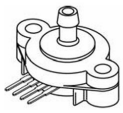
MPX2102AP, MPX2102ASX
MPXM2102A, MPXM2102AS

Datasheet

100 kPa on-chip temperature compensated silicon pressure sensors

MPX2102AP
CASE 344B



MPX2102ASX
CASE 344F

MPAK

MPXM2102A/ATI

CASE 1320

MPXM2102AS/AST1
MPXM2102 /AS
CASE 1320A

Features

- Temperature Compensated Over 0°C to +85°C
- Easy-to-Use Chip Carrier Package Options
- Available in Absolute, Differential and Gauge Configurations
- Absolute, Differential and Gauge Options

Applications

- Pump/Motor Control
- Robotics
- Level Detectors
- Medical Diagnostics
- Pressure Switching
- Barometers
- Altimeters

Description

The MPX2102 series devices are silicon piezoresistive pressure sensors 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

Table 1. **Ordering information**

Device Name	Package Options	Case No.	# of Ports				Pressure Type		Device Marking
			None	Single	Dual	Gauge	Differential	Absolute	
Unibody Package (MPX2102 Series)									
MPX2102AP	Tray	344B		•				•	MPX2102AP
MPX2102ASX	Tray	344F		•				•	MPX2102A
Small Outline Package (MPXV2102G Series)									
MPAK Package (MPXM2102 Series)									
MPXM2102A	Rail	1320	•					•	MPXM2102A
MPXM2102AT1	Tape and Reel	1320	•					•	MPXM2102A
MPXM2102AS	Rail	1320A		•				•	MPXM2102AS
MPXM2102AST1	Tape and Reel	1320A		•				•	MPXM2102AS

2 Operating characteristics

Table 2. **Table 1. Operating Characteristics (V_S = 10 V_{DC}, T_A = 25°C unless otherwise noted, P1 > P2)**

Characteristic	Symbol	Min	Typ	Max	Units
Pressure Range(1) Absolute Pressure Range MPX2102A Differential Pressure Range MPX2102D	 P_{OP} P_{OP}	 20 0	 — —	 100 100	 kPa kPa
Supply Voltage(2)	V_S	—	10	16	V_{DC}
Supply Current	I_O	—	6.0	—	mAdc
Full Scale Span(3)	V_{FSS}	38.5	40	41.5	mV
Offset(4) MPX2102D Series MPX2102A Series MPXM2102D/G Series MPXM2102A Series	 V_{OFF} V_{OFF}	-1.0 -2.0 -1.0 -2.0	— — — —	 1.0 2.0 1.0 2.0	mV mV
Sensitivity	ΔV/ΔP	—	0.4	—	mV/kPa
Linearity(5) MPX2102D Series MPX2102A Series MPXM2102D/G Series MPXM2102A Series	— — — —	-0.6 -1.0 -0.6 -1.0	— — — —	 0.4 1.0 0.4 1.0	 %V_{FSS} %V_{FSS}
Pressure Hysteresis(5) (0 to 100 kPa)	—	—	±0.1	—	%V_{FSS}
Temperature Hysteresis(5)(-40°C to +125°C)	—	—	±0.5	—	%V_{FSS}
Temperature Coefficient of Full Scale Span(5)	TCV_{FSS}	-2.0	—	2.0	%V_{FSS}
Temperature Coefficient of Offset(5)	TCV_{OFF}	-1.0	—	1.0	mV
Input Impedance	Z_{IN}	1000	—	2500	W
Output Impedance	Z_{OUT}	1400	—	3000	W
Response Time(6) (10% to 90%)	t_R	—	1.0	—	ms
Warm-Up Time	—	—	20	—	ms
Offset Stability(7)	—	—	±0.5	—	%V_{FSS}

1. 1.0 kPa (kiloPascal) equals 0.145 psi.
2. 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.
3. 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 related pressure.
4. Offset (V_{OFF}) is defined as 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, using 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 with 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 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.

6. Response Time is defined as the time from 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. Offset stability is the product's output deviation when subjected to 1000 hours of Pulsed Pressure, Temperature Cycling with Bias Test. 3

3 Maximum ratings

Table 3. **Maximum Ratings**(1)

Rating	Symbol	Value	Unit
Maximum Pressure (P1 > P2)	P_{MAX}	400	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.

