AN13889

Porting options for pressure sensors

Rev. 1 — 12 May 2023 Application note

Document Information

Information	Content
Keywords	FXPS7x series, porting options, pressure sensors, top-side vent, bottom-side vent, PCB, heat cured epoxy
Abstract	This application note discusses porting options for the FXPS7x series of pressure sensors.

Revision history

Rev	Date	Description
v.1	20230512	Initial release

1 Introduction

The compact size of these pressure sensors provides the end user with a number of porting options for their specific design needs. Figure 1 shows the FXPS7x series pressure sensor including the top-side and bottom-side vents. Refer to the FXPS7x series data sheets or user manual for detailed package information.

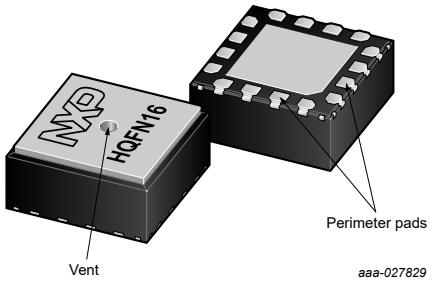

Figure 1. FXPS7250 top and bottom footprint

There are various methods of porting the FXPS7x series. This application note shows some options of attaching the ports to the PCB. The recommended procedure is to assemble all components onto the PCB followed by adding the port in the final assembly. Once assembled, the last step is attaching the ports to the PCB with epoxy. NXP demo boards use Lord EP-937 heat cured epoxy to attach the port in the final assembly. Infrared light curing epoxy and equipment is also used at many PCB manufacturing facilities to cure the epoxy in a few seconds. Typically multiple PCBs can be cured at the same time.

2 Port attach parameters

When attaching the port to the PCB utilizing Lord EP-937 epoxy, there are several design parameters that must be considered. The critical parameters are:

- dispensed epoxy thickness
- epoxy width
- keep out area

Figure 2 illustrates the placement of the epoxy for the FXPS7250 series device footprint and the keep out area.

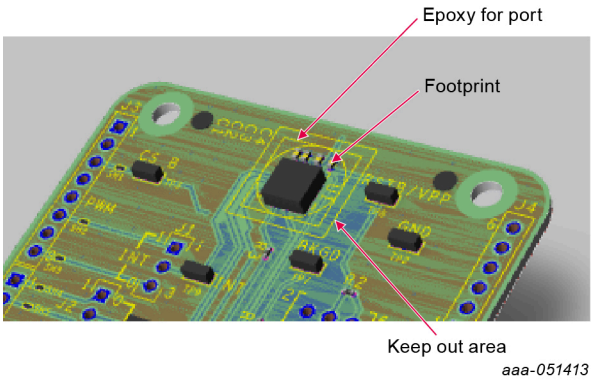

Figure 2. Example epoxy footprint

The minimum epoxy thickness recommended is 70 µm. The recommended epoxy width protrudes the width of the port wall by 25 µm per side. For example, in the reference designs the port wall thickness is 1 mm (1000 µm), so the width of epoxy dispensed would be 1050 µm. This extra 25 µm per side creates a fillet around the port insuring a good seal.

Figure 3 is a mechanical drawing that shows an example epoxy footprint for the ports, a 5.5 mm by 4.5 mm opening when the port OD dimensions are 6 mm by 7 mm with a 0.75 mm width.

