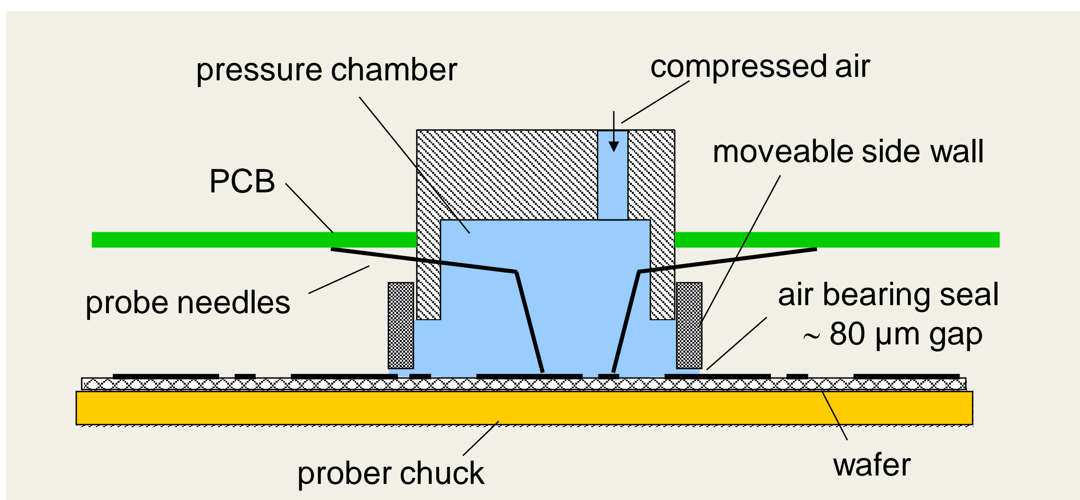
# High Voltage – High Current
# Probe Cards for Power Semiconductors

Wafer test of power semiconductor poses some quite specific challenges as test currents of more than 1000 Amps and test voltages exceeding 10 Kilovolts.
Well proven for "classical" devices fabricated in Silicon technology, as examples being rectifier diodes, IGBTs and Power MOSFETS, T.I.P.S.' patented high voltage arc suppression technology provide spark-free probing for devices made in Si, SiC and GaN technology with their inherent capability for smaller chip sizes and risk of sparking during wafer test.

Both for high volume mass production as well as the early lab test stages of chip development, T.I.P.S. provides turnkey probe card solutions here.

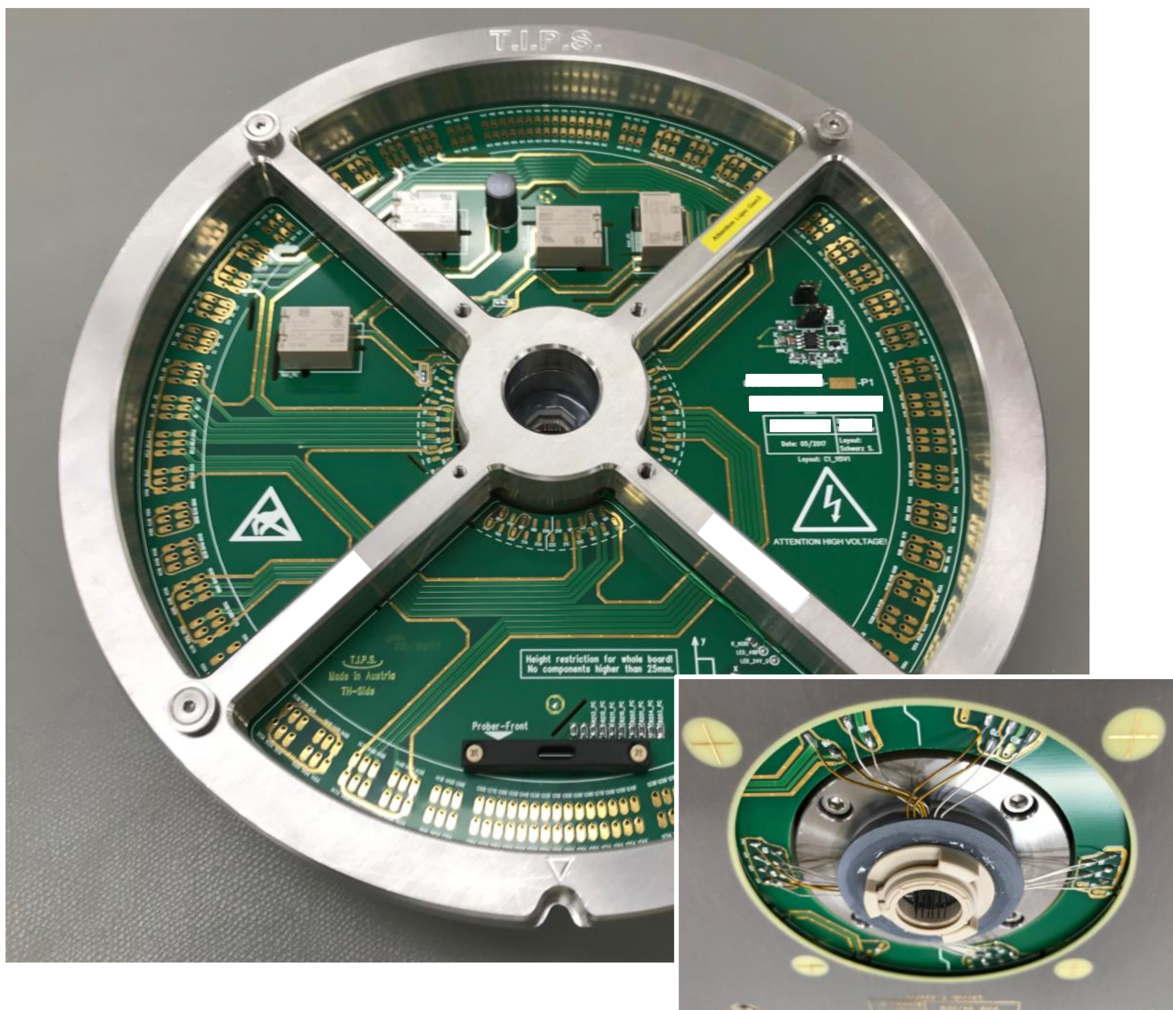
- **High Voltage "LuPo" Probe Card:** a chip-scale pressure chamber allows for testing under compressed air atmosphere to avoid high voltage flashovers at wafer test. This pressure chamber can be paired with either well-proven cantilever probes or vertical probes head (for special applications) suitable for both High Voltage and High Current test as well as for dynamic switching applications.




