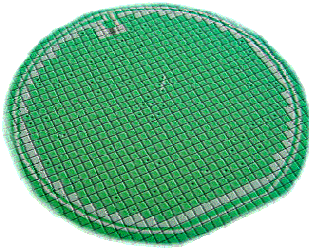


# MS7212

# PRESSURE SENSOR DIE (0-12 BAR) FOR HARSH ENVIRONMENT



- 0 to 1200 kPa range (12 bar or 174 PSI)
- Absolute pressure sensors
- Hermetic sensor
- RoHS-compatible & Pb-free<sup>1</sup>

## DESCRIPTION

The MS7212 is an absolute silicon micro-machined pressure sensor for harsh environment. A vacuum reference cavity is sealed on top of the sensitive silicon membrane by the anodic bonding of a Pyrex™ cap. The pressure, applied on the backside, is converted in electrical signal by piezo-resistors implanted in the silicon membrane. To improve the sensor stability, a drilled Pyrex™ is bonded on the backside. As the pressure port consists of Pyrex™ and silicon, both stable in most of the chemicals, the MS7212 is suitable for media-resistive applications.

## FEATURES

- |                                       |  |
|---------------------------------------|--|
| • Media resistive pressure sensor die | • Linearity 0.05% (typical)            |
| • Output Span 150mV @ 5 V             | • Die Size 1.63 x 1.95 mm <sup>2</sup> |
| • Temperature Range -40°...+125°C     | • Low Cost, High reliability           |

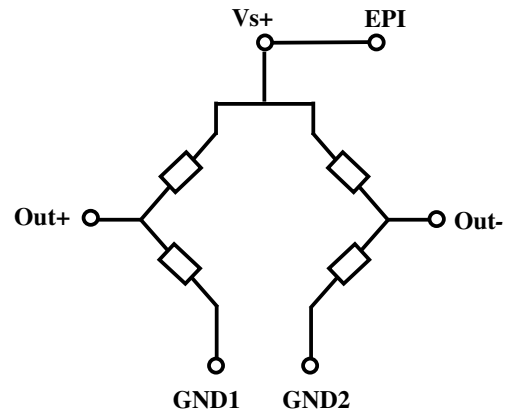
## APPLICATION

- |                                    |                    |
|------------------------------------|--------------------|
| • Harsh environments               | • Tire pressure    |
| • Absolute pressure sensor systems | • Engine controls  |
| • Braking systems                  | • Diving computers |

## ELECTRICAL CONNECTIONS

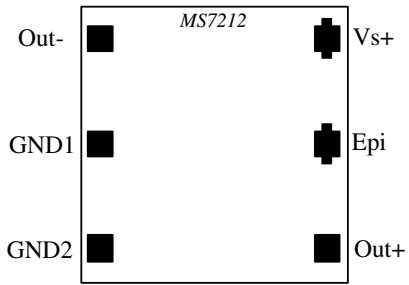
Positive output for pressure applied backside

- Vs+ : Supply voltage of Wheatstone bridge
- Epi : Connection of epitaxial layer (membrane)
- Out- : Negative output
- Out+ : Positive output
- GND1 : Ground
- GND2 : Ground



<sup>1</sup> 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).

