

BMP585

Waterproof, barometric pressure sensor

BMP585 – HSMI

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Notes

Data and descriptions in this document are subject to change without notice. Product photos and pictures are for illustration purposes only and may differ from the real product appearance.

Purpose of this document

This document describes the conditions and parameters to be applied when handling, soldering and mounting the BMP585 to a PCB.

Important:

- In order to avoid any damages of the BMP585 and resultant loss of warranty please strictly keep with the instructions described within this document.
- It is also strongly recommended to study the BMP585 data sheet prior to handling the BMP585 sensor device.
- In case you have any questions, please do not hesitate to contact your nearest Bosch Sensortec representative for further advice.

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1 Package outline dimensions

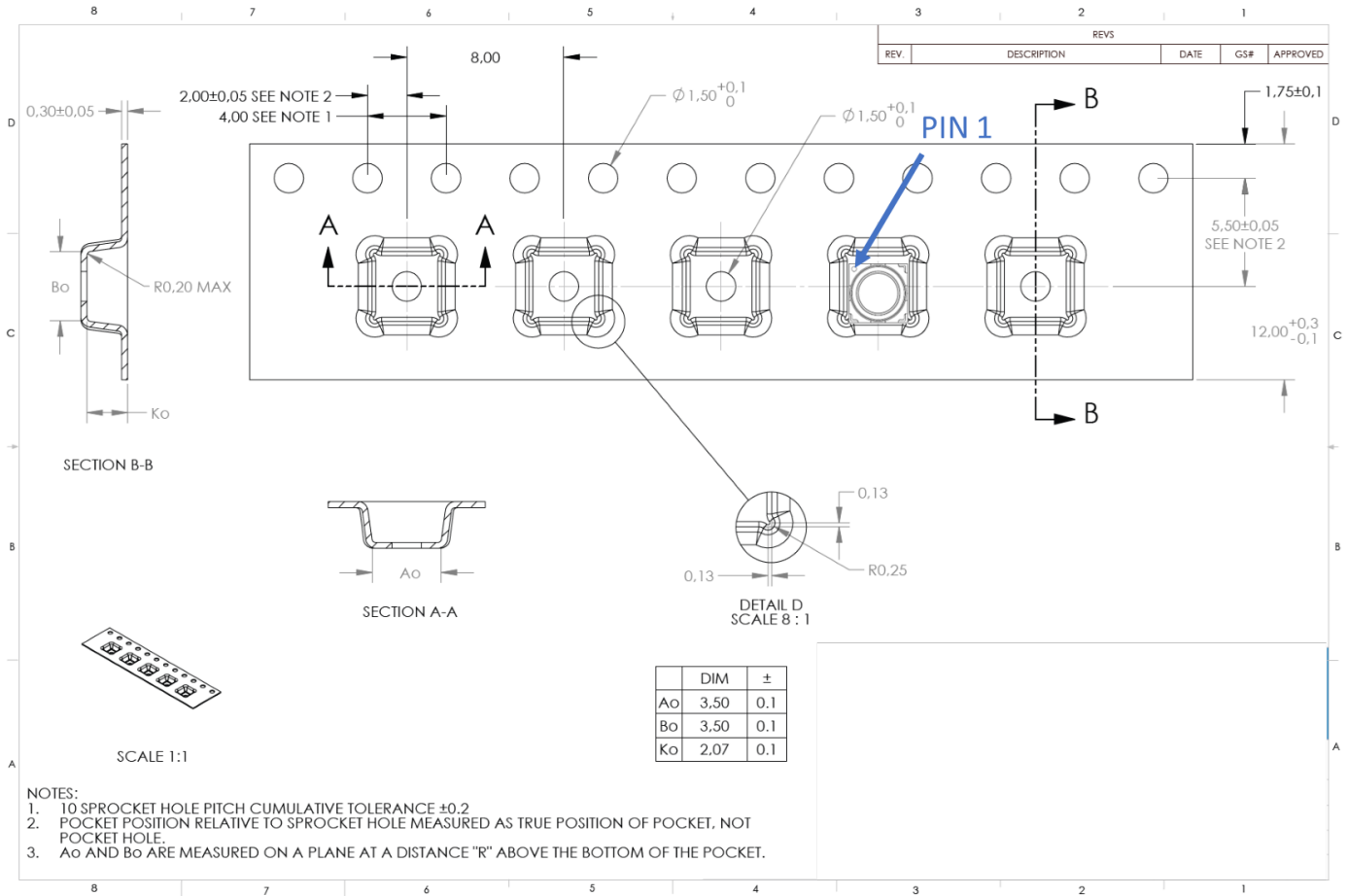
Please refer to the latest version of the corresponding product datasheet.

2 Device Marking

Please refer to the latest version of the corresponding product datasheet.

3 Blister Tape Specification

3.1 Orientation in Blister Tape



3.2 PIN1 marker

PIN1 is currently indicated with the small golden circle visible from the top.

