MS52XX (RoHS*) SMD PRESSURE SENSOR

- **1 and 12 bar absolute pressure range**
- **Uncompensated**
- **Piezoresistive silicon micromachined sensor**
- **Surface mount 7.6 x 7.6 mm**
- **Low noise, high sensitivity, high linearity**
- **RoHS-compatible & Pb-free***

DESCRIPTION

The MS52XX SMD pressure sensor series is designed for pressure sensor systems with highest demands on resolution and accuracy. The device consists of a silicon micromachined pressure sensor die mounted on a 7.6 x 7.6 mm ceramic carrier protected by a metal cap. The MS52XX can be delivered in a highly sensitive version giving a maximal output voltage or in a highly linear version giving a linear output voltage directly proportional to the applied pressure.

Full Scale Pressure	High Sensitivity Version		High Linearity Versions	
	Product Code	Full Scale Span / Linearity	Product Code	Full Scale Span / Linearity
1 bar	MS5201-AN	240 mV / ±0.2% FS	MS5201-BN	150 mV / ±0.05% FS
12 bar			MS5212-BM	150 mV / ±0.05% FS

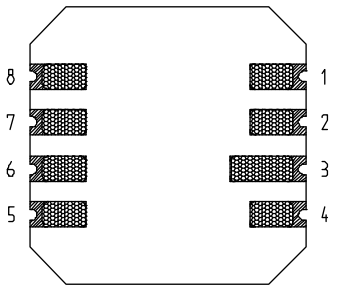
FEATURES

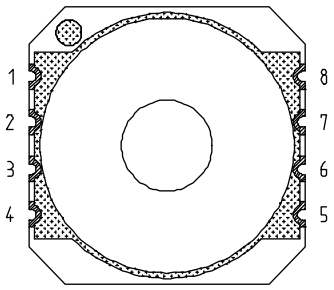
- Low cost SMD ceramic package
- High reliability, low drift
- -40°C to +125 °C operation range
- Optional: Gel protection against humidity and water

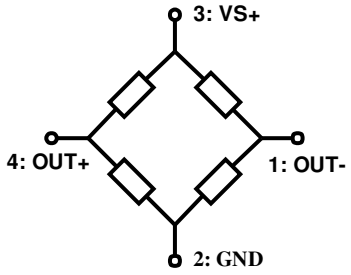
APPLICATIONS

- Absolute pressure sensor systems
- High resolution altimeters, variometers
- Barometers
- Engine controls
- Diver's computers
- Tire pressure

PIN CONFIGURATION







* The European RoHS directive 2002/95/EC (Restriction of the use of certain Hazardous Substances in electrical and electronic equipment) bans the use of lead, mercury, cadmium, hexavalent chromium and polybrominated biphenyls (PBB) or polybrominated diphenyl ethers (PBDE).

PIN DESCRIPTION

Pin Name	Pin No.	Function
OUT-	1	Negative output voltage of Wheatstone bridge
GND	2	Ground
VS+	3	Supply voltage of Wheatstone bridge
OUT+	4	Positive output voltage of Wheatstone bridge

ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Conditions	Min	Max	Unit
Supply voltage	VS+	Ta = 25°C		20	V
Storage temperature	T_S		-40	+125	°C
Overpressure MS5201-AN	P	Ta = 25 °C	-	5	bar
MS5201-BN			-	10	
MS5212-BM			-	30	

ELECTRICAL CHARACTERISTICS

HIGH SENSITIVITY VERSION

(VS+ = 5 V; Ta = 25°C)

	Parameter	Min	Typ	Max	Unit	Notes
MS5201-AN	Operating pressure range	0	-	1	bar	
	Full-scale span (FS)	190	240	290	mV	
	Sensitivity	190	240	290	mV/bar	
	Linearity	-	±0.15	±0.4	% FS	1, 6
	Operating temperature range	-40	-	125	°C	
	Zero pressure offset	-40	0	40	mV	
	Pressure hysteresis	-	-	±0.20	% FS	2, 6
	Temperature hysteresis	-	0.3	0.8	% FS	3, 6
	Repeatability	-	-	±0.20	% FS	4, 6
	Bridge resistance	3.0	3.4	3.8	kΩ	
	Temperature coefficient of resistance Temperature coefficient of span Temperature coefficient of offset	+2'400 -1'500 -80	2'900 -1'900 -	+3'300 -2'300 +80	ppm/°C ppm/°C µV/°C	5, 6 5, 6 5, 6

NOTES

1) Deviation at one half full-scale pressure from the least squares best line fit over pressure range.
2) Maximum difference of output voltage after 1 pressure cycle at any pressure within the operating pressure range.
3) Maximum difference in offset after one thermal cycle from -40°C to +125°C.
4) Same as 2) after 10 pressure cycles.
5) Slope of the endpoint straight line from 25°C to 60°C.
6) Not 100% tested.

