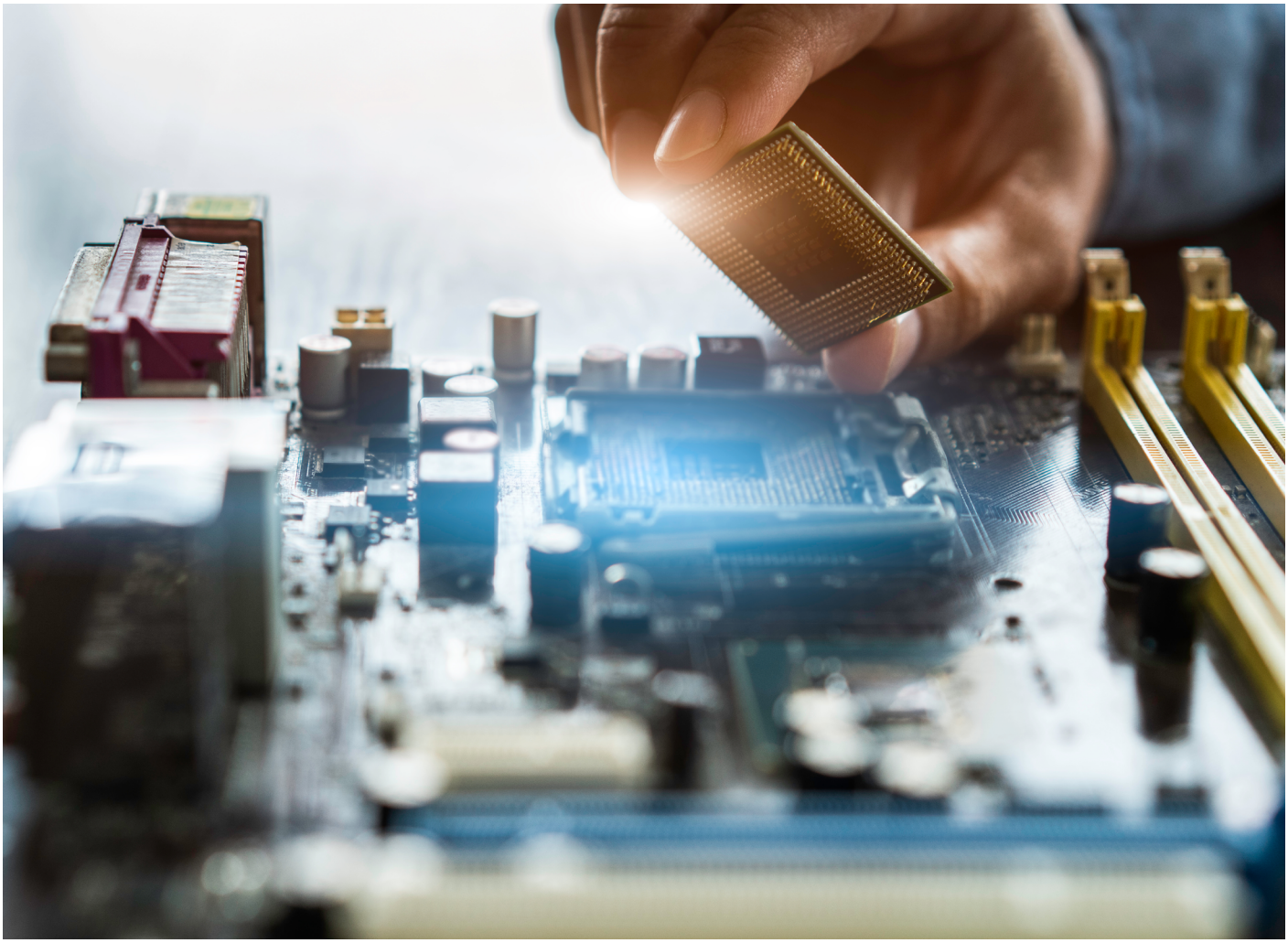
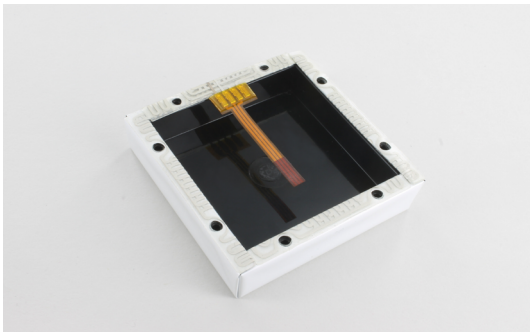
PROTECT YOUR PHYSICAL DATA USING TAMPER DETECTION SENSORS



DESIGN

TE Connectivity's (TE) tamper detection sensor is a combination of two different detection concepts. The first is the drill plate designed to detect the penetration of the enclosure by drilling or cutting. The second is a breakwire pattern, designed to protect the drill plate from any attempts to peel the sensor from the PCB or to peel the sensor apart.

