MPX5010xx, MPXV5010xx, MPVZ5010xxx

Datasheet

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

Features

- 5.0% maximum error over 0° to 85°C
- Ideally suited for microprocessor or microcontroller-based systems
- Durable epoxy unibody and thermoplastic (PPS) surface mount package
- Temperature compensated over –40° to +125°C
- Patented silicon shear stress strain gauge
- Available in differential and gauge configurations
- Available in surface mount (SMT) or through-hole (DIP) configurations

Applications

- Hospital beds
- Respiratory systems
- Process control
- Washing machine water level measurement (Reference AN1950)
- Ideally suited for microprocessor or microcontroller-based systems
- Appliance liquid level and pressure measurement

Description

The MPxx5010 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. The axial port has been modified to accommodate industrial grade tubing.

1 Ordering information

Table 1. Ordering information

Type number	Package		
	Name	Description	Version
Unibody package (MPX5010 series)			
MPX5010DP	SENSOR4F	sensor package, 6 terminals, 2.54 mm pitch, 17.78 mm x 29.48 mm x 10.67 body	SOT1756-1
MPX5010GP	SENSOR6F	sensor package, 6 terminals, 2.54 mm pitch, 17.78 mm x 29.47 mm x 8.01 mm body	SOT1852-1
Small outline package (MPXV5010 series)			
MPXV5010DP	S08	plastic, small outline package, 8 terminals, 2.54 mm pitch, 12.06. mm x 12.06 mm x 7.62 mm body	SOT1693-1
MPXV5010GC6T1	S08	plastic, small outline package, 8 terminals, 2.54 mm pitch, 10.67. mm x 10.67 mm x 12.96 mm body	SOT1854-1
MPXV5010GC7U	S08	plastic, small outline package, 8 terminals, 2.54 mm pitch, 10.67. mm x 10.67 mm x 12.96 mm body	SOT1863-1
MPXV5010GP	S08	plastic, small outline package, 8 terminals, 2.54 mm pitch, 12.06. mm x 12.06 mm x 7.62 mm body	SOT1693-3
Small outline package (Media resistant gel) (MPVZ5010 series)			
MPVZ5010GW6U	S08	plastic, small outline package, 8 terminals, 2.54 mm pitch, 1.07 mm x 1.07 mm x 1.99 mm body	SOT1691-2
MPVZ5010GW7U	S08	plastic, small outline package, 8 terminals, 2.54 mm pitch, 1.07 mm x 1.07 mm x 1.99 mm body	SOT1691-1

1.1 Ordering options

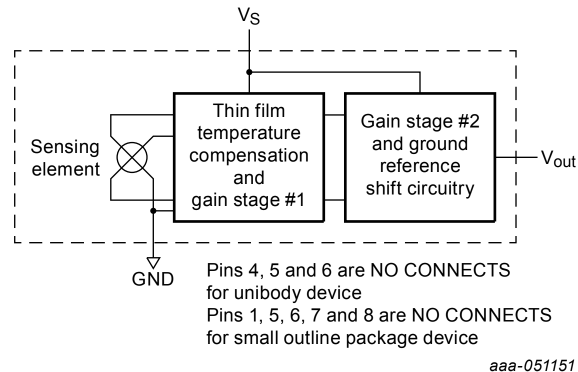
Table 2. Ordering options

ORDERING INFORMATION								
Device Name	Case No.	None	Single	Dual	Gauge	Differential	Absolute	Device Marking
		# of Ports			Pressure Type			
Unibody Package (MPX5010 Series)								
MPX5010DP	867C			•		•		MPX5010DP
MPX5010GP	867B		•		•			MPX5010GP
Small Outline Package (MPXV5010 Series)								
MPXV5010DP	1351			•		•		MPXV5010DP
MPXV5010GC6T1	482A		•		•			MPXV5010G
MPXV5010GC7U	482C		•		•			MPXV5010G
MPXV5010GP	1369		•		•			MPXV5010GP
Small Outline Package (Media Resistant Gel) (MPVZ5010 Series)								
MPVZ5010GW6U	1735		•		•			MZ5010GW
MPVZ5010GW7U	1560		•		•			MZ5010GW

2 Block diagram

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

Figure 1. Fully Integrated Pressure Sensor Schematic



3 Pinning information

3.1 Pinning - Unibody packages

Figure 2. MPX5010DP - SOT1756-1 - Case 867C-05

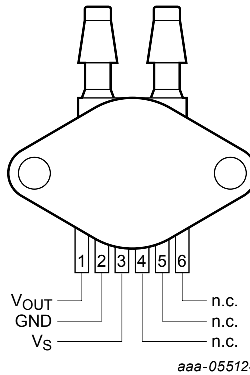
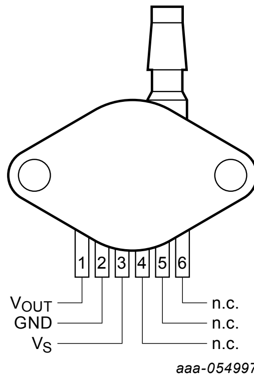


Figure 3. MPX5010GP - SOT1852-1 - Case 867B-04



3.2 Pin description - Unibody packages

This table defines the pin configuration for the Unibody packages identified in Table 1.

