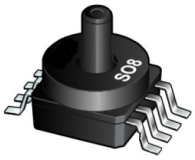
MPXV7007DP, MPXV7007GC6, MPXV7007GP

Datasheet

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

MPXV7007DP
CASE 1351-01
SOT1693-1



MPXV7007GC6U
CASE 482A-01
SOT1854-1

MPXV7007GP
CASE 1369-01
SOT1693-3

Features

- Ideally suited for microprocessor or microcontroller-based systems
- Temperature compensated over –40 °C to +125 °C
- Thermoplastic (PPS) surface mount package
- Patented silicon shear stress strain gauge
- Available in differential and gauge configurations

Applications

- Hospital beds
- HVAC
- Respiratory systems
- Process control

Description

The MPXV7007 series piezoresistive transducers are monolithic silicon pressure sensors. The MPXV7007 is designed for a wide range of applications, particularly applications employing a microcontroller, or microprocessor with analog-to-digital 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

Type number	Package		
	Name	Description	Version
MPXV7007DP	SO8	Plastic, small outline package, 8 terminals, 2.54 mm pitch, 12.06 mm x 12.06 mm x 7.62 mm body	SOT1693-1
MPXV7007GC6U	SO8	Plastic, small outline package, 8 terminals, 2.54 mm pitch, 10.67 mm x 10.67 mm x 12.96 mm body	SOT1854-1
MPXV7007GP	SO8	Plastic, small outline package, 8 terminals, 2.54 mm pitch, 12.06 mm x 12.06 mm x 8.38 mm body	SOT1693-3

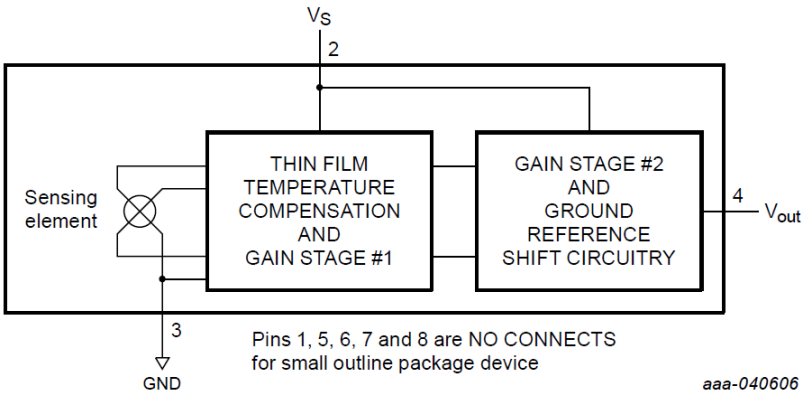
1.1 Ordering options

Table 2. Ordering options

Device name	Package options	SOT no.	# of Ports			Pressure type			Device marking
			None	Single	Dual	Gauge	Differential	Absolute	
Small Outline Package									
MPXV7007DP	Trays	1693-1			•		•		MPXV7007DP
MPXV7007GC6U	Rails	1854-1		•		•			MPXV7007G
MPXV7007GP	Trays	1693-3		•		•			MPXV7007GP

2 Block diagram

Figure 1. **Integrated pressure sensor schematic**



3 Pinning information

3.1 Pinning

Figure 2. **MPXV7007DP pin diagram**

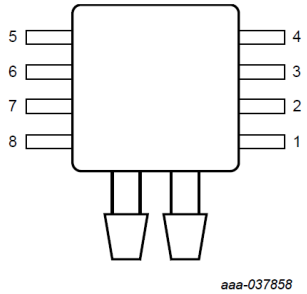


Figure 3. **MPXV7007GC6U pin diagram**

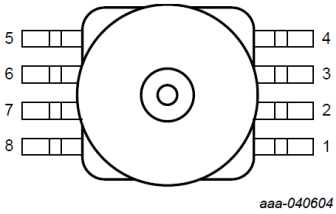
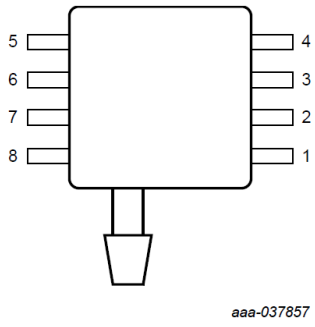


Figure 4. **MPXV7007GP pin diagram**



3.2 Pin description

This device family uses the style 2 pin configuration documented in Table 3 and shown in Figure 13.

