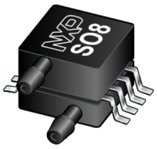
4.1 Ordering options

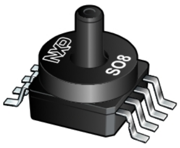
Table 2. Ordering options

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
MPXV7007DPT1	Tape and Reel	1693-1			•		•		MPXV7007DP
MPXV7007GC6U	Rails	1854-1		•		•			MPXV7007G
MPXV7007GC6T1	Tape and Reel	1854-1		•		•			MPXV7007G
MPXV7007GP	Trays	1693-3		•		•			MPXV7007GP

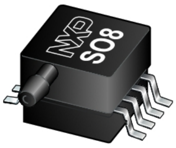
Small outline packages



MPXV7007DP/DPT1
CASE 1351-01
SOT1693-1



MPXV7007GC6U/C6T1
CASE 482A-01
SOT1854-1



MPXV7007GP
CASE 1369-01
SOT1693-3

5 Block diagram

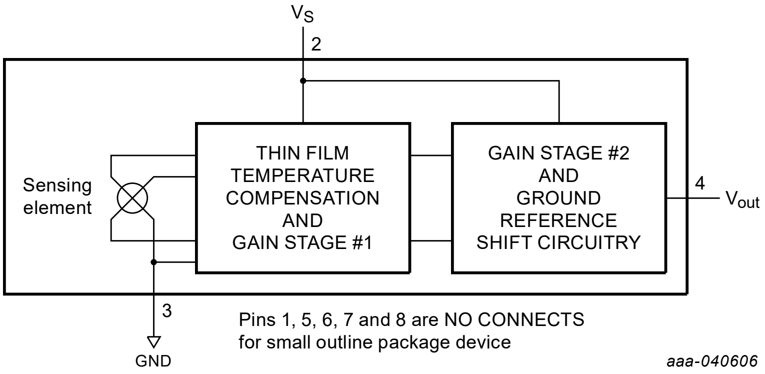


Figure 1. Integrated pressure sensor schematic

6 Pinning information

6.1 Pinning

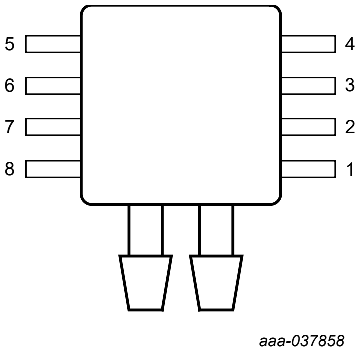


Figure 2. MPXV7007DP/DPT1 pin diagram

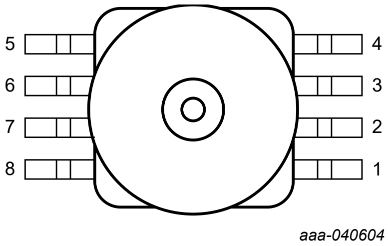


Figure 3. MPXV7007GC6U/C6T1 pin diagram

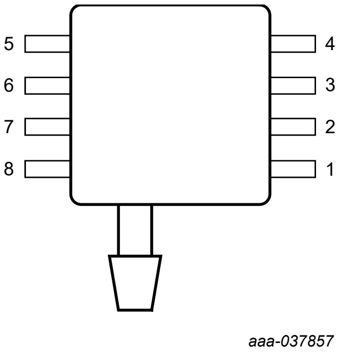


Figure 4. MPXV7007GP pin diagram

6.2 Pin description

This device family uses the style 2 pin configuration documented in Table 3 and shown in Figure 12.

Table 3. 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

7 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.

8 Operating characteristics

Table 5. Operating characteristics)

(V_S = 5.0 Vdc, T_A = 25 °C unless otherwise noted. Decoupling circuit shown in Figure 6 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.

9 Characteristics

9.1 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.

