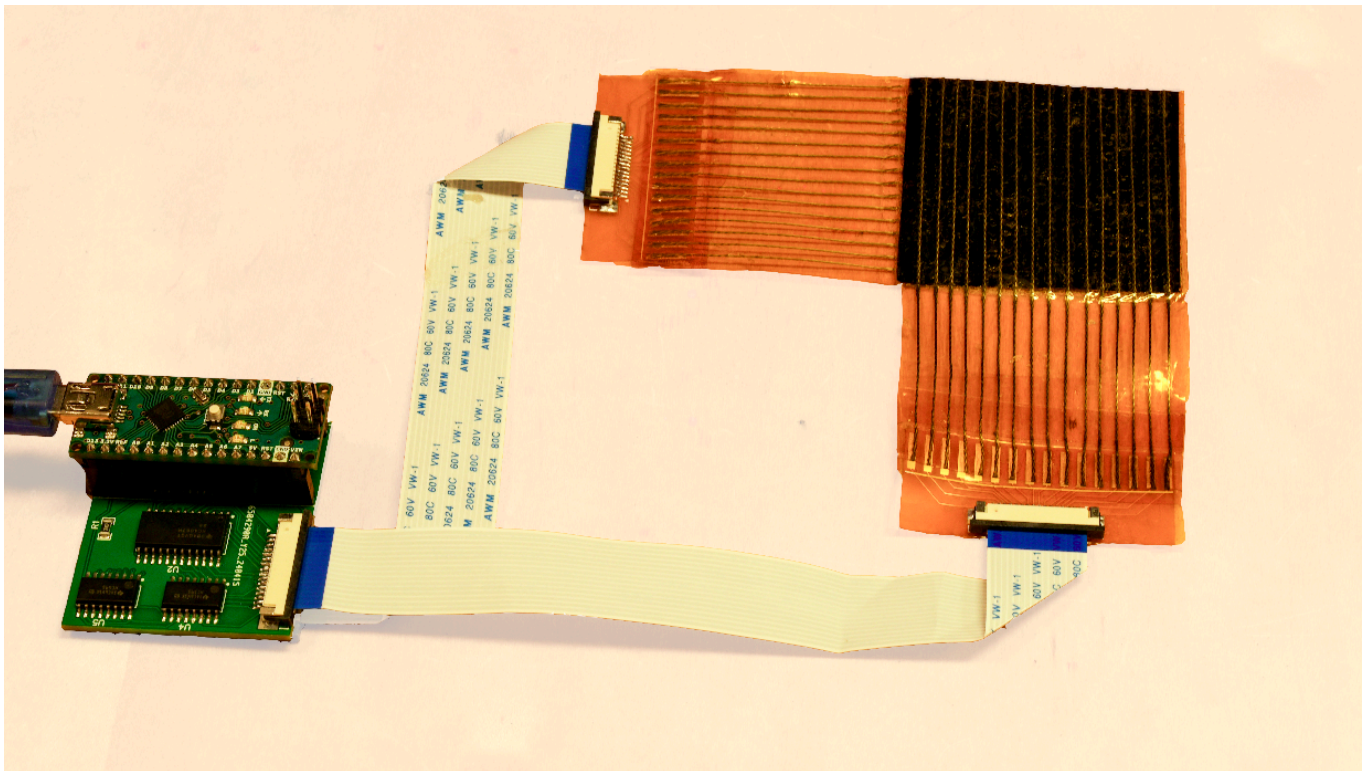


3D ViTac

3D ViTac

Learning Fine-Grained Manipulation with Visuo-Tactile Sensing (Hardware Guide)



Resources

Bill of Materials:

[\[BOM\]](#)

PCB Related:

Circuit:

[\[Circuit Reading Board\]](#)

Connector:

[\[Gerber_Connector\]](#)

[\[BOM_Connector\]](#)

[\[PickandPlace_Connector\]](#)

Reading Board:

[\[Gerber_Reading_Board\]](#)

[\[BOM_Reading Board\]](#)

[\[PickandPlace_Reading_Board\]](#)

Hardware Codebase:

[\[Arduino Code\]](#)

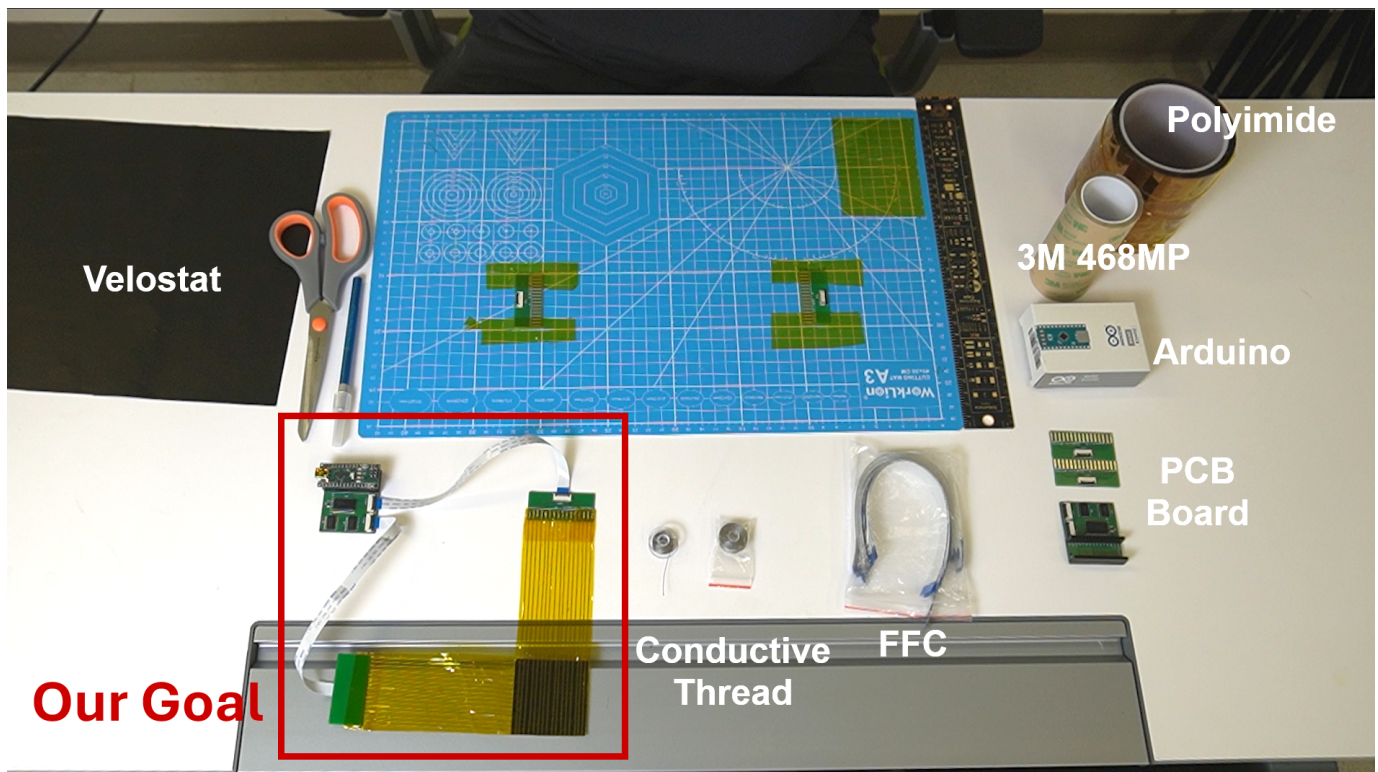
[\[Python Package or Ros Package\]](#)

Build It Like a Sandwich: Simple, Layered, and Ready-to-Use Sensors!

