

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 / $\pm 0.2\%$ FS | MS5201-BN | 150 mV / $\pm 0.05\%$ FS |
| 12 bar | | | MS5212-BM | 150 mV / $\pm 0.05\%$ FS |

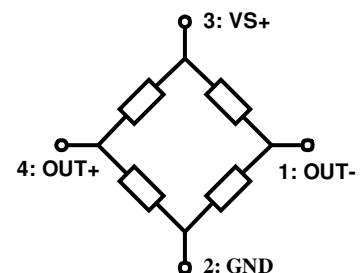
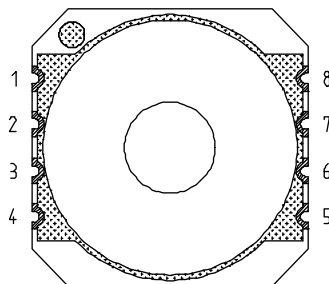
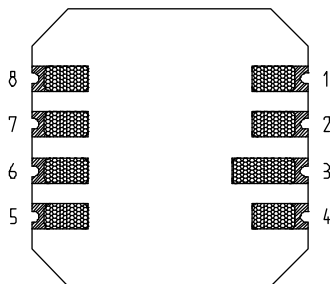
FEATURES

- 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



深圳市新世联科技有限公司

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 MS5201-BN MS5212-BM | P Ta = 25 °C | - | 5 10 30 | bar |

深圳市新世联科技有限公司

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 | +2'400 | 2'900 | +3'300 | ppm/°C | 5, 6 |
| Temperature coefficient of span | -1'500 | -1'900 | -2'300 | ppm/°C | 5, 6 | |
| Temperature coefficient of offset | -80 | - | +80 | μV/°C | 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.

深圳市新世联科技有限公司

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 | +2'400 | 2'900 | +3'300 | ppm/°C | 5, 6 |
| Temperature coefficient of span | -1'500 | -1'900 | -2'300 | ppm/°C | 5, 6 | |
| Temperature coefficient of offset | -80 | - | +80 | μV/°C | 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.

深圳市新世联科技有限公司

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 through.

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

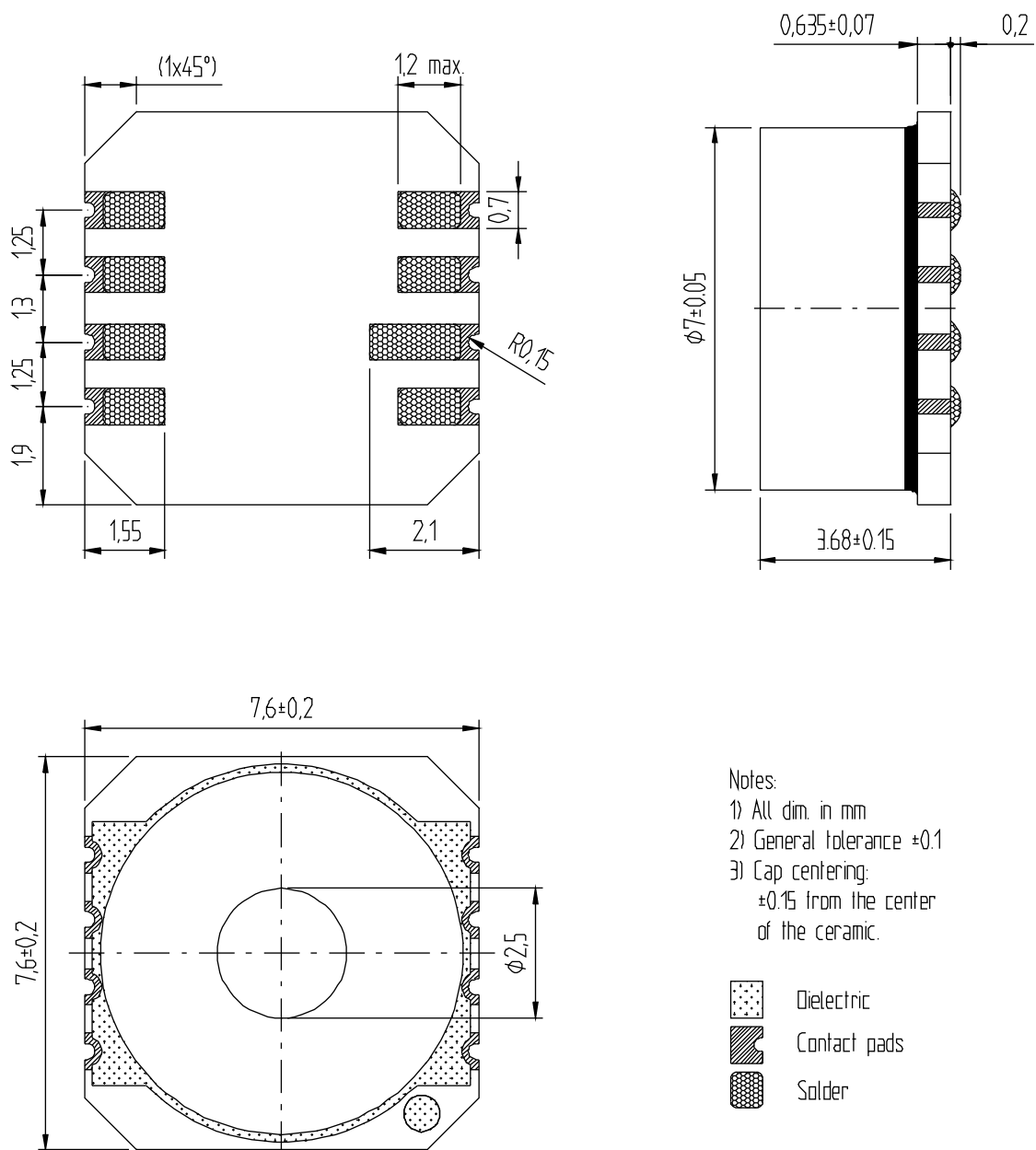
Please refer to the application note AN808 for all soldering issues.