Principle setup for T.I.P.S. High Voltage "LuPo" Probe Cards

# "LuPo" ABS Probe Card for Production Test

A chip-scale pressure chamber allows for testing under compressed air atmosphere to avoid high voltage flashovers at wafer test. The chamber seal towards the wafer is of "non-touch" design towards the wafer surface. An air bearing structure on the pressure chamber seal facing the wafer surface keeps the chamber seal hovering at a self-regulating gap distance of approx. 50 µm above the wafer surface – ABS = Air Bearing Seal. The alignment of the seal to the probe card is automatic and self-regulating – the probe card is designed to be used in conventional automated wafer probers. This technology is employed in production test at major semiconductor suppliers since 20 years – now available in its latest version "Gen3" employing an optimized "dynamic" air bearing design catered for both low pressure (Silicon devices) and high pressure (SiC, GaN) applications.

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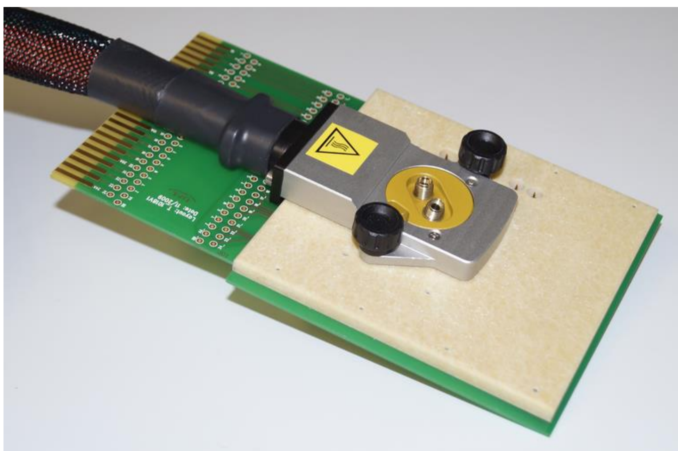
# "LuPo" Probe Card for High Temperature – High Voltage Test

For high temperature / high voltage probing applications significant cooling of the device under test might occur when probing is performed with a probe card supplied with compressed air at ambient temperature – thus significantly degrading the accuracy of a high temperature test. The "LuPo HT" probe card allows for a hot compressed air supply with an air temperature being equivalent to the wafer chuck temperature – up to 150 °C. This type of probe card is to be combined with a compact fully automatic heater unit (LMH 150) that automatically regulates temperatures of the compressed air supply to the probe card. A patented hot/cold air stream technology cools the probe card temperatures to a safe low level and keeps only the core of the probe card at temperature (pressure chamber and probes). "LuPo HT" Probe Cards are suitable both for production test and analytical probing.



