Bosch Sensortec Inertial Measurement Units
Handling, Soldering and Mounting Instructions

HSMI for BMI2xy/BMI3xy/BMI4xy/BHI3xy IMUs

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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. The technical details and legal disclaimer of the respective product data sheet apply.

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1 Purpose of this document

This document describes the recommended conditions and parameters to be applied when handling, soldering, and mounting Bosch Sensortec's Inertial Measurement Units (IMUs, incl. programmable IMUs) to a PCB. This document applies to all Sales Part Numbers mentioned on the cover sheet. In case the Sales Part Number of your Bosch Sensortec device is not listed, contact your Bosch Sensortec representative.

Important:

- To avoid damage to the sensor and the loss of warranty, strictly follow the instructions described in this document.
- It is strongly recommended to study the sensor datasheet before handling the sensor device.
- In case you have any other questions, do not hesitate to contact your Bosch Sensortec representative.

2 Package outline

Refer to the latest version of the corresponding product datasheet or preliminary datasheet.

3 Landing pattern

Refer to the latest version of the corresponding product datasheet or preliminary datasheet.

4 Moisture sensitivity level (MSL)

The moisture sensitivity level of the device corresponds to JEDEC Level 1. Also, see the following standards:

- IPC/JEDEC J-STD-020E "Joint Industry Standard: Moisture/Reflow Sensitivity Classification for non-hermetic Solid State Surface Mount Devices."
- IPC/JEDEC J-STD-033D "Joint Industry Standard: Handling, Packing, Shipping and Use of Moisture/Reflow Sensitive Surface Mount Devices."

Both standards are available on JEDEC's website.

The sensor fulfills the lead-free soldering requirements of the IPC/JEDEC standard mentioned above, i.e., reflow soldering with a peak temperature T_p up to 260°C.

5 RoHS compliance/halogen content

As listed on the cover sheet, the devices (Sales Part Numbers) comply with directive 2011/65/EU (RoHS) and its subsequent amendments, restricting the use of hazardous substances in electrical and electronic equipment.

The devices comply with the industry standard IEC 61249 for halogen content. For more details on the corresponding analysis results, contact your Bosch Sensortec representative.

Corresponding chemical analysis certificates are available as separate documents from Bosch Sensortec.

6 Mounting recommendations

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

To achieve the best possible results for your design, the following recommendations should be considered when mounting the sensor on a printed circuit board (PCB).

The scenarios described below, for example, may lead to a bending of the PCB, which consequently might influence the performance of the sensor mounted to the PCB. Due to the natural presence of eigenmodes in MEMS gyroscopes, strain-induced changes in the modal landscape can, in unfavourable cases, also lead to offset anomalies.

It is recommended to use additional tools during the design-in phase to evaluate and optimize the considered placement position of the sensor on the PCB, for example:

- infrared camera regarding thermal aspects
- warpage measurements and/or FEM simulations regarding mechanical stress
- drop tests of the device after soldering on the target application PCB regarding shock robustness

It is recommended to keep a reasonable distance between the sensor mounting location on the PCB and the critical locations described in the following examples. The exact value for a "reasonable distance" depends on the individual design and, therefore, must be determined case by case.

Contact your Bosch Sensortec representative if you have questions regarding the mounting of the sensor on your PCB or about evaluating and/or optimizing the considered placement position of the sensor on your PCB. If the recommendations mentioned above cannot be met, a specific in-line offset calibration after device placement onto your PCB might help minimize the potential remaining effects.

6.1 External loads/forces

In certain applications, circuit boards may feature an array of functional buttons or connection points. External loads or forces applied to these points can transmit stress through the board to the MEMS sensor, potentially causing mechanical damage. It is advisable to position MEMS sensors at a distance from these force-prone areas. See Figure 1.

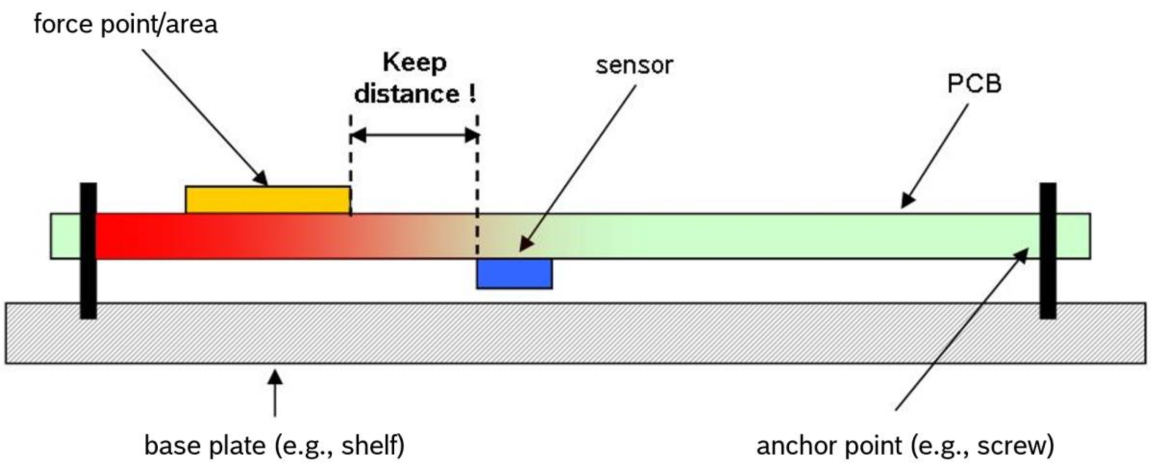


Figure 1: External loads/forces

6.2 Thermal hot spots on the PCB

It is recommended to keep a reasonable distance from any thermal hot spots or areas with large thermal gradients, especially those that fluctuate over time when placing the sensor device to achieve higher accuracy measurements. See Figure 2. Hot spots can include a µController or a graphic chip, other integrated circuits with high power consumption, processors, batteries, power management circuitry, or high-current devices. Thermal gradients refer to the uneven variation of temperature across space or time. These temperature differences are typically caused by factors such as the power consumption of various components on the PCB, heat dissipation efficiency, and the material properties of the PCB.

The hot spots and thermal gradients on the PCB will have two effects: temperature rise will affect the performance of IMU series sensors, including the impact on the sensitivity and zero-g offset of the acceleration and gyroscope. Additionally, the rise in temperature will cause the PCB to deform, generating additional mechanical stress. Time-varying thermal gradients can cause uneven thermal expansion of PCB materials, resulting in dynamic warping that may affect measurement accuracy and introduce calibration errors. Choosing PCB materials (such as prepreg and laminate) with a smaller coefficient of thermal expansion (CTE) can reduce the strain caused by temperature variations.

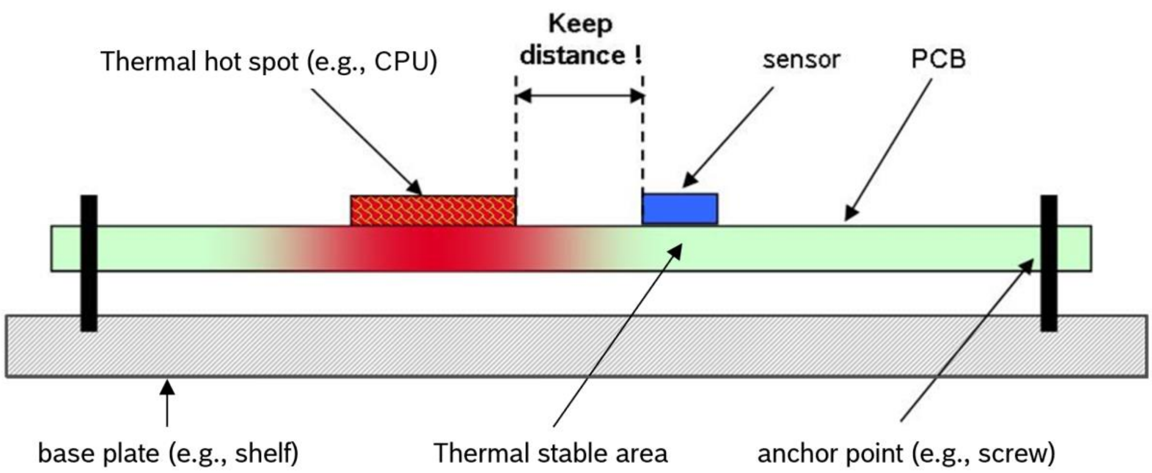


Figure 2: Thermal hot spots on the PCB

Prevent any contact between heat sinks or other external structures and the sensor, which may also create thermal conduction and mechanical stress. See Figure 3.

