br>8 LD SOP, SIDE PORT                | DOCUMENT NO: 98ASA99303D      REV: E |                            |
|                                                  | STANDARD: NON-JEDEC                  |                            |
|                                                  | SOT1693-3                            | 14 MAR 2016                |

**Figure 13. Case 98ASA99303D, small outline package**

## 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 (0.152) PER SIDE.

 4. DIMENSION DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR  
 PROTRUSION SHALL BE .008 (0.203) MAXIMUM.

| DIM                                               | INCHES   |      | MILLIMETERS        |       | DIM                                  | INCHES                     |             | MILLIMETERS |      |
|---------------------------------------------------|----------|------|--------------------|-------|--------------------------------------|----------------------------|-------------|-------------|------|
|                                                   | MIN      | MAX  | MIN                | MAX   |                                      | MIN                        | MAX         | MIN         | MAX  |
| A                                                 | .300     | .330 | 7.62               | 8.38  | Ø                                    | 0"                         | 7"          | 0"          | 7"   |
| A1                                                | .002     | .010 | 0.05               | 0.25  | —                                    | ----                       | ----        | ----        | ---- |
| b                                                 | .038     | .042 | 0.96               | 1.07  | —                                    | ----                       | ----        | ----        | ---- |
| D                                                 | .465     | .485 | 11.81              | 12.32 | —                                    | ----                       | ----        | ----        | ---- |
| E                                                 | .717 BSC |      | 18.21 BSC          |       | —                                    | ----                       | ----        | ----        | ---- |
| E1                                                | .465     | .485 | 11.81              | 12.32 | —                                    | ----                       | ----        | ----        | ---- |
| e                                                 | .100 BSC |      | 2.54 BSC           |       | —                                    | ----                       | ----        | ----        | ---- |
| F                                                 | .245     | .255 | 6.22               | 6.47  | —                                    | ----                       | ----        | ----        | ---- |
| K                                                 | .120     | .130 | 3.05               | 3.30  | —                                    | ----                       | ----        | ----        | ---- |
| L                                                 | .061     | .071 | 1.55               | 1.80  | —                                    | ----                       | ----        | ----        | ---- |
| M                                                 | .270     | .290 | 6.86               | 7.36  | —                                    | ----                       | ----        | ----        | ---- |
| N                                                 | .080     | .090 | 2.03               | 2.28  | —                                    | ----                       | ----        | ----        | ---- |
| P                                                 | .009     | .011 | 0.23               | 0.28  | —                                    | ----                       | ----        | ----        | ---- |
| T                                                 | .115     | .125 | 2.92               | 3.17  | —                                    | ----                       | ----        | ----        | ---- |
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| TITLE:<br><br>8 LD SOP, SIDE PORT                 |          |      |                    |       | DOCUMENT NO: 98ASA99303D      REV: E |                            |             |             |      |
|                                                   |          |      |                    |       | STANDARD: NON-JEDEC                  |                            |             |             |      |
|                                                   |          |      |                    |       | SOT1693-3                            |                            | 14 MAR 2016 |             |      |

## Revision history

**Table 6. Document revision history**

| Date        | Version | Changes                                         |
|-------------|---------|-------------------------------------------------|
| 14-May-2026 | 1       | Initial release from ST, rebranded NXP document |

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