



OEM- Pressure Sensors

AMS 5105 / 5612 / 5812 / 5915

- Mounting Instructions -

Dual-in-Line pressure sensors on the basis of silicon measurement cells are well-established measuring devices for all pressure types (absolute, gage and differential). They are rugged OEM sensors and easy to handle. But during the mounting process one should pay attention to some rules, which are valid for all sensors of the AMS 5105, AMS 5612, AMS 5812 and AMS 5915 series. This summary describes these rules.

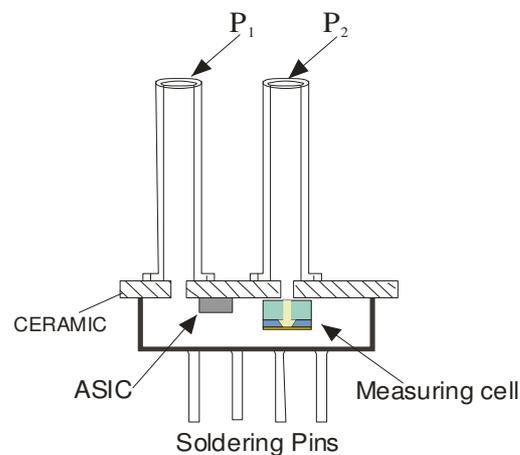
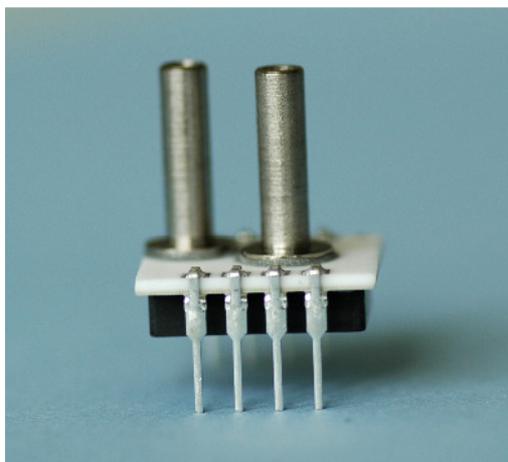


Figure 1: Dual-in-Line Pressure sensors from the AMS 5812, AMS 5612, AMS 5915 and AMS 5105 series, side view and schematic profile (Dimension: ceramic substrate 15.2x15.2mm²)

Description Dual-in-Line Sensors

In case of the Dual-in-Line sensors from the AMS 5XXX series there are four variants with identical dimensions (600mil grid) and configuration in the basic version:

- AMS 5105
- AMS 5612
- AMS 5812
- AMS 5915

The basic versions (see *Figure 1*) consist of different silicon measurement dies and different signal conditioning ASICs, depending on the pressure range and output signal. But they always consist of same ceramic substrates, ceramic cap, metallic tubes and solder pins (for through-hole technology).

The OEM-Sensors are individually calibrated to the specific output values during the production process, linearized and temperature compensated. All versions are able to measure absolute, gage and differential (also bidirectional-differential) pressure in a wide range.



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AMS 5105 [1]

The AMS 5105 series is a sensor family with two independent, logical switching outputs combined with an analog linear voltage output (0.5 – 4.5 V, ratiometric). The sensors are powered with a voltage supply of 5 V. The switching function (normally open, normally close, window switch), the switching points, the hysteresis and the switching delay can be adjusted by a programming circuit (USB Starter-KIT AMS 5105) or by the manufacturer. This sensor family is designed for applications which do not have an additional electronic network following the sensor and whose switching characteristics will not be changed during operation.

AMS 5612 [2]

The sensors of the AMS 5612 series have a non-amplified, analog output, which is ratiometric to the supply voltage. The sensors are powered with a voltage supply of max. 20 V. They are calibrated and compensated using a resistance network (thick-film resistors) on the ceramic substrate. Since this sensor family is completely analog, the resolution is only restricted by the resistors noise of the silicon measurement cell. Since no A/D conversion takes place, the sensor is especially suitable for time-critical applications (< 1 msec) with high resolution.

