

Company Overview

- Founded in 2008
- Hand-picked industry professionals
 - Senior Staff with 170 combined years experience
 - Design, material and process experts fully accessible to customers
- Privately held, debt free
- Small business classification
- D&B Class 1 Credit Score
 - 1R3 Rating
- Exclusively flex and rigid flex
 - Small to medium production
 - Serving defense, medical and industrial markets
- Made in the USA



PITTSBURGH
BUSINESSTIMES
2011 MANUFACTURER OF THE
YEAR FINALIST



Flexible PCB Benefits

- **Flex Properties**
 - Heat dissipation, shock and vibration resistant
 - Electrical characteristics: predictable and controllable (impedance, cross-talk, noise)
 - Versatile shape enables 3-dimensional configurations
- **Weight and Size**
 - Allows dramatic reduction of electronics package size and weight (up to 75% compared to rigid and round wire configurations)
- **Cost effective**
 - Designed to eliminate board to board interconnects or board to wire connections (the most common failure points in electronic assemblies)
 - Easier to install or replace (removes human-error associated with point to point wire assemblies)
- **Durability**
 - Bend & straighten up to 500 million times without a failure
 - Unmatched performance for applications with repetitive motion
 - Polyimide is known for its dimensional stability, dielectric strength and high heat resistance



Circuits' Facilities

50,000 sq. ft. facility designed *specifically* for manufacturing highly reliable flexible PCBs

- Class 1000 Clean Room central to operations, equipped with independent air-handling units, HEPA air filtration system, interlocking pass-through unit and UV light protection
- Open, highly efficient, work-flow designed to minimize transport and handling
- Custom-engineered equipment built to handle thin core materials
- Electroless copper and full panel electroplating using chemistry tuned for flexible substrates
- Two UV laser driller/routers
- High speed, fine pitch flying probe test
- Complete in-house cross section and failure analysis lab



Clean Manufacturing



- Solar Energy –chemical rinses are heated with thermal solar power
 - Panels heat 10 gallons water per minute to 70°F with 3 ½ hours average sunlight per day
 - Warm rinse water reduces chemical bleed from one bath to next eliminating organic contaminants
- Facility outfitted with exhaust and fume scrubbers
 - Reduces any pollutants leaving the manufacturing area
- Water treatment – ion exchange technology to remove metallic and chemical contaminants
 - Eliminates the generation of hazardous wastes
 - Reclamation/recycle of valuable materials
- Efficient and environmentally-friendly process choices
 - ENIG (cleanest, most reliable, assembly-friendly lead-free finish)
 - Plasma etch – clean smear removal and etchback
 - Cobra Bond™ - inner layer adhesion promotion

Capabilities - Overview

Flex and Rigid-Flex PCBs	
Flex Materials	DuPont Pyralux AC, AP, FR and LF
Rigid Materials	FR4 & Polyimide
Copper Weight	¼ oz to 3 oz
Core Thickness Min	. 5 mils
Board Thickness	2 – 125 mils
Layer Count Max	16
Max board Size	22"x16"
Lead Time	3 to 10(*) business days
Specifications	IPC-6013(*), MIL-PRF-31032
Trace/Space	3/3 mils
Via Structure	Through, Blind, Buried, Microvias
Hole Sizes	2-250 mils
Surface Finish	ENIG (*), HAL, Hard and Soft Gold, Immersion Silver, OSP
Surface Coatings	Coverlay Pyralux LF(*) and FR, LPI
Special Processes	Controlled Impedance, flying leads

* Denotes standard processes

Standard lead time is 10-days for single & double sided flex using stock stack-ups. Accelerated deliveries are available for time-critical projects

Quality Across the Board

- ISO9001:2008 Certified
- ITAR Certified
- UL 94v.0 flex, multilayer flex and rigid-flex
- MIL-PRF-31032: targeted for 2012
- AS9100 to follow MIL Spec qualification



In-house SEM/EDAX

- SPC throughout manufacturing
- Cross-section analysis
- Controlled impedance TDR Testing
- Fixtureless flying probe 100% netlist test
 - Continuity and isolation testing
 - No witness marks left on SMT pads
- Comprehensive final inspection procedures

- Data Integrity
 - Netlist extracted from “as received” gerber is compared to customer supplied netlist
 - Electrical test netlist extracted
- Design Rule Check
 - Comprehensive DRC to resolve any potential manufacturability issues and suggested areas of improvement for increased yields or cost savings
 - All alterations made by Circuits require customer approval
- Manufacturing Tools
 - Full panel optimization for individual pieces or assembly
 - Conformance coupons added
 - Master output files created for imaging, drill, laser, test and routing

INFINITE GRAPHICS

Snapshots of job flex2

Type	Layer	Image	Bird's Eye	X-Location	Y-Location	Comment
(1) DRC: Clearances @ .005.	1a-1c			-1.132004	-0.009441	Can we increase clearances to .008?
(2) DRC: Coverlay ann. ring @ .002, need .005	1a-1c, 1m			-0.568966	0.622111	Can we increase and merge coverlay openings? Can not hold slivers when they become reduced.
(3) Approval: Markings for location approval	1a-1c, 1m-1o			0.235582	-0.336449	We will put our markings here in copper
(4) DRC: Coverlay ann. ring @ .003, need .005	4a-4m			-1.206680	0.709626	We need to increase ann. ring but may expose via pad.
	1a, 1e, 1o			0.892984	1.189975	