Table 1. Pin description

Symbol	Pin[1]	Description
n.c.	1	—[2]
V_s	2	Supply voltage
GND	3	Ground
V_{out}	4	Voltage output
n.c.	5	—[2]
n.c.	6	—[2]
n.c.	7	—[2]
n.c.	8	—[2]

1. The notch in the lead indicates pin 1.
2. Internal device connection. Do not connect to external circuitry or ground

4 Maximum ratings

Table 4. Maximum ratings[1]

Rating	Symbol	Value	Unit
Maximum pressure	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.

5 Operating characteristics

Table 5. Operating characteristics)

(V_S = 5.0 Vdc, T_A = 25 °C unless otherwise noted. Decoupling circuit shown in Figure 7 required to meet specification.

Characteristic	Symbol	Min	Typ	Max	Unit
Pressure range[1]	P_{OP}	–7	—	7	kPa
Supply voltage[2]	V_S	4.75	5.0	5.25	Vdc
Supply current	I_o	—	7.0	10	mAdc
Minimum pressure offset[3] (0 °C to 85 °C) @ V_S = 5.0 Volts	V_{off}	0.33	0.5	0.67	Vdc
Full scale output[4] (0 °C to 85 °C) @ V_S = 5.0 Volts	V_{FSO}	4.3	4.5	4.7	Vdc
Full scale span[5] (0 °C to 85 °C) @ V_S = 5.0 Volts	V_{FSS}	—	4.0	—	Vdc
Accuracy[6] (0 °C to 85 °C)	—	—	—	±5.0	$\%V_{FSS}$
Sensitivity	V/P	—	286	—-	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 °C to 85 °C, relative to 25 °C.
   - TcOffset: Output deviation with minimum rated 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 output deviation of the product when subjected to 1000 hours of pulsed pressure, temperature cycling with bias test.

6 Characteristics

6.1 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 5 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 MPXV7007 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 6 shows the recommended decoupling circuit for interfacing the integrated sensor to the analog-to-digital input of a microprocessor or microcontroller. Proper decoupling of the power supply is recommended.

Figure 7 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 6. The output saturates outside the specified pressure range.

Figure 5. Cross-Sectional Diagram SOP (not to scale)