Lead time: < 30 mins

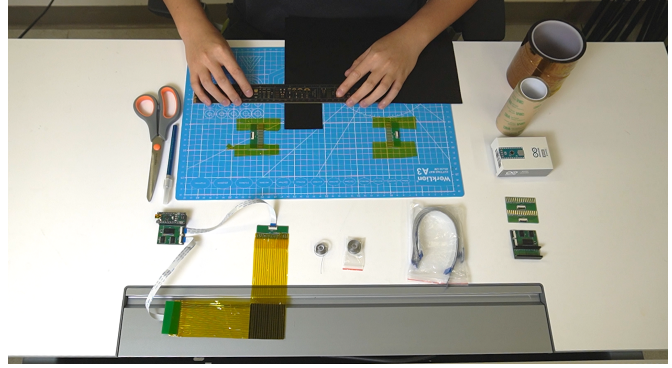
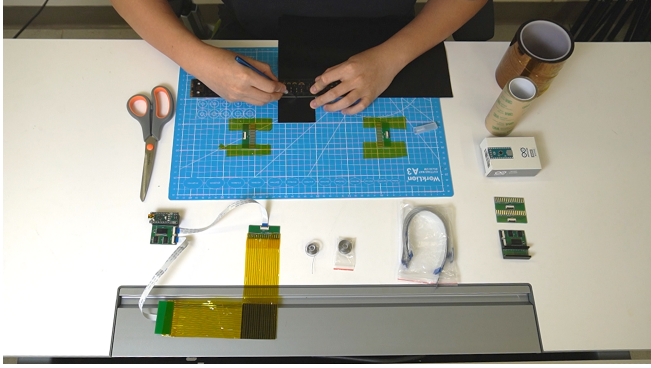
Step-by-Step Illustrated Guide

Overview of Materials:

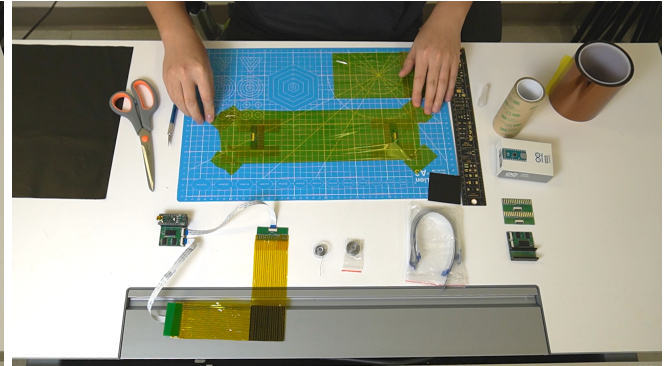
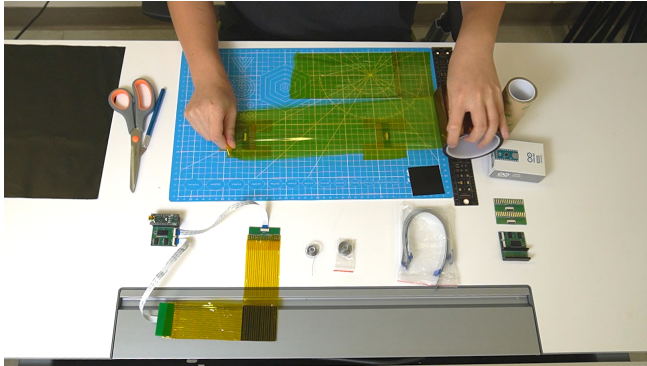


Step 1

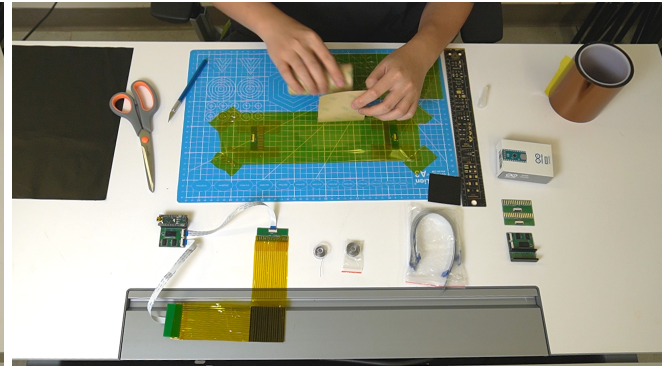
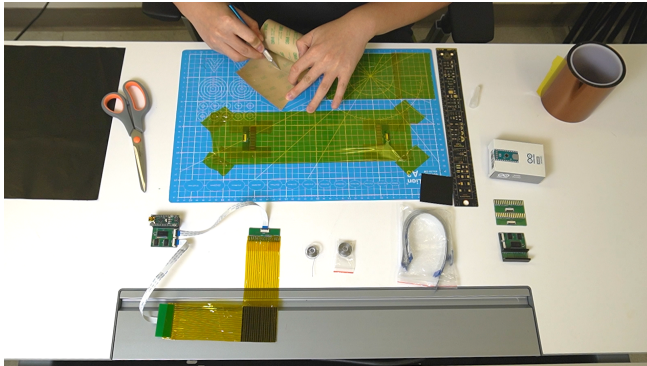
(1) Cut a small piece of Velostat measuring 5 cm by 5 cm.

