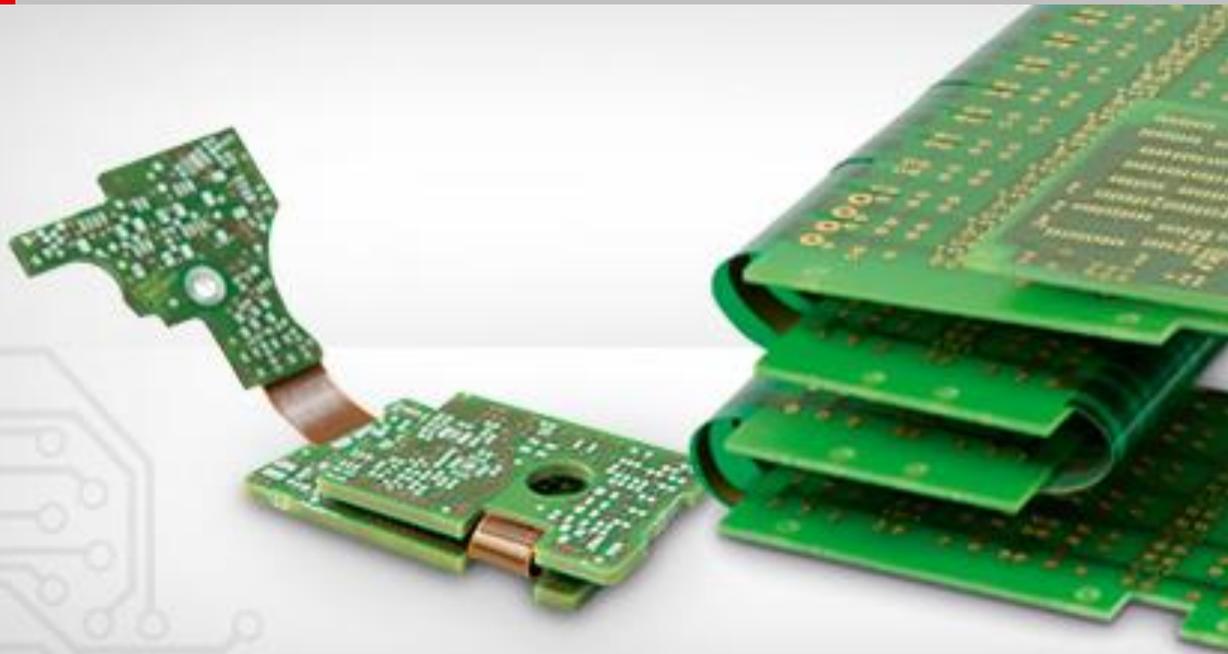


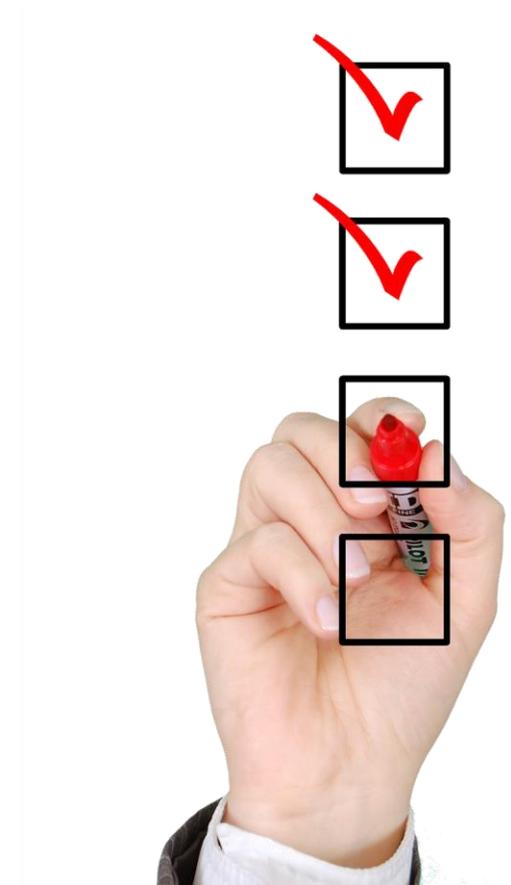
Flex-rigid Designs carefully examined



Andreas Schilpp

Agenda

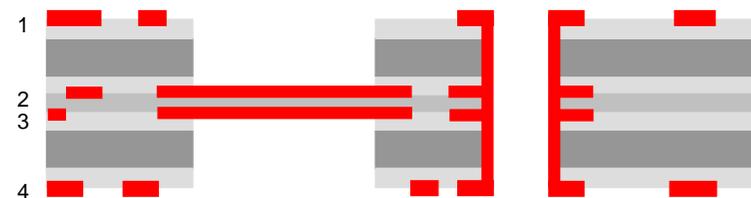
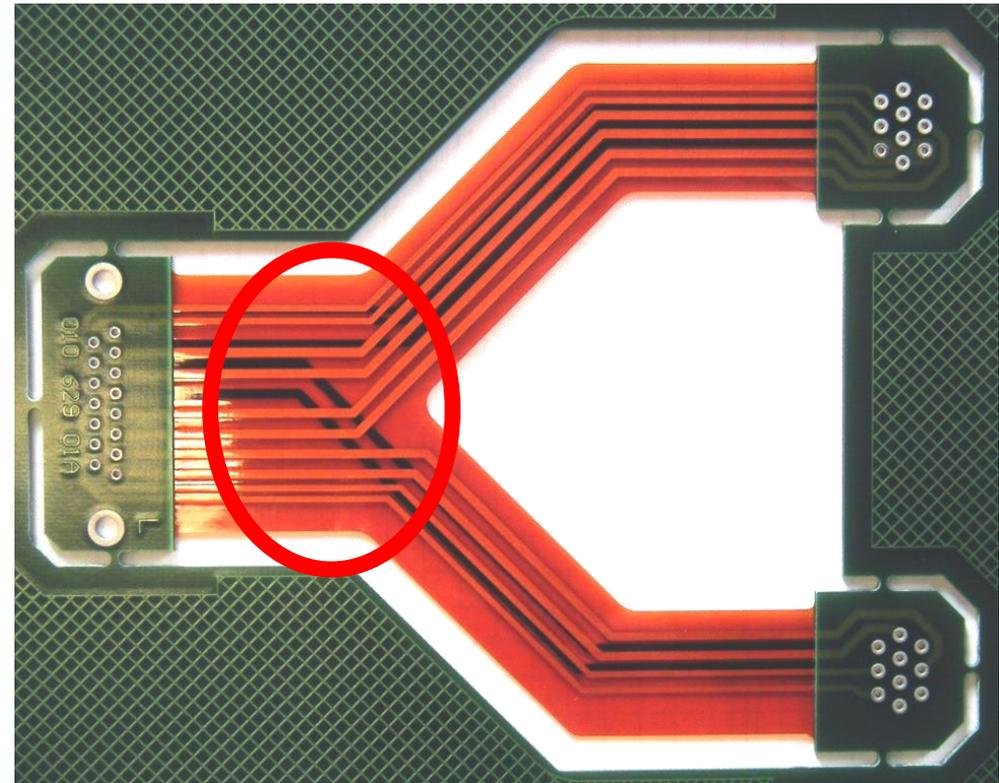
- **Plug Splitter**
- **Backplane**
- **IR Camera**
