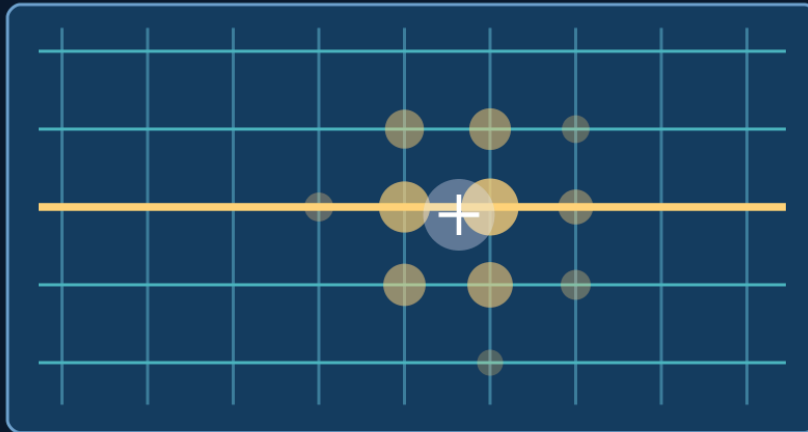


Projected capacitive: electric fields, electrodes and touch maps

Chapter 5 | Reading 1 of 3

PCAP: scan a field-change map



TX / RX nodes

Baseline → change

Qualitative field map

Illustrative mechanism • not to scale • no product performance prediction

Self-capacitance

Self-capacitance measures an electrode relative to the controller's electrical reference. A finger changes the effective coupling. The return path includes the person, equipment and surroundings; the finger does not need a wired connection to chassis ground.

A controller establishes a no-touch baseline and detects changes from it. Sensitivity depends on geometry, cover dielectric and thickness, signal processing and interference. Separate row and column measurements can create ambiguous pairings when several contacts are present. This is a limitation of that measurement arrangement, not a universal ban on self-capacitive multitouch.

The useful engineering quantity is touch signal relative to disturbances. A larger reported coordinate range cannot recover a signal buried in noise.

Projected capacitive: electric fields, electrodes and touch maps

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Mutual-capacitance scanning

Mutual sensing measures coupling between a transmit electrode and a receive electrode. Their crossing regions form an array of measurement nodes. A finger perturbs the field and changes the measured coupling. The sign and interpretation of the reported delta depend on the circuit and firmware convention.

The controller scans, removes baseline effects, identifies regions of change, estimates contact centroids and associates them between frames. A finger spans several nodes; interpolation allows coordinate increments finer than electrode pitch. It does not make the physical uncertainty vanish.

Real controllers may combine self and mutual measurements for different tasks. Our animated grid is a qualitative map, not a field solver or a vendor scan sequence.

Projected capacitive: electric fields, electrodes and touch maps

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The real stack decides

Thicker cover material and gloves change coupling; water may create additional paths, especially when it bridges to grounded structures. A controller tuned to detect weak glove signals may also become more vulnerable to disturbances. Some products use specialized sensing modes and classification to balance these needs.

Test the final cover, adhesive, display, metal bezel, heater, power supply and cable together. Change one variable at a time during troubleshooting. Compare idle and touched raw measurements across brightness levels and display patterns, then confirm application behavior.

Acceptance should specify gloves by construction and condition, water by composition and application, and success by missed touches, false touches and coordinate error.

Apply the idea

Why can a PCAP panel work on a bench and fail after installation behind thicker glass?

Discussion: The installed dielectric stack changes signal coupling; bezel and display coupling may also change. Retune and validate the assembled configuration rather than relying on the bare-panel demonstration.

References:

- S04 Microchip - [Self-capacitance](#)
- S05 Microchip - [Mutual capacitance](#)
- S06 Microchip - [Moisture tolerance](#)
- S07 Microchip - [Automotive touchscreen controllers: gloves, moisture and signal processing](#)
- S25 Microchip - [AN2934 capacitive sensor design](#)