

Handling Instructions

For SHTxx Humidity and Temperature Sensors

Preface

SHTxx are relative humidity and temperature sensors of high quality. For taking benefit of their outstanding performance some precautions must be taken during storage, assembly and packaging. Therefore, please read the following instructions carefully - at best during design-in phase and before production release of the applying device.

A special focus requires exposure to volatile organic compounds, i.e. high concentration and long exposure time to respective gases shall be avoided. Such conditions are known to occur in manufacturing environment and/or at storage. Therefore handling and choice of housing and packaging materials are crucial. Applying devices in the field in ambient environment is not critical.

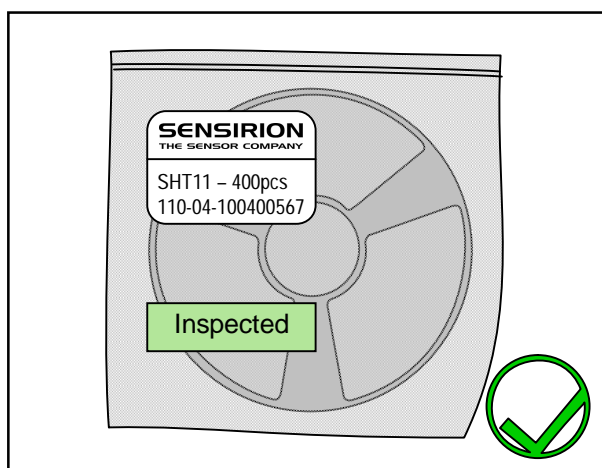
Applicability

This document is applicable to all humidity and temperature sensors supplied by Sensirion, e.g. SHT1x, SHT2x and SHT7x.

Processing the Sensor

Storage

Prior to assembly or use of the sensors it is strongly recommended to store the sensors in original packaging including the sealed ESD bag at following conditions: Temperature shall be in the range of 10°C – 50°C (0 – 125°C for limited time) and humidity at 20 – 60%RH (sensors that are not stored in ESD bags). For sensors that have been removed from the original packaging we recommend to store them in metal-in antistatic shielded ESD bags made of PE-HD. For example, 3M antistatic bag, product "1910" with zipper.



Store sensors in original, unopened packaging. Place additional stickers outside antistatic bag.

In particular, it is recommended not to use any adhesive or adhesive tapes (see above) to reseal the

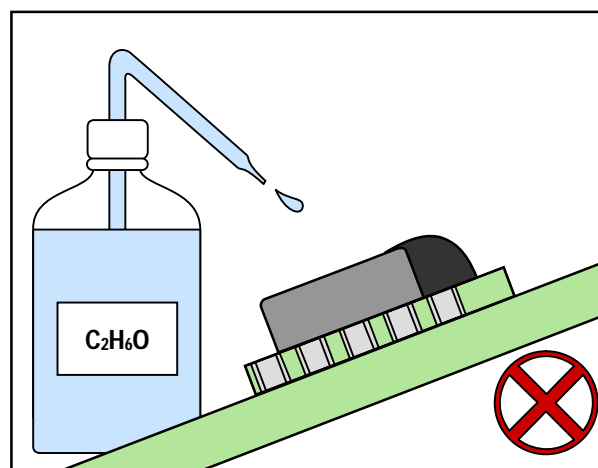
sensor package after opening. Therefore bags with zipper are recommended.

The guaranteed shelf life for SHTxx sensors is 12 months. For SMD type sensors (SHT1x, SHT2x) please apply Moisture Sensitivity Level 2 (IPC/JEDEC J-STD-020D.1).

Assembly

Before developing the assembly process please read the User's Guide of the Datasheets carefully. In the following, crucial items are underlined plus additional items are given:

For soldering please read carefully the corresponding Section in the User's Guide of respective Datasheet. Make sure that maximum temperatures and exposure times are respected. It is important that "no-clean" solder paste is used and no board wash is applied once the sensor is assembled to the PCB.