Table 3. Pin descriptions - Unibody pacakages

Symbol	Pin	Description
VOUT	1	VOUT
GND	2	Ground
V_S	3	Supply voltage
N.C.	4	No connect
N.C.	5	No connect
N.C.	6	No connect

3.3 Pinning - Small Outline packages

Figure 4. MPXV5010DP - SOT1693-1 - Case 1351-01

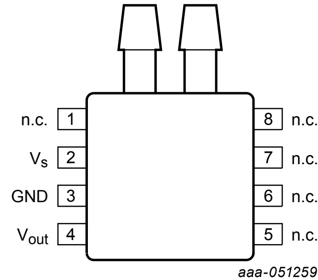


Figure 5. MPXV5010GC6T1- SOT1854-1 - Case 482A-01

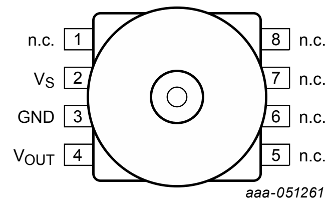


Figure 6. MPXV5010GC7U - SOT1863-1 - Case 482C-03

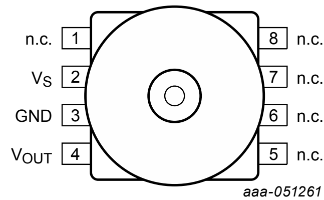


Figure 7. MPXV5010GP - SOT1693-3 - Case 1369-01

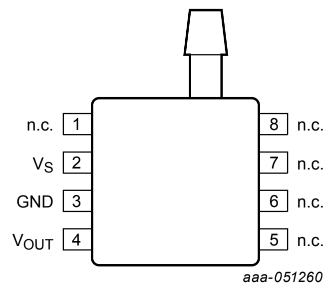


Figure 8. MPVZ5010GW6U - SOT1691-2 - Case 1735-01

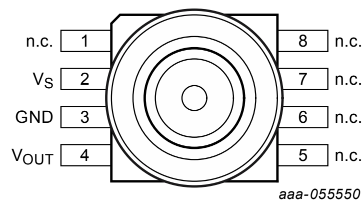
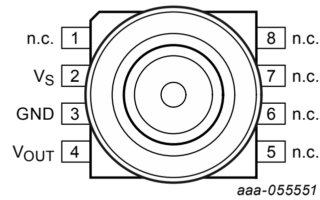


Figure 9. **MPVZ5010GW7U - SOT1691-1 - Case 1560-02**



3.4 Pin description - Small Outline packages

This table defines the pin configuration for the Small Outline packages identified in Table 1.

Table 4. **Pin descriptions - Small Outline packages**

Symbol	Pin	Description
N.C.	1	No connect
V_S	2	Supply voltage
GND	3	Ground
VOUT	4	VOUT
N.C.	5	No connect
N.C.	6	No connect
N.C.	7	No connect
N.C.	8	No connect

4 Limiting values

Table 5. Limiting values

Rating	Symbol	Value	Unit
Maximum Pressure (P1 > P2)	P_{max}	40	kPa
Storage Temperature	T_{stg}	–40 to +125	°C
Operating Temperature	T_A	–40 to +125	°C

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

5 Recommended operating conditions

V_S = 5.0 Vdc, T_A = 25°C unless otherwise noted, P1 > P2. Decoupling circuit shown in Figure 11 required to meet specification.

Table 6. Recommended operating conditions

Characteristic	Symbol	Min	Typ	Max	Unit
Pressure Range	P_{OP}	0	—	10 1019.78	kPa mm H_2O
Supply Voltage[(1)]	V_S	4.75	5.0	5.25	Vdc
Supply Current	I_o	—	5.0	10	mAdc
Minimum Pressure Offset[(2)] (0 to 85°C) @V_S=5.0 Volts	V_{off}	0	0.2	0.425	Vdc
Full Scale Output[(3)](0 to 85°C) @V_S=5.0 Volts	V_{FSO}	4.475	4.7	4.925	Vdc
Full Scale Span[(4)] (0 to85°C) @V_S=5.0 Volts	V_{FSS}	4.275	4.5	4.725	Vdc
Accuracy[(5)] (0 to85°C)	—	—	—	±5.0	%V_{FSS}
Sensitivity	V/P	—	450 4.413	—	mV/kPa mV/kPA H_2O
Response Time[(6)]	t_R	—	1.0	—	ms
Output Source Current at Full Scale Output	I_{O+}	—	0.1	—	mAdc
Warm-Up Time[(7)]	—	—	20	—	ms
Offset Stability[(8)]	—	—	± 0.5	—	%V_{FSS}

1. *Device is ratiometric within this specified excitation range.*
2. *Offset (V_{off}) is defined as the output voltage at the minimum rated pressure.*
3. *Full Scale Output (V_{FSO}) is defined as the output voltage at the maximum or full rated pressure.*
4. *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.*
5. *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 V_{FSS}, at 25°C.
6. *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. *Warm-up Time is defined as the time required for the product to meet the specified output voltage after the Pressure has been stabilized.*
8. *Offset Stability is the product's output deviation when subjected to 1000 hours of Pulsed Pressure, Temperature Cycling with Bias Test.*

6 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 10 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 MPxx5010G 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 11 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 12 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 11. The output will saturate outside of the specified pressure range.

Figure 10. Cross-sectional diagram SOP (not to scale)