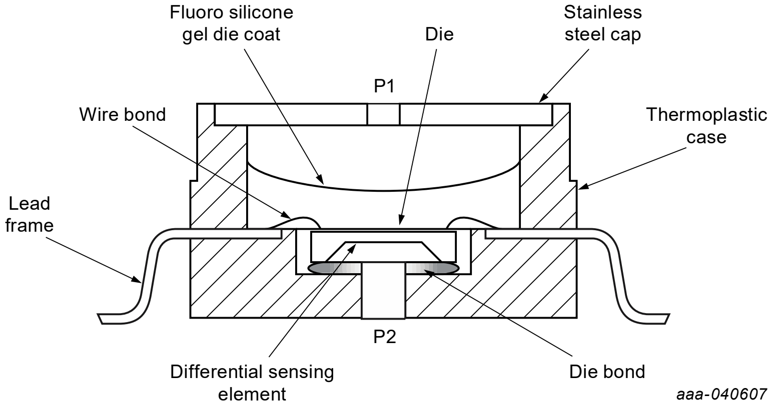


Figure 5. Cross-Sectional Diagram SOP (not to scale)

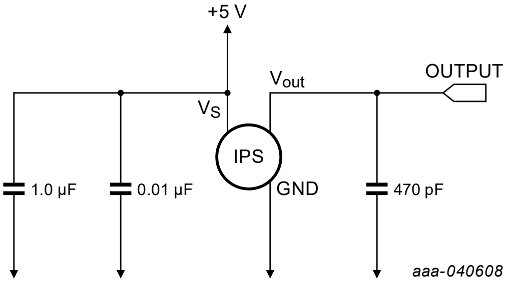


Figure 6. Recommended Power Supply Decoupling and Output Filtering

For additional output filtering, refer to Application Note AN1646[1].

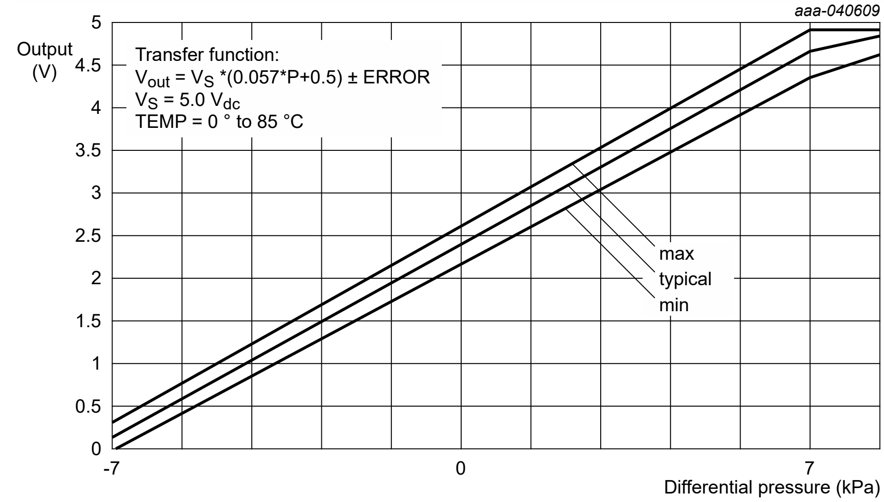


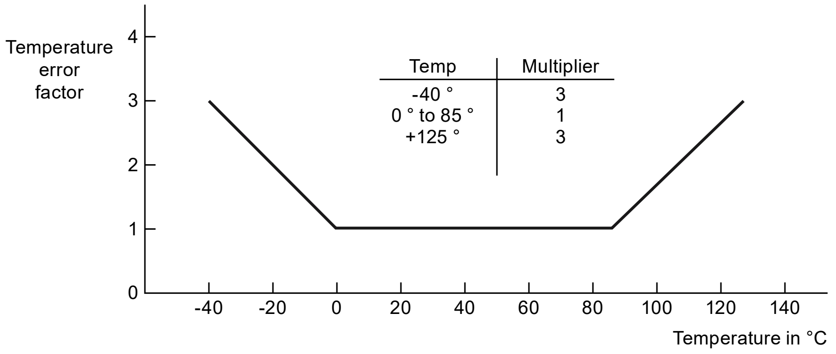
Figure 7. Output versus Pressure Differential