4 Voltage output vs. applied differential

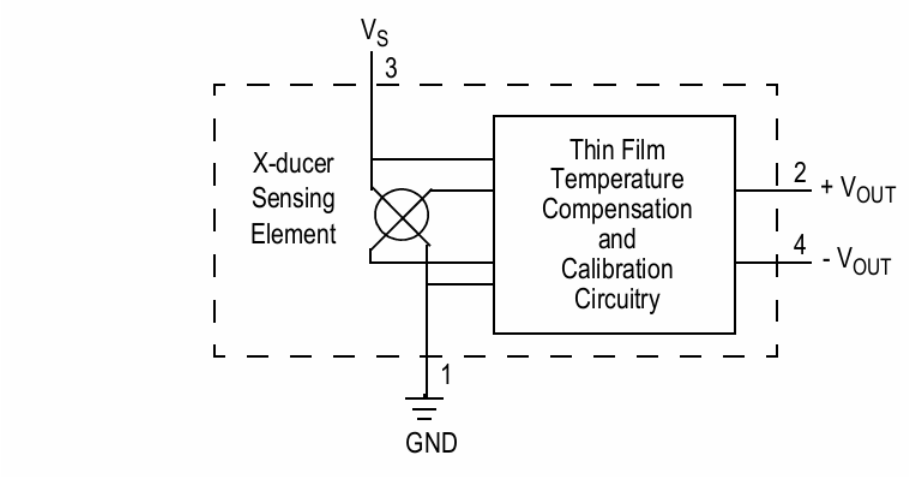
The differential voltage output of the sensor is directly proportional to the differential pressure applied.

The absolute sensor has a built-in reference vacuum. The output voltage will decrease as vacuum, relative to ambient, is drawn on the pressure (P1) side.

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

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

Figure 1. Temperature Compensated Pressure Sensor Schematic



5 On-chip temperature compensation and calibration

Figure 2 shows the output characteristics of the MPX2102 The effects of temperature on Full Scale Span and Offset series at 25°C. The output is directly proportional to the are very small and are shown under Operating differential pressure and is essentially a straight line. Characteristics.

Figure 3 illustrates the absolute sensing configuration (right) and the differential or gauge configuration in the basic chip carrier (Case 344). 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.

The MPX2102 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 2. Output vs. Pressure Differential

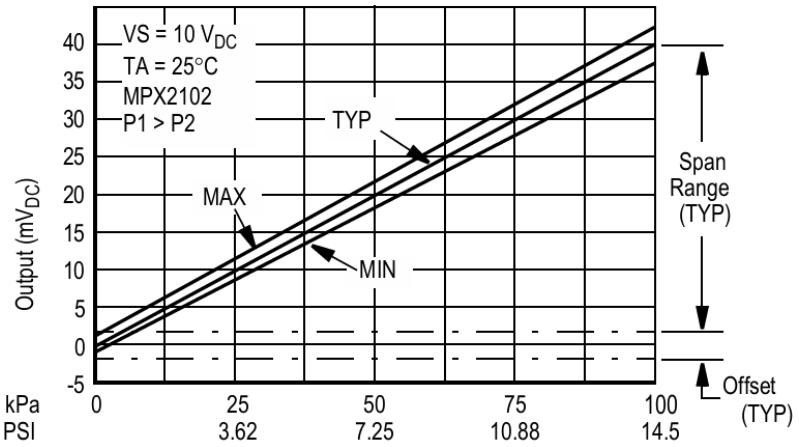
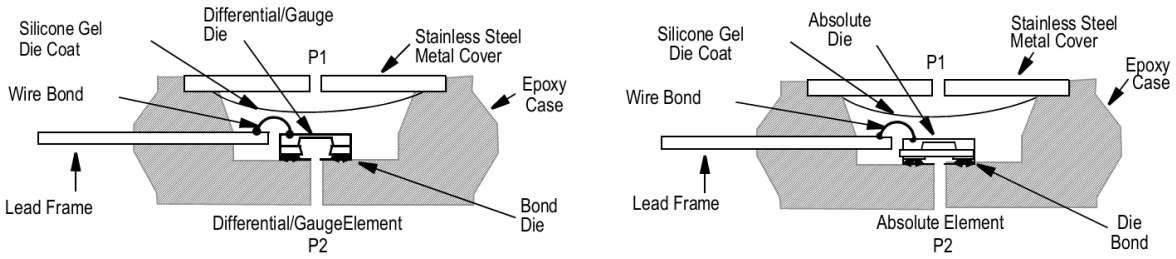


Figure 3. Cross Sectional Diagrams (Not to Scale)

