MPC2520

Digital pressure sensor
Design Guide

Restricted

1. Security warning

The information contained in this document is the exclusive property of MaierTek Inc. and should not be disclosed to any third party without the written consent of MaierTek Inc.

This document describes the conditions and parameters to be applied when handling, soldering and mounting the MPC2520 to a PCB.

Important:

- In order to avoid any damages of the MPC2520 and resultant loss of warranty please strictly keep with the instructions described within this document.

- It is also strongly recommended to study the MPC2520 data sheet prior to handling the MPC2520 sensor device.

- In case you have any questions, please do not hesitate to contact your nearest MaierTek Inc. representative for further advice.

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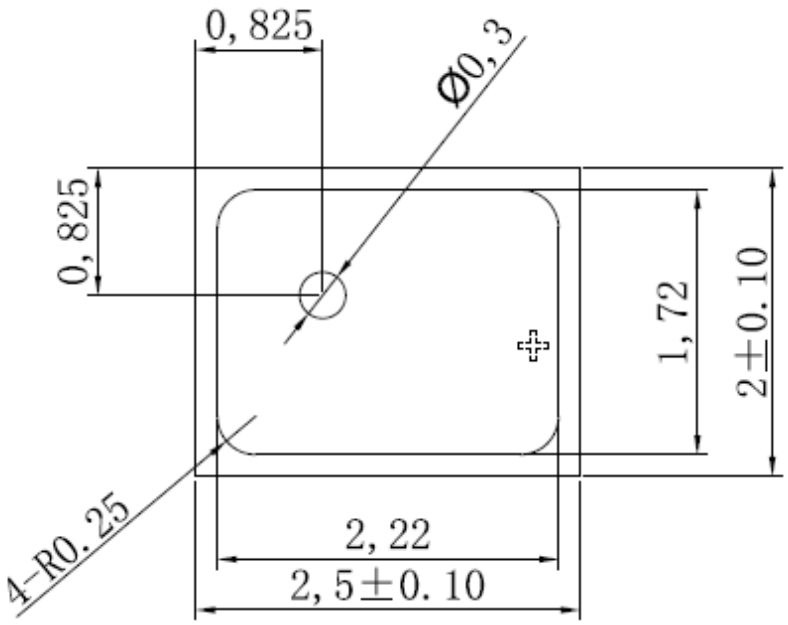
1. Package outline dimensions

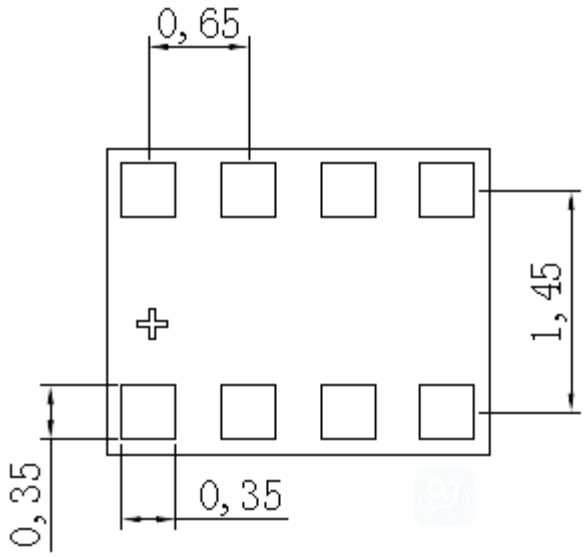
The sensor housing is a standard 8-pin LGA package with metal lid with a vent hole for pressure supply. Its dimensions are 2.0 mm (±0.1 mm) × 2.5 mm (±0.1 mm) × 0.95 mm (±0.05 mm).

Note: All dimensions are in mm. If not specified otherwise, tolerances are ±0.05 mm, ±1°.

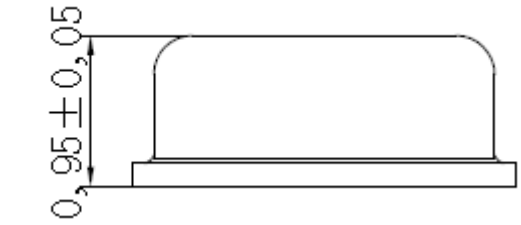
1.1 Top view



1.2 Bottom view



1.3 Side view



2. Moisture sensitivity level and soldering

2.1 MSL and device storage

The MPC2520 is classified as MSL 1 (moisture sensitivity level) according to IPC/JEDEC standards J- STD-020C and J-STD-033A.

