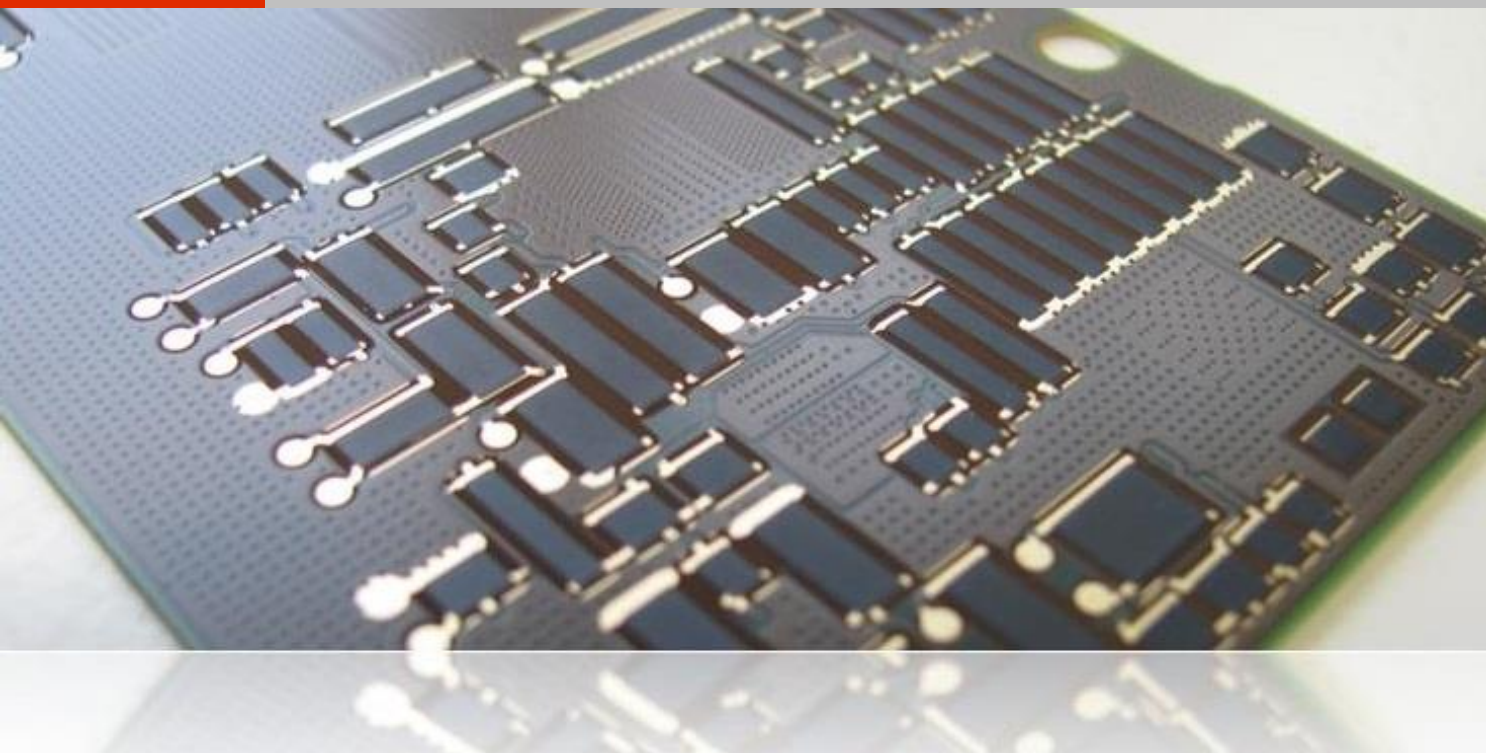


Printed Polymer

An alternative to the SMD assembly



Content & Speaker

Printed Polymer

- **Opportunities of the technology**
- **Benefits to your products**
- **Impacts on the layout**
- **Differences to SMD**

