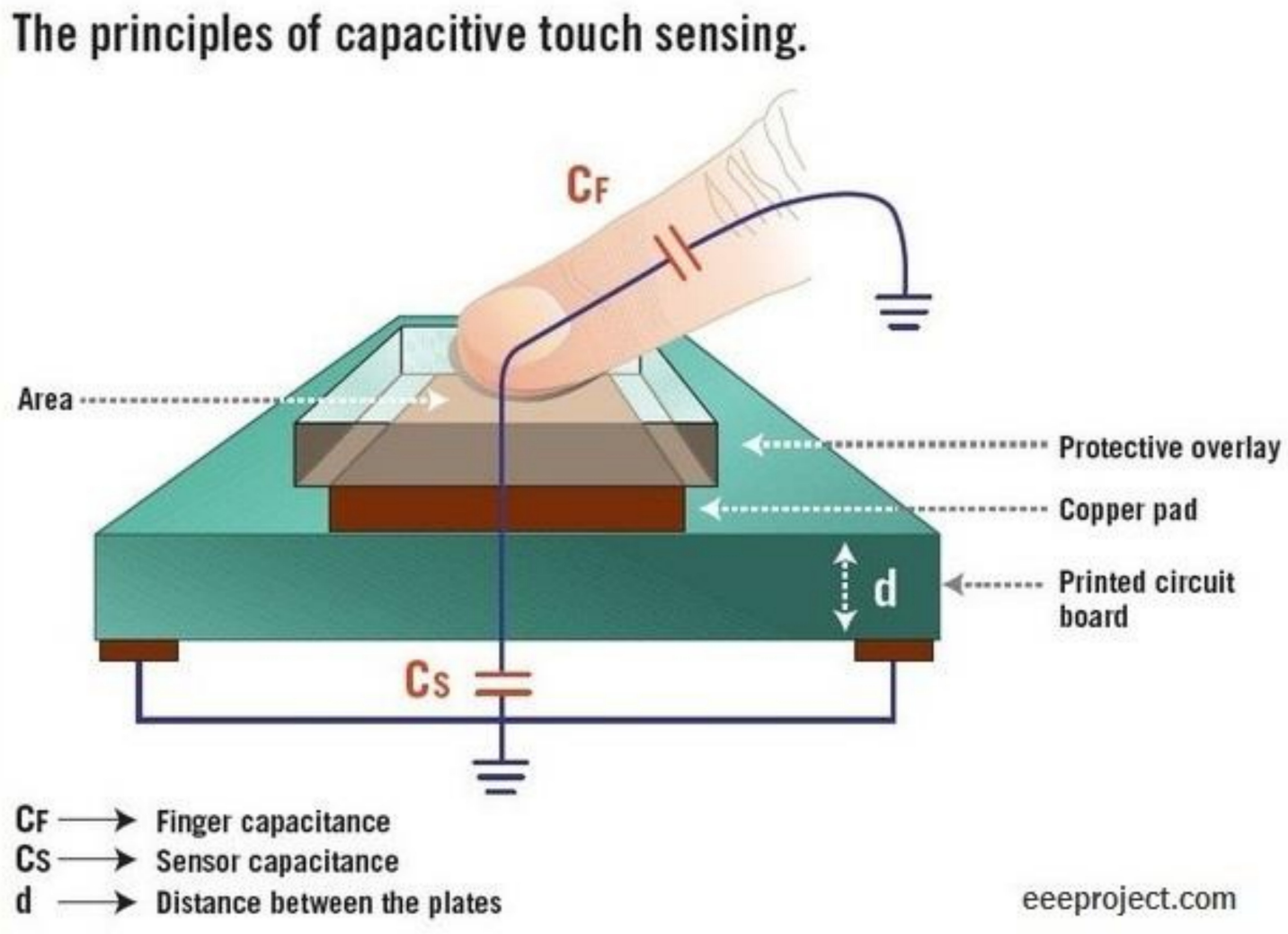
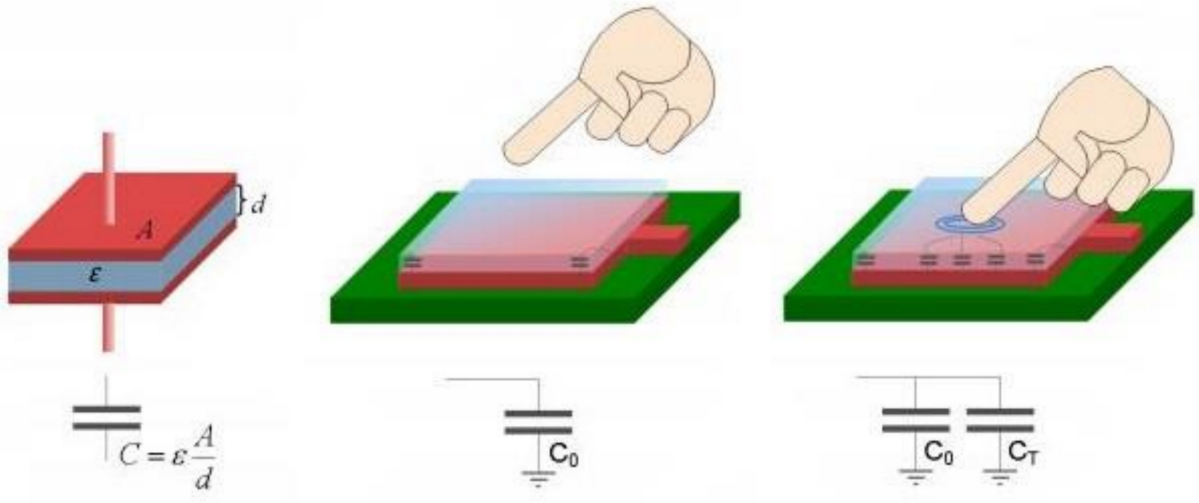
# Tactile Sensor/Touch Sensor



