

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 (ISO 10993)
- Provided in Easy-to-Use Tape and Reel

MPX2300DT1 MPX2301DT1

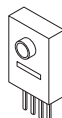
Pressure Sensors
0 to 300 mmHg
(0 to 40 kPa)

Application Examples

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

ORDERING INFORMATION						
Device Name	Package Options	Case No.	Pressure Type			Device Marking
			Gauge	Differential	Absolute	
MPX2300DT1	Tape and Reel	423A		•		Date Code, Lot ID
MPX2301DT1	Tape and Reel	423A		•		Date Code, Lot ID

CHIP PAK PACKAGE



MPX2300DT1/MPX2301DT1
CASE 423A-03

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.

Table 1. Pin Numbers

Pin Number	1	2	3	4
Description	V _s	S ⁺	S ⁻	GND

The MPX2300DT1/MPX2301DT1 Pressure Sensors have been designed for medical usage by combining the performance of Freescale'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: 10993-5:1999, 10993-10:2002, and 10993-11:1993.

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.

Maximum Ratings

Table 2. Maximum Ratings⁽¹⁾

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

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

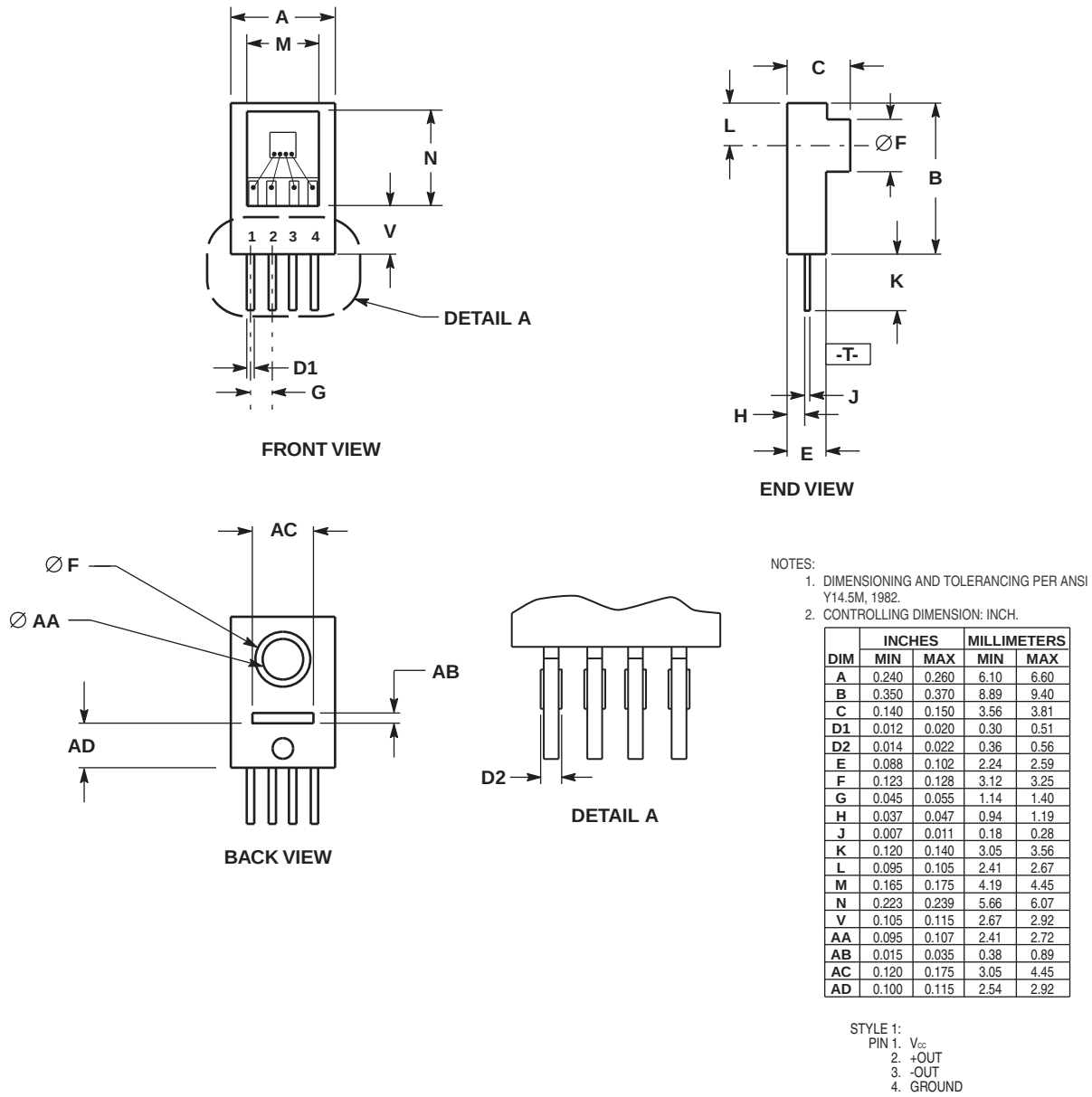
Operating Characteristics

Table 3. Operating Characteristics ($V_S = 6 \text{ Vdc}$, $T_A = 25^\circ\text{C}$ unless otherwise noted)

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

1. Recommended voltage supply: $6 \text{ V} \pm 0.2 \text{ V}$, regulated. Sensor output is ratiometric to the voltage supply. Supply voltages above +10 V may induce additional error due to device self-heating.
2. 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.
3. Maximum deviation from end-point straight line fit at 0 and 200 mmHg.
4. Slope of end-point straight line fit to full scale span at 15°C and $+40^\circ\text{C}$ relative to $+25^\circ\text{C}$.
5. Slope of end-point straight line fit to zero pressure offset at 15°C and $+40^\circ\text{C}$ relative to $+25^\circ\text{C}$.
6. Offset measurement with respect to the measured sensitivity when a 150 k resistor is connected to V_S and S+ output.
7. For a 0 to 300 mmHg pressure step change.
8. Stability is defined as the maximum difference in output at any pressure within P_{OP} and temperature within $+10^\circ\text{C}$ to $+85^\circ\text{C}$ after:
 - 1000 temperature cycles, -40°C to $+125^\circ\text{C}$.
 - 1.5 million pressure cycles, 0 to 300 mmHg.

PACKAGE DIMENSIONS



CASE 423A-03 ISSUE C CHIP PAK PACKAGE

Table 4. Revision History

Revision number	Revision date	Description of changes
9	10/2012	• Added Table 1. Pin Numbers on page 1.

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