

Handling Instructions

For SDP3x Differential Pressure Sensors

Preface

This document gives guidelines on how to handle the sensor during storage, assembly and use. Qualification of the assembly process and correct implementation and usage of the sensor is the responsibility of the customer.

It is important to note that the SDP3x is not a standard electronic component, but an advanced and thus inherently sensitive sensor, which needs - in contrast to standard electronics - interaction with the environment. The sensor is pre-calibrated and it is assumed that its physical characteristics don't change during assembly

and use. If the physical characteristics of the sensor change due to mechanical or thermal stress, the calibration might not be valid anymore or in extreme cases the sensor might even be destroyed. The same applies to contamination of the sensor.

The most critical step during assembly is reflow-soldering of the sensor. Extra care needs to be taken during this process. Also any process inducing dust should generally be avoided.

Vapor phase soldering is not recommended.

Applicability

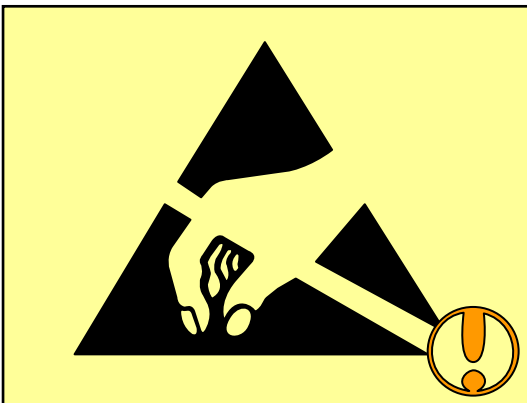
This document is applicable to all Sensirion SDP3x differential pressure sensors.

General Requirements

Any dust, spraying or coating contamination on the sensor must be prevented, especially on the connection ports.

ESD Protection

The sensor shall be protected from ESD (Electrostatic Discharge) and only be handled in ESD protected areas under protected and controlled conditions (ground all personnel with wrist-straps, ground all non-insulating and conductive objects, exclude insulating materials from the EPA, operate only in grounded conductive floor, etc.). Protect sensor outside the EPA using ESD protective packaging.



Protection against ESD is mandatory.

Packing and Storage

The parts are delivered and must be stored in a sealed dry pack. Long term storage in a Tape and Reel must be at a temperature between 10°C and 40°C. Short term exposure to a temperature between -40°C and 85°C is acceptable.

Assembly

Before developing the assembly process please read the soldering instructions of the datasheet carefully. In the following, crucial items are underlined plus additional recommendations are given:

Moisture Sensitivity Level

Sensirion SDP3x sensors shall be treated according to Moisture Sensitivity Level 3 (MSL3) as described in IPC/JEDEC J-STD-033D. Exposure to moisture levels or solder reflow temperatures, which exceed the limits as stated in this document, can result in yield and reliability degradation.

The manufacturing floor time (out of bag) at the customer's end is 168 hours at normal factory conditions ($\leq 30^{\circ}\text{C}/60\%\text{RH}$). If sensors are not mounted within this time, or were exposed to higher temperatures and humidity ($>30^{\circ}\text{C}/>60\%\text{RH}$), or at any doubt about the airtight integrity of the dry pack, the parts should be baked. The maximum baking temperature is 40°C if the sensors are in the Tape and Reel.

| Max baking temperature | Min baking time |
|--------------------------------------|--------------------------------------|
| 125°C (sensors removed from tape) | 24 hours |
| 40°C (in tape) | 23 days ($\leq 5\% \text{ RH}$) |

Temperature and Solder Time

The sensor must enter the reflow process only once, with a minimal temperature and exposure time. In any case the temperature should not exceed 260°C; In case the PCB passes through multiple solder cycles (as is the case for e.g. PCB that are assembled on top and bottom side), the SDP3x must be assembled only in the last solder cycle.

