



MPXV2010xP, MPX2010D, MPX2010xP MPX2010GSX, MPXM2010GS

Datasheet

10 kPa temperature compensated pressure sensors



MPXV2010GP
Case 1369-01



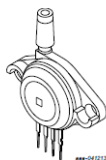
MPXV2010DP
Case 1351-01



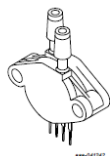
MPXM2010GS/GST1
Case 1320A-02



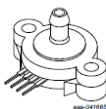
MPX2010D
Case 344-15



MPX2010GP
Case 344B-01



MPX2010DP
Case 344C-01



MPX2010GSX
Case 344F-01

Features

- Ratiometric to Supply Voltage
- Differential and Gauge Options
- Temperature Compensated over 0 °C to 85 °C
- Easy-to-Use Chip Carrier Package Options

Applications

- Air Movement Control
- Respiratory Diagnostics
- Controllers
- Pressure Switching

Description

The MPX2010 series device is a silicon piezoresistive pressure sensor providing a highly accurate and linear voltage output directly proportional to the applied pressure. The sensor is a single monolithic silicon diaphragm with the strain gauge and a thin-film resistor network integrated on-chip. The chip is laser trimmed for precise span and offset calibration and temperature compensation.



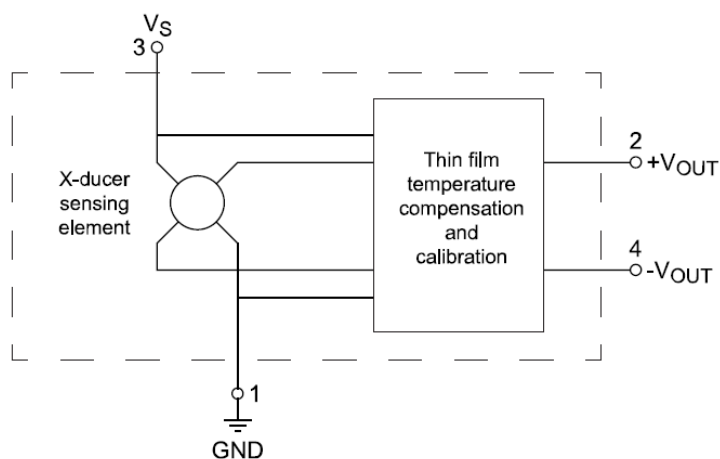
1 Ordering Information

Ordering Information									
Device name	Package options	Case number	Number of ports				Pressure type		Device marking
			None	Single	Dual	Gauge	Differential	Absolute	
Small Outline Package (MPXV2010 Series)									
MPXV2010GP	Tray	1369		•		•			MPXV2010GP
MPXV2010DP	Tray	1351			•		•		MPXV2010DP
Unibody Package (MPX2010 Series)									
MPX2010D	Tray	344	•				•		MPX2010D
MPX2010DP	Tray	344C			•		•		MPX2010DP
MPX2010GP	Tray	344B		•		•			MPX2010GP
MPX2010GSX	Tray	344F		•		•			MPX2010D
MPAK Package (MPXM2010 Series)									
MPXM2010GS	Rail	1320A		•		•			MPXM2010GS
MPXM2010GST1	Tape & Reel	1320A		•		•			MPXM2010GS

2 Block Diagram

Figure 1 shows a block diagram of the internal circuitry on the stand-alone pressure sensor chip.

Figure 1. Temperature compensated pressure sensor schematic

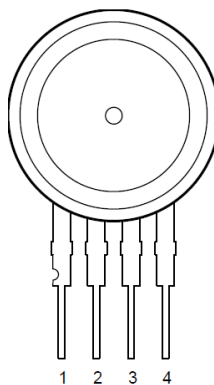


aaa-038712

3 Pin Information

3.1 MPX2010D

Figure 2. Case 344-15



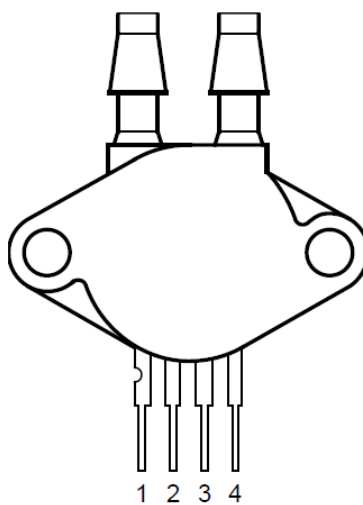
aaa-037831

Table 1. Pin definitions - MPX2010D

Symbol	Pin	Description
GND	1	Ground
+V _{OUT}	2	+ Voltage output
V _S	3	Power supply
-V _{OUT}	4	- Voltage output