Transfer function

Nominal transfer value:

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

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



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

aaa-040610

Figure 8. Temperature error band

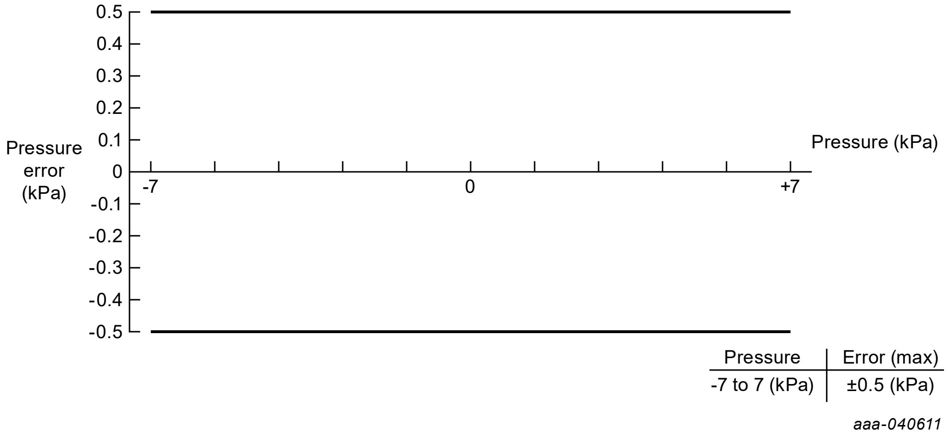


Figure 9. Pressure error band

9.2 Pressure (P1)/Vacuum (P2) side identification table

NXP 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 Table 6.

Table 6. Pressure side identification

Part number	Case type	Pressure (P1) Side identifier
MPXV7007GC6U/C6T1	482A	Side with port attached
MPXV7007GP	1369	Side with port attached
MPXV7007DP/DPT1	1351	Side with part marking

9.3 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. NXP recommends designing boards with a solder mask layer to avoid bridging and shorting between solder pads.