ELECTRICAL CHARACTERISTICS (CONT.)

HIGH LINEARITY VERSIONS

(VS+ = 5 V; Ta = 25°C)

	Parameter	Min	Typ	Max	Unit	Notes
MS5201-BN	Operating pressure range	0	-	1	bar	
	Full-scale span (FS)	120	150	180	mV	
	Sensitivity	120	150	180	mV/bar	
	Linearity	-	±0.05	±0.2	% FS	1, 6
MS5212-BM	Operating pressure range	0	-	12	bar	
	Full-scale span (FS)	120	150	180	mV	
	Sensitivity	10	12.5	15	mV/bar	
	Linearity	-	±0.05	±0.2	% FS	1, 6
All Ranges	Operating temperature range	-40	-	125	°C	
	Zero pressure offset	-40	0	40	mV	
	Pressure hysteresis	-	-	±0.2	% FS	2, 6
	Temperature hysteresis	-	0.3	0.8	% FS	3, 6
	Repeatability	-	-	±0.2	% FS	4, 6, 7
	Bridge resistance	3.0	3.4	3.8	kΩ	
	Temperature coefficient of resistance Temperature coefficient of span Temperature coefficient of offset	+2'400 -1'500 -80	2'900 -1'900 -	+3'300 -2'300 +80	ppm/°C ppm/°C µV/°C	5, 6 5, 6 5, 6

NOTES

1) Deviation at one half full-scale pressure from the least squares best line fit over pressure range.
2) Maximum difference of output voltage after 1 pressure cycle at any pressure within the operating pressure range.
3) Maximum difference in offset after one thermal cycle from -40°C to +120°C.
4) Same as 2) after 10 pressure cycles.
5) Slope of the endpoint straight line from 25°C to 60°C.
6) Not 100% tested.
7) MS5212-BM: Max. 0.3% FS.

APPLICATION INFORMATION

GENERAL

The MS52XX is a miniaturised absolute pressure sensor series that has been designed for surface mounting applications. Its main advantages are the high reliability of the semiconductor sensor and a design which makes it suitable for applications requiring small-scale and cost-efficient solutions.

The sensor element of the MS52XX consists of a micromachined silicone membrane with Pyrex glass wafer-bonded under vacuum to the backside for reference pressure. Implanted resistors make use of the piezo-resistive effect to sense pressure applied to the membrane. The sensor is mounted in a special process allowing best-offset stability making the part suitable for direct PCB assembly.

Typical applications for this miniaturised pressure sensor MS52XX are altitude measurements and the measurement of atmospheric reference pressure in medical and industrial equipment as well as in automotive and household applications, consumer electronics and pneumatics.

Full Scale Pressure	High Sensitivity Version (MS5201-AN)	High Linearity Versions (MS5201-BN and MS5212-BM)
1 bar	Variometer, Altimeter, Barometer	High End Altimeter, Medical Instrumentation
12 bar		Pneumatic Brake, Diving Computer

LIGHT SENSITIVITY

The MS52XX is sensitive to sunlight, especially to infrared light sources. This is due to the strong photo effect of silicon. As the effect is reversible there will be no damage, but the user has to take care that in the final product the sensor cannot be exposed to direct light during operation. This can be achieved for instance by placing mechanical parts with holes in such way that light cannot go trough.

CONNECTION TO PCB

The package outline of the module allows the use of a flexible PCB to connect it. This can be important for applications in watches and other special devices, and will also reduce mechanical stress on the device.
For applications subjected to mechanical shock, it is recommended to enhance the mechanical reliability of the solder junctions by covering the rim or the corners of MS52XX ceramic substrate with glue or Globtop-like material.

