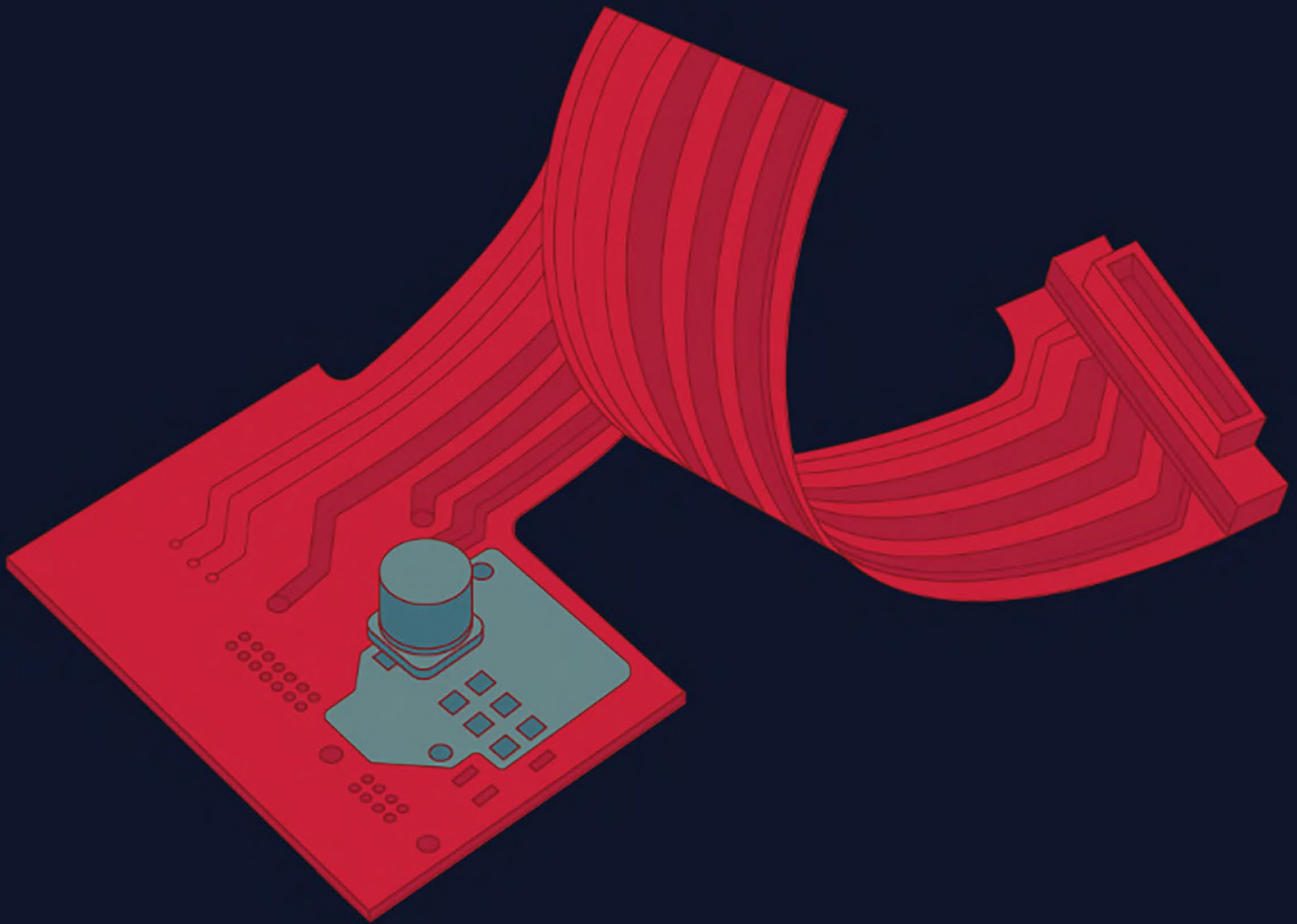


# MOLEX FLEXIBLE PRINTED CIRCUIT SOLUTIONS >

Maximum Performance for Demanding Applications



**molex**

# INNOVATIVE FLEX CIRCUITS

## Molex flexible printed circuit technology is the answer for your most challenging interconnect applications.

We are your total solution for flexible printed circuitry because we design and manufacture both the flex and the connectors. A flexible printed circuit (FPC or flex) is an ultra-reliable technology. An FPC is a versatile solution for creating products that are complex, small, lightweight or are subject to harsh environmental conditions. Flex can be designed to meet a wide range of temperature and environmental extremes.

This custom solution has a variety of applications. Flex circuits are excellent for designs with high density circuitry, and for dynamic applications such as hinge and drawer devices.

Flex circuits make electronic interconnection both simpler and more reliable. FPC interconnects are often used in applications where high signal speed, power distribution, heat, flexibility or space savings are issues.