AMS 5812 [3]

The AMS 5812 family offers a digital output in I²C format and a ratiometric, linear 0.5-4.5 V voltage output, which can be used independently from each other. The sensors are powered with a voltage supply of 5 Volt. The address of the sensors is preset, but can be adjusted by a programming circuit (USB Starter-KIT AMS 5812) or by the manufacturer according to the customers specifications (e.g. for a sensor network). Additionally the temperature of the measuring cell is provided as an output signal on the digital interface. The cell is in direct contact with the measuring media, therefore the media temperature can be measured nearly failure-free after the temperature has settled. Because of the independence of both outputs this sensor series can be used for digital signal communication with analog status control.

AMS 5915 [4]

The AMS 5915 series has a digital output in I²C format and is powered using 3 Volt. The sensor's address is preset, but can be adjusted by a programming circuit (USB Starter-KIT AMS 5915) or by the manufacturer according to the customers specifications (e.g. for a sensor network). Additionally the temperature which is measured by the temperature sensor in the ASIC is provided at the output. This sensor family is designed for applications in a digital network.



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Mounting on Printed Circuit Board (PCB)

For board mounting it is recommended to push the soldering pins through the PCB's soldering holes until the ceramic cap is seated on the board (*figure 3*). Afterwards the contacts can be soldered from the front or back side. This kind of mounting ensures optimal mechanical stability of the sensor system.

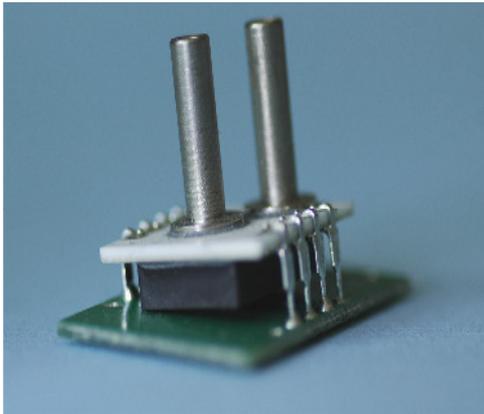


Figure 2: Incorrect Mounting

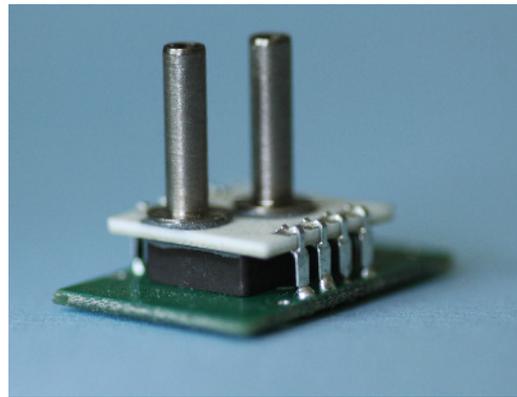


Figure 3: Correct Mounting

Soldering Standard

For lead-free soldering the soldering standard IPC/JEDEC J-STD-020B has to be considered.