## PAD OUT

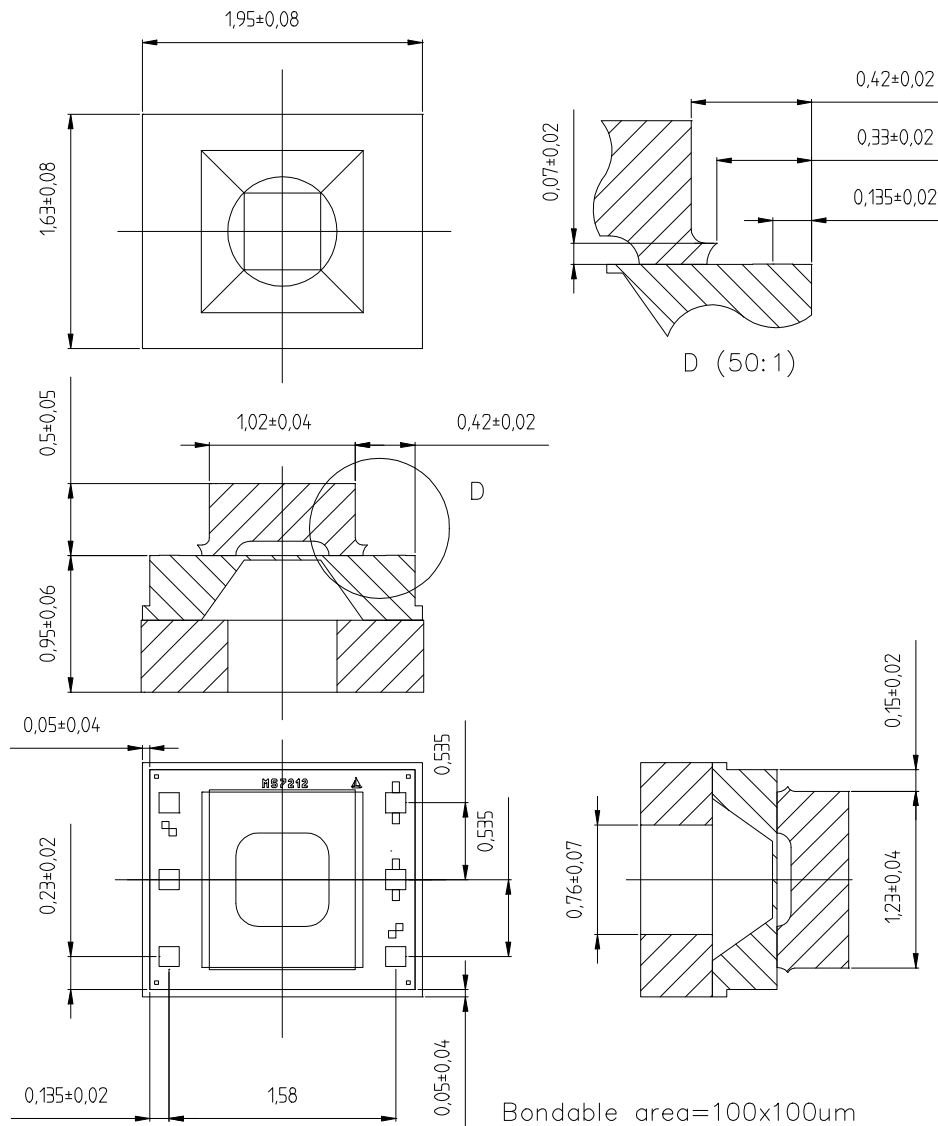


### Important remarks:

As the sensing elements are diffused resistances, the voltage applied on the ground pads (GND1 and GND2) has to be lower than the voltage applied on supply voltage pad (Vs+).

The epitaxial layer is connected to the Vs+ pin on the die.

## LAYOUT



## FULL SCALE PRESSURE

| kPa  | bar | mbar  | PSI | atm  | mm Hg | m H <sub>2</sub> O | Inches H <sub>2</sub> O |
|------|-----|-------|-----|------|-------|--------------------|-------------------------|
| 1200 | 12  | 12000 | 174 | 11.8 | 9001  | 122                | 4818                    |

## ABSOLUTE MAXIMUM RATINGS

| Parameter           | Symbol         | Conditions | Min | Max  | Unit |
|---------------------|----------------|------------|-----|------|------|
| Supply voltage      | VS+            | Ta = 25 °C |     | 20   | V    |
| Storage temperature | T <sub>s</sub> |            | -40 | +150 | °C   |
| Pressure overload   |                |            |     | 30   | Bar  |