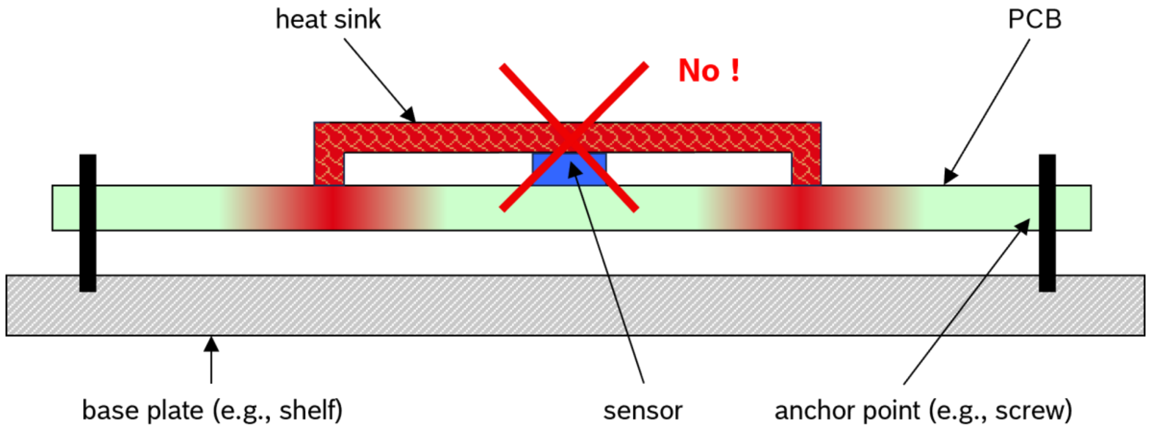


Figure 3: Heat sinks

6.3 Mechanical stress maximum on the PCB

It is recommended to keep a reasonable distance from any mechanical stress maximum when placing the sensor device.

Figure 4 shows a stress maximum in the center of the diagonal crossover of the four anchor points. It is good manufacturing practice to always avoid or reduce mechanical stress by optimizing the PCB design first, then placing the sensor in an appropriate low-stress area.

A best practice is to place MEMS components on the PCB in locations where the stress value is not exceeding 500 µstrain.

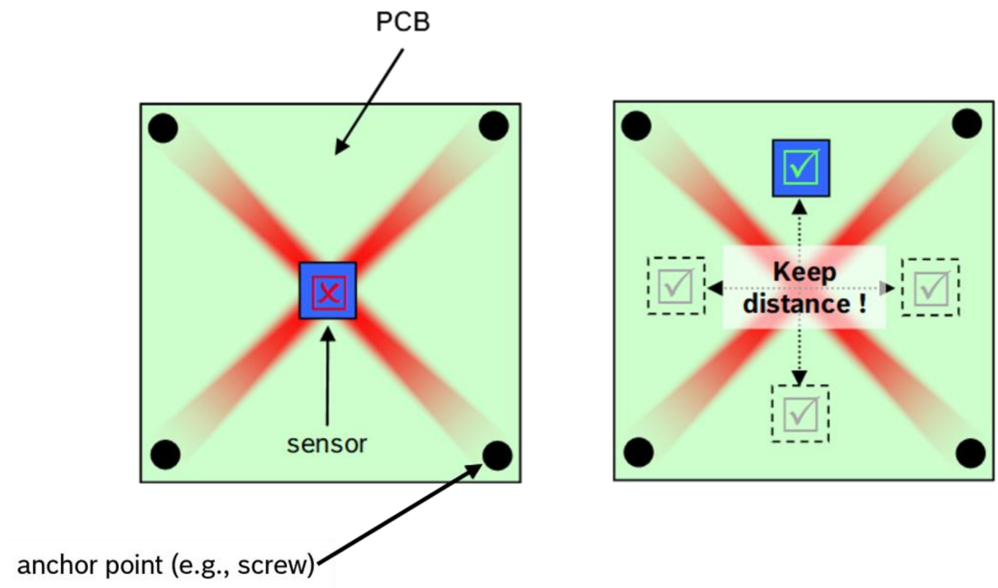


Figure 4: Mechanical stress maximum on the PCB

6.4 Distance to PCB anchor points

When placing the sensor device, keep a reasonable distance from anchor points where the PCB is fixed at a base plate (e.g., a shelf or something similar). See Figure 5.

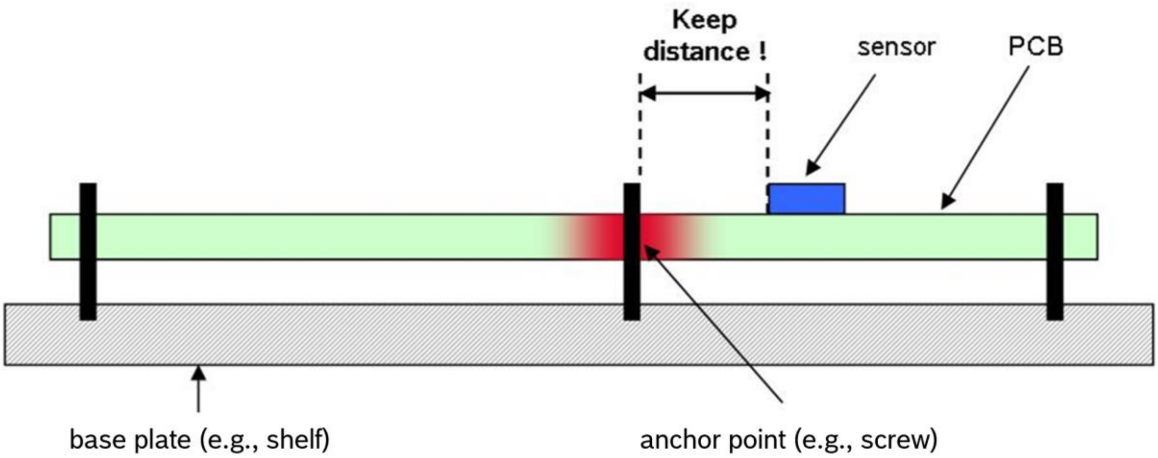


Figure 5: Distance to PCB anchor points

6.5 Vibrations on the PCB

Various measures can be applied to minimize vibration transmission, such as adding damping washers or foam pads at anchor points or optimizing the placement of the IMU to reduce the vibration effects.

It is recommended to position the IMU away from other sub-systems/modules (from the top and bottom side) on the PCB to mitigate or prevent the impact of vibrations from these parts to the sensor. MEMS gyroscopes and accelerometers have multiple internal eigenmodes. In the case of a resonant match between an external aggressor and an eigenmode of the sensor, even relatively low vibration amplitudes might cause damage to the MEMS structures. The system-level design should avoid vibrations that align with the resonant frequencies of the IMU.

External vibrations that coincide with the sensor's eigenfrequencies may introduce extra noise, extra offset, or even damage the sensor. Do not place the sensor next to components or in areas where the PCB's resonant amplitudes (vibrations) are likely to occur or to be expected.

It is recommended to contact your Bosch Sensortec representative to get the specific application notes in case vibration sources have to be placed on the same PCB. For the new-generation BMI series sensors, Bosch Sensortec will provide details on safe external aggressor loads to help make optimized platform integration easier.

The predominant vibration sources at the PCB board level are those listed below. Measures must be taken to avoid their impact on the sensor.

6.5.1 Mechanical vibration sources

Vibrating components, such as speakers, vibration/haptic motors, fans, etc., should be mechanically isolated from the IMU.