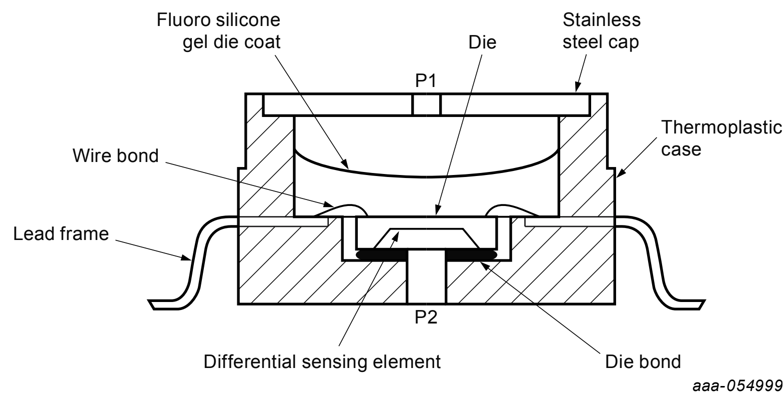
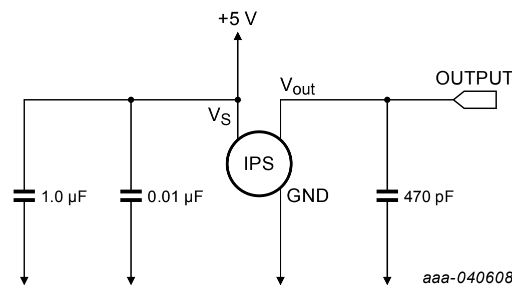
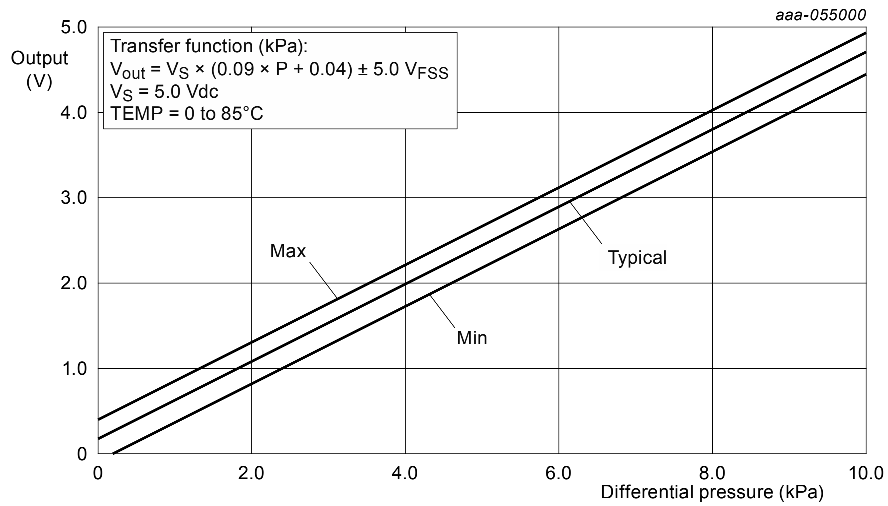


Figure 11. Recommended power supply decoupling and output filtering



Note: For additional output filtering, please refer to Application Note AN1646.

Figure 12. **Output vs. Pressure Differential**



Nominal Transfer Value:

$V_{OUT} = V_S \times (0.09 \times P + 0.04) \pm (Pressure\ error \times Temp.factor \times 0.09\, V_S)$

$V_S = 5.5V \pm 0.25Vdc$

Figure 13. **Temperature error band**

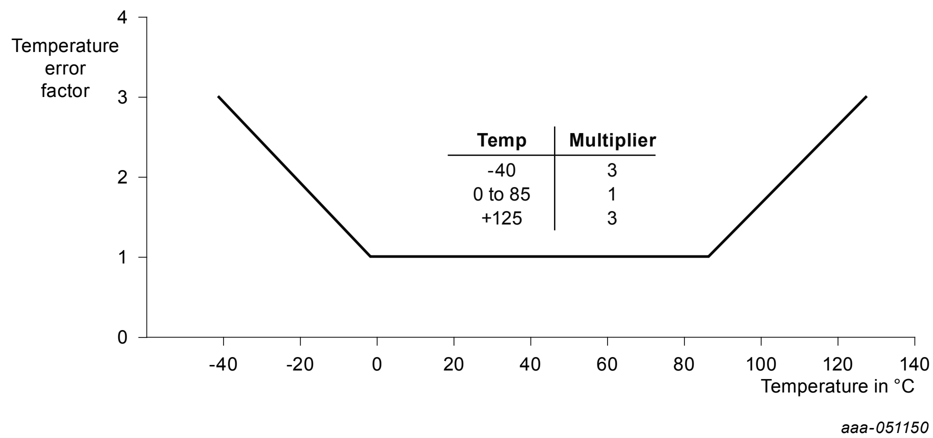
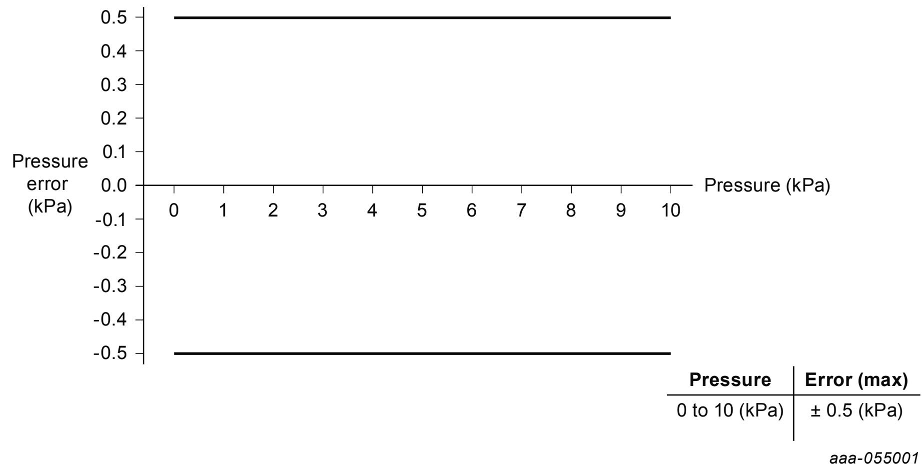


Figure 14. Pressure error band



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

The Pressure (P1) side may be identified by using Table 7.

