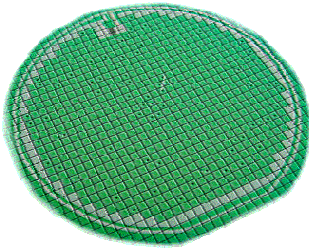


MS7228

PRESSURE SENSOR DIE (0-28 BAR) FOR HARSH ENVIRONMENT



- 0 to 2800 kPa range (28 bar or 406 PSI)
- Absolute pressure sensors
- Hermetic sensor
- RoHS-compatible & Pb-free¹

DESCRIPTION

The MS7228 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 MS7228 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 ² |
| • 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

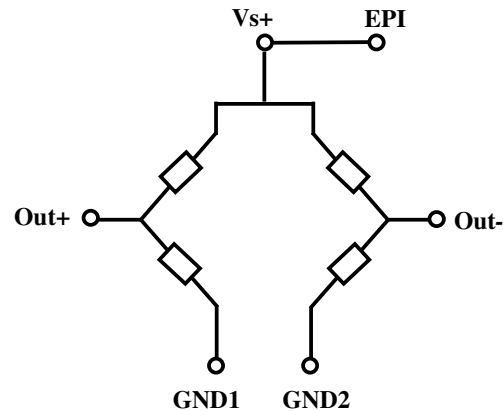
Epi : Connection of epitaxial layer (membrane)

