Flex-Rigid Design Guide part II – how important are mechanical issues with flex-rigid pcbs?

- mechanical construction
- layout and wiring
- documents for a flex-rigid circuit board
- questions and suggestions from the last Webinar part I
Thesis: The Flex-Rigid Design Guide makes me happy!

- the ultimate „proof“:
standard shapes, mechanical options

Cuboid

Pyramid

Cylinder
standard shapes, mechanical options

Triangle
Box
Toothing
standard shapes, mechanical options

Stack

Fixing

Fans
FR4 Semiflex: Pre-bending and fixation

- accurately defined pre-bending prior to box assembly!

- Assembly on plastic housing:
bending radius, - angle, flexible length - formulae

- **flex-rigid**

IPC-2223: Use A (Flex-to-install):
R: Thickness flex x 10

- **FR4 Semiflex**

<table>
<thead>
<tr>
<th>angle [°]</th>
<th>Length L of the bending area 1-layer @ bending radius [mm]</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>4</td>
</tr>
<tr>
<td>45</td>
<td>3.9</td>
</tr>
<tr>
<td>90</td>
<td>7.1</td>
</tr>
<tr>
<td>180</td>
<td>13.4</td>
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</table>
Next up, we do a....

What do you guess:

Which one is the main cost driver with flex-rigid?
some cost drivers

- number of flexible layers !!
- number of process steps
- area
  - unfavourable flex extensions
  - distribution
  - length
  - delivery panel
- number of layers rigid area, via-technology
- IPC2223 use B
- material (Polyimide 50µm / 75µm / 100µm)
- coverlay – flexible soldermask
comparison: stack-up with 6 layers

flex-rigid 1F-5Ri / HDI 1-4-1

flex-rigid 2Ri-2F-2Ri / HDI 1-4b-1
layout and wiring

Basic Design Rules

HDI Design Rules
layout and wiring

Copper shield

Shield opening

IPC 2223

good example
flex-rigid and signal integrity

- simulation with Polar SI software
- fitting layer stack-up and line width / space parameters
- integration of impedance test coupons
  - for prototypes only or
  - also for series (cost!)
- measuring with Polar CITS
- rule of thumb: reference layer with cross hatch - impedance increase by 10%

![Graph showing yield benefits of Pyralux® AP laminate in controlled impedance microstrip design](image)
flex-rigid and signal integrity

- integrated impedance test coupon

- impedance test protokoll
Next up, we do a….

What is the **deadly – enemy** of every flex-rigid or semiflex circuit board concerning separation of the delivery panel?
the answer

 POLL

 the answer
pcb-form and panelling

- paper model, 3D-model
targets for panelling

- efficiency
- stability
- separability
depanelling
documentation for a flex-rigid pcb

- layer stack-up with material – provided by us
- elektronical data –
  one extra layer for the definition of flexible and rigid areas
- in case of a drawing – define the leading document
- pcb specification according project checklist page 2
- delivery panel – agreed with and provided by us
- 3D view of the assembly situation with bending radius
- if ZIF-contact: ZIF specification sheet added or values integrated in your pcb specification
Service – our proposal

- discussion of variants
- Individual layer stack-up
- rough price estimation
- preliminary data check
- prototypes 1 piece, Series
- Optimization of delivery panel
- FAIR (First article inspection report)
- reliability testing
- breakdown analysis, optimization
- flex-rigid – samples

get it here: www.we-online.com/flexrigidsample
Final Summary

- **Mechatronic: Mechanic & Electronic:**

- **Mechanical Design:**
  - Mechanical pcb design becomes very important
  - All interfaces have to be regarded

- **The Design Guide assists you in choosing the fitting technology**
  - Answering the questions of the Design Guide’s project checklist creates a good basis for the development session

- Let us talk about your project!
  - the earlier the better!