# Capacitive Type




Source : www.fujitsu.com/downloads/MICRO/fme/articles/fujitsu-whitepaper-capacitive-touch-sensors.pdf

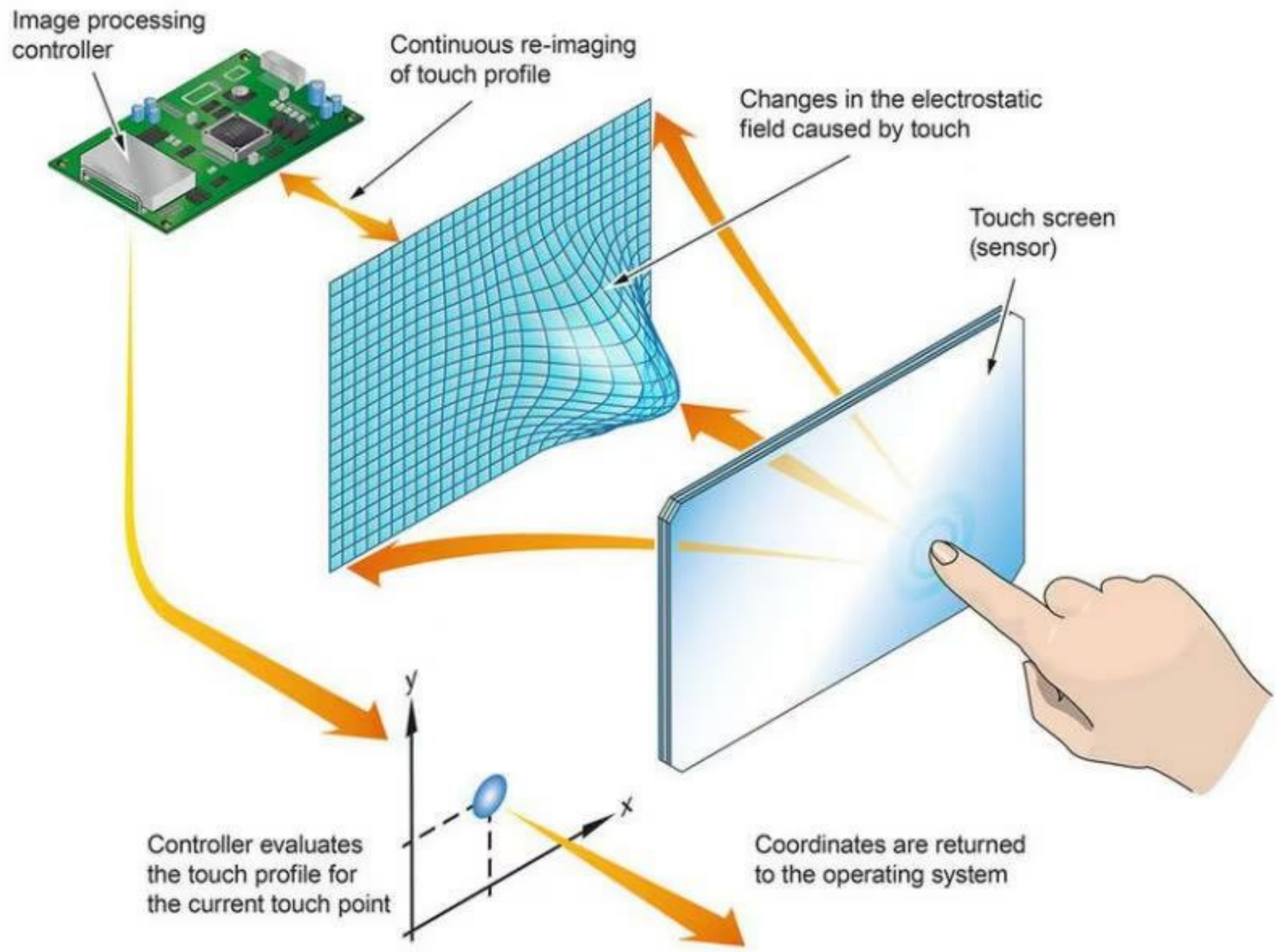
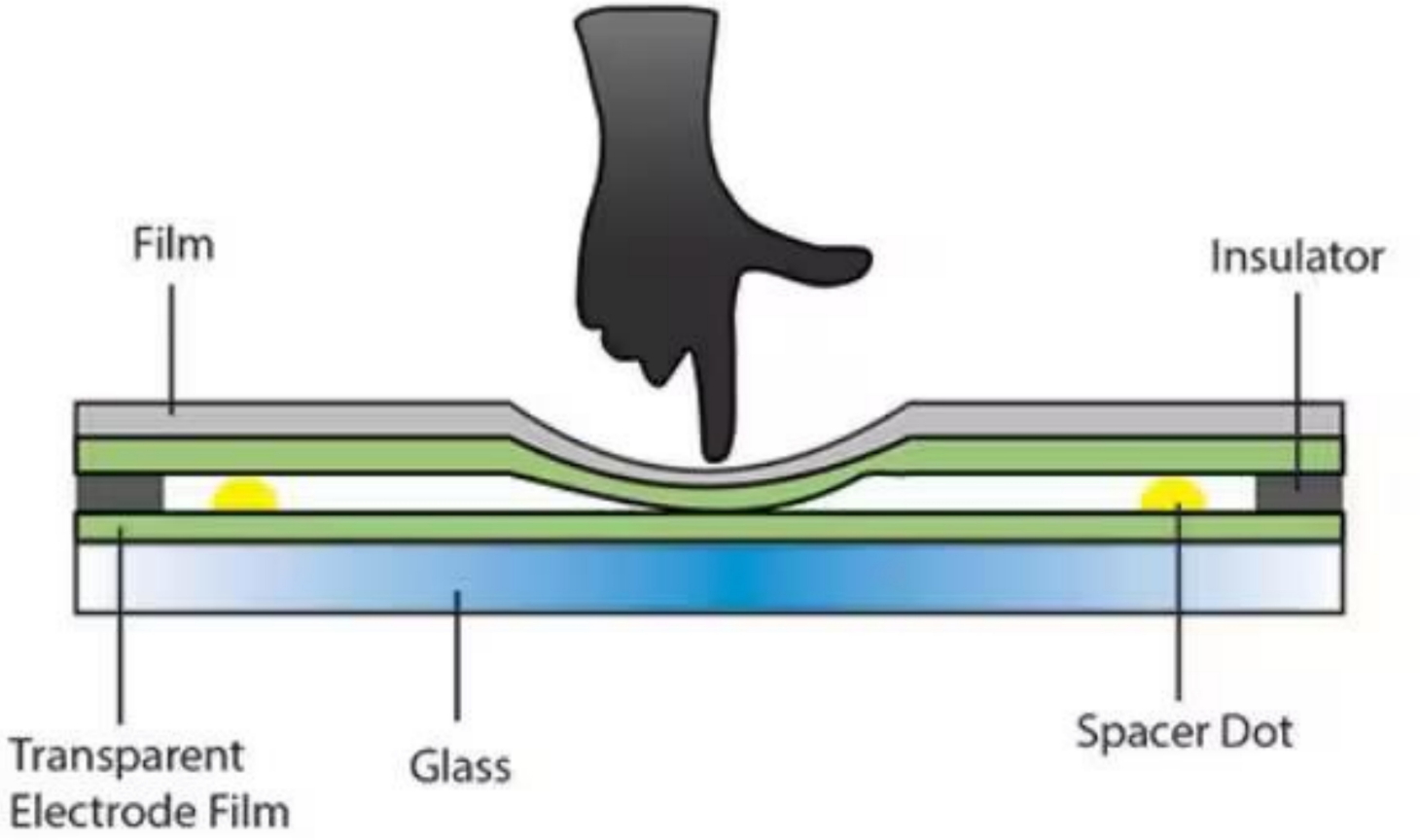