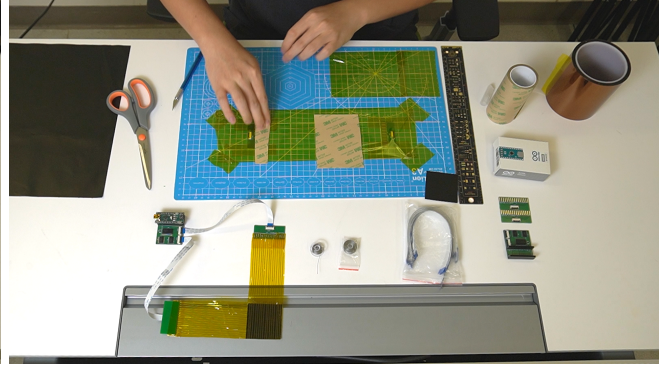
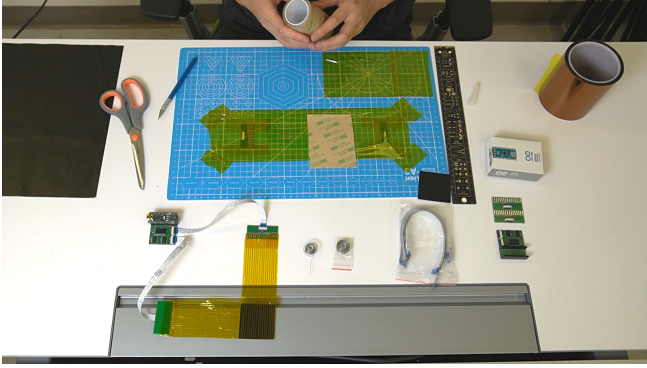


(2) Place the polyimide with the sticky side facing up and adhere it to the work area. (The two connector PCBs on the table are only for alignment and are not connected to the conductive thread, so the polyimide can directly cover these alignment connector PCBs.)

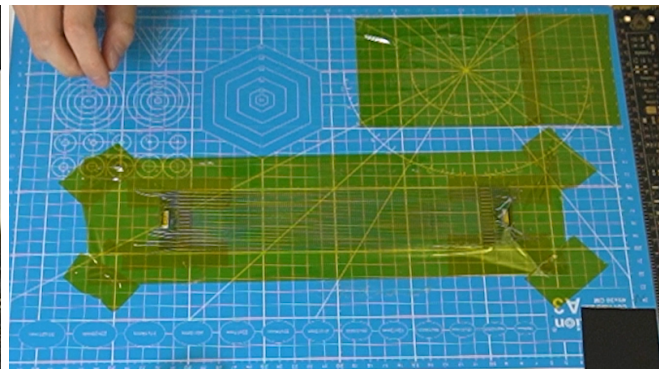
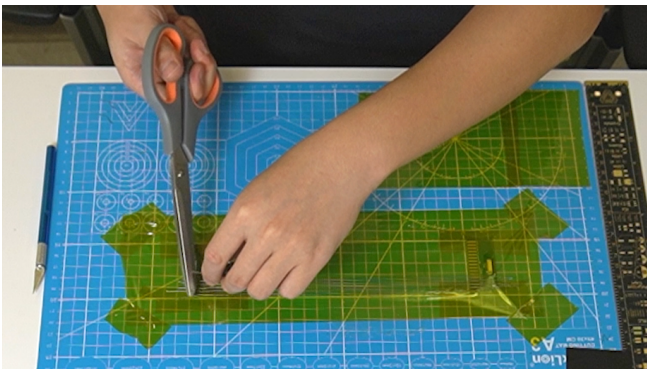
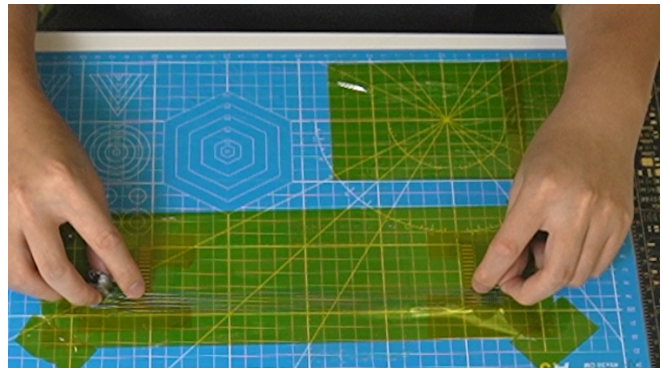
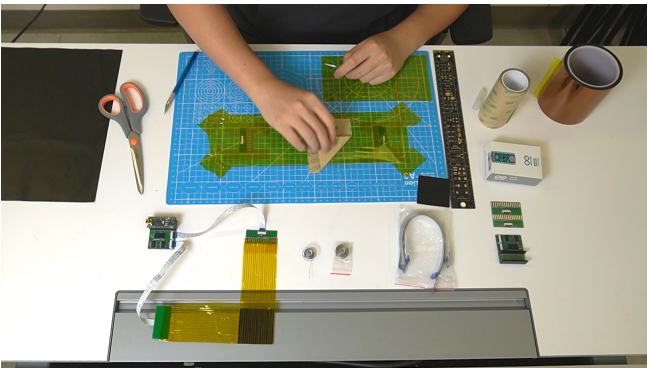


(3) Stick the double-sided tape (3M 468MP) onto the polyimide. A 5 cm width will be the sensor area, and a 1 cm width will be the area for connecting the conductive thread and connector.

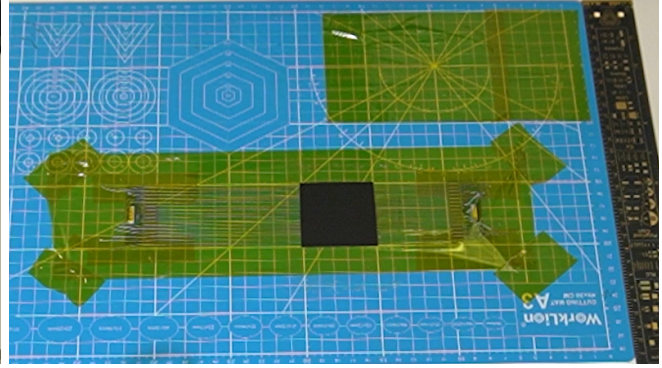
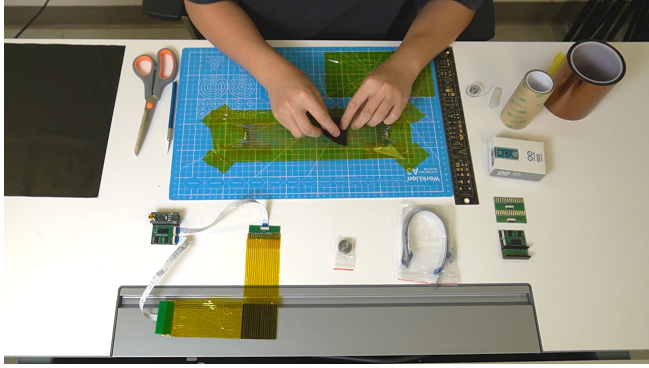