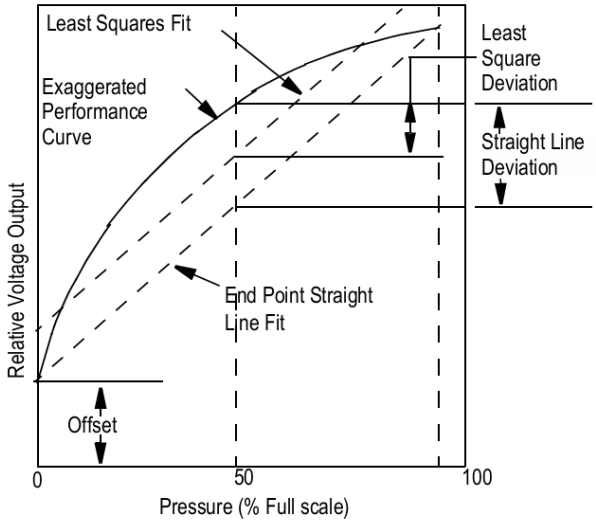


6 Linearity

Linearity refers to how well a transducer's output follows the equation: $V_{OUT} = V_{OFF}$ + sensitivity x P over the operating pressure range. There are two basic methods for calculating nonlinearity: (1) end point straight line fit (see Figure 4) or (2) a 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. The specified pressure sensor linearities are based on the end point straight line method measured at the midrange pressure.

Figure 4. Linearity Specification Comparison



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 the silicone gel which isolates the die. The differential or gauge sensor is designed to operate with positive differential pressure applied, P1 > P2. The absolute sensor is designed for vacuum applied to P1 side.

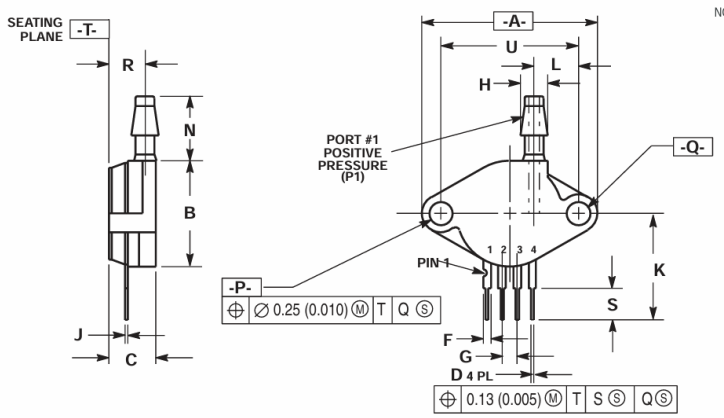
The Pressure (P1) side may be identified by using the following table.

Table 4. Pressure (P1) side delineation

Part Number	Case Type	Pressure (P1) Side Identifier
MPX2102AP	344B	Side with Port Attached
MPX2102ASX	344F	Side with Port Marking
MPXM2102A, MPX2102ATI	1320	Stainless Steel Cap
MPXM2102AS MPXM2102ASTI	1320A	Side with Port Attached

8 Package dimension

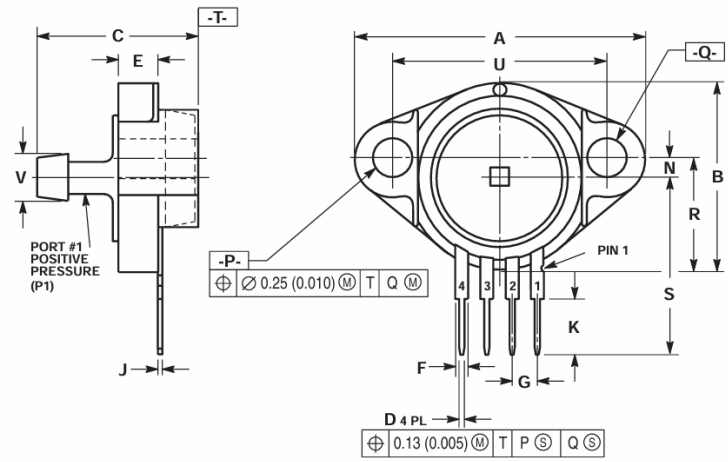
Figure 5. **CASE 344B-01 ISSUE B UNIBODY PACKAGE**