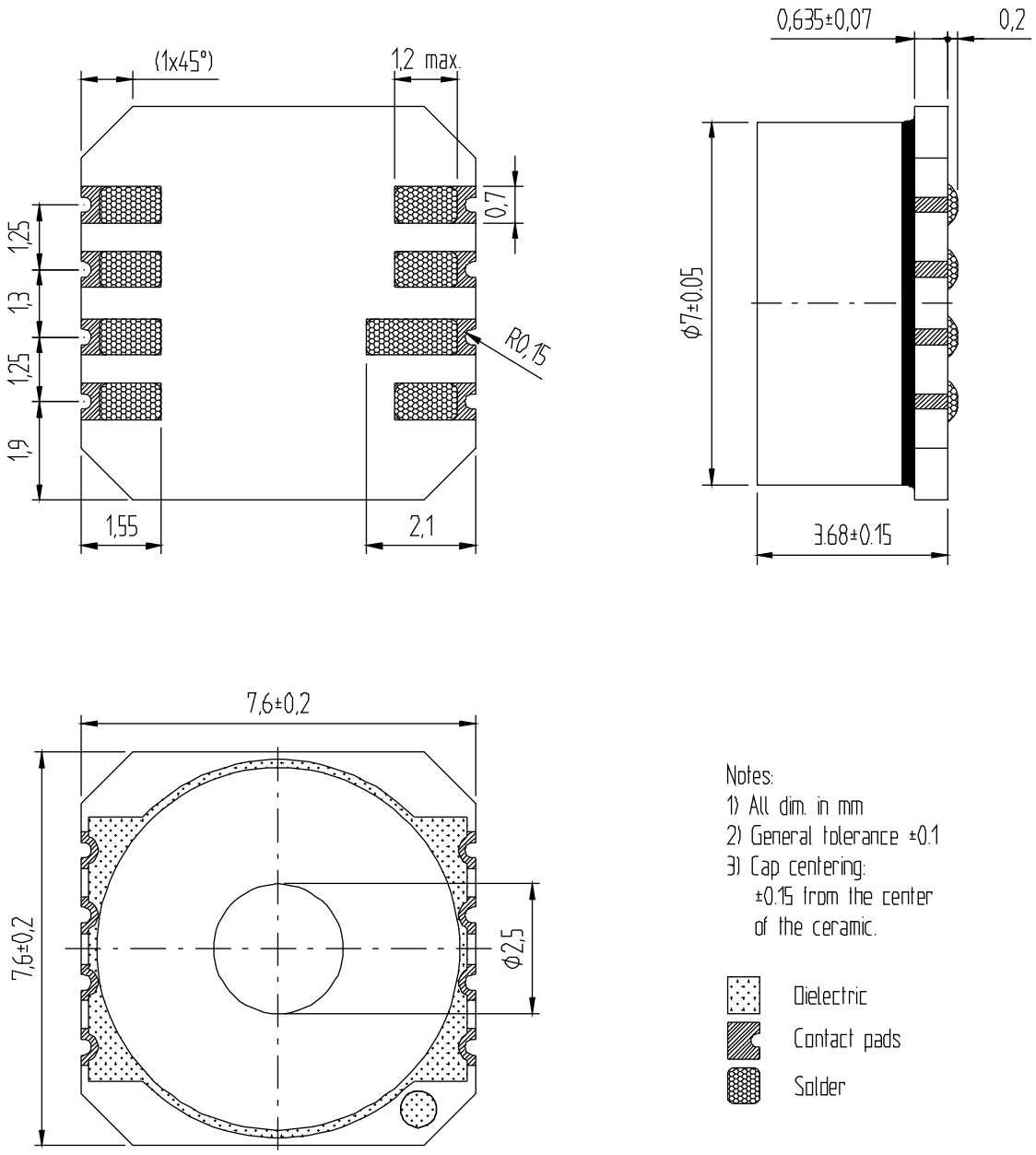
SOLDERING

Please refer to the application note AN808 for all soldering issues.