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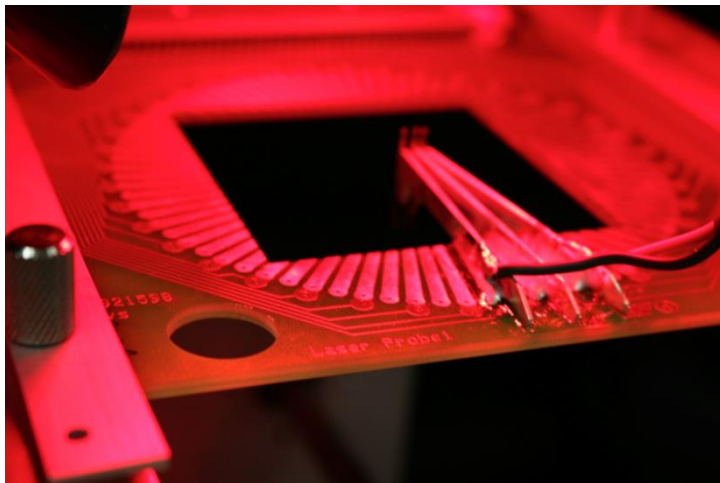
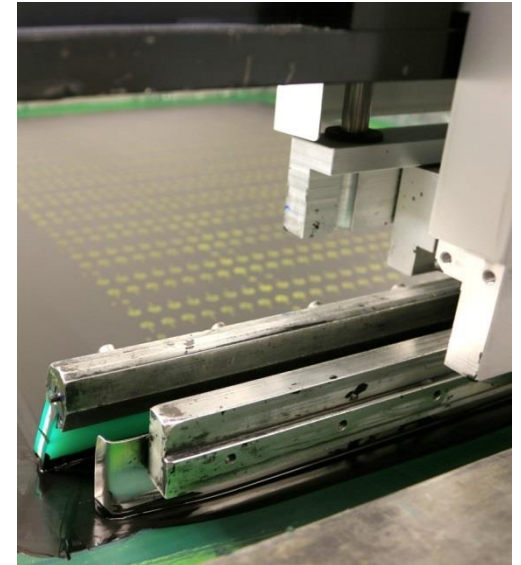
matthias.raab@we-online.de

Team address:

CBT-DE-Schopfheim-TP@we-online.com

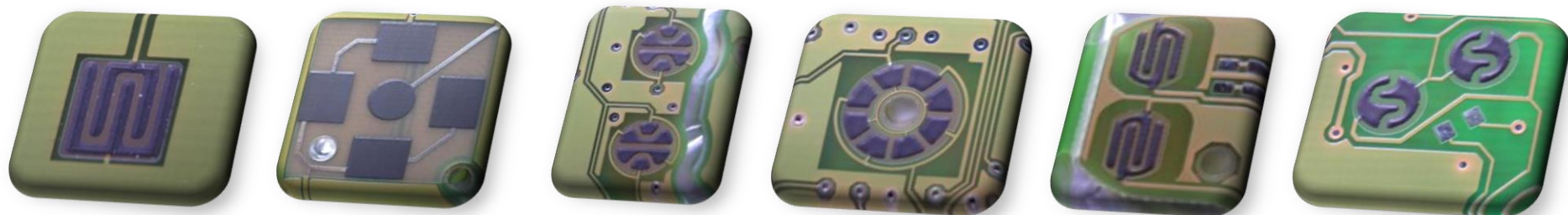
Technology

- polymeric conductive inks applied by screen printing
- full automatic production line
- curing in an infrared continuous furnace
- trimming of the resistors by laser



Keypads

- The print is used as passivation of the copper to prevent it from oxidation and has a constant contact resistance over the lifetime
- The contact resistance is influenced by the material and the contact-pressure and is normally $< 20 \Omega$
- Keypads are used in combination with conductive-rubber-mats or metal contact-springs. Two areas with a different electrical potential are shorted
- several million cycles of operations without problems

