XactFSR Application Guide

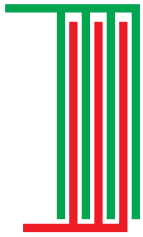
Sensitronics, LLC

XactFSR provides increased tolerances for both DIY projects and large scale manufacturing.

XactFSR was envisioned as a way to improve precision in the realm of printed electronics. Typical force sensing resistors have a part to part repeatability on order of 10-20%. XactFSR brings this into the range of 3-5%. This allows for less calibration and a more accurate sensor. Additionally, the material is easier to prototype with and can be extremely cost effective in large scale production.

A growing number of individuals are prototyping with electronics in a DIY fashion. Often, these projects have limited budgets and highly specified requirements. For applications that require force sensing the common solutions are usually restrained to off-the-shelf parts with fixed sizes, limited force range, and little to no customization. With XactFSR and a printed circuit board (PCB), anyone can make force sensors to their specifications. Here is how:

- Create a printed circuit board with interdigitated fingers in the areas you would like a force sensor.



These are an example of interdigitated fingers. The green and red traces are electrically isolated. By placing XactFSR over top of these fingers, you will short or “shunt” the circuit. The resistance between the red and green traces then becomes a function of how much pressure is applied to the XactFSR.

- The geometry of the interdigitated fingers, as well as the materials used, will influence the response of the sensor, and can also affect sensor lifespan. Here are some things to consider when designing your PCB:
    - The width of the fingers and the spaces between them—often referred to as the "space-and-trace" of the sensor—will affect the sensor’s response. 7mil (.007") is a common dimension for both, but other dimensions are workable and may even be desirable depending upon the application.
    - Sensors with finely-spaced fingers will be more sensitive to small forces than sensors with coarsely-spaced fingers.
    - PCB finish will influence the sensor’s response. ENIG (gold) finish is recommended.
    - Copper weight will influence the sensor’s response, but will also affect its lifespan. Heavier-weight copper fingers will elevate the FSR material and enhance deformation of the sensor under load. This enhanced deformation permits the knife-sharp edges of the copper fingers to penetrate the surface of the FSR material, degrading and eventually destroying it. We have found that copper weights of a half ounce or less, together with 7mil finger spacing, yield a good general-purpose sensor response and a long sensor lifespan.

- Here are some of our recommended PCB manufacturers:
    - ExpressPCB – Fast turnaround, free software, and reasonably priced boards

    - OSHpark – 2 layer boards for $5 per square inch. Solder mask and silk screen layers included.
    - SeeedStudio – up to 30cm x 30cm boards for very reasonable prices.

- XactFSR is available in a variety of formats. If other formats are desired, please email info@sensitronics.com with your desired specifications and we'll be happy to discuss them with you.

		Resistance (kOhms per square inch)		
		100	225	350
Thickness (mil)	2	n/a	n/a	●
	4	●	●	●
	5	●	●	●
	7	●	n/a	n/a