6.5.2 Electrical sources

A switched-mode power supply (SMPS) converts voltage through high-frequency switching, which can induce vibrations in its circuit components, such as inductors and capacitors. If the SMPS's specific switching frequencies (including harmonic frequencies) coincide with the sensor's specific eigen frequencies (including harmonic frequencies), it could result in increased noise and offset in the sensor gyroscope or even cause damage to the MEMS.

6.5.3 MLCCs

Multilayer ceramic chip capacitors (MLCCs) are commonly employed in wireless and fast-charging ICs and DC-DC conversion circuits. Some ceramic capacitors may exhibit vibration or low-frequency buzzing with very high acceleration loads, known as "singing capacitors," due to imbalances in the power circuit. This phenomenon, attributed to the piezoelectric effect, can induce vibrations overlapping with the resonant frequency of the IMU, thereby impacting sensor performance or causing damage to the fine structures inside the MEMS. Furthermore, prepolarization from DC bias enables AC voltages to generate mechanical stresses, resulting in the deformation of the MLCC and the attached PCB substrate. See Figure 6.

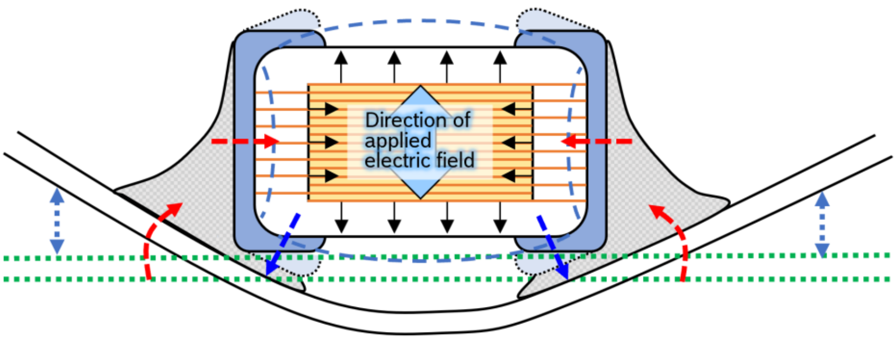


Figure 6: Deformation of MLCC affected by electric field

Recommendations for PCB material and thickness:

- Increasing PCB thickness resists deformation and reduces (body) sound pressure level (SPL).

Optimize the layout of MLCCs on the PCB:

- MLCCs are placed as far away from the sensor as possible.
- Prioritizing placing MLCCs on PCB edges produces a lower SPL.
- When MLCCs are placed symmetrically on opposite sides of a PCB, the vibrations generated by each other can often be canceled out.
- When placed in an L-shape or T-shape layout configuration, the vibrations of the two MLCCs are orthogonal to each other and provide a certain level of cancellation. See Figure 7.

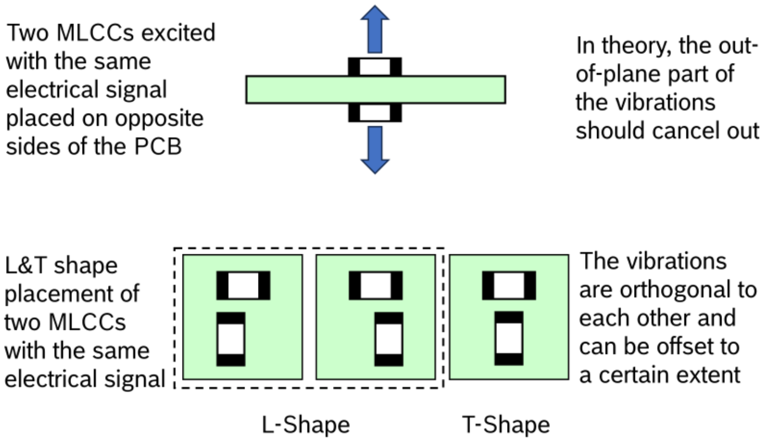


Figure 7: Placement of MLCCs to significantly reduce vibration

- MLCCs can be replaced with tantalum capacitors; the structural composition of tantalum capacitors prevents them from generating vibration and deformation effects similar to those of MLCCs on the PCB board.

It is recommended that the impact of MLCCs on IMUs can be reduced or avoided in the early design-in phase from the following aspects:

- Consider aggressor frequencies (e.g., frequency of fast charging and/or wireless charging ICs) and ideally test more than one fast-charging IC frequency.
- Invest in Laser Doppler Vibrometer (LDV) measurements to scan the vibration profile of the target PCB and assess expected load (g's) at available placement position (s) of IMU.
- Perform finite element modeling (FEM) simulations to understand the impact of aggressors better.
- Qualify the IMU based on HSMI recommendations.

By implementing best practices, vibrations caused by MLCCs can be reduced but not entirely prevented. If switching the frequency hits an eigenmode of the IMU, vibration reduction alone cannot guarantee the absence of interference. If you have any questions about the placement of MLCCs, contact your Bosch Sensortec representative.

6.5.4 PCB with large span

Avoid placing the IMU on the end of a long hanging beam or the PCB with a large span. See Figure 8.

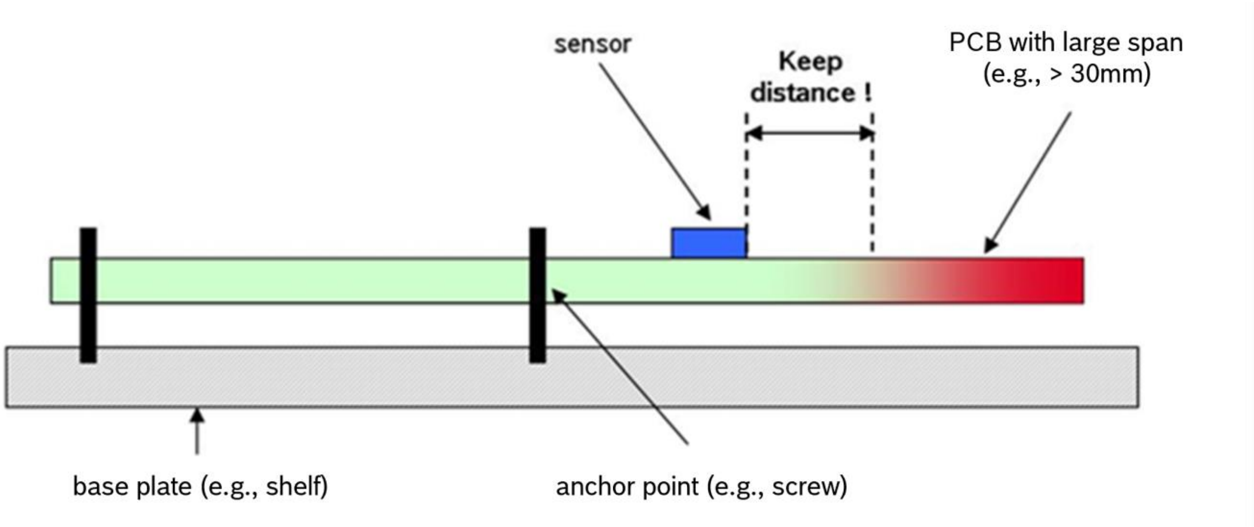


Figure 8: Long hanging beam or large span PCB

6.6 Resin coatings and shields

6.6.1 Encapsulation/over-molding/resin coatings

As shown in Figure 9 and Figure 10, avoid encapsulating/over-molding or even partially covering the sensor with any protective materials, such as epoxy resin. Doing so can lead to an asymmetric stress distribution over the sensor package.