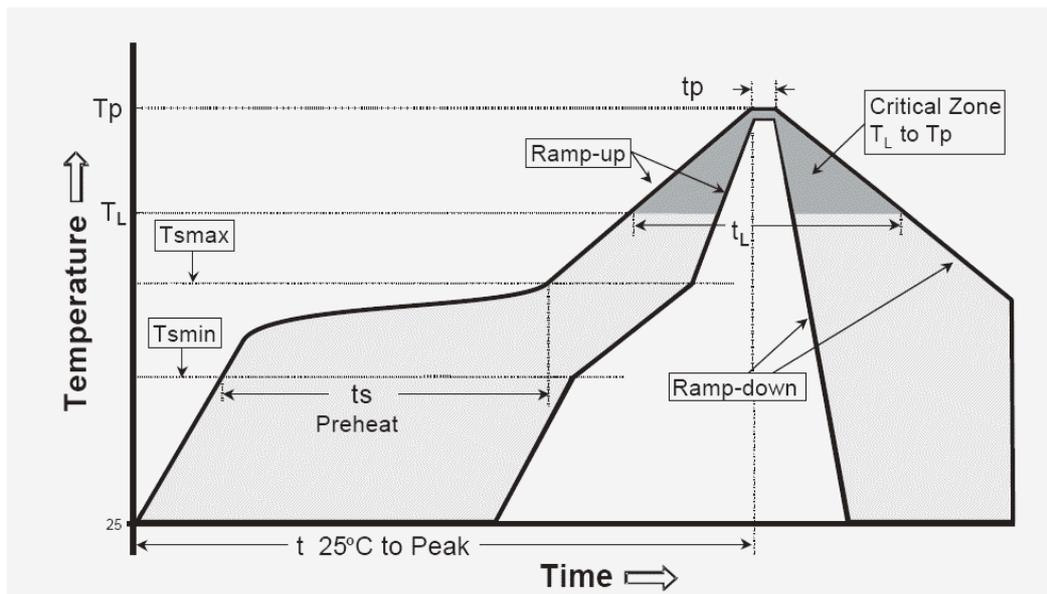


Figure 4: Temperature/time chart for lead-free soldering



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Pb-free assembly (IPC/JEDEC J-STD-020B)	Package thickness \geq 2.5 mm or Package volume \geq 350 mm	Package thickness $<$ 2.5 mm or Package volume $<$ 350 mm
Average ramp-up rate (TL to Tp)	3°C/second max.	
Preheat – temperature Min (T _{sm}) – temperature Max (T _{sm}) – time (min to max) (t _s)	150°C 200°C 60-180 seconds	
T _{sm} to TL – Ramp-up rate	3°C/second max	
Time maintained above – temperature (TL) – time (t _L)	217°C 60-150 seconds	
Peak temperature (T _p)	245 \pm 0/-5°C	250 \pm 0/-5°C
Time within 5°C of actual peak temperature (t _p)	10-30 seconds	20-40 seconds
Ramp-down rate	6°C/second max.	
Time 25°C to peak temperature	8 minutes max.	

Figure 5: Parameter for lead-free reflow soldering according to IP/JEDEC J-STD-020B

The soldering standard can be used for reflow soldering, but can also be considered as a guideline for Pb free hand soldering.

Covering during storage and mounting process

During storage and mounting it has to be avoided that particles get into the tubes. On the one hand they could clog up the vent in the ceramic substrate ($\varnothing = 0.5$ mm) and on the other hand smaller particles could get into the ceramic cap and lay down on the measuring cell effecting the pressure measurements in some cases.

If it is likely that the storage and mounting conditions as well as the soldering process might lead to a contamination with filth or dust particles, the metal tubes of the sensors should be covered up. In doing so it should be noted, that especially for the low pressure sensors, the capping and removal of protective covers have to be done very slowly, because otherwise an over pressure respectively under pressure can occur in the tube, which could lead to the destruction of the pressure sensor's membrane. Because of this the tubes should not be covered with protection sleeves but with small plugs (e.g. silicon plastics), which can easily be removed.



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ESD precautions

The necessary precautions for handling and storage of the pressure sensors are based on the standard CEI/IEC 61340-5-1: 1998 and CEI/IEC 61340-5-2/TS: 1999, which were published by the „International Electrotechnical Commission“. [6]

STANDARDS

IEC 61340-5-1 Protection of electronic devices from electrostatic phenomena - General requirements (1999)

IEC 61340-5-2 Protection of electronic devices from electrostatic phenomena; User guide (1999)

IEC 61340-4-1 Electrical resistance of floor coverings and installed floors

ANSI/ESD S20.20-1999 Protection of Electrical and Electronic Parts, Assemblies and Equipment, USA 1999.

ANSI/ESD S541-2003 Packaging Materials for ESD Sensitive Items, USA 2003.

Pressure Ports

For pressure applications up to 1 bar silicon hoses with 2mm inner diameter and 6mm outer diameter are recommended. Above 1 bar the hose should be attached to the tube using an one ear clamp. Above 2 bar PU (soft polyurethane)-hoses with clamps should be used instead of silicon hoses.