CLEANING

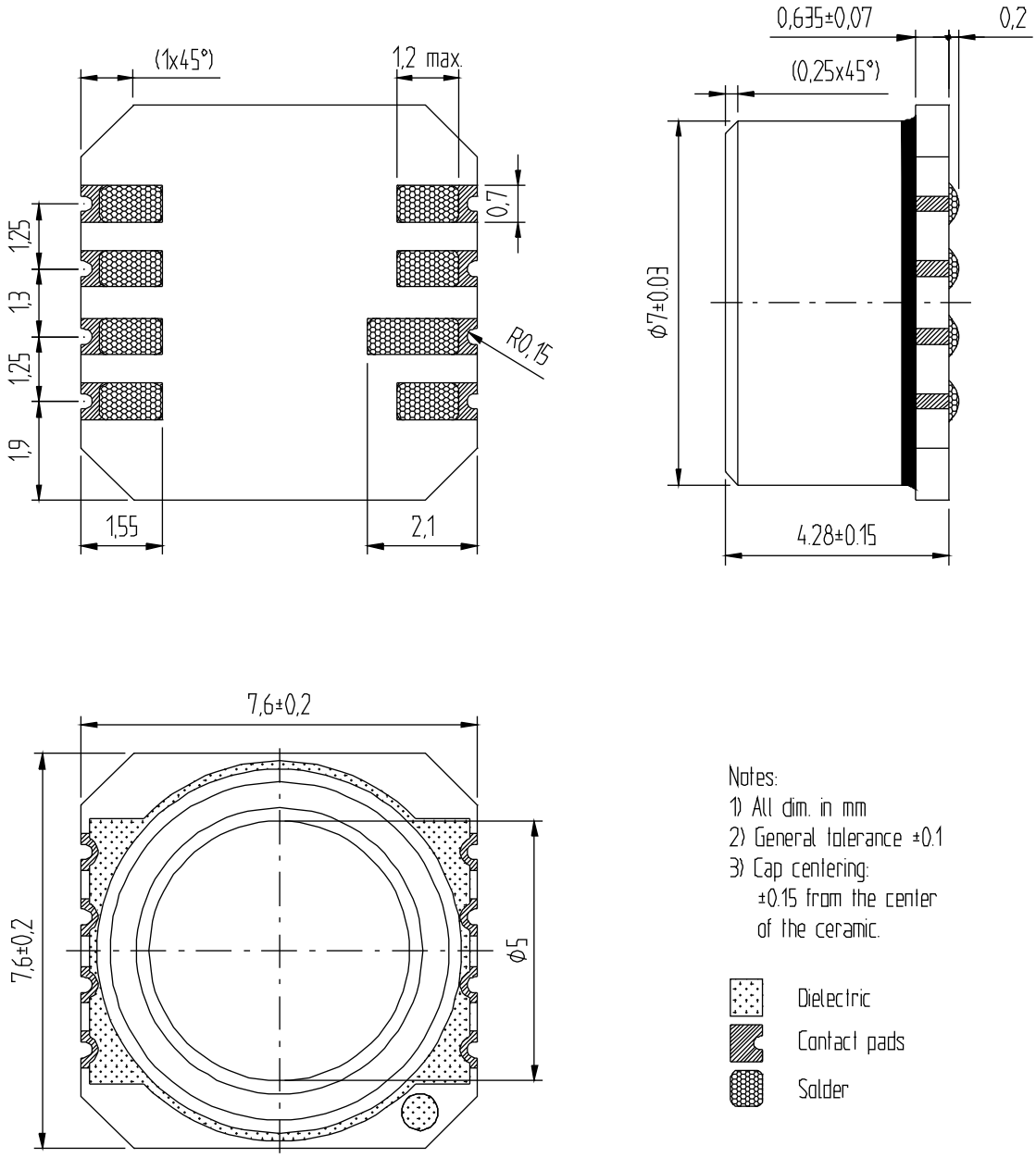
The MS52XX has been manufactured under cleanroom conditions. Each device has been inspected for the homogeneity and the cleanness of the silicone gel. It is therefore recommended to assemble the sensor under class 10'000 or better conditions. Should this not be possible, it is recommended to protect the sensor opening during assembly from entering particles and dust. To avoid cleaning of the PCB, solder paste of type "no-clean" shall be used. **Cleaning might damage the sensor.**

PACKAGE OUTLINES



Device package outlines of **MS5201-AN** and **MS5201-BN**
(Metal cap with nickel finish, gel protection of bonding wires)

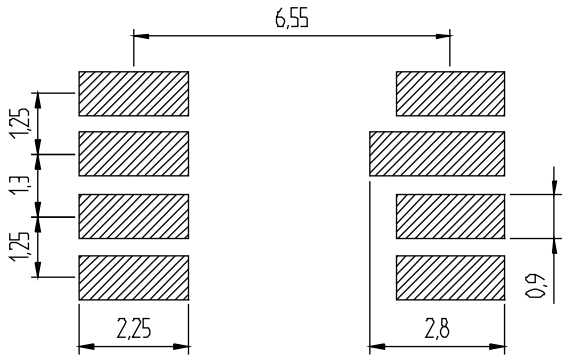
PACKAGE OUTLINES (CONT.)



Device package outlines of **MS5212-BM** (Stainless steel cap, no gel protection of bonding wires)

RECOMMENDED PAD LAYOUT

Recommended pad layout for soldering of the MS52xx on a printed circuit board



ORDERING INFORMATION

Product Code	Product	Art.-Nr.	Package	Comment
MS5201-AN	Pressure sensor 1 bar High sensitivity	325201002	SMD hybrid with solder bumps, metal cap with nickel finish, drop of gel on sensor, no gel protection of the bonding wires	
MS5201-BN	Pressure sensor 1 bar High linearity	325201000		
MS5212-BM transparent gel	Pressure sensor 12 bar High linearity	325212001	SMD hybrid with solder bumps, Stainless steel cap, Gel protection of sensor and bonding wires	Same sensor for both articles, Only the gel protection changes
MS5212-BM white gel		325212002		

FACTORY CONTACTS

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