3.2 MPX2010DP

Figure 3. Case 344C-01



aaa-037859

Table 2. Pin definitions - MPX2010DP

Symbol	Pin	Description
GND	1	Ground
+V _{OUT}	2	+ Voltage output
V _S	3	Power supply
-V _{OUT}	4	- Voltage output

3.3 MPX2010GP

Figure 4. Case 344B-01

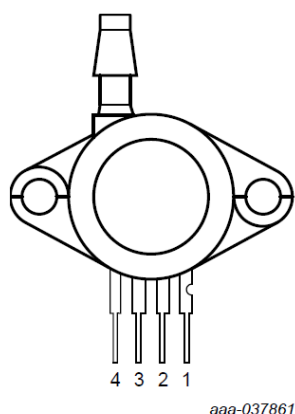


Table 3. Pin definitions - MPX2010GP

Symbol	Pin	Description
GND	1	Ground
+V _{OUT}	2	+ Voltage output
V _S	3	Power supply
-V _{OUT}	4	- Voltage output

3.4 MPXM2010GS/GST1

Figure 5. Case 1320A-02

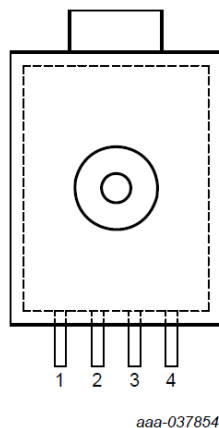


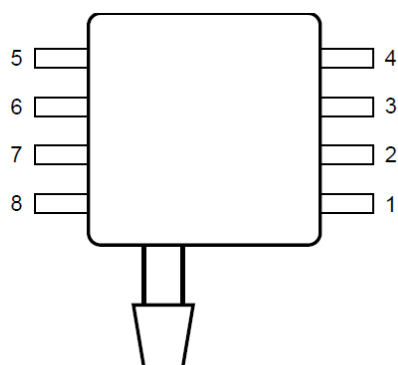
Table 4. Pin definitions - MPXM2010GS/GST1

Symbol	Pin	Description
GND	1	Ground
+V _{OUT}	2	+ Voltage output
V _S	3	Power supply
-V _{OUT}	4	- Voltage output

3.5

MPXV2010GP

Figure 6. Case 1369-01



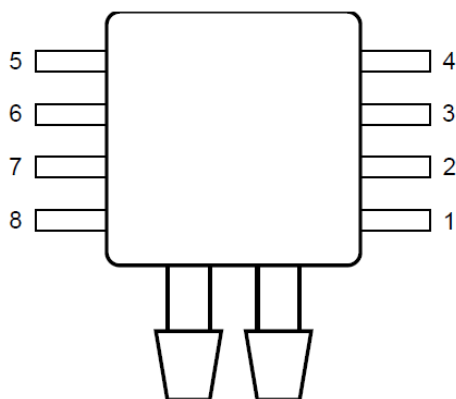
aaa-037857

Table 5. Pin definitions - MPXV2010GP

Symbol	Pin	Description
GND	1	Ground
+V _{OUT}	2	+ Voltage output
V _S	3	Power supply
-V _{OUT}	4	- Voltage output
n.a.	5	—
n.a.	6	—
n.a.	7	—
n.a.	8	—

3.6 MPXV2010DP

Figure 7. CASE 1351-01



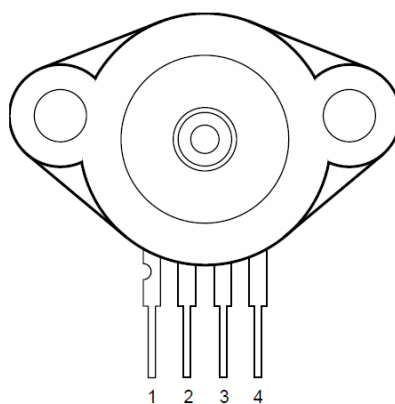
aaa-037858

Table 6. Pin definitions - MPXV2010DP

Symbol	Pin	Description
GND	1	Ground
+V _{OUT}	2	+ Voltage output
V _S	3	Power supply
-V _{OUT}	4	- Voltage output
n.a.	5	—
n.a.	6	—
n.a.	7	—
n.a.	8	—

3.7 MPX2010GSX

Figure 8. Case 344F-01



aaa-038356

Table 7. Pin definitions - MPX2010GSX



Symbol	Pin	Description
GND	1	Ground
+V _{OUT}	2	+ Voltage output
V _S	3	Power supply
-V _{OUT}	4	- Voltage output



4 Maximum Ratings

Note: Exposure beyond the specified limits may cause permanent damage or degradation to the device.
In accordance with the Absolute Maximum Rating System (IEC 60134).