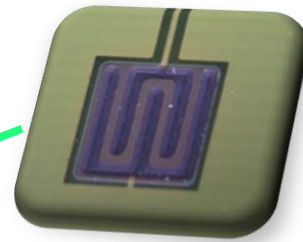


Keypads

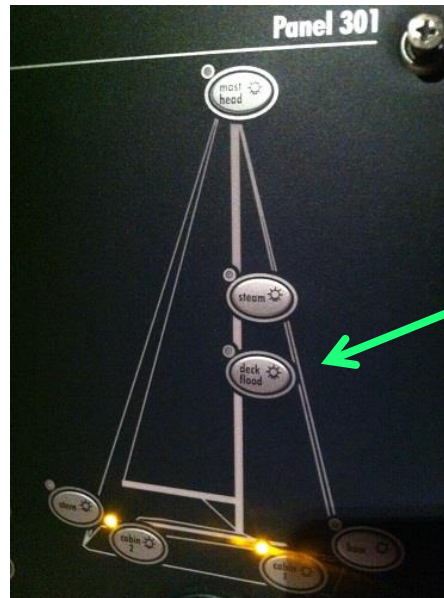
sample applications



Cash Terminal



remote controller



control panel on a sailing yacht

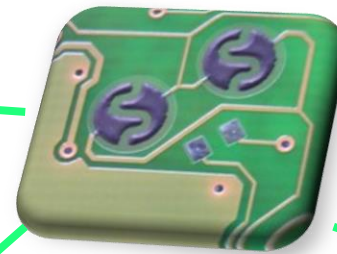


Keypads

sample applications



fog light switches in a car



car key

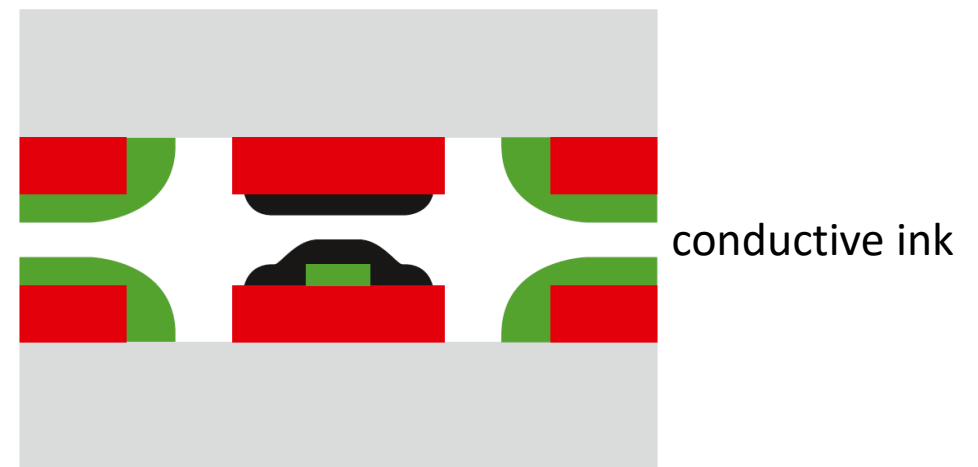
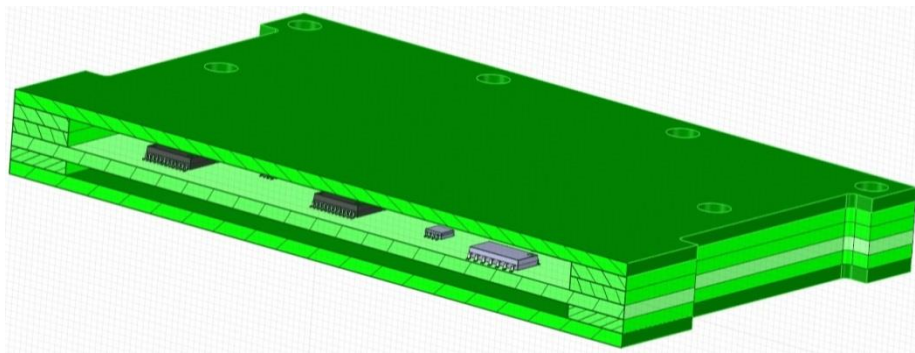
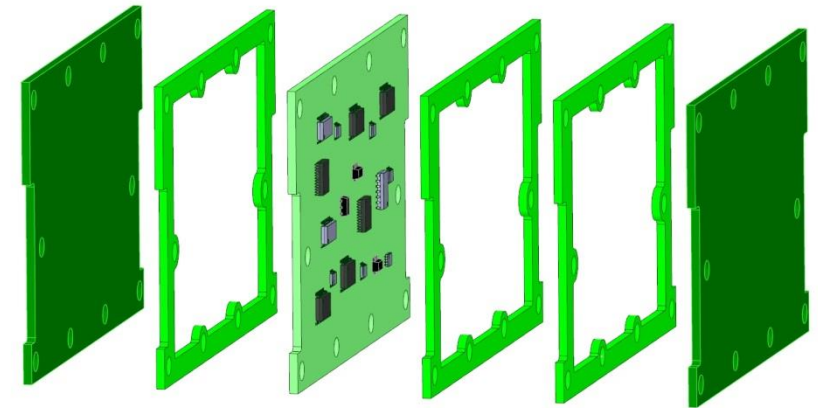
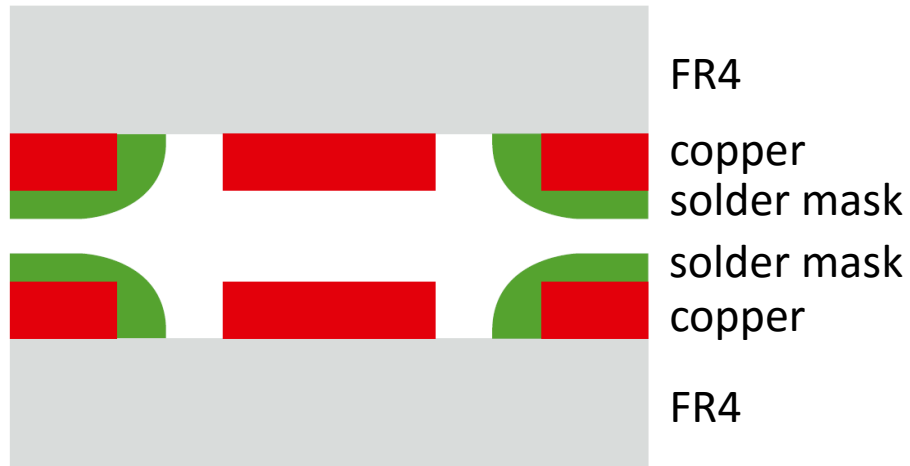


