MPX5050DP, MPXV5050xxx

Datasheet

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

Features

- 2.5 % Maximum Error over 0 ° to 85 °C
- Ideally suited for Microprocessor or Microcontroller-based systems
- Temperature compensated over –40 ° to +125 °C
- Patented silicon shear stress strain gauge
- Durable epoxy unibody element
- Easy-to-use chip carrier option

Description

The MPXx5050 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

Type number	Package		
	Name	Description	Version
MPX5050DP	SENSOR4F	Pressure sensor, 5 V, 0/50 kPa, Port; Unibody package, 4 terminals; 2.54 mm pitch; 17.78 mm x 29.48 mm x 10.67 mm body	SOT1756-1
MPXV5050DP	SENSOR6F	Pressure sensor, 5 V, 0/50 kPa, Port, 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
MPXV5050GP	SO8	Pressure sensor, 5 V, 0/50 kPa, Port, 8 terminals; 2.54 mm pitch; 12.06 mm x 12.06 mm x 3.38 mm body body	SOT1693-3
MPXV5050GC6T1	SO8	Pressure sensor, 5 V, 0/540 kPa, small outline package, Port, 8 terminals; 2.54 mm pitch; 10.67 mm x 10.67 mm x 12.96 mm body	SOT18454-1

1.1 Ordering options

Table 2. Ordering options

ORDERING INFORMATION								
Device Name	Case No.	# of Ports			Pressure Type			Device Marking
		None	Single	Dual	Gauge	Differential	Absolute	
Unibody Package (MPX5050 Series)								
MPX5050DP	867C			•		•		MPX5050DP
Small Outline Package (MPXV5050 Series)								
MPXV5050GP	1369		•		•			MPXV5050GP
MPXV5050DP	1351			•		•		MPXV5050DP
MPXV5050GC6T1	482A		•		•			MPXV5050G

2 Pinning information

2.1 Pinning

Figure 1. **MPX5050DP - SOT1756-1 - Case 867C-05**

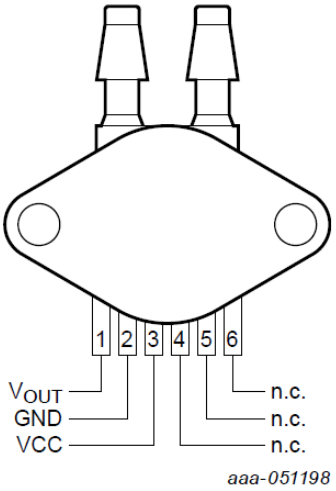


Figure 2. **MPXV5050DP Case 1351-01**

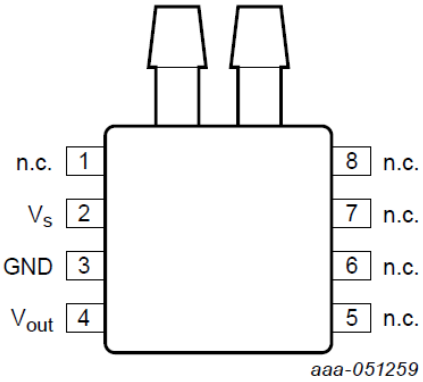


Figure 3. **MPXV5050GP Case 1369-01**

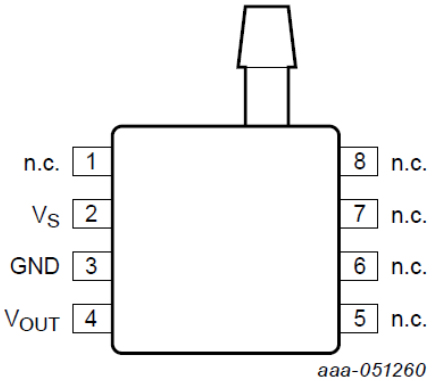
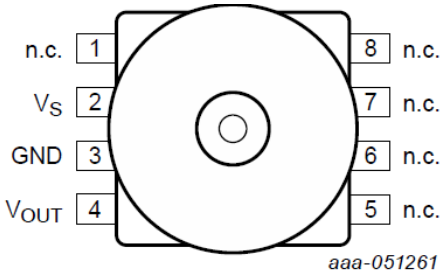


Figure 4. **MPXV5050GC6T1 – Case 482A-01**



2.2 Pin description

Table 3. **Pin descriptions - MPX5050DP**

Symbol	Pin	Description
V_{OUT}	1	V_{OUT}
Ground	2	Ground
V_{CC}	3	Supply voltage
N.C.	4	No connection.
N.C.	5	No connection.
N.C.	6	No connection.