Table 1. Maximum ratings

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
P _{max}	Overpressure	P1 > P2	—	—	75	kPa
P _{burst}	Burst Pressure	P1 > P2	—	—	100	kPa
T _{stg}	Storage Temperature		–40	—	+125	°C
T _A	Operating Temperature		–40	—	+125	°C

5 Operating Characteristics

Table 9. Operating characteristics ($V_S = 10$ Vdc, $T_A = 25$ °C unless otherwise noted, $P_1 > P_2$)

Characteristic	Symbol	Min	Typ	Max	Units
Operating Pressure Range [1]	P_{OP}	0	—	10	kPa
Supply Voltage [2]	V_S	—	10	16	Vdc
Supply Current	I_o	—	6.0	—	mAdc
Full Scale Span [3]	V_{FSS}	24	25	26	mV
Offset [4]	V_{off}	−1.0	—	1.0	mV
Sensitivity	$\Delta V/\Delta P$	—	2.5	—	mV/kPa
Linearity [5]	—	−1.0	—	1.0	% V_{FSS}
Pressure Hysteresis (0 kPa to 10 kPa) [5]	—	—	±0.1	—	% V_{FSS}
Temperature Hysteresis (−40 °C to +125 °C) [5]	—	—	±0.5	—	% V_{FSS}
Temperature Coefficient of Full Scale Span [5]	TCV_{FSS}	−1.0	—	1.0	% V_{FSS}
Temperature Coefficient of Offset [5]	TCV_{off}	−1.0	—	1.0	mV
Input Impedance	Z_{in}	1300	—	2550	Ω
Output Impedance	Z_{out}	1400	—	3000	Ω
Response Time (10% to 90%) [6]	t_R	—	1.0	—	ms
Warm-Up Time [7]	—	—	20	—	ms
Offset Stability [8]	—	—	±0.5	—	% V_{FSS}

- 1.0 kPa equals 0.145 PSI.
- Device is ratiometric within this specified excitation range. Operating the device above the specified excitation range may induce additional error due to device self-heating.
- 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.
- Offset (V_{off}) is defined as the output voltage at the minimum rated pressure. [5] Accuracy (error budget) consists of the following:
 - Accuracy (error budget) consists of the following:
 - Linearity: Output deviation from a straight line relationship with pressure using the end point 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 at full rated pressure 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
- 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.
- Warm-Up Time is defined as the time required for the product to meet the specified output voltage after the pressure has been stabilized.
- Offset Stability is the product's output deviation when subjected to 1000 hours of Pulsed Pressure Temperature Cycling with Bias test.

6 Characteristics

6.1 Voltage output versus applied differential pressure

The output voltage of the differential or gauge sensor increases with increasing pressure applied to the pressure side (P1) relative to the vacuum side (P2). Similarly, output voltage increases as increasing vacuum is applied to the vacuum side (P2) relative to the pressure side (P1).

6.2 On-chip temperature compensation and calibration

Figure 9 shows the typical output characteristics of the MPX2010 series at 25 °C.

The effects of temperature on full scale span and offset are very small and are shown under [Section 8 "Operating Characteristics"](#).

This performance over temperature is achieved by having both the shear stress strain gauge and the thin-film resistor circuitry on the same silicon diaphragm. Each chip is dynamically laser trimmed for precise span and offset calibration and temperature compensation.