The drill plate consists of a pair of conductive flood plains that are printed on a thin (0.001") layer of uniaxially-oriented long-chain polymer film. As soon as there is a penetration of the drill plate, a high impedance short will occur between the two electrodes on the PVDF film. This would be caused either by the connection of the two electrodes by the penetrating device if it is conductive or by the contact between the two electrodes if the penetrator is non-conductive. The short is easy for the electronics to detect but is difficult to remove.



SILVER INK PATTERNS ON THE PIEZO FILM PROVIDE A DOUBLE LAYER OF PROTECTION: DRILL PLATE AND BREAKWIRE

An interlaced series of breakwires consisting of a narrow conductive ink pattern is printed onto the polymer film. The breakwire pattern is designed to be fragile, so that if there is an attack the pattern is electrically opened. The film element is adhered to the enclosure with a robust adhesive. If the film element is peeled off the enclosure, the circuit will break. A small electrical current is used to monitor the continuity of the breakwire. Any subtle changes in current indicate an attack has occurred.

The tamper detection sensor offers several advantages to the user allowing for a high level of physical data protection. The normal application for sensors of this type would be small encryption modules as well as locations where sensitive electronic data is stored or used, even temporarily. An example of this is in ATMs, where the PIN and the account number are both available. Highly proprietary and confidential algorithms or other intellectual property that is in a digital form is another example. Tampering or unauthorized access to this information could cause irreparable harm. The tamper detection sensor provides a high level of protection which would be difficult to defeat with either an analytical or random attack. The sensor has ultra-low power requirements for the circuit, making it ideal for battery operated applications. It is also designed to defeat a wide variety of attack modes, including drilling, cutting, laser, chemical and disassembly. The sensor is volumetrically efficient, using only a small volume for high levels of protection. It can be formed into almost any enclosure with no entry points and is easy to apply. Working closely with the customer, TE can design an enclosure that will meet their specific requirements. TE can even install the tamper detection sensor into the enclosure, with the end customer adding the PCB in their facility at the end of the production process.

APPLICATION

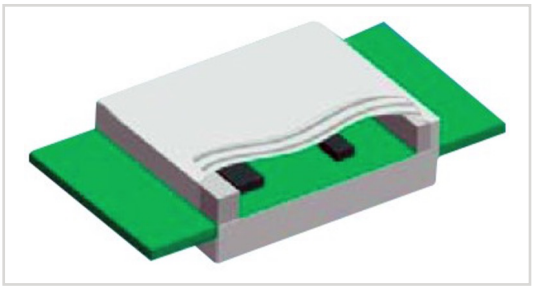
TE's tamper detection sensors have been successfully integrated into systems achieving up to FIPS 140-2 Level 4 certification. The completed sensor can be used in different manners and in different embodiments. The film element is thin and flexible, and it can be folded and shaped into complex shapes and patterns. All sensors are custom designed and manufactured for the specific application.

The tamper detection sensor is attached to the PC board around the perimeter using a robust adhesive that is an integral part of the sensor. Electrical connection to the board can be done in a variety of options including z-axis conductive tape or flexible circuit leads. The sensor is rated for operation up to 100°C.

FEATURES

A single custom designed tamper detection sensor element can be wrapped around the board so that it covers all six sides. Small, protected openings can be designed to accommodate connectors. Any attempt to drill or cut into the housing will be detected. Also, any attempt to breach the housing by prying or tearing it apart will be detected.

Variations of these can be designed based on individual requirements. It is possible to print sections of one sheet of film with both the drill plate and breakwire sensors. Plated Through Holes (PTH) can be created on the sensors, allowing for added complexity by moving the breakwire from one side of the film to the other. Multiple breakwires can be added, either in different areas or by adding a complete additional polymer layer.



TAMPER DETECTION SENSORS CAN WRAP AROUND THE SECURE PCB TO PROTECT ALL SIX SIDES.

ELECTRICAL CONNECTION

There are several different circuit configurations and connection methods to the circuit board, as well as algorithms, for identifying a tamper event. The sensor most commonly utilizes a 5, 6, or 8-pin connection typically done via a small tail coming off the film, made either of the polymer film with screen-printed traces, or with an interconnect to a section of flex circuit material to facilitate being able to solder connections to the PCB. A low profile ZIF (Zero Insertion Force) connector can also be used, either with a tail on the polymer film or with the flex circuit material. Standard low profile 0.100" OC pins and connectors can also be designed in, depending on the space constraints that the design imposes. Z-axis conductive tape and silver filled epoxy can be used as well. Both options allow for the tamper detection sensor to be completely folded around the board prior to making the lead attachment. They are very thin, adding only minimal thickness to the overall sensor. Additionally, they provide tamper detection in that if that section is peeled off, then the contact to the circuit will be broken.

OPERATION

Monitoring the tamper detection sensor is quite simple, but also versatile, with individualized monitoring of up to 10 unique circuits within a single sensor. The drill plates are a normally open circuit that becomes closed (high impedance short) when attacked and penetrated. The breakwire conductors are a normally closed circuit that becomes open when attacked and a breakwire is broken. Fairly simple electronics will reliably monitor these two functions and provide the necessary signals for the rest of the circuit.

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