- **Sensor use B**



Plug Splitter | Initial Situation and Challenge

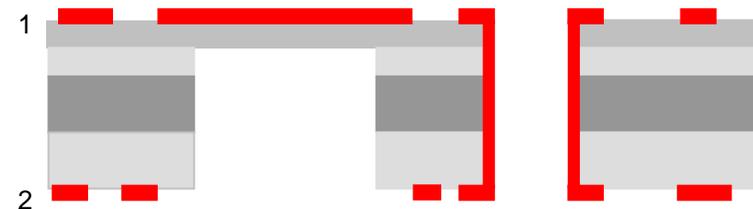
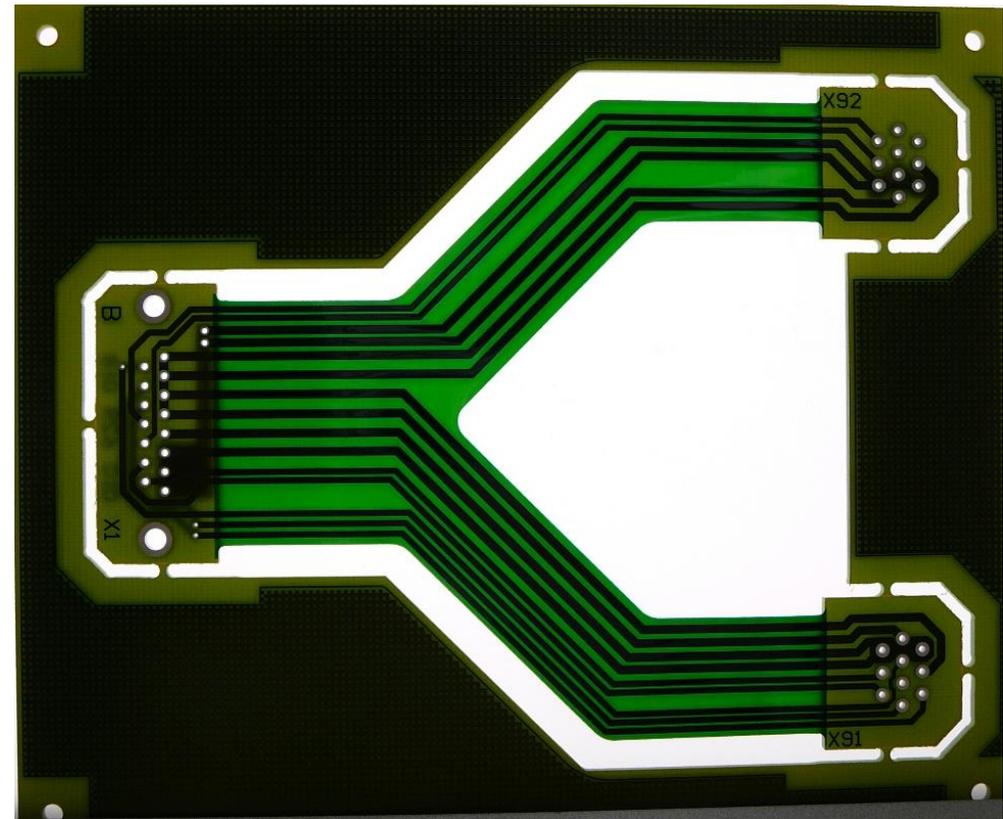
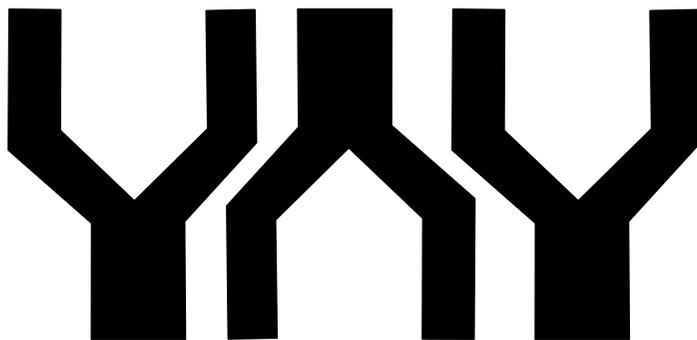
- Simple cable harness replacement
- Well-known stack-up for Flex-rigid
- By chance found in production