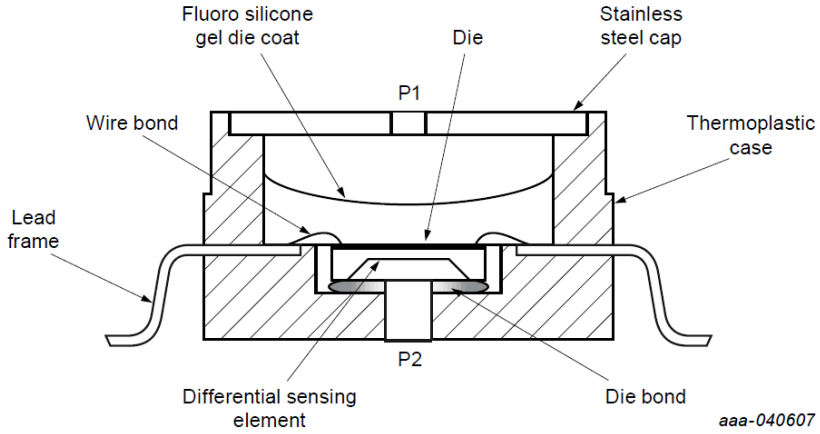


Figure 6. Recommended Power Supply Decoupling and Output Filtering

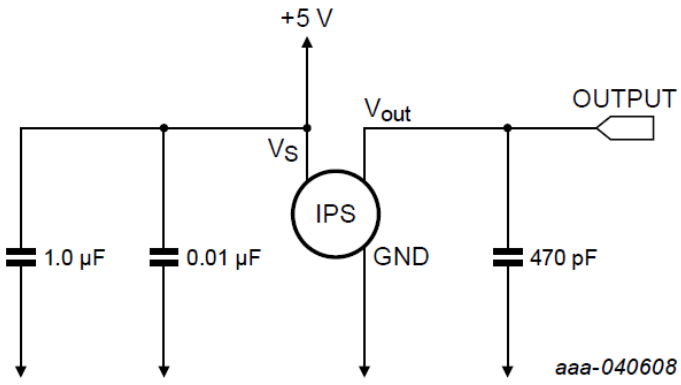


Figure 7. Output versus Pressure Differential

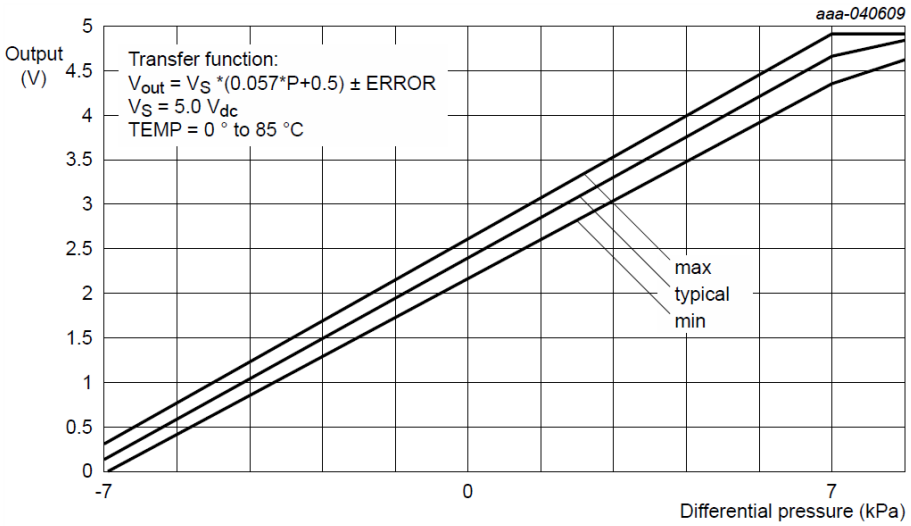


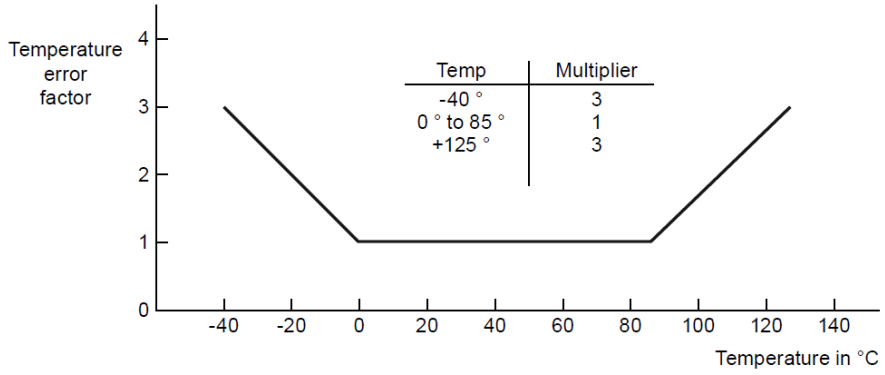
Figure 8. Transfer function

Nominal transfer value:

$V_{out} = V_S \times (0.057 \times P + 0.5) \pm (\text{Pressure Error} \times \text{Temp. Factor} \times 0.057 \times V_S)$

$V_S = 5.0\ V \pm 0.25\ Vdc$

