Integrated Silicon Pressure Sensor On-Chip Signal Conditioned, Temperature Compensated and Calibrated

MPVZ5004G SERIES

INTEGRATED PRESSURE SENSOR
0 to 3.92 kPA
(0 to 400 mm H_2O)
1.0 to 4.9 V OUTPUT

The MPVZ5004G series piezoresistive transducers are state-of-the-art monolithic silicon pressure sensors designed for the appliance, consumer, healthcare and industrial market. The analog output can be read directly into the A/D input of Freescale microcontrollers. 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.

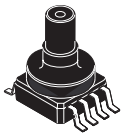
Features

- 1.5% Maximum Error for 0 to 100 mm H_2O over +10° to +60°C with Auto Zero
- 2.5% Maximum Error for 100 to 400 mm H_2O over +10° to +60°C with Auto Zero
- 6.25% Maximum Error for 0 to 400 mm H_2O over +10° to +60°C without Auto Zero
- Temperature Compensated over +10° to +60°C
- Available in Surface Mount (SMT) or Through-hole (DIP) Configurations

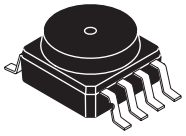
Application Examples

- Washing Machine Water Level Measurement (Reference AN1950)
- Ideally Suited for Microprocessor or Microcontroller-Based Systems
- Appliance Liquid Level and Pressure Measurement
- Respiratory Equipment

SMALL OUTLINE PACKAGE SURFACE MOUNT

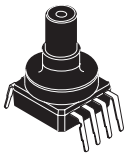


MPVZ5004GW6U
CASE 1735-01

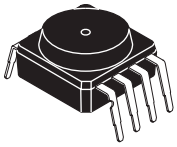


MPVZ5004G6U/T1
CASE 482-01

SMALL OUTLINE PACKAGE THROUGH-HOLE



MPVZ5004GW7U
CASE 1560-02



MPVZ5004G7U
CASE 482B-03

ORDERING INFORMATION				
Device Type	**Case No.**	**MPVZ Series Order No.**	**Packing Options**	**Device Marking**
Surface Mount	1735-01	MPVZ5004GW6U	Rails	MZ5004GW
Through-Hole	1560-02	MPVZ5004GW7U	Rails	MZ5004GW
Surface Mount	482-01	MPVZ5004G6U	Rails	MZ5004G
Surface Mount	482-01	MPVZ5004G6T1	Tape & Reel	MZ5004G
Through-Hole	482B-03	MPVZ5004G7U	Rails	MZ5004G

PIN NUMBERS[1]			
1	N/C	5	N/C
2	V_S	6	N/C
3	GND	7	N/C
4	V_{OUT}	8	N/C

1. Pins 1, 5, 6, 7, and 8 are internal device connections. Do not connect to external circuitry or ground. Pin 1 is noted by the notch in the lead.

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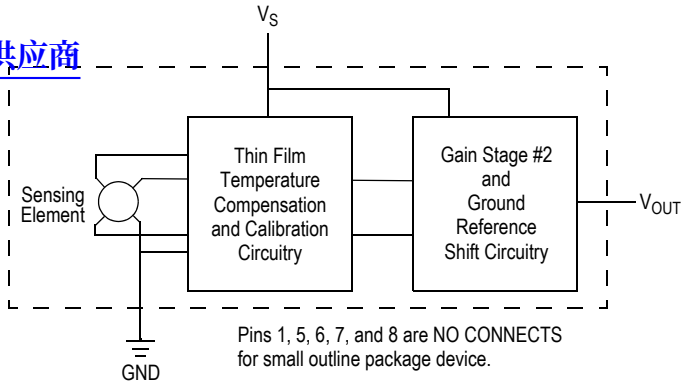


Figure 1. Fully Integrated Pressure Sensor Schematic

Table 1. Maximum Ratings(1)

Rating	Symbol	Value	Unit
Maximum Pressure (P1 > P2)	P_{MAX}	16	kPa
Storage Temperature	T_{STG}	–30 to +100	°C
Operating Temperature	T_A	0 to +85	°C