- But unnecessarily expensive, as
 - crossings in layout forcing 2 flex layers
 - 1x „array“ consumes a lot of area



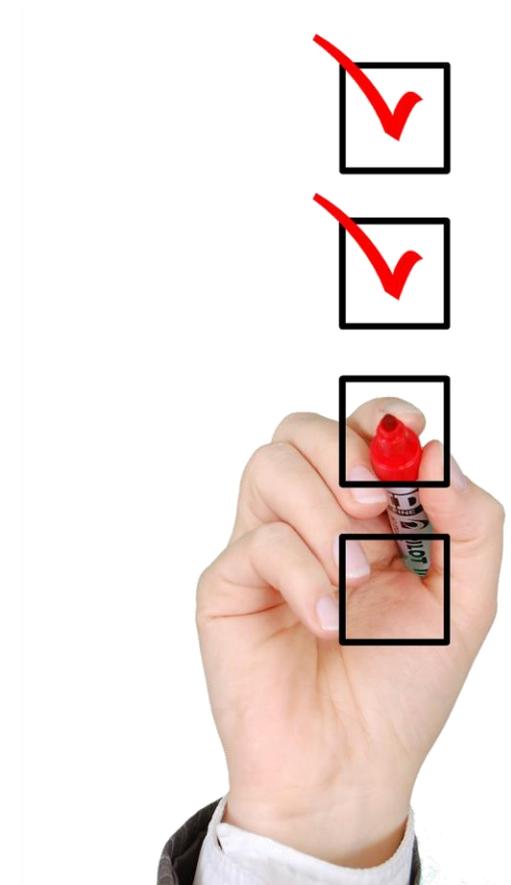
Plug Splitter | Solution

- Reposition of crossings into rigid area, pre-alignment of lines before flex-rigid transition
 - reduction from 4 to 2 rigid layers considerable, from 2 flex layers to 1
 - replacing PI-coverlayer by flexible soldermask
- Nesting would improve utilisation ratio in the delivery array



Agenda

- Plug Splitter
- Backplane
- IR Camera
- Sensor use B



Backplane | Initial Situation and Challenge

- **Size: 431mm x 300mm x 2mm**
- **1652 component connections**
 - 14 connectors 64 pins
 - 18 connectors 42 pins
- **Mechanical construction: Sequence of connections in a chaotic manner**

- **idea / question:**
4 flexible layers
- ?
- **very expensive!**

IPC-2223D

containing three or more conductive layers with PTHs (see Fig-

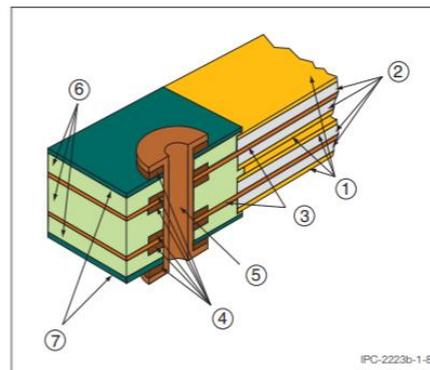
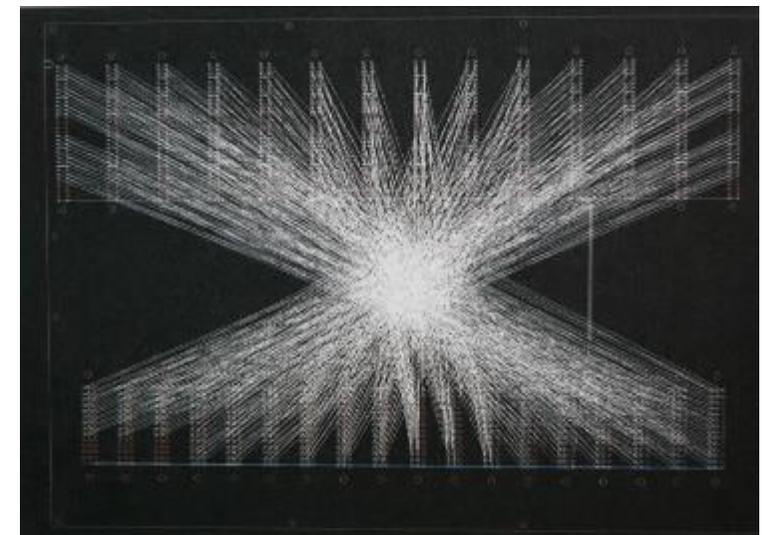
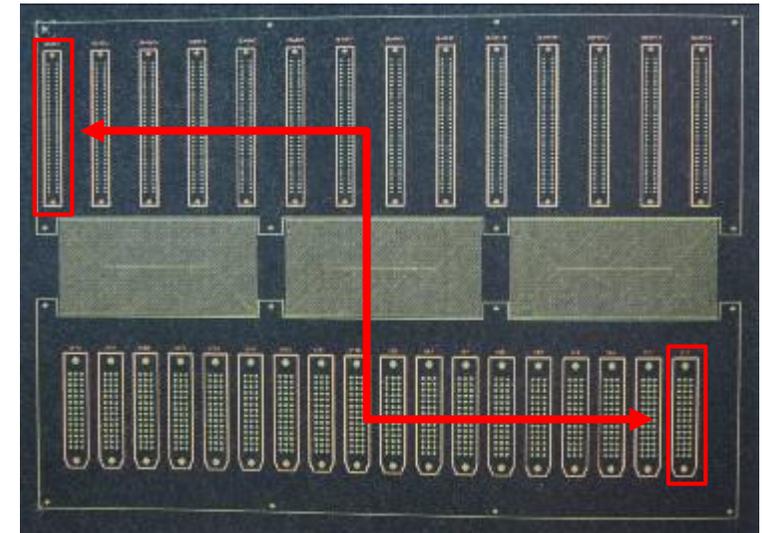