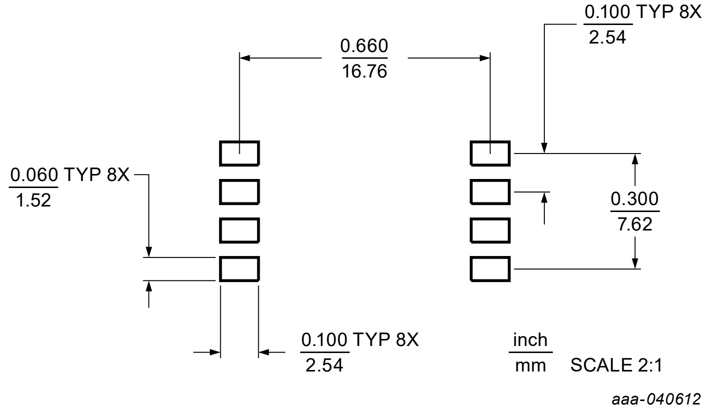
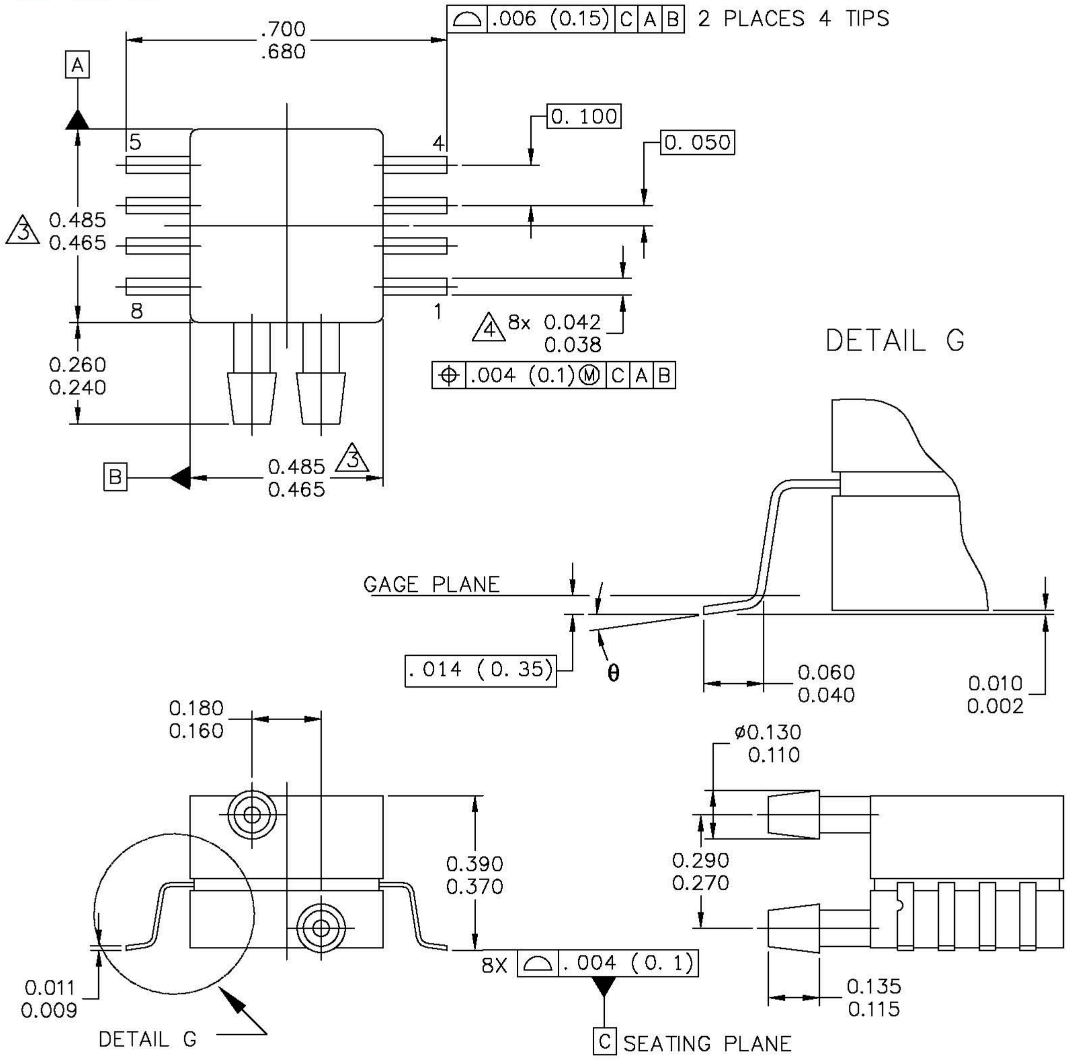


Figure 10. Small Outline Package Footprint

10 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 11. SOT1693-1, 8 Lead sensor, dual port package outline, 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:
PIN 1: GND
PIN 2: +Vout
PIN 3: Vs
PIN 4: –Vout
PIN 5: N/C
PIN 6: N/C
PIN 7: N/C
PIN 8: N/C