Table 4. **Pin descriptions - MPXV5050GC6T1, MPXV5050DP, and MPXV5050GP**

Symbol	Pin	Description
N.C.	1	No connect
V_S	2	Supply voltage
Ground	3	Ground
V_{OUT}	4	V_{OUT}
N.C.	5	No connect
N.C.	6	No connect
N.C.	7	No connect
N.C.	8	No connect

3 Limiting values

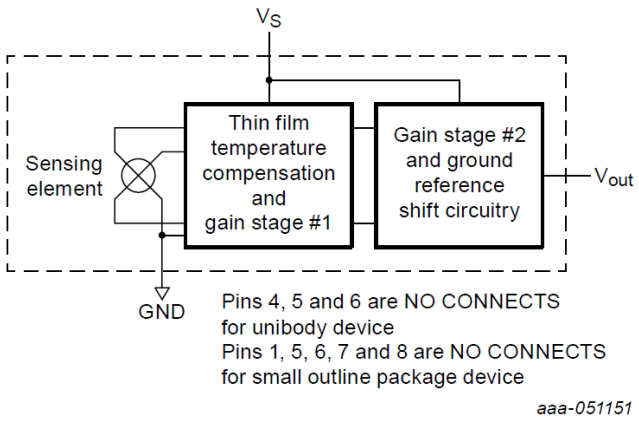
Table 5. Limiting values [1]

Rating	Symbol	Value	Unit
Maximum pressure (P1 > P2)	P_{max}	200	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 5 shows a block diagram of the internal circuitry integrated on a pressure sensor chip.

Figure 5. Fully Integrated Pressure Sensor Schematic



4 Recommended operating conditions

Table 6. Recommended operating conditions (V_S = 5.0 Vdc, T_A = 25 °C unless otherwise noted, P1 > P2. Decoupling circuit shown in Figure 8 required to meet electrical specifications.)

Characteristic	Symbol	Min	Typ	Max	Unit
Pressure Range[1]	P_{OP}	0	—	50	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}	0.088	0.2	0.313	Vdc
Full Scale Output[4] (0 °C to 85 °C) @ V_S = 5.0 Volts	V_{FSO}	4.587	4.7	4.813	Vdc
Full Scale Span[5] (0 °C to 85 °C) @ V_S = 5.0 Volts	V_{FSS}	—	4.5	—	Vdc
Accuracy[6] (0 °C to 85 °C)	—	—	—	±2.5	$\%V_{FSS}$
Sensitivity	V/P	—	90	—	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 theminimum 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 VFSS 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

5 On-chip Temperature Compensation and Calibration

Figure 7 illustrates the Differential/Gauge Sensing Chip in the basic chip carrier (Case 867). 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 MPX5050/MPXV5050G 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 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 9. The output will saturate outside of the specified pressure range.

Figure 9 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 6. Output vs. pressure differential

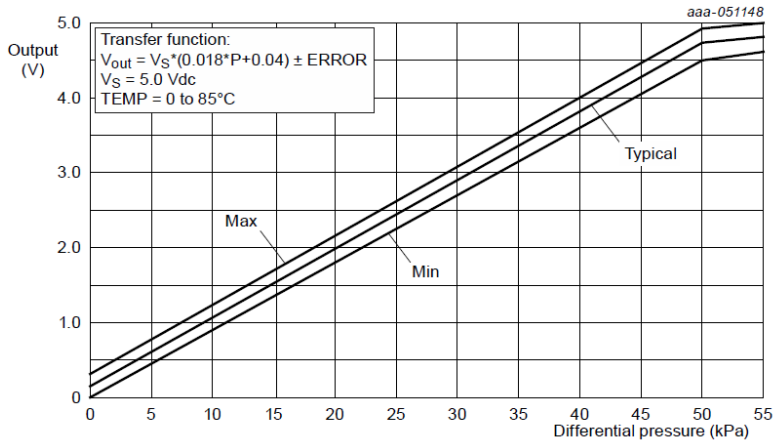


Figure 7. Cross-sectional diagram (not to scale)