Image processing controller
Continuous re-imaging of touch profile
Changes in the electrostatic field caused by touch
Touch screen (sensor)
y
x
Controller evaluates the touch profile for the current touch point
Coordinates are returned to the operating system

- It's called **capacitive** because the technology is based on capacitive coupling that detects anything that is conductive or has a dielectric different from air. In this case, the human body (your fingers) is being used as an electrical charge conductor.
- The way it locates where your finger is on the screen is the change of local electrostatic field when your finger touches the glass of the capacitive surface. An image processing controller continuously monitors the electrostatic field (or the movement of each tiny capacitor) to find where exactly the finger touched the screen. Figure 1 shows a helpful diagram from TCI.ed on how it tracks the electrostatic field.

- The advantages of using capacitive touchscreens include a brighter and sharper image due to the glass layer, highly touch sensitive, and supportive of multi-touch functions.
- This makes it great for smartphones and why you see it on iPhones, Samsung Galaxy, and HTC phones. Some disadvantages on using this touchscreen over a resistive one is that it is dependent on the conductivity of the human body, so a person can't wear gloves (unless it has a conductive material on it). It's also more expensive, and glass is prone to breaking more often.

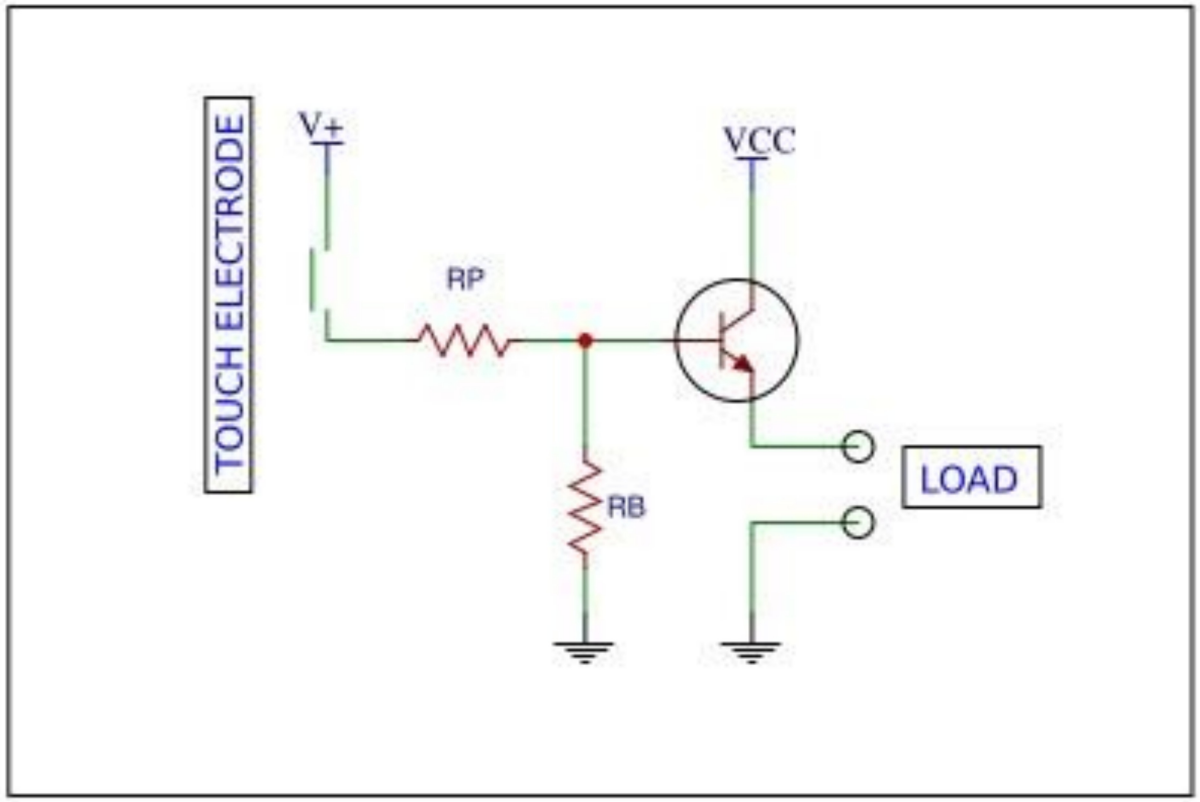
Resistive touchscreen and its layers.



- The other type of touch screen/sensor is resistive. Unlike capacitive touch sensors which have a glass layer only, resistive touch sensors have several layers, where the two main layers are the flexible plastic and glass layer.

- The front surface has a flexible scratch-resistant plastic with a coating of conductive material (usually Indium Tin Oxide) on the underside. The second layer is also coated with ITO and is made of either glass or hard plastic. When a finger (or a stylus) presses down on the flexible plastic, it contacts the second layer and measures the resistance of both the layers at wherever the point of contact was. Figure 2 shows a diagram on how it works.