Sample DRC feedback report

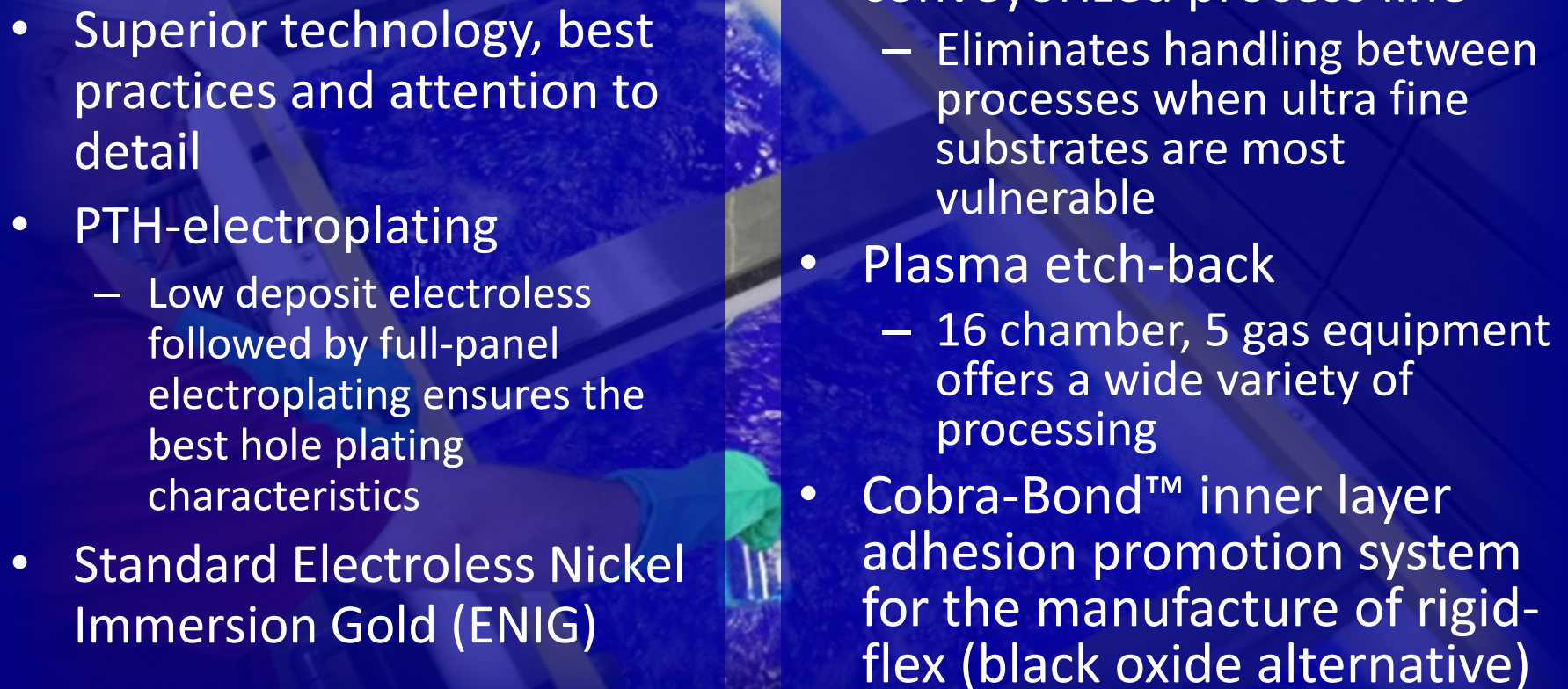
Imaging

- Photoplotting
 - Crescent 30 Photoplotter integrated with upfront CAM software
 - .25 mil resolution
- Printer
 - Point source printer, 25 X 30 exposure area
 - Self-contained air conditioner and multiple drawer processing unit



- Imaging-intensive processing
 - 16' X 20' modular Class 1000 Clean Room
 - Rigorous quality control regimen and safeguards in place
 - State-of-the-art imaging equipment



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- Superior technology, best practices and attention to detail
 - PTH-electroplating
 - Low deposit electroless followed by full-panel electroplating ensures the best hole plating characteristics
 - Standard Electroless Nickel Immersion Gold (ENIG)
 - Custom-engineered DES conveyORIZED process line
 - Eliminates handling between processes when ultra fine substrates are most vulnerable
 - Plasma etch-back
 - 16 chamber, 5 gas equipment offers a wide variety of processing
 - Cobra-Bond™ inner layer adhesion promotion system for the manufacture of rigid-flex (black oxide alternative)

- Lamination Press
 - Programmable Vac-Q-Lam
 - Pressure uniformity and temperature ramp up/ramp down capabilities
- Mechanical Drilling and Routing
 - Uniline 2000 turns 80K RPM for routing and 125K RPM drilling
 - EX200
 - Continuous laser inspection of bit quality and hit count
 - Fully integrated with upfront CAM operations
- Laser Drill and Route
 - ESI 5150 laser (1 mil precision laser)
 - ESI 5200 Laser microVia Drill
 - Microvias, tight radii and critical dimension features
 - Variable depth



Contact Us

- Flex PCB pricing in 24-hours or less
- Full Support and Design Help
 - Flex conversion, Design Rule and Design for Manufacturability support available to all customers
- Full turn key available through Circuits' qualified suppliers
 - Design
 - Assembly

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*Count on us for consistent quality,
competitive pricing and reliable on-
time delivery. Every time.*



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