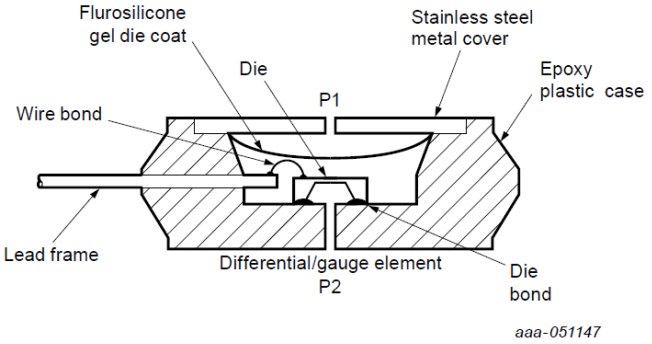


Figure 8. Nominal Transfer Value

$$V_{OUT} = V_S\ (P\ \times 0.018 + 0.04)$$
$$\pm(Pressure\ Error\ \times Temp.\ Factor\ \times 0.018\ \ V_S\ )$$
$$V_S\ = 5.0\ V\ \pm 0.25\ Vdc$$

Figure 9. Recommended power supply decoupling and output filtering (For additional output filtering, refer to application note AN1646)

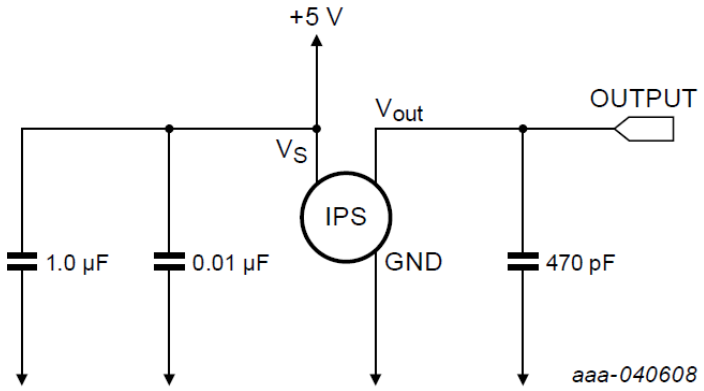


Figure 10. Temperature error band

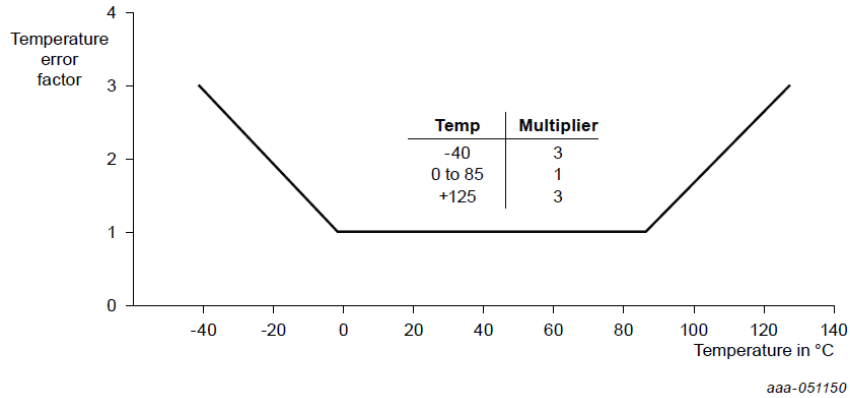
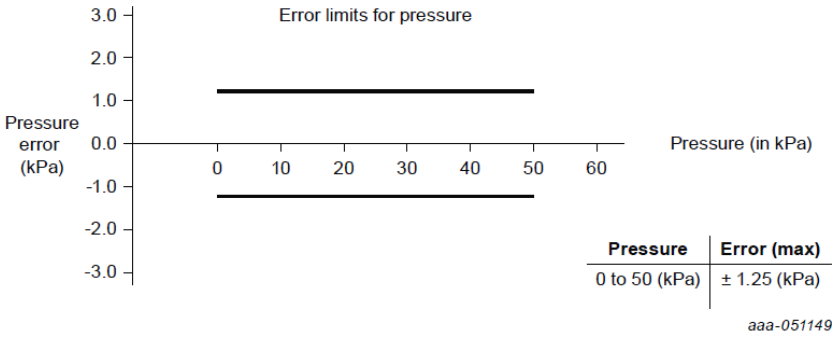


Figure 11. Pressure error band



6 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.

