Flex-Rigid, Semiflex & Flex Design Guide

Technology variants

Flex / TWINflex®

2F (Flex)

2F-Ri (TWINflex)

4F with microvias 1-2/2-3/3-4

In comparison:
1F-Ri (TWINflex)

stiffener

1F-0Ri (flex-rigid)

FR4 core

Flex-Rigid

1F-3Ri

2F-2Ri

3Ri-2F-3Ri

3Ri-8F-3Ri

FR4 Semiflex

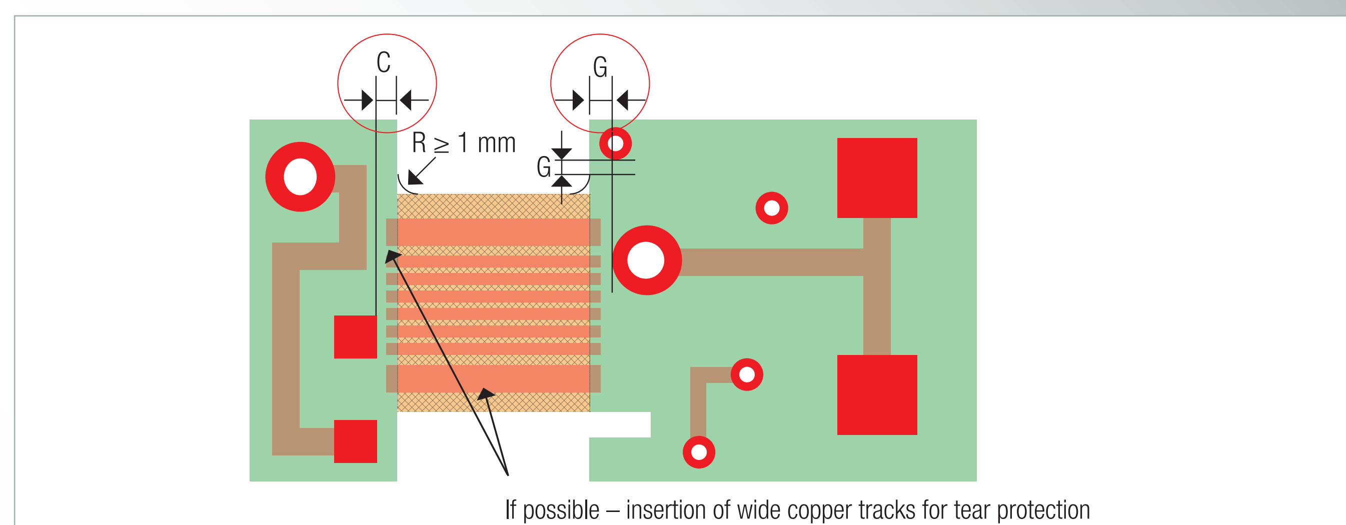
1Ri-3Ri

2Ri-4Ri

NOTE:

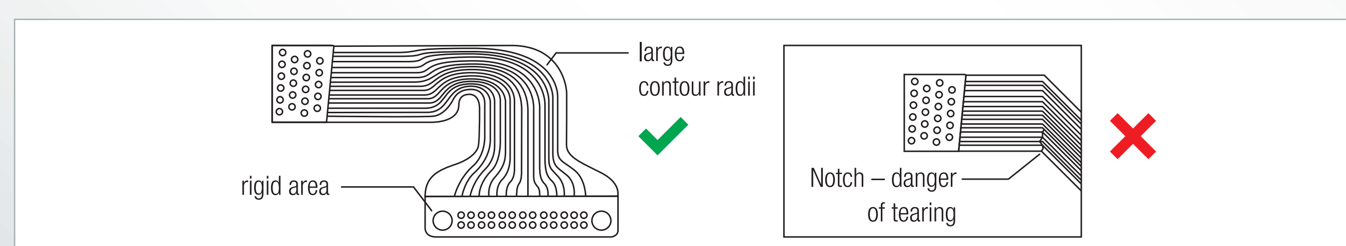
- Often more affordable than a connector-cable-connector solution
- Definitely better and cheaper compared to shielded connectors and cables

Layout / routing in the bending area



- No vias in flexible area with flex-rigid
- Use teardrops
- Round routing in flexible area
- Preserve NFP (Non Functional Pads) on flexible layers (reliability risk)

! Regard distances of drill holes and SMD pads to flex-rigid transition, see Würth Elektronik design rules.



- No PTH in the bending area with flex circuit boards
- On flexible cores use offset design for tracks (avoid „I-Beam“ effect)
- Always provide hatched copper reference layers with copper openings to improve flexibility and accelerate drying
- Apply round routing and big outline radii
- Even distribution of conductors, fill copper-free areas
- No change in width or direction of the conductor in the bending area
- Conductors in orthogonal direction to the flex-rigid transition

Design bending radii based on flex thickness

bending radius [mm]	1	2	3	4	5	6	7	
Flex area 1-layer				Thickness x 10				IPC-2223: Use A Flex-to-install
Flex area 2-layers				Thickness x 10				
Flex area 4-layers				Thickness x 20				
FR4 Semiflex								