4 Moisture sensitivity level and soldering

4.1 MSL and device storage

The BMP585 is classified as MSL 3 (moisture sensitivity level) according to IPC/JEDEC standards J-STD-020C and J-STD-033A.

Unless explicitly stated otherwise, the following storage should be followed:

- Avoid placing or storing BMP585 in the following conditions because it may cause characteristic changes in sensor performance:
 - Do not expose BMP585 to strong vibrations or shocks
 - Do not expose BMP585 to water or other liquids
 - Do not expose BMP585 to salt water and corrosive gas
- Use material on hand within 6 months of delivery
- Standard environmental conditions for storing are +25 °C and 40% relative humidity (r.h.). For a short time BMP585 can be stored outside standard storage conditions but has to stay within a temperature range from -10 °C to +40 °C and a humidity range from 15% r.h. to 90% r.h.. Exposure to condensation, shock, corrosive gas, sunlight, dust etc has to be avoided. Store BMP585 in moisture-proof packaging.
- Material on hand older than 6 months may have decreased solderability characteristics. If material on hand is older than 6 months, please verify the solderability before use, and put the modules through the following baking process:
 - Moisture proof packaging may only be opened under ambient temperatures between 5°C and 30°C and ambient humidity less than 60% RH
 - Once the moisture proof packaging is opened, sensors should be solder-mounted within 168hrs. This 168hrs time limit is only valid if sensors are kept in ambient temperatures between 5°C and 30°C and ambient humidity less than 60% RH. Outside of these ambient conditions, the time limit may vary and is not defined for this product. If the moisture proof packaging has been opened for more than 168hrs
 - (in 5-30°C & < 60%RH conditions), then the entire reel must be baked (dehydration bake) [baking conditions upon request].
 - If moisture indicator card in moisture proof packaging shows a color change from blue to lavender (pink) across more than 10% of its measurement area, then the entire reel must be baked prior to mounting (dehydration bake) [baking conditions upon request].
 - Do not puncture, throw, or drop the moisture-proof packing to avoid damage
 - Do not expose BMP585 to low molecular weight gas such as hydrogen or helium. It may cause characteristic defects in the sensor.
 - The gel within BMP585 is reactive to fluorinated polymers. Do not expose BMP585 to fluorinated polymer liquids or gels, as it will cause an adverse reaction to the gel, causing damage and defects. Examples of fluorinated polymer liquids are Galden and Fluorinert, typically used in liquid-liquid thermal shock testing or as thermal transport liquids in refrigeration/heating systems.

4.2 Electrostatic Discharge

Unless otherwise specified, the BMP585 ESD specification can be found in the Table below:

Description	Units	Minimum	Maximum
ESD Rating (CDM)	V	-250.0	250.0

However, all precautions must be taken to avoid any generation of ESD.

4.3 Soldering

The device has been tested for soldering according to J-STD-002E with Pb-free soldering. Vapor Phase soldering is not recommended due to liquids in the soldering process possibly damaging the sensor.

The minimum height of the solder after reflow shall be at least 50 µm. This is required for a good mechanical decoupling between sensor device and the printed circuit board (PCB). To ensure good solder-ability, the devices shall be stored at room temperature (20°C).

The soldering process can lead to an offset shift. The physical origin of this shift is not material aging but mechanical hysteresis frozen in by the soldering temperature cycle. Thus, the shift is temporary and ceases within 24 h after soldering. Manual unsoldering can lead to further offset shift, especially if the soldering temperature and / or soldering time is above the given values in J-STD-002E. Re-work is generally not recommended.

Avoid contact of the device with liquids or small particles.

No solder flux allowed at the sides of the BMP585 to prevent solder shorts. The solder balls and solder flux must stay on the bond pads.

We recommend a 24h wait time after soldering prior to performing measurements.

Please note that when the sensor is heated above 200°C (e.g. in order to de-solder a part), HF gas might potentially gas out from the gel. Thus, safety measures such as using a fume hood and other personal safety measures should be installed.

4.4 Multiple reflow soldering cycles

The BMP585 can withstand in total up to 3 reflow soldering cycles.

This could be a situation where a PCB is mounted with devices from both sides (i.e. 2 reflow cycles necessary) and where in the next step an additional re-work cycle could be required (1 reflow).

Multiple reflow cycles will not add up in multiple offset shifts. The device is in the same condition after every solder reflow cycle.

4.5 Landing pattern

We suggest the BMP585 outline Dimensions from the latest version of product datasheet as landing pattern.

When designing the solder paste silk print opening window, avoid excess solder paste to allow good reflow.

It is recommended to use a land pattern with a size of Footprint +25 µm on each side. We recommend at least 200 µm distance between the pads. We do not recommend vias or traces under the BMP585. Furthermore, it is recommended that there is no solder mask under the sensor. The recommended horizontal clearance for the solder mask is 20 µm on each side. If the solder mask or other material underneath the sensor gets in contact with the sensor, there may be a negative impact on performance.