Figure 1-8 Type 4 Rigid-Flex Printed Board – Adhesiveless Substrate Construction

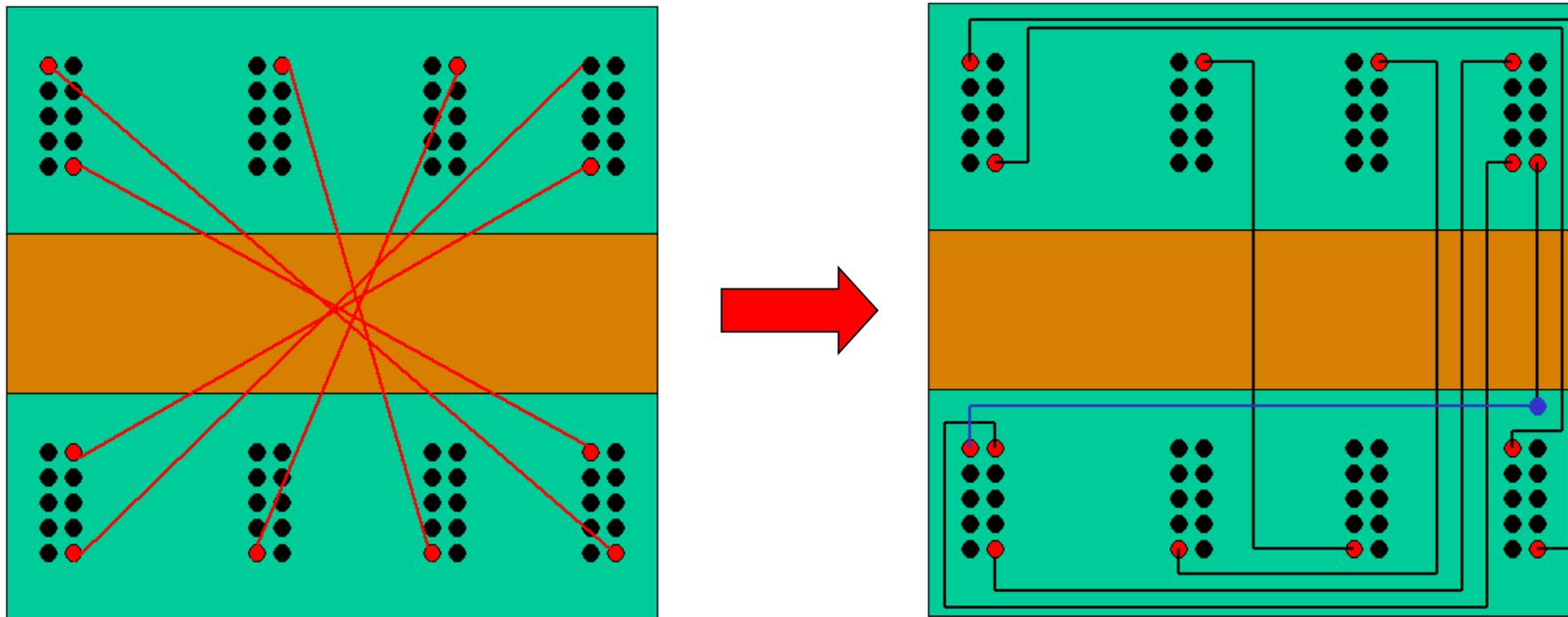
- Note 1: Coverlay.
- Note 2: Adhesive.
- Note 3: Adhesiveless Substrate.
- Note 4: Copper Pad.
- Note 5: Copper PTH.
- Note 6: Prepreg.
- Note 7: Rigid Material.