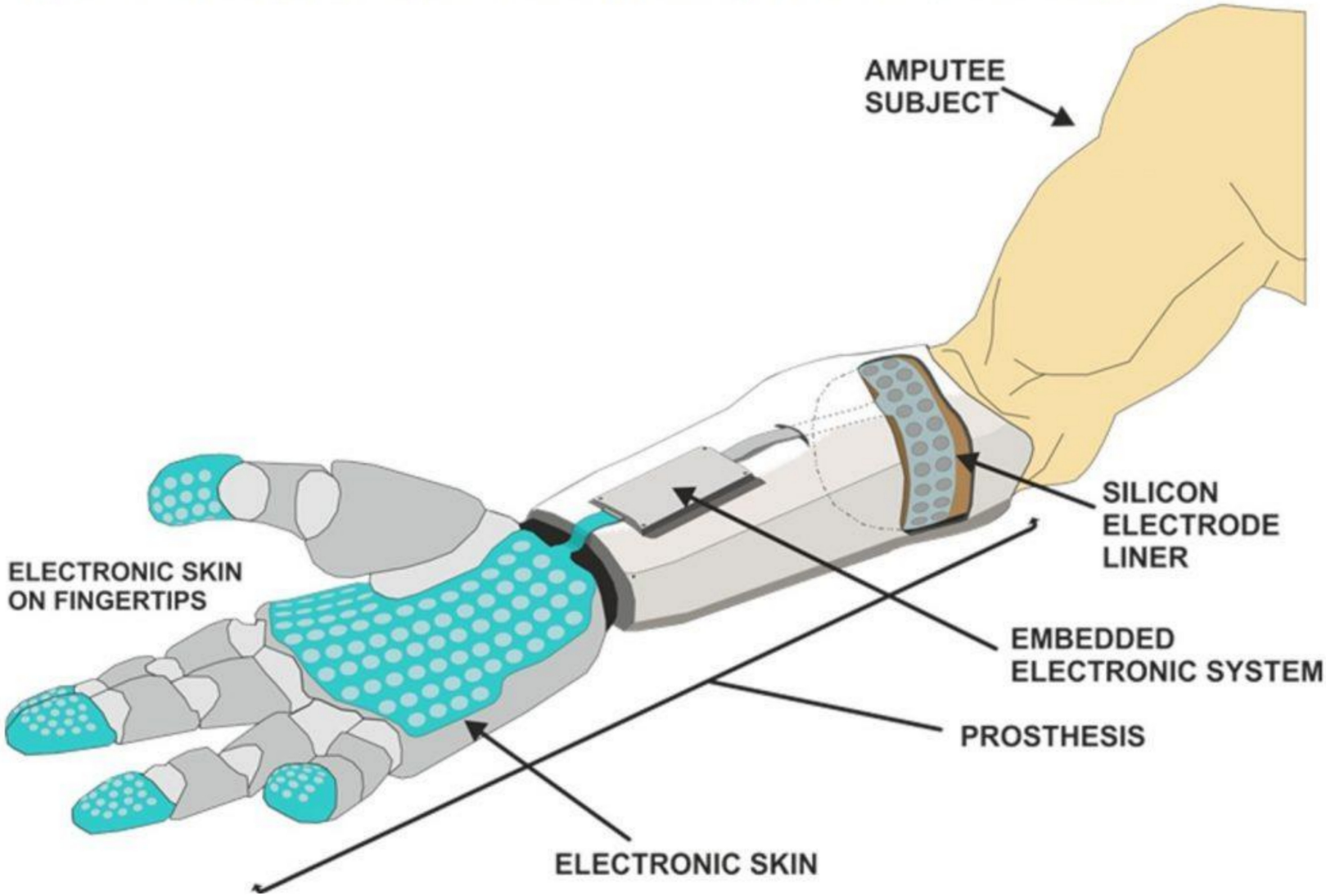
# Resistive Type



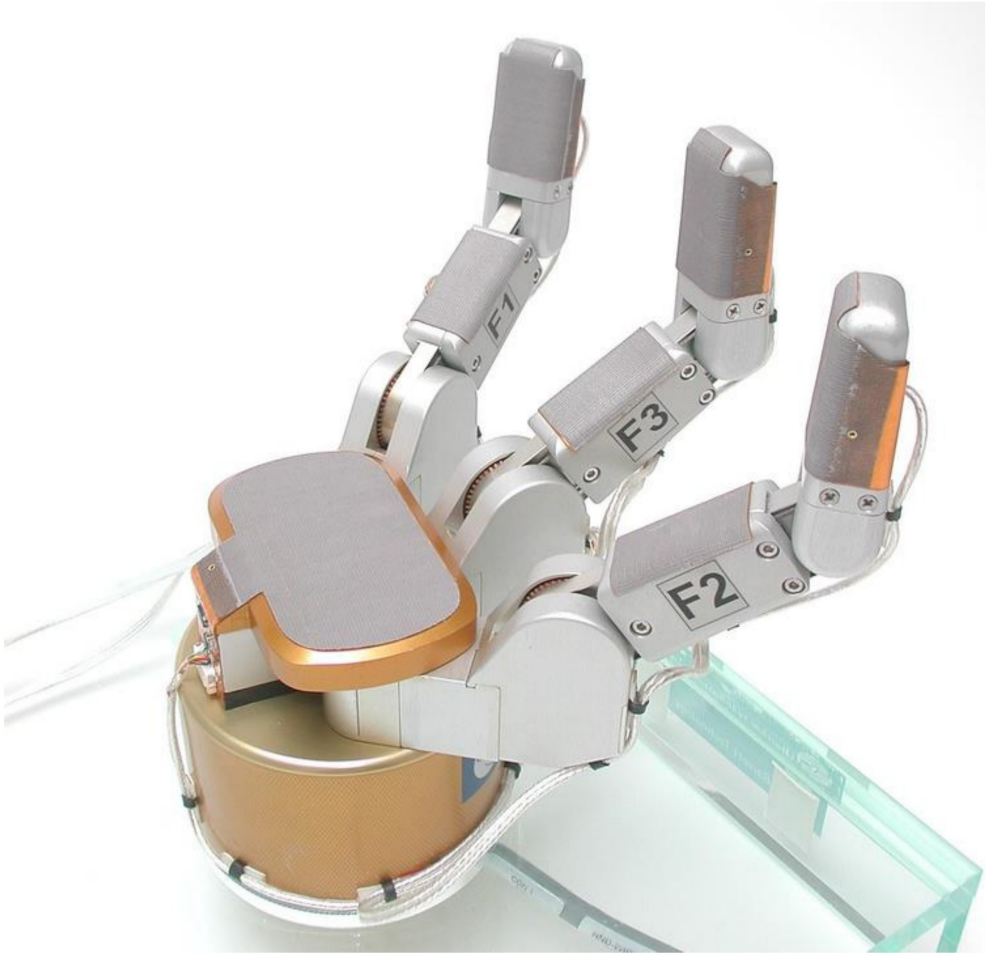

**Piezoresistive Tactile Sensor**

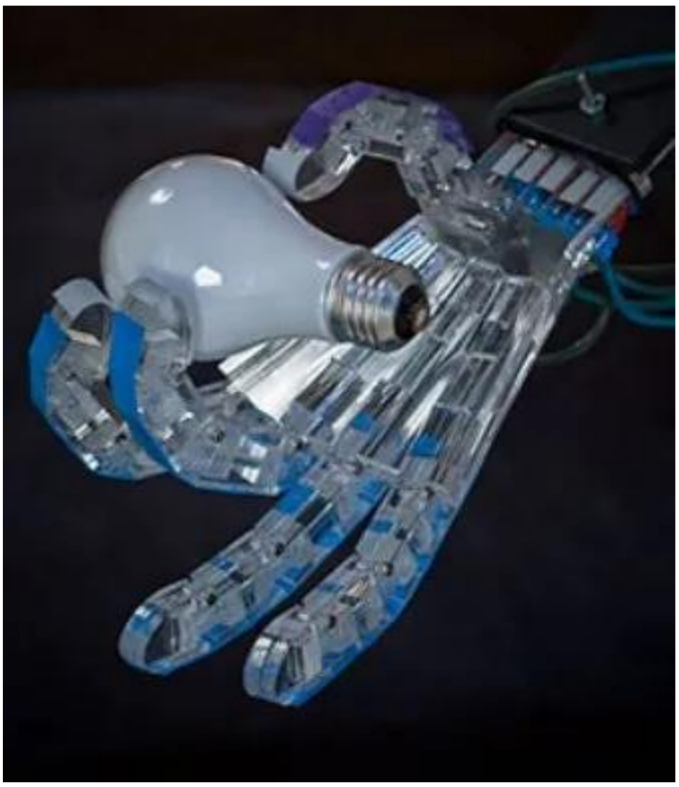
- Tactile sensors are basically distributed sensors which translate mechanical variables (e.g. pressure, strain), temperature, humidity and pain stimuli into electrical variables. Contact information is