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.**

深圳市新世联科技有限公司

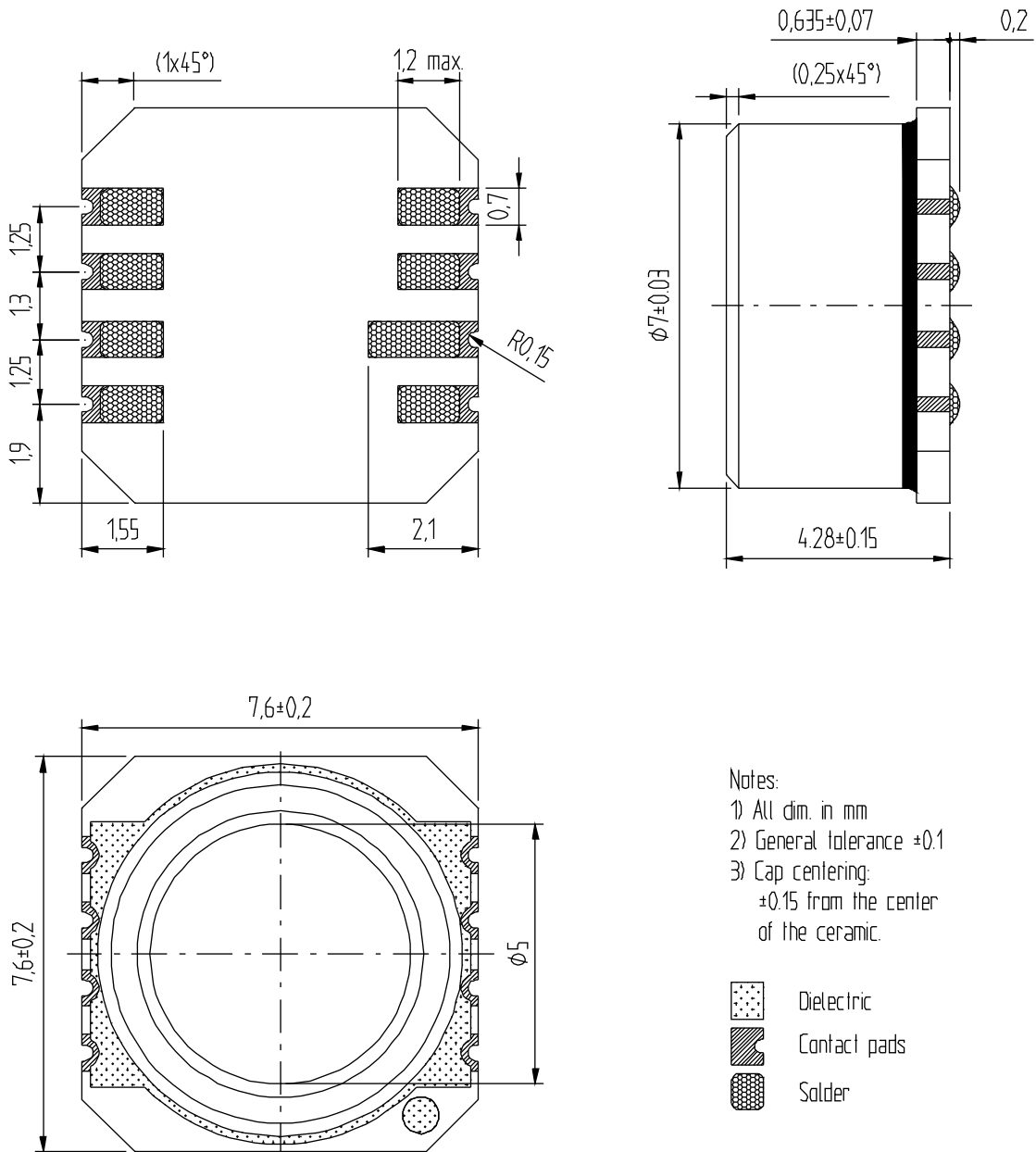
PACKAGE OUTLINES



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

深圳市新世联科技有限公司

PACKAGE OUTLINES (CONT.)



Notes:

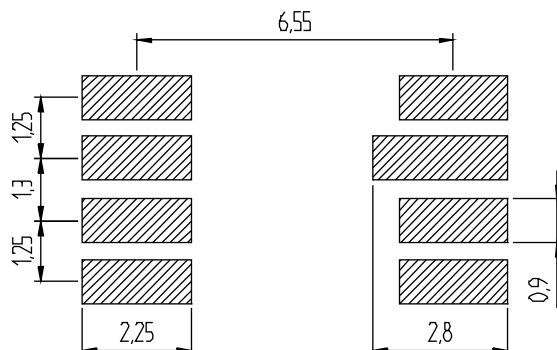
- 1) All dim. in mm
- 2) General tolerance ± 0.1
- 3) Cap centering:
 ± 0.15 from the center of the ceramic.

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

深圳市新世联科技有限公司

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 | | |

深圳市新世联科技有限公司