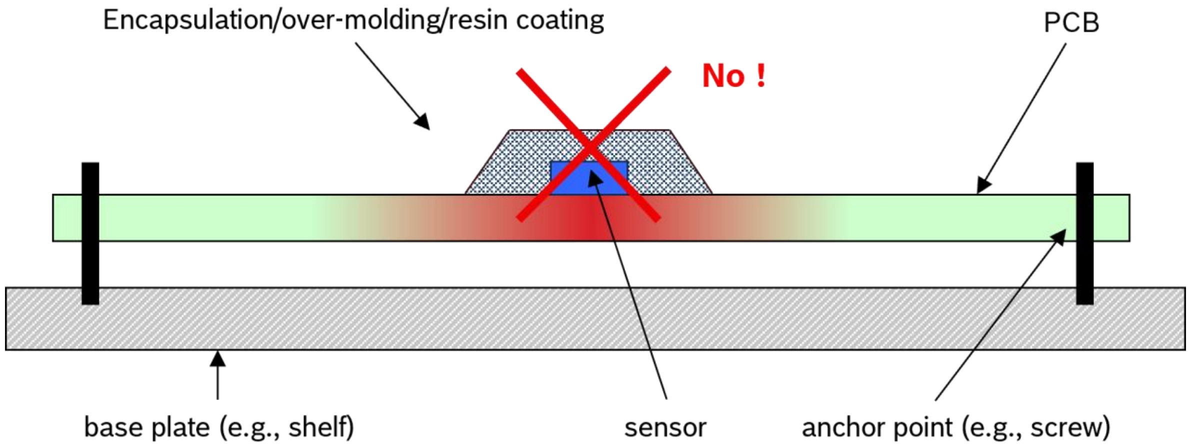


Figure 9: Encapsulation/over-molding/resin coatings fully cover the sensor

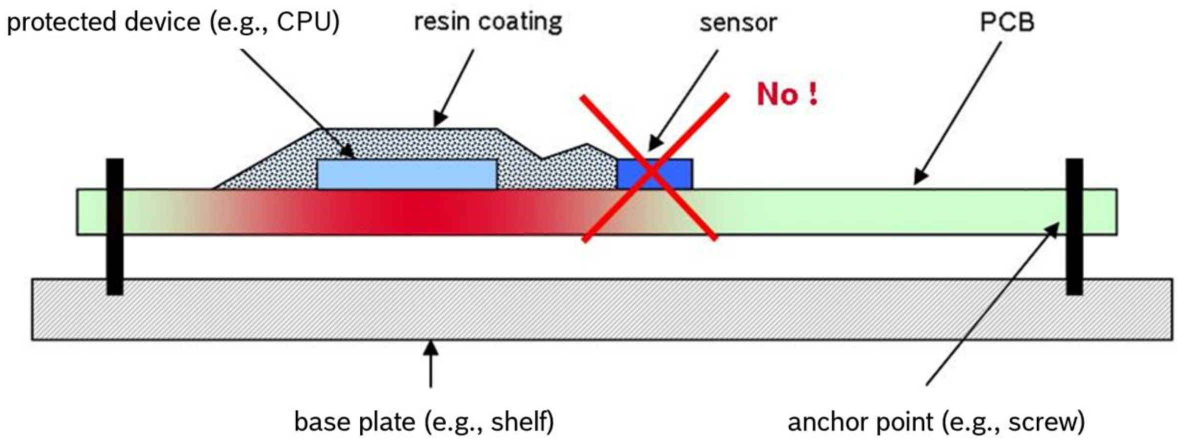


Figure 10: Resin coatings partially cover the sensor

6.6.2 Shields

A shield can cause mechanical stress on the PCB, which may have the effect of causing additional offset of sensors located close to the shield. Keep the sensor away from the shield, including the opposite side of the shield. See Figure 11.

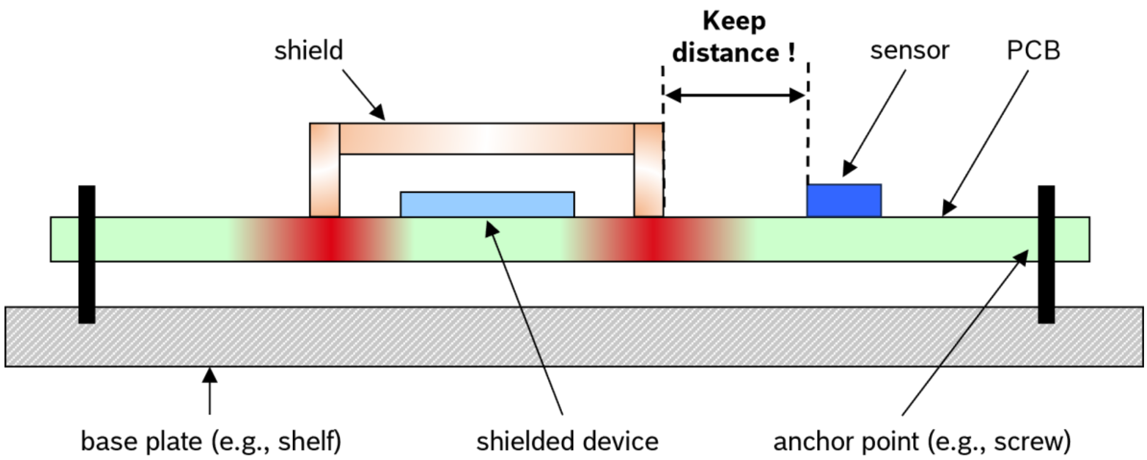


Figure 11: Shields

6.7 PCB precautions

- Keep the IMU at least 2 mm away from PCB edges and bridges or V-Grooves (see Figure 12) to ensure optimal performance, as deflection caused by milling drills or saws when separating the PCB can damage the MEMS device.
- Avoid dull milling cutters and saw blades, which can cause excessive mechanical vibration.
- Do not break the panel. Severe bending force and mechanical shock may damage the IMU.

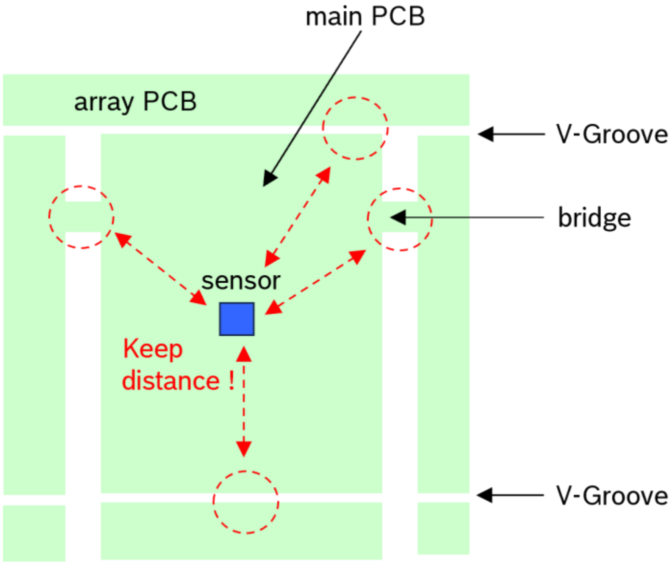


Figure 12: Edge of PCB

6.8 Multiple IMUs on the same PCB

When multiple IMUs are mounted on the same PCB with close gyroscope drive frequencies (delta of drive frequencies inside the output signal bandwidth), mechanical resonance or frequency coupling may occur. Oscillation energy can transfer through the PCB, leading to tones in the rate signal and offset change.

It is strongly recommended not to place two or more IMUs on the same PCB.

In cases where it is necessary to use multiple IMUs on the same PCB, at least one of the following strategies should be implemented:

- Mechanically isolate IMUs from each other to break the vibration transmission path. Cutting PCB slots is a recommended method, as illustrated in Figure 13.

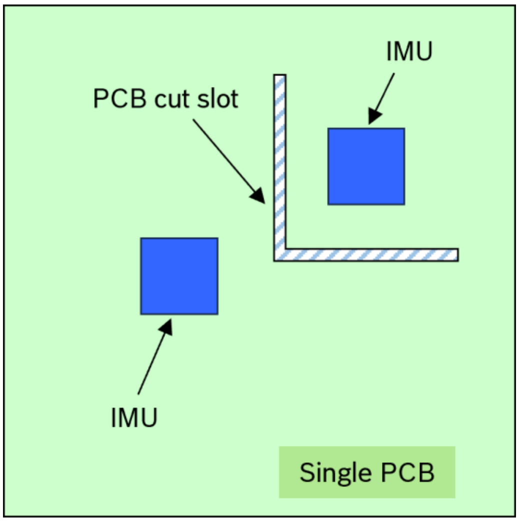


Figure 13: PCB cut slot for multiple IMUs on the same PCB

- Avoid running multiple IMUs simultaneously and enable only one gyroscope at a time.