5 Internal package structure

Within the scope of Bosch Sensortec's ambition to improve its products and secure the mass product supply, Bosch Sensortec qualifies additional sources (e.g. 2nd source) for the LGA package of the BMP585.

While Bosch Sensortec took care that all of the technical packages parameters are described above are 100% identical for all sources, there can be differences in the chemical content and the internal structural between the different package sources. However, as secured by the extensive product qualification process of Bosch Sensortec, this has no impact to the usage or to the quality of the BMP585 product.

6 Environmental safety

6.1 RoHS compliancy

The BMP585 sensor meets the requirements of the EC directive "Restriction of hazardous substances (RoHS)", see also: "Directive 2002/95/EC of the European Parliament and of the Council of 11 September 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment".

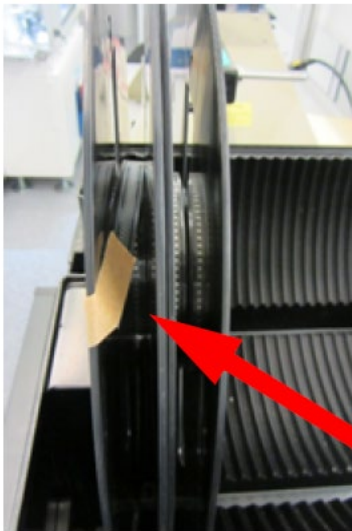
6.2 Halogen content

The BMP585 is halogen-free. For more details on the analysis results please contact your Bosch Sensortec representative.

7 Handling recommendations

7.1 Handling of reels

Once the reels are removed from the pizza box, they should always be stacked in vertical condition.



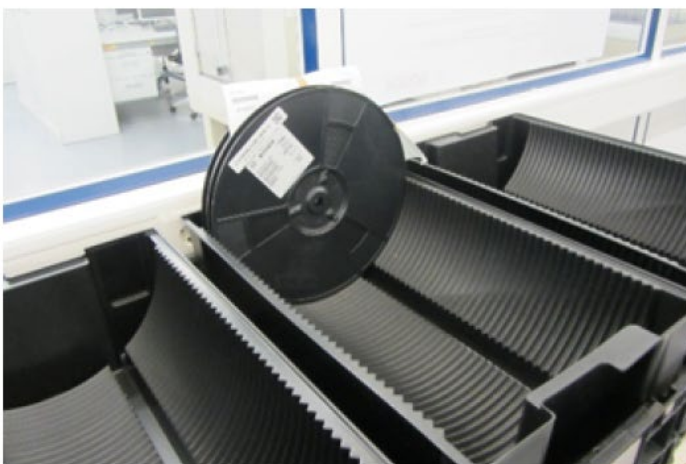
Reel trailer was removed!



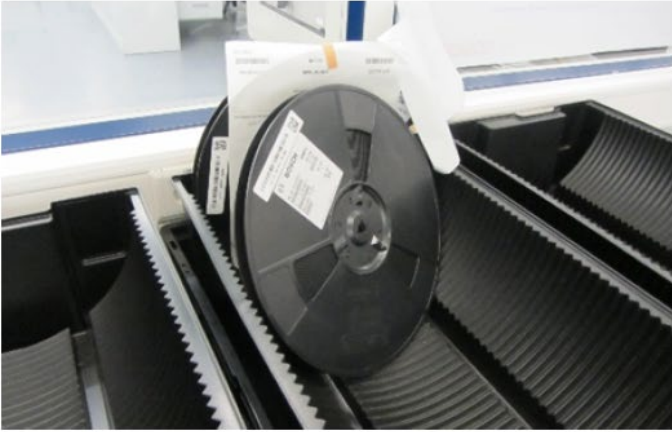
Reel trailers must not be removed. Removal of the trailer could cause deformation of the reel during de-reeling and consequently tilted parts.

Reels must be stored vertically as shown in the image below.

When reels are to be stored horizontally, they must be ordered in a stack with at most 4 reels pro stack.



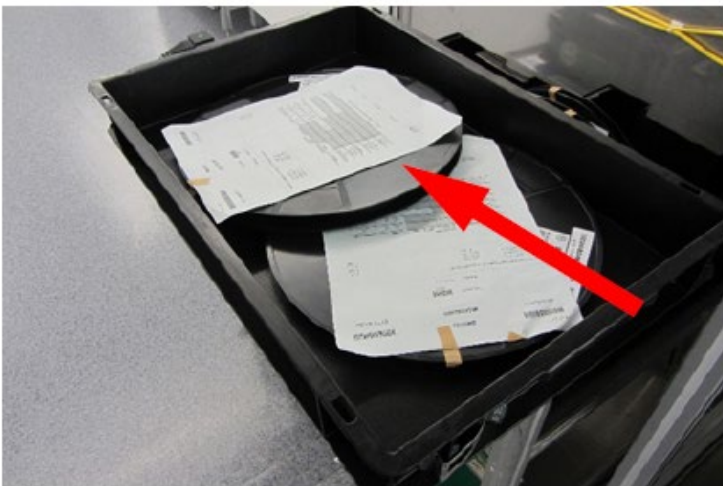
Correct Storage.