further processed and conveyed to the “brain” (human or artificial). Tactile arrays ought to be mechanically flexible (i.e. conformable to the object to be applied on) and stretchable and tactile information processing must be implemented in real time.

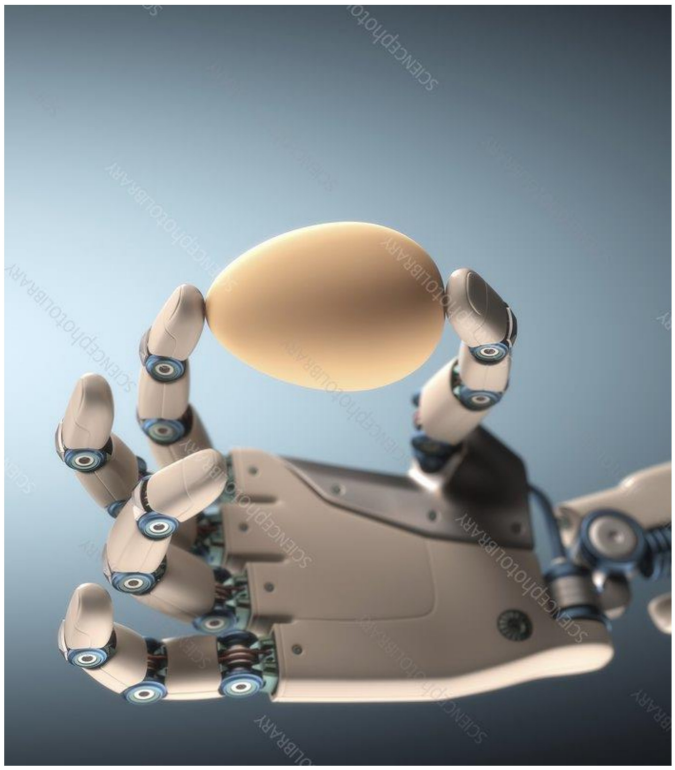
**Electronic skin on upper limb prosthesis (courtesy COSMIC lab, University of Genova)**