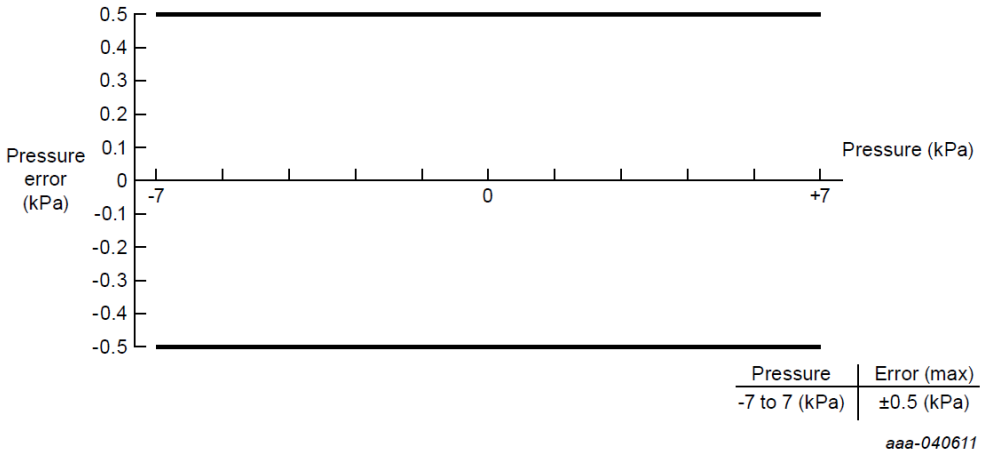
Figure 9. Temperature error band



Note: The temperature multiplier is a linear response from 0 ° to -40 °C and from 85 ° to 125 °C.

aaa-040610

Figure 10. **Pressure error band**



6.2 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 P1 side is the side containing fluoro silicone gel which protects the die from harsh media. The pressure sensor is designed to operate with both positive and negative differential pressure applied, P1 > P2 or P1 < P2.