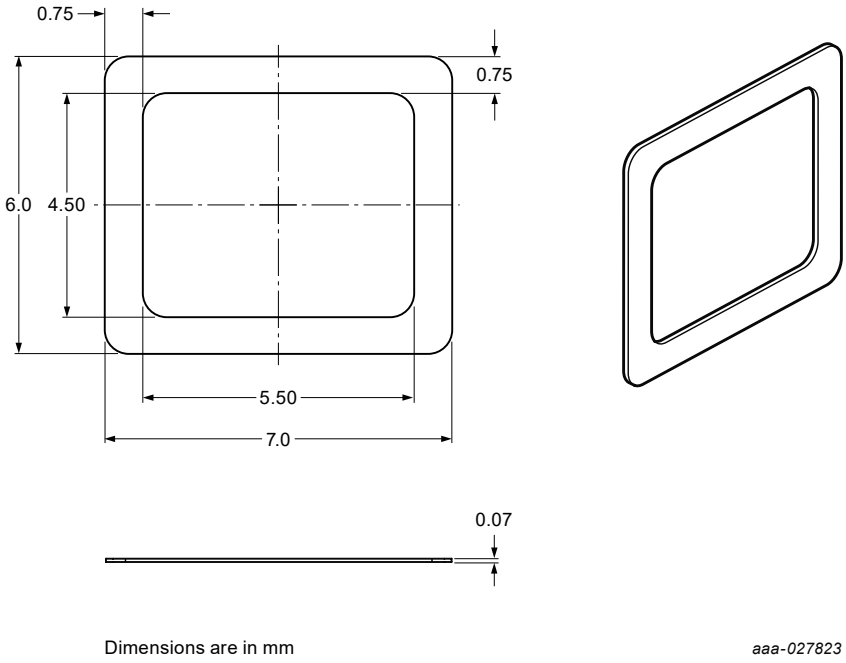

Figure 3. Epoxy footprint

Figure 4 illustrates a PCB prior to port placement.

- Device is assembled on the PCB
- Epoxy is dispensed

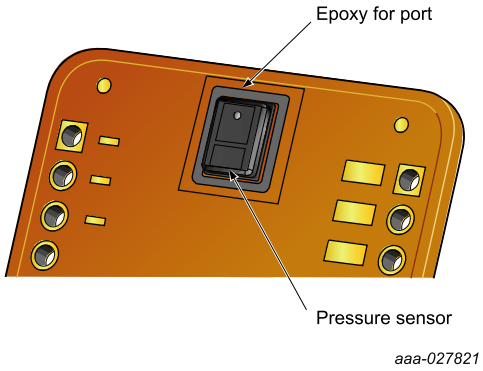

Figure 4. PCB after reflow with dispensed epoxy

Figure 5 shows the fully assembled board with the side port attached.

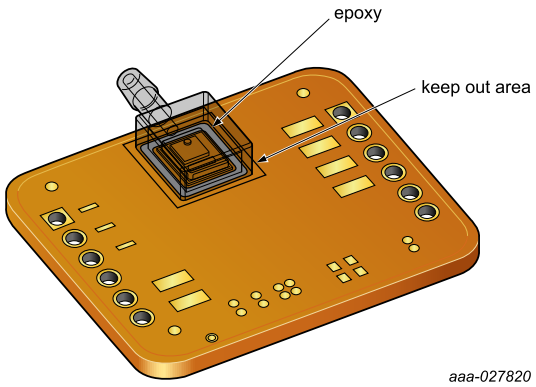

Figure 5. Completely assembled PCB with side port

Figure 6 shows the fully assembled board with the top port attached.

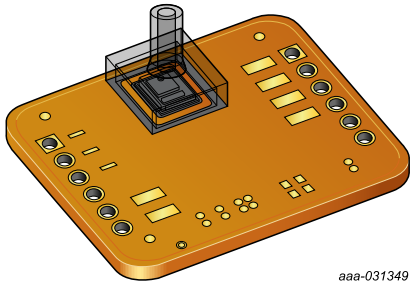

Figure 6. Completely assembled PCB with top port

Another option is to apply the epoxy to the rim of the port and then place the port onto the PCB after assembly. Selecting a PCB manufacturer with an automated epoxy dispensing machine allows several porting footprints to be applied to the custom PCB design. See Figure 7.

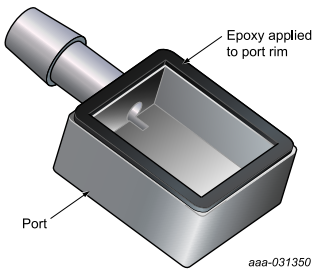

Figure 7. Dispensed epoxy onto rim of port

3 Port 2D dimensional drawings

Figure 8 illustrates a barbed side port configuration. Figure 9 illustrates a barbless top port configuration. These ports can be utilized on either side of the PCB in a gauged or differential configuration.

