

MICRODUL GAINS DEEPER INSIGHT INTO FINGER DETECTION SENSORS WITH CST EM STUDIO

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THE CHALLENGE: RELIABILITY OF ELECTROSTATIC PROXIMITY SENSORS IN A DIFFICULT ENVIRONMENT

Microdul produces proximity sensor chips that can be used with remote sensing plates. Changes in plate capacitance are detected by a digital auto-calibrating algorithm. An approaching human finger typically causes a switching operation. This principle is demonstrated in Figure 2. The capacitive switch can be used for many non-contact applications. The main challenge is to develop a sensor which can reliably distinguish between intentional switching operation and environmental interference.

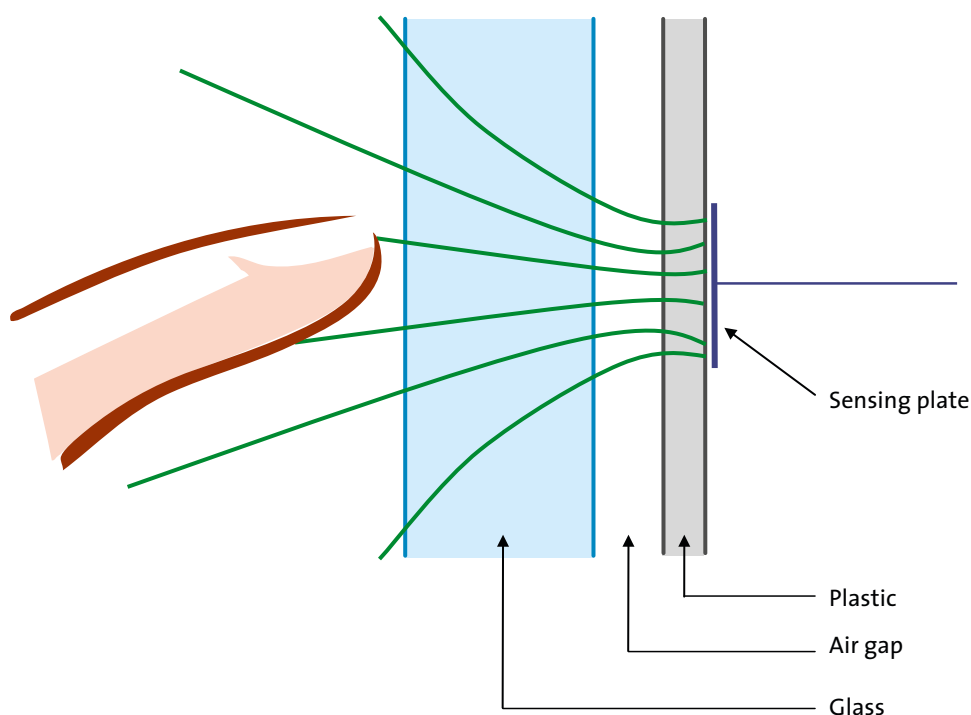


Figure 1: Finger sensor application

Microdul AG is a specialist in high quality microelectronics. Microdul has a broad range and depth of experience. Thanks to Microdul's three business lines, Module, Thick-film and Semiconductors there is a wide spectrum of choice with respect to electronic miniaturisation. Microdul's core competence is the production of cutting edge individual solutions in close cooperation with the customer.

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APPLICATION

Microdul investigated the influence of different grounding arrangements on the sensor's capacitance. Figure 2 shows a finger model placed above two sensor plates. The objective is to obtain the influence of the ground rings.

The plots of the electric potential distribution show how the field is constrained by the ground rings. This constriction is highlighted by arrows in Figure 3.

By using the integrated parameter sweep of CST EM STUDIO the capacitance can be rapidly and efficiently obtained for different values of the permittivity (ϵ_r) and the panel thickness (d_{Panel}) for configurations with and without ground rings. Figure 4 shows these results.

CST HELPS TO UNDERSTAND THE SENSOR'S ELECTROSTATIC BEHAVIOR BETTER

The main benefit gained by using the CST software is an improved understanding of the effect of design parameters on the performance of the sensing plate. CST EMS helps Microdul to support existing or potential customers more efficiently with their individual needs with proximity sensors. This deeper insight allows Microdul to provide their customers with higher quality application notes.

CST EMS' combination of accuracy and speed is the most significant advantage for Microdul. Reliable simulation results are available within a reasonable time. The software is intuitive and easy to use, since using an EM simulation tool was completely new to Microdul. All models were created in CST EMS using the powerful built-in 3D modeller with its parameterization capabilities. The "parameter sweep tool" turned out to be a very useful function since multiple simulations could be run over night to obtain results for the complete parameter space.

"CST software has definitely improved our knowledge about EM fields. With the newly obtained knowledge we can now better advise potential customers. We believe that this puts us ahead of our competitors. The CST software definitely met our expectations. The intuitively usable software is working efficiently and is stable."

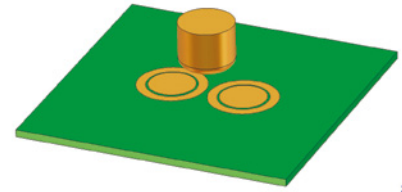


Figure 2: Finger model above sensor plates with ground rings (enclosing the sensor plates)

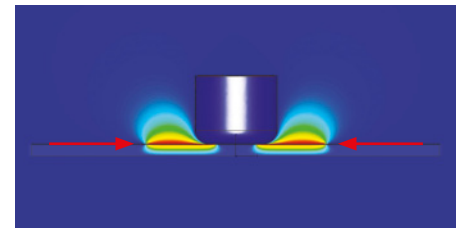


Figure 3: Double sensor plate: Electric potential distribution with ground rings

Sensor-Finger Capacitance with /without Ground Ring

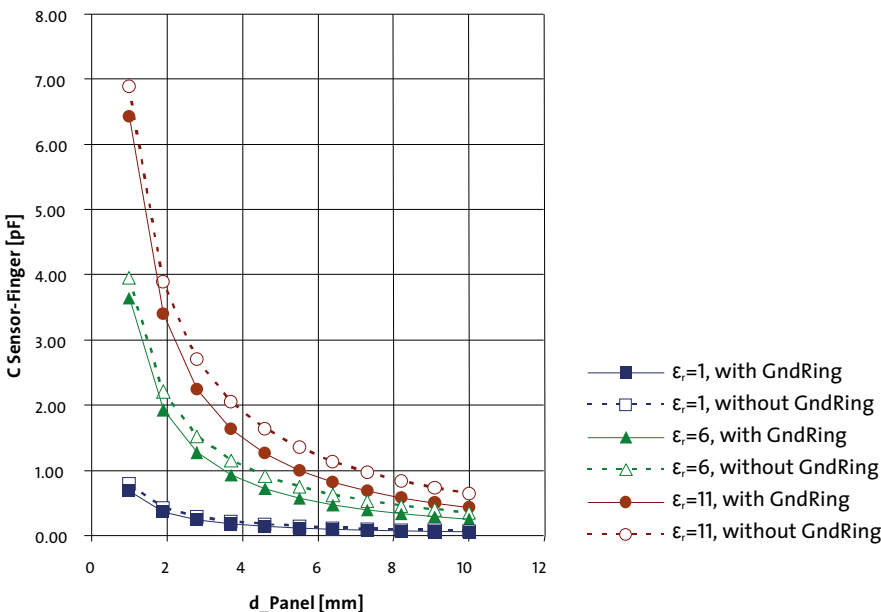


Figure 4: The sensor's capacitance is slightly higher without ground rings

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