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

Table 2. Operating Characteristics (V_S = 5.0 V_{DC}, T_A = 25°C unless otherwise noted, P1 > P2)

Characteristic		Symbol	Min	Typ	Max	Units
Pressure Range		P_{OP}	0	—	3.92 400	kPa mm H_2O
Supply Voltage(1)		V_S	4.75	5.0	5.25	V_{DC}
Supply Current		I_S	—	—	10	mAdc
Full Scale Span(2) @ V_S = 5.0 Volts		V_{FSS}	—	4.0	—	V
Offset(3) (4)		V_{OFF}	0.75	1.0	1.25	V
Sensitivity		V/P	—	1.0 9.8	—	V/kPa mV/mm H_2O
Accuracy(4) (5)	0 to 100 mm H_2O (10 to 60°C)	—	—	—	±1.5	$\%V_{FSS}$ with auto zero
	100 to 400 mm H_2O (10 to 60°C)	—	—	—	±2.5	$\%V_{FSS}$ with auto zero
	0 to 400 mm H_2O (10 to 60°C)	—	—	—	±6.25	$\%V_{FSS}$ without auto zero

1. Device is ratiometric within this specified excitation range.
2. Span is defined as the algebraic difference between the output voltage at specified pressure and the output voltage at the minimum rated pressure.
3. Offset (V_{off}) is defined as the output voltage at the minimum rated pressure.
4. 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.
   - Offset Stability: Output deviation, after 1000 temperature cycles, -30 to 100°C, and 1.5 million pressure cycles, with minimum rated pressure applied.
   - TcSpan: Output deviation over the temperature range of 10 to 60°C, relative to 25°C.
   - TcOffset: Output deviation with minimum rated pressure applied, over the temperature range of 10 to 60°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.
5. Auto Zero at Factory Installation: Due to the sensitivity of the MPVZ5004G, external mechanical stresses and mounting position can affect the zero pressure output reading. Autozeroing is defined as storing the zero pressure output reading and subtracting this from the device's output during normal operations. Reference AN1636 for specific information. The specified accuracy assumes a maximum temperature change of ± 5°C between autozero and measurement.

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 2 illustrates the Differential or Gauge configuration in the basic chip carrier (Case 482). A gel die coat isolates the die surface and wire bonds from the environment, while allowing the pressure signal to be transmitted to the silicon diaphragm.

The MPVZ5004G series sensor operating characteristics are based on use of dry air as pressure media. Media, other than dry air, may have adverse effects on sensor performance and long-term reliability. Internal reliability and qualification test for dry air, and other media, are available from the factory. Contact the factory for information regarding media tolerance in your application.

Figure 3 shows the recommended decoupling circuit for interfacing the output of the MPVZ5004G to the A/D input of the microprocessor or microcontroller. Proper decoupling of the power supply is recommended.

Figure 4 and Figure 5 shows the sensor output signal relative to pressure input. Typical, minimum and maximum output curves are shown for operation over a temperature range of 10°C to 60°C using the decoupling circuit shown in Figure 3 The output will saturate outside of the specified pressure range.

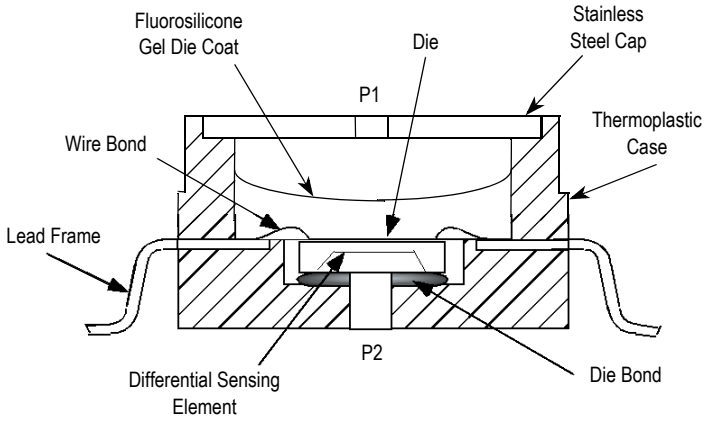


Figure 2. Cross-Sectional Diagram (Not to Scale)