Wrong Storage.



Correct Storage.



Wrong Storage.

7.2 Automatic Handling

- When picking up the component from the Tape and Reel carrier, it is recommended that you place the pick-up tool at a vertical-height distance from the sensor.
- Use vacuum pressure at approximately -80kPa (with unit) as indicated in the picker vacuum gauges. Optimal conditions may depend on picker design.
- Make sure, to apply not more than 5N of static force and 10N of dynamic force to the lid during pick and place.
- Shear forces are not allowed.
- Similarly, set vertical-height distance during placement on the board to zero to avoid overdrive beyond the limit of the PCB.
- Avoid rear side handling of the sensor, otherwise the device can be destroyed.

The following table reflects the recommended settings for pick and place equipment when handling BMP585.

Parameter	Best Practice
Nozzle	Use a low stress pick and place nozzle (refer to Figure below)
Collet Material	A rubber collet should be used
Picking up module	The pick and place tool should focus its vacuum to the shoulders of the package and not on the gel; the vacuum pressure acting on the gel should be minimized
Pickup speed	Minimize z-axis acceleration. Excessive z-axis force ($F=ma$) can cause the transducer membrane to crack and fail.
Transfer speed	A low velocity transfer speed is recommended
Place speed	Minimize z-axis acceleration. Excessive z-axis force ($F=ma$) can cause the transducer membrane to crack and fail.

Light tension spring



Tight tension spring

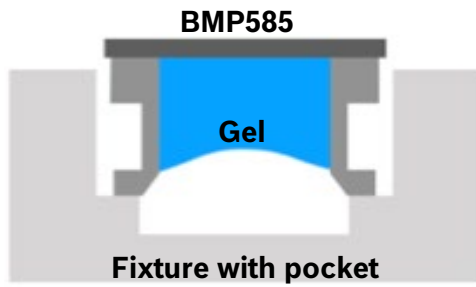


7.3 Handling when placing on stage

If BMP585 is upside down on a flat surface (which may occur at test, assembly or inspection microscopes), the gel could be contaminated with foreign particles or fibers from the flat surface. To protect the module, exercise the following precautions:

- ▶ Wipe flat surface clean with fibreless cleanroom wipe to remove possible contaminants
- ▶ Protect snout with protective cover or film so gel is covered

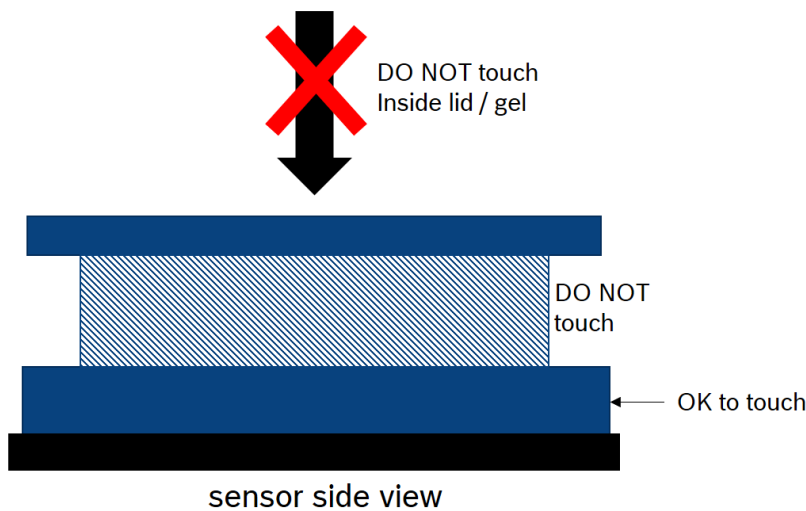
- ▶ If the protective cover or film is not possible at a step where the snout is facing downwards, a fixture should be machined to hold BMP585 over a pocket or cavity so that the bottom of the pocket is > 3mm distance away from the snout.



7.4 Manual Handling

BMP585 has an exposed gel that can be deformed, contaminated or otherwise damaged from its original condition if it comes into contact with foreign objects. During manual handling for various assembly steps or visual inspection, avoid putting fingers over the opening of the sensor (see below). Finger contact with the gel may contaminate the gel with material from the skin or gloves and may also deform the gel shape. Do not apply shear forces to the lid.

When picking up the component from a tray, we recommend that you pick it up using tweezers by grabbing on the sides of the metal lid. Ensure that you do not touch the notch while picking (see below Figure). Ensure that you do not touch the gel inside the metal lid. Avoid rear side handling of the BMP585 sensor, otherwise the device can be destroyed. Please also follow the mounting recommendations.