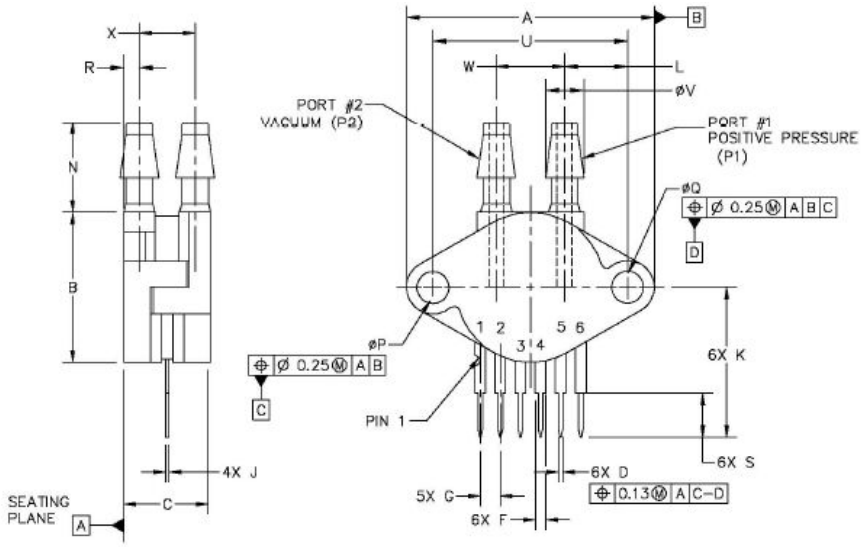
The Pressure (P1) side may be identified by using Table 7.

Table 7. Pressure (P1) side identification

Part Number	Case Type	Pressure (P1) Side Identifier
MPX5050DP	867C	Side with Part Marking
MPXV5050GP	1369	Side with Port Attached
MPXV5050DP	1351	Side with Part Marking
MPXV5050GC6/T1	482A	Vertical Port Attached

7 Package outline

Figure 12. MPX5050DP - SOT17560-1 - Case 867C package outline [1]



DIM	MILLIMETERS MIN	MAX	DIM	MILLIMETERS MIN	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 5: V2
2: GROUND 6: V EX
3: VCC
4: V1

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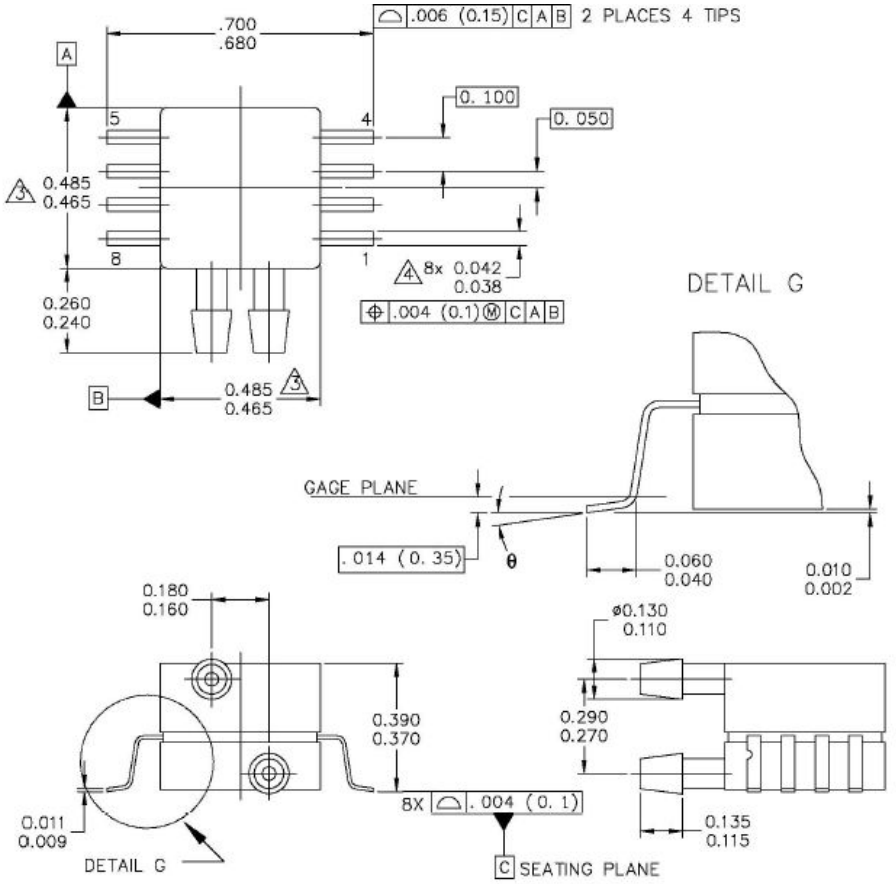
MECHANICAL OUTLINE | PRINT VERSION NOT TO SCALE

