Your „clear perspective“ in Flex / Flex-Rigid / FR4 Semiflex

Flex-Rigid Design Guide, Part 1

- Systematic View
- Project checklist for system requirements
- Introduction into the different variants
- Examples of each technology
Purpose of a Flex-Rigid Design Guide?

Which one?

Cost

ml4 semiflex 1-layer

1f-5ri

2f-ri (twinflex)

3ri-2f-3ri

www.we-online.com/flexrigid
Systematic View

Flex-Rigid is mechatronic = Mechanic + Electronic

www.we-online.com/flexrigid  Product management 3D Technology – V 2013  page 3 of 21
Project-Checklist – Analysis of System requirements

- Cooperation of all participants of the value-added chain is necessary
- Quality and reliability must be planned
- Design-to-cost
- Design-for-manufacturing
- Testability (homogeneous System!)
- Listings and permits, i.e. UL

There are a lot of dependencies and feedbacks!
# Selection of the right technology

<table>
<thead>
<tr>
<th>Flex / TWINflex®</th>
<th>Flex-rigid</th>
<th>FR4 Semiflex</th>
</tr>
</thead>
<tbody>
<tr>
<td>2F (Flex)</td>
<td>1F-5RI</td>
<td>ML4 Semiflex 1-layer</td>
</tr>
<tr>
<td>2F-Ri (TWINflex)</td>
<td>2F-2Bi</td>
<td>ML6 Semiflex 2-layers</td>
</tr>
<tr>
<td>4F with microvias 1-2/2-3/3-4</td>
<td>3R-2F-9RI</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3R-8F-3RI</td>
<td></td>
</tr>
</tbody>
</table>
- Thin and flexible
- Made out of Polyimide or LCP material
- Fotosensitive soldermask (Coverfilm) SMT-capable or PI Coverlay
- Complex outlines could be cut by laser
Application
mobile electrocardiogram with TWINflex® pcb

- LCP-foil 50µm
- Stackup 2F-Ri (with stiffener)
- 50µm line / space (compatible with FSTN-Display)
- Solderable / bondable ENIG
Which technology is more expensive in higher volumes? TWINflex 1F-Ri or Flex-rigid 1F-0Ri?
TWINflex usually more expensive as

- Expensive manual processes (registration, glueing)
- More process steps
- Smaller production panel for flex ➔ less pcbs on the panel
Cost efficient: Standard- / HDI-pcb + deep milling process + screen printing
No special drying process prior to soldering
Bending area with 2 copper layers outside in a cost efficient way
Multiple bending is possible (typical 20 x, please care for the bending Radius and bending direction!)
Application
FR4 Semiflex

Touch panel TPC84, Ethernet and TCP/IP
Flex-Rigid

- flexibel, suitable for many bendings
- Tight bending radius possible
- Combinable with i.e. Microvia, Heatsink etc.

www.we-online.com/flexrigid
Application
Flex-Rigid 1F

- Flexible extensions are cut by LASER
  - High-precision contacts for ZIF-/FPC-connectors
  - Good cutting quality
  - Separation without tools
  - Stable delivery panel, Rigid material below flex
- Well defined mounting points using holes in the rigid area

Flex-Rigid 1F-1Ri
- Thickness 0,8 mm
- ENIG

Mobile data sampler for inventory control
ZIF Adapter board
Application
Flex-Rigid 1F

- High wiring density in the smallest housing
  - enabled through Flex-Rigid (no place for connectors)
- Improved testability prior to assembly and simple installation
- Fully automatic SMD assembly in delivered panel with standard equipment
- Substitution of and thus reduction in connectors, solder joints and wiring
  through flexible connection, thus increased reliability when used

- Flexrigid 1F-3Ri
- ENIG
- Polyimide 50µm outside
- Flexible soldermask

Contour meter in inspection sensors
Next up, we do a....

What do you guess:

- Which one is the most common design fault in Flex-Rigid?
Most common design fault in Flex-Rigid:

- If possible – insertion of wide copper tracks for tear protection

Regard distances of drill holes and SMD pads to flex-rigid transition, see Würth Elektronik design rules.
Application IPC2223 Use A „Flex-to-install“

- Polyimide coverlay partially
- FR4-Material according to IPC-4101C/128
  - Multiple leadfree Reflow processes possible
- Good reliability in harsh environment
Application Flex-Rigid 4F

- Flex-Rigid 1Ri-4F-1Ri, 100µm line width / space
- Four Flex layers inside, 2 of them as Ground for decoupling of Audio Input / Output

Professionell Audiosystem
Other Issues…

- Mechanical construction
- Layout and Routing
- Documents for a Flex-Rigid circuit board

… will be discussed in the next Webinar:
Flex-Rigid Design Guide, Part 2

- Get the DIN A2 poster of the Design Guide:
  On Request under
  www.we-online.com/flexrigidposter
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!