

# Handling and Assembly Instruction

## For Sensirion's STC Thermal Conductivity Sensor

### Preface

The Sensirion STC thermal conductivity sensor is designed for high volume applications. It is therefore compatible with standard assembly and soldering processes. Nevertheless, these sensors are non-standard electronic components. Some care must be taken to ensure proper and reliable

operation of the sensors after assembly. This document contains information on the handling and assembly of Sensirion STC thermal conductivity sensors in a production environment.

## 1 Applicability

This document is applicable to all Sensirion STC thermal conductivity sensors.

## 2 ESD protection

The sensor shall be protected from ESD (Electrostatic Discharge) and only be handled in ESD protected areas (EPA) 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 sensors outside the EPA using ESD protective packaging.

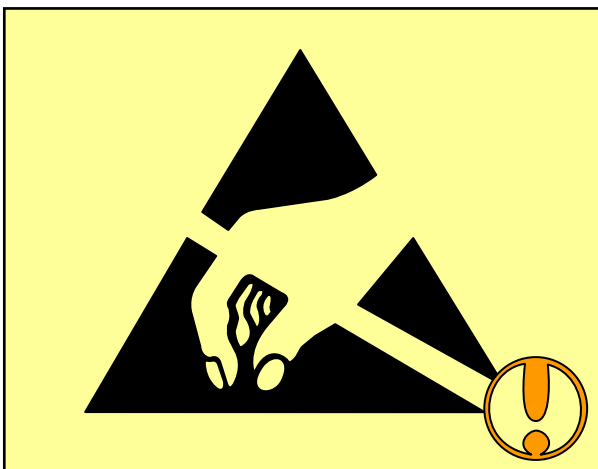


Figure 1 Protection against ESD is mandatory.

## 3 Pick & place process

Standard pick & place equipment for QFN packages may be used for handling. The upper part of the sensor, where the membrane-covered cavity resides, is very sensitive to mechanical impact and any contact must be prevented. Direct contact between the nozzle and sensor membrane must be avoided. The lower 1.6 mm of the sensor surface is intended for pick & place (see Figure 2). The tool surface touching the module in the pick area should be flat and smooth. Pick & place forces should not exceed 4N.

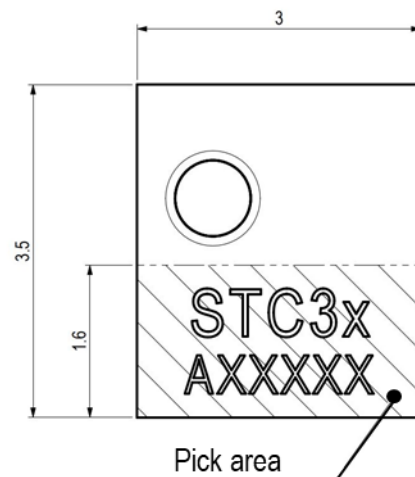


Figure 2 Area of the sensor suitable for application of force during mounting process is indicated with dashed lines. All dimensions are in mm.

## 4 Water & dust protection membrane

The STC sensor is equipped with a water and dust protection membrane that is directly attached to the sensor. The membrane completely covers the sensor opening (see Figure 3) and thus acts as a shield against pollution from spray water and dust. The membrane is completely permeable to all target gases the STC is intended to measure. Therefore, the *water and dust protection membrane must not be removed, damaged or altered in any way* to ensure reliable operation of the STC sensor.

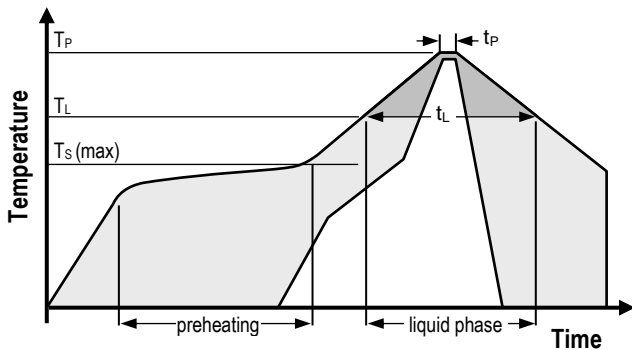
Sensor area covered by membrane



Figure 3 The dust protection membrane completely covers the STC sensor surface.

## 5 Soldering instructions

Standard reflow soldering ovens may be used for soldering. The sensors are designed to withstand a soldering profile according to IPC/JEDEC J-STD-020 with a recommended peak temperatures of 260 °C up to 30 seconds for Pb-free assembly in IR/Convection reflow ovens (see **Figure 4**). In addition, we also recommend a maximum ramp-down rate of <math>4\text{ °C/s}</math>.



**Figure 4** Soldering profile according to JEDEC standard. Recommended  $T_P = 260\text{ °C}$  and  $t_P \leq 30\text{ sec}$  for Pb-free assembly.  $T_L < 220\text{ °C}$  and  $t_L < 150\text{ sec}$ . Ramp-up rate  $< 3\text{ °C}$  and ramp-down rate  $< 4\text{ °C/sec}$ .

It is recommended not to use vapor phase soldering to avoid potential contamination of the sensor.

The use of “no clean” type 3 solder paste is recommended. An appropriate amount of solder paste shall be used to achieve a stand-off height (clearance between the package body and any part of the substrate) of 50 – 75  $\mu\text{m}$ . Please consult the appropriate sensor datasheet for device specific information on metal land patterns and recommendations on solder paste printing stencils.