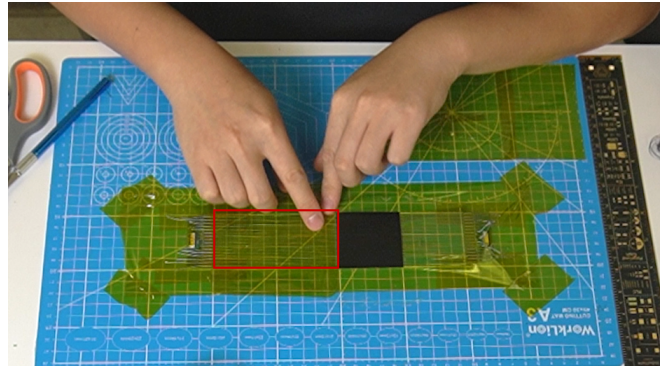
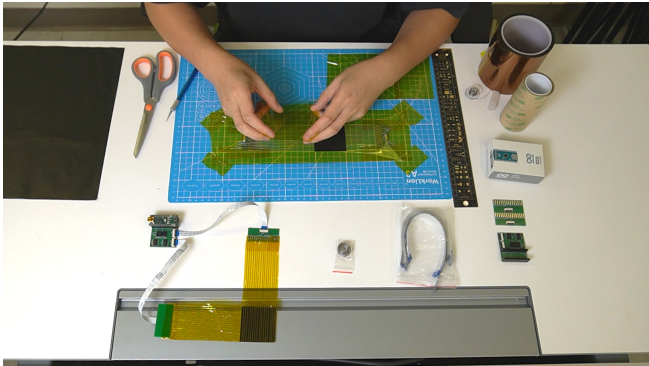
(4) Peel off the outer layer of the double-sided tape and start laying the wires on it, aligning each conductive thread with the solder pads on the left and right connector PCBs. In total, we will need to align 16 conductive threads in this step.



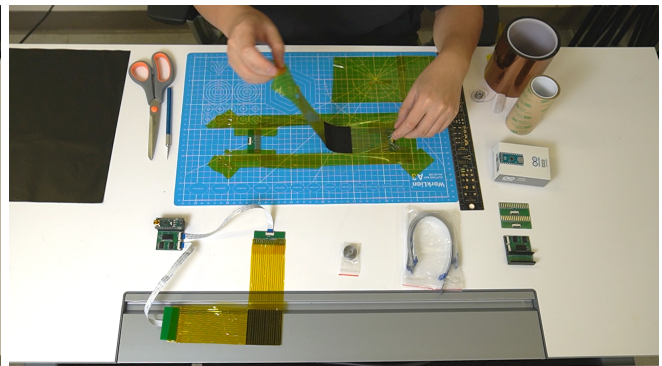
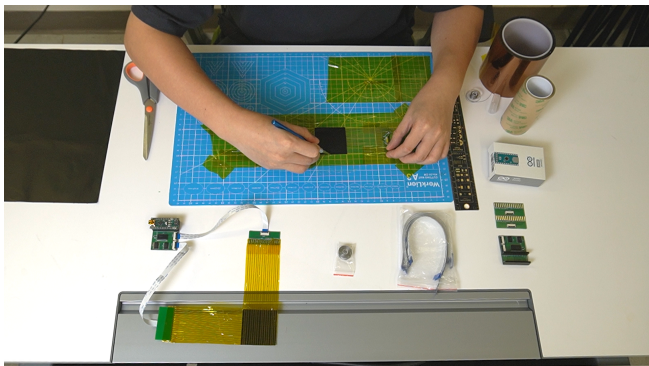
(5) Place the Velostat over the conductive threads and press down firmly to ensure the double-sided tape adheres tightly to the Velostat. Make sure the Velostat covers all 16 conductive threads and leaves a small margin around them.



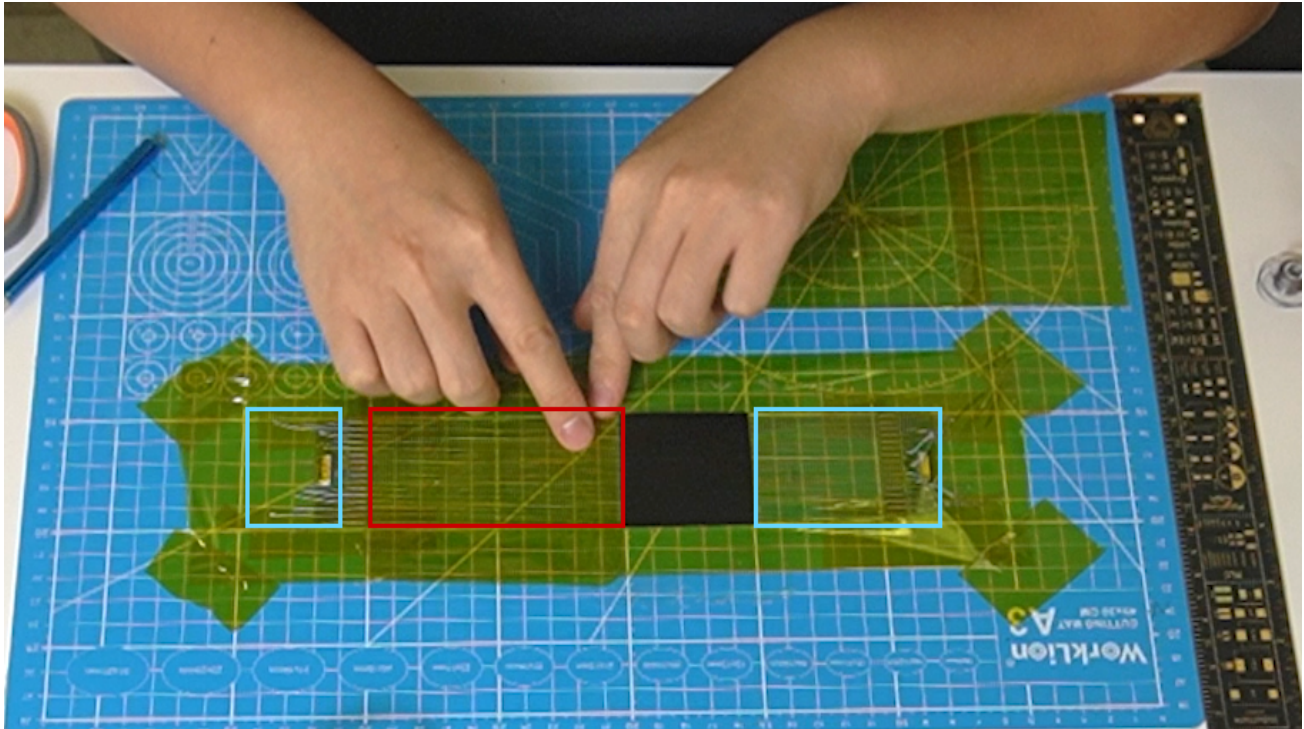
(6) Place another cut piece of polyimide over the exposed conductive threads, pressing down to adhere it to the double-sided tape. Be careful to stick it only within the **red** outlined area, avoiding coverage of the Velostat and the part above the connectors.