## ELECTRICAL CHARACTERISTICS

(Reference conditions: Supply Voltage VS+ = 5 Vdc; Ambient Temperature Ta = 25 °C)

| Parameter   | Min                      | Typ              | Max                      | Unit                      | Notes |
|---|--------------------------|------------------|--------------------------|---------------------------|-------|
| Operating Pressure Range                                | 0                        |                  | 12                       | Bar                       |       |
| Operating Temperature Range                             | -40                      |                  | 125                      | °C                        |       |
| Bridge Resistance                                       | 3.0                      | 3.4              | 3.8                      | kΩ                        |       |
| Full-scale span (FS)                                    | 120                      | 150              | 180                      | mV                        |       |
| Zero Pressure Offset                                    | -40                      | 0                | 40                       | mV                        |       |
| Linearity   |                          | ± 0.05           | ± 0.15                   | % FS                      | 1     |
| Temperature Coefficient of Resistance<br>Span<br>Offset | + 2400<br>- 1500<br>- 80 | + 2800<br>- 1900 | + 3300<br>- 2300<br>+ 80 | ppm/°C<br>ppm/°C<br>μV/°C | 2     |
| Pressure Hysteresis                                     |                          | ± 0.05           | ± 0.15                   | % FS                      | 3     |
| Repeatability   |                          | ± 0.05           | ± 0.15                   | % FS                      | 4     |
| Temperature Hysteresis                                  |                          |                  | 0.3                      | % FS                      | 5     |

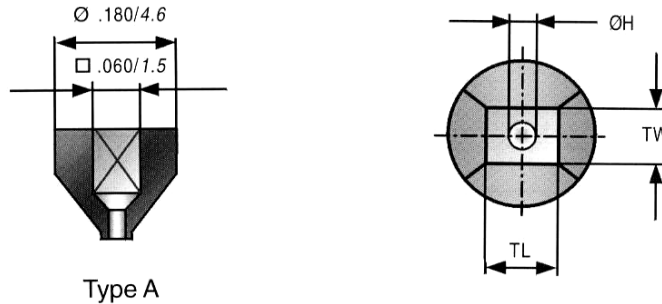
### NOTES

- 1) Deviation at one half full-scale pressure from the least squares best line fit over pressure range (0 to 12 bar).
- 2) Slope of the endpoint straight line from 25 °C to 60 °C.
- 3) Output deviation at any pressure within the specified range, when this pressure is cycled to and from the minimum or maximum rated pressure, at 25 °C.
- 4) Same as 3) after 10 pressure cycles
- 5) Maximum difference in offset after one thermal cycle from -40 °C to +125 °C.

## PICKING TOOLS

The MS7212 sensors have a topside Pyrex™ cap (1.23 x 1.02 mm<sup>2</sup>) and a backside Pyrex™ (1.95 x 1.63 mm<sup>2</sup>). The pick and place tool has to be of a soft material as rubber (Hardness 78-97 Shore A). Its external size must fit the Pyrex™ cap. Successful tests were done with some tools of SPT (see SPT drawing and references below).

|                     |                              |
|---------------------|------------------------------|
| SPT references      | RTR-A1-060x060               |
| External dimension  | TL & TW: 0.06 inch / 1.52 mm |
| Internal dimensions | ØH: 0.035 inch / 0.89 mm     |



## WIRE BONDING

The bondable area is 100 x 100 µm<sup>2</sup>. The location of the bonding pads is close to the top Pyrex glass edge reducing the possible size and angle of the bonding capillary. Refer to the detail view *D* on the layout for more precision.

## ORDERING INFORMATION

| Product Code | type     | Product                             | Art.-Nr.  |
|--------------|----------|-------------------------------------|-----------|
| MS7212-A     | Absolute | 12 bar Pressure Sensors sawn on b/f | 721225021 |

The MS7212 dice are supplied sawn on blue foil, mounted on plastic rings

## FACTORY CONTACTS

|   |  |
|---|--|
| Intersema Sensoric SA<br>Ch. Chapons-des-Prés 11<br>CH-2022 BEVAIX<br><br>SWITZERLAND | Tel. 032 847 9550<br>Tel. Int. +41 32 847 9550<br>Telefax +41 32 847 9569<br>e-mail: <a href="mailto:sales@intersema.ch">sales@intersema.ch</a><br><a href="http://www.intersema.ch">http://www.intersema.ch</a> |
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