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

MECHANICAL OUTLINE

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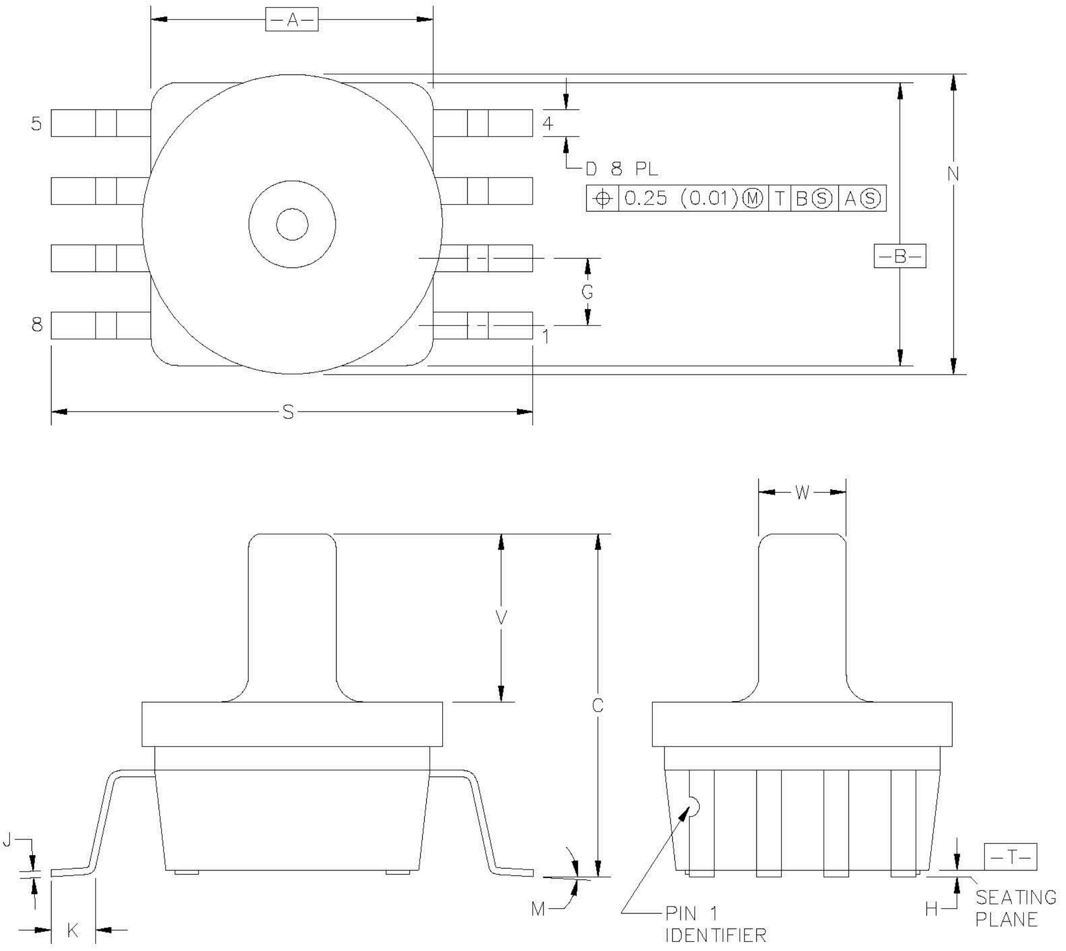
TITLE:
8 LD SNSR, DUAL PORT