7 kV, 100 A, 150 °C probe card with LMH150 compressed air heater unit

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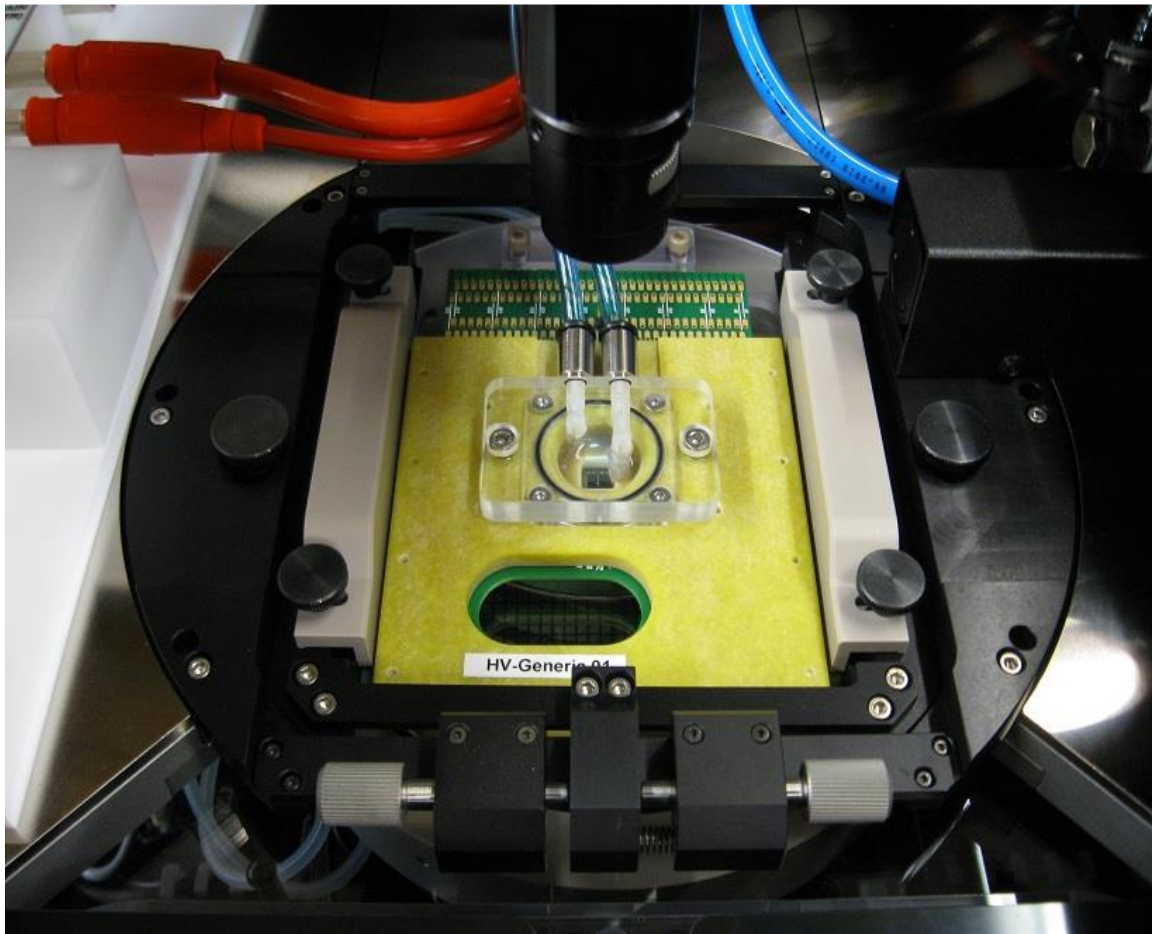
# "LuPo" Probe Card for Analytical Probing

A special version of the chip-scale pressure chamber allows for testing under compressed  air atmosphere to avoid high voltage flashovers at wafer test. The pressure chamber seal towards the wafer surface is designed to minimize compressed air consumption with a non-floating seal that is self-aligning with the wafer surface when contacting the wafer with the probe needles. This configuration leads to low compressed air consumtion, low noise levels and minimizes cooling of the wafer surface when performing hot tests. This type of probe card can be used on both manual probe stations as well as on automated wafer probers. Due to the non-floating pressure chamber seal this type of probe card is not recommended for production probing.



TIPS HV probe card set up on analytical probe station

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