TITLE: SENSOR, 4 LEAD UNIBODY

DOCUMENT NO: 98ASB42797B REV: H
STANDARD: NON–JEDEC
SOT1756–1 29 JAN 2016

1. *Refer to Table 3. Pin descriptions - MPX5050DP.*

Figure 13. MPX5050DP - SOT1693-1 - Case 1351-01 package outline



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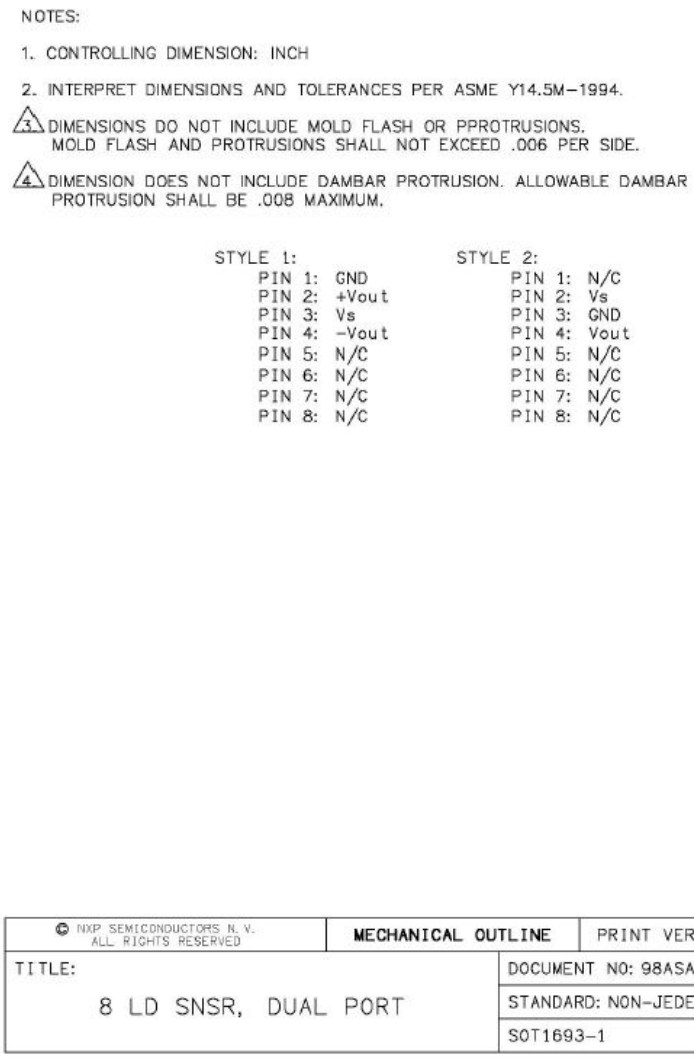
TITLE: 8 LD SNSR, DUAL PORT	DOCUMENT NO: 98ASA99255D	REV: B
	STANDARD: NON-JEDEC	
	SOT1693-1	14 MAR 2016

Figure 14. MPX5050DP - SOT1693-1 - Case 1351-01 package outline notes [2]


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

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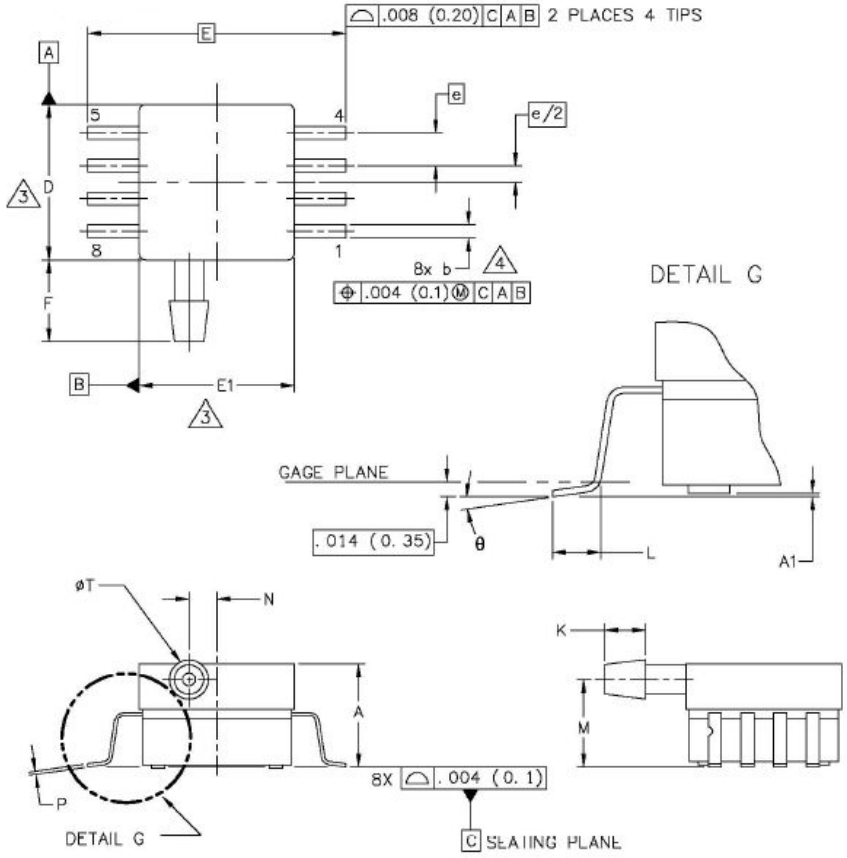
	STANDARD: NON–JEDEC
	SOT1693–1 14 MAR 2016