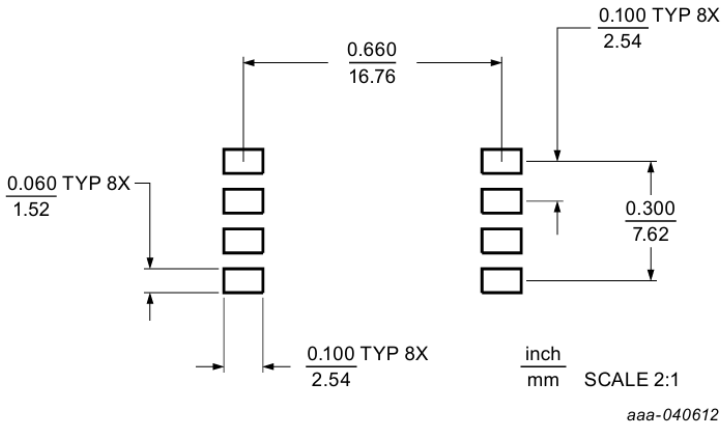
The P1 side may be identified by using the following table.

Part number	Case type	Pressure (P1) Side identifier
MPXV7007GC6U	482A	Side with port attached
MPXV7007GP	1369	Side with port attached
MPXV7007DP	1351	Side with part marking

6.3 Minimum recommended footprint for surface-mounted applications

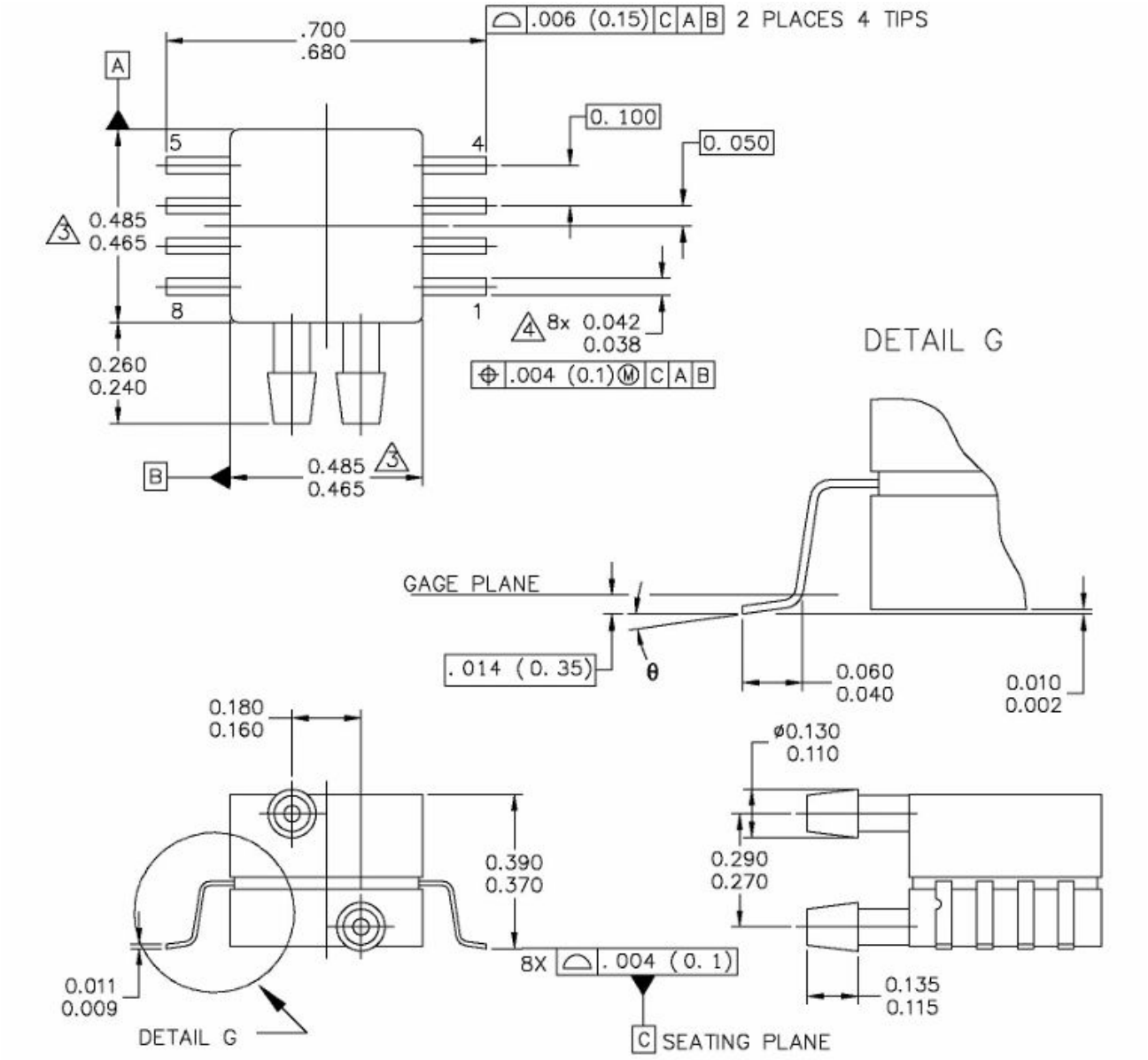
Surface mount board layout is a critical portion of the total design. The footprint for the surface mount packages must be the correct size to ensure proper solder connection interface between the board and the package. With the correct footprint, the packages self-align when subjected to a solder reflow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

