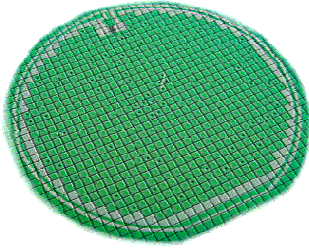


# MS7228

# 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-free<sup>1</sup>

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

## APPLICATION

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

## ELECTRICAL CONNECTIONS

Positive output for pressure applied backside

Vs+ : Supply voltage of Wheatstone bridge

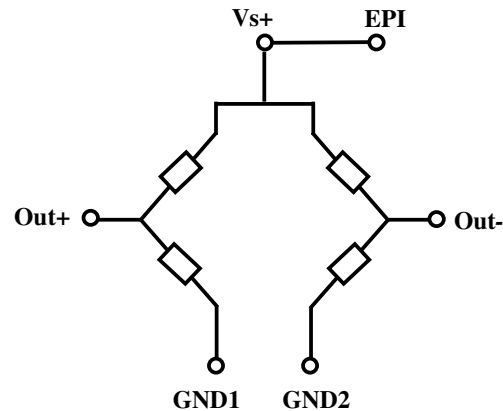
Epi : Connection of epitaxial layer (membrane)

Out- : Negative output

Out+ : Positive output

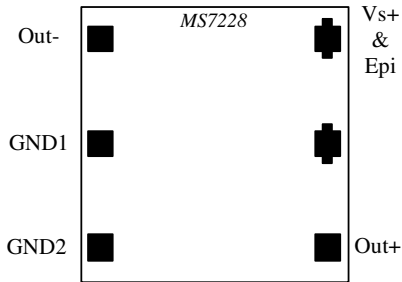
GND1 : Ground

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).

## BOND PAD CONFIGURATION



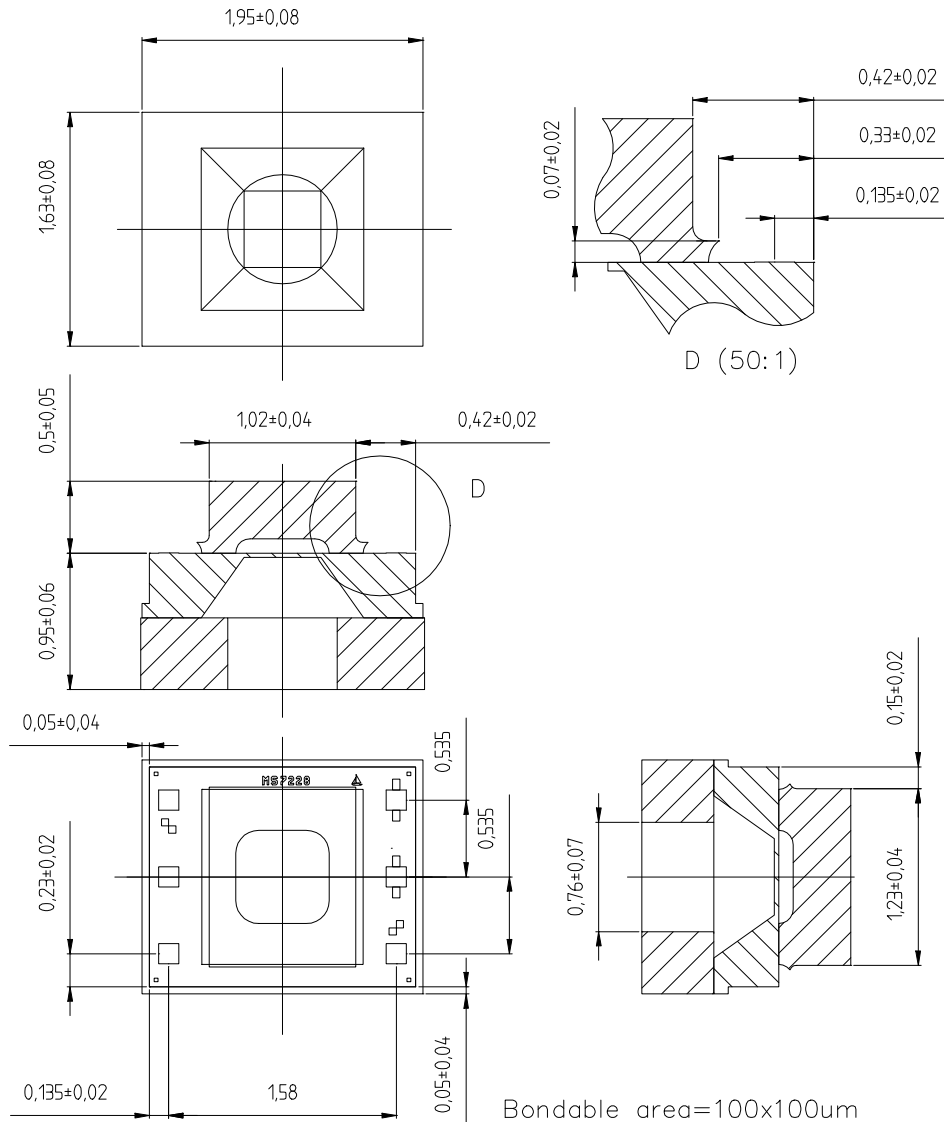
### Important remarks:

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.

Gold ball bonding or aluminium wedge bonding can be used to wire-bond the sensor. The quality of the wire-bonding is equipment and process dependant. For this reason, it is strongly recommended that a thorough wire-bonding qualification is made by the end user if the sensor is going to be operated over an extended temperature range.

## LAYOUT



## FULL SCALE PRESSURE

kPa	bar	mbar	PSI	atm	mm Hg	m H <sub>2</sub> O	Inches H <sub>2</sub> 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 <sub>s</sub>		-40	+150	°C
Pressure overload				170	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)	120	150	180	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

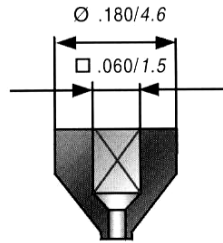
## NOTES

- 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.

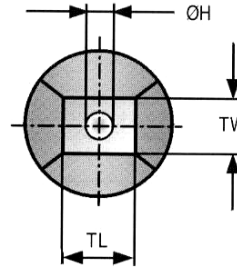
## PICKING TOOLS

The MS7228 sensors have a topside Pyrex™ cap (1.23 x 1.02 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	∅H: 0.035 inch / 0.89 mm



Type A



## 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.
MS7228-A	Absolute	28 bar pressure sensor die for harsh environment sawn on b/f	722825021

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

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## FACTORY CONTACTS

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