Flexible PCBs: Glossary

Sierra Circuits is the leading name in printed circuit boards, specializing in PCB manufacturing and the assembly of High Density Interconnect Technology. From PCB layout and design to assembly and manufacturing, Sierra Circuits handles all aspects of PCB production.
Access Hole:
Opening in a cover material or layer of dielectric material that provides access to a conductive layer of the flex circuit. Used for electrical connection to a conductor’s pads and through-holes.

ACF (Anisotropic Conductive Film):
Adhesive film used to electrically and mechanically join conductive surfaces on a flex circuit. These films are only electrically conductive in the Z-axis.

Acrylic Adhesive:
This thermo-setting film adhesive is the preferred adhesive for flex circuits manufactured in the United States.

Adhesions (Pressure Sensitive Tape):
Bond produced by contact between pressure-sensitive adhesive and a surface.

Adhesive:
A substance, typically an epoxy or acrylic glue, used to adhere coverlays, stiffeners, etc to a flex circuit.

Adhesive Squeeze Out:
Adhesive that flows out onto a conductive surface during lamination.

Anchors (Spurs or Hold Down Tabs):
An extension of copper foil on a conductor pad that aids the pad in gripping to the base substrate. Recommended especially on single-circuits; provides additional mechanical strength.

Annular Ring:
The minimum width of exposed copper or solder that surrounds a flex circuit’s through-holes.
Artwork:
An accurately-scaled configuration used to produce the conductor pattern.

Base Material:
Copper-clad flexible dielectrics, usually Polyimide film, with or without adhesive. Insulative material upon which a conductive pattern may be formed. The base material may be rigid or flexible.

Bend Radius/Bend Ratio:
The minimum amount the flex area can bend; the ratio of bend radius to circuit thickness.

Bending Resistance:
A material’s ability to withstand repeated bending without producing cracks or breaks in excess to the allowance specifications.

Bonding Layer:
Adhesive layer used to bond together dielectric and conductive materials during lamination.

Bondply:
A combination of insulating material with adhesive on both sides supplied as a film.

Cap Lamination:
The process of making multilayer printed boards with surface layers of metal-clad laminates bonded in a single operation.

Chemically Milled Die (CMD):
A tool used in a punch press with blades formed by a chemical milling process, and mounted on an aluminum base.
Circuit Class:
Flex Classes 1 – 3 based on inspection, testing, and performance requirements.

Circuit Type:
Flex Types 1 – 5 based on layer count, material selection, and vias.

Conductive Ink:
Typically more flexible than copper foil, this conductive particle can be used to make conductive traces, or as a replacement for a copper shield. The particles are typically made of silver or copper and are suspended in an adhesive carrier—usually epoxy.

Conductor:
Path that carries electrical current from one point to another.

Conductor Layer:
Total conductive pattern formed on one side of a single layer of base material.

Conductor Spacing:
Width of space between conductor strands or pads. Minimum conductor spacing prevents conductors from shorting together.

Conductor Width:
Width of a conductor measured across the base.

Controlled Impedance:
Combining material selection, circuit construction, and circuit feature sizes to yield a predetermined characteristic impedance. Impedance control requirements typically result in a thicker, less flexible circuit.

Cover:
Insulator material laminated to an etched element. Covers can be located on the inner or outer layers. Internal cover layers are found in the unbonded regions of a circuit.
**Covercoat:**
Liquid or semi-liquid insulating material used as a permanent cover over the outer conductive layers.

**Coverlay (Coverfilm):**
Film of dielectric material with adhesive, which is bonded over the etched conductor runs for insulation. A combination of insulating material with adhesive on one side supplied as a film.

**Dielectric Strength:**
The maximum voltage a dielectric can withstand (under specified conditions) without resulting in a voltage breakdown, usually expressed as volts per unit of dimension.

**Dynamic Flex:**
Flexible circuit designed to withstand hundreds of thousands of bends during operation. Applications require repeated flexing while in use.

**Edge Spacing:**
Distance of an etched feature to the edge of the PCB.

**Factory Forming:**
Factory-formed circuits follow tight curves to save space.

**Fillets:**
Flaring of a conductor as it connects to a pad. Used to minimize stress points.

**Flexible Multilayer PCB:**
Multilayered PCB made of only flexible material. Different areas of the multilayer PCB may have different layer and thickness numbers. Defined as a Type 3 flex board.
Flexible PCB:
Printed circuit board made out of only flexible materials, or etched foil conductor strands, which have been laminated between insulating layers. Typically Polyimide- or Polyester-based. Flexible PCBs can be found as single-layer, double-layer, or multi-layer boards.

Hardboard:
Resin impregnated glass cloth, most common epoxy or Polyimide resin, with or without copper cladding.

I-Beam:
Refers to a flex circuit’s tendency to have reduced flexibility and to fracture conductor strands if the strands are stacked instead of staggered.

Impedance:
Measurement in Ohms of the apparent resistance of an AC circuit. Impedance depends on several factors: DC resistance, capacitance, inductance of the line, conductor strand width, and the conductor spacing relative to ground and insulating layers.

Insulation Resistance:
Electrical resistance of an insulting material determined under specific conditions between any pair of contacts, conductors or grounding devices in various combinations.

Kapton:
The most common base material used in flexible circuits.

Neutral Bend Axis:
Imaginary planar region of flex that does not experience any tension or compression forces when the circuit is bent or folded.
Pad (Terminals or Lands):
Portion of a conductor, usually surrounding a through-hole, used to connect a component for electrical connections.

Polyimide:
Synthetic polymer with more than two imide radicals in the main chain. This material is typically used as a coverlay on flex PCBs.

Prepreg:
Material sheet cured with resin to an intermediate stage (like B-Staged Resin), then used for bonding laminates.

Rigid-flex PCB:
Printed circuit board made out of both flexible and rigid materials. The rigid layers have conductors and plated through-holes connecting them to other layers.

Selective Plating (Button Plating or Pads-Only Plating):
Process where copper is plated only in through-holes and on pads. Used to reduce thickness and increase flexibility.

Shielding:
Solid or patterned shield places reduce noise and control impedance of signal lines. Use matched impedance flex circuits for high-speed signal integrity.

Static Flex (Bend-To-Install):
Flexible printed circuit board designed to be bent for installation purposes only; flex in installation, not in operation. Flexes less than 100 times in its lifetime. Requires minimal flexing—typically only during installation and for equipment maintenance.
**Stiffeners:**
Flexible or rigid material (usually Polyimide or FR-4) added to the surface of a flexible printed circuit board to increase mechanical strength or offer additional reinforcement for component mounting. Stiffeners have no conductors.

**Strain Relief:**
Usually refers to a bead of semi-rigid adhesive applied along a rigid-flex interface, but can also refer to any of a number of features that can reduce, or eliminate, stress concentration features.

**Substrate:**
Layer of insulator bonded on one or both sides with foil.

**Tangency:**
Condition that occurs when the edge of a stiffener or cover access hole is flush with the edge of a through-hole.

**Tear Stops:**
Copper, Polyimide, or Teflon guards that are located in the inner corners of Polyimide-insulated flex circuits in order to prevent propagation of tears.

**Thermal Cure:**
Chemical reaction using heat energy that hardens organic substances like adhesive and coating materials.

**Window (in the cover layer):**
An opening in the dielectric of a flexible PCB that exposes conductors.

**Next Steps**
Need help designing your flex circuit? Want to speak directly to one of our flex experts? We’ve got answers to all these questions. [Download our flexible design guide today](mailto:files@protoexpress.com), and contact Sierra at 408.735.7137 or files@protoexpress.com.