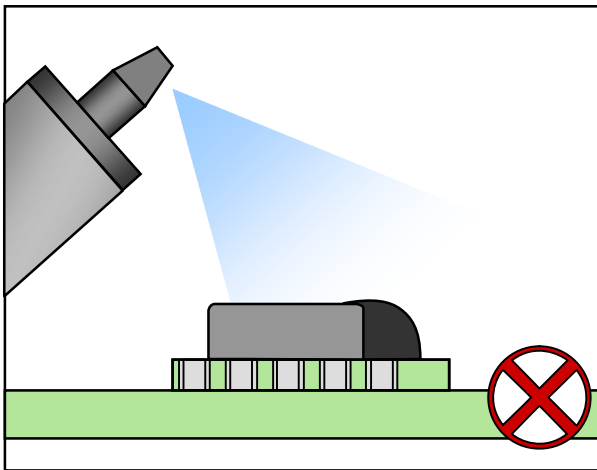
Do not apply board wash (except pure water)

No mechanical force shall be applied to any part of the sensor during assembly or usage. Especially, after soldering no force shall be applied to the sensor cap

(SHT1x) to prevent weakening of the adhesive joint between cap and PCB.

The sensor shall not get in contact with cleaning agents (e.g. PCB board wash after soldering) or strong air blasts from an air-pistol (not oil-free air). Applying cleaning agents to the sensor may lead to drift of the reading or complete breakdown of the sensor.

Low viscose conformal coatings or potting materials may flow into the inside the sensor cap, get onto the sensor chip and damage the sensor element. Use only high viscose conformal coatings or potting materials, or seal interface between sensor cap and sensor printed circuit board before applying conformal coating. Make sure that used conformal coating is not out-gasing. *Elpeguard SL 1301 ECO-FLZ* has been tested and found to be suitable if cured according to respective datasheet and applied under ventilation.

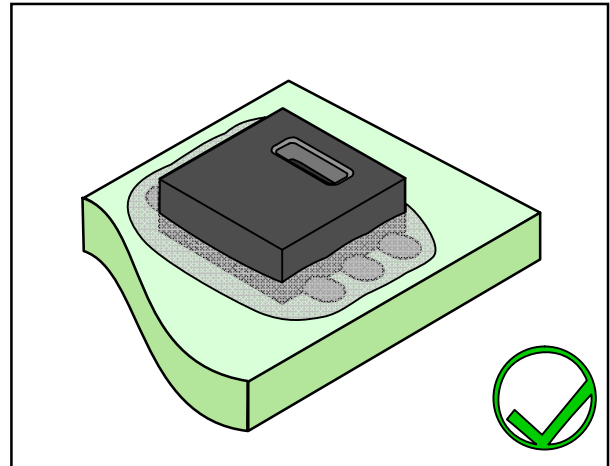


Do not apply spray to unprotected sensor.

Whenever using spray coating techniques (e.g. to apply varnish or conformal coating, etc.) the SHTxx sensor has to be covered by e.g. Kapton tape – for example *Electrical Tape 92* by 3M.

If the device with the sensor is exposed to corrosive environment – such as condensed water or corrosive gases – the soldered contacts must be passivated. Such passivation may be achieved by conformal coating or by applying adhesive.

The sensor shall be mounted into the device, if possible, after all materials that are used in the assembly process have completely cured or dried out. Otherwise ensure good ventilation in curing ovens and assembly lines.



Solder contacts shall be protected against corrosion.

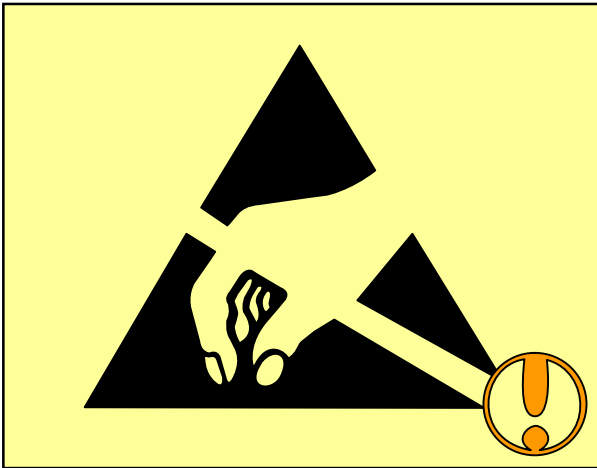
Exposure to Chemicals

The sensor shall not get in close contact with volatile chemicals such as solvents or other organic compounds. Especially high concentration and long exposure must be avoided. Ketenes, Acetone, Ethanol, Isopropyl Alcohol, Toluene, etc. are known to cause drift of the humidity reading – irreversibly in most of the cases. Please note that such chemicals are integral part of epoxies, glues, adhesives, etc. and out-gas during baking and curing. These chemicals are also added as plasticisers into plastics, used for packaging materials, and do out-gas for some period.