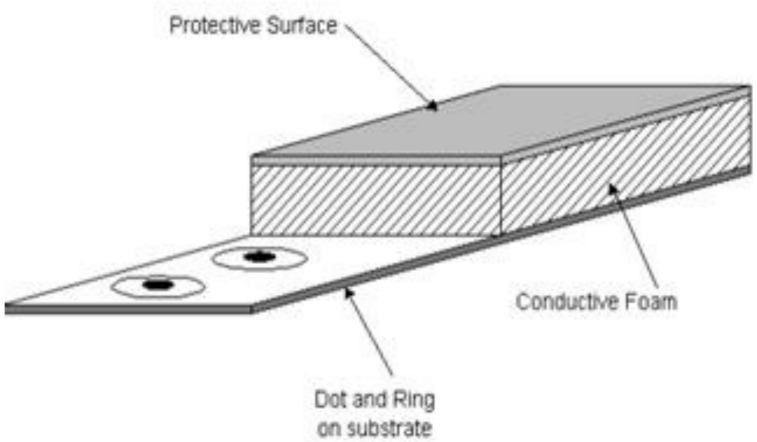
# Give robots the “Sense of Touch”.



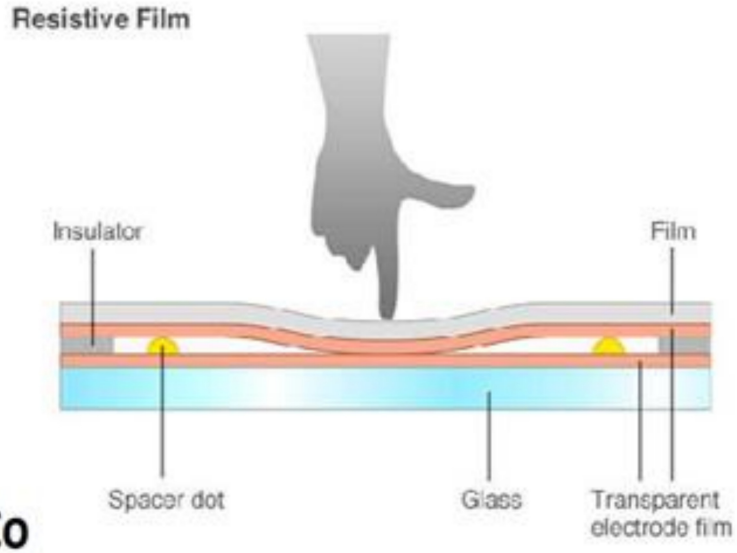




# Tactile sensor

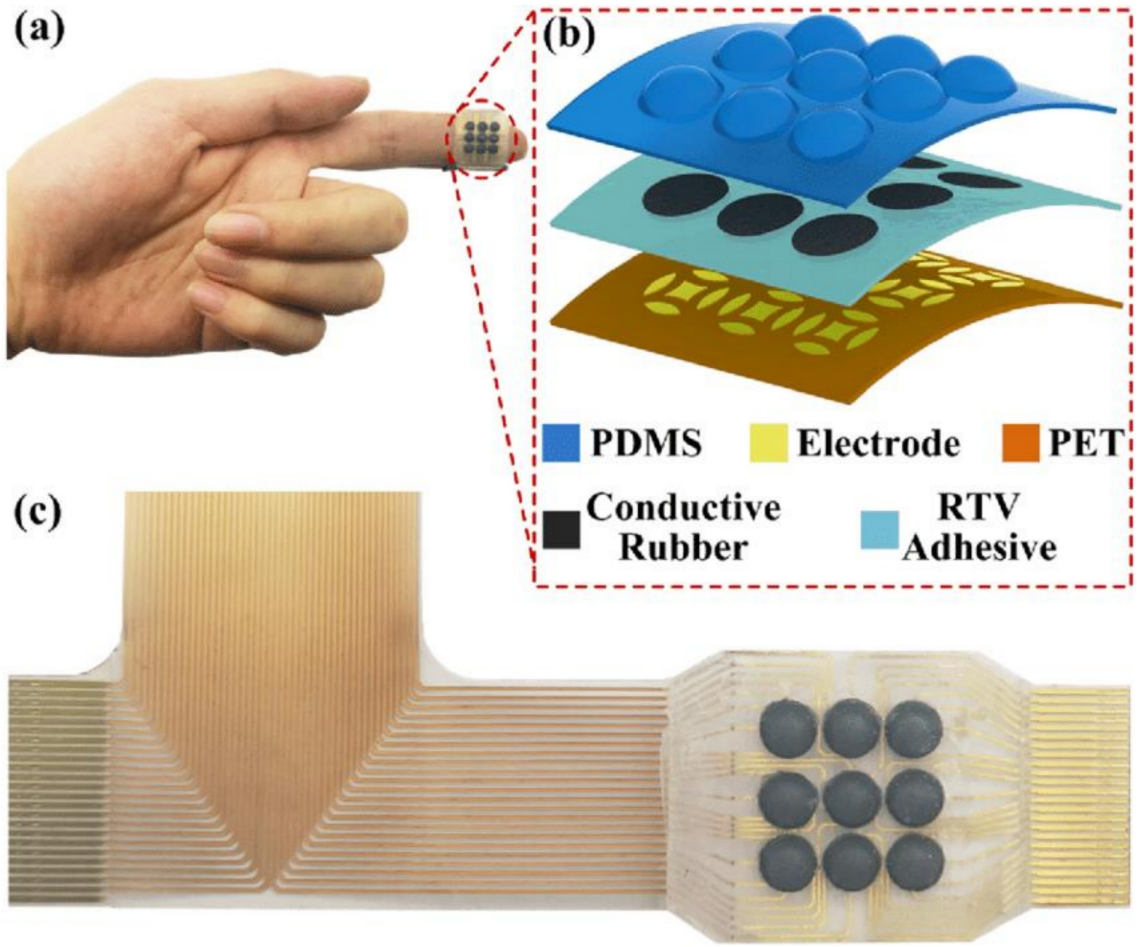