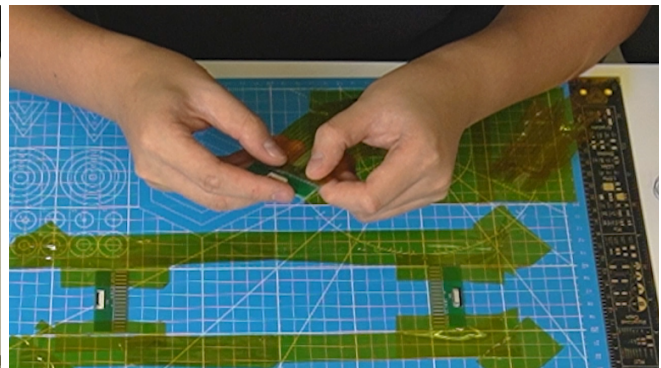
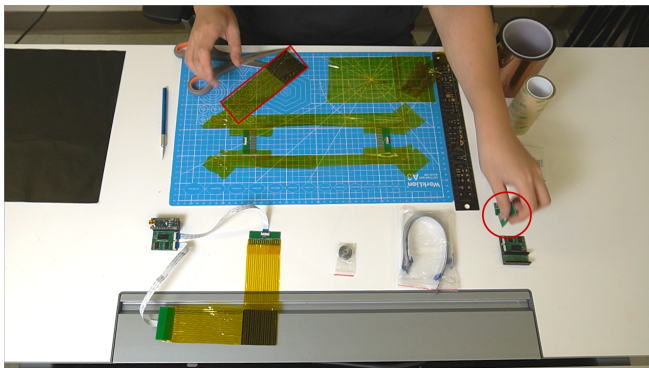
(7) Cut off the entire section with the conductive threads and peel it away.



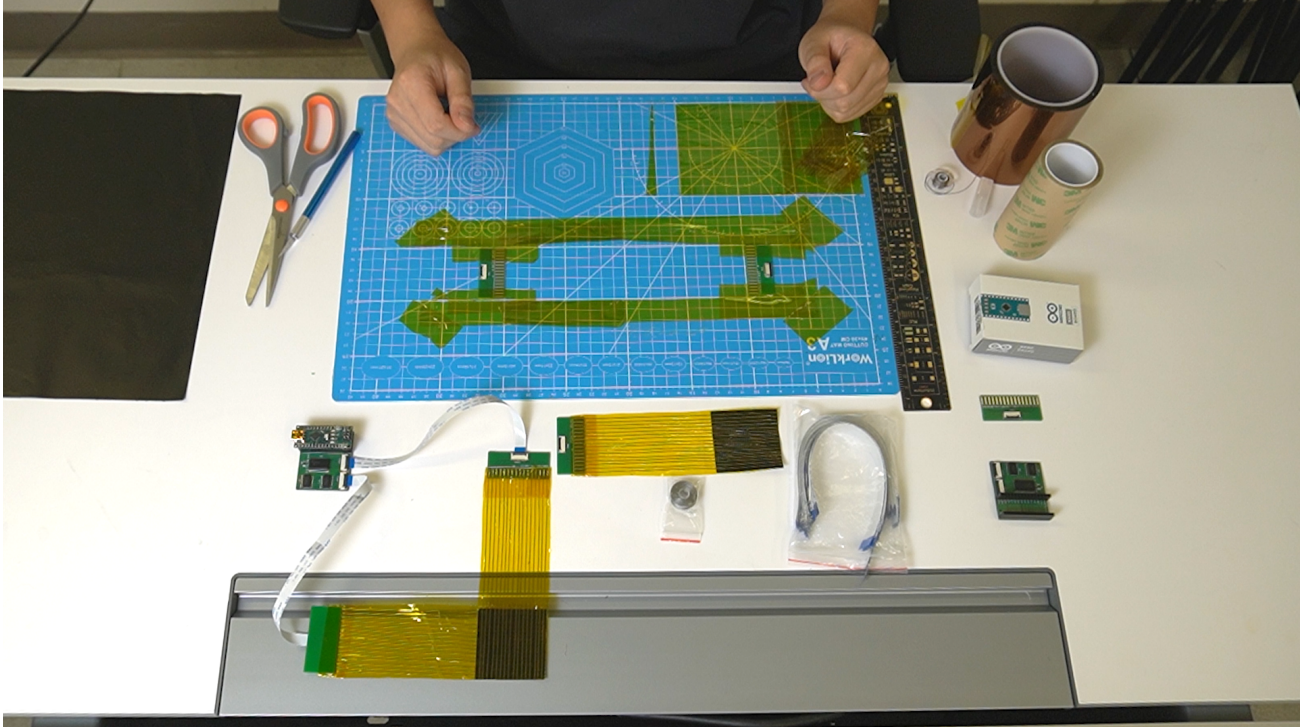
(8) Trim off the excess conductive thread (the **blue** section in the image).



(9) Take a new connector and align its 16 solder pads with the 16 conductive threads. Press firmly by hand to secure the connection. This completes the wiring on one side of the sensor.



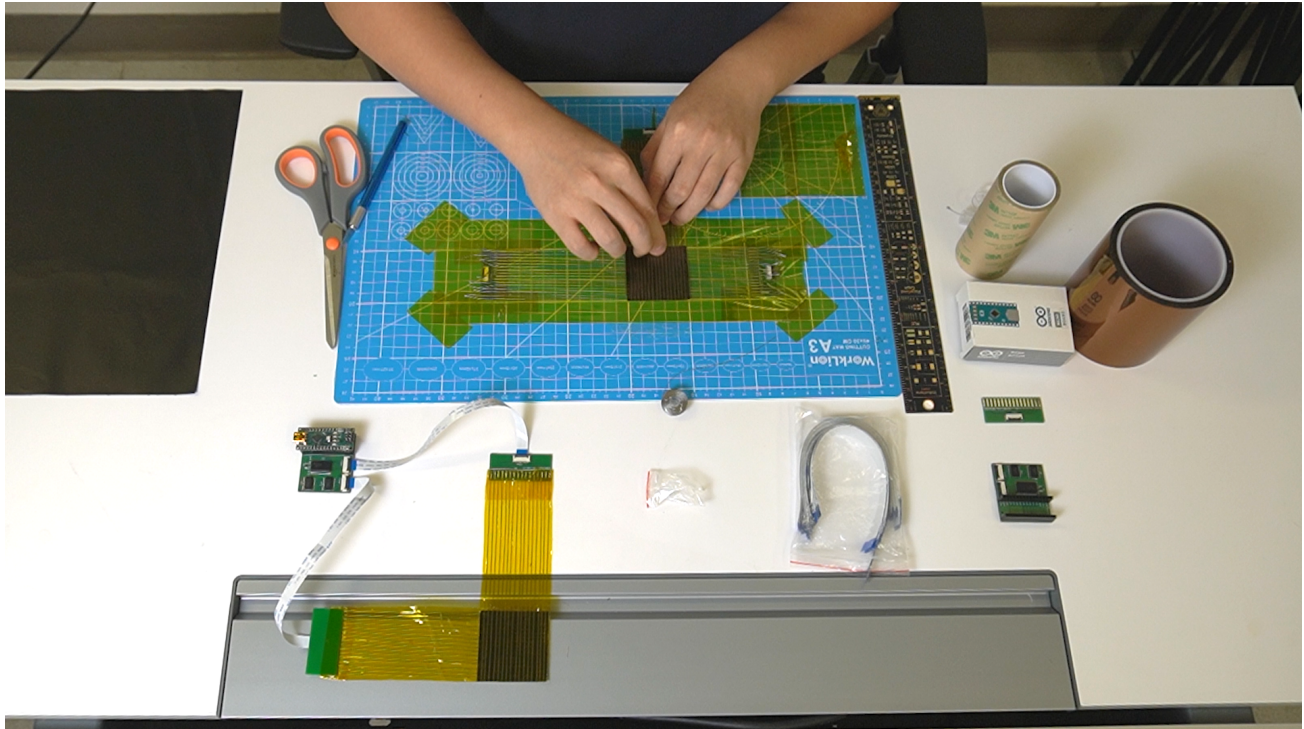
(10) Now, we complete the wiring on one side of the sensor.