Table 7. Pressure(P1) side identification

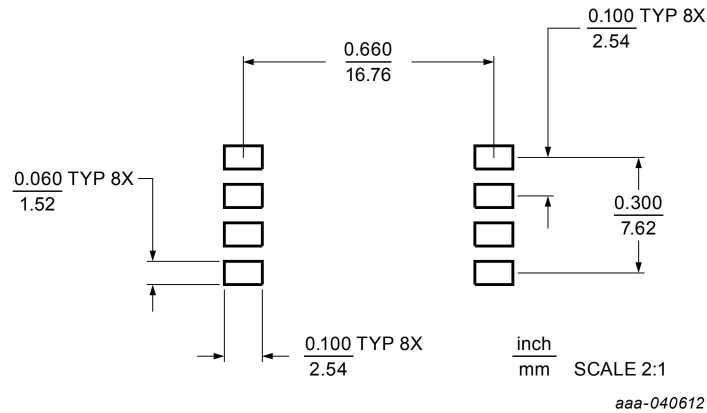
Part Number	Case Type	Pressure (P1) Side Identifier
MPX5010DP	867C	Side with Part Marking
MPX5010GP	867B	Side with Port Attached
MPXV5010DP	1351	Side with Part Marking
MPXV5010GC6T1	482A	Side with Port Attached
MPXV5010GC7U	482C	Side with Port Attached
MPXV5010GP	1369	Side with Port Attached
MPVZ5010GW6U	1735	Vertical Port Attached
MPVZ5010GW7U	1560	Vertical Port Attached

8 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 15. SOP Footprint (Case 482)



9 Package outline

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

Figure 16. **SOT1691-1 Package Outline**

© NXP SEMICONDUCTORS N.V. ALL RIGHTS RESERVED	MECHANICAL OUTLINE	PRINT VERSION NOT TO SCALE
TITLE: SO, 8 I/O, .420 X .420 PKG, .100 IN PITCH	DOCUMENT NO: 98ASA10611D	REV: E
	STANDARD: NON-JEDEC	
	SOT1691-1	15 JAN 2016

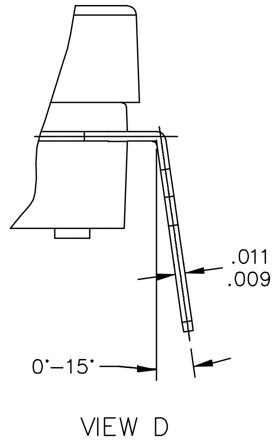


Figure 17. SOT1691-1 Package Outline Detail

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TITLE: SO, 8 I/O, .420 X .420 PKG, .100 IN PITCH	DOCUMENT NO: 98ASA10611D	REV: E
	STANDARD: NON-JEDEC	
	SOT1691-1	15 JAN 2016

Figure 18. **SOT1691-1 Package Outline Notes**

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: SO, 8 I/O, .420 X .420 PKG, .100 IN PITCH	DOCUMENT NO: 98ASA10611D	REV: E
	STANDARD: NON—JEDEC	
	SOT1691—1	15 JAN 2016

Figure 19. SOT1691-2 Package Outline

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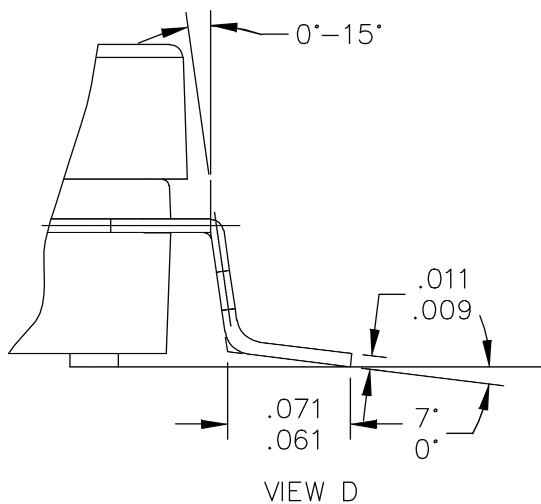
TITLE: SO, 8 I/O, .420 X .420 PKG, .100 IN PITCH	DOCUMENT NO: 98ASA10686D	REV: C
	STANDARD: NON–JEDEC	
	SOT1691–2	15 JAN 2016

Figure 20. SOT1691-2 Package Outline Detail



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ALL RIGHTS RESERVED</td><td>MECHANICAL OUTLINE</td><td colspan="2">PRINT VERSION NOT TO SCALE</td></tr>
<tr><td colspan="2" rowspan="3">TITLE:
SO, 8 I/O, .420 X .420 PKG,
.100 IN PITCH</td><td colspan="2">DOCUMENT NO: 98ASA10686D REV: C</td></tr>
<tr><td colspan="2">STANDARD: NON–JEDEC</td></tr>
<tr><td>SOT1691–2</td><td>15 JAN 2016</td></tr>
</table>