Out- : Negative output

Out+ : Positive output

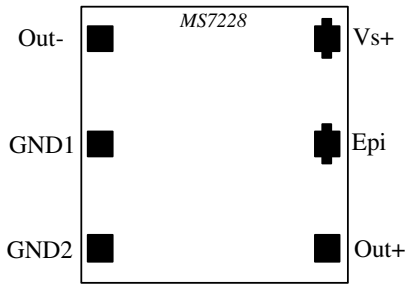
GND1 : Ground

GND2 : Ground



¹ 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

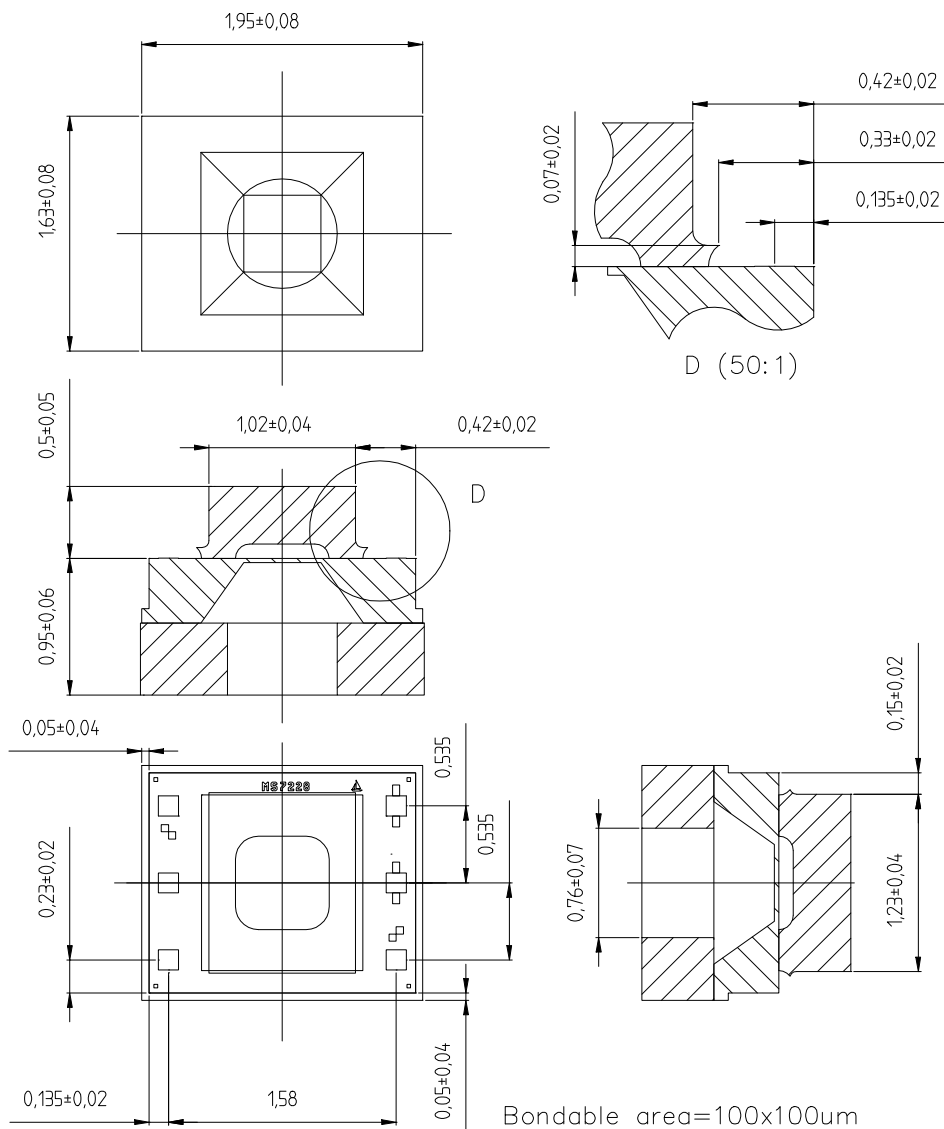


Important remarks:

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 ₂ O | Inches H ₂ O |
|------|-----|-------|-----|------|-------|--------------------|-------------------------|
| 2800 | 28 | 28000 | 406 | 27.5 | 21002 | 285 | 11242 |

ABSOLUTE MAXIMUM RATINGS

| Parameter | Symbol | Conditions | Min | Max | Unit |
|---------------------|----------------|------------|-----|------|------|
| Supply voltage | VS+ | Ta = 25 °C | | 20 | V |
| Storage temperature | T _s | | -40 | +150 | °C |
| Pressure overload | | | | 70 | 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 | | 28 | Bar | |
| Operating Temperature Range | -40 | | 125 | °C | |
| Bridge Resistance | 3.0 | 3.4 | 3.8 | kΩ | |
| Full-scale span (FS) | 100 | 130 | 160 | mV | |
| Zero Pressure Offset | -40 | 0 | 40 | mV | |
| Linearity | | ± 0.05 | ± 0.15 | % FS | 1 |
| Temperature Coefficient of Resistance Span Offset | + 2400 - 1500 - 80 | + 2800 - 1900 | + 3300 - 2300 + 80 | ppm/°C ppm/°C μV/°C | 2 |
| Pressure Hysteresis | | ± 0.05 | ± 0.15 | % FS | 3 |
| Repeatability | | ± 0.05 | ± 0.15 | % FS | 4 |
| Temperature Hysteresis | | | 0.3 | % FS | 5 |

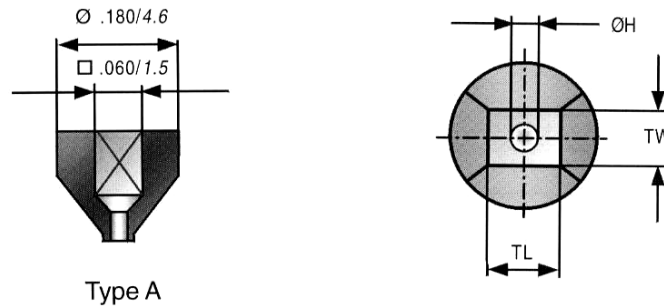
NOTES

- 1) Deviation at one half full-scale pressure from the least squares best line fit over pressure range (0 to 28 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 MS7228 sensors have a topside Pyrex™ cap (1.23 x 1.02 mm²) and a backside Pyrex™ (1.95 x 1.63 mm²). 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 | ∅H: 0.035 inch / 0.89 mm |



WIRE BONDING

The bondable area is 100 x 100 μm². 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. |
|--------------|----------|-------------------------------------|-----------|
| MS7228-A | Absolute | 28 bar Pressure Sensors sawn on b/f | 722825021 |

The MS7228 dice are supplied sawn on blue foil, mounted on plastic rings

FACTORY CONTACTS

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