Figure 10 illustrates a circular top port configuration.

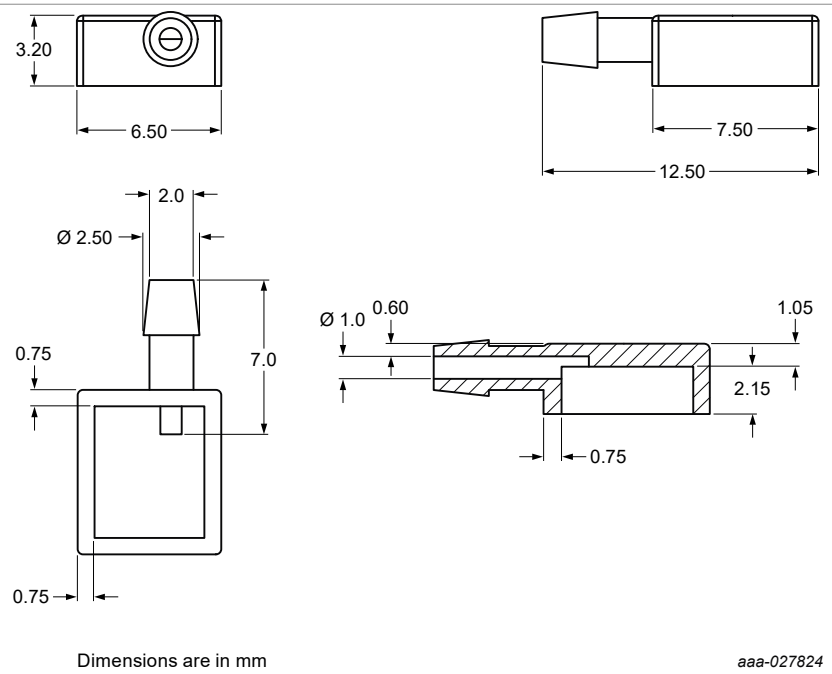

Figure 8. Side port with barbed fitting

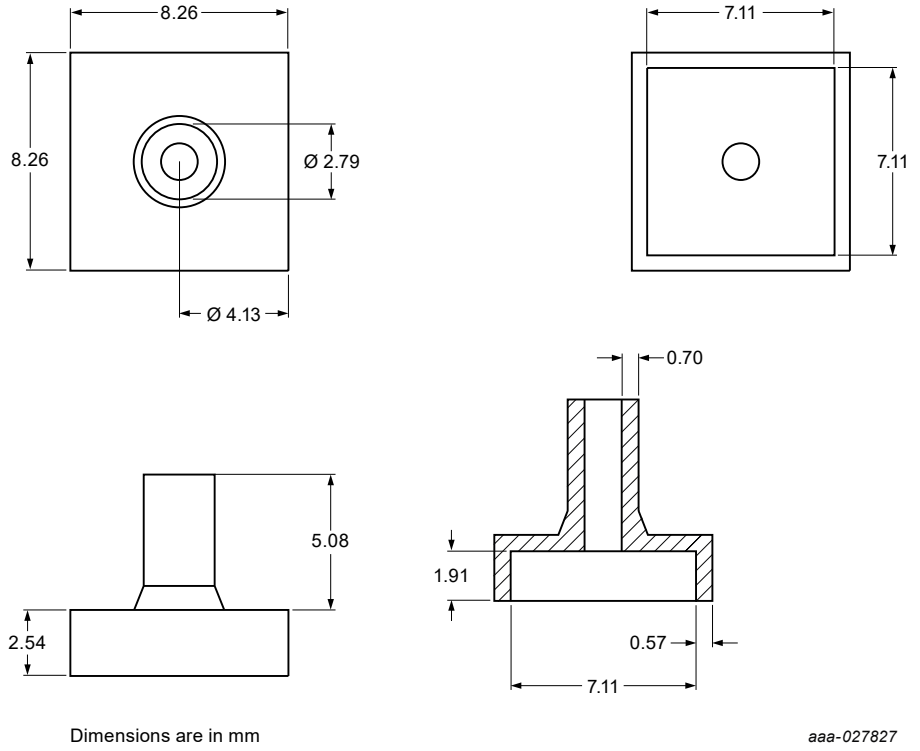

Figure 9. Top port with barbless fitting

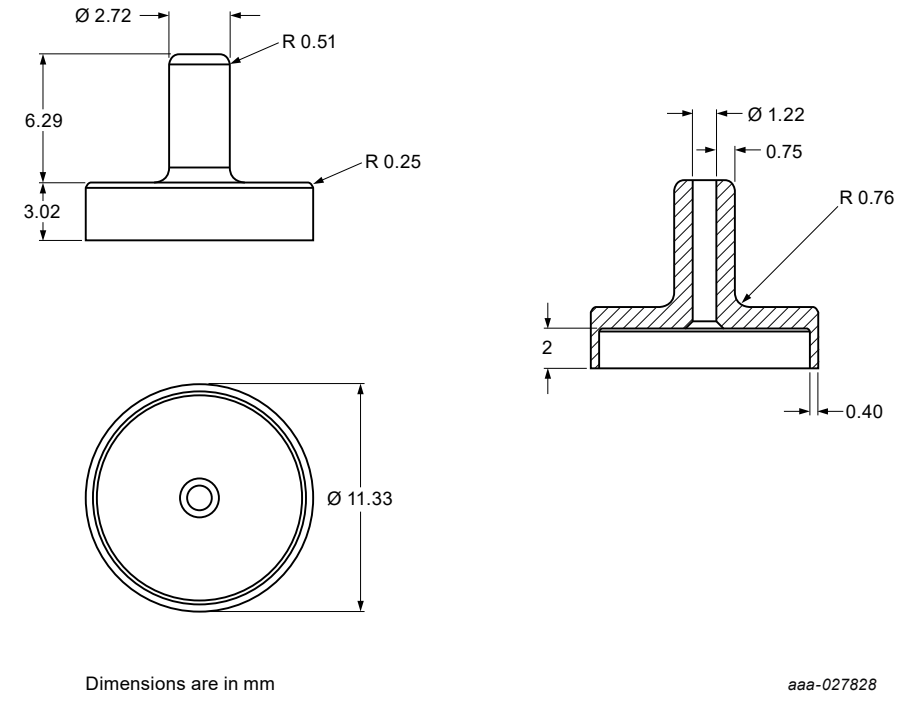

Figure 10. Top port with circular fitting

4 Legal information

4.1 Definitions

Draft — A draft status on a document indicates that the content is still under internal review and subject to formal approval, which may result in modifications or additions. NXP Semiconductors does not give any representations or warranties as to the accuracy or completeness of information included in a draft version of a document and shall have no liability for the consequences of use of such information.

4.2 Disclaimers

Limited warranty and liability — Information in this document is believed to be accurate and reliable. However, NXP Semiconductors does not give any representations or warranties, expressed or implied, as to the accuracy or completeness of such information and shall have no liability for the consequences of use of such information. NXP Semiconductors takes no responsibility for the content in this document if provided by an information source outside of NXP Semiconductors.

In no event shall NXP Semiconductors be liable for any indirect, incidental, punitive, special or consequential damages (including - without limitation - lost profits, lost savings, business interruption, costs related to the removal or replacement of any products or rework charges) whether or not such damages are based on tort (including negligence), warranty, breach of contract or any other legal theory.

Notwithstanding any damages that customer might incur for any reason whatsoever, NXP Semiconductors' aggregate and cumulative liability towards customer for the products described herein shall be limited in accordance with the Terms and conditions of commercial sale of NXP Semiconductors.

Right to make changes — NXP Semiconductors reserves the right to make changes to information published in this document, including without limitation specifications and product descriptions, at any time and without notice. This document supersedes and replaces all information supplied prior to the publication hereof.