Figure 21. SOT1691-2 Package Outline Notes

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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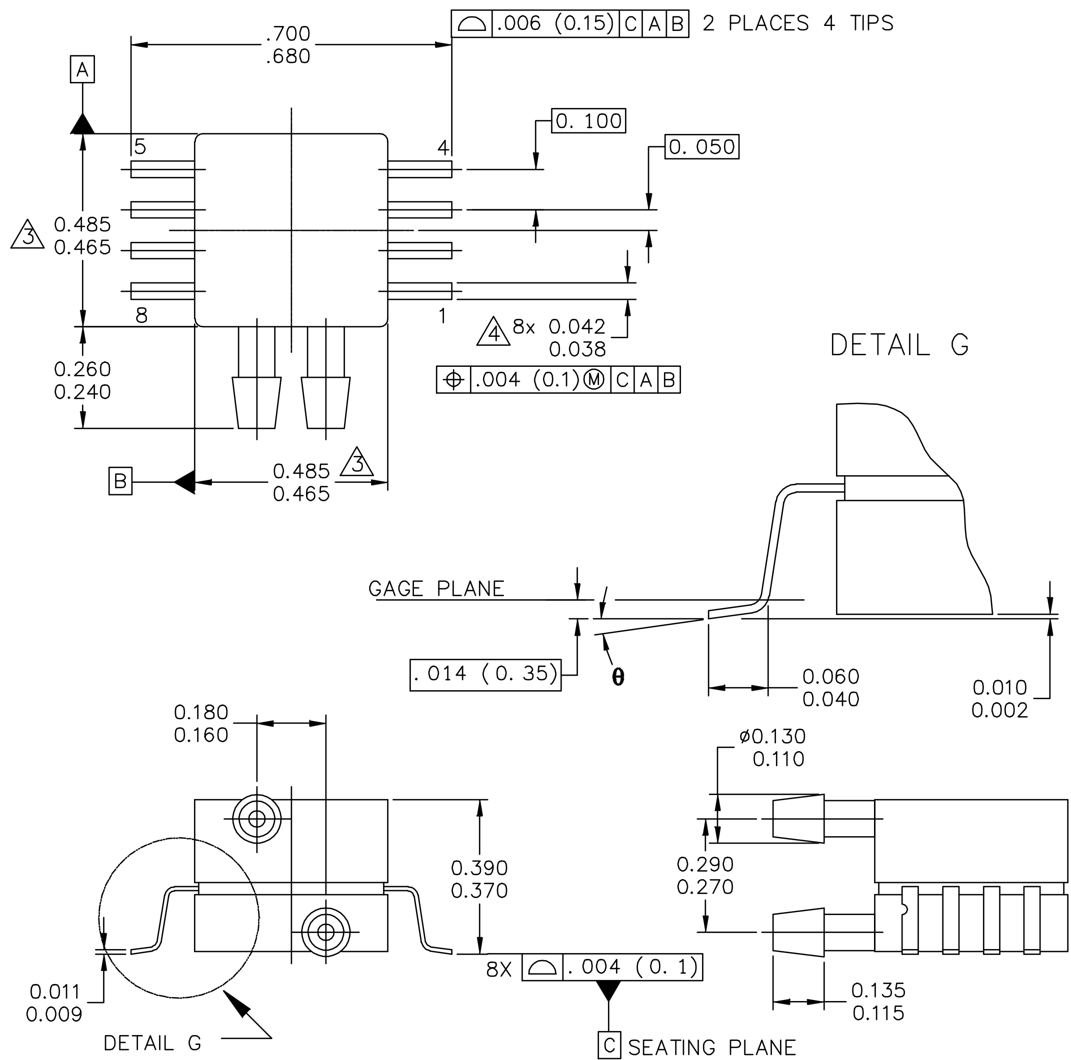
TITLE: SO, 8 I/O, .420 X .420 PKG, .100 IN PITCH	DOCUMENT NO: 98ASA10686D	REV: C
	STANDARD: NON–JEDEC	
	SOT1691–2	15 JAN 2016

Figure 22. SOT1693-1 Package Outline



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TITLE: 8 LD SNSR, DUAL PORT	DOCUMENT NO: 98ASA99255D REV: B	
	STANDARD: NON-JEDEC	
	SOT1693-1 14 MAR 2016	

Figure 23. **SOT1693-1 Package Outline Notes**

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

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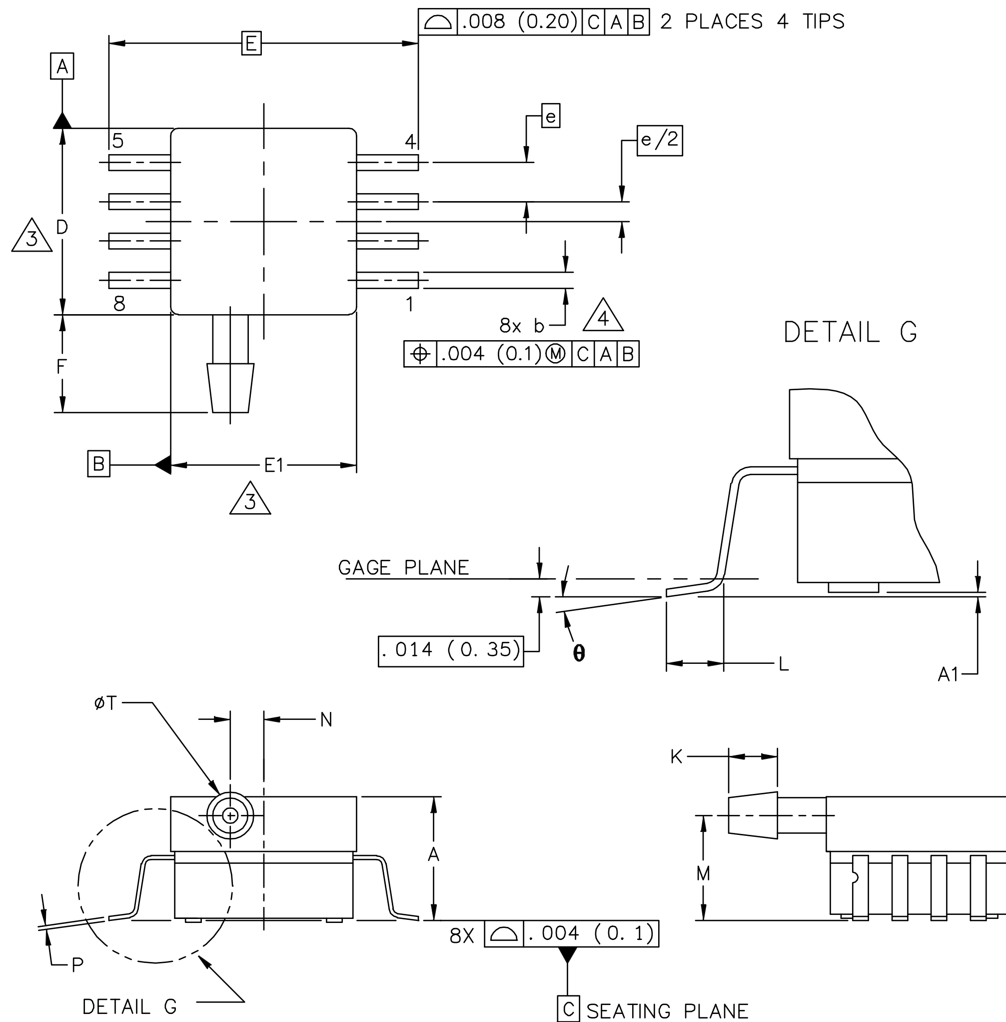
TITLE: 8 LD SNSR, DUAL PORT	DOCUMENT NO: 98ASA99255D	REV: B
	STANDARD: NON−JEDEC	
	SOT1693−1	14 MAR 2016