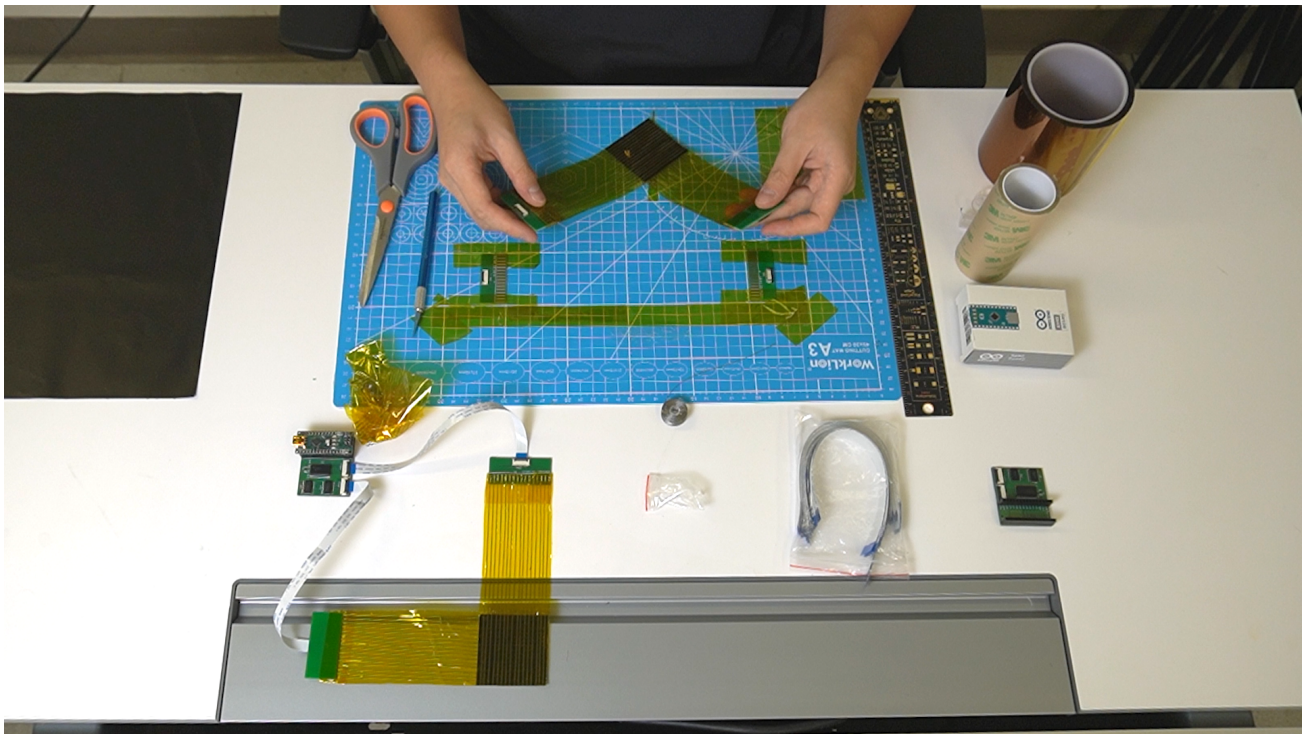
Step 2

(1) Repeat Step 1 to build the other side of sensor

(2) After aligning 16 conductive threads, directly place the piece we made in Step 1 over the conductive threads and press down firmly to ensure the double-sided tape adheres tightly to the Velostat.

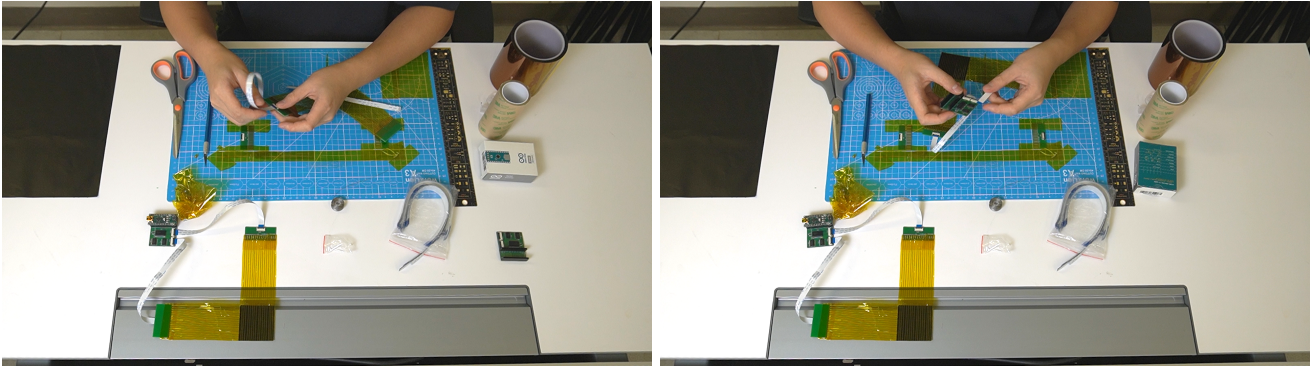


(3) Cut out the new piece, then attach another connector to it. This completes both sides of the sensor.



