

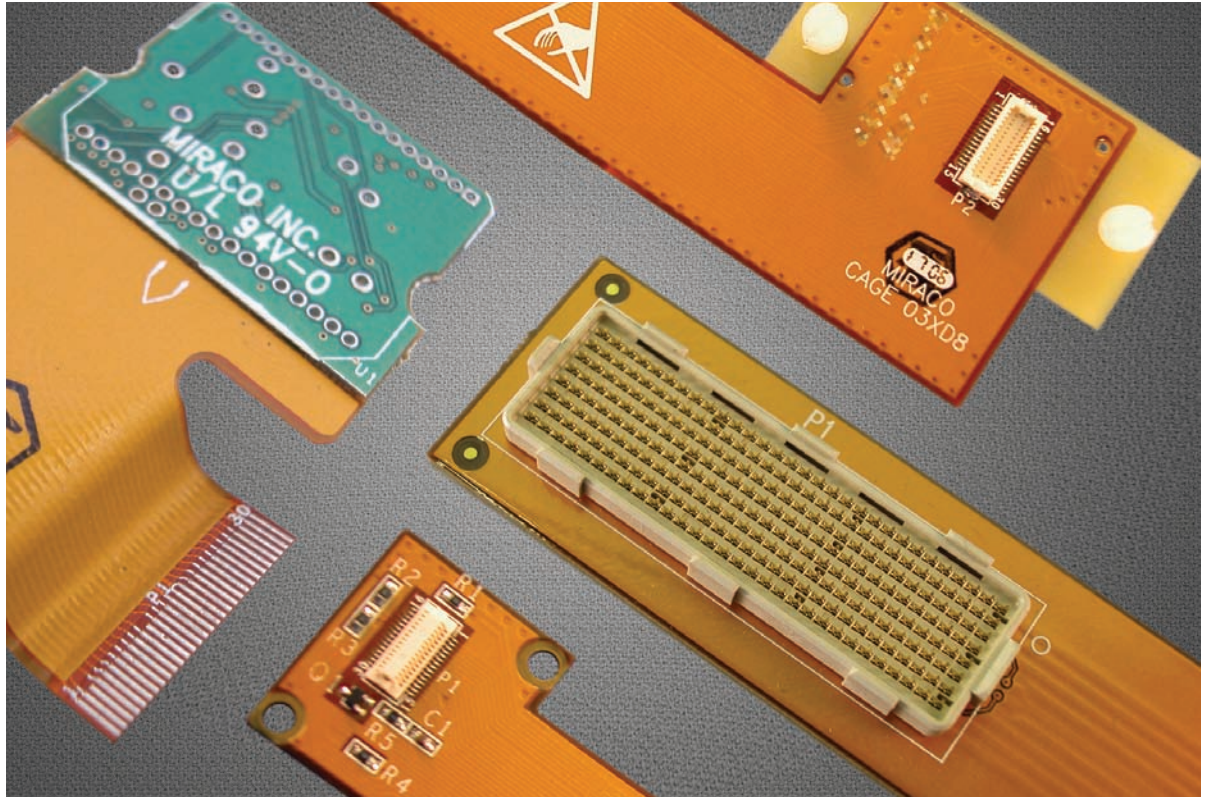


FLEXIBLE PRINTED CIRCUIT DESIGN & Source Control Services

Capabilities Overview

MIRACO...connecting technology

Service Overview



Miraco's mission is to provide comprehensive engineering and global sourcing services specializing in flexible interconnect systems. Miraco provides design engineering, documentation, procurement, supply chain management and specialized added value services. We focus on meeting the program goals of environmental, electrical, mechanical and cost objectives while providing a balanced solution.

Miraco's engineering design team, specialized added value services, quality control lab and test equipment located in Manchester, NH combined with FPC manufacturers, both foreign and domestic, provides our customers with the complete solution that anticipates the issues encountered during the product life cycle:

- In-house Engineering Design Team
- In-house Quality Control Lab
- Domestic partners who specialize in quick turn prototypes, production volumes and ITAR requirements
- Off shore partners where Miraco can transparently move the manufacturing to a low cost region while still maintaining quality controls

Miraco's expertise in all forms of interconnect solutions provides customers with flexible printed circuit designs that meet the many constraints system architects place on their designs.