Figure 24. SOT1693-3 Package Outline



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TITLE: 8 LD SOP, SIDE PORT	DOCUMENT NO: 98ASA99303D	REV: E
	STANDARD: NON-JEDEC	
	SOT1693-3	14 MAR 2016

Figure 25. **SOT1693-3 Package Outline Notes**

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		MILLIMETERS		DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX		MIN	MAX	MIN	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	–	---	---	---	---

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MECHANICAL OUTLINE

PRINT VERSION NOT TO SCALE

TITLE:

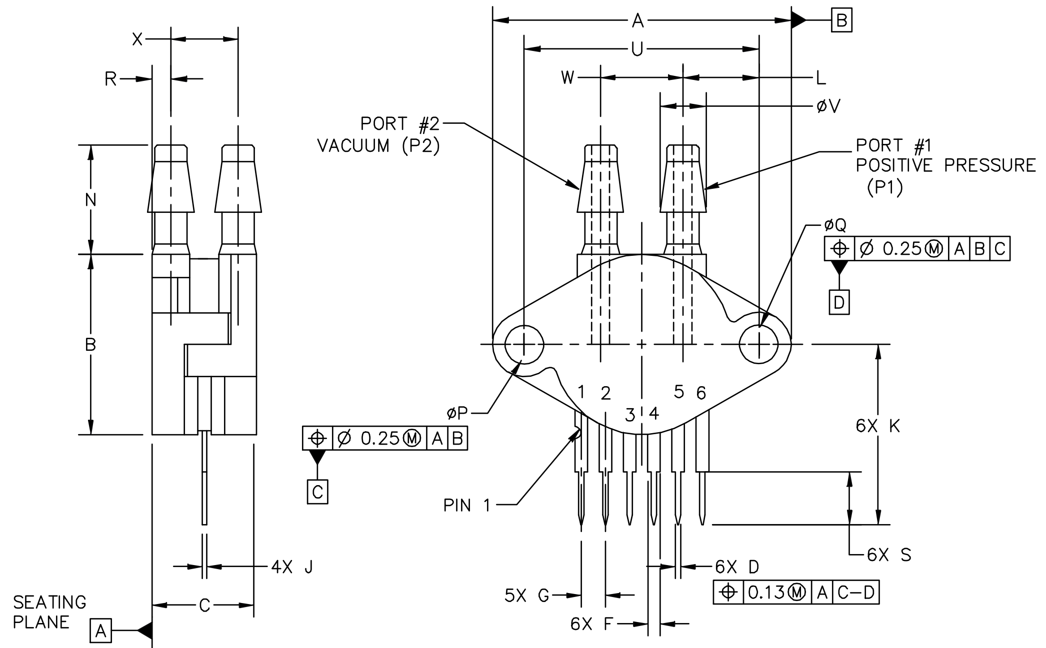
8 LD SOP, SIDE PORT

DOCUMENT NO: 98ASA99303D REV: E

STANDARD: NON-JEDEC

SOT1693-3 14 MAR 2016

Figure 26. **SOT1756-1 Package Outline**



DIM	MILLIMETERS MIN	MILLIMETERS MAX	DIM	MILLIMETERS MIN	MILLIMETERS MAX
A	29.08	29.85	P	ø3.89	ø4.04
B	17.40	18.16	Q	ø3.89	ø4.04
C	10.29	11.05	R	1.60	2.11
D	0.68	0.84	S	5.59	6.10
F	1.22	1.63	U	23.11 BSC	
G	2.54 BSC		V	4.62	4.93
J	0.36	0.41	W	7.87	8.38
K	17.65	18.42	X	6.30	7.06
L	7.37	7.62			
N	10.67	11.18			

NOTES:

1. DIMENSIONS ARE IN MILLIMETERS.
2. DIMENSIONS AND TOLERANCES PER ASME Y14.5M–1994.
3. 867C–01 THRU –04 OBSOLATE, NEW STANDARD 867C–05.
3. STYLE 1:

PIN 1: V OUT
2: GROUND
3: VCC
4: V1
5: V2
6: V EX

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MECHANICAL OUTLINE — PRINT VERSION NOT TO SCALE

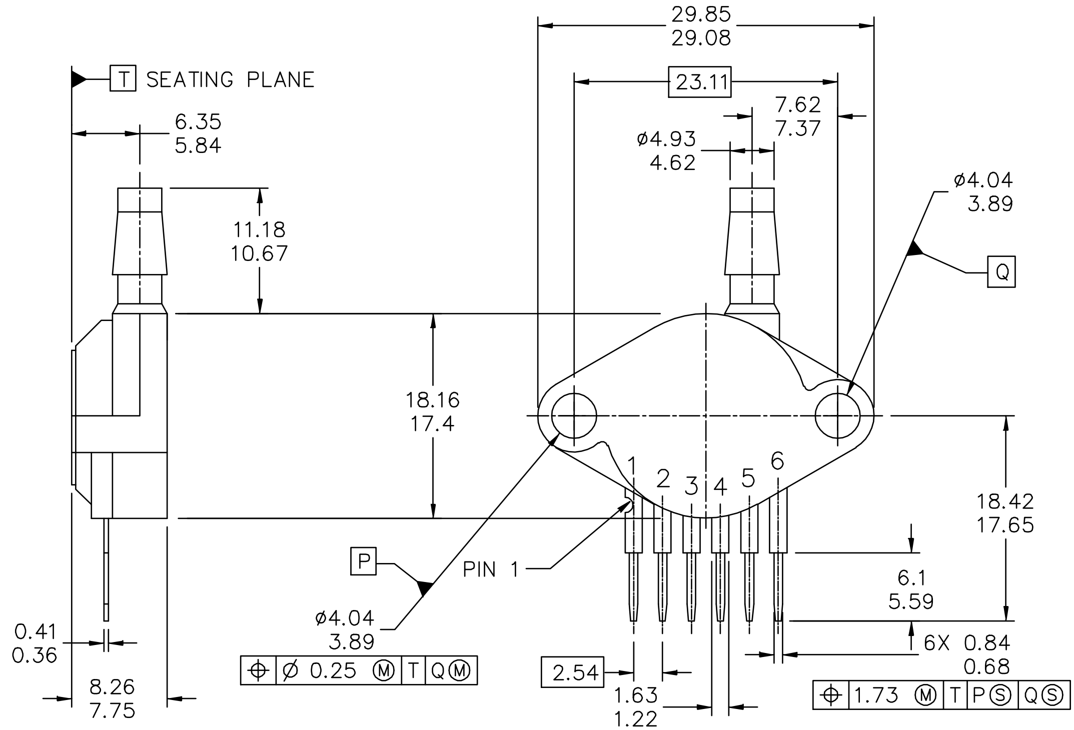
TITLE: SENSOR, 4 LEAD UNIBODY

DOCUMENT NO: 98ASB42797B REV: H

STANDARD: NON–JEDEC

SOT1756–1 29 JAN 2016

Figure 27. SOT1852-1 Package Outline



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TITLE: SENSOR, 6 LEAD UNIBODY CELL, AP & GP 01ASB09087B	DOCUMENT NO: 98ASB42796B	REV: J
	STANDARD: NON-JEDEC	
	SOT1852-1	15 MAR 2016

Figure 28. **SOT1852-1 Package Outline Notes**

NOTES:

1. DIMENSIONS ARE IN MILLIMETERS.
2. DIMENSIONS AND TOLERANCES PER ASME Y14.5M−1994.
3. 867B−01 THRU −3 OBSOLETE, NEW STANDARD 867B−04.

STYLE 1:

PIN 1: V OUT
2: GROUND
3: VCC
4: V1
5: V2
6: V EX

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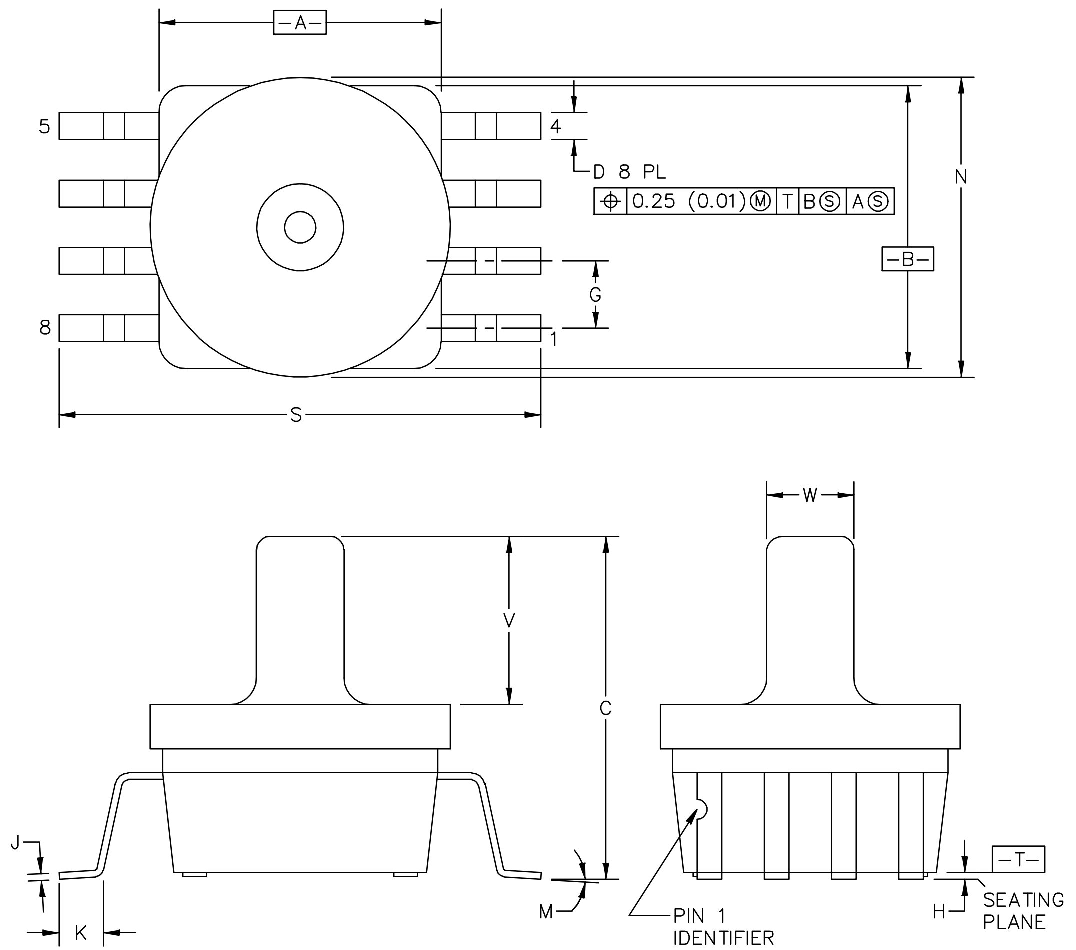
	STANDARD: NON−JEDEC	
	SOT1852−1	15 MAR 2016