DOCUMENT NO: 98ASA99255D REV: B
STANDARD: NON–JEDEC
SOT1693–1 14 MAR 2016

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



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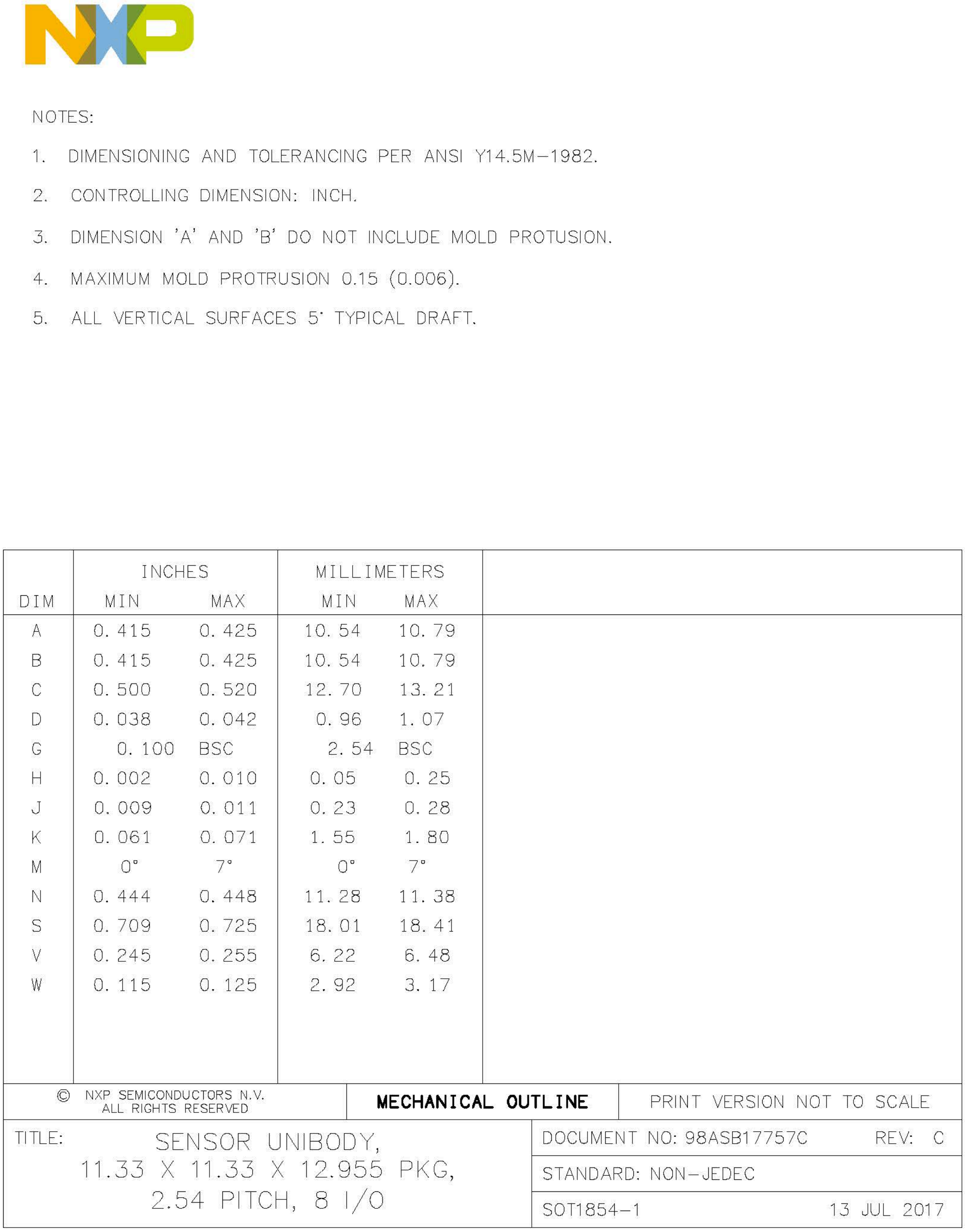
TITLE: SENSOR UNIBODY, 11.33 X 11.33 X 12.955 PKG, 2.54 PITCH, 8 I/O	DOCUMENT NO: 98ASB17757C	REV: C
	STANDARD: NON-JEDEC	
	SOT1854-1	13 JUL 2017

Figure 13. SOT1854-1, Unibody sensor package outline, 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

