Application note HSFPAR0 series

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History of revision

Rev.	Date	Note
1.0	Apr/4/2017	First edition
1.1	Jun/26/2017	Add P8
1.2	Oct/2/2017	Revised P9
1.3	Jul/9/2018	Revised P5, P7, P8, P9
2.0	Dec/21/2018	Update design guide
2.1	Apr/2/2019	Company name revision.
2.2	Apr/8/2019	Fixed typo P5, P6, P7

Contents

1. Overview

本製品は、シリコンダイアフラム上にピエゾ抵抗が形成されており、荷重が加わるとダイアフラムが撓むことでピエゾ抵抗に応力が発生し、抵抗率が変化するピエゾ抵抗効果を利用した荷重センサ。

・This product is a force sensor using effect of piezo resistive bridge circuit formed on silicon diaphragm.
・Piezo resistance is changed according to strain by applying force to the diaphragm.

2. Features

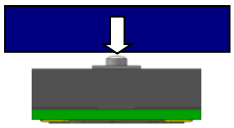
・小型低背です。
　PKGサイズが小さくスペースを取らないため、様々な製品デザインに対応出来ます。
・感度が高く、直線性に優れます。
　0.01Nレベルの小さな応力から検出可能です。
・信頼性に優れます。
　100万回の荷重試験後で、特性の変化は有りません。

・Small Footprint and Low Profile
　User design flexibility by small package.
・High Sensitivity and Good Linearity.
　Precisely detect micro force less than 0.01 N.
・High Durability.
　No characteristics change after 1 million cycles.

3. Design guide

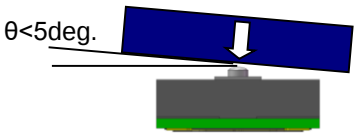
3-1 Precautions

・Please don’t apply the static force and the impact force of max load rating or more to this sensor.
・Must be pressed with a metal plate.
Recommendation：SUS440C,t=0.2mm
・Characteristic abnormality may occur when using resin type like plastic.

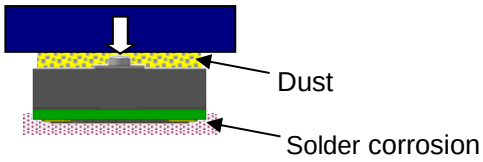


*1 :Note) Please refer to the data sheet for the max load rating of the force sensor.

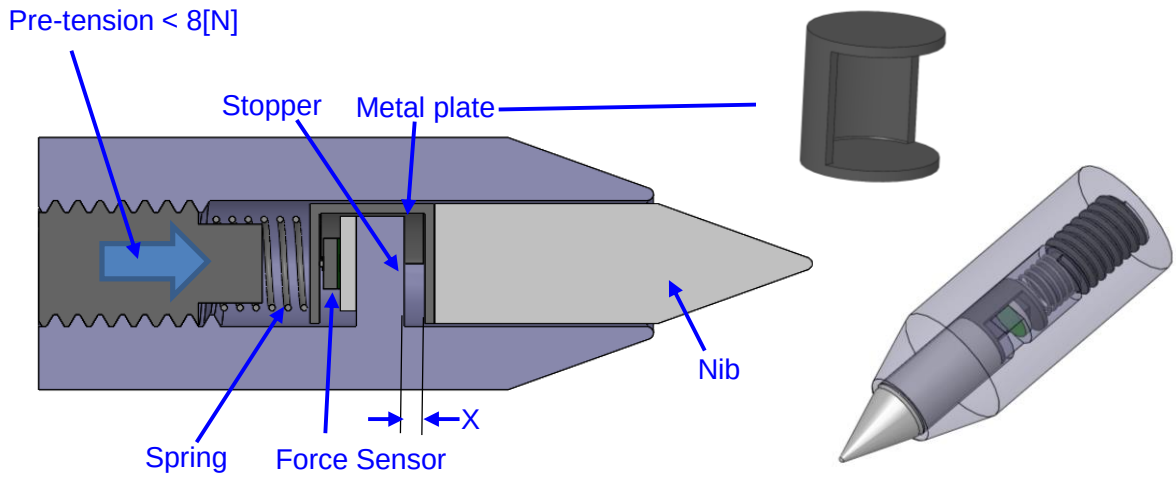
・Please don’t apply force at an angle to the sensor.



・The dust such as sand must not enter.
・Something that corrode solder must not enter.