Figure 9. Output vs. pressure differential

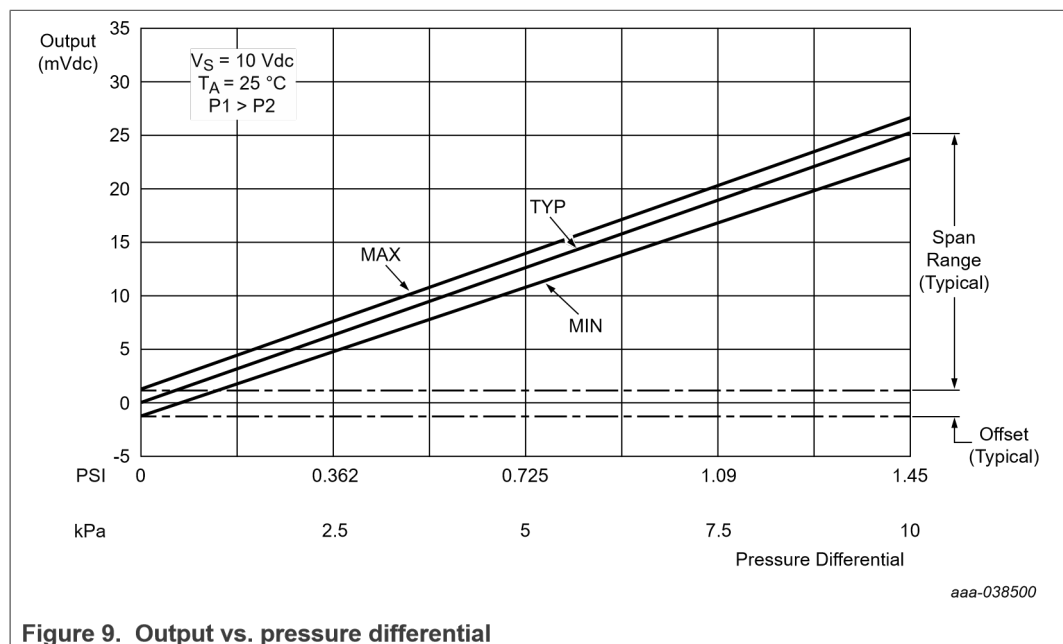


Figure 9. Output vs. pressure differential

6.3 Linearity

Linearity refers to how well a transducer's output follows the equation

$V_{out} = V_{off} + \text{Sensitivity} \times P$ over the operating pressure range ([Figure 10](#)). There are two basic methods for calculating nonlinearity:

- End point straight line fit
- Least squares best line fit

While a least squares fit gives the "best case" linearity error (lower numerical value), the calculations required are burdensome.

Conversely, an end point fit will give the "worst case" error (often more desirable in error budget calculations) and the calculations are more straightforward for the user.

ST's specified pressure sensor linearities are based on the end point straight line method measured at the midrange pressure.

Figure 10. Linearity specification comparison

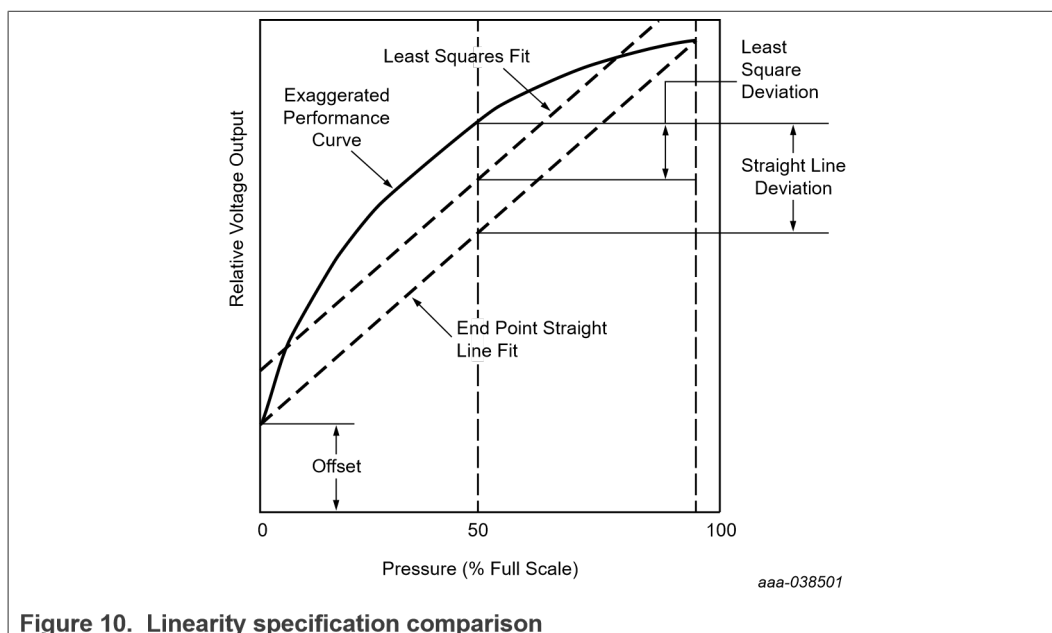


Figure 10. Linearity specification comparison

6.4

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 that isolates the die from the environment. The ST MPX pressure sensor is designed to operate with positive differential pressure applied, $P1 > P2$.

The Pressure (P1) side may be identified by using [Table 10](#).

Table 2.

Part Number	Case Type	Pressure (P1) Side Identifier
MPX2010D	344	Stainless Steel Cap
MPX2010DP	344C	Side with Part Marking
MPX2010GP	344B	Side with Port Attached
MPX2010GSX	344F	Side with Port Attached
MPXV2010GP	1369	Side with Port Attached
MPXV2010DP	351	Side with Part Marking
MPXM2010GS/GSTI	1320A	Side with Port Attached