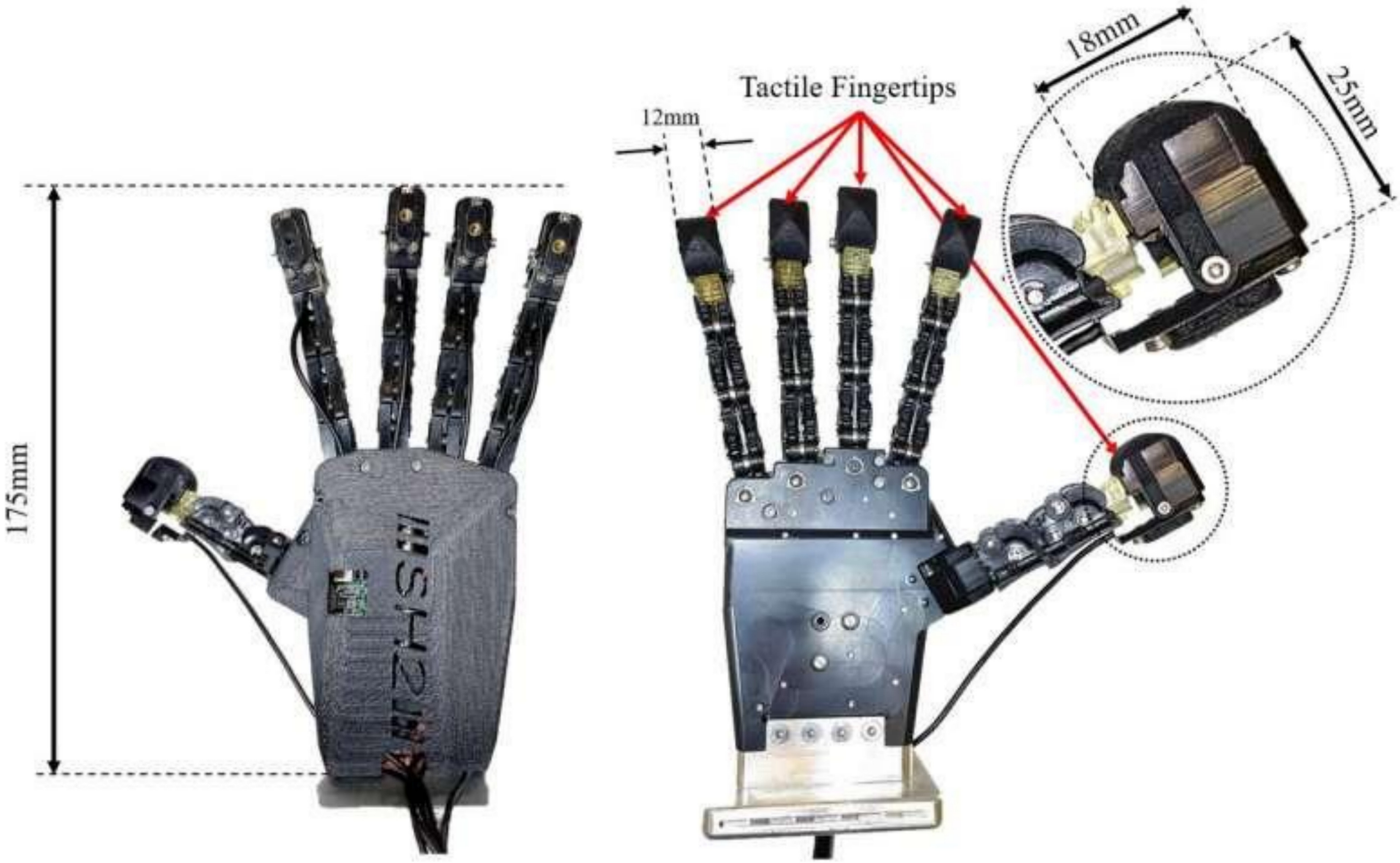

# Touch screen




ARROWHEAD

(a) and (b) Structure of the flexible tactile sensor array; (c) Fabricated tactile sensor array.




175mm
Tactile Fingertips
12mm
18mm
25mm