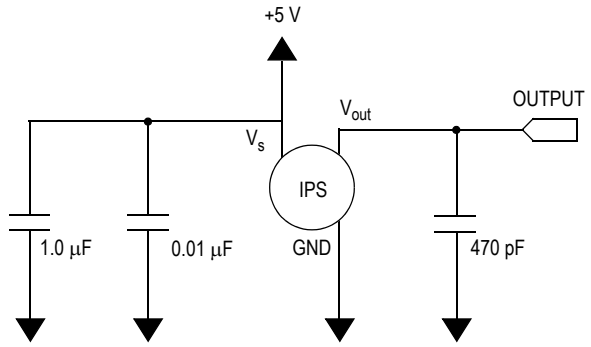


Figure 3. Recommended Power Supply Decoupling and Output Filtering.
(For additional output filtering, please refer to Application Note AN1646.)

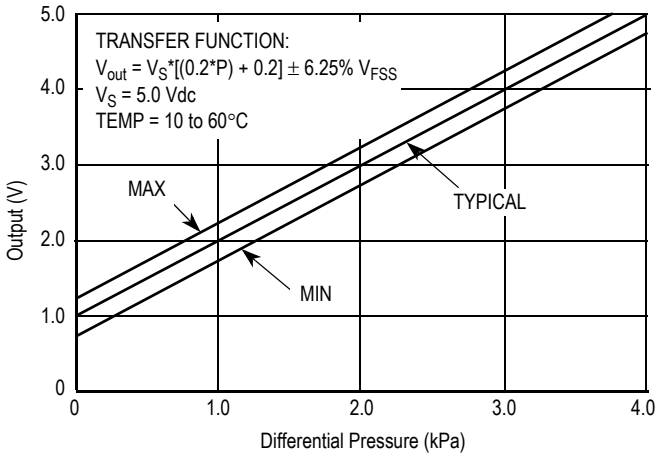


Figure 4. Output versus Pressure Differential at ±6.25% V_{FSS} (without auto zero, note 5 in Operating Characteristics)

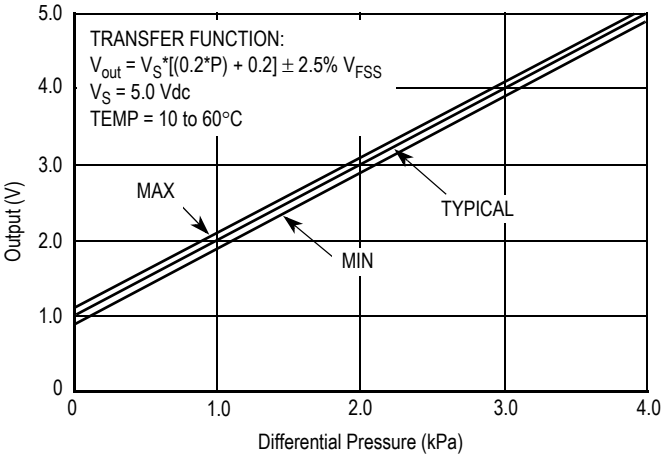


Figure 5. Output versus Pressure Differential at ±2.5% V_{FSS} (with auto zero, note 5 in Operating Characteristics)

PRESSURE (P1)/VACUUM (P2) SIDE IDENTIFICATION TABLE

Freescale Semiconductor 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 a gel die coat which isolates the die from the environment. The Freescale Semiconductor pressure sensor is designed to operate with positive differential pressure applied, P1 > P2.

The Pressure (P1) side may be identified by using the table below.

Part Number	Case Type	Pressure (P1) Side Identifier
MPVZ5004GW6U	1735-01	Vertical Port Attached
MPVZ5004GW7U	1560-02	Vertical Port Attached
MPVZ5004G6U/T1	482-01	Stainless Steel Cap
MPVZ5004G7U	482B-03	Stainless Steel Cap

INFORMATION FOR USING THE SMALL OUTLINE PACKAGE (CASE 482)

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.

