

# High Volume Pressure Sensor For Disposable Applications

Freescale Semiconductor has developed a low cost, high volume, miniature pressure sensor package which is ideal as a sub-module component or a disposable unit. The unique concept of the Chip Pak allows great flexibility in system design while allowing an economic solution for the designer. This new chip carrier package uses Freescale Semiconductor's unique sensor die with its piezoresistive technology, along with the added feature of on-chip, thin-film temperature compensation and calibration.

**NOTE:** Freescale Semiconductor is also offering the Chip Pak package in application-specific configurations, which will have an "SPX" prefix, followed by a four-digit number, unique to the specific customer.

## Features

- Low Cost
- Integrated Temperature Compensation and Calibration
- Ratiometric to Supply Voltage
- Polysulfone Case Material (Medical, Class V Approved)
- Provided in Easy-to-Use Tape and Reel

## Application Examples

- Medical Diagnostics
- Infusion Pumps
- Blood Pressure Monitors
- Pressure Catheter Applications
- Patient Monitoring

**NOTE:** The die and wire bonds are exposed on the front side of the Chip Pak (pressure is applied to the backside of the device). Front side die and wire protection must be provided in the customer's housing. Use caution when handling the devices during all processes.

**Freescale Semiconductor's MPX2300DT1/MPX2301DT1 Pressure Sensors** have been designed for medical usage by combining the performance of Freescale Semiconductor's shear stress pressure sensor design and the use of biomedically approved materials. Materials with a proven history in medical situations have been chosen to provide a sensor that can be used with confidence in applications, such as invasive blood pressure monitoring. It can be sterilized using ethylene oxide. The portions of the pressure sensor that are required to be biomedically approved are the rigid housing and the gel coating.

The rigid housing is molded from a white, medical grade polysulfone that has passed extensive biological testing including: tissue culture test, rabbit implant, hemolysis, intracutaneous test in rabbits, and system toxicity, USP.

A silicone dielectric gel covers the silicon piezoresistive sensing element. The gel is a nontoxic, nonallergenic elastomer system which meets all USP XX Biological Testing Class V requirements. The properties of the gel allow it to transmit pressure uniformly to the diaphragm surface, while isolating the internal electrical connections from the corrosive effects of fluids, such as saline solution. The gel provides electrical isolation sufficient to withstand defibrillation testing, as specified in the proposed Association for the Advancement of Medical Instrumentation (AAMI) Standard for blood pressure transducers. A biomedically approved opaque filler in the gel prevents bright operating room lights from affecting the performance of the sensor. The **MPX2301DT1** is a reduced gel option.

**Preferred** devices are Freescale Semiconductor recommended choices for future use and best overall value.

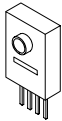
## MPX2300DT1 MPX2301DT1

Freescale Semiconductor Preferred Device

### PRESSURE SENSORS

0 to 300 mmHg (0 to 40 kPa)

### CHIP PAK PACKAGE



**MPX2300/1DT1  
CASE 423A**

PIN NUMBER			
1	V <sub>S</sub>	3	S-
2	S+	4	Gnd

**MAXIMUM RATINGS(NOTE)**

Rating	Symbol	Value	Unit
Maximum Pressure (Backside)	$P_{max}$	125	PSI
Storage Temperature	$T_{stg}$	-25 to +85	°C
Operating Temperature	$T_A$	+15 to +40	°C