Tweezers

At any point if an operator or piece of equipment needs to come into direct contact with BMP585, no sharp edges on grippers, tweezers, or other handling equipment should be used. Sharp point objects or tools could go into the sensor’s snout and damage the transducer. The gripper of the tweezers should not consist of hard material, i.e. metal or ceramics, in order to avoid scratching of the sensor. The following figure illustrates an example of “good” and “not good” (NG) handling tools for BMP585:



Fig: Tweezers Suitable for BMP585 Handling

The tweezers on the bottom have a blunt tip and cannot go into the BMP585 snout by design. This makes it very unlikely that the tweezer will go into the sensor's snout and damage the transducer. Another interim solution to reduce the likelihood of damaging BMP585 while handling, is to keep the tweezer covers on (this is only meant to be for a short period of time). The tweezers on the top are an example of improper or "no good" (NG) tweezers due to the sharp tips. This makes it very easy for the tweezers to enter the snout and damage the transducer.

7.5 Particle Contamination

BMP585 has an open snout that exposes a soft gel to the outside world. Foreign particles such as small debris and fibers can stick to the gel and cause damage or VI inspection failures down the line. General cleanroom precautions should be taken to minimize such foreign particle contamination.

- ▶ Protective tape or cover should be installed on BMP585 snout when possible
- ▶ Workbenches, VI stations, test stations and assembly equipment should be clean and should be inspected to not produce particles
- ▶ Cleanroom gown procedure should be in place (wear lab jacket buttoned all the way up, wear face mask, wear hair net) and care should be taken to avoid generating fibers or particles that could contaminate BMP585
- ▶ IQC VI failure rates should be compared to OQC VI failure rates in order to confirm minimum yield loss from particle contamination. If unacceptable yield loss is found, a more thorough audit of particle contamination on BMP585 should be conducted on the assembly line to identify and address particles issues.
- ▶ If necessary, installing a dust free laminar flow station or other countermeasures to clean up a dirty station.

8 Mounting recommendations

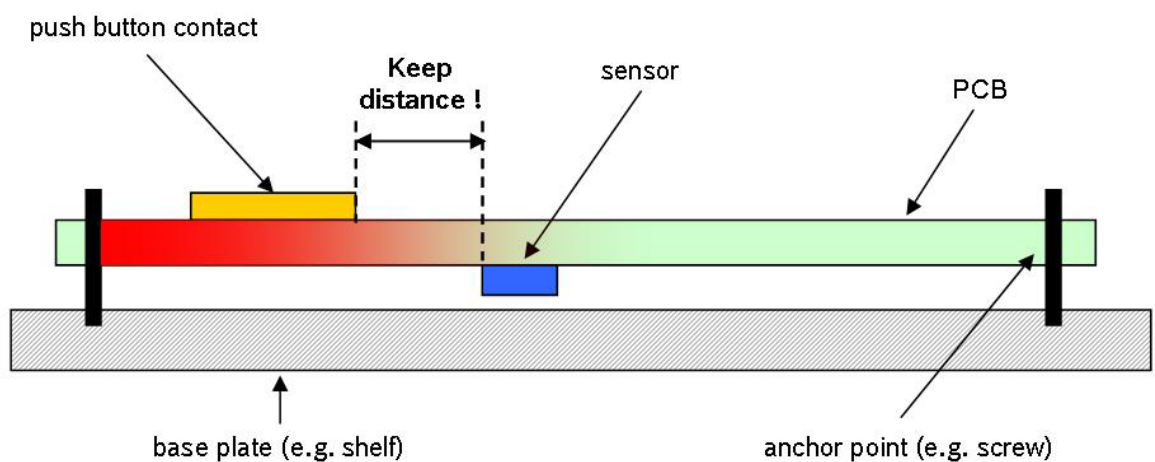
MEMS sensors in general are high-precision measurement devices, which consist of electronic as well as mechanical silicon structures. Bosch Sensortec MEMS sensor devices are designed for precision, efficiency and mechanical robustness.

However, in order to achieve best possible results for your design, the following recommendations should be taken into consideration when mounting a pressure sensor on a printed-circuit board (PCB).