The device can be soldered Pb-free with a peak temperature of 260°C for 20 to 40 sec. The minimum height of the solder after reflow shall be at least 50µm. This is required for a good mechanical decoupling between sensor device and the printed circuit board (PCB).

Note: When designing the solder paste silk print opening window, avoid excess solder paste to

allow good reflow.
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 reversible.
Manual unsoldering can lead to further offset shift, especially if the soldering temperature and / or soldering time is above the given values of 260°C and 40 sec.
Avoid contact of the device with liquids.

2.2 Multiple reflow soldering cycles

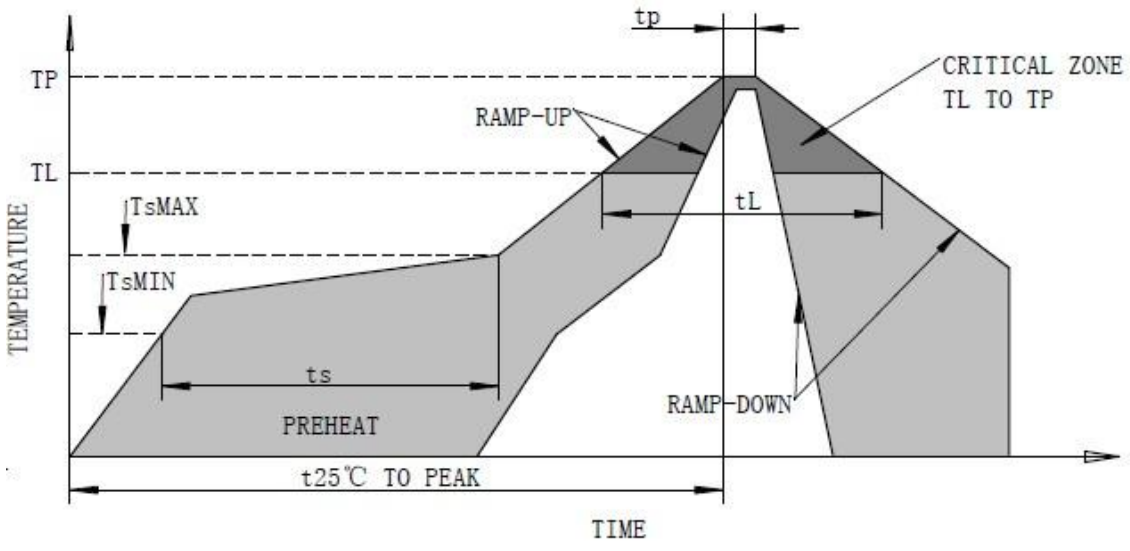
The MPC2520 can withstand in total up to 3 reflow soldering cycles.

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.

2.3 Classification reflow profile

The following figure describes the recommended reflow soldering process.

Vapor phase soldering has to be avoided.



Profile Feature	Pb-Free Assembly
Average ramp-up rate(TsMAX to TP)	3℃/seconds max.
Preheat -Temperature Min.(TsMIN) -Temperature Max.(TsMAX) -Time(TsMIN to TsMAX)(Ts)	 150℃ 200℃ 60～80seconds
Time maintained above: -Temperature(TL) -Time(tL)	 217℃ 60～150seconds
Peak temperature(TP)	260℃
Time within 5℃ of actual peak temperature(TP)2	20～40seconds
Ramp-down rate	4℃/seconds max.
Time 25℃ to peak temperature	8 minutes max.

3. Environmental safety

3.1 RoHS compliancy

The MPC2520 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".
The MPC2520 is also Lead (Pb)-free and halogen-free.

3.2 Halogen content

The MPC2520 is halogen-free. For more details on the analysis results please contact your MaierTek representative.

3.3 Internal package structure

Within the scope of MaierTek's ambition to improve its products and secure the mass product supply, MaierTek Inc. qualifies additional sources (e.g. 2nd source) for the LGA package of the MPC2520.
While MaierTek Inc. 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 MaierTek Inc., this has no impact to the usage or to the quality of the MPC2520 product.

4. Mounting recommendations

The MPC2520 has an aperture on top of the package, so special care is required since sensor performance could be compromised by:

- Mechanical stress coming from the PCB board
  – The whole package surface + air should have minimum temperature gradient
  – Avoid placement in long and narrow PCB area, warp-free area
- Temperature gradients (non-uniform/rapidly changing temperature around sensor)
- Strong electrical field / light source
- Localized air pressure stability (unwanted fast air pressure variation, fans)
- Dust and water exposure/condensation (GORE-TEX® protection, etc.)