Figure 11. **Small Outline Package Footprint**



7 Package outline

Figure 12. **SOT1693-1, 8 Lead sensor, dual port package outline, 98ASA99255D, Rev. B**



	MECHANICAL OUTLINE	PRINT VERSION NOT TO SCALE
TITLE: 8 LD SNSR, DUAL PORT	DOCUMENT NO: 98ASA99255D	REV: B
	STANDARD: NON-JEDEC	
	SOT1693-1	14 MAR 2016

Figure 13. SOT1693-1, 8 Lead sensor, dual port package outline notes, 98ASA99255D, Rev. B

NOTES:

1. CONTROLLING DIMENSION: INCH

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

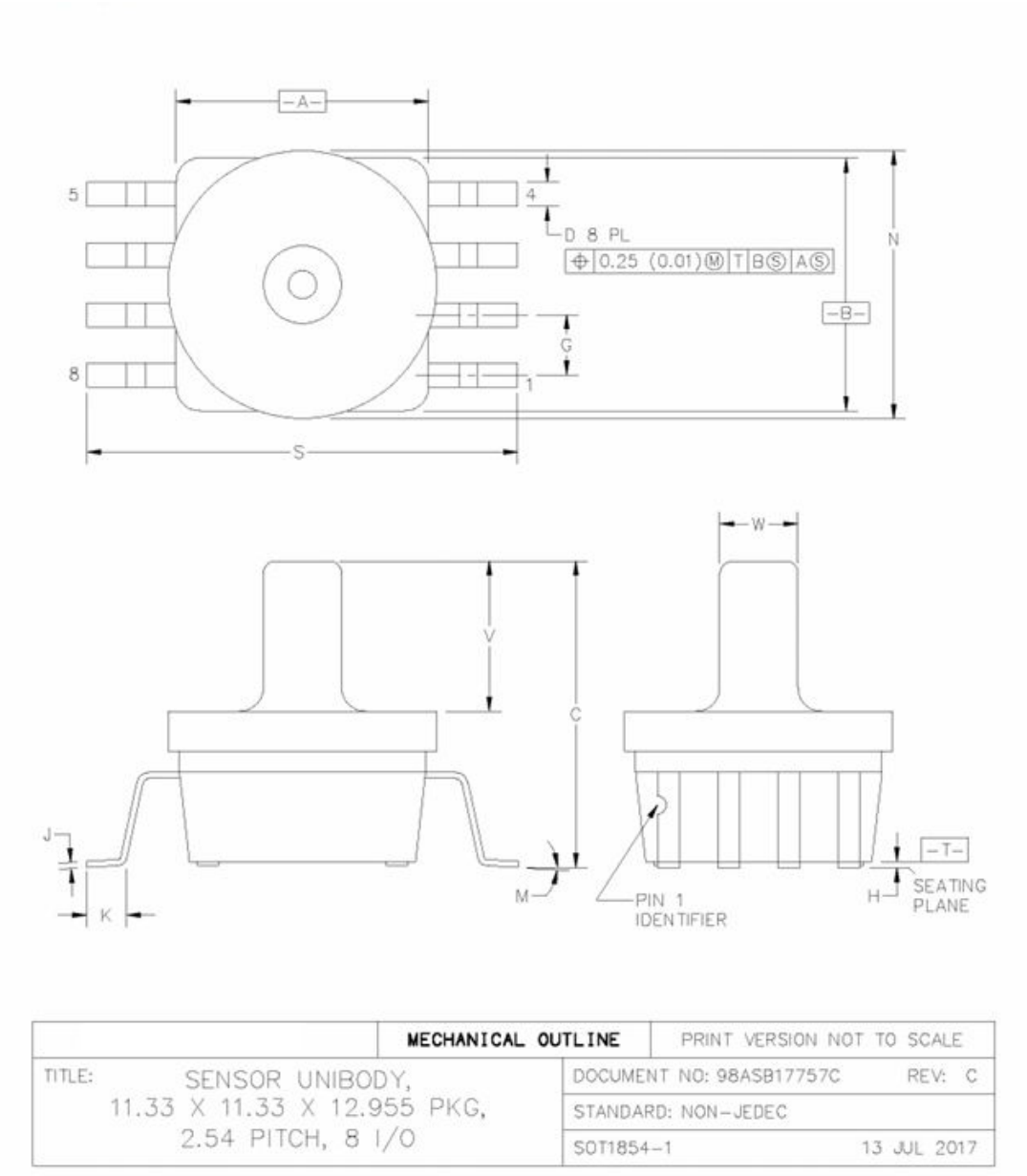
3. DIMENSIONS DO NOT INCLUDE MOLD FLASH OR PPROTRUSIONS.
MOLD FLASH AND PROTRUSIONS SHALL NOT EXCEED .006 PER SIDE.

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

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

	MECHANICAL OUTLINE	PRINT VERSION NOT TO SCALE
TITLE: 8 LD SNSR, DUAL PORT	DOCUMENT NO: 98ASA99255D	REV: B
	STANDARD: NON–JEDEC	
	SOT1693–1	14 MAR 2016

Figure 14. **SOT1854-1, Unibody sensor package outline, 98ASB17757C, Rev. C**



	MECHANICAL OUTLINE	PRINT VERSION NOT TO SCALE
TITLE: SENSOR UNIBODY, 11.33 X 11.33 X 12.955 PKG, 2.54 PITCH, 8 I/O	DOCUMENT NO: 98ASB17757C	REV: C
	STANDARD: NON-JEDEC	
	SOT1854-1	13 JUL 2017

Figure 15. SOT1854-1, Unibody sensor package outline notes, 98ASB17757C, Rev. C

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.

