

TRIANGLE CIRCUITS OF PITTSBURGH MANUFACTURING PROCESS CAPABILITIES AND