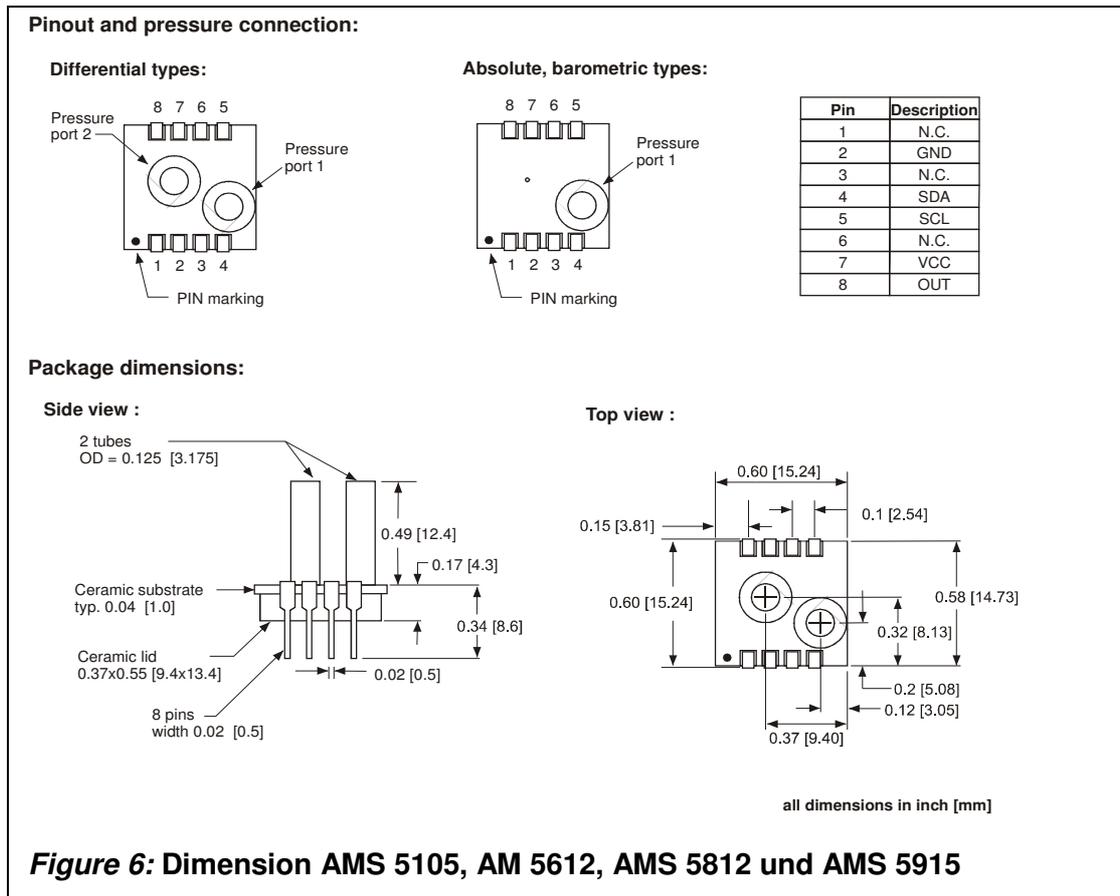
The metal tubes can be loaded with a lateral shearing force of max. 40 N. A torsional moment applied on the tube-ceramic substrate connection by movements (vibrations) of the connected hoses should also be avoided. Therefore a mechanical release should be provided when using longer hoses.

As an alternative to the hose connection, the sensors can also be delivered without tubes on request. This version is sealed to the housing using an o-ring (manifold mounting). This version is labeled with a N at the end of the product name e.g. AMS 5915-0010-D-B-N.



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Dimension



Literature:

- [1] Homepage AMYS: <http://www.amsys.info>
- [2] Datasheet AMS 5105:
http://www.analogmicro.de/pages/sens/ams5105/ams5105_data_sheet.pdf
- [3] Datasheet AMS 5612:
http://www.analogmicro.de/pages/sens/ams5612/ams5612_data_sheet.pdf
- [4] Datasheet AMS 5812:
http://www.analogmicro.de/pages/sens/ams5812/ams5812_data_sheet.pdf
- [5] Datasheet AMS 5915:
http://www.analogmicro.de/pages/sens/ams5915/ams5915_data_sheet.pdf
- [6] Soldering Standard: (<http://www.iec.ch>).
- [7] ESD Precautions: (www.esda.org)