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	1.145	1.175	29.08	29.85
B	0.685	0.715	17.40	18.16
C	0.305	0.325	7.75	8.26
D	0.016	0.020	0.41	0.51
F	0.048	0.064	1.22	1.63
G	0.100 BSC		2.54 BSC	
H	0.182	0.194	4.62	4.93
J	0.014	0.016	0.36	0.41
K	0.695	0.725	17.65	18.42
L	0.290	0.300	7.37	7.62
N	0.420	0.440	10.67	11.18
P	0.153	0.159	3.89	4.04
Q	0.153	0.159	3.89	4.04
R	0.230	0.250	5.84	6.35
S	0.220	0.240	5.59	6.10
U	0.910 BSC		23.11 BSC	

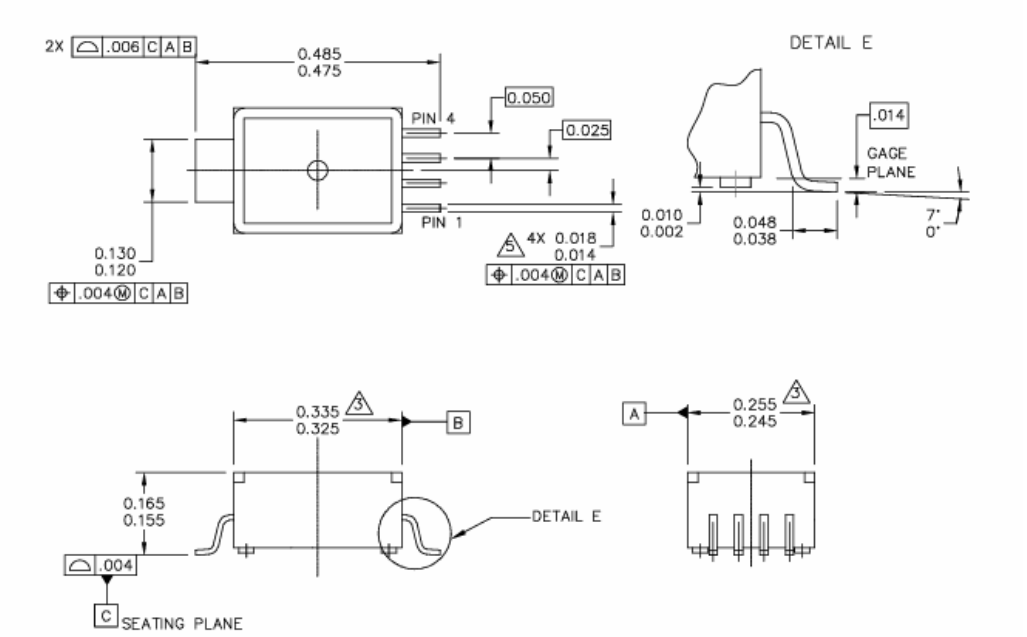
Figure 6. **CASE 344F-01 ISSUE B UNIBODY PACKAGE**



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	1.080	1.120	27.43	28.45
B	0.740	0.760	18.80	19.30
C	0.630	0.650	16.00	16.51
D	0.016	0.020	0.41	0.51
E	0.160	0.180	4.06	4.57
F	0.048	0.064	1.22	1.63
G	0.100 BSC		2.54 BSC	
J	0.014	0.016	0.36	0.41
K	0.220	0.240	5.59	6.10
N	0.070	0.080	1.78	2.03
P	0.150	0.160	3.81	4.06
Q	0.150	0.160	3.81	4.06
R	0.440	0.460	11.18	11.68
S	0.695	0.725	17.65	18.42
U	0.840	0.860	21.34	21.84
V	0.182	0.194	4.62	4.92

Figure 7. **CASE 1320-02 ISSUE B MPAK**



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	CASE NUMBER: 1320–02	22 JUL 2005
	STANDARD: NON–JEDEC	