Note: Avoid using dip, spray, or partial coating methods to alter the mechanical connection between the sensor and PCB, as this could potentially affect sensor performance and board-level reliability.

6.9 Magnetic, Electric, Infrared (IR), and Radio Frequency (RF)

Avoid mounting (and operating) the sensor in the vicinity of strong magnetic, electric, infrared (IR), and radio frequency (RF) radiation fields.

6.10 Electrostatic charging

Avoid electrostatic charging of the sensor and device wherein the sensor is mounted.

7 PCB Design Guidelines

- For the solder mask design of each pin, it is recommended to use Non-Solder Mask Defined (NSMD) pads. NSMD and SMD (Solder Mask Defined) are illustrated in Figure 14.

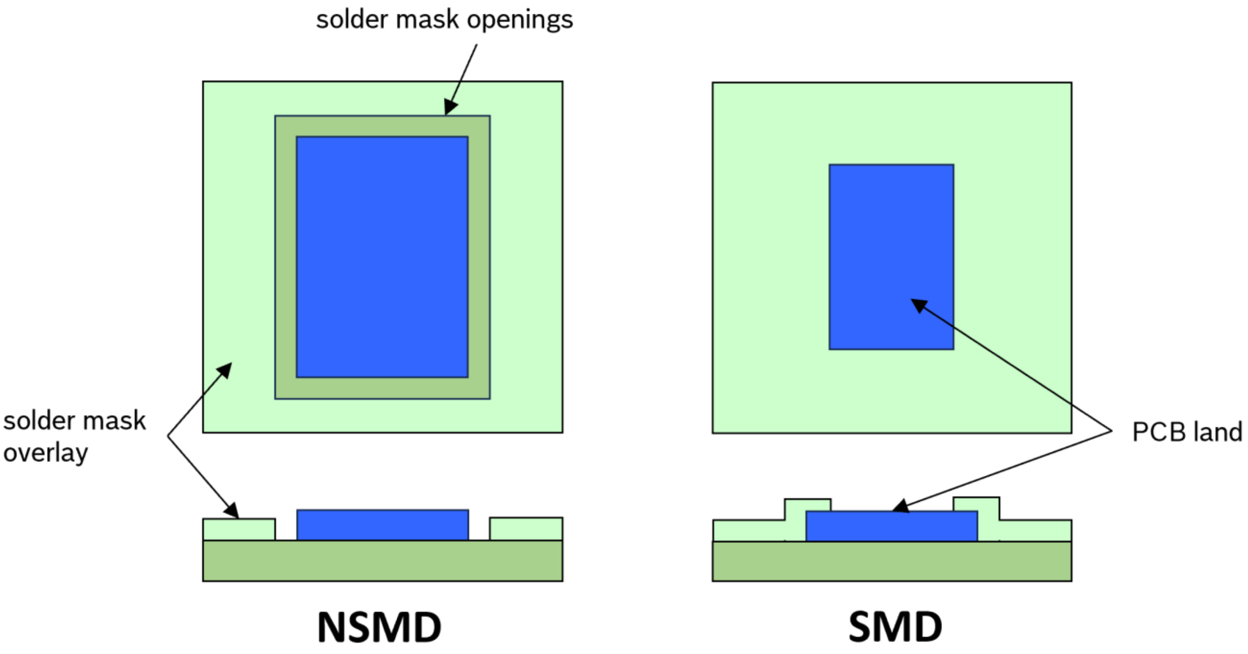


Figure 14: NSMD and SMD

- Placing any structure or routing on the top layer of the PCB below the sensor is strictly prohibited.
- The symmetry of the traces connected to the pads can optimize component self-alignment and promote improved solder paste reduction after reflowing, so it is recommended to maintain symmetry and balance of traces on the pads as much as possible.
- Keep the distance between the screw hole and the sensor greater than 2 mm for best performance.
- Confirm that the pin #1 indicator is unconnected and must remain unconnected to avoid affecting sensor functionality.

7.1 Footprint design rules

All lands are required to be of equal size and do not need to be large. General recommendations for PCB pads and solder mask layers are illustrated in Figure 15. Refer to the datasheet for specific pad count, size, and pitch.

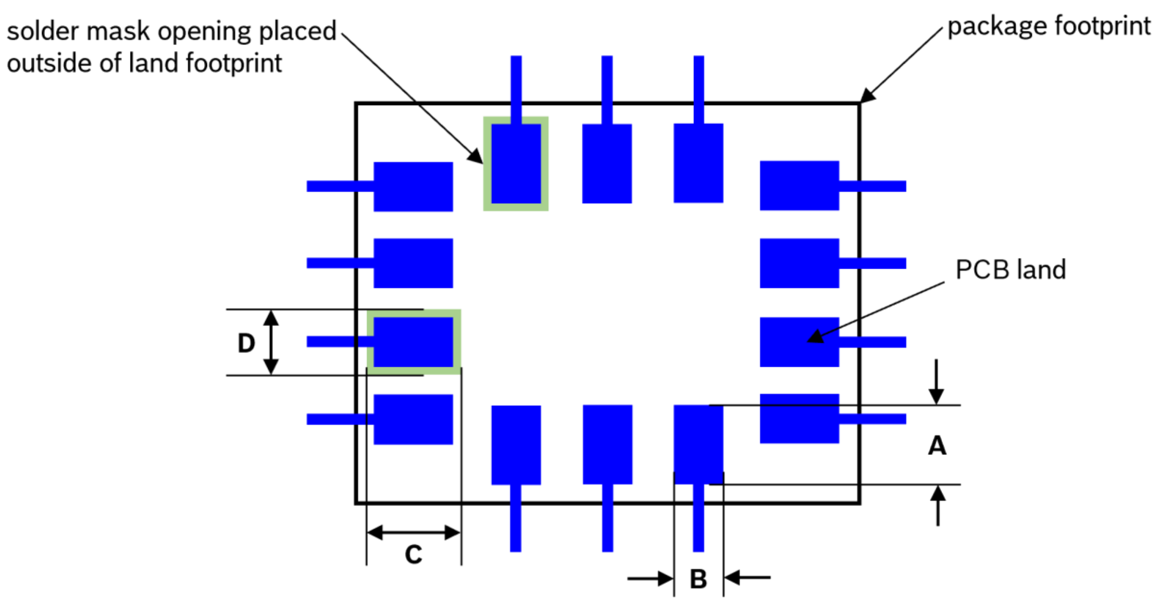


Figure 15: Footprint design rules

PCB land and connecting traces should be designed symmetrically.

A = PCB land length = LGA solder pad length
B = PCB land width = LGA solder pad width
C = Solder mask opening length (longer than A)
D = Solder mask opening width (wider than B)

7.2 Stencil design

The stencil design is very important for sensor soldering. See Figure 16.

- It is recommended to use a stainless-steel stencil to apply solder paste.
- Stencil thickness will result from pad size, aspect, and area Ratio.
- The stencil opening dimensions need to follow the general best practices for stencil design.
- Aspect ratio of stencil openings: Aperture width/stencil thickness = W/T > 1.5
- Area ratio of stencil openings: Aperture area/aperture wall cross-sectional area = (W x L)/ [2 x (W+L) x T] > 0.66

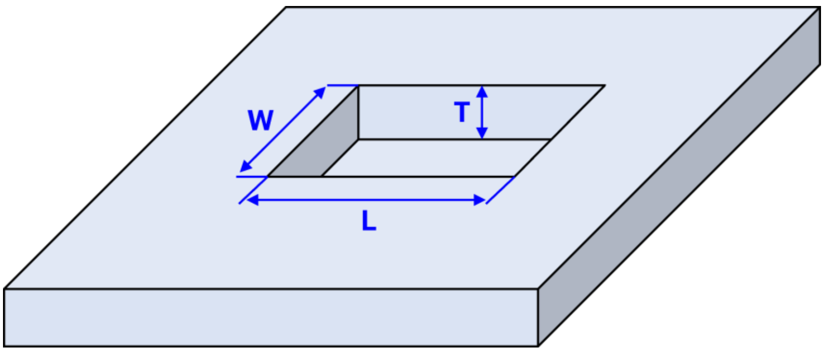


Figure 16: Stencil opening dimensions

7.3 PCB design rules for the traces

All traces must flow outside the component, remain symmetrical, and be parallel to the long sides of the pads.