Suitability for use — NXP Semiconductors products are not designed, authorized or warranted to be suitable for use in life support, life-critical or safety-critical systems or equipment, nor in applications where failure or malfunction of an NXP Semiconductors product can reasonably be expected to result in personal injury, death or severe property or environmental damage. NXP Semiconductors and its suppliers accept no liability for inclusion and/or use of NXP Semiconductors products in such equipment or applications and therefore such inclusion and/or use is at the customer's own risk.

Applications — Applications that are described herein for any of these products are for illustrative purposes only. NXP Semiconductors makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

Customers are responsible for the design and operation of their applications and products using NXP Semiconductors products, and NXP Semiconductors accepts no liability for any assistance with applications or customer product design. It is customer's sole responsibility to determine whether the NXP Semiconductors product is suitable and fit for the customer's applications and products planned, as well as for the planned application and use of customer's third party customer(s). Customers should provide appropriate design and operating safeguards to minimize the risks associated with their applications and products.

NXP Semiconductors does not accept any liability related to any default, damage, costs or problem which is based on any weakness or default in the customer's applications or products, or the application or use by customer's third party customer(s). Customer is responsible for doing all necessary testing for the customer's applications and products using NXP Semiconductors products in order to avoid a default of the applications and the products or of the application or use by customer's third party customer(s). NXP does not accept any liability in this respect.

Export control — This document as well as the item(s) described herein may be subject to export control regulations. Export might require a prior authorization from competent authorities.

Evaluation products — This product is provided on an "as is" and "with all faults" basis for evaluation purposes only. NXP Semiconductors, its affiliates and their suppliers expressly disclaim all warranties, whether express, implied or statutory, including but not limited to the implied warranties of non-infringement, merchantability and fitness for a particular purpose. The entire risk as to the quality, or arising out of the use or performance, of this product remains with customer.

In no event shall NXP Semiconductors, its affiliates or their suppliers be liable to customer for any special, indirect, consequential, punitive or incidental damages (including without limitation damages for loss of business, business interruption, loss of use, loss of data or information, and the like) arising out the use of or inability to use the product, whether or not based on tort (including negligence), strict liability, breach of contract, breach of warranty or any other theory, even if advised of the possibility of such damages.

Notwithstanding any damages that customer might incur for any reason whatsoever (including without limitation, all damages referenced above and all direct or general damages), the entire liability of NXP Semiconductors, its affiliates and their suppliers and customer's exclusive remedy for all of the foregoing shall be limited to actual damages incurred by customer based on reasonable reliance up to the greater of the amount actually paid by customer for the product or five dollars (US$5.00). The foregoing limitations, exclusions and disclaimers shall apply to the maximum extent permitted by applicable law, even if any remedy fails of its essential purpose.

Translations — A non-English (translated) version of a document, including the legal information in that document, is for reference only. The English version shall prevail in case of any discrepancy between the translated and English versions.

Security — Customer understands that all NXP products may be subject to unidentified vulnerabilities or may support established security standards or specifications with known limitations. Customer is responsible for the design and operation of its applications and products throughout their lifecycles to reduce the effect of these vulnerabilities on customer's applications and products. Customer's responsibility also extends to other open and/or proprietary technologies supported by NXP products for use in customer's applications. NXP accepts no liability for any vulnerability. Customer should regularly check security updates from NXP and follow up appropriately.

Customer shall select products with security features that best meet rules, regulations, and standards of the intended application and make the ultimate design decisions regarding its products and is solely responsible for compliance with all legal, regulatory, and security related requirements concerning its products, regardless of any information or support that may be provided by NXP.

NXP has a Product Security Incident Response Team (PSIRT) (reachable at PSIRT@nxp.com) that manages the investigation, reporting, and solution release to security vulnerabilities of NXP products.

4.3 Trademarks

Notice: All referenced brands, product names, service names, and trademarks are the property of their respective owners.

NXP — wordmark and logo are trademarks of NXP B.V.

Figures

Contents

For more information, please visit: http://www.nxp.com

Date of release: 12 May 2023
Document identifier: AN13889