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

**OPERATING CHARACTERISTICS** ( $V_S = 6$  Vdc,  $T_A = 25^\circ\text{C}$  unless otherwise noted)

Characteristics	Symbol	Min	Typ	Max	Unit
Pressure Range	$P_{OP}$	0	—	300	mmHg
Supply Voltage <sup>(7)</sup>	$V_S$	—	6.0	10	Vdc
Supply Current	$I_o$	—	1.0	—	mAdc
Zero Pressure Offset	$V_{off}$	-0.75	—	0.75	mV
Sensitivity	—	4.95	5.0	5.05	$\mu\text{V}/\text{V}/\text{mmHg}$
Full Scale Span <sup>(1)</sup>	$V_{FSS}$	2.976	3.006	3.036	mV
Linearity + Hysteresis <sup>(2)</sup>	—	- 1.5	—	1.5	% $V_{FSS}$
Accuracy <sup>(9)</sup> $V_S = 6$ V, $P = 101$ to 200 mmHg	—	- 1.5	—	1.5	%
Accuracy <sup>(9)</sup> $V_S = 6$ V, $P = 201$ to 300 mmHg	—	- 3.0	—	3.0	%
Temperature Effect on Sensitivity	TCS	-0.1	—	+0.1	%/°C
Temperature Effect on Full Scale Span <sup>(3)</sup>	$TCV_{FSS}$	-0.1	—	+0.1	%/°C
Temperature Effect on Offset <sup>(4)</sup>	$TCV_{off}$	-9.0	—	+9.0	$\mu\text{V}/^\circ\text{C}$
Input Impedance	$Z_{in}$	1800	—	4500	$\Omega$
Output Impedance	$Z_{out}$	270	—	330	$\Omega$
$R_{CAL}$ (150 k $\Omega$ ) <sup>(8)</sup>	$R_{CAL}$	97	100	103	mmHg
Response Time <sup>(5)</sup> (10% to 90%)	$t_R$	—	1.0	—	ms
Temperature Error Band	—	0	—	85	°C
Stability <sup>(6)</sup>	—	—	$\pm 0.5$	—	% $V_{FSS}$

**NOTES:**

- Measured at 6.0 Vdc excitation for 100 mmHg pressure differential.  $V_{FSS}$  and FSS are like terms representing the algebraic difference between full scale output and zero pressure offset.
- Maximum deviation from end-point straight line fit at 0 and 200 mmHg.
- Slope of end-point straight line fit to full scale span at 15°C and +40°C relative to +25°C.
- Slope of end-point straight line fit to zero pressure offset at 15°C and +40°C relative to +25°C.
- For a 0 to 300 mmHg pressure step change.
- Stability is defined as the maximum difference in output at any pressure within  $P_{OP}$  and temperature within +10°C to +85°C after:
  - 1000 temperature cycles, -40°C to +125°C.
  - 1.5 million pressure cycles, 0 to 300 mmHg.
- Recommended voltage supply: 6 V  $\pm$  0.2 V, regulated. Sensor output is ratiometric to the voltage supply. Supply voltages above +10 V may induce additional error due to device self-heating.
- Offset measurement with respect to the measured sensitivity when a 150k ohm resistor is connected to  $V_S$  and S+ output.
- Accuracy is calculated using the following equation:

$$\text{Error}_p = \{[V_p - \text{Offset}] / (\text{Sens}_{Nom} * V_{EX}) - P\} / P$$

Where:

- $V_p$  = Actual output voltage at pressure P in microvolts ( $\mu\text{V}$ )
- Offset = Voltage output at P = 0mmHg in microvolts ( $\mu\text{V}$ )
- $\text{Sens}_{Nom}$  = Nominal sensitivity = 5.01  $\mu\text{V}/\text{V}/\text{mmHg}$
- $V_{EX}$  = Excitation voltage
- P = Pressure applied to the device