### There are several advantages that flexible printed circuits have over other interconnect devices:

- **Signal Integrity** - The material used in the construction of flex minimizes signal loss, maintaining high-speed integrity.
- **Impedance Control** - Flex promotes a robust design pitch due to the close proximity of circuitry and ground planes/shields.
- **Temperature Resistance** - Materials used in the construction of flex have closely matching thermal expansion rates. This causes flex to be suitable for hot and cold temperatures as well as large temperature fluctuations.
- **Thermal Management** - Flex does not require cooling from both sides. It also dissipates heat quickly.
- **Space Reduction** - Flex is able to occupy three dimensions. It can be bent around packaging and even over itself in order to fit into a much smaller device enclosure.
- **Weight Reduction** - Flex is significantly thinner and lighter than traditional circuit boards; products using flex will naturally be lighter.



# CIRCUITS DESIGNED WITH A RANGE OF CAPABILITIES

## Flex and Rigid Flex (Typical)

### Layer count

1 to 8 layers

### Standard panel sizes (others available)

Taiwan

250.00 by 540.00mm

250.00 by 600.00mm

### Base material

Rigid and flex IPC-6011 subspecifications/1 adhesive and /11 adhesiveless

Polyimide flex and epoxy-glass rigid materials

### Stiffeners

Thermal-set or pressure-sensitive adhesive

FR4

Polyimide

Aluminum

Stainless steel

### Shielding

Etched copper, silver ink, shielding film

### Hole size

Drilled: 0.20mm minimum

Laser-drilled holes available

### Aspect ratio

6:1

### Soldermask

Coverlay film

Liquid photo imageable

Thermal/ultraviolet cured inks

### Inkjet/silkscreen legend options

White, yellow, black

### Finish plating

OSP

Electroless nickel/immersion gold (ENIG)

Electroless nickel/electroless palladium/immersion gold (ENEPIG)

Electrolytic/hard gold

Electrolytic tin

Immersion silver

### Finished copper trace/space

Outer layers

35µm copper – 125µm trace/space

70µm copper – 203µm trace/space

Inner layers

12µm copper – 50µm trace/space

18µm copper – 75µm trace/space

35µm copper – 125µm trace/space

70µm copper – 178µm trace/space

### Quality and testing

IPC-6013 class 3

### Mechanical

Bend radius calculator, environmental, RF, optical mechanical, surface and metallurgical analysis, thermal analysis and imaging, SEM, x-ray analysis, EMI

### Electrical

Impedance calculator, crosstalk, skew, insertion loss, return loss, eye diagram

### Certifications

ISO 9001:2008

ISO 14001:2004

TS 16949

IPC 600/610 certified

ULV94-0

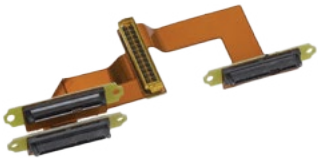

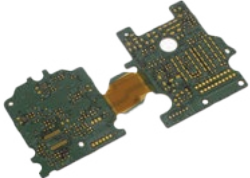
### Assembly

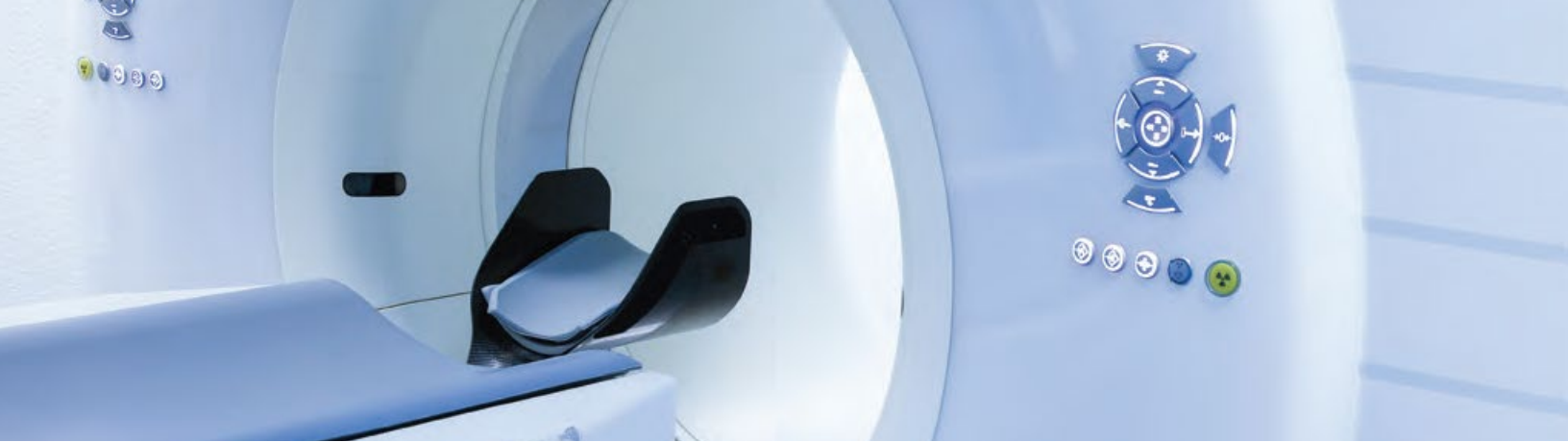
Through hole, SMT, BGA, press-fit, mechanical hardware