Design & Sourcing Capabilities

“We Connect the Inner Systems”

Engineering:

- 200 plus combined years of design and manufacturing experience with all FPC and other interconnect solutions
- Knowledge derived from 30+ patents in the field of flex interconnects and connector technology
- Complete engineering support takes the customer from design and testing to manufacturing
- Full documentation on Miraco's or customer's format

Source Control Management:

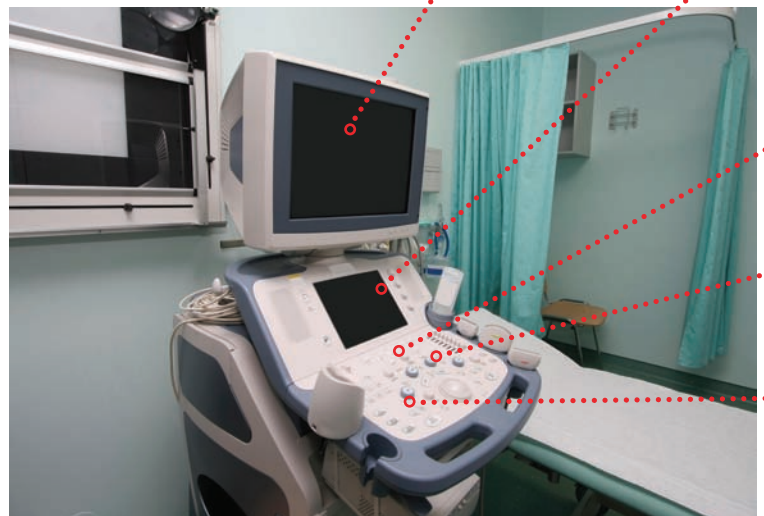
- Miraco leverages its combined flex circuit purchases to achieve the best lead time and lowest material cost to benefit all our customers
- Miraco creates, controls and provides complete “READY FOR MANUFACTURING” documentation and data packages
- Miraco can seamlessly dual source applications to assure program delivery requirements
- Miraco exceeds conventional quality control practices to insure all parts are built to print
- Miraco has the systems and procedures in place to accommodate your preferred scheduling requirements such as: Kanban, JIT, Ship-to-Stock
- Assembly services provided by Miraco using approved and qualified contract manufacturers

Manufacturing Services:

- Laser Services and Plasma Cleaning
- Silver Shielding (360 degree Coverage)
- Class A Die Outling
- Folding, Wrapping, Forming
- Overmolding
- Steel Rule Die Outlining
- Marking and Labeling
- Solder Assembly
- Electrical Testing

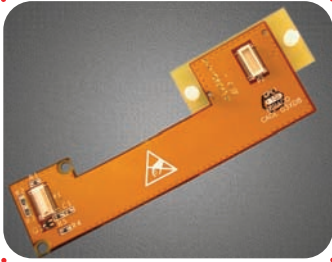
Miraco Advantage:

- Independent, unbiased design
- Total Solution provider
- Improve reliability while enhancing performance
- Improved overall system cost
- Improved design
- Improved manufacturability
- Improved time to market



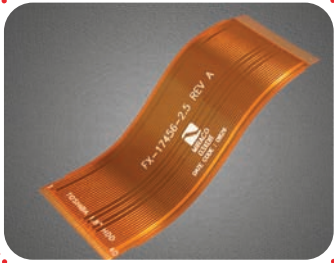
Sample System

Display Interconnect Systems



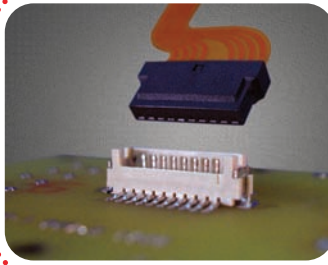
1. 100 OHM differential pairs
2. EMI control
3. Active component assemblies with custom laminated stiffeners

Internal Disc Drive



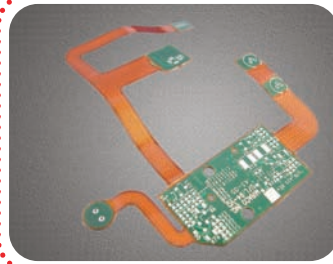
1. Impedance controlled, 50 OHM single ended
2. Highly flexible construction
3. Accommodates various ZIF thicknesses

Custom Connection Interface



1. Flexible interconnect conversions available
2. Configurable to any board terminator
3. Custom connector designs available

