



A nanotechnology development has taken place that will arguably revolutionise the electronics industry. Liquid semiconductors are creating new markets for displays, sensors, solar cells and even integrated circuits and will eventually replace silicon-based semiconductors in a wide range of applications. Thanks to rapid injection moulding services provided by Protomold®, Nanoident AG has already stolen-a-march on the competition.

Nanoident Technologies AG, based in Linz, Austria, is the acknowledged leader in the development and production of printed semiconductor-based sensors and was the world's first company to commercialise printed sensor products for high volume applications.

Thanks to inks made from conductive and semi-conductive liquid materials, it's possible to print electronic circuits on almost any surface using state-of-the-art printing systems. This enables a dramatic increase in productivity and a corresponding decrease in production time and device costs – arguably representing the first paradigm shift (since Intel invented the metal oxide semiconductor in 1962) in the semiconductor industry.

Production and testing of these organic semiconductor devices takes place at Linz. The devices are printed on glass slides and scrutinised after the printing process.

The future is nano

Nanoident Technologies AG

“Our initial attempts to interconnect the glass devices with automated test systems were cumbersome,” states Jeff Graw, the man responsible for electronics development. “We tried things like gluing ribbon cable to the glass and utilising ‘bed-of-nails’ spring contacts. Then we decided to use a new, two-axis connector device that we could fix to glass and obtain a reliable contact. However, we needed a plastic housing to hold the connector – it wouldn’t just sit on the glass by itself.”

The two-piece plastic housing had some demanding requirements. Firstly the two halves had to fit together

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perfectly, so that over-screwing the fastener wouldn’t crack the glass. Also the contacts on the glass slide had to line-up precisely with the contacts on the connector.



“By trade I’m an electrical engineer and I had never done anything like this before,” admits Mr Graw. “I started by laying-out the plastic parts using SolidWorks. It seemed to make sense but I knew the test would be in the manufacture. I found Protomold on the internet and submitted my SolidWorks 3D model via

Protomold’s website. Within a couple of hours a ProtoQuote® price and manufacturing quotation for tooling and parts arrived in my e-mail inbox.”

The ProtoQuote cost and manufacturability quotation system is, primarily, a summary of potential problems with the part, explained in a clear, simple and non-technical way, incorporating suggested changes and, if necessary, redesigns. One of the main benefits of the ProtoQuote system is that it simplifies and demystifies injection-moulding for everyone involved in the product development project and takes a lot of the

guesswork out of the process.

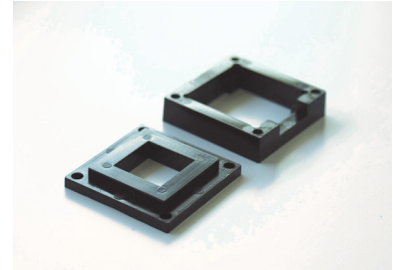
As well as tight tolerance requirements the plastic housing also needed to be static-charge dissipative, yet not conductive enough to generate an electrical short-circuit.

“Protomold did an excellent job regarding the material,” he says. “Not only does the housing fit together perfectly, we have also tested the component for dissipation and so far, so good.”

Protomold was able to talk Mr. Graw through the process of adding a draft angle to his design for injection moulding purposes, despite his lack of design experience.

“The team at Protomold were great to work with,” he says. “Within two weeks the first batch of 100 samples were received in Austria. When I saw them I was amazed to see they had produced an exact replica

of my design. As I say, mechanical design is new to me and it’s a weird thing to have someone make a real product from a CAD model. I would feel very confident about using Protomold on future projects.”



The Protomold-supplied connector housings are currently undergoing accelerated life testing at Nanoident, which mostly means spending several months inside an oven.

“So far they are holding up well,” says Mr Graw. “They look good and there is no warping or cracking on the plastic part. We are definitely going to need more, so Protomold can expect another order shortly.”

The success of the work taking place at Nanoident is there for all to see. Established in 2004, the Austrian company already has subsidiaries in the US, France, and has just added a location in Germany.

Nanoident’s printed semiconductor devices are bendable, disposable, light and ultra thin, have application specific spectral properties, and can contain light sources and light detectors as well as electronic circuits. Based on permanent improvements to its industry-leading Semiconductor 2.0 technology platform, the company is well on course to become the dominant player in the printed semiconductor market.