







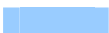


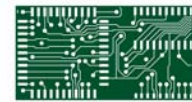
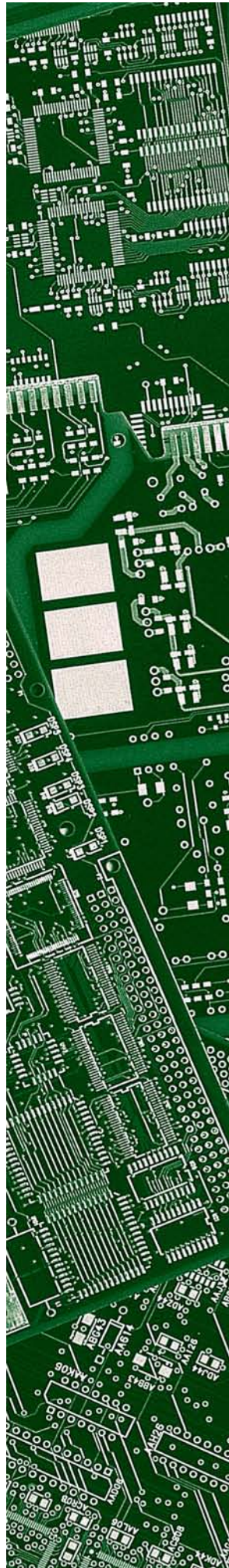
Quality Printed Circuits  
**Circuit Science, Inc.**

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Quality Printed Circuits  
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## COMPANY & MANUFACTURING BACKGROUND

Circuit Science, Inc. has been a manufacturer of rigid printed circuit boards since 1967.

Beginning as a prototype facility, our early success with several accounts demonstrated the need to provide manufacturing, from prototype through production.

Today, we enjoy relationships with customers who have relied on Circuit Science manufacturing capabilities for over 40 years. As we prepare to grow into the next Century, our most important goal is continuous process improvement through employee training and equipment modernization.

## OUR GOAL WILL BE REALIZED THROUGH

- Employee Recognition and Involvement
- Facility Improvements
- Handling Equipment
- Enhancements to our Computerized Manufacturing
- Effective use of Statistical Process Control
- Equipment Modernization
- Aggressive Preventive Maintenance Programs
- ISO Certification

## PRODUCTION CAPACITY

Our current production capacity is 16 thousand panels per month with a sales volume of \$25 million per year.

## QUALITY

Our quality control system is a direct response to customer requirements and is ISO9002 certified.

In lieu of customer specifications, boards are manufactured to meet the requirements of IPC-A-600, and U.L. Standards 796/94V-O, as applicable.

For more information, CSI has a "Quality Manual" which will be provided upon request.

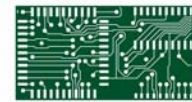
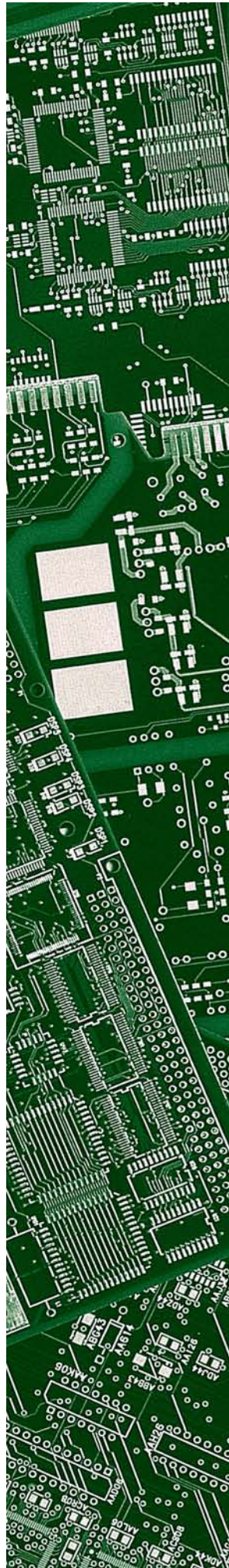
## STATISTICAL PROCESS CONTROL

We are committed to the use and practice of W. Edwards Deming's methods of statistical process control. This commitment is demonstrated by the emphasis put on the benefits of SPC and the importance of proper training.

