Control Systems with CapKeys

Elegant and reliable solutions for touchscreens.

From industrial machines and medical devices to parking meters and vending machines: touchscreens are increasingly used to control these applications. Capacitive keys or in short 'CapKeys' offer extra possibilities compared to conventional touch systems.

Capacitive keys (Source SCHURTER)

In the world of control panels, capacitive touch systems have made an unstoppable advance. These elegant, user-friendly and hygienic buttons are now used in a wide range of equipment.

Simple control panels (without screen) often have single buttons, which are backlit. Technically, this type of system consists of a sensor that registers the touch and a controller chip that links an action to it. The surface is illuminated by LEDs. These single capacitive buttons are called CapKey.

Sensor

The most obvious way to build such a user interface is to mount a printed circuit board (PCB) directly behind the control panel. At the front of this PCB the touch sensors are placed and at the back are the electronic components. For the lighting, a hole is made in the panel, over which an LED is placed that radiates at the back.

See figure 1, the simple setup of a CapKey with PCB.

The disadvantage of this construction is that the homogeneity of the button lighting leaves much to be desired. Also, a hole has to be made in the touch sensor to let the light through and this can negatively influence the sensitivity.

A common solution is to mount a separate sensor foil behind the front plate. With SCHURTER a sensor circuit is printed on the foil by means of screen printing. To prevent the touch sensors on the foil from blocking the light, they are made of a transparent conductive material based on Indium Tin Oxide (ITO).