sources: Sirona, book „Leiterplattendesign“, Leuze-Verlag“

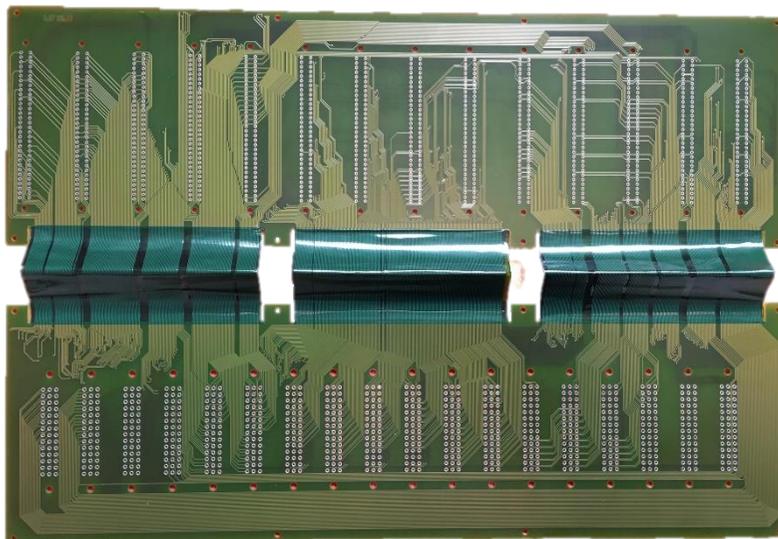
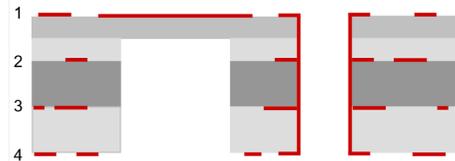
Backplane | Solution

- Crossings only in rigid areas
- Lines 1:1 over the flex areas
- Are you replacing round cables? Or perhaps shielded / hf cables?
 - omit panic layers in the flex area: shielding or reference layer really required?

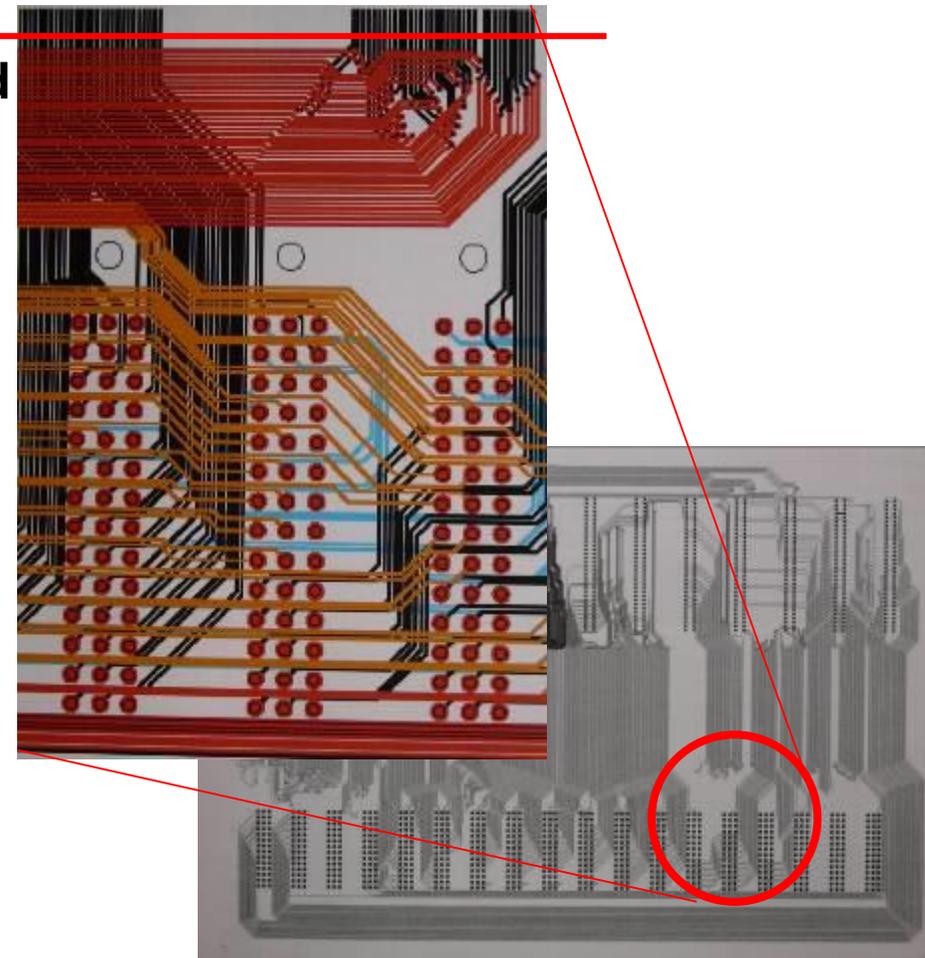


Backplane | Solution

- Placing of all crossings in rigid area, pre-alignment of lines before flex-rigid transition
- 4 layers: 1F-3Ri
- Costeffective solution



flex
rigid



Call for more Examples | Success Stories

You apply flex-rigid designs or have just started ?

Maybe you are facing a number of challenges to tackle? Either in terms of:

- material and layer structure
- design and space requirements
- delivery panel and processing
- module interfaces
- performance in the application
- cost reasons

We will be glad to assist!