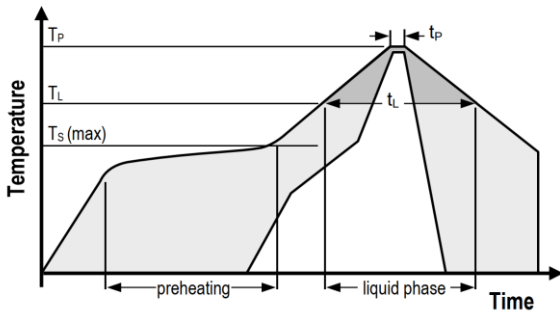


Figure 1: **Soldering profile according to JEDEC standard.** $T_P \leq 260^\circ\text{C}$ and $t_P \leq 30\text{sec}$ for Pb-free assembly. $T_L < 220^\circ\text{C}$ and $t_L < 150\text{sec}$. Ramp-up rate $\leq 3^\circ\text{C/s}$ and ramp-down rate $\leq 6^\circ\text{C/sec}$ for temperatures $> T_L$.

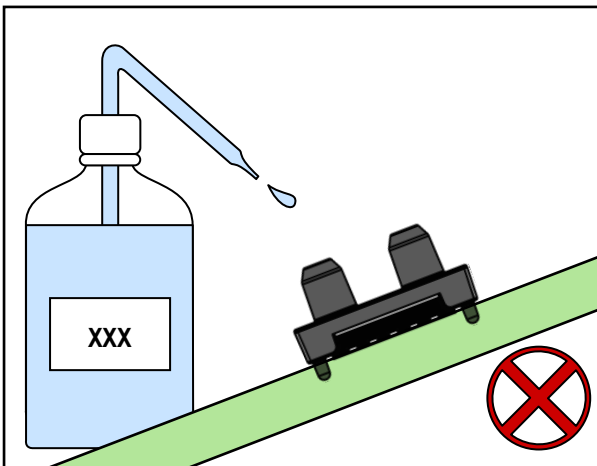
Vapor phase soldering is not recommended.

Manual soldering is not recommended by Sensirion.

Furthermore, exposing the sensor to temperatures above 200°C should be limited to a maximum of 150 seconds.

Protection Against Contaminants

Assure that the ports of the sensor are well protected during assembly and soldering so that no dust, solder flux, conformal coating, or other liquids can enter the flow channel of the sensor.



Do not apply board wash.

It is important that “no-clean” solder paste is used and no board wash is applied once the sensor is assembled to the PCB.

Land Pattern and Stencil Aperture

The landing pads should preferably be of NSDM (Non Solder Mask Defined) type. For solder paste printing it is recommended to use a laser-cut, stainless steel stencil with electro-polished trapezoidal walls and with 0.1 or 0.125 mm stencil thickness.

The recommended land pattern and stencil aperture can be found in the SDP3x datasheet.

The hole in the middle of the die pad must stay open during soldering

No mechanical stress shall be applied to any part of the sensor during assembly or usage

Depaneling & Mounting

Any depanel or separation process of the PCB after soldering of the sensor must be done with special care. Handle the PCB with the ports facing downwards or ensure that the ports are covered if any dust is created by the depaneling process. During mounting and once integrated into a device, mechanical stress on the sensor should be avoided. Sensirion recommends sealing radially on the connection ports with a soft material.

Application in Extreme Environment

Avoid any kind of liquid, fatty and oil emulsive vapors inside the flow channel. If exposed to such conditions, it cannot be guaranteed that the sensors have no drift.

Protect the sensor from dust, which could enter into the flow channel.

Avoid condensation inside the sensor. After condensed water has completely evaporated, the sensor will be fully functional again.

The sensor is specified for operation in air, N_2 or O_2 . Avoid aggressive or etching substances such as H_2O_2 or NH_3 .

Application of Sensirion differential pressure sensors to harsh environment must be carefully tested and qualified. The user is responsible for qualification of the sensor for use in a harsh environment.

Disclaimer

The above given restrictions, recommendations, materials, etc. do not cover all possible cases and items.

Revision history

| Date | Version | Author | Changes |
|---------------------------|---------|----------|---|
| April 2015 | V0.1 | ANB | Initial Draft |
| Nov 2015 | V0.2 | ANB | Updated product name. Added land pattern and stencil aperture |
| March 2016 | V0.3 | ANB | Refer to SDP3x datasheet for landing pattern and stencil aperture |
| May 2016 | V0.4 | PHA | Layout changed, MSL3 description added, assembly in last solder cycle, no board wash, no mechanical force |
| August 2016 | V0.5 | ANB | Minor changes after review |
| January 2017/October 2020 | V0.6 | ANB/JGOE | Added note about vapor phase soldering and clarified soldering profile. |

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