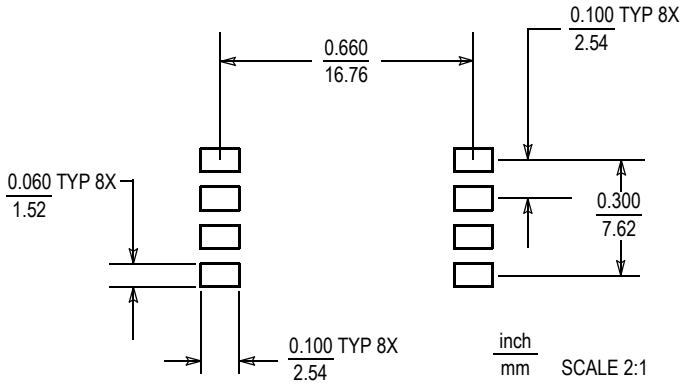
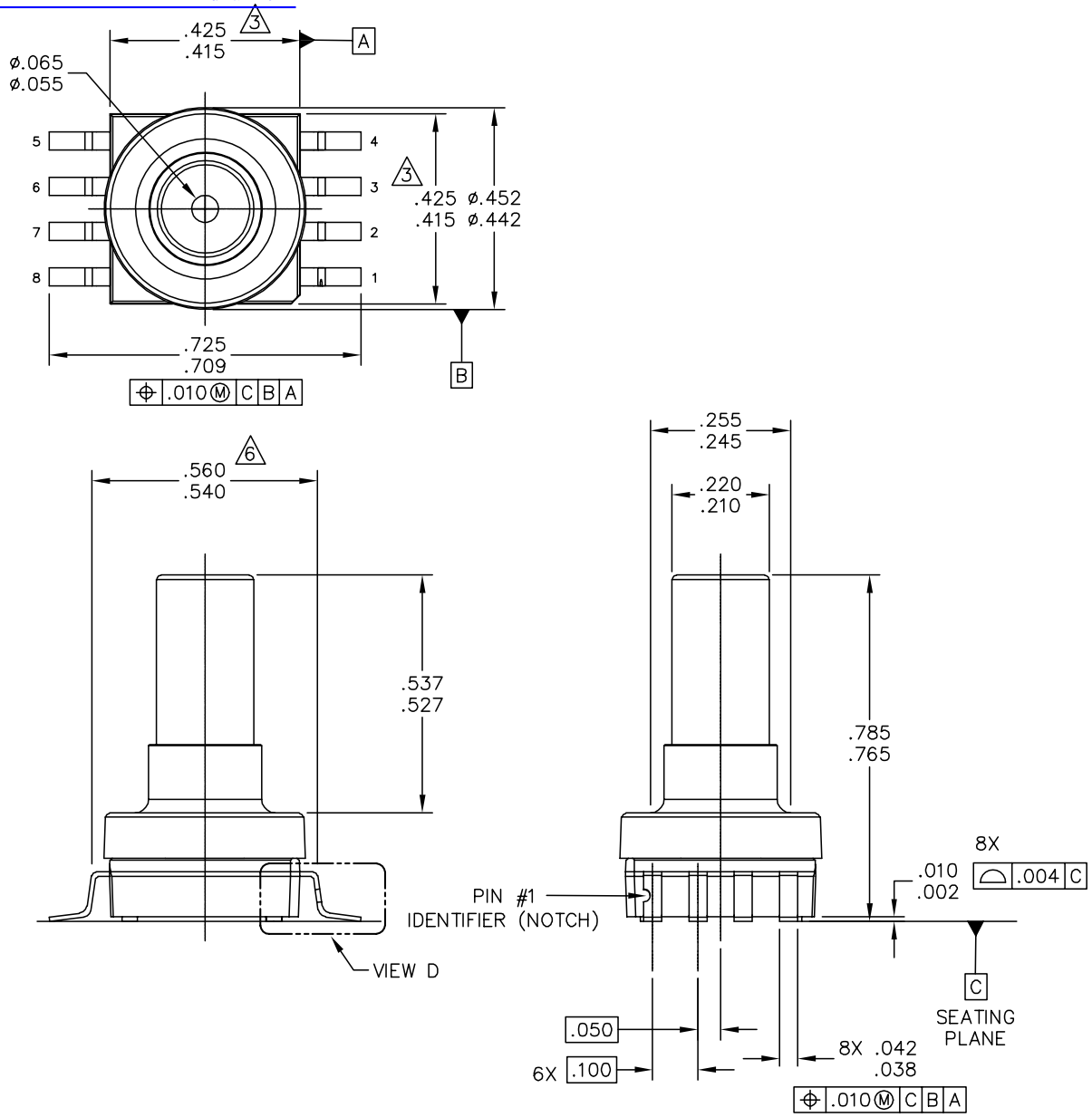