Figure 8. **CASE 1320-02 ISSUE B MPAK**

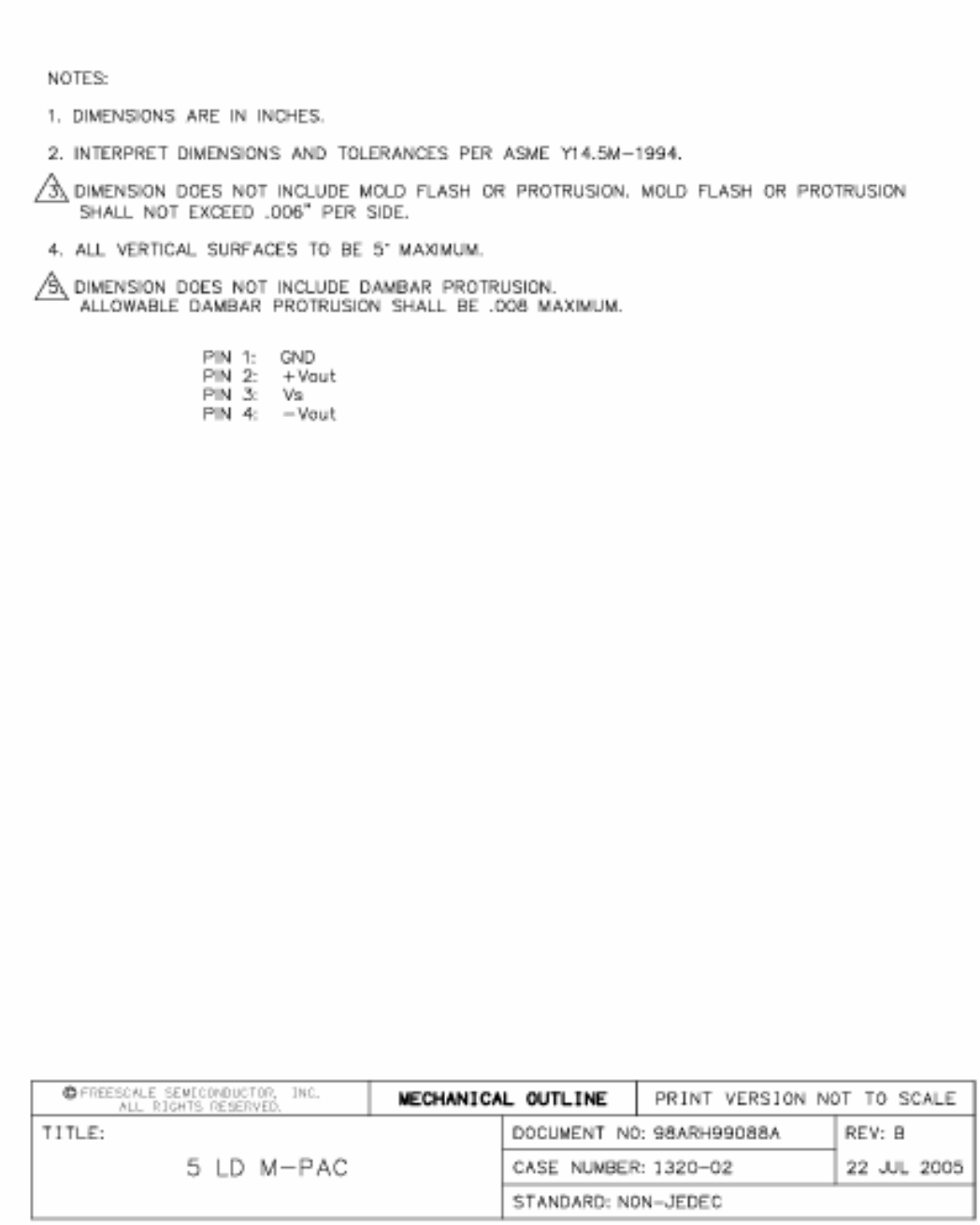
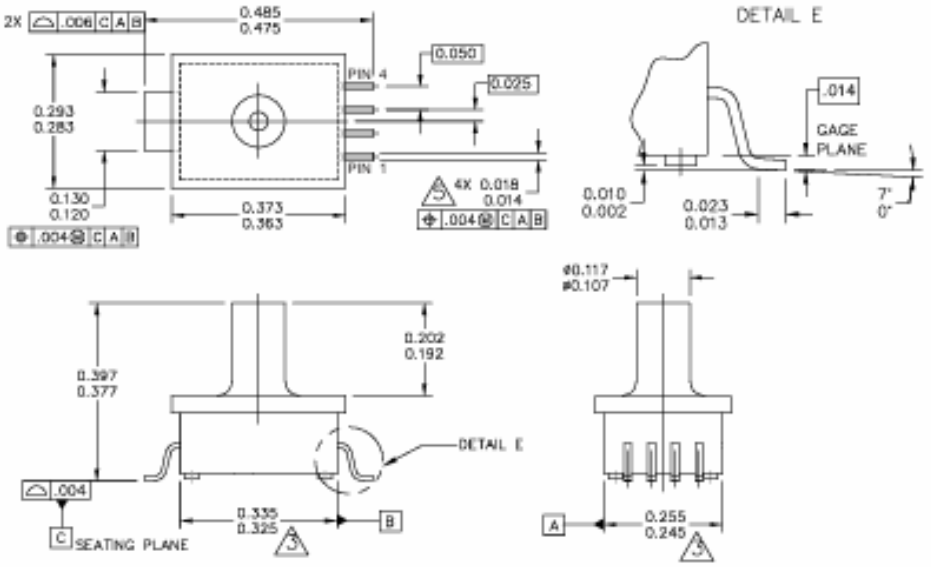