door console



overhead console

Keypads as pcb connector



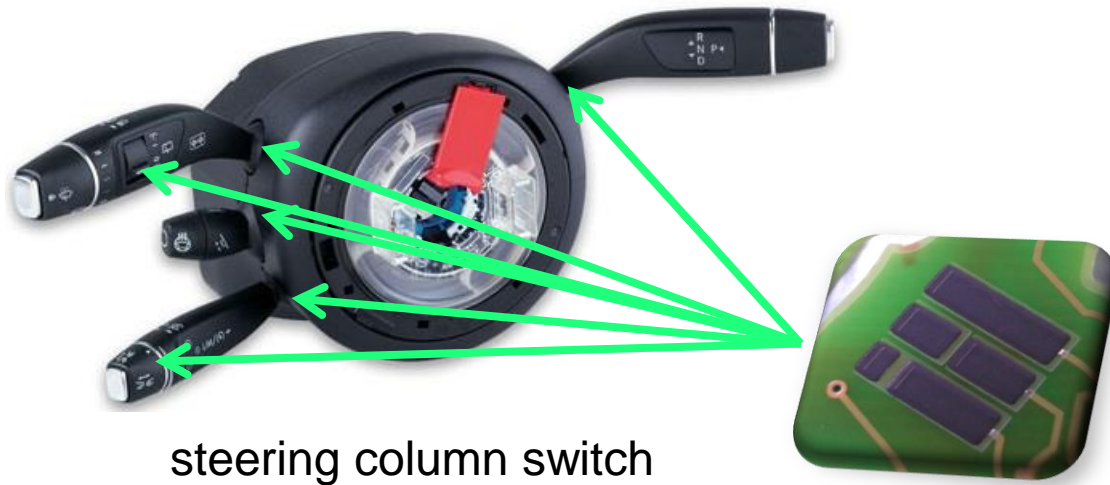
Switches

- The print is used for passivation of the copper and achieves a constant contact-resistance over the lifetime
- Switches are used with sliding-contacts. Two contact-areas of different electrical potentials are shorted by the slider
- The copper-areas have to be fully covered
- The contact-resistance is influenced by the contact material and the contact-pressure and is normally $<20 \Omega$
- up to 200.000 cycles of operations with standard wiper