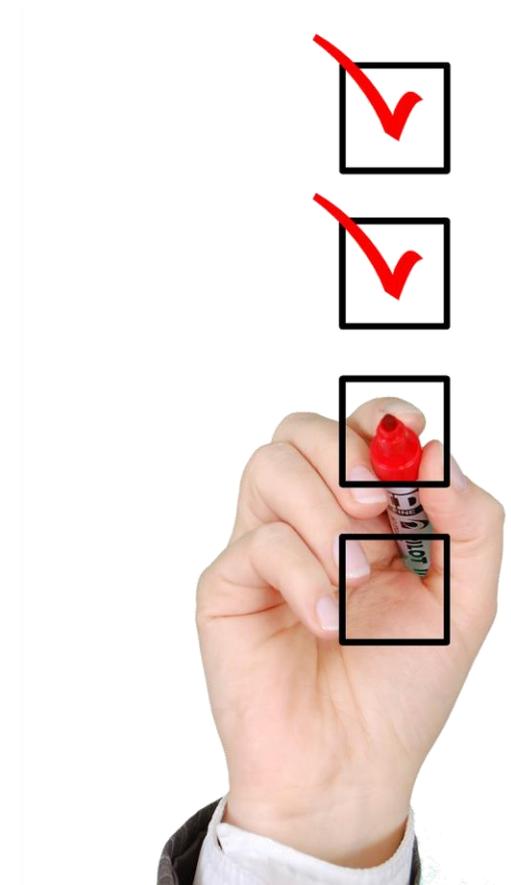
Also we are sure that you have already mastered similar or even greater challenges!

- Would you like to share these successes with us?
- Which of your application could be of general interest and are we allowed to present this at a webinar?

Please give us a hint now in the question window, we will then contact you.

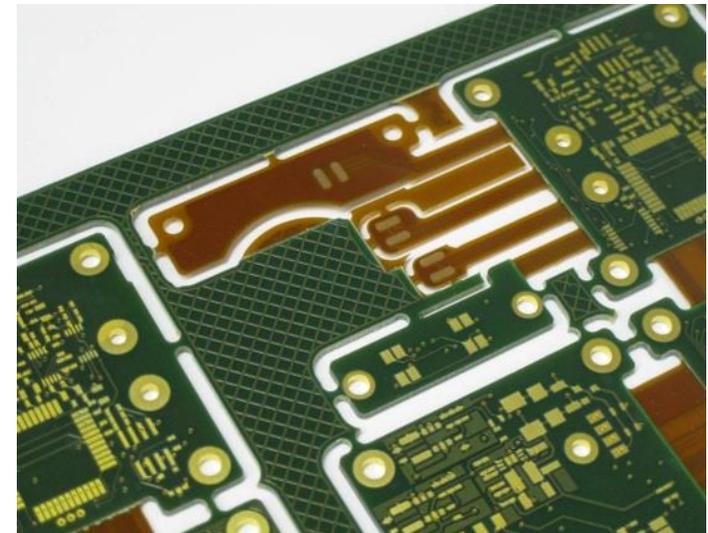
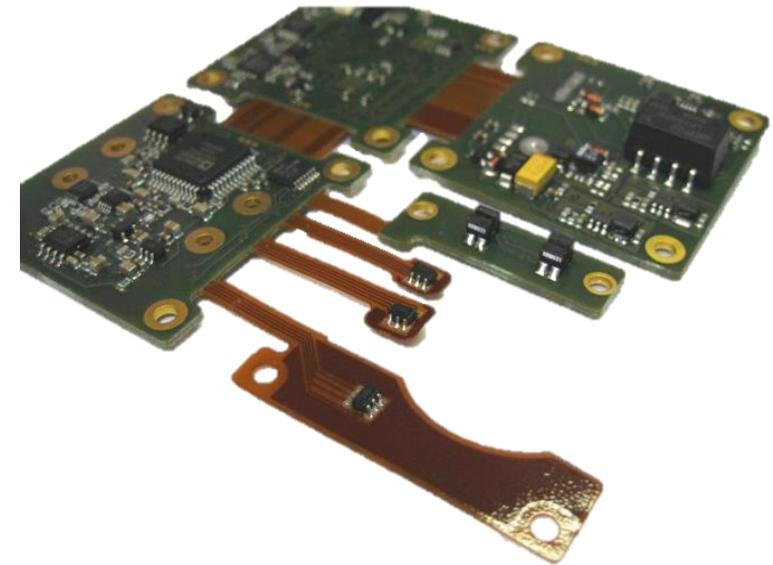
Agenda

- Plug Splitter
- Backplane
- **IR Camera**
- Sensor use B



IR Camera | Initial Situation and Challenge

- Some components on flexible parts
- Special production of pcb
 - openings in coverlayer foil
 - ENIG on flexible innerlayer
- Special processes for
 - solder paste
 - assembly
 - soldering
 - testing