Calculation of flex length

thickness T

flex length L

case 1 | case 2 | case 3 | case 4

distance A

R

distance B

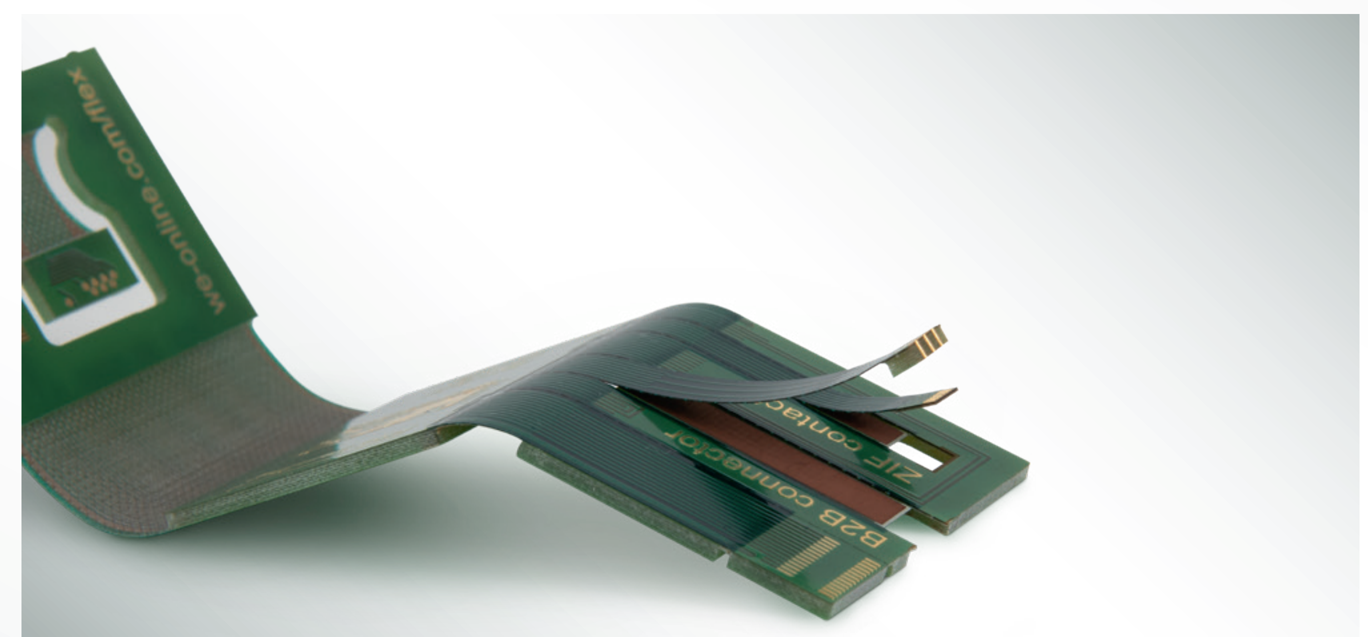
distance C

$L \geq A + \pi \cdot R + 2\,(T - R)$ $\quad L \geq A + R\,(\pi - 2)$ $\quad L \geq A + T + R\,(\pi - 2)$ $\quad L \geq B + C + T + R\,(½ \cdot \pi - 2)$

Geometric conditions:

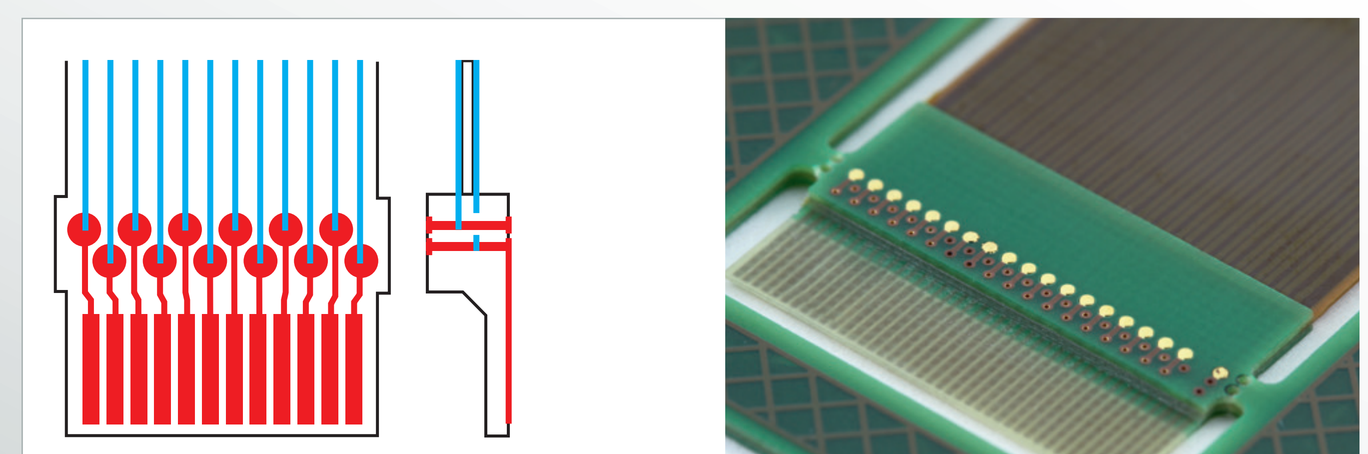
$A + 2T \geq 2R$ $\quad A \geq 2R$ $\quad A + T \geq 2R$ $\quad B + C + T \geq 2R$

Lift-off option



- No PTH in the lift-off area
- no copper design allowed on the layer adjacent to the lifted flex area
- Specification in drawing, i.e.“lift-off area, not laminated“

ZIF contacts on outer layer by using vias



! Please respect the Basic Design Guide of Würth Elektronik for design rules regarding structures, via sizes and soldermask.

Here you will find more information about the stack-ups:
www.we-online.com/ flex-stackups

HOTLINE to our „FLEXperts“
Starrflex **LIVE-CHAT**

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