

Design Rules

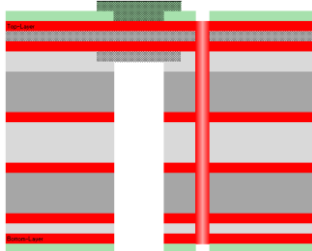
Flex-rigid 2F – xRi

Application in accordance with IPC 2223 Use A: Flex-to-install
UL labelling in accordance with UL94 and UL796 possible

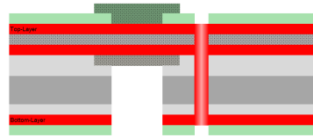


These design rules apply to:

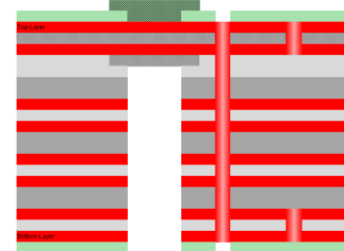
flex-rigid circuit boards with 2 copper layers on flexible polyimide material, externally located.



Example: 6 copper layers
2F-4Ri



Example: 3 copper layers
2F-1Ri

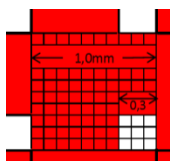


Example: 8 copper layers:
2F-6Ri + HDI 1-6-1

Nomenclature: F = flexible, Ri = rigid

Basic information

- Please comply with general standards, such as IPC or IEC
- Please note the useful information and tips in the WE Flex-Rigid Design Guide *
- Please see the WE Basic Design Guide for rules for line widths, spacing, via and pad sizes, solder mask*
- Filling of plated through holes (PTH):
Never use open vias in solder areas! For PTH plugging (IPC Type III) always keep a clearance of 400µm to solder areas on both sides! In case of IPC Type VII (filled and capped) please ask for possible design rules (in special: line space parameters).
- **Lift-off** areas - attention: NO copper layout below the flex and NO vias permitted!
- Flex-rigid circuit boards must be dried before they are assembled and soldered. Further information about this can be found on our Internet pages. *
- For the drying, copper openings in ground / reference layers and in large copper areas on flex material are needed. Recommendation:



→ Copper openings: 0.3mm per 1mm length of copper (up to 70µm Cu thickness).

- Flex-to-install bending radius: Assembly bending requirement according to IPC-2223:
 - 2 copper layers: Bending radius at least 10 x total thickness (IPC-2223D, Section 5.2.3.3)
 - For use in more demanding conditions, please contact us
- We will be happy to create the optimal delivery panel for you (best price!)

* All mentioned documents can be found online at: www.we-online.com/flex

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Material	Standard	Spec. Sheet	Description	Application
flexible base material	IPC-4204	11	Polyimide adhesiveless	Standard
Rigid material (core, prepreg)	IPC4101	128	FR4 Tg 150°C, low-halogen, low CTE(z)	Standard
LowFlow Prepreg	IPC-4101	128	Epoxy Prepreg Tg150°C	Standard
Soldermask	IPC-SM840		green, photosensitive	Standard lacquer in the rigid areas
Flexible solder-mask	JIS C 5012/ IPC-SM840		green	Partially in the flex area or over the entire area of flex side
Coverlay foil	IPC-4203	1 / 2	Polyimide coverlay film, acrylic or epoxy glue	Standard covering of flexible area on layer 2

Layer stack-up

Standard stack-up drawings see www.we-online.com/flex

Customer											
pcb name											
WE-number											
engineer											
date											
Rigidflex 2F-2Ri											
PCB Thickness : 0,97 mm +/- 10% Flex Thickness: 0,19 mm +/- 0,05mm											
Rigid area Structure	Flex area Thickness	Rigid area Thickness	Material description	Flex area Structure	Via types	Layer usage	Impedance				
							Z[Ohm] / Line / Space				
Flex Soldermask	40	15									
Soldermask	15	45									
L1	45	50	incl. plating								
	50	50	Polyimide adhesiveless								
L2	17	17									
	40		Coverlay								
		90	FRM TG150 HF								
		610	FRM TG150 HF								
L3	17										
	85		FRM TG150 HF								
L4	45		incl. plating								
Soldermask	15										
Notes:			Microvia types - definition of colours				Via types - definition of colours				
IPC 2223 use A "Flex to install"			colour				Standard Via				
Please specify Flex layer as "TOP"			via type				Filled & Capped Via (IPC Type VII)				
Please regard our sectional design rules 2F-xRi www.we-online.com/3D			explanation								
			Microvia standard								
			Microvia copper filling								
			Microvia filled & capped								
Template Revision: 01/2017 by Andreas Schilpp / Michael Kress / Werner Ochstein											

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Standard design

1. Flexible layer out of Polyimide 50µm adhesiveless, ED copper on both sides, PCB total thickness 0.8mm to 1.55mm
2. Copper layer thickness inner layers 18µm
3. Flexible area partially covered by Coverlay film the on layer 2, flexible soldermask on TOP layer
4. Low-Flow Prepreg between flexible and rigid material
5. rigid areas with standard green solder resist photosensitive
6. Standard PTHs
7. Smallest milling diameter 1.6mm
8. Solderable surface ENIG
9. Packaged in ESD shrink wrap