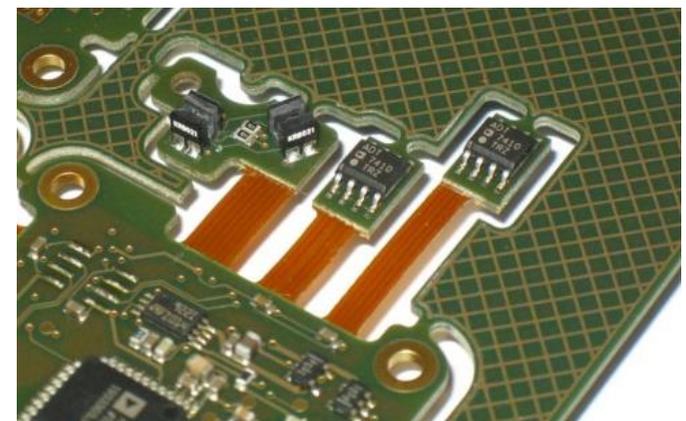
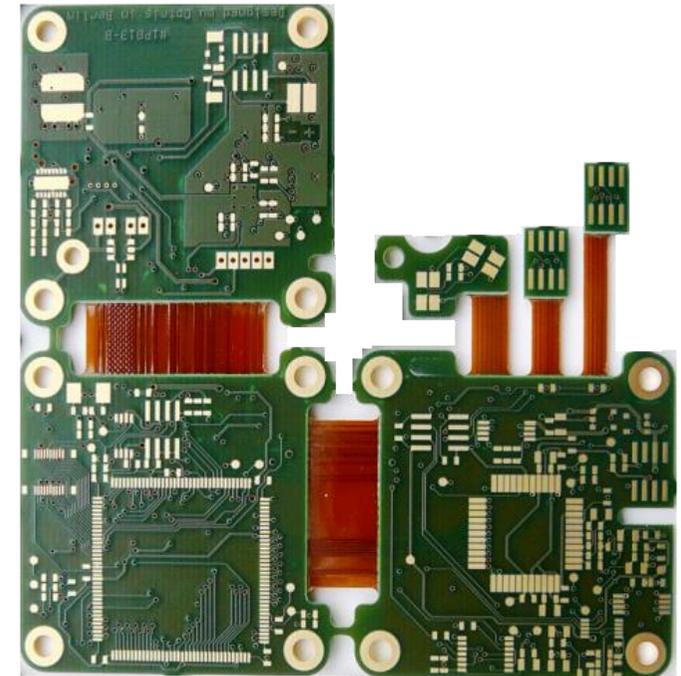
IR Camera | Solution

Components always on rigid parts!

- **Standard production of flex-rigid**
 - No openings in coverlay film needed
 - No ENIG on inner layers needed
 - No Vias in flex areas!

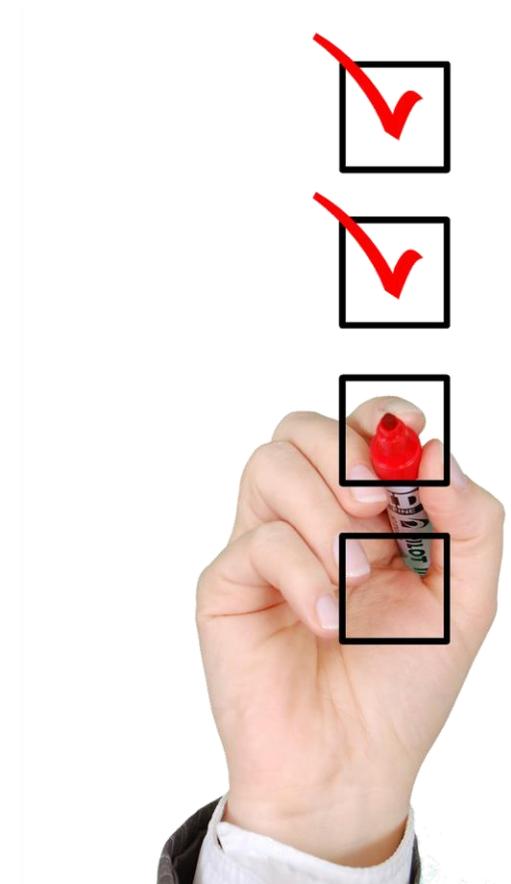
- **Standard processes for**
 - solder paste printing
 - assembly
 - soldering (no hand soldering!)

- **Cost savings: up to 30%**



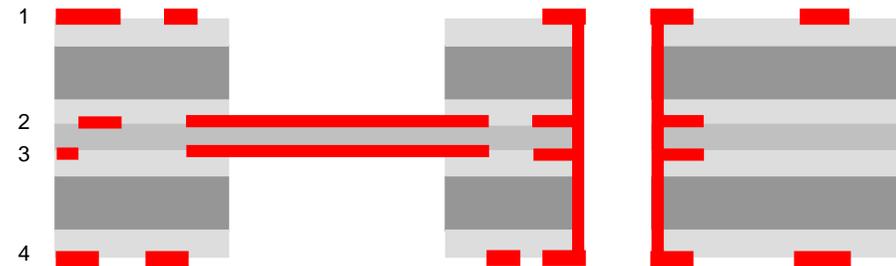
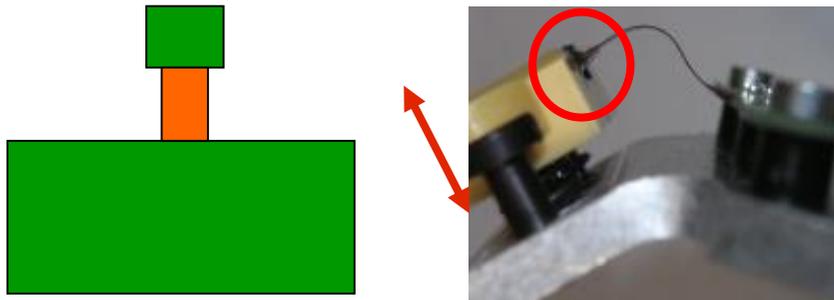
Agenda