## Perimeter Tolerances (millimeters)

Feature	Steel Rule Die	Chemical Milled Die	Laser Profile	Hard Tool Tie	CNC Drill	CNC Rout
Hole to edge	± 0.254	± 0.254	± 0.051	± 0.051		
Hole to hole	± 0.254	N/A	± 0.051	± 0.051	± 0.127	
Cutline	± 0.254	± 0.127	± 0.051	± 0.051		
Cutline to hole	± 0.254	± 0.254	± 0.051	± 0.051	N/A	
Outline dimensions	± 0.254	± 0.127	± 0.051	± 0.051		± 0.127
Trace to edge	± 0.254	± 0.127	± 0.051	± 0.102		



PRODUCT	FEATURES	FLEX TYPES
<p data-bbox="107 646 386 674">Interconnect Assemblies</p> 	<ul data-bbox="581 646 963 835" style="list-style-type: none"> <li>• Virtually unlimited variety of interconnect options</li> <li>• Reduces assembly time</li> <li>• Superior thermal management</li> </ul>	<ul data-bbox="1055 646 1237 802" style="list-style-type: none"> <li>• Single-sided</li> <li>• Double-sided</li> <li>• Multi-layer</li> </ul>
<p data-bbox="107 1024 363 1052">Multi-layer Assemblies</p> 	<ul data-bbox="581 1024 1032 1306" style="list-style-type: none"> <li>• Typically three or more layers</li> <li>• Large number of interconnect options</li> <li>• High-density routing</li> <li>• Impedance control</li> <li>• Low signal loss</li> </ul>	<ul data-bbox="1055 1024 1208 1052" style="list-style-type: none"> <li>• Multi-layer</li> </ul>
<p data-bbox="107 1402 490 1430">Rigid Flex Circuits and Assemblies</p> 	<ul data-bbox="581 1402 993 1684" style="list-style-type: none"> <li>• Surface mount on both sides</li> <li>• Press-fit connector capability</li> <li>• Elimination of connectors and cables for improved reliability</li> <li>• Combination of flexible polyimide and rigid FR4</li> </ul>	<ul data-bbox="1055 1402 1188 1430" style="list-style-type: none"> <li>• Rigid flex</li> </ul>



## A complete source for flex and rigid flex circuit design, development, manufacturing and assembly

### Versatile interconnect solutions for design and manufacturing

- Molex flex circuit and connector manufacturing expertise
- Connector customization to meet application requirements
- Molex assembly expertise
- One supplier – complete assembly

### Full range of flex circuit and assembly technologies

- One-stop shop for flex assemblies
- Single, double, multi-layer and rigid flex; up to eight layers
- Impedance control design and manufacture
- Value-add assembly: through hole, SMT, BGA, press-fit and mechanical hardware

### Expertise in electrical, mechanical, reliability and manufacturing properties

- Multidisciplinary engineering support
- Optimize electrical, mechanical, flexibility and manufacturing requirements to meet application needs
- Extensive background in mechanical design and manufacturing
- Minimize points of flex stress; provide long-term reliability products
- Synergistic design approach to flex
- Standards certification support

### Industry leader in signal integrity design

- Specialize in high-speed design and materials support
- Full signal integrity modeling and testing capabilities
- Internally developed impedance calculator based on manufacturing parameters and material selection

### Customer engagement to avoid overdesign

- Simplify design to meet application requirements while minimizing costs
- Early engagement with complete design for manufacturing to streamline production release and builds

### Multiple manufacturing locations

- Disaster recovery backup
- Low-cost geography manufacturing
- US and Taiwan design centers
- China, Taiwan and Mexico manufacturing facilities
- ISO 14001, ISO 9001 and TS 16949-certified facilities

### Locations

- Design Centers:  
St. Paul, MN; Taipei, TW
- Flex Circuit Manufacturing:  
Taipei, TW
- Assembly Fabrication:  
Naperville, IL; Taipei, TW; Guadalajara, MX; Dongguan, PRC

## MOLEX DELIVERS:

Design engineering support

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Proven quality and reliability

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In-house value-add capabilities

## The Molex Approach

Molex takes a multidimensional approach to develop complete, integrated solutions that turn ideas into reality. With the industry's broadest line of flexible electronic solutions and the expertise to work through mechanical rigors, Molex provides expert guidance on the best fit for your needs, balancing cost, performance, durability, weight and other requirements.

Learn more about Molex flexible printed circuits for end applications and start designing for quality solutions.

Visit [www.molex.com/en-us/products/printed-circuit-solutions/flexible-printed-circuits-fpc](http://www.molex.com/en-us/products/printed-circuit-solutions/flexible-printed-circuits-fpc)

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