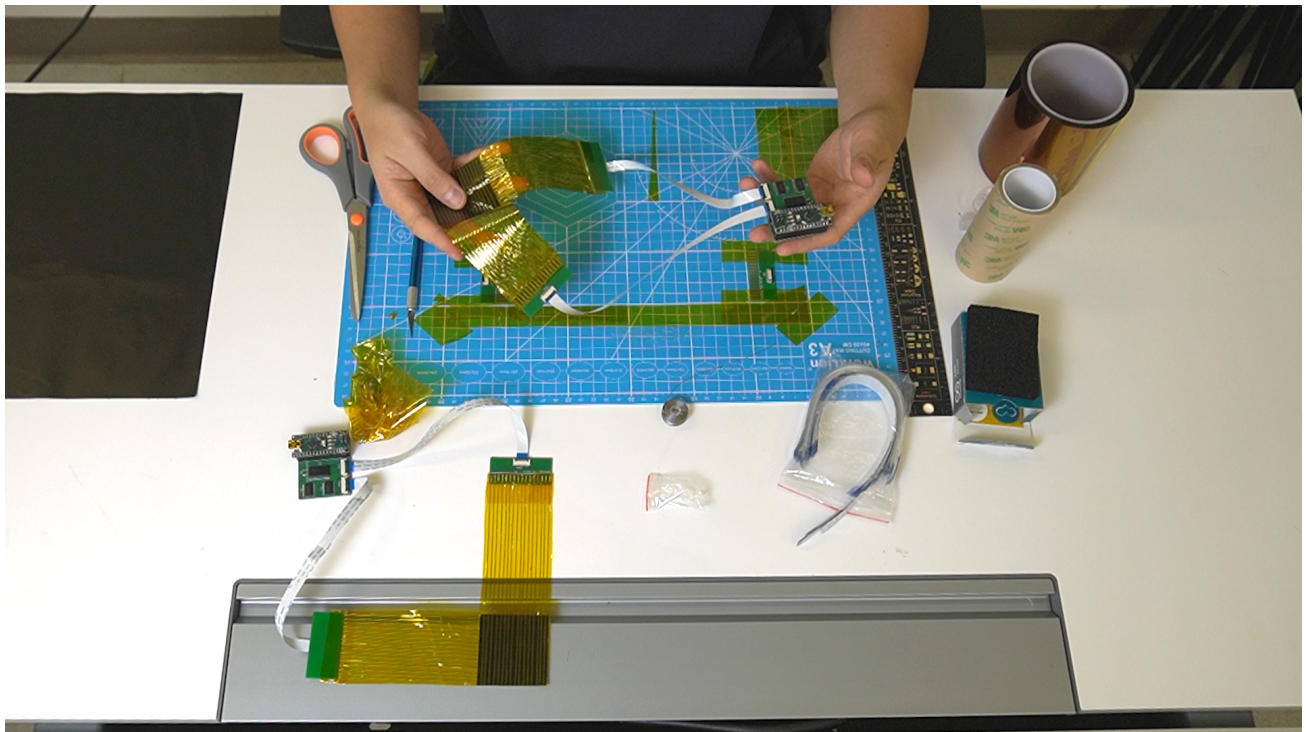
Step 3

Use the FFC to connect the two connectors to the PCB Board.



Step 4

Finally, take the Arduino and attach it to the PCB, either by plugging it in or soldering it onto the board. With that, the sensor is complete, taking less than 30 minutes to assemble.



Tips and Issues with Sensor Fabrication

1. Stabilizing the Sensor: Gently press the entire sensor surface 4 to 5 times. This step only needs to be performed once. After repeated use, the sensor will become more stable in its operation.
2. Bubble Removal Tip: Ensure there are no air bubbles trapped between the adhesive and the piezoresistor layer. If any bubbles are present, carefully press them out to remove them and ensure a proper seal.

PCB Manufacturing Guide

Step 1

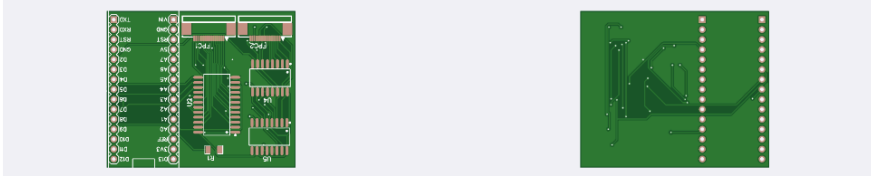
Download all the necessary materials, and upload the Gerber file to the PCB manufacturer. Choose the "PCB Assembly Bottom" option.

Standard PCB/PCBA

Limited Time Offer
Advanced PCB/PCBA

SMT-Stencil

3D Printing/CNC



[Back to Upload File](#) Detected 2 layer board of 39.88x48.12mm(1.57x1.89 inches). [Gerber Viewer](#)

Base Material
FR-4 Flex Aluminum Copper Core Rogers PTFE Teflon

Layers
1 2 4 High Precision PCB 6 8 10 12 14 16 More

Dimensions
48.12 * 39.88 mm

PCB Qty
5

Product Type
Industrial/Consumer electronics Aerospace Medical

PCB Specifications

Different Design
1 2 3 4

Delivery Format
Single PCB Panel by Customer Panel by JLCPCB

PCB Thickness
0.4 0.6 0.8 1.0 1.2 1.6 2.0

PCB Color
Green Purple Red Yellow Blue White Black

Silkscreen
White

Surface Finish
HASL(with lead) LeadFree HASL ENIG

High-spec Options

Charge Details

Special Offer \$2.00

Via Covering \$0.00

Surface Finish \$0.00

Economic PCBA Price

Components -

Extended components fee -

SMT Assembly -

Hand-soldering labor fee -

Manual Assembly -

Build Time

PCB: 2 days \$0.00

24 hours \$7.30

24 hours PCBA Only \$0.00

Calculated Price

\$4.99

\$2.00

Additional charges may apply for special cases

NEXT

Shipping Estimate

UPS Worldwide Express 2-4 business days

Weight 0.15kg

Coupons

Save \$30.00

Save \$9.00

PCB Assembly

coupon

Free Assembly for your PCB order

☒

☒ Assemble top side
 ☐ Assemble bottom side

PCBA Type

?

Economic

Standard

What's the difference?

Assembly Side

?

Top Side

Bottom Side

Both Sides

PCBA Qty

?

5

2

Tooling holes

?

Added by JLCPCB

Added by Customer

Confirm Parts Placement

?

No

Yes

Advanced Options

^

Step 2

Upload the BOM (Bill of Materials) file and the Pick-and-Place file. Ensure all components are available except for the Arduino. Then, select "Do Not Place" for the Arduino and proceed.

:

✓

BOM_05mm_FFC_16_16-1mux_2shiftregist...

Only accept XLS,XLSX,CSV. [View Sample BOM](#)

✓

PickAndPlace_PCB_05mm_FFC_16_16-1mu...

Pick&Place File, Only accept XLS,XLSX,CSV. [View Sample CPL](#)

Not sure where to start? Check our [SMT FAQs page](#).