Switches

sample applications



steering column switch



headlight switch



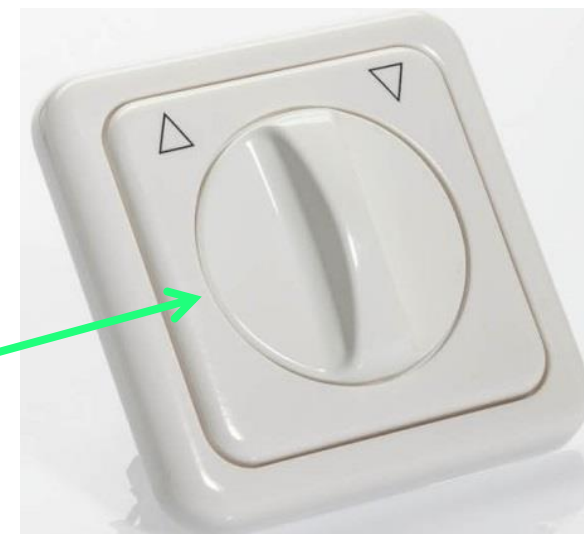
climate control unit

Switches

sample applications



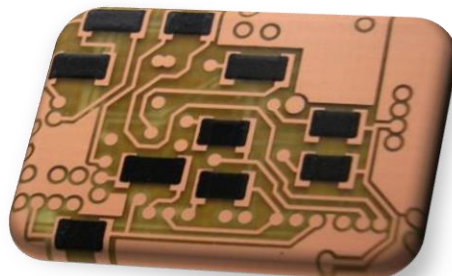
selector switch for washing machine



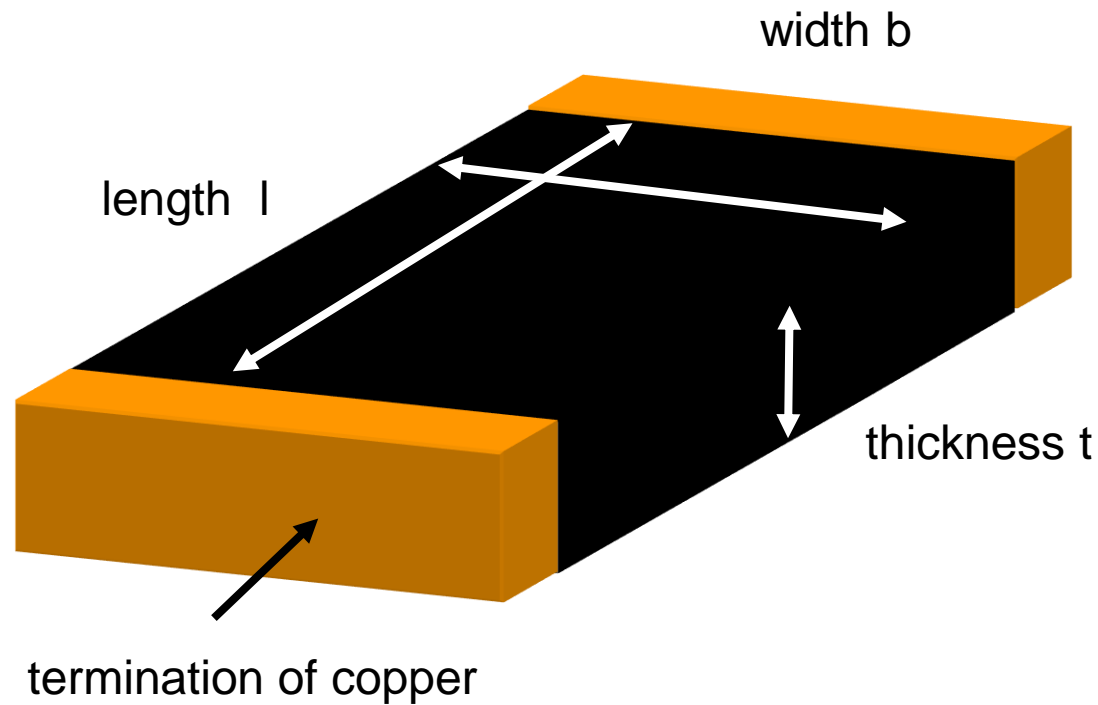
direction switch

Resistors

- Can be printed on inner and outer layer
- They are perfect for use as pull up-/down- and/or terminal-resistors
- The tolerance for the not trimmed resistors is $<+/- 30\%$
- Trimmed resistors have a typical tolerance of $+/- 5\%$
- The resistance of the inks (inkresistance) we use is defined in Ω/\square
- We use inks from $10 \Omega/\square$ to $100 \text{ k}\Omega/\square$
- The thickness for the resistors is $20 \mu\text{m}$ in standard
- Till today resistors from 10Ω up to $1 \text{ G}\Omega$ were realised



Calculation

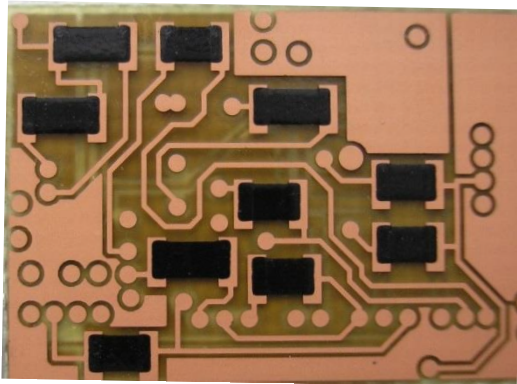


$$\text{resistance } R = \frac{\text{length } l}{\text{width } b} \times \text{inkresistance } \rho$$

The thickness could be ignored because we print as thick as the ink is calibrated