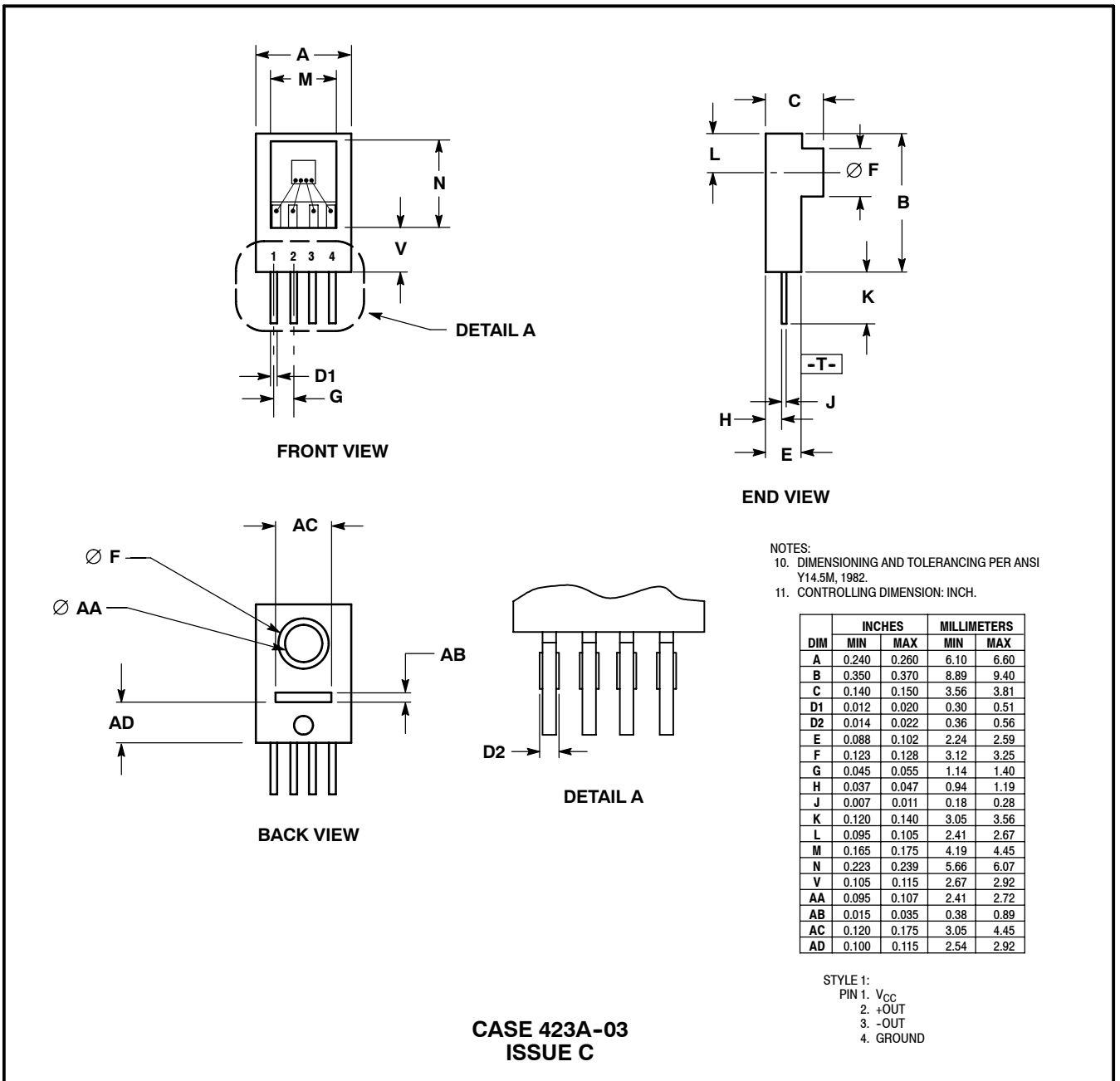
## ORDERING INFORMATION

The MPX2300DT1/MPX2301DT1 silicon pressure sensors are available in tape and reel packaging.

Device Type/Order No.	Case No.	Device Description	Marking
MPX2300DT1	423A	Chip Pak, Full Gel	Date Code, Lot ID
MPX2301DT1	423A	Chip Pak, 1/3 Gel	Date Code, Lot ID

Packaging Information	Reel Size	Tape Width	Quantity
Tape and Reel	330 mm	24 mm	1000 pc/reel

## PACKAGE DIMENSIONS



MPX2300DT1 MPX2301DT1

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