6.5

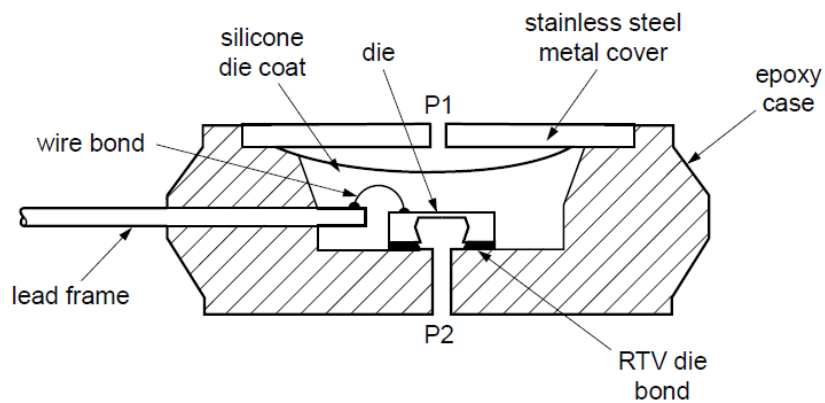
Media compatibility

[Figure 11](#) illustrates the differential or gauge configuration in a typical chip carrier. A silicone gel isolates the die surface and wire bonds from the environment while allowing the pressure signal to be transmitted to the silicon diaphragm.

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

For more information, refer to application note [AN3728](#).

Figure 11. Unibody package — cross-sectional diagram (not to scale)



aaa-037713

7 Package Outlines

7.1 Small outline packages

Figure 12. SOT1693-1 (Case 1351) – Page 1

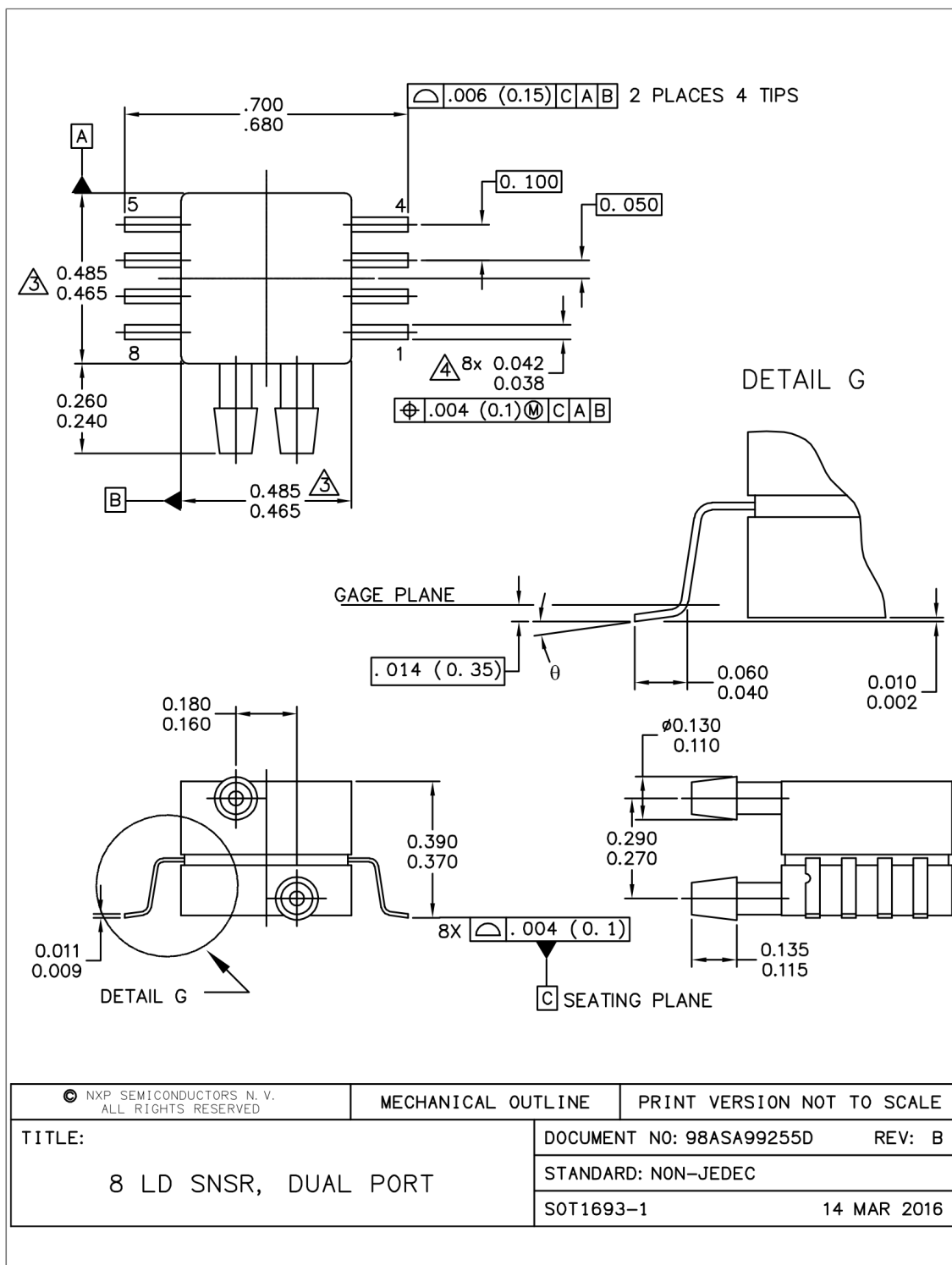


Figure 13. SOT1693-1 (Case 1351) – Page 2

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.