3-2 Design guide for Stylus-pen



➢This structure detects load force of pen tip as opposite direction.
➢Therefore impact stress doesn't apply directly to the sensor projection.

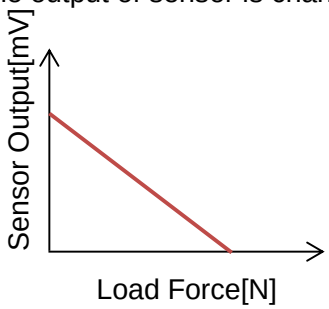
➢Spring is recommended below.
Coil spring

➢Displacement is limited to X[mm] by the stopper.

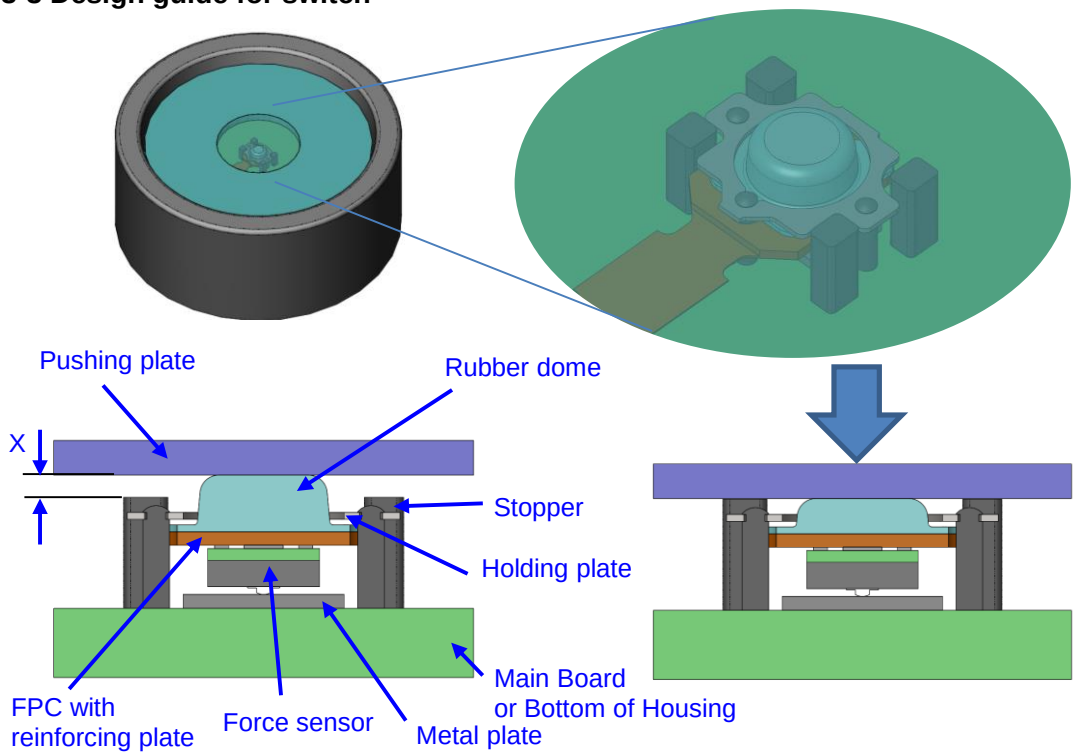
➢Limit the impact force applied to the sensor by the stopper.
Recommendation) Limit force : F < 8[N]
Spring constant : k[N/mm] , Displacement : X[mm]
F = kX < 8[N]
Pre-tension - F > 0[N]

➢Metal plate is recommended stainless steel.
e.g.) Metal plate : SUS440C

➢The output of sensor is changed as below figures.



3-3 Design guide for switch



➢This structure is suitable for switch applications.
➢The force pushed by the Pushing plate is transmitted to the force sensor via the rubber dome and is received by the metal plate.
➢Therefore, shock are absorbed.