Acids and bases may affect the sensor irreversibly and shall be avoided: HCl, H₂SO₄, HNO₃, NH₃ etc. Also Ozone in high concentration or H₂O₂ have the same effect and therefore shall be avoided. Please note, that above examples represent no complete list of harmful substances.

Electrical

ESD (Electrostatic Discharge): The sensor shall 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 sensor outside the EPA using ESD protective packaging.



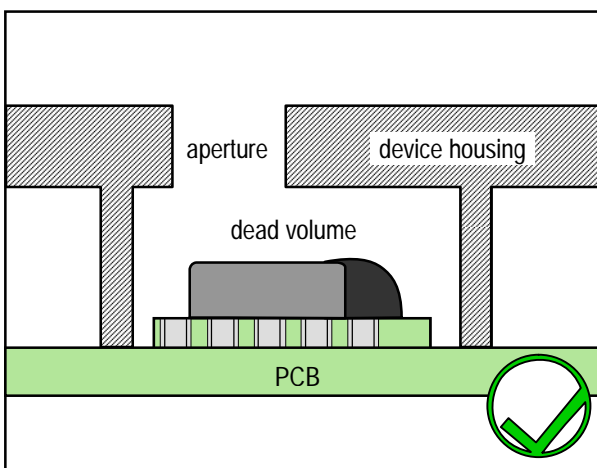
Protection against ESD is mandatory.

Please note, that supply voltage VDD and ground GND must be decoupled close to the sensor with a 100nF capacity in case the distance to the micro controller is longer than 10cm (does not apply for SHT7x as sensor packaging includes such capacitor).

Design

Device Housing

Inappropriate housing design may have a severe impact on response times of the sensor. For an optimized response time the sensor must be placed as close as possible to an aperture in the housing wall. The apertures extension shall be made as large as possible and the dead volume, the volume inside the device that is accessed by the incoming air, shall be kept as small as possible.



Make sure aperture is large, dead volume is small and sensor is separated from heat sources inside device.

In the best case a compartment is built around the sensor separating the sensor against the rest of the

inside volume of the device. In case membranes are used all volume behind the membrane must be considered to be dead volume. Please make sure only one membrane is placed in the air path.

On the PCB and inside the device housing, the sensor must be separated against external heat impact. The thermal mass of the substrate must be reduced to a minimum – for example by slitting in the PCB – and dimensions of wires to sensor shall be kept small. Electrical components shall be arranged such that heat generating components are well separated from the sensor.

Materials

Device Housing

In order to avoid drift by out-gasing volatile organic compounds the materials of the device housing shall be chosen carefully:

All metals and hard plastics (such as LCP, POM (Delrin), PTFE (Teflon), PE, PEEK, PP, PB, PPS, PSU, PVDF, PVF, ABS, PC) as long as there are no additives are safe to use. PVC often contains plasticisers that may out-gas and therefore shall be carefully applied. PS (Poly Styrene) must be avoided.

Regarding adhesives and encapsulants the following materials may be used – according to respective datasheets and cured in well ventilated environment. Materials and brands not listed in the following may be harmful and shall be tested carefully before applying.

Epoxy adhesives: EPO-TEK H70E/S, EPO-TEK T6067, EPO-TEK 93-86, Lord MD-130, Eccobond E3503-1, Ablebond 84-3. Silicone Adhesives: RTV 6424 (Momentive), Dow Corning 732. Silicone Glob Tops: Stycast S 7503. Epoxy Glob Tops: Stycast 50300 / 50400 series, Hysol EO1061/EO1062. Instant Adhesive: Loctite 401. PUR (Polyurethane): Peters VU 4457-61.