	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

MECHANICAL OUTLINE — PRINT VERSION NOT TO SCALE

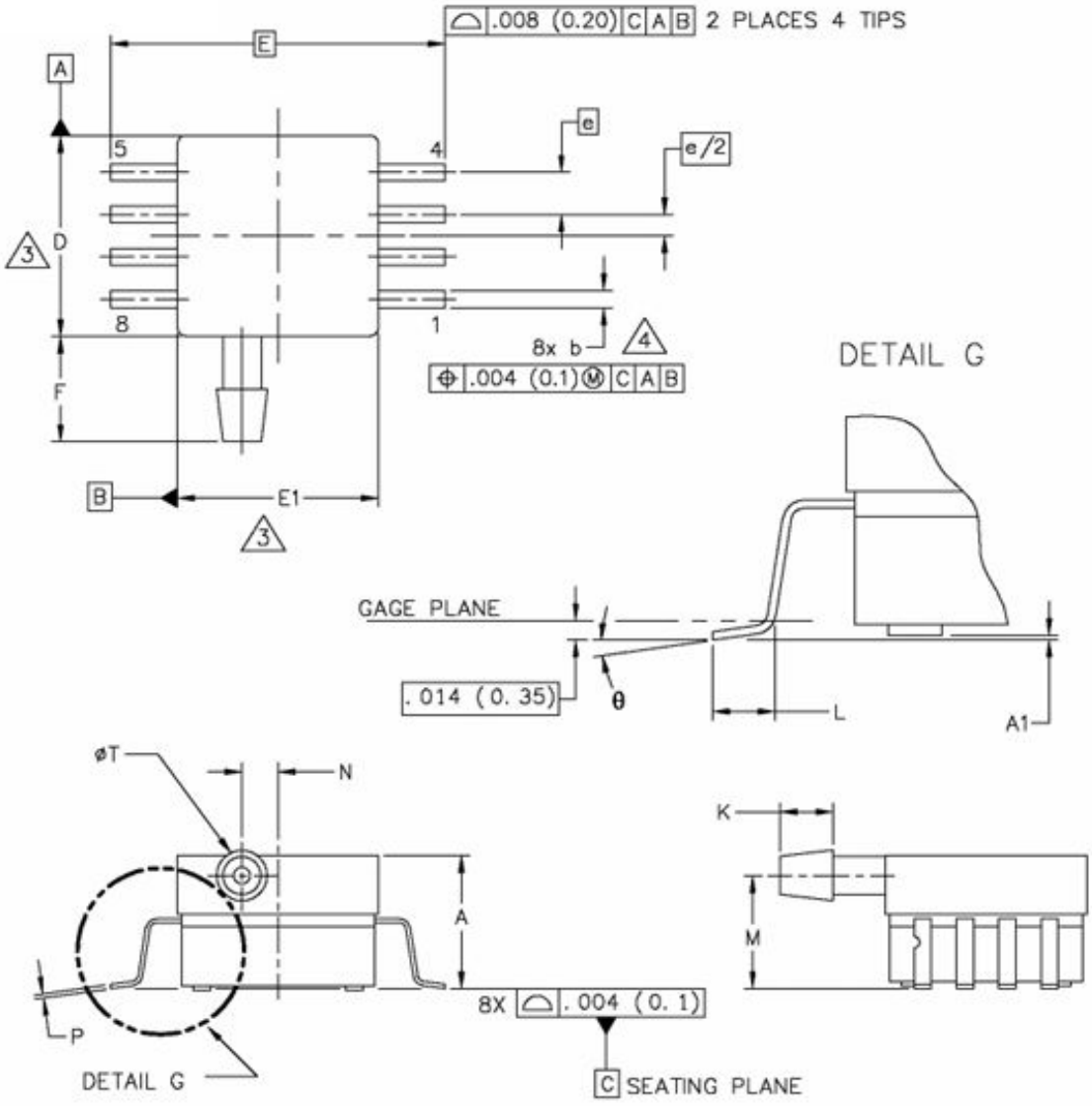
TITLE: SENSOR UNIBODY, 11.33 X 11.33 X 12.955 PKG, 2.54 PITCH, 8 I/O

DOCUMENT NO: 98ASB17757C REV: C

STANDARD: NON–JEDEC

SOT1854–1 13 JUL 2017

Figure 16. **SOT1693-3, 8 Lead SOP, Side port package out line, 98ASA99303D, Rev. E**



	MECHANICAL OUTLINE	PRINT VERSION NOT TO SCALE
TITLE: 8 LD SOP, SIDE PORT	DOCUMENT NO: 98ASA99303D	REV: E
	STANDARD: NON-JEDEC	
	SOT1693-3	14 MAR 2016

Figure 17. SOT1693-3, 8 Lead SOP, Side port package out line notes, 98ASA99303D, Rev. E

NOTES:
1. CONTROLLING DIMENSION: INCH

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

3. DIMENSIONS DO NOT INCLUDE MOLD FLASH OR PPROTRUSIONS.
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 MIN	INCHES MAX	MILLIMETERS MIN	MILLIMETERS MAX	DIM	INCHES MIN	INCHES MAX	MILLIMETERS MIN	MILLIMETERS MAX
A	.300	.330	7.62	8.38	θ	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	–	---	---	---	---

	MECHANICAL OUTLINE	PRINT VERSION NOT TO SCALE
TITLE: 8 LD SOP, SIDE PORT	DOCUMENT NO: 98ASA99303D	REV: E
	STANDARD: NON-JEDEC	
	SOT1693-3	14 MAR 2016

Revision history

Table 2. **Document revision history**

Date	Revision	Changes
24-Jun-2026	1	Initial release from ST, rebranded NXP document

Contents