Current features of the program include training sessions, which promote the use and practice of a successful SPC program. Employees are trained in charting critical process parameters and the use of such charting to control and improve those processes.

The basic philosophy behind the SPC program is that this is a continuous program of quality improvements.





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### CSI'S COMMITMENT

**Quality** – By utilizing Total Quality Management (TQM) for a defect-free product to meet or exceed customer specifications.

**Delivery** – With the use of Bar Coded Travelers and Computerized production planning and scheduling, our goal is 98% on-time deliveries, with advanced notification to all customers whose shipment may be delayed.

**Pricing** – To compete effectively in today's marketplace by offering aggressive pricing which is firm and competitive.

**Service** – To provide the highest level of customer support by consistently supplying accurate information in a timely manner.

### MANAGEMENT'S COMMITMENT TO OUR CUSTOMERS & EMPLOYEES

**Our Philosophy** – To provide the excellent service, product quality and competitive pricing our customers expect and deserve.

**Teamwork Approach** – We will work with our customers to understand and solve technical and business problems. We will continue to be 100% customer oriented and technology driven.

**Quality** – By obtaining quality materials from our suppliers to assist us in producing to customer specifications a 100% defect free product.

**Delivery** – To expand manufacturing techniques that allow CSI to maintain a consistent lead-time.

**Manufacturing Methods and Technology** – We will improve upon our manufacturing procedures through on-going employee training, certification programs and equipment modernization.

**Research and Development** – CSI is committed to providing leading edge technology while allowing for a reliable, competitive and profitable manufacturing environment.

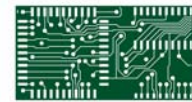
**Pricing** – To consistently provide a realistic cost structure based on the actual fabrication requirements with minimal variation based on market conditions.

**Immediate Goal** – Continue our journey toward the Total Quality Management Philosophy that will involve all employees and enable Circuit Science to succeed and become a stronger business partner to all of our customers now and into the future.

### CSI'S MISSION STATEMENT

**"Our Mission at Circuit Science is to *meet or exceed* our customer expectations through *quality* products, and *on-time* delivery."**





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## DESIGN SPECIFICATIONS/MANUFACTURING CAPABILITIES

(Referencing .062" Bare Board Thickness)

### Capabilities —

Minimum Line Width and Spacing — .004"  
Feature Size Reproducibility — +/- 20%  
Impedance Control Tolerance — +/- 10%  
Panel Size of 18 x 24 - Useable area of 16.5" x 22.5"

### Holes —

Minimum Drill Diameter — .008  
Tolerance on Plated Diameter — +/- .003"  
Tolerance on Non-Plated Diameter — +.002 / -.001"  
Hole Placement Accuracy — +/- .003"

### Lamination —

Individual Dielectric Thickness Tolerances — +/- .0015"  
Finished Board Thickness — +/- .005"

### Image Placement —

Feature Location — +/- .002"  
Photoimageable Soldermask Registration — +/- .003"

### Fabrication —

N. C. Rout Dimensional Tolerance — +/- .005"  
Scoring Dimensional Tolerance — +/- .005"

### Electrical Testing —

Double Density Clam Shell Net list Testing — 12 - 20 mil. Pitch  
Probot Flying-Probe Point-to-Point Net list Testing — 12 - 20 mil. Pitch

### Surface Finishes —

Hot Air Leveling  
High Temp Entek Organic Solderability Preservative (O. S. P.)  
Deep Gold — 100-200 $\mu$  Nickel / 30-50 $\mu$  Gold  
Immersion Nickel / Gold — 140-200 $\mu$  Nickel / 2-4 $\mu$  Gold  
Immersion Silver

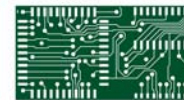
### IPC Manufacturing Specifications —

IPC-D-300  
IPC-6011  
IPC-6012

(All Capabilities and Tolerances listed above are standard practice at Circuit Science.)  
For further information please contact one of our sales engineers at (763) 559-9515.

Circuit Science also provides engineering support for products beyond our normal manufacturing guidelines.