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

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STANDARD: NON-JEDEC

SOT1693-3 14 MAR 2016

Figure 15. SOT1693-3 (Case 1369-01) – page 2

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	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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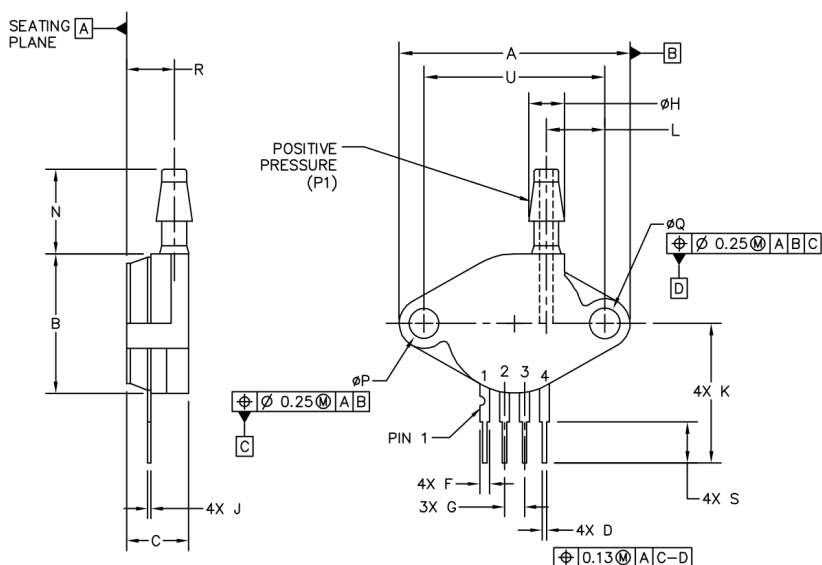
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SOT1693-3

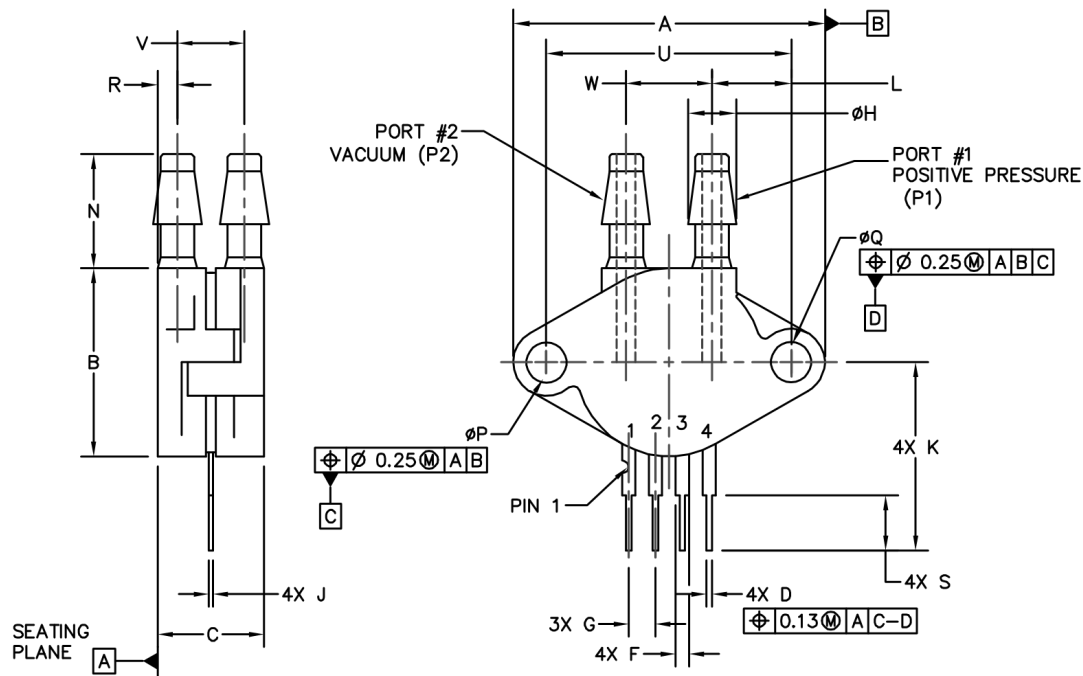
14 MAR 2016

7.2 Unibody packages

Figure 16. SOT1753-1 (Case 344B-01)