Process BOM & CPL

Top Side

Total

5 parts detected

|

2 Parts confirmed

|

2 parts to be confirmed

|

1 parts Inventory shortage

Single Piece ▾

Upload BOM/CPL

Uploaded BOM Data			Review Matched Parts						
Top Designator	Comment	Footprint	Matched Part Detail	Qty	Source	Lib Type	Total Cost	Select	
FPC1,FPC2	FFC05001-1...	FFC-SMD_FFC...	FFC05001-16SBB124W5M C2833986 Drawer Type -40°C~+85°C 16P Bottom Cont...		10	JLCPCB	Extended	\$1.2180	☒
R1	20k	R1206	1206W4F2002T5E C18003 250mW Thick Film Resistors 200V ±100ppm...		20	JLCPCB	Extended	\$0.0580	☒
U2	CD74HC406...	SOIC-24_L15.4...	CD74HC4067M96 C496123 1 160Ω SOIC-24-300mil Analog Switches, M...		5	JLCPCB	Extended	\$2.6405	☒
U4,U5	SN74HC595...	SOP-16_L10.3-...	SN74HC595NSR C191873 2V~6V Serial to serial or parallel SOP-16-20...		10	JLCPCB	Extended	\$4.8090	☒
U1	ARDUINO_N...	COMM-TH_AR...	ARDUINO_NANO C9900017879 ARDUINO_NANO		5		Extended	\$0.00	5 shortfall

Please carefully check the packages of selected parts before proceeding.

NEXT

PCB

Bill of Materials

Component Placements

Quote & Order

Automatically saved, last updated on 14 November, 01:06

Top Side

Total

5 parts detected

|

2 Parts confirmed

|

2 parts to be confirmed

|

1 parts Inventory shortage

Single Piece ▾

Upload BOM/CPL

Uploaded BOM Data			Review Matched Parts						
Top Designator	Comment	Footprint	Matched Part Detail	Qty	Source	Lib Type	Total Cost	Select	
FPC1,FPC2	FFC05001-1...	FFC-SMD_FFC...	FFC05001-16SBB124W5M C2833986 Drawer Type -40°C~+85°C 16P Bottom Cont...		10	JLCPCB	Extended	\$1.2180	☒
R1	20k	R1206	1206W4F2002T5E C18003 250mW Thick Film Resistors 200V ±100ppm...		20	JLCPCB	Extended	\$0.0580	☒
U2	CD74HC406...	SOIC-24_L15.4...	CD74HC4067M96 C496123 1 160Ω SOIC-24-300mil Analog Switches, M...		5	JLCPCB	Extended	\$2.6405	☒
U4,U5	SN74HC595...	SOP-16_L10.3-...	SN74HC595NSR C191873 2V~6V Serial to serial or parallel SOP-16-20...		10	JLCPCB	Extended	\$4.8090	☒
U1	ARDUINO_N...	COMM-TH_A...	ARDUINO_NANO C9900017879 ARDUINO_NANO		5		Extended	\$0.00	5 shortfall

Please carefully check the packages of selected parts before proceeding.

Project has unselected parts

Some items have no parts selected yet, please confirm you have selected all the parts you want to assemble.

If you don't want to place those parts, just go ahead.

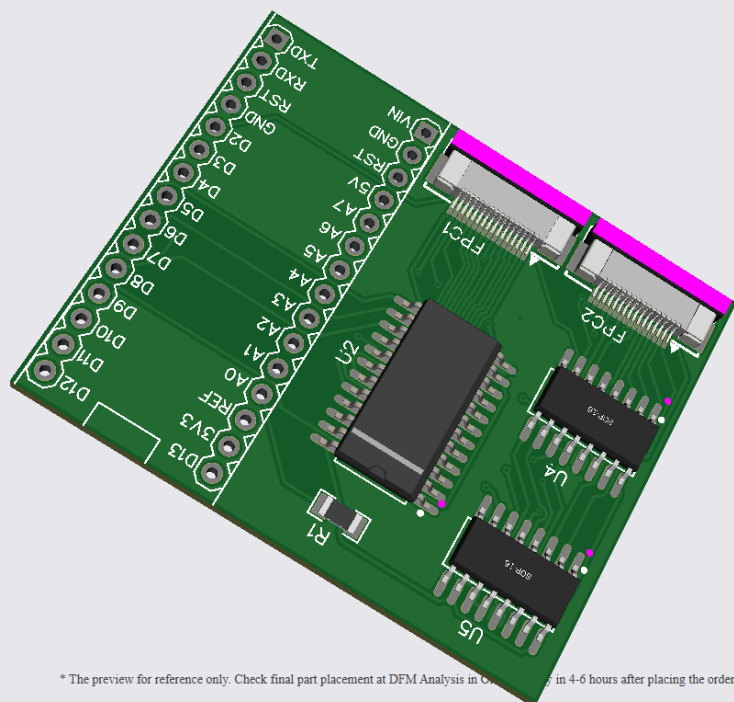
Do not place

Select parts

NEXT

Step 3

Review the PCB assembly draft and the 3D rendering to confirm everything is correct.

☐ Select all top parts

* The preview for reference only. Check final part placement at DFM Analysis in [Creo](#) in 4-6 hours after placing the order.

Top Designator	JLPCB Part #	Comment	Footprint
FPC1,FPC2	C2833986	FFC0500...	FFC-SMD...
R1	C18003	20k	R1206
U2	C496123	CD74HC...	SOIC-24...
U4,U5	C191873	SN74HC...	SOP-16...

Step 4

Check the order price for the sensor, which reflects the total cost for 5 units. Place the order, and expect a delivery time of approximately one week.

PCB Bill of Materials Component Placements Quote & Order Automatically saved, last updated on 14 November, 01:09

Charge Details

PCB Price	\$2.00
Via Covering:	\$0.00
Special Offer:	\$2.00

Economic PCBA Price \$31.03

Setup Fee:	\$8.00
Stencil:	\$1.50
Panel:	\$0.00
Large Size:	\$0.00
Components(4 Items):	\$8.73
Extended components fee:	\$12.00
SMT Assembly	\$0.80

Build Time:

PCB: 24 hours	\$0.00
Assembly: 1 - 2 days	\$0.00

Total Price: \$33.03

Weight 303.03g

Product Description

Select

SAVE TO CART

Tips and Issues with PCB Manufacturing

1. For Gerber_Connector, there's no need to solder the 16 Pin Header, there are no pre-drilled holes, and tutorial video shows using tape to directly attach the conductive thread.
2. For Gerber_Reading_Board, two 15 Pin Headers are required, which need to be manually soldered if not pre-assembled by the company.

(Optional) Educational Kit

We're also excited to introduce an educational kit designed for easy circuit assembly. With this kit, you'll only need to check that all the lines connect correctly according to the circuit draft. It's perfect for those new to hardware who want a straightforward way to get started with tactile sensors.