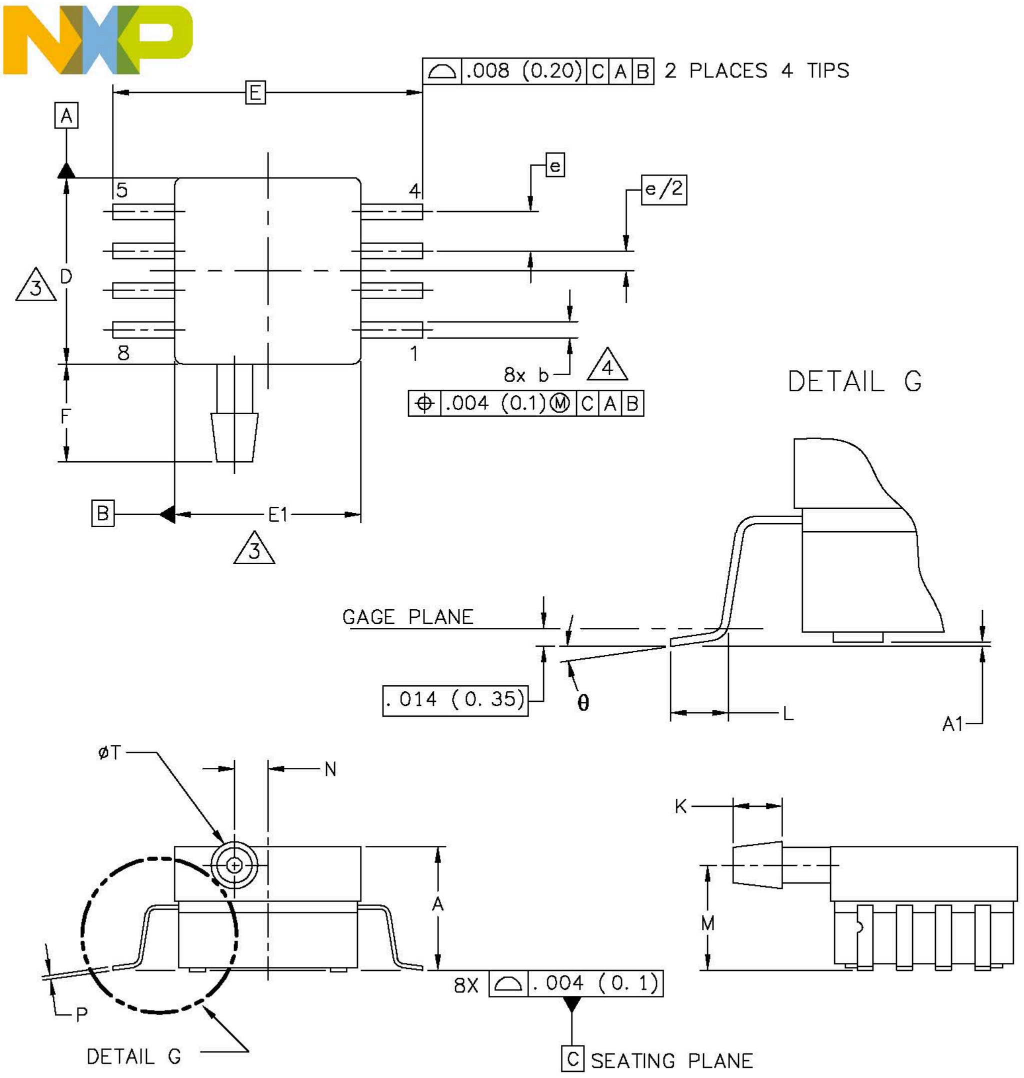
TITLE: SENSOR UNIBODY,
11.33 X 11.33 X 12.955 PKG,
2.54 PITCH, 8 I/O

DOCUMENT NO: 98ASB17757C REV: C

STANDARD: NON-JEDEC

SOT1854-1 13 JUL 2017

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



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

Figure 15. SOT1693-3, 8 Lead SOP, Side port package out line, 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

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

11 References

[1] AN1646 – Noise considerations for integrated pressure sensors
https://www.nxp.com/docs/en/application-note/AN1646.pdf

12 Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
MPXV7007 v.4	20210126	Product data sheet	—	MPXV2050 v.3
Modifications	• The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors, N.V. Legal texts have been adapted to the new company name where appropriate. • Global changes, revised as follows: – Revised all images including the package outline drawings to comply with NXP Semiconductor graphic standards. – Performed minor grammatical, content, and typographical changes throughout. • Section 1, revised the first paragraph. • Section 2, removed bullet "5.0 % maximum error over 0 °C to 85 °C". • Section 6.2, added clarification stating this device family uses the style 2 pin configuration as shown in Figure 12. • Section 11, added new reference section.			
MPXV7007 v.3	201210	Product data sheet	—	MPXV7007 v.2
Modifications	• Deleted references to device numbers MPXV7007G6T1/U, MPXV7007G6U/T1, and MPXV7007GPT1 throughout the document, deleted Case 482-01 Issue O Small Outline Package diagram on page 7.			

13 Legal information

13.1 Data sheet status

Document status[1][2]	Product status[3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

[1] Please consult the most recently issued document before initiating or completing a design.
[2] The term 'short data sheet' is explained in section "Definitions".
[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL http://www.nxp.com.

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