Logic Interface



1. Rigid-flex design
2. Suitable for pick and place SMT
3. Can be supplied in panel form with breakouts

Board-to-Board Interconnect Systems



1. High density BGA connectors
2. Isolated layer pairs for additional flexibility
3. High density: Up to 10 layers

Product Capabilities

DESIGN FORMATS	Autocad (DXF, DWG), Gerber (RS274-X), Solid Works (IGES, SLDPRPT)																
PANEL SIZE	24" maximum width 10'+ length																
COVERCOAT THICKNESS	.0005 and up																
LAYER COUNT	1-18																
INTERCONNECT ASSEMBLY TYPES	Thru hole SMT, BGA, Hybrid FFC/FPC																
FINISHED HOLE SIZE	Compliant Pinned (rigid zone only) - 0.018" (0.457mm) Minimum Via (A/R dependent) - 0.008" (0.203mm) Minimum																
INTERNAL FEATURES (COPPER WEIGHT DEPENDENT)	Trace - 0.003" (0.0762mm) Spacing - 0.003" (0.0762mm)																
MATERIALS	<table border="0"> <tr> <td>Polymide - Standard acrylic/epoxy</td> <td>Silvery Epoxy Shielding</td> </tr> <tr> <td>Polymide - FR acrylic/epoxy</td> <td>Soldermask</td> </tr> <tr> <td>Polymide - AP</td> <td>FR-4/21 & 24</td> </tr> </table>	Polymide - Standard acrylic/epoxy	Silvery Epoxy Shielding	Polymide - FR acrylic/epoxy	Soldermask	Polymide - AP	FR-4/21 & 24										
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COPPER PROCESSING	1/4 oz. up to .032"																
IMPEDANCE (SINGLE AND DIFFERENTIAL)	+/- 10%																
SURFACE FINISHES	HASL, OSP-Entek 106, ENIG, Immersion tin, Immersion silver, Bright tin, Ni/Au																
ASSEMBLY CAPABILITIES	Full turn-key, Thru-hole - Wave & Manual, SMT - Pick & Place, Wire-bond, Crimp, RoHS Compliance																
ASSEMBLY FINISHING	Conformal Coat - UR, AR, ER Glop top Overmolding																
TEST CAPABILITIES	<table border="0"> <tr> <td>Impedance testing</td> <td>Bed of Nails</td> </tr> <tr> <td>Hi-Pot up to 5,000 VDC</td> <td>Flying Probe</td> </tr> <tr> <td>2,000+ points per circuit</td> <td>Flex Cycling</td> </tr> <tr> <td>Insulation resistance up to 500 VDC</td> <td>Environmental</td> </tr> <tr> <td>Four wire Kelvin .001 OHM & up</td> <td>Functional Test</td> </tr> <tr> <td>IPC-TM-650 (Env-Mech testing)</td> <td>LED's, Diodes, Resistance Capacitors</td> </tr> <tr> <td>X-Ray Composition Analysis</td> <td></td> </tr> <tr> <td>Plating Thickness</td> <td></td> </tr> </table>	Impedance testing	Bed of Nails	Hi-Pot up to 5,000 VDC	Flying Probe	2,000+ points per circuit	Flex Cycling	Insulation resistance up to 500 VDC	Environmental	Four wire Kelvin .001 OHM & up	Functional Test	IPC-TM-650 (Env-Mech testing)	LED's, Diodes, Resistance Capacitors	X-Ray Composition Analysis		Plating Thickness	
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LASER CAPABILITIES	Outline +/- 0.003" Exposure single & double sided																
DIELECTRIC STRENGTH	>5 kV/mil @ 1mil																
DIELECTRIC CONSTANT	@1 KHz test frequency - 3.4																
WATER ABSORPTION	3%																
OPERATING TEMPERATURE	-55° C - 125/150° C																

Miraco Inc. is dedicated to developing innovative high-density interconnect solutions for the flexible printed circuit (FPC) and laminated flat flexible cable (FFC) industries. Miraco solutions not only offer a complete line of standard interconnect products and customized connectors, but also the revolutionary Quick Laser and Quick Cable circuit and cable finishing services. Miraco continues to maintain an aggressive research and development program focused on developing new products and processes to meet tomorrow's electronic packaging challenges.

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ISO 9001:2008 CERTIFIED

