ROYAL FLEX CIRCUITS

RIGID-FLEX GRAPHIC DESIGN GUIDE

Flexible PCBs have gained popularity over the past decade because of their inherent advantages in packing, reliability and overall cost saving. Industries from Military, Aerospace, Medical, Industrial and Consumer have embraced this technology as a proven, reliable part of the entire electronic assembly package.

Rigid-Flex in particular offers the designer opportunities to conform to mechanical restrictions of an existing system. It solves part of the Form Factor and Fit, enabling the designer to meet the function of the overall design and /or retrofit in existing designs. Rigid-flex construction allows for use of many variables while meeting the needs for signal processing and predictable values for impedance, mechanical configuration, cost, and reliability.

Below is a brief guide to designing with rigid-flex:

Initial Considerations

- Design the board as you would any board.
- Decide what needs to be flexible.
- Consider all of your mechanical dimensions and tolerances.
- Consider radius and bending requirements.

Flex Materials Thickness Typical 1 mil to 5 mil

Copper on one side or both sides as off the shelf product.

IPC Specifications	IPC 4204 / 11 Adhesiveless-based flex material
	IPC 4203 / 1 for Adhesives and Covelay materials
	IPC 4552 ENIG plating
	IPC 4101 Multiple Rigid low and high temp materials copper clad

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Example of Rigid Flex Construction

This could be a simple cable with connectors on each end or fingers.

Range

.0008 to .0018 Mask Layer

.0007 to .003 Layer 1 Copper Rigid Section

.002 to .094 FR-4 of Poly Core

.0007 to .003 Layer 2 Copper Rigid Section

.0015 to .010 Prepreg

.0007 to .003 Layer 3 Copper Flex

.001 to .005 Kapton Core Flex

.007 to .003 Layer 4 Copper Flex

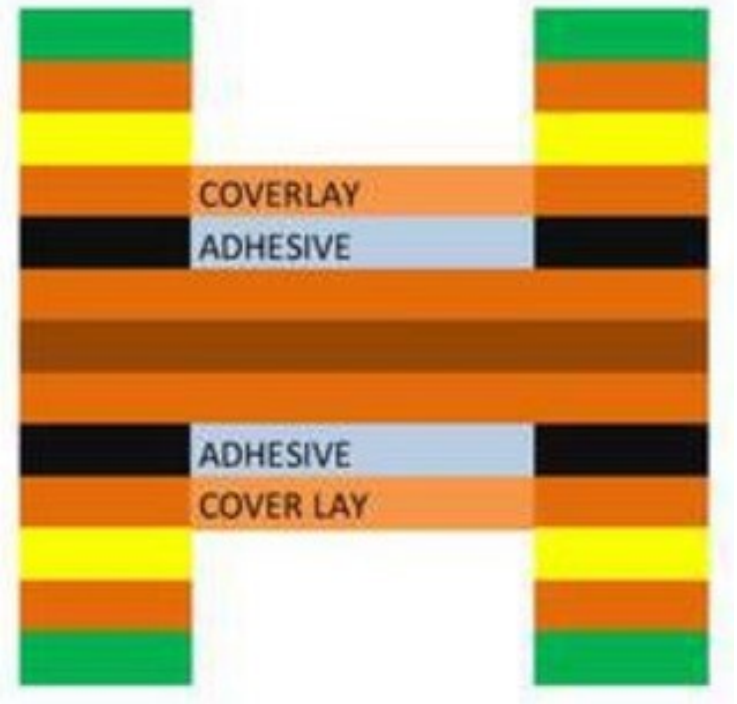
.0015 to .010 Prepreg

.007 to .003 Layer 5 Copper Rigid Section

.002 to .094 FR-4 or Poly Core

.0007 to .003 Layer 6 Copper Rigid Section

.0008 to .0018



Things to Consider

1. Copper weight for the application.
2. Thickness overall including adhesive and prepreg layers.
3. Coverlay is equivalent to solder mask for flex substitute flex LPI also.
4. Flex may transition out as an appendage in many directions.
5. Specify tight tolerances like Ziff connector usage. +/- .001. Must be laser trimmed.
6. Include mask thickness in stackup total.
7. Impedance yes or no?
8. Eccobond is used to relieve shear stress points if the flex has to bend over a hard edge.
9. Covelay range is .0005 to .004. It is bonded to adhesive layers that typically are .0005 to .003.
10. Coverlay is an off the shelf product.
11. Raw adhesives are .0005 to .003 typical.
12. Coverlay materials do not go inside rigid areas more than .050.

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CIRCUITS

The following example represents a double-sided flex circuit with a stiffener on one end. The stiffener is bonded with Acrylic or epoxy adhesives.