Figure 9. **CASE 1320A-02 ISSUE A MPAK**



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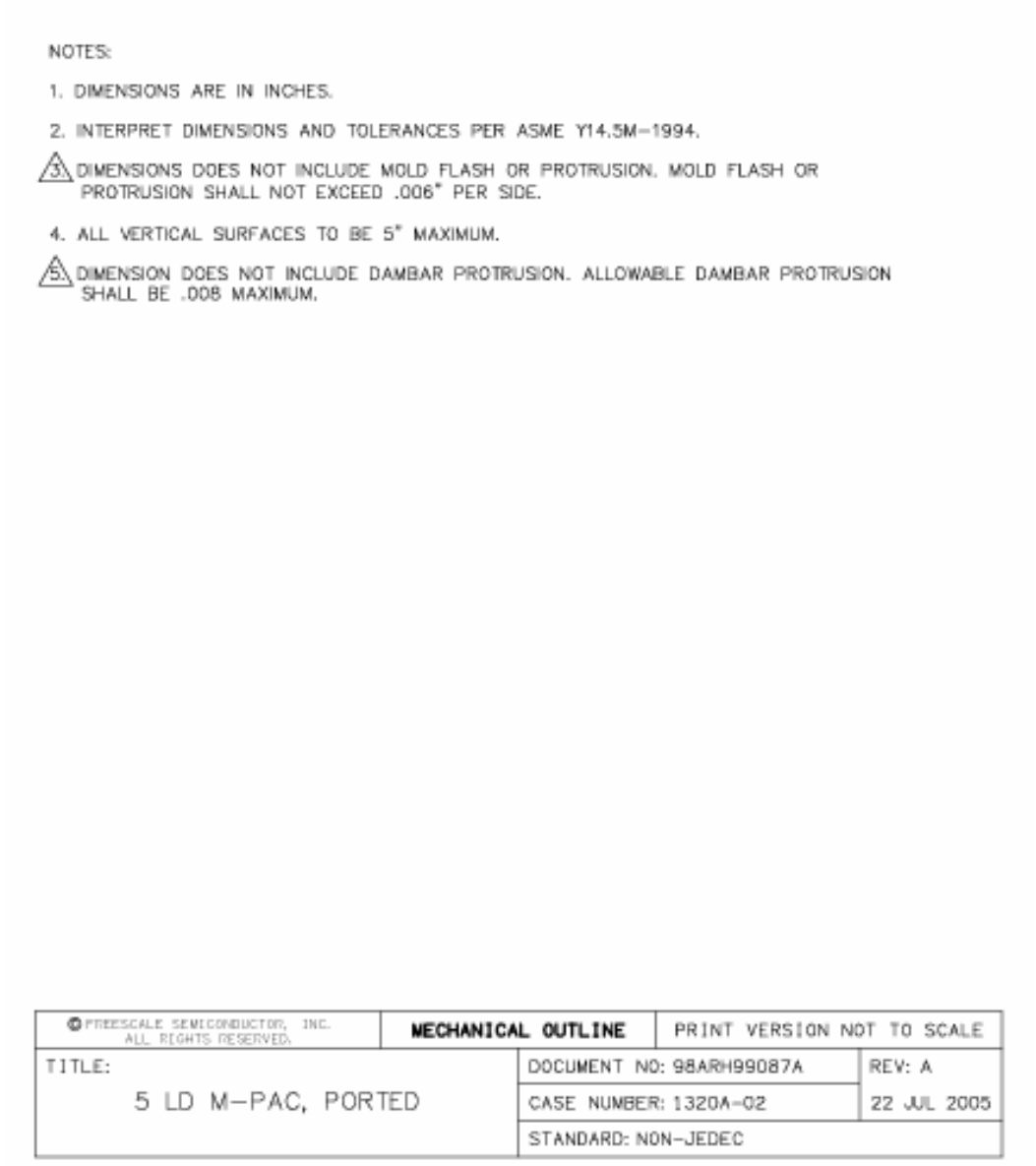
	CASE NUMBER: 1320A–02	22 JUL 2005
	STANDARD: NON–JEDEC	

Figure 10. **CASE 1320A-02 ISSUE A MPAK**



Revision history

Table 5. **Document revision history**

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

Contents