Figure 29. **SOT1854-1 Package Outline**



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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 30. **SOT1854-1 Package Outline Notes**

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

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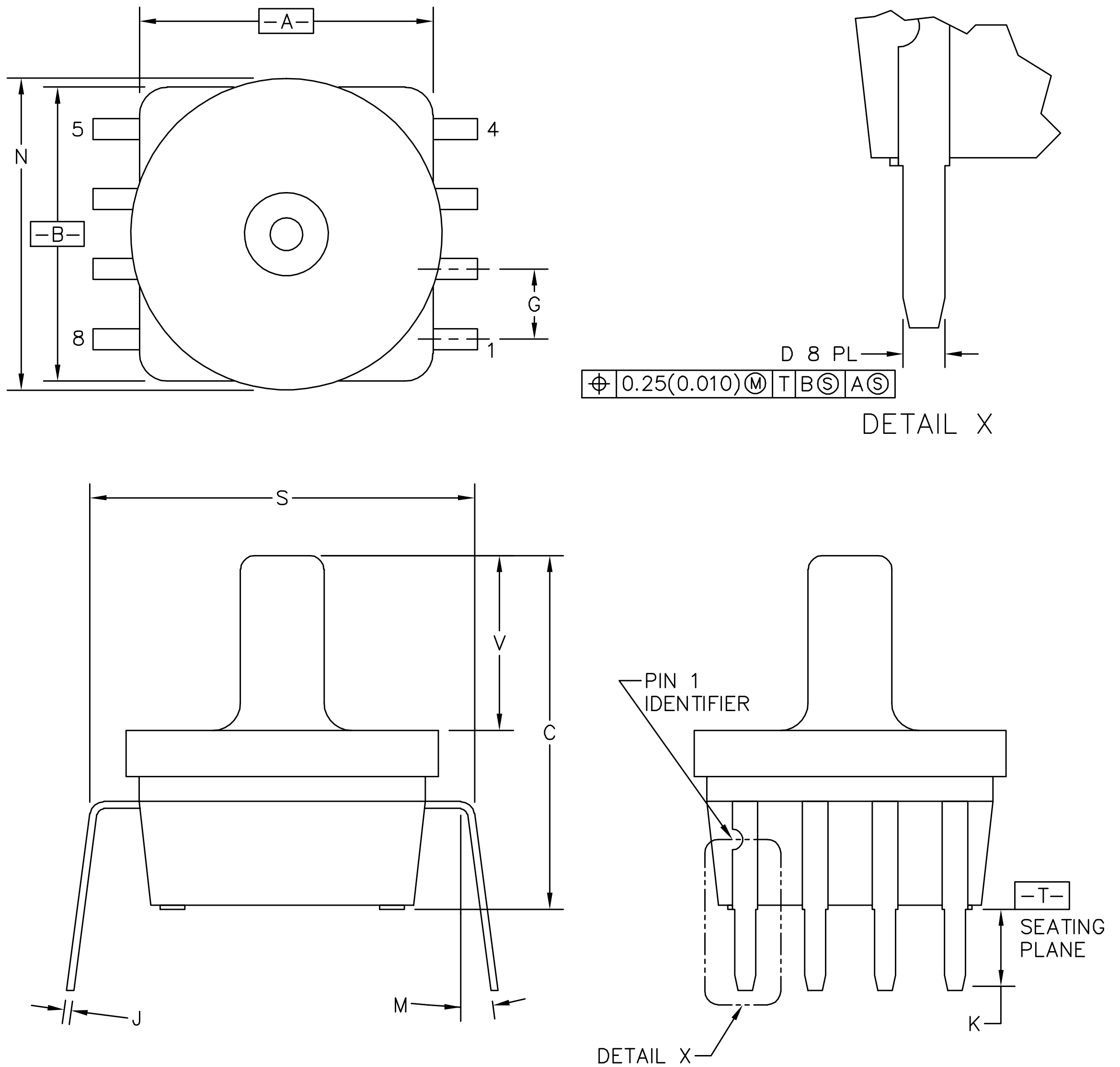
TITLE: SENSOR UNIBODY, 11.33 X 11.33 X 12.955 PKG, 2.54 PITCH, 8 I/O	DOCUMENT NO: 98ASB17757C REV: C
	STANDARD: NON–JEDEC
	SOT1854–1 13 JUL 2017

Figure 31. **SOT1863-1 Package Outline**



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TITLE: SENSOR UNIBODY, 11.33 X 11.33 X 12.955 PKG, 2.54 PITCH, 8 I/O	DOCUMENT NO: 98ASB17759C	REV: F
	STANDARD: NON–JEDEC	
	SOT1863–1	24 OCT 2017

Figure 32. **SOT1863-1 Package Outline Notes**

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.
6. DIMENSION 'S' TO CENTER OF LEAD WHEN FORMED PARALLEL.
7. 482C–01 AND –02 OBSOLETE. NEW STANDARD 482C–03.

DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	10.54	10.79	0.415	0.425
B	10.54	10.79	0.415	0.425
C	12.70	13.21	0.500	0.520
D	0.66	0.864	0.026	0.034
G	2.54	BSC	0.100	BSC
J	0.23	0.28	0.009	0.011
K	2.54	3.05	0.100	0.120
M	0°	15°	0°	15°
N	11.28	11.38	0.444	0.448
S	13.72	14.22	0.540	0.560
V	6.22	6.48	0.245	0.255
W	2.92	3.17	0.115	0.125

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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: 98ASB17759C REV: F

STANDARD: NON–JEDEC

SOT1863–1 24 OCT 2017

Revision history

Table 8. **Document revision history**

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

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