DIM	MILLIMETERS MIN	MILLIMETERS MAX	DIM	MILLIMETERS MIN	MILLIMETERS MAX	NOTES: 1. DIMENSIONS ARE IN MILLIMETERS. 2. DIMENSIONS AND TOLERANCES PER ASME Y14.5M-1994. 3. STYLE 1: PIN 1: GROUND 2: + OUTPUT 3: + SUPPLY 4: - OUTPUT
A	29.08	29.85	P	3.89	4.04	
B	17.40	18.16	Q	3.89	4.04	
C	7.75	8.26	R	5.84	6.35	
D	0.41	0.51	S	5.59	6.10	
F	1.22	1.63	U	23.11	BASIC	
G	2.54	BASIC				
H	4.62	4.93				
J	0.36	0.41				
K	17.65	18.42				
L	7.37	7.62				
N	10.67	11.18				
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						STANDARD: NON-JEDEC
						SOT1753-1 18 JAN 2016

Figure 17. SOT1754-1 (Case 344C-01)


DIM	MILLIMETERS MIN	MILLIMETERS MAX	DIM	MILLIMETERS MIN	MILLIMETERS MAX	NOTES: 1. DIMENSIONS ARE IN MILLIMETERS. 2. DIMENSIONS AND TOLERANCES PER ASME Y14.5M-1994. 3. STYLE 1: PIN 1: GROUND 2: + OUTPUT 3: + SUPPLY 4: - OUTPUT
A	29.08	29.85	N	10.67	11.18	
B	17.40	18.16	P	$\phi 3.89$	$\phi 4.04$	
C	10.29	11.05	Q	$\phi 3.89$	$\phi 4.04$	
D	0.41	0.51	R	1.60	2.11	
F	1.22	1.63	S	5.59	6.10	
G	2.54	BSC	U	23.11	BSC	
H	$\phi 4.62$	$\phi 4.93$	V	6.30	7.06	
J	0.36	0.41	W	7.89	8.38	
K	17.65	18.42				
L	7.37	7.62				