Figure 6. SOP Footprint (Case 482)

PACKAGE DIMENSIONS

查询"MPVZ5004G6U"供应商



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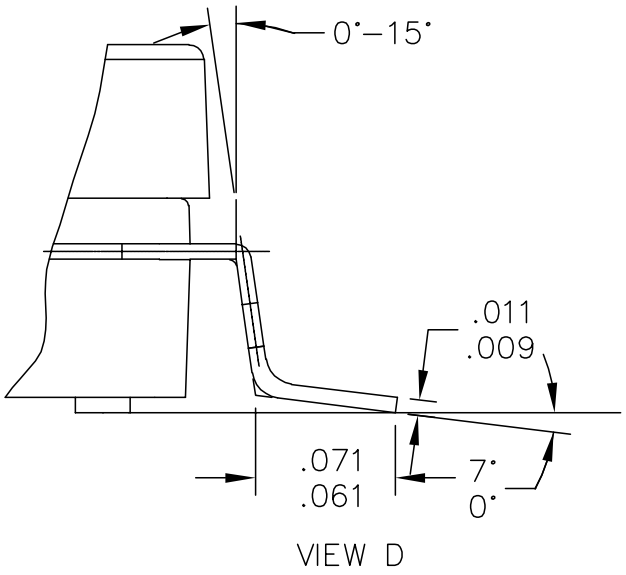
	CASE NUMBER: 1735–01	16 AUG 2005
	STANDARD: NON–JEDEC	

PAGE 1 OF 3

CASE 1735-01
ISSUE A
SMALL OUTLINE PACKAGE



VIEW D

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TITLE: SO, 8 I/O, .420 X .420 PKG, .100 IN PITCH	DOCUMENT NO: 98ASA10686D	REV: A
	CASE NUMBER: 1735–01	18 AUG 2005
	STANDARD: NON–JEDEC	

CASE 1735-01
ISSUE A
SMALL OUTLINE PACKAGE

NOTES:

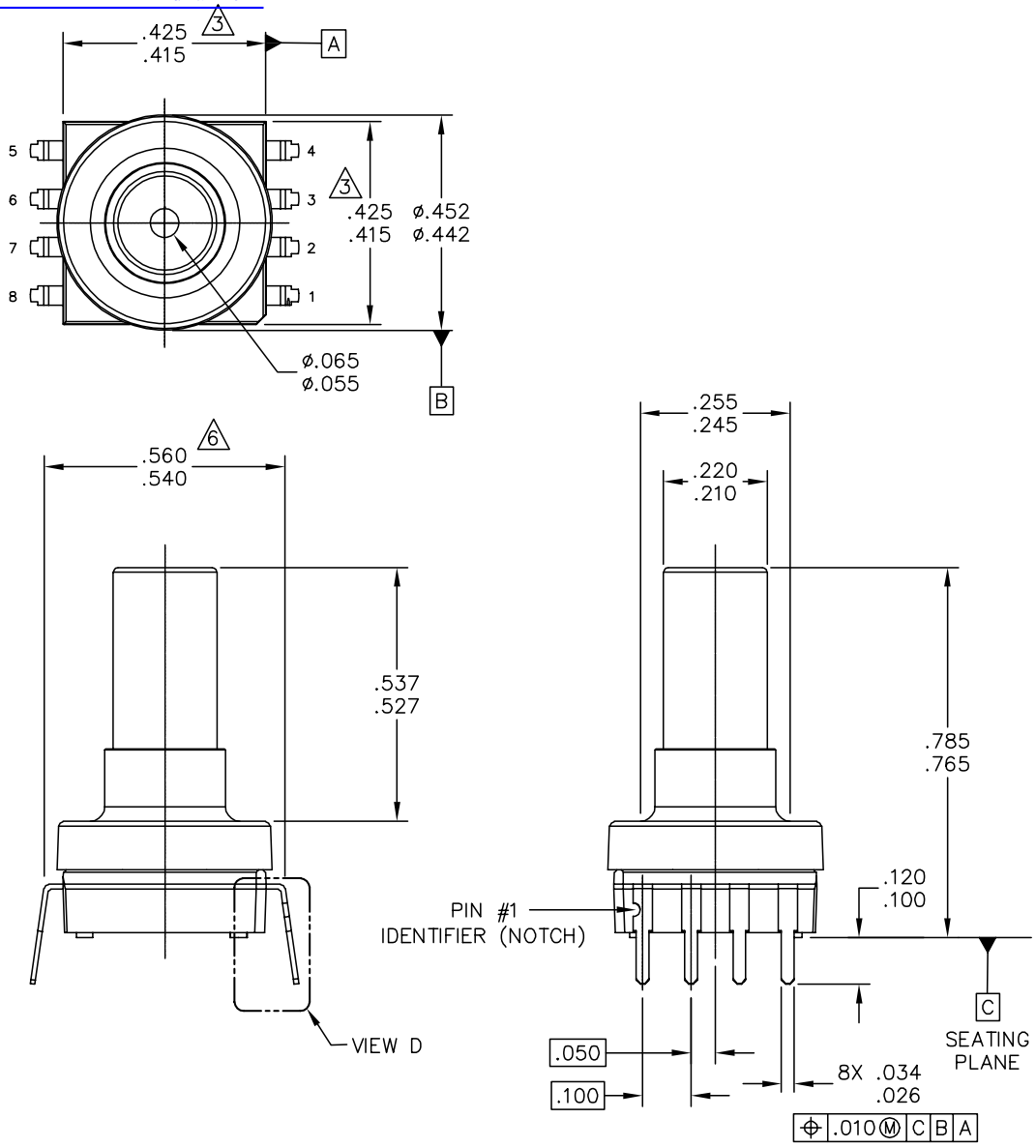
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M – 1994.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSIONS DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION IS .006.
5. ALL VERTICAL SURFACES 5° TYPICAL DRAFT.
6. DIMENSION TO CENTER OF LEAD WHEN FORMED PARALLEL.

	MECHANICAL OUTLINE	PRINT VERSION NOT TO SCALE
TITLE: SO, 8 I/O, .420 X .420 PKG, .100 IN PITCH	DOCUMENT NO: 98ASA10686D	REV: A
	CASE NUMBER: 1735–01	18 AUG 2005
	STANDARD: NON–JEDEC	

CASE 1735-01
ISSUE A
SMALL OUTLINE PACKAGE

PACKAGE DIMENSIONS

查询"MPVZ5004G6U"供应商



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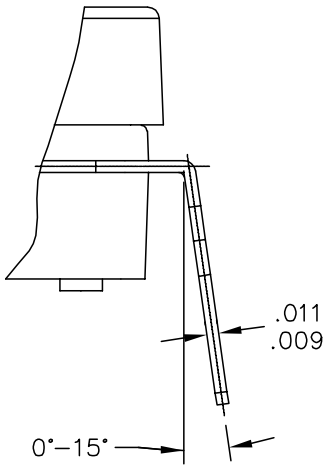
TITLE: SO, 8 I/O, .420 X .420 PKG, .100 IN PITCH	DOCUMENT NO: 98ASA10611D	REV: C
	CASE NUMBER: 1560–02	26 MAY 2005
	STANDARD: NON–JEDEC	

PAGE 1 OF 3

CASE 1560-02
ISSUE C
SMALL OUTLINE PACKAGE



VIEW D

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TITLE: SO, 8 I/O, .420 X .420 PKG, .100 IN PITCH	DOCUMENT NO: 98ASA10611D	REV: C
	CASE NUMBER: 1560–02	26 MAY 2005
	STANDARD: NON–JEDEC	