The HLGA package is compliant with the ECOPACK® standard and is qualified for soldering heat resistance according to JEDEC J-STD-020.

4.1 Recommendation details

- Please avoid rear side handling of the MPC2520 sensor, otherwise the device can be destroyed
- It is generally recommended to keep a reasonable distance between the sensor mounting location on the PCB and the critical points described in the following examples. 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 µController) as this can result in heating-up the sensor
- 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

- 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
- The clearance above the metal lid of the MPC2520 shall be 0.1mm at minimum
- For the device housing appropriate venting needs to be provided in case the ambient pressure shall be measured
- The pressure sensor has to be protected against all kinds of liquids, during processing (e.g. solder flux, cleaning agents) and during operation
- The MPC2520 sensor is sensitive to light, which can influence the accuracy of the measurement. Therefore, the hole in the top lid shall not be exposed to direct light during operation
- The MPC2520 shall not be placed close to fast heating parts.
- During handling of the MPC2520, especially in case parts are handled manually, make sure that no objects, like for example tweezers tips or other sharp objects do get inside of the vent hole of the sensor. This could damage the device
- 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
- Vapor phase soldering: connecting MPC2520 on the PCB through vapor phase soldering might cause deposits on the diaphragm which can distort the electrical signal

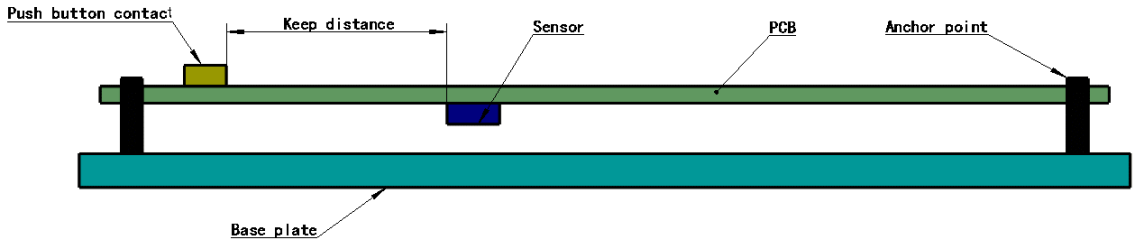
In case you have any questions with regard to the mounting of the sensor on your PCB, do not hesitate to contact us.

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 MaierTek Inc. devices, but may as well occur with 3rd party MEMS devices in a similar manner.

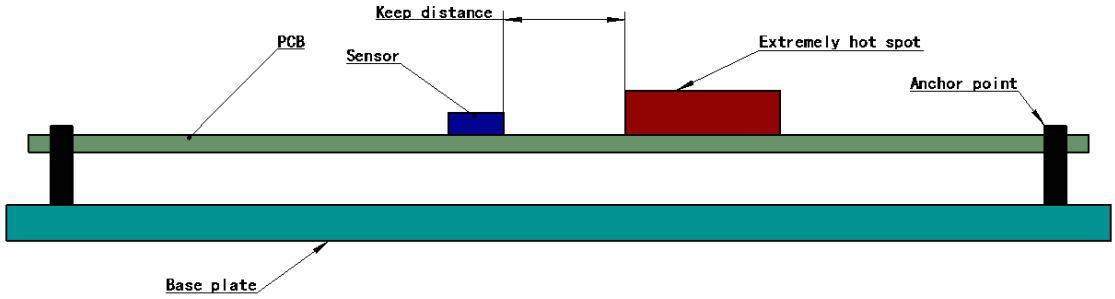
4.1.1 Push-button contacts

Keep a reasonable distance to push-button contacts, when placing the sensor device. Do not position the sensor directly beneath a push-button contact.