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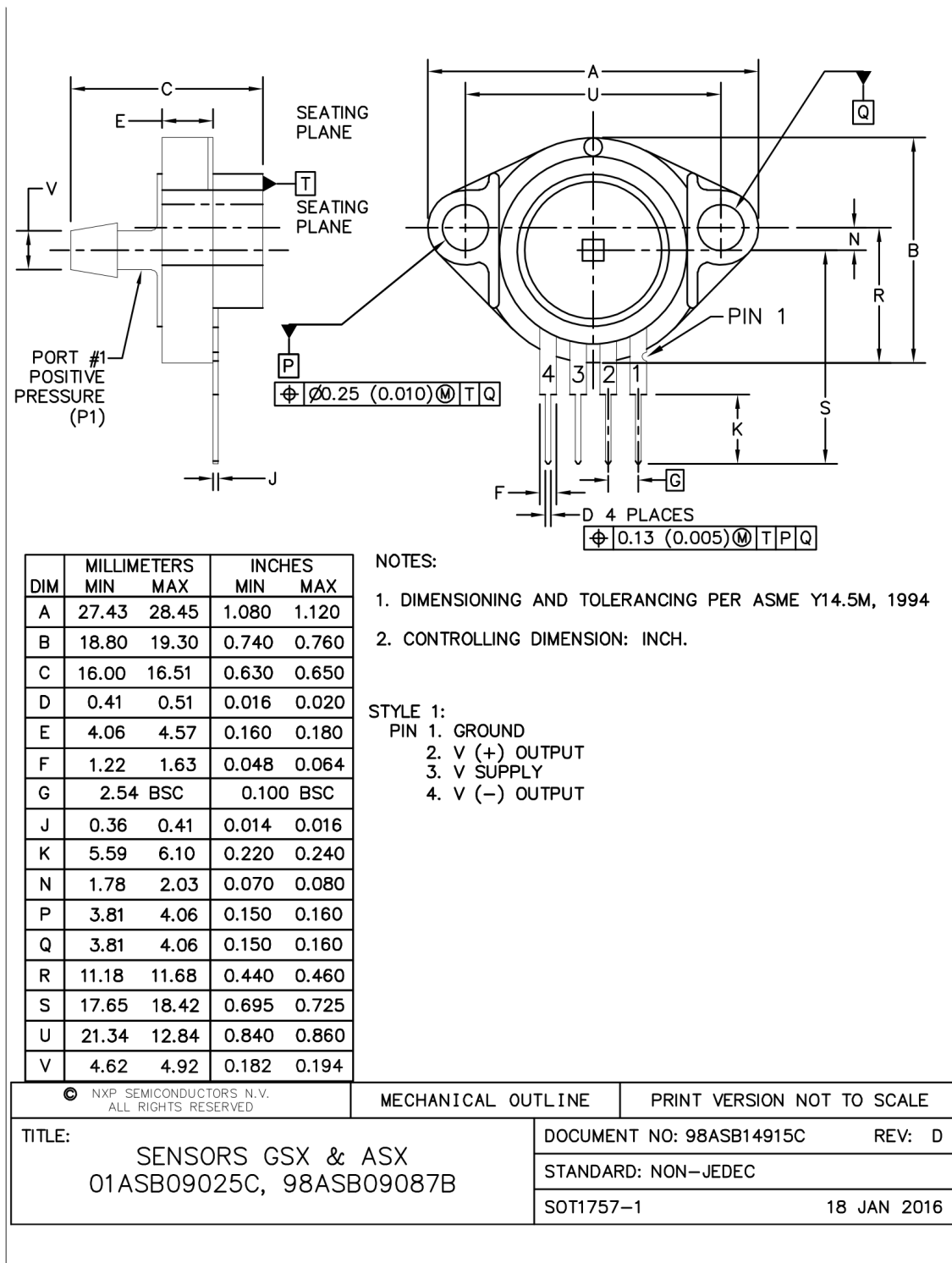
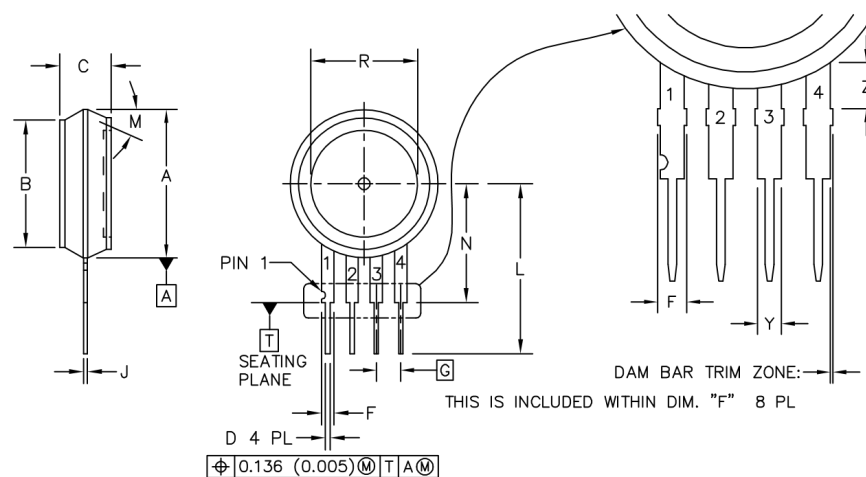
Figure 18. SOT1757-1 (Case 344F-01)


Figure 19. SOT1772-1 (Case 344-15)


DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	15.11	16.00	0.595	0.630
B	13.06	13.56	0.514	0.534
C	5.08	5.59	0.200	0.220
D	0.41	0.51	0.016	0.020
F	1.22	1.63	0.048	0.064
G	2.54 BSC		0.100 BSC	
J	0.36	0.40	0.014	0.016
L	17.65	18.42	0.695	0.725
M	30° NOM		30° NOM	
N	12.07	12.57	0.475	0.495
R	10.92	11.43	0.430	0.450
Y	1.22	1.32	0.048	0.052
Z	2.68	3.00	0.106	0.118

NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION A IS INCLUSIVE OF THE MOLD STOP RING NOT TO EXCEED 16.00 (0.630)
4. 344-01 THRU -4 OBSOLETE.
5. 344-05 THRU -11 OBSOLETE, NEW STANDARD 344-15.

STYLE 1:

PIN 1. GROUND
 2. + OUTPUT
 3. + SUPPLY
 4. - OUTPUT

STYLE 2:

PIN 1. VCC
 2. - SUPPLY
 3. + SUPPLY
 4. GROUND

STYLE 3:

PIN 1. GROUND
 2. - VOUT
 3. VS
 4. + VOUT

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		STANDARD: NON-JEDEC	
		SOT1772-1	02 FEB 2016

Figure 21. SOT1673-1 (1320A-02) – Page 2

NOTES:

1. DIMENSIONS ARE IN INCHES.
2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M-1994.
3. DIMENSIONS DOES NOT INCLUDE MOLD FLASH OR PROTRUSION. MOLD FLASH OR PROTRUSION SHALL NOT EXCEED .006" PER SIDE.
4. ALL VERTICAL SURFACES TO BE 5" MAXIMUM.
5. DIMENSION DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE .008 MAXIMUM.

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	SOT1673-1	29 FEB 2016



Revision history

Table 3. Document revision history

Date	Version	Changes
13-Jul-2026	1	Initial release from ST, rebranded NXP document



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