The traces must remain the same thickness; power signals do not require thicker traces because the current flowing into them is very low, thus avoiding potential mechanical stress.

It is not recommended the ground plane be connected directly to the package pad. It is better connected via standard traces. See Figure 17.

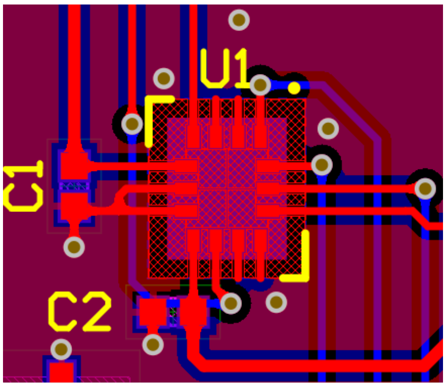


Figure 17: Correct traces

High-frequency communication lines (as SCx or OSCx) should be routed with enough distance of several millimeters from the sensor. The traces to the clock pads should extend in a direction that is as perpendicular as possible to the closest edge of the sensor package to reduce coupling into sensitive areas.

When designing the layout, as much as possible, ensure that VDD, VDDIO, and serial interface traces are isolated from any components and signals related to battery charging and DC-DC switching power regulation. The substantial energy carried by power signals can induce significant noise or spikes.

If the above requirements cannot be met during actual wiring, the 3W principle can be followed, where the center spacing of high-speed signal traces is not less than three times the line width. See Figure 18.

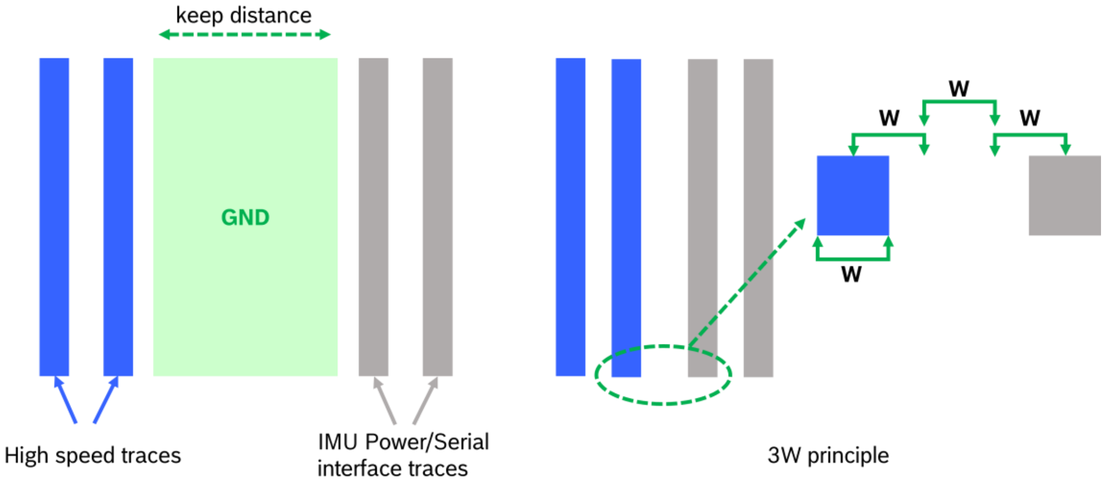
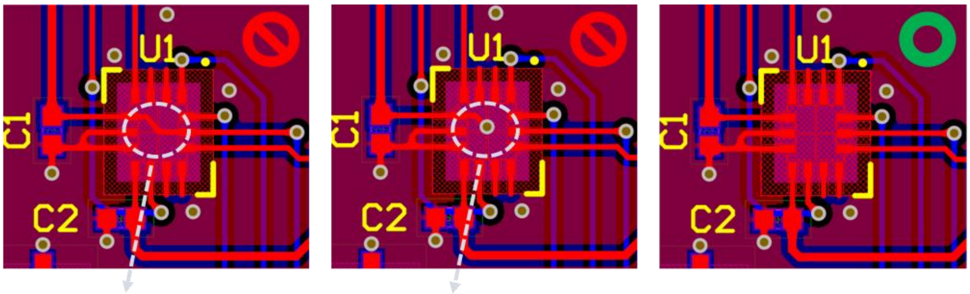


Figure 18: High-speed traces

7.4 BMI2xy, BMI3xy and BMI4xy placement rules for the top layer

For all MEMS devices, soldering takes place exclusively on the top layer. Avoid positioning any routing or vias directly under the device on the top side. See Figure 19.



WRONG: Routing under the sensor on TOP layer

WRONG: Via under the sensor on TOP layer

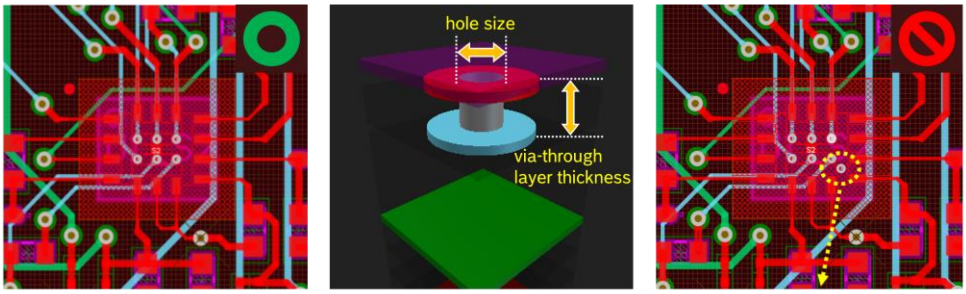
RIGHT: leave free space under the sensor on TOP layer

Figure 19: Top layer placement examples for BMI2xy/BMI3xy

7.5 BHI3xy placement rules for the top layer

BHI3xy is pin-to-pin compatible with BMI2xy and BMI3xy for outer pads. In addition, BHI3xy has six inner pads.

- For inner pads, blind vias can be used to route the signals.
- The size of the blind vias should not exceed the pad size.
- The blind vias must comply with a drilling aspect ratio of 1:1 or greater, where the aspect ratio is defined as the hole size divided by the via-through layer thickness. See Figure 20.
- Note that other top-layer placement rules are consistent with the BMI2xy and BMI3xy.



RIGHT: Place blind vias within central pads for signal routing

RIGHT: Drilling aspect ratio of 1:1 or greater

WRONG: Via under the sensor except for the central pads

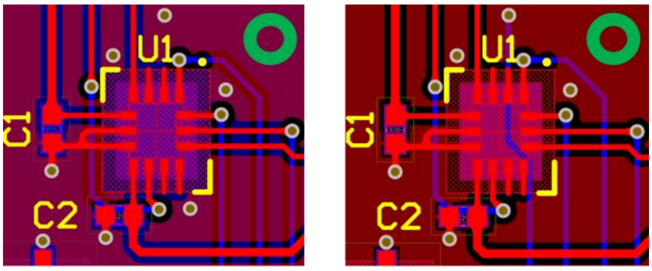
Figure 20: Top layer placement examples for BHI3xy

Note:

- To ensure full compatibility with other BMI2xy and BMI3xy sensors, additional points outlined in Chapter 4.2 of BHI3xy datasheet also need to be considered.
- If the customer solders the BMI2xy using the BHI3xy landing pattern for a compatible design to prevent a decrease in BM2xy performance, it is recommended the customer prepare a separate set of stencils for BMI2xy soldering.

7.6 Placement rules for the middle and bottom layers

Power plane or signal routing can be done on the middle and the bottom layer below the sensor. See Figure 21. Note that this bottom placement rule only applies to MEMS accelerometers, gyroscopes, and pressure sensors. The BMI2xy/BMI3xy and BHI3xy share these rules.



RIGHT: Power plane on MIDDLE or BOTTOM layer under the sensor

RIGHT: Signal routing on MIDDLE or BOTTOM layer under the sensor

Figure 21: Middle and bottom layer placement examples

8 Note on internal package structures

Within the scope of Bosch Sensortec's ambition to improve its products and secure the product supply while in mass production, Bosch Sensortec qualifies additional sources for the LGA package of its sensors.

While Bosch Sensortec took care that all of the technical package parameters as described above are 100% identical for both sources, there can be differences in the chemical analysis and internal structure between the different package sources.

However, as secured by the extensive product qualification processes at Bosch Sensortec, this has no impact on the usage or the quality of the sensor.

9 Device marking

Refer to the latest version of the corresponding product datasheet or preliminary datasheet.

10 Pick and place guidelines

The IMU product is a surface mount device (SMD) that requires surface mount technology (SMT) for mounting onto a PCB using high-speed, high-precision automated equipment. SMT machines typically use nozzles to pick components from a predetermined area and accurately place them at specified soldering locations. This process must be strictly controlled, as the nozzle position, pick and place force, and mechanical parameters involved may damage the structure of the MEMS sensor being handled.

To minimize the risk of damage to MEMS sensors during the SMT process, consider the following key factors:

- Ensure the equipment can trigger an alarm to alert operators in case of mispicking or uncontrolled pickup height.
- Avoid any improper contact, impact, or pressure from mechanical equipment or components on the IMU or its PCB.
- Ink-jet printing, laser marking, or any form of direct marking on the IMU is not recommended as it may induce damage to the MEMS element or compromise sensor performance by thermal or mechanical stress.
- Remove unnecessary hazardous tools, such as screwdrivers and scissors, to prevent accidental damage to the PCB and components.
- Correctly set the nozzle vacuum pressure level to avoid excessive force that could damage the MEMS structure.

- Use pick and place machines with Z-axis dynamic control technology, such as high-precision pressure feedback control, to ensure stable component placement and prevent impact or excessive force on the MEMS structure.

11 Reflow soldering

11.1 Recommendation for soldering of sensors in the LGA package

Ensure that the edges of the LGA substrate of the sensor are free of solder material. It is not recommended to allow solder material to form a high meniscus covering on the edge of the LGA substrate (see Figure 22) since metal traces of the internal LGA substrate wiring are exposed.

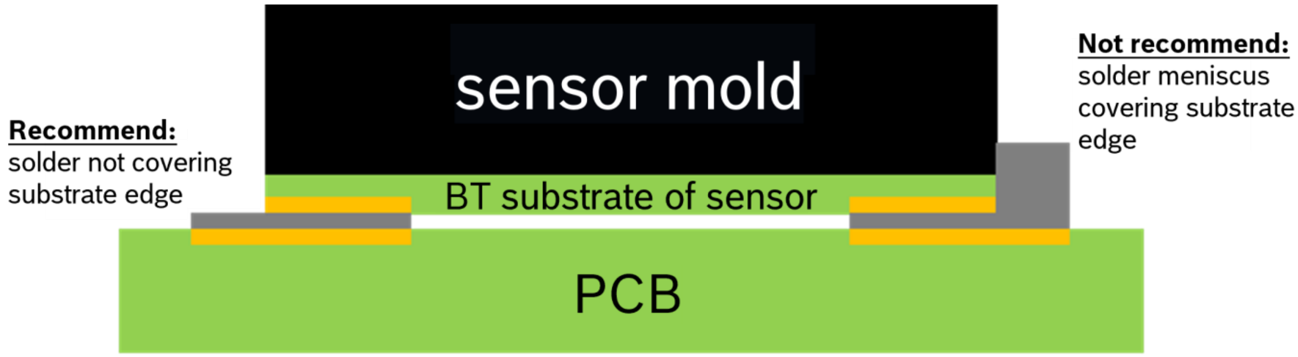


Figure 22: Recommendation to keep the side of LGA free from solder material

Using underfill (e.g., copper underfill) for the LGA package is forbidden. See Figure 23.

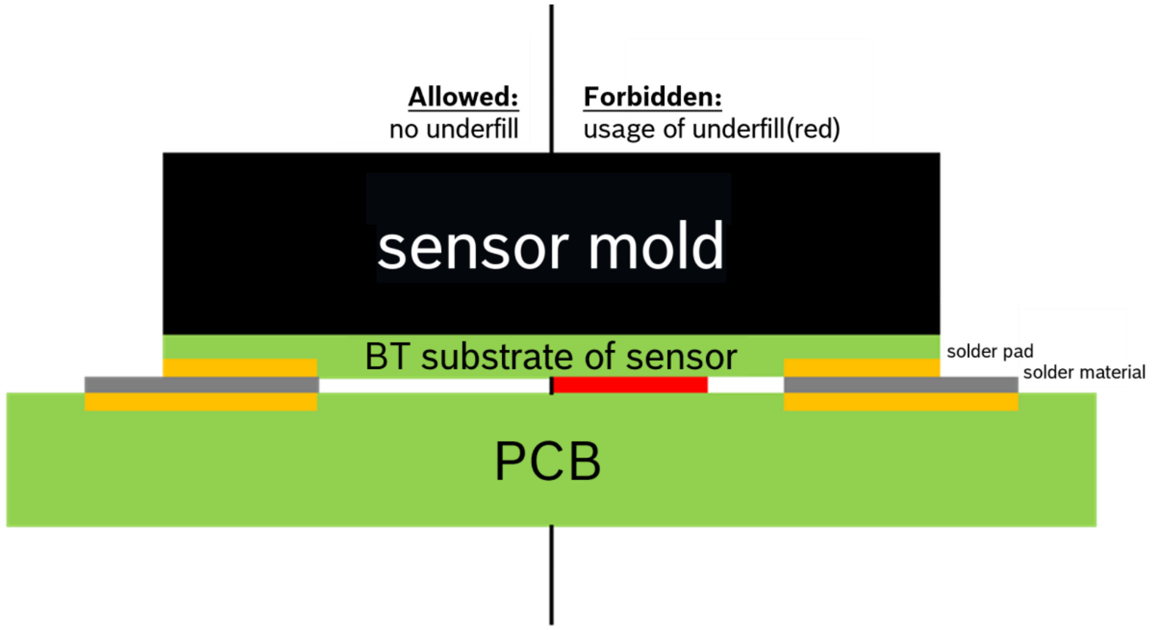


Figure 23: Recommendation not to use underfill for LGA packages

11.2 Classification reflow profiles

The sensor fulfills the JEDEC and lead-free soldering requirements described in Chapter 4, i.e., reflow soldering (after MSL1 pretreatment) with a peak temperature T_p up to 260 °C.

11.3 Multiple reflow soldering cycles

The product can withstand up to 3 reflow soldering cycles in total. In case 5 cycles are required, contact your local Bosch Sensortec representative.

12 Desoldering recommendations

The desoldering process for MEMS products is critical. Follow the recommendations below to prevent device damage and ensure the integrity and performance of the components.

Temperature Control

- Use a controlled heat source (220 °C - 250 °C) and avoid exceeding 260 °C (maximum peak temperature).
- Limit heating time to 30 seconds to prevent internal stress and pad detachment.
- The desoldering tool maintains a stable and controlled temperature, preferably monitored through temperature sensor feedback, to prevent overheating and potential device damage.

Minimize Mechanical Stress

- Ensure that the solder is fully melted before the sensor is removed.
- Avoid prying or applying excessive force to prevent pad or MEMS structure damage.

ESD (Electrostatic Discharge) Protection

- Handle the sensor in an ESD-safe environment with grounding measures.
- Avoid direct contact with solder pads to prevent static discharge.