2. Style 1 is not applicable for the parts covered by this datasheet.

Figure 15. **MPX5050GP - SOT1693-3 - Case 1369-01 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 16. **MPX5050GP - SOT1693-3 - Case 1369-01 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 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	–	---	---	---	---

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8 LD SOP, SIDE PORT

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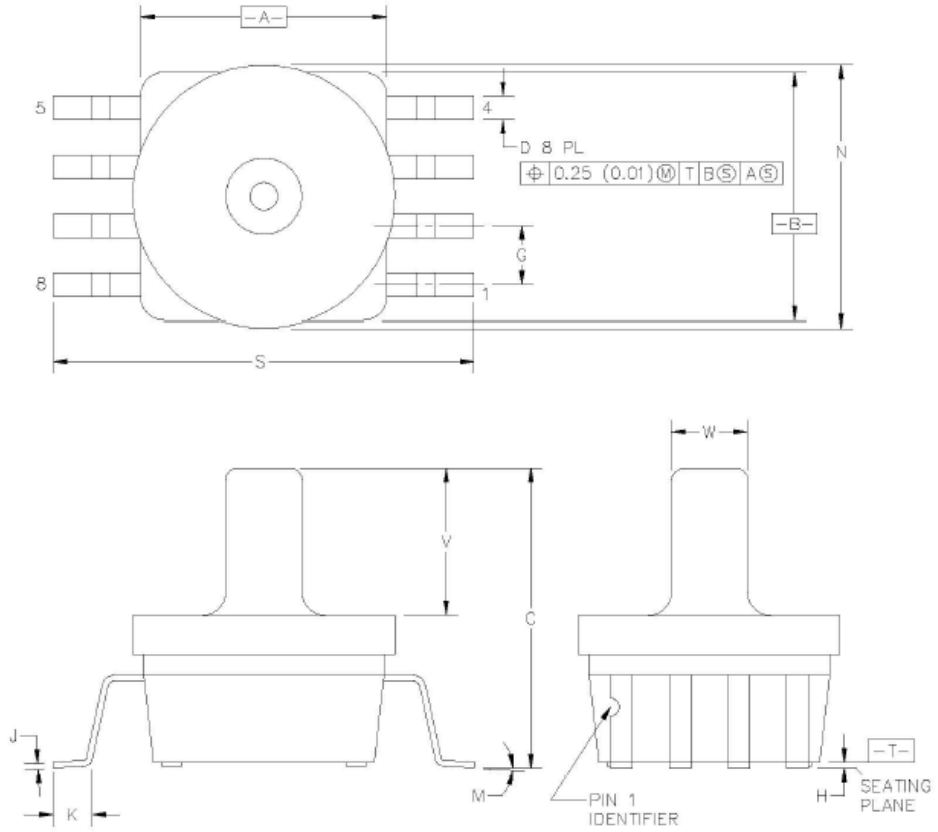
STANDARD: NON–JEDEC
SOT1693–3 14 MAR 2016

Figure 17. MPXV5050GC6T1 - SOT1854-1, Case 482-A 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 18. MPXV5050GC6T1 - SOT1854-1, Case 482-A 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 MIN	INCHES MAX	MILLIMETERS MIN	MILLIMETERS 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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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

Revision history

Table 8. **Document revision history**

Date	Revision	Changes
22-May-2026	1	Initial release from ST, rebranded NXP document

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