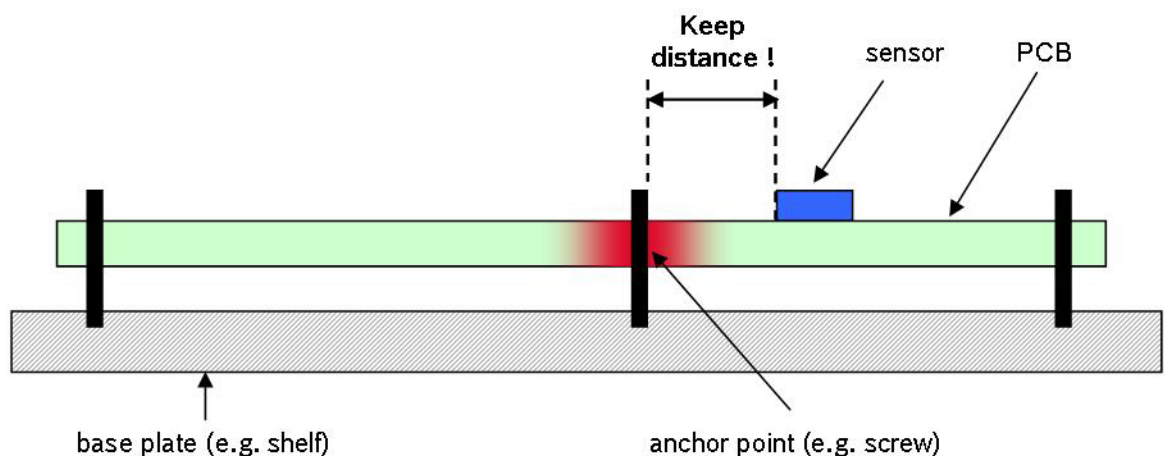
8.1 Placement on PCB

► It is generally recommended to keep a reasonable distance between the sensor mounting location on the PCB and critical points on the PCB as given in the examples below. The exact value for a “reasonable distance” depends on many customer specific variables and must therefore be determined case by case.

- It is not recommended to place the sensor directly under or next to push-button contacts as this can result in mechanical stress.

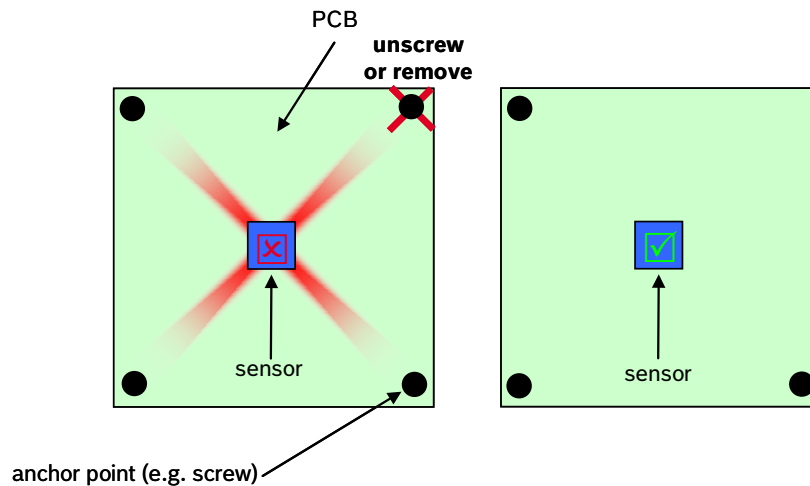


- It is not recommended to place the sensor close to the edge of the PCB.
- It is not recommended to place the sensor in direct vicinity of extremely hot spots (e.g. a μ Controller) as this can result in heating-up the sensor. The BMP585 shall not be placed close to fast heating parts. In case of temperature changes $> 3.0^{\circ}\text{C}/\text{sec}$ during operation, please contact your Bosch Sensortec representative for support.

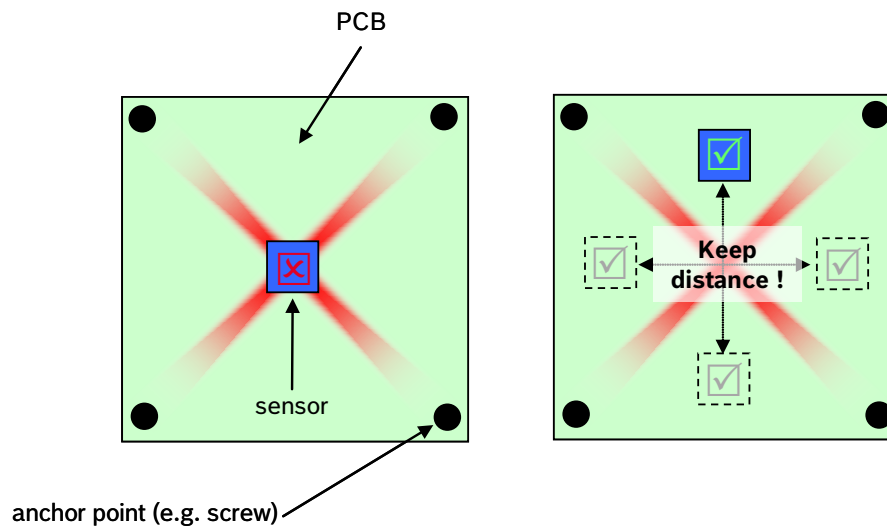


- Do not mount the sensor too close to a PCB anchor point, where the PCB is attached to a shelf (or similar) as this could also result in mechanical stress.