Resistors

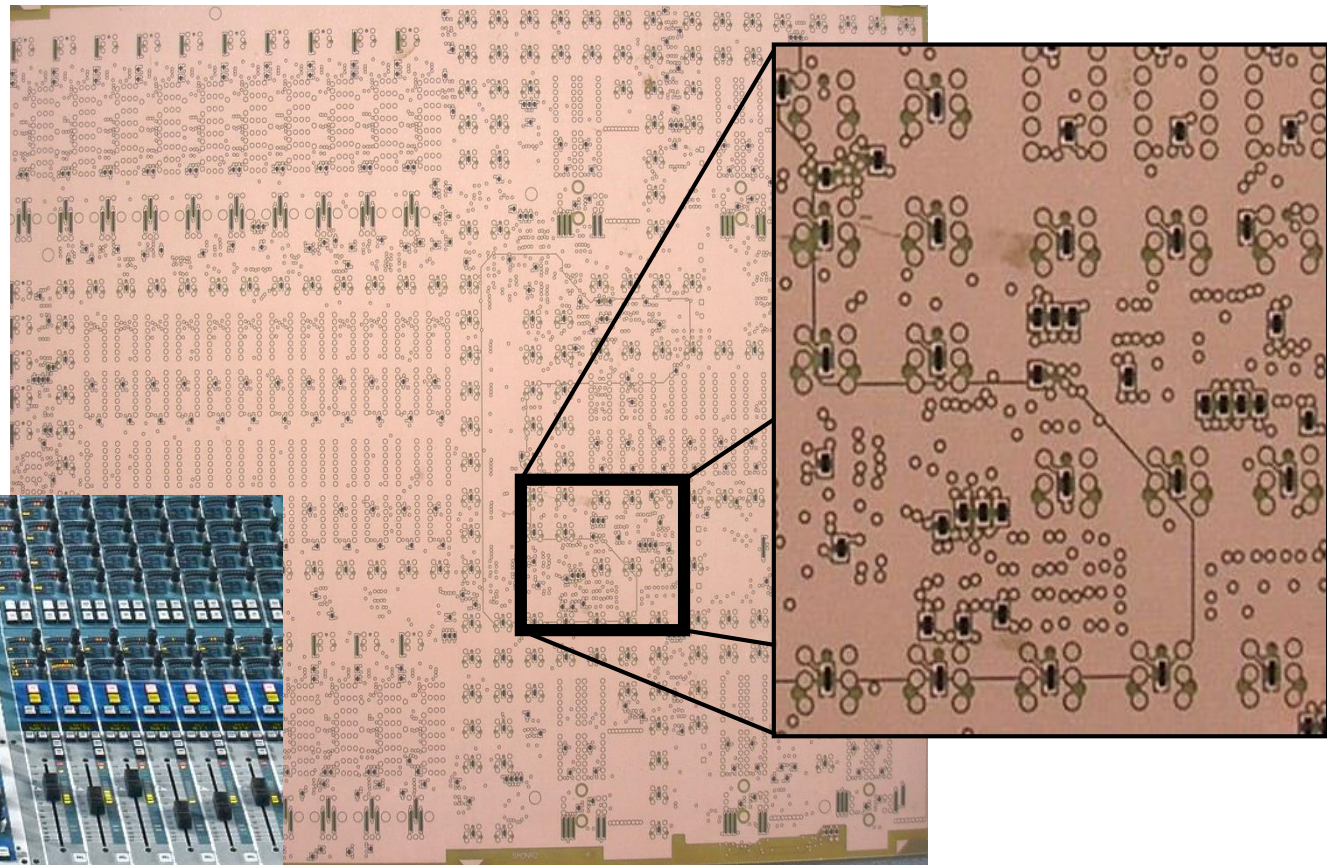
on inner layer



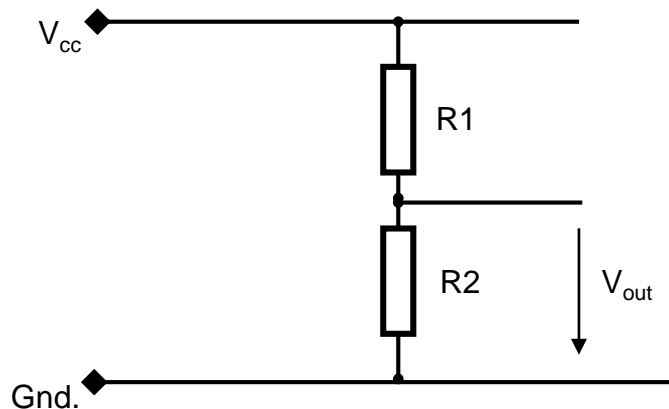
- 6-layer PCB
- 10 resistors
- 3 different values