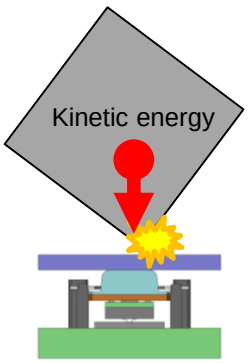
➢Rubber dome is recommended hard rubber.
e.g.) Shore A 70 (ISO 7619-1)

➢Metal plate is recommended stainless steel.
e.g.) Metal plate : SUS440C

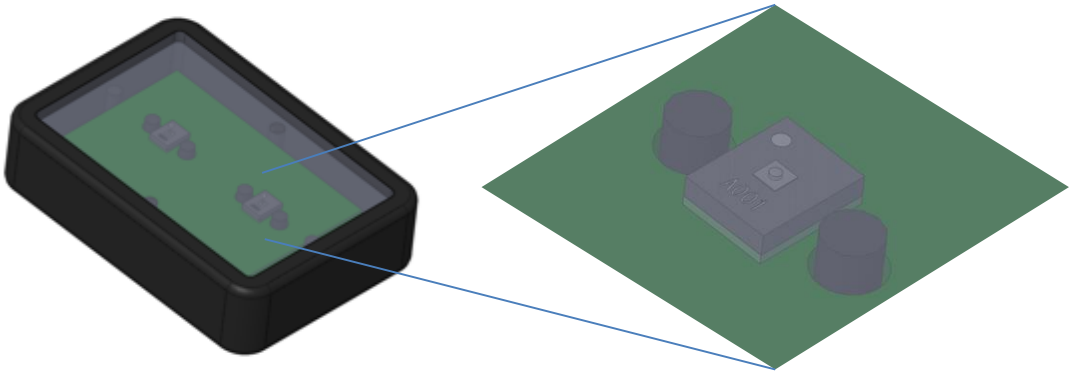
➢The holding plate is not indispensable
when the Force sensor and the Rubber dome can be held by a pushing plate or the like.

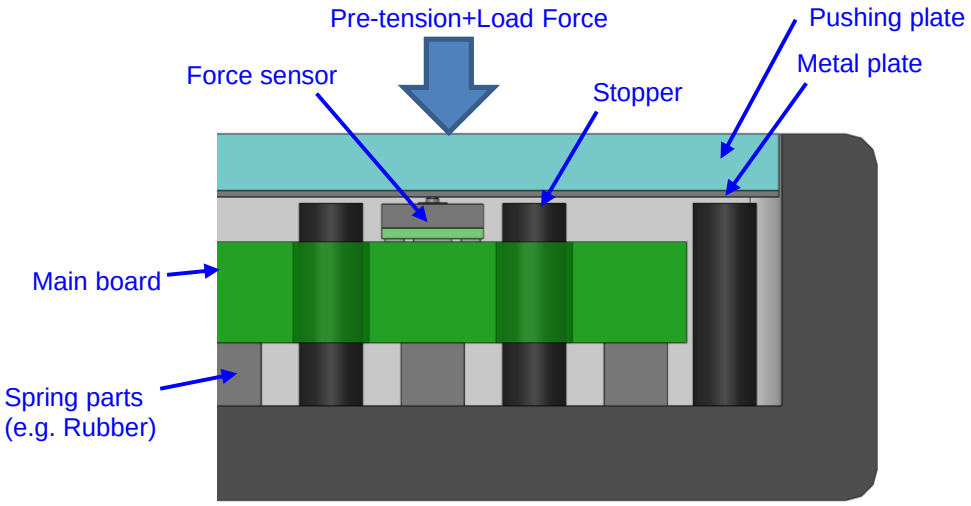
➢Displacement is limited to X[mm] by the stopper.
Recommendation) Rubber dome spring constant : k[N/mm] ,
Displacement : X[mm]
F = kX < Max load rating

➢Do not apply large impact directly to the pushing plate.
Although there is a rubber dome,
the knob of the force sensor may be damaged.
Kinetic energy (1/2 m･v^2) < 20 g･m/sec^2
※Reference value (Not a guaranteed value)
If a further impact is applied,
an additional shock absorbing mechanism is required.



3-4 Design guide for main board mounting





Cross section

➢This is an example of mounting the force sensor on the main board.
➢The force pushed by the pressing plate is transmitted to the force sensor and is received by the main board and the spring part.

➢If there is no metal plate, the force sensor knob may pierce the push plate and the output may malfunction.

➢Displacement is limited by the stopper.
Recommendation) Spring pates constant : k[N/mm]
Displacement : X[mm]
F = kX < Max load rating

➢In order to absorb parts and assembly errors, Spring parts and Pre-tension are necessary.
Recommendation)Limit force : F < 8[N]
Load Force:f1[N],
Pre-tension:f2[N]
F = f1+f2 < 8[N]

➢Do not apply large impact directly to the pushing plate.
If in case of the force sensor's knob is damaged,
some kind of shock absorbing mechanism is necessary.

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