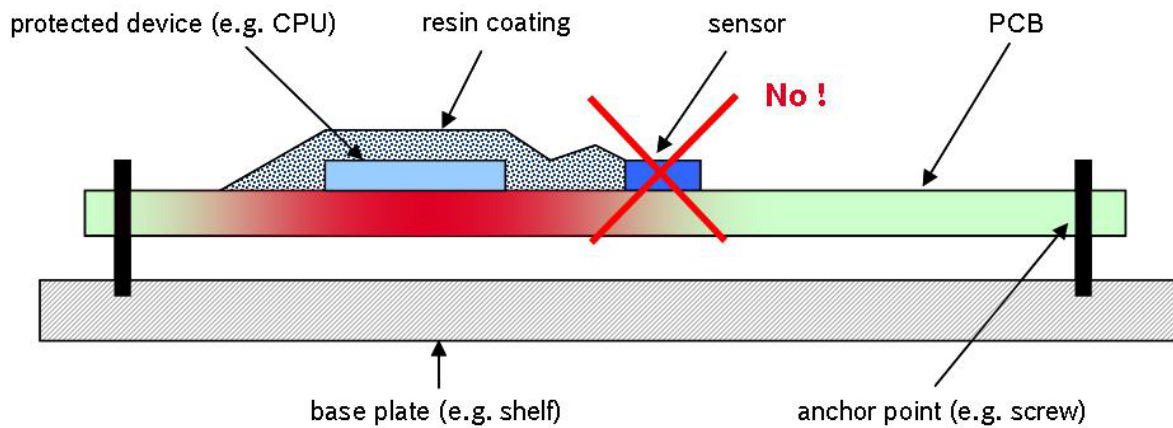
- It is recommended to unscrew or remove any redundant PCB anchor points. In theory, an ideal flat plane is determined by 3 anchor points, exclusively. Any further anchor point will over-determine the ideal flat plane criteria. If these redundant anchor points are out of plane position (which means not 100% exact in plane position) the ideal flat criteria is infringed, resulting in mechanical stress.



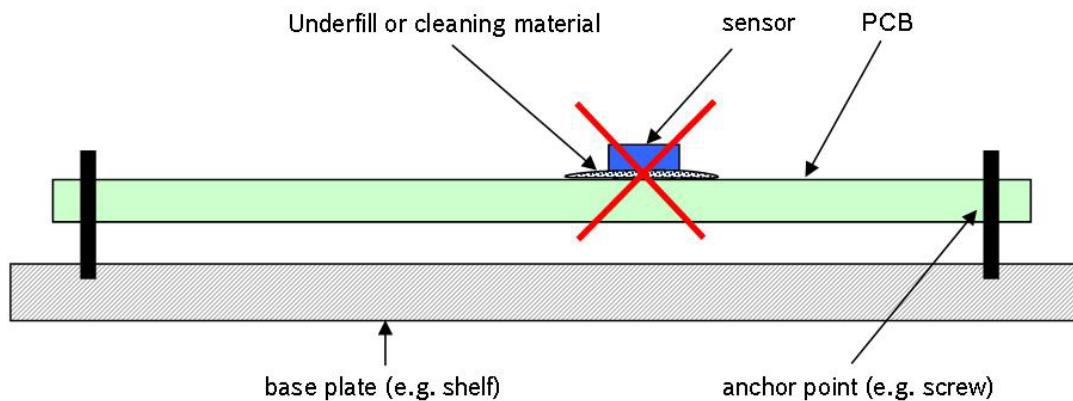
- It is recommended to keep a reasonable distance from any mechanical stress maximum, when placing the sensor device. Mechanical stress can be induced for example by redundant anchor points. The below given example will show a stress maximum in the center of the diagonal crossover of the 4 anchor points. It is good manufacturing praxis to always avoid or reduce the mechanical stress by optimizing the PCB design first, then to place the sensor in an appropriate low stress area.



- Please avoid total or partial coverage of the sensor by any kind of (epoxy) resin, as this can possibly result in mechanical stress and could clog the hole in the sensor's top lid. As shown, please take care that the sensor is not covered and not in contact with any (epoxy) resins material leading to an un-symmetric stress distribution over the sensor package.



- ▶ Please avoid all kinds of foreign materials under the sensor, e.g. underfill and cleaning materials.



- ▶ The distance between the sensor and the PCB after the soldering process must be at least 50µm.
- ▶ For the device housing appropriate venting needs to be provided in case the ambient pressure shall be measured.
- ▶ Avoid a tilting of sensor while soldering.

In case you have any questions with regard to the mounting of the sensor on your PCB, do not hesitate to contact us.

The scenarios described below - given as examples - may lead to a bending of the PCB, which as a consequence, might influence the performance of a sensor mounted on the PCB.

Please note that this possible behavior is not limited to Bosch Sensortec devices, but may as well occur with third party MEMS devices in a similar manner.

8.2 Integration in 2nd level system

When integrating the sensor into 2nd level, application note should be considered.