- Plug Splitter
- Backplane
- IR Camera
- **Sensor use B**

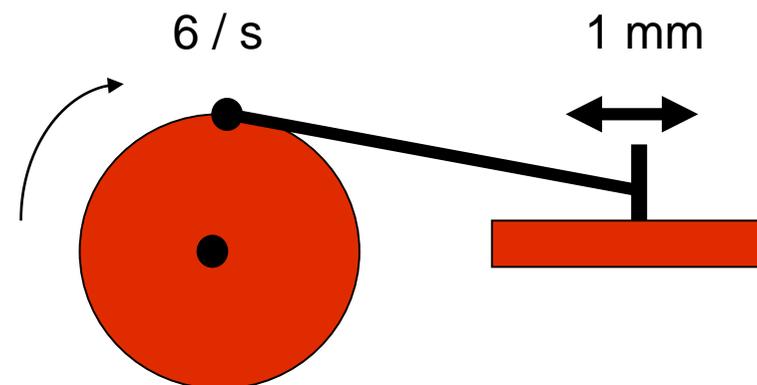


Sensor use B | Initial Situation and Challenge

- Sensorhead in flex-rigid technology
 - 4 layers 1Ri - 2F -1Ri

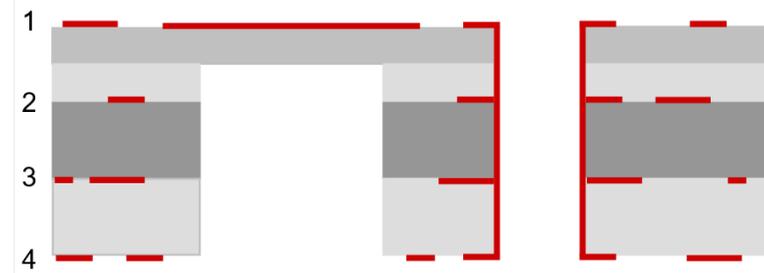


- **Problem:**
open circuit in the flex-rigid intersection near to the sensorhead after 500.000 bending cycles in Test setup (Target was 1 Mio. cycles)

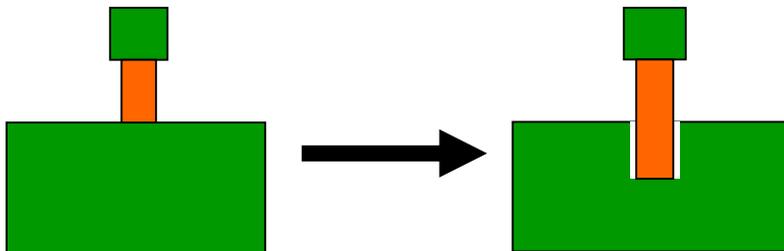


Sensor use B | Solution

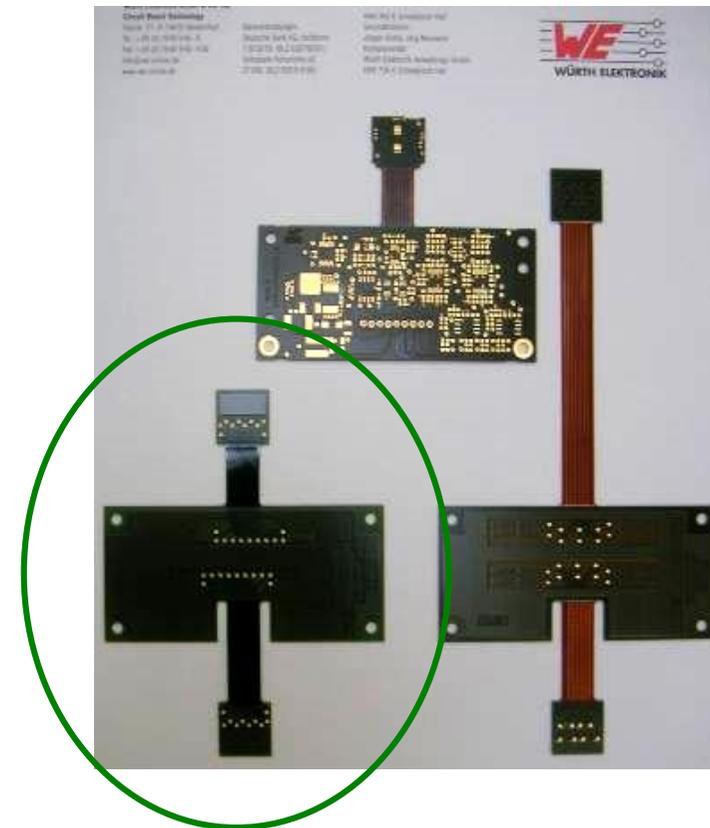
- **Change in Stack-up to 1F-3Ri**
 - 1 layer Flex outside, flexible soldermask
 - thus significantly thinner = more flexible
 - PCB price reduced by 40%



- **Geometric improvement:
Improved flexibility due to a longer flexible part**



- **Result: better and cheaper!**
 - Qualification test terminated after 2,1 Mio. bending cycles:
All contacts were still OK!





Thank you very much for your attention!

**What
Applications
do you have?**

**Where we can
support you?**