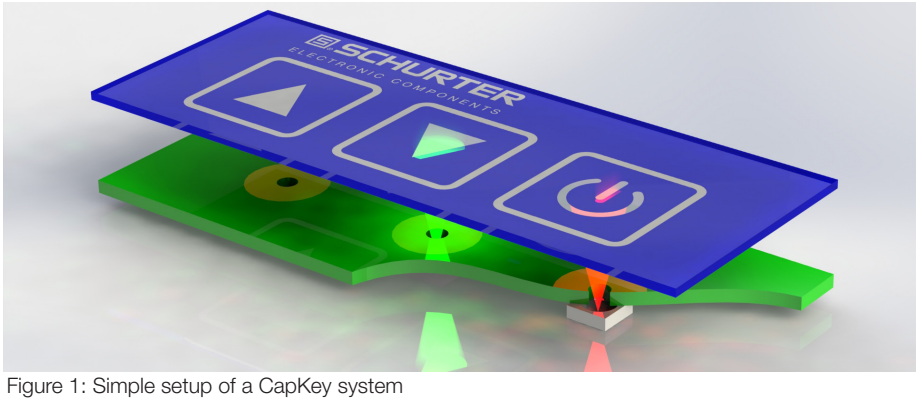

Figure 1: Simple setup of a CapKey system

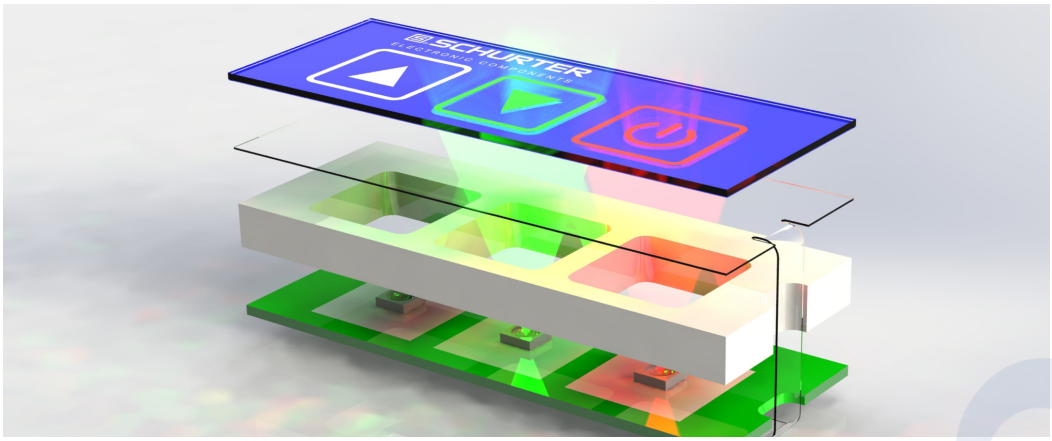

Figure 2: Setup with ITO foil

A spacer is placed between the foil and the PCB. The larger distance between the PCB and the foil ensures a more homogeneous illumination of the keys. Optionally a diffuser can be used to further even out the light. See figure 2.

The contact between the sensor and the PCB is usually made by allowing the foil to pass through further and then connecting it to the PCB in a connector. If this is not possible, spring contacts are mounted on the PCB and contact is made with a contact point on the foil, through holes in the spacer.

Depending on the field of application, the CapKey needs certain protections against unintentional touching, the so-called false touches. For example, contact with (salt) water, palm of the hand, rain or dew. Such protection is often achieved by means of a guard system around the CapKey. This requires a somewhat more complex sensor.

The CapKey and the accompanying guard can be refined thanks to computer simulations. Finite Element Method simulations are done in the electrostatic domain. This way, "what-if" scenarios are tried out very quickly, on the basis of which the design can be optimized.

Touch controller

The applied touch controllers can be divided into two groups:

- The standard touch controllers, which communicate with a host controller via a communication bus (usually I2C). After start-up, the host controller configures the touch controller once. These configuration settings are used to determine which CapKey are active, what the sensitivity is and which filter settings are used.
- The microcontrollers are able to read out the CapKey by means of software (-libraries). Some controllers have special hardware on board for this purpose, but this is not always necessary.

Depending on the application, the electrical engineer will make a choice from the different possibilities. The standard touch controllers are useful if the host controller can no longer do this work or if the already selected controller is unsuitable for touch measurement. The microcontroller is preferred if (RGB) LEDs also need to be controlled or if other functionality needs to be integrated.

Responsibility

The capacitive touch interface is often not the core business of most companies and therefore this beautiful technology remains underexposed in new products. SCHURTER has the knowledge and experience to develop a suitable sensor design with associated electronics for every application for a reliable, effective and eye-catching operation.

About SCHURTER

SCHURTER continues to be a progressive innovator and manufacturer of electronic and electrical components worldwide. Our products ensure safe and clean supply of power, while making equipment easy to use.

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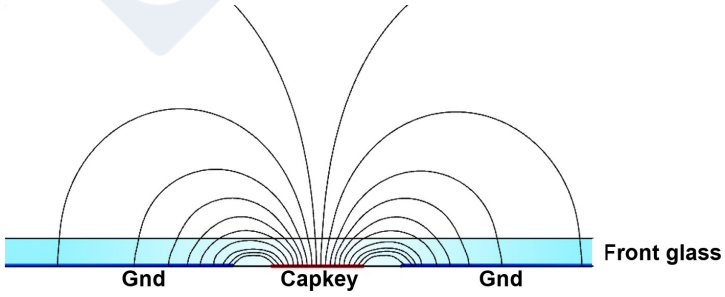

Figure 3: Simulation without touch

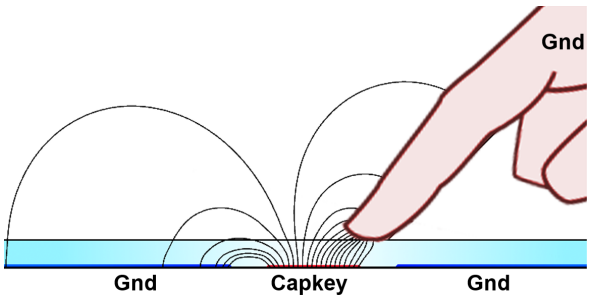

Figure 4: Simulation during a touch