Direct exposure of the gel surface towards medias without protection should be avoided. It is recommended to introduce suited protection measures on 2nd level system side, e.g. mesh or channel.

In case you have any questions with regard to integrating your sensor, do not hesitate to contact us.

8.3 Miscellaneous

- Ultrasonic welding: ultrasonic welding can induce damage in the pressure sensor. Customer - in case of using this process in his manufacturing line - has to secure the parameter of the process for each project individually to protect the pressure sensor.
- ~~The pressure sensor has to be protected against all kinds of liquids during processing (e.g. solder flux, cleaning agents)~~

- The BMP585 sensor is sensitive to light, which can influence the accuracy of the measurement. Therefore, the sensor shall not be exposed to direct light during operation.
- Vapor phase soldering: connecting BMP585 on the PCB through vapor phase soldering might cause deposits on the gel which can distort the electrical signal
- Radiation hardness:
 - Max X-Ray radiation exposures of 1 Gy (Gray) over lifetime should not be exceeded.
 - For X-Ray monitoring a 0.5mm CU filter is required.
 - Radiation exposures derived with following test setup and conditions:
 - X-ray source: Tungsten micro-focus x-ray source
 - Acceleration voltage: 200 kV
 - Acceleration current: 420 μ A
 - 150 mm distance to focus
 - 0.5 mm Cu filter
 - Dosimeter: RadEye PRD ER4 (Thermo Scientific)

In case you have any questions with regard to the mounting of the sensor on your PCB, do not hesitate to contact us. The scenarios described below - given as examples - may lead to a bending of the PCB, which as a consequence, might influence the performance of a sensor mounted on the PCB.

Please note that this possible behavior is not limited to Bosch Sensortec devices, but may as well occur with third party MEMS devices in a similar manner.

8.4 Radio interaction

BMP585 provides excellent RF immunity performance, even if subject to high RF radiation.

For best performance, the sensor shall be placed in the following conditions:

- Not close to antennas for radio protocols like LTE, 5G and WIFI.
- Ground pins should be connected to a common ground (ideally, a ground plane) as close to the sensor as possible
- If long signal lines to the sensor cannot be avoided, they should be shielded by an adjacent ground plane.

A typical use case where such measures have to be taken into account is the integration of a waterproof pressure sensor into the encasing of a mobile device. The encasing typically acts as the device's antenna, and the connection may require longer traces on a flex circuit board. RF decoupling can be further improved by integrating inductors to the signal traces.

9 Legal Disclaimer

9.1 Engineering samples

Engineering Samples are marked with an asterisk (*), (E) or (e). Samples may vary from the valid technical specifications of the product series contained in this data sheet. They are therefore not intended or fit for resale to third parties or for use in end products. Their sole purpose is internal client testing. The testing of an engineering sample may in no way replace the testing of a product series. Bosch Sensortec assumes no liability for the use of engineering samples. The Purchaser shall indemnify Bosch Sensortec from all claims arising from the use of engineering samples.

9.2 Product use

Bosch Sensortec products are developed for the consumer goods industry. They may only be used within the parameters of this product data sheet. They are not fit for use in life-sustaining or safety-critical systems. Safety-critical systems are those for which a malfunction is expected to lead to bodily harm, death or severe property damage. In addition, they shall not be used directly or indirectly for military purposes (including but not limited to nuclear, chemical or biological proliferation of weapons or development of missile technology), nuclear power, deep sea or space applications (including but not limited to satellite technology).

Bosch Sensortec products are released on the basis of the legal and normative requirements relevant to the Bosch Sensortec product for use in the following geographical target market: BE, BG, DK, DE, EE, FI, FR, GR, IE, IT, HR, LV, LT, LU, MT, NL, AT, PL, PT, RO, SE, SK, SI, ES, CZ, HU, CY, US, CN, JP, KR, TW. If you need further information or have further requirements, please contact your local sales contact.

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The purchaser shall indemnify Bosch Sensortec from all third party claims arising from any product use not covered by the parameters of this product data sheet or not approved by Bosch Sensortec and reimburse Bosch Sensortec for all costs in connection with such claims.

The purchaser accepts the responsibility to monitor the market for the purchased products, particularly with regard to product safety, and to inform Bosch Sensortec without delay of all safety-critical incidents.

9.3 Application examples and hints

With respect to any examples or hints given herein, any typical values stated herein and/or any information regarding the application of the device, Bosch Sensortec hereby disclaims any and all warranties and liabilities of any kind, including without limitation warranties of non-infringement of intellectual property rights or copyrights of any third party. The information given in this document shall in no event be regarded as a guarantee of conditions or characteristics. They are provided for illustrative purposes only and no evaluation regarding infringement of intellectual property rights or copyrights or regarding functionality, performance or error has been made.

10 Document history and modifications

Rev. No	Chapter	Description of modification/changes	Date
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