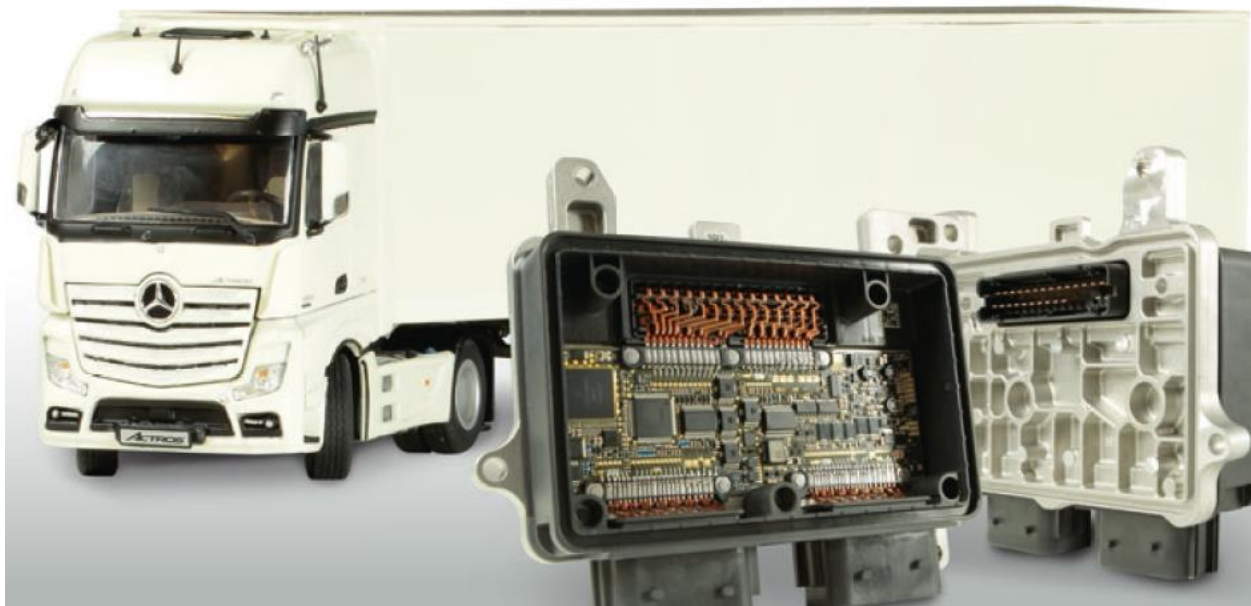
- 8-layer PCB
- 940 resistors
- 5 different values



Voltage divider



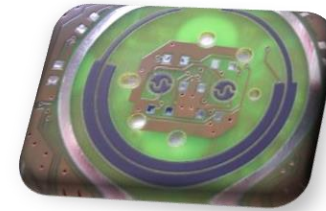
- big range for the resistance value
- Constant ratio because of self compensation
- $< \pm 3\%$ accuracy for the ratio by laser trimming



Potentiometer



joystick



climate control unit

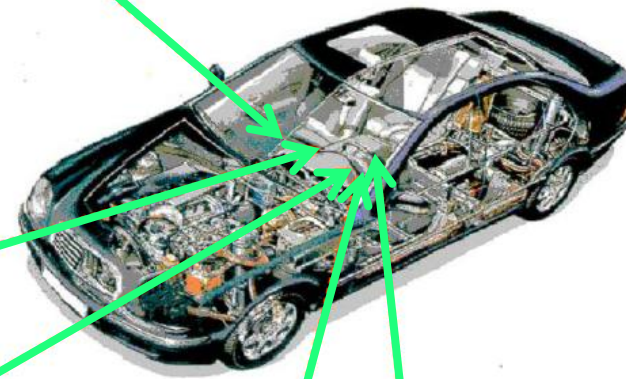


wiper delay control switch

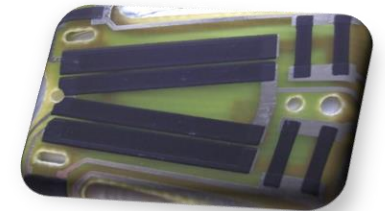
light switch unit



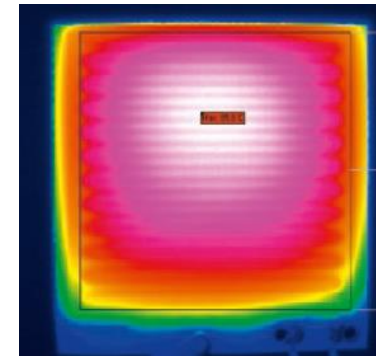
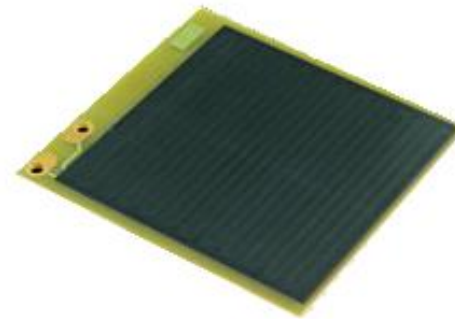
gear selection switch