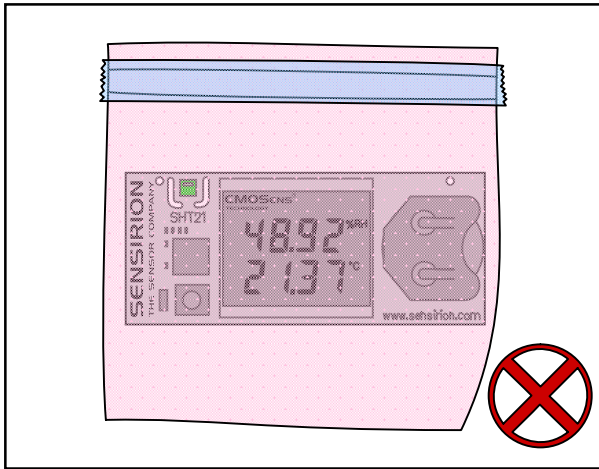
Hot melts may absorb water and thus may have an impact on the response time of the sensor in the device. Therefore hot melt shall be applied sparingly.

Do not apply any adhesive tapes such as Scotch Tape, Sello Tape, Tesa Film, etc. The only approved tape is Kapton made adhesive tape 3M Electrical Tape 92.

Device Packaging

Sensors as a component or mounted into the final product shall not be packaged in out-gasing plastic materials, which could cause sensor contamination. Recommended materials are *Metal-In antistatic shielded bags* (PE-HD is preferred to PE-LD), paper or

cardboards based packaging, deep drawn plastic trays (PE, PET, PP). Do not use *antistatic polyethylene bags* (light blue or pink or rose color); be very careful with *bubble foils* and *foams*.



Do not use polyethylene antistatic bags (rose or light blue color). Do not use adhesive tapes inside packaging.

Be careful placing stickers on the housing of the device. Sticker size should be kept to a minimum, and the sticky side shall be fully covered by housing material.

Please note that many of the packaging materials may be provided with additives (plasticizers) which may have a contaminating effect on the sensor. Generally speaking, if a material emits a strong odor you should not use it, or leave it unused for a while until the out-gassing is reduced. Additives may also be added to materials which are registered for recommended use. For high safety, device housing and shipment packaging must be qualified. Such a qualification test may contain exposure of the final device with sensor in its shipment packaging to temperature above 50°C for more than 48 hours. The sensor reading then shall show no changed deviation against a reference compared to same measurements before the exposure.

For guidance on simple and straight-forward testing of humidity sensors please consult the Qualification Guide.

Application in extreme environment

Some applications require the exposure of humidity and temperature sensors to harsh environments. In many of the cases the sensor is uncritical to be used. However, some precautions must be taken.

For exposure to extreme conditions with regards to humidity and temperature please consult the Section 1.1 of the User's Guide of respective Datasheet. Please

make sure that exposure time of the sensor to maximum range of operating conditions is limited as given in such Section. Exceptions are conditions in reflow ovens, as defined in Section 1.2 of said User's Guide.

Exposure to volatile organic compounds at high concentration and long exposure time is critical not only in assembly but also in the field. Such application needs to be carefully tested and qualified.

Exposure to acids or bases may be critical, too. However, the concentration must be such that polymers are attacked. For bases there is a rule of thumb that pH<9 are uncritical. Etching substances such as H₂O₂, NH₃, etc. at high concentrations are critical to the sensor, too.

Corrosive substances at very low concentrations are not critical to the sensor itself. However, they may attack the solder contacts. Therefore, the contacts must be well protected (passivated) in case of an application to such environment – compare also Section "Assembly".

Application of Sensirion humidity and temperature sensors to harsh environment must be carefully tested and qualified. Sensirion qualifies its humidity and temperature sensors to work properly within ambient clean air – qualification for use in harsh environment is duty of the user of the sensor.

Disclaimer

The above given restrictions, recommendations, materials, etc. do not cover all possible cases and items. This document is not to be considered to be complete and it is subject to change without prior notice.

Revision History

Date	Revision	Changes
29 June 2007	0.1 (Preliminary)	Initial revision
7 January 2009	1.0	Complete rework.
18 March 2010	1.1	New format, implementation of pictograms.

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