CASE 1560-02
ISSUE C
SMALL OUTLINE PACKAGE

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: C
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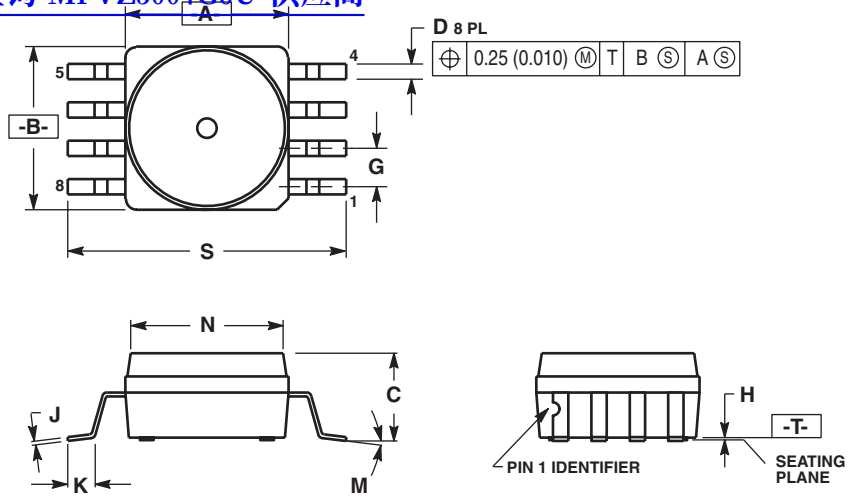
	STANDARD: NON–JEDEC	

CASE 1560-02
ISSUE C
SMALL OUTLINE PACKAGE

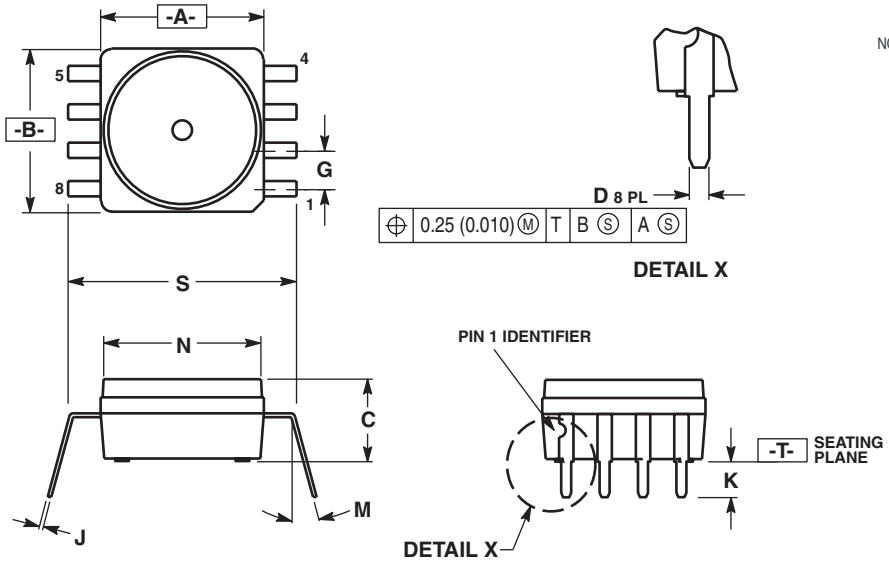
PACKAGE DIMENSIONS



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION A AND B DO NOT INCLUDE MOLD PROTRUSION.
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	0.212	0.230	5.38	5.84
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	0.405	0.415	10.29	10.54
S	0.709	0.725	18.01	18.41

CASE 482-01
ISSUE O
SMALL OUTLINE PACKAGE



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5. ALL VERTICAL SURFACES 5° TYPICAL DRAFT.
6. DIMENSION S TO CENTER OF LEAD WHEN FORMED PARALLEL.

	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	0.210	0.220	5.33	5.59
D	0.026	0.034	0.66	0.864
G	0.100 BSC		2.54 BSC	
J	0.009	0.011	0.23	0.28
K	0.100	0.120	2.54	3.05
M	0°	15°	0°	15°
N	0.405	0.415	10.29	10.54
S	0.540	0.560	13.72	14.22

CASE 482B-03
ISSUE B
SMALL OUTLINE PACKAGE

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