mirror control



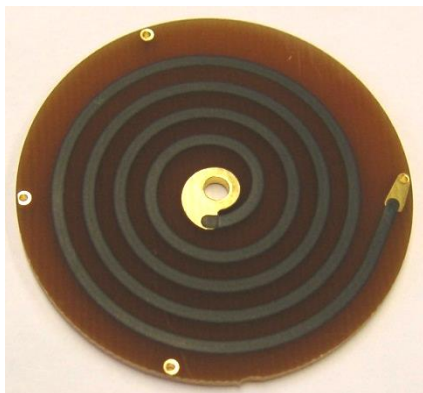
Heating systems



Typical values at a heating surface of 40 x 40 mm

Supply voltage	6 V	12 V
Power rating	ca. 3 W	ca. 12 W
Maximum temperature	ca. 85 °C	ca. 220 °C

Pulse Resistors / High Voltage Resistors



- 10 MOhm resistor
- 100 kV voltage drop



- 17 – 550 MOhm resistor
- 24 - 420 kV voltage drop



- 40 & 60 kOhm resistor
- 200 & 300kV voltage drop



Benefits to your products

- very flat applications
- integration onto and into the PCB
- short signal way between resistors and I/O's
- reduction of the weight
- combinable with all other technologies (HDI & 3D/FLEX & Thermal Management)

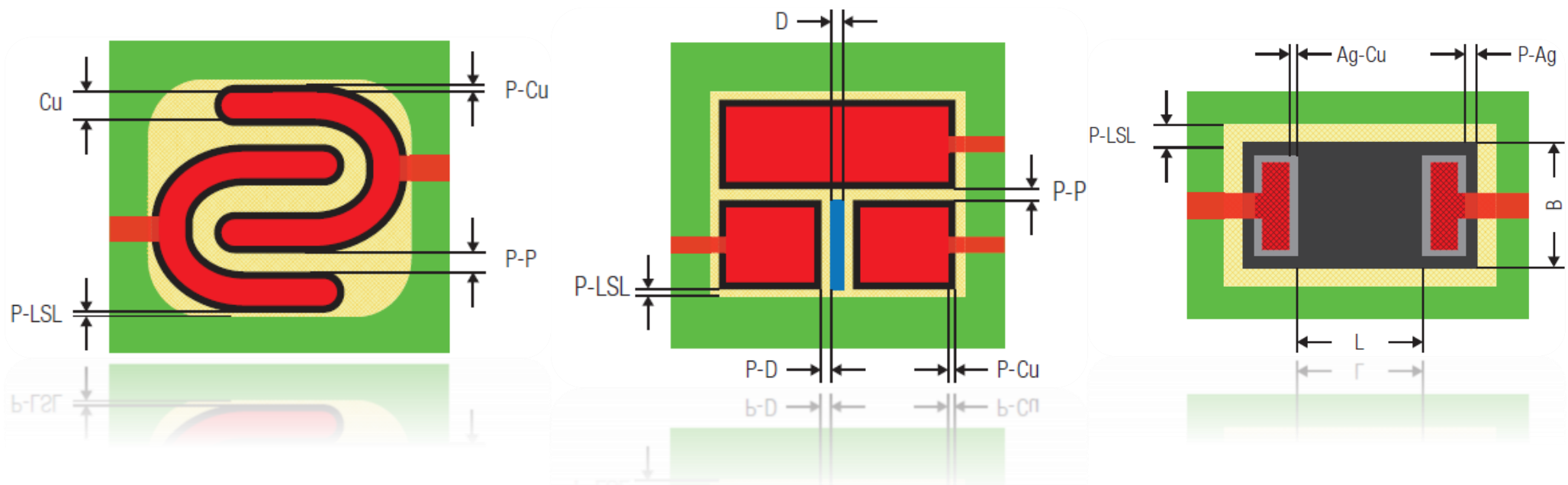
miniaturization

- constant contact resistance over life time
- robust than ENIG & cheaper than galv. gold
- reduction of solder joints and elements
- regarding to the whole system it can reduce the assembly processes to zero
- very flexible in geometry and value

optimization

Impacts on the layout

- design guide show you how to create a layout
- free layout because of the free shaping regarding the requirements
- smaller PCB geometry because of saving space
- additional layers for the print-layout in your design software similar to legend print
- thanks to long-time experience you get professional support to find a solution



Differences to SMD

- Resistors don't have to be on the outer layers
- the assembled board get's thinner
- reduction of numbers of solder joints leads to an extended lifetime
- reduction of system coast because reducing components incl. all relevant cost
- better head assignment over bigger area
- flexible design and placement on your PCB



Thanks for your Attention!

I'm looking forward to work with you!

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Thanks for your Attention!



What kind of application do you have?

HOW can WE support you?

Contact:
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