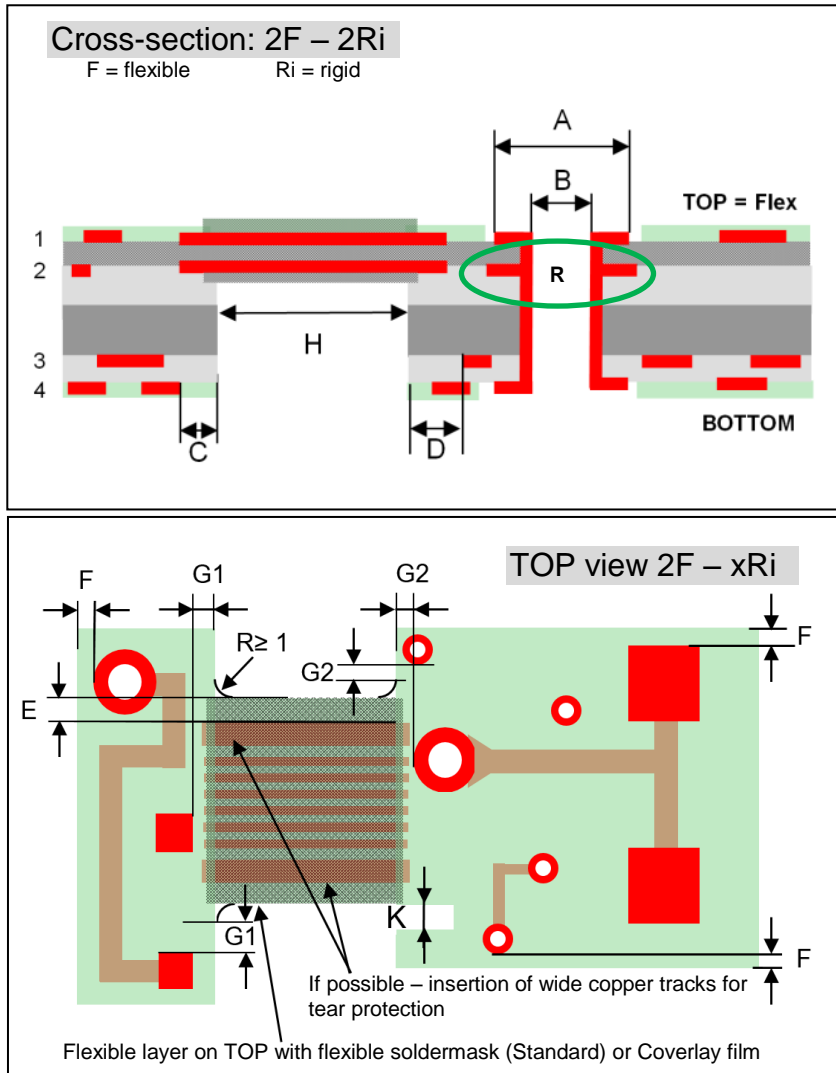
Combination with microvia technique possible: see WE HDI Design Guide

Attention: Buried Vias starting on layer 2 are generally not possible with this stack-up approach!

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Symbol	Description	Technical standard	Advanced requirements
	Line widths and spacings	see WE Basic Design Guide!	
A	Minimum via pad diameter →→ teardrops recommended for all connections ←←	see WE Basic Design Guide!	
B	Final diameter of Through Hole Vias	see WE Basic Design Guide!	
R	→→ NFP: Non functional pads- do NOT remove!! ←←		
C	Spacing, Cu – outer layer to flex-rigid transition (bottom)	≥ 300 µm	
D	Spacing, Cu – inner layer to flex-rigid transition	≥ 500 µm	
E	Distance of conductor to the flexible contour	≥ 300 µm	
F	Spacing, exposed Cu – outside of flex-rigid transition	≥ 300 µm	
G1	Flexible lacquer: Spacing, exposed Cu to flex-rigid transition (top)	≥ 1000 µm	≥ 800 µm
G1	Spacing, exposed Cu to flex-rigid transition (top)	≥ 1500 µm	≥ 1000 µm
G1	Spacing exposed Cu to flex-rigid transition (top) with UL Listing	≥ 2000 µm	≥ 1500 µm
G2	Spacing via pad to flex-rigid transition: Cu inner layers 18µm	≥ 1500 µm	≥ 1000 µm
G2	Spacing via pad to flex-rigid transition: Cu inner layers 35µm or with UL Listing	≥ 2000 µm	≥ 1500 µm
G2	Recommendation in IPC-2223D 5.2.2.3:	3.18 mm+ ½ pad diameter	
H	Length of the flex area	≥ 5mm	≥ 2.5 mm
K	Minimum recess width directly at the flex area	1.6 mm	1.0 mm
“K”	Outline manufacturing of flex area:	No scoring permitted!	
“ZIF”	ZIF contacts thickness tolerance	± 0.05 mm	

→ Enhanced specifications on request – please. Contact us at: flex@we-online.de