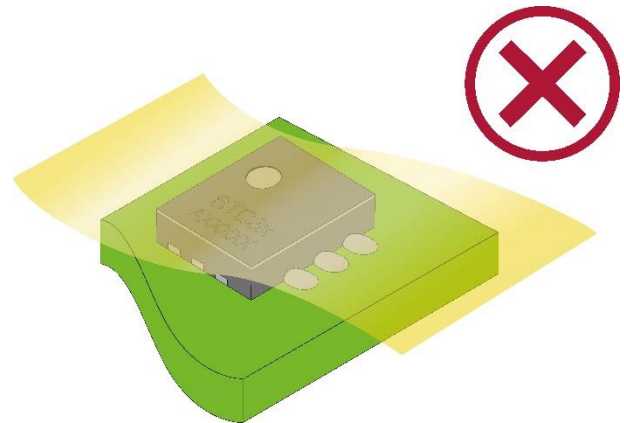
Board wash is to be avoided for Sensirion STC sensors and it is therefore recommended to use a “no-clean” solder paste. In addition, we recommend *not to use ultrasonic cleaning* since it could result in damage of the sensor. If a board wash is a requirement for the final product or application, the corresponding wash process needs to be properly qualified to be proven compatible with the STC sensor.

We recommend *not to manually solder* the Sensirion STC sensor since corresponding process parameters may not be controlled well and it could result in a damage of the sensor. In particular, hot air with an air temperature above 260°C on the device surface should be avoided. Since the sensing element has a very low thermal mass, it heats up to the air temperature very quickly.

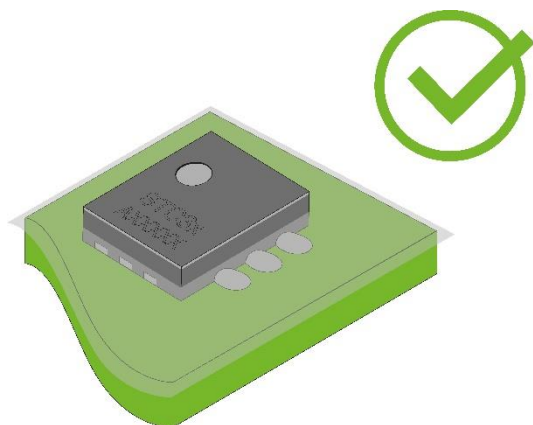
It is important to note that the side faces of the I/O pads may oxidise over time. Therefore, a solder fillet may or may not form.

## 6 Conformal coating

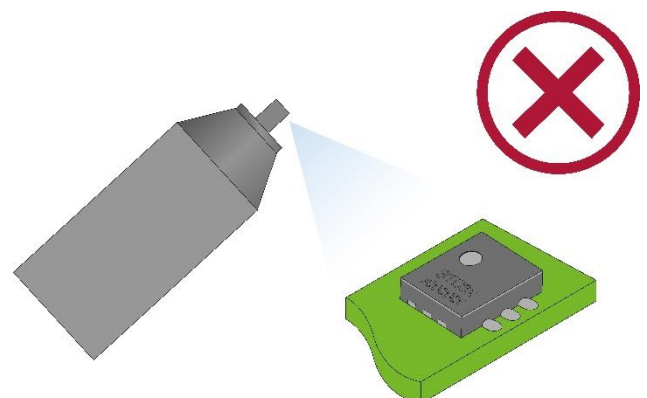
Low viscose conformal coatings or potting materials can flow onto the sensor, cover the sensor element, and thus make the gas sensor inoperative. Ensure that nothing is (even partly) covering the sensor’s dust protection membrane. Do not protect/cover the top surface with tape as this may harm the sensor’s dust protection membrane.



**Figure 5** Do not put tape on sensor.



**Figure 6** If conformal coating is applied, the top surface of the sensor must remain free of coating.



**Figure 7** Do not spray onto sensor.

Specifically, in applications where a form of coating is necessary the following approach can be used.

Use a PCB with plugged vias. Cover traces and vias with solder mask. For most applications the solder mask will already protect the PCB traces and the vias from corrosion. The solder joints can be protected with an underfill material. The underfill must precisely coat the solder joints of the STC sensor without coating the top surface. This can be achieved with a jetting procedure. This procedure is easier to control with a low viscosity coating.

As an example, we can recommend the 2-component epoxy Epotec Epoxy 301-2fl. Due to the low viscosity of the coating, it can be jetted at an appropriate distance to the STC sensor while still covering all soldering joints.

Do not cure the coating at high temperatures and ensure that temperature ramps are slow, since deformation due to stress in the material could damage the Sensor.

Also follow the guidelines for handling and soldering the SHT4x sensor in the Handling Instructions for SHT Sensors documentation.

## 7 Storage conditions and handling instructions

Sensirion STC thermal conductivity sensors are non-standard electronic components and need to be handled with care.

Sensors in SMT packages, such as Sensirion STC sensors, are classified as Moisture Sensitivity Level 1 (IPC/JEDEC J-STD-020). It is recommended to process the sensors within 1 year after delivery.

Wear clean gloves or finger cots while handling the sensor and avoid touching the sensor's dust protection membrane.

Ensure recommendations in this application note are equally considered during repair and rework of assemblies containing the STC sensor.

Sensor storage is recommended to be under ambient humidity conditions.

For more detailed information please contact Sensirion.



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