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## CIRCUIT SCIENCE INC. HIGHLIGHTS



ISO9001-2000 Certified (TUV)

Statistical Process Control (SPC) —  
**Continual reduction in variation**  
**Management commitment and involvement**

Total Quality Management —  
**On-site training for all employees**  
**Policies and Objectives reflect continual process improvement**

Fully Computerized Production Control Management —  
**Syteline Resource Planning system: Bar-coding for each step in our Manufacturing process**  
**Programmed for Capacity Scheduling**  
**Instant Job Status**

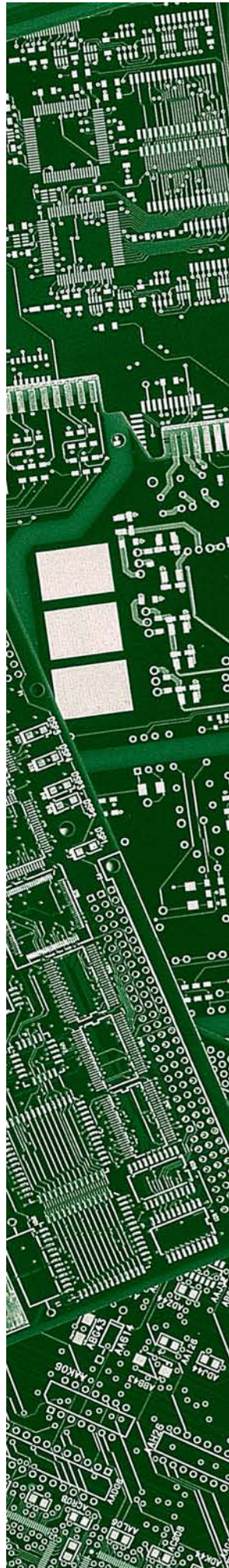
Full Testing Capabilities —  
**PC 1411 Advanced Optical Inspection (A.O.I)**  
**Mania Barco – Argos 8008 High Speed A.O.I**  
**Mania Double Density Clam Shell Net List Testing (Out-Sourced Mania Testerion)**  
**Mania High Density SMT bare board testing(Out-Sourced Mania Testerion)**  
**Pro-Bot Flying-Probe Point-to-Point Net list Testing (Out-Sourced Mania Testerion)**

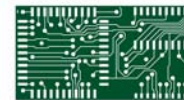
CAD Data Manipulation —  
**Extraction from 1.44 mb Diskette, CD-Roms, E-Mail or our FTP site or Website**  
**Panelization and Design Rule Checks (DRC) using Valor/Orbotech Genesis 2000**  
**Photo-Plotting**

Extensive Capabilities —  
**Prototype to Production**  
**Double sided to 18 layer**  
**4/4 mil Line and Spacing**  
**Blind or Buried Via's**  
**Carbon Ink**  
**Photo-Imagable Soldermask**  
**Horizontal Hot Air Leveling**  
**Organic Solderability Preservative (OSP)**  
**Deep Gold**  
**Immersion Nickel / Gold**  
**Silver Immersion**  
**Lead Free Hot Air**  
**SMOBC**  
**Scoring**



Approved 94V-O





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## FACILITIES LIST

63,000 sq.ft. of manufacturing and offices  
Complete Ion Exchange System for copper and lead  
Complete Fire Protection System  
Weather-Rite 45,000 CFM heated air-make-up system  
Air Conditioned and Environmentally Controlled  
Bulk storage for ammonia hydroxide  
Worthington Roll Air Compressor (260 C.F.M.)  
Airteck SC500 Air Dryer  
Quiney 235 Compressor 235 C.F.M.  
6.2 G.P.M. Reverse Osmosis System with two 1000 gallon holding tanks

## PHOTO IMAGE EQUIPMENT

1-NuARC (Ft-40 up) flip top  
1-CSI- Punch-film registration system  
1-Carlson spacemaster  
1-Dynachem (450) dry developer  
1-DAC-CDC 2 programmer  
1-Gerber Crescent 30 Photo Plotter  
1-Escort 300 Front Loader  
1-Glunz & Jenson Processor  
1-Multiline film punch  
2-Intel Pentium Cam/Par stations  
1-Hewlett Packard Design Jet 2200 Plotter  
1-Hewlett Packard Laser Jet 4 Plus Printer  
1-NT Server & Microsoft Networks  
1-Ledco protective film coater

## DRY FILM

1-Circuit Chem VIP inner layer vertical developer, etch, strip line  
1-Hakato cut-sheet laminator, A.L. 150  
1-Dynachem (1500B) cut-sheet laminator with wet lamination unit  
1-Dynachem Hot Roll Preheater for cut-sheet laminator  
1-DuPont (HRL-24) dry film laminator  
1-Colight (1330) printer  
1-Morton Hi-Tac cleaner  
1-Dynachem clean machine  
1-Pumiflex Pumice Scrubber  
1-Filtrex System  
2-ORC (Model HMW) 201B water cooled printer (3K & 5K)  
1-Tek Nek Clean Machine  
1-Dayton (4Z788) registration punch  
1-Walk-in refrigeration unit for pre-preg storage (6 x 6 x 7) Volrath

1-Multiline Acculine Layer Punch Press with glass registration frames  
1-Hakato 150 cut sheet laminator  
1-Dynachem 24" Hitac Cleaner  
1-Amtech accumulator  
1-Amtech Feeder  
1-Amtech incline feeder  
1-Amtech incline receiver

## LAMINATING EQUIPMENT

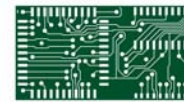
Advanced Plasma Systems 6 opening vacuum laminating press (30 x 30)  
Pasadena-automatic 4 opening press (24 x 30) w/ cooling tower.  
Excellon (XL-3 flash router) 3 spindle with Excellon controller  
1-B-Stage punch  
1-Numberall serialization punch

## DRILL&ROUT EQUIPMENT

1-ESI 6-Pak drill with tool management  
1-ESI SmartDrill  
1-Dynamotion Model #9500 with broken bit detection system  
5 - Dynamotion Model #9400 with broken bit detection system  
1-ESI 6-Pak Router  
1-Excellon (Mark V) 4 Spindle Router  
1-Nicolet X-Ray Unit NXR-1002/Quar System and video graphic printer  
3-P.B-15 Arco Wand Vacuums  
1-25 HP Spencer Vacuum System

## PLATING EQUIPMENT

1-Baker Bros Model B-10 Hoist copper & tin-plating line. Two side arm hoist system, PC/PLC driven. (85 panels per hour)  
1-Amtech accumulator  
1-Somaca 24" scrubber  
1-Avalon-Avtec 4000 hot air leveling system with pre-clean fluxer and post-clean  
1-Surface finishing technologies MP80 gold tab plater with auto load/unload  
1-Circuit Chemistry automated desmear line. Capacity of 500 panels per shift  
1-Circuit Chemistry Solder strip (HIP-TS)



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### PLATING EQUIPMENT CONT.

- 1-Circuit Chem horizontal processing system for the application of organic solderability preservative (OSP) Di-Acro Power Shear-Gold Line
- 1-Non tox Dryer, Somnoca
- 1-Elite 606 hot tape press
- 1-Chemcut 107/ I Sander with high pressure spray

### SCREENING EQUIPMENT

- 2-Systematic Automation Auto Screeners
- 2-Custom hand screening tables
- 1-Colight 1530 Printer – water cooled (5K)
- 1-Circuit Automation TC120 tunnel oven
- 1-Grieve (B1-450) walk-in curing (4x4x6) oven
- 1-Grieve (BIH500) walk-in curing (4x4x6) oven
- 1-Grieve CBV 550 walk in oven
- 1-Dispatch curing oven
- 1-DP10-Double-Sided coater (Photoimagable soldermask) with auto ink replenisher
- 1-Douthitt vacuum frame
- 1-Addalux 5 KW printing light
- 1-Lighted washout booths
- 1-CD 1502 power sprayer
- 1-VIP vertical developer

### FABRICATING EQUIPMENT

- 1-Barnaby Pin Router
- 1-Start Slot Table with tilt
- 1-Carbide Products Edgemate
- 1-ARCO beveler
- 1-Bevelmate Model 035

### TESTING EQUIPMENT

- 2-Microscope 7-30x Bausch & Lomb
- 1-Fluke meter series II multimeter (8012)
- 2-Hughs Aircraft welder (MCW - 550) with microscope 7-30x Bausch & Lomb
- 1-Microscope 7-30x Bausch & Lomb
- 1-Mitutoyo QC-40L micrometer
- 1-Mania Tester – See Testerion
- 1-Mania Tester – See Testerion
- 1-Fluke 10
- 1-Fluke 77
- 1- PolarFab Controlled Impedance Testing Station
- 1-CamTek 2V50 A.O.I. System

- 1-Mani Barco Argos 8008 High speed A.O.I System

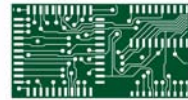
- 1-Unitek HF25 Welder

### QUALITY EQUIPMENT

- 1-CMI (1700) Beta backscatter gold measuring instrument
- 1-Nickelderm- UPA, nickel measuring instrument
- 1-CMI (Model PTH100) hole copper thickness measuring instrument
- 1-Unitron (unimer Model MR1-2-4) cross section microscope
- 1-Buehler cross-sectioning system
- 1-Solder float thermal shock testing unit
- 1-Beckman spectrophotometer unit
- 10-Bausch and Lomb stereo zoom 30x microscopes
- 1-Flat plate 18" x 24"
- 10-Micrometers
- 13-Calipers
- 1-Kuroda gauge blocks set-approve N.B.S.
- 2-60x scopes with .001 scale
- 14-Steel hole gauge sets. (Sizes .021 to .250)
- 1-Numerex-coordinate measuring machine
- 3-100x scopes with .001 scale
- 1-MFX-B-M copper resistance measuring unit Beta Backscatter tin thickness
- 1-CRX hand held foil thickness measuring instrument
- 1-Toledo scale
- 1-Mettler scale
- 1-Beckman ph meter
- 1-Bio medical ph meter
- 1-Solder ability solder float & testing unit
- 1-Hull cell testing system
- 1-Corning hot stir plate
- 1-Corning stir plate
- 1-Thermolyne roto mixer
- 1-Weldotron shrink wrapper
- 1-Christopher E.C. Series vacuum shrink wrapper

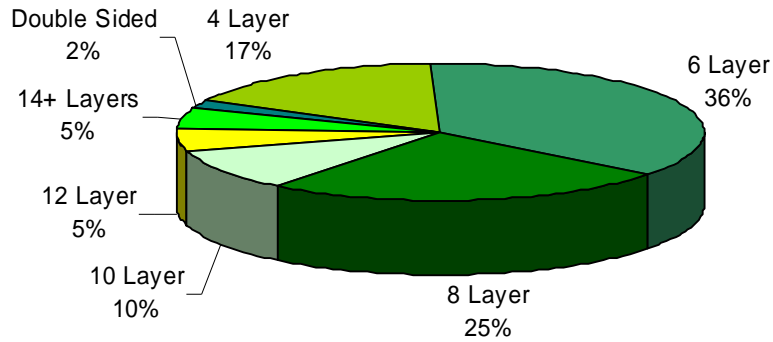
All inspection equipment is inspected and maintained to ANSI/NCSSL



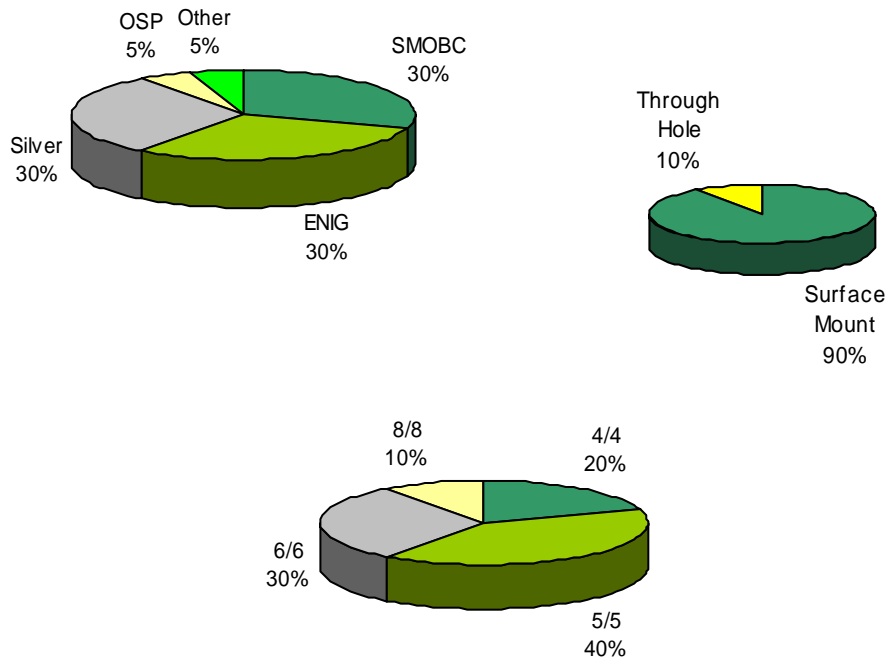


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### PRODUCT MIX BY SOPHISTICATION



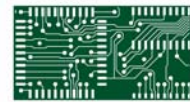
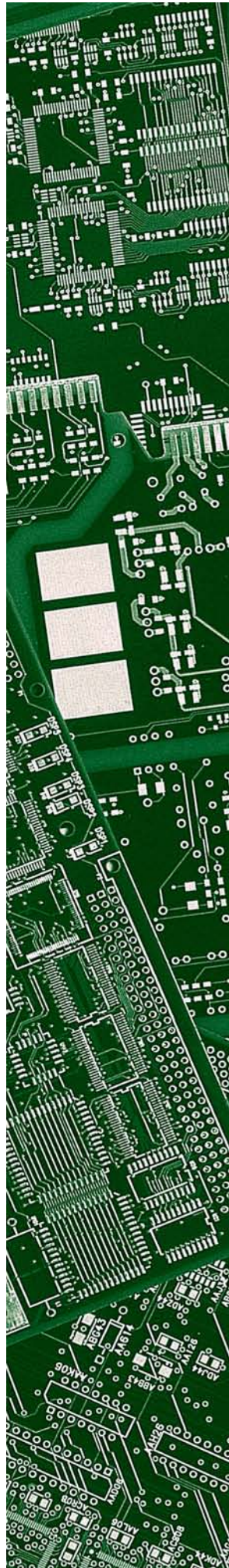
### PRODUCT MIX BY TECHNOLOGY & PROCESS



CSI has enjoyed manageable growth with unmatched customer relations. Our ability to deliver a consistent product on time, has allowed this growth to continue.

CSI continues to keep pace with industry technology. We are focused on our customers and continually upgrade processes and equipment to meet the requirements of today's high tech environment.



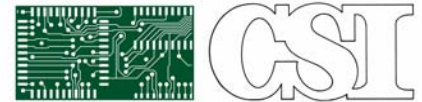


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## CIRCUIT SCIENCE INC. CUSTOMER LIST

Customer contacts available upon request.





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## CSI CONTACT INFORMATION

### GENERAL —

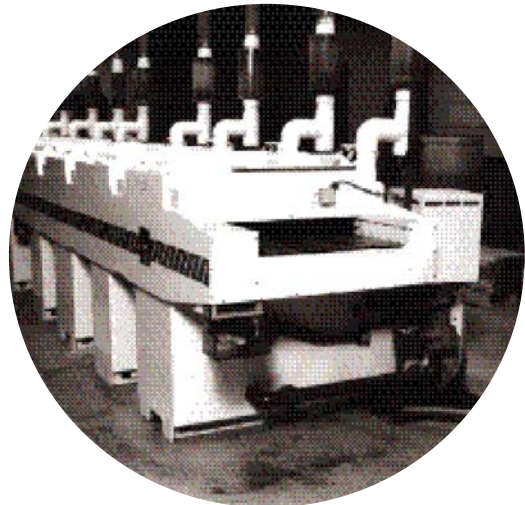
Phone: 763-559-9515  
Fax: 763-559-2569  
Web Site: [www.circuitscience.com](http://www.circuitscience.com)

### ENGINEERING —

Phone: 763-559-9515  
Fax: 763-559-2569  
E-mail: [cam@circuitscience.com](mailto:cam@circuitscience.com) (20MB Attachment limit)  
FTP site: <ftp.circuitscience.com> (contact us for an account)

### SALES —

Phone: 763-559-9515  
Fax: 763-559-2569  
E-mail: [sales@circuitscience.com](mailto:sales@circuitscience.com)



**Horizontal Processing System  
For Organic Solderability  
Preservative (OSP).**