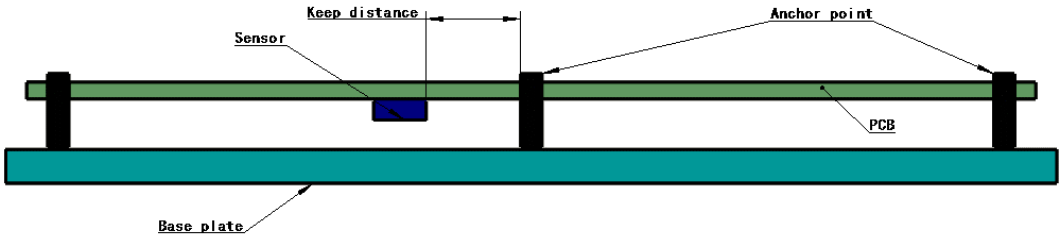
4.1.2 Hot-spots on the PCB

Keep a reasonable distance from any hot spots, when placing the sensor device. Hot spots can be for example other integrated circuits with high power consumption.



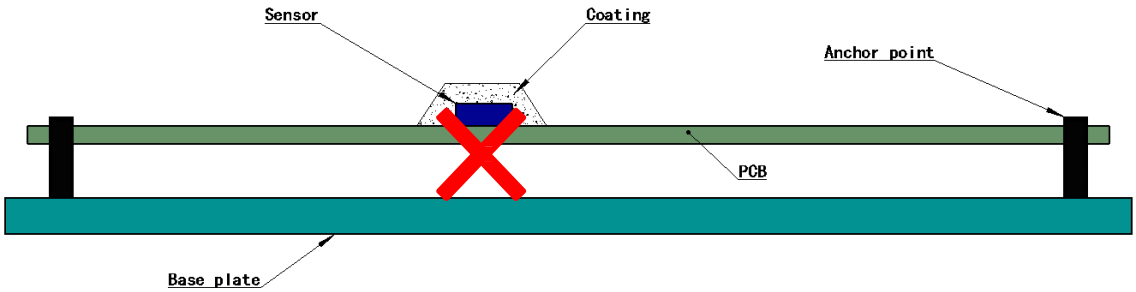
4.1.3 PCB anchor points

Please keep a reasonable distance from any anchor points, where the PCB is fixed at a base plate (e.g. like a shelf or similar), when placing the sensor device.



4.1.4 Resin coatings

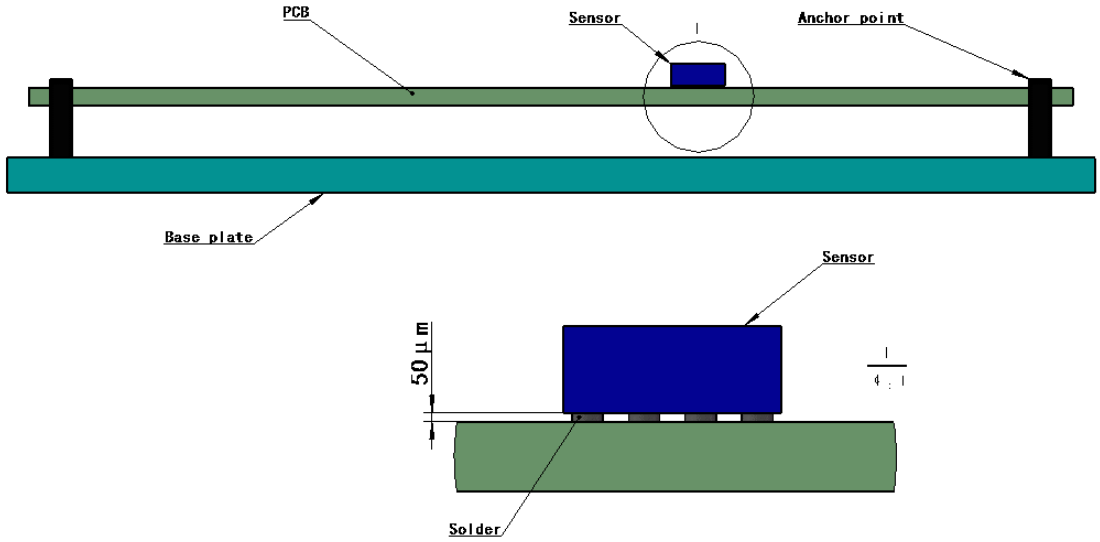
Please avoid total and partial covering of the MPC2520 sensor with any protective material like for example epoxy resin.



As shown in the above figure, please take care that the sensor is not covered and not in contact with any (epoxy) resign material leading to an un-symmetric stress distribution over the sensor package.