Moisture Sensitivity

- Follow MSL (Moisture Sensitivity Level) storage guidelines, see Chapter 4.
- If the sensor has been exposed to moisture, bake it before desoldering to prevent the popcorn effect.

Note: Do not resolder sensors that have been desoldered. Resoldering previously desoldered components may affect their reliability and performance.

13 Customer Return

In case a part needs to be returned to Bosch Sensortec for failure analysis (FA) purposes, it is preferred that the whole PCB with an assembled sensor is provided. Removing the PCB area where the sensor is located may cause severe damage to the internal MEMS structure and make failure analysis impossible. If this is not possible, consider carefully cutting a larger area around the part while avoiding the warpage of the assembly.

If neither of the aforementioned recommendations for re-using the PCB is possible, desolder the sensor following the recommendations in section 12. Use this method only if necessary and avoid additional manual handling. It needs to be noted that different IMU generations may require dedicated test sockets when measured in an unsoldered state, even if their pin-out and package dimensions are identical, due to differences of the internal MEMS element and contact sensitivity.

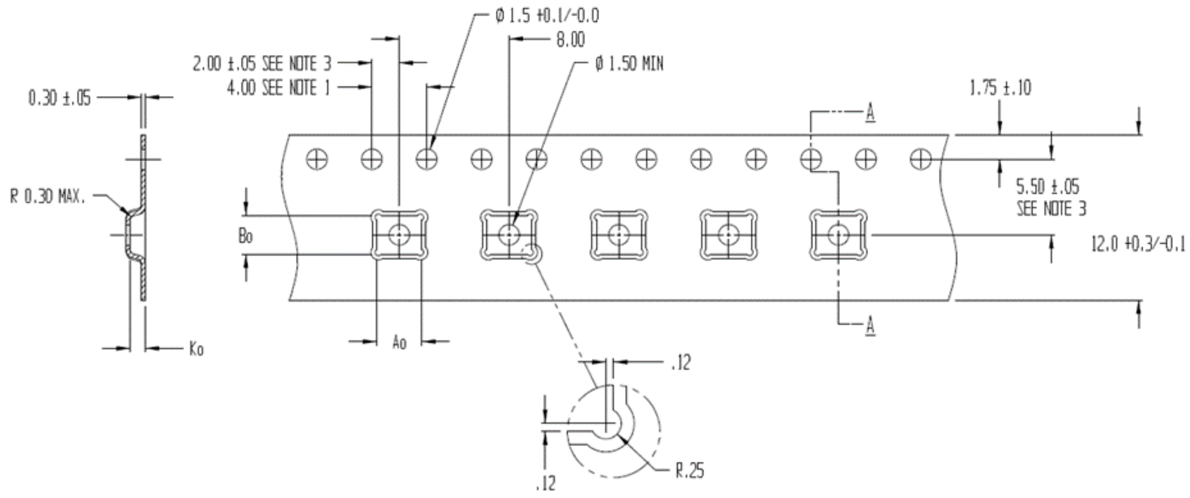
When shipping the part, carefully pack it to prevent ESD and mechanical damage during transportation. It is recommended to place the part in an ESD bag, wrap the bag in foam or bubble materials, and ship it in a stable package. These procedures are required to ensure that the failure analysis (FA) can be conducted at Bosch Sensortec successfully.

In addition, please get in contact with your local Bosch Sensortec representative for further information, support, and delivery of the desoldered parts.

Note: If any underfill/encapsulation/over-molding was used (not recommended, see section 6.6 and 10) and the part needs to be returned to Bosch Sensortec for FA, please provide details on the type of materials used for the underfill/encapsulation/over-molding (e.g., silicone-based) to facilitate chemical removal at Bosch Sensortec for FA. Also, in such cases, the FA might take longer, and the reliability of the FA results cannot be guaranteed.

14 Tape & reel

14.1 Tape & reel specification



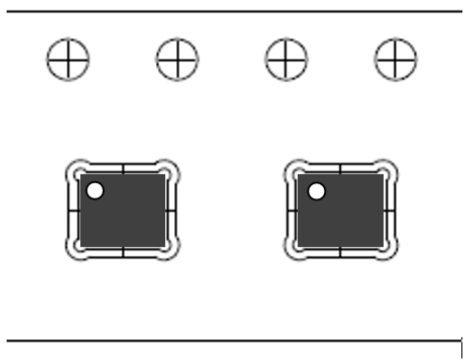
A_0 = 3.30mm, B_0 = 2.80mm, K_0 = 1.10mm

Note:

- Tolerances unless noted: ±0.1mm
- Sprocket hole pitch cumulative tolerance ±0.1mm
- Camber in compliance with EIA481
- Pocket position relative to sprocket hole measured as the true position of the pocket, not the pocket hole
- A_0 and B_0 are calculated on a plane at a distance "R" above the bottom of the pocket.

14.2 Orientation within the reel

→ Processing direction →



15 Further important mounting, assembly & handling recommendations

Bosch Sensortec's IMUs are designed to sense acceleration and rate of rotation with high accuracy, even at low amplitudes, and contain highly sensitive structures inside the sensor element. The MEMS sensor can tolerate mechanical shocks up to several thousand g's. However, these limits might be exceeded in conditions with extreme shock loads, such as a hammer hitting the sensor or next to the sensor, dropping the sensor onto hard surfaces, etc.

We strongly recommend avoiding any g-forces beyond the limits specified in the datasheet during the sensors' transport, handling, and mounting in a defined and qualified installation process.

The IMUs have built-in protections against high electrostatic discharges or electric fields (2kV HBM); however, anti-static precautions should be taken for any other CMOS component.

Unless otherwise specified, proper operation can only occur when all terminal voltages are kept within the supply voltage range. Unused inputs must always be connected to a defined logic voltage level.

Ultrasonic cleaning and welding are strongly not recommended, as they may cause severe damage to the sensor's internal MEMS structures.

16 Document history and modification

Rev. No	Chapter	Description of modification/changes	Date
0.5	all	Document creation	3 Apr 2018
0.5.1	Cover 9.2 10	Updated Part# Updated Table + Graphic Spec, Graphic + Definition included	18 Sep 2018
0.5.2	all	Document name change to MIS-HS001	28 Nov 2018
1.0	Cover 4 5 6.2.6 9.2 11	Included Part# 0.273.017.003, -.004, -.008 Updated to latest JEDEC STD Sentence rephrased Updated content Shortened content Sentence rephrased Updated Legal Disclaimer	09 Oct 2019
1.1	All Cover Cover Cover 1 5 6.1 6.2.4 9.3 11	Updated template Legal Disclaimer replaced by reference page 1 "Notes" Included BMI32x, Part# 0 273 017 018, 0 273 017 028 Excluded Part# 0 273 017 002, 0 273 017 003, 0 273 017 004 (EOL) Sentence rephrased Updated directive Radio frequency environments + other components included Updated content 5 cycles included Sentence rephrased	17 Feb 2022
1.2	all Cover	Updated template Included Part# 0.273.017.037, -.039, added BHI3xx in title	19 Dec 2022
1.3	Cover	Included Part# 0.273.017.029	06 Oct 2023
1.4	Cover Cover Cover Cover All All 6 7	Document title changed Cover image changed Included Part# 0 273 017 056 Excluded Part# 0 273 017 037, 0 273 017 039 Cover and header subtitles changed Grammar modification Content merged from Rev 1.3 and updated Added content	25 Apr 2024
1.5	Cover Cover 7	Cover image changed Included Part# 0 273 017 037, 0 273 017 039, added BHI3xy in title Added BHI3xy layout rules	14 Nov 2024
1.6	Cover 6.2 6.5 6.6.1 6.8 10 11 12 13 15	Included Part# 0 273 017 061, - 063, - 064, - 068 Updated content Updated content Added content Added content Added content Updated content Added content Added content Updated content	28 May 2025

Bosch Sensortec GmbH
Gerhard-Kindler-Straße 9
72770 Reutlingen / Germany

contact@bosch-sensortec.com
www.bosch-sensortec.com

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