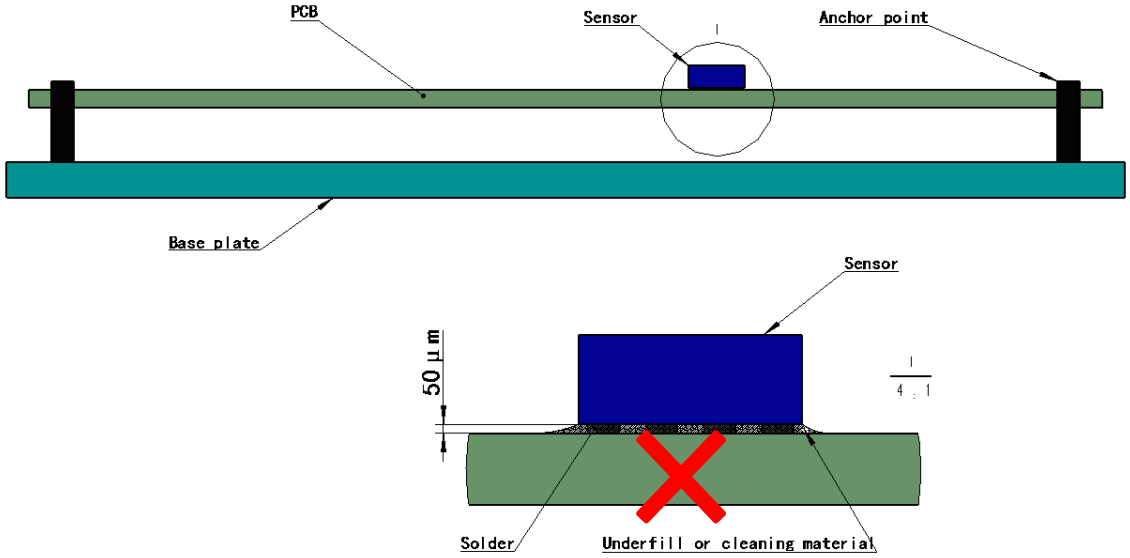
4.1.5 Minimum distance between Sensor and PCB

The distance between the sensor and the PCB after the soldering process must be at least 50µm.



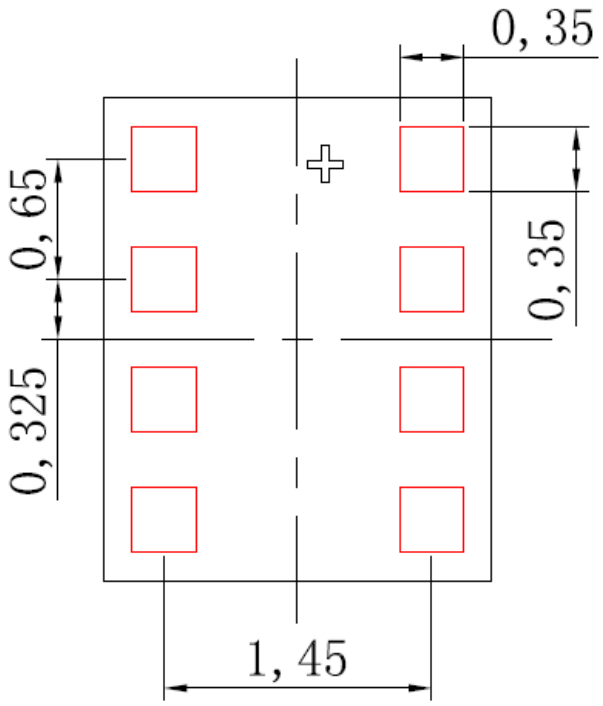
4.1.6 Underfill and cleaning materials

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



4.2 Landing pattern recommendation

For the design of the landing pattern, the following dimensioning is recommended:



Note: red areas demark exposed PCB metal pads.

- In case of a solder mask defined (SMD) PCB process, the land dimensions should be defined by solder mask openings.
- In case of a non-solder mask defined (NSMD) PCB process, the land dimensions should be defined in the metal layer.

4.3 Soldering drift

The following is a brief guideline to reduce the impact of soldering.

- Soldering drift is a complex process and it is not easy to identify the single root cause of soldering stress.
- We define the soldering drift as the difference between the accuracy of the pressure sensor before and after soldering.
- Soldering temperature profile is one of the major contributors to soldering shift.
- A well-controlled temperature soldering profile, which avoids peak temperature over the max JEDEC spec can reduce the accuracy drift.
- Be sure to re-hydrate the device package by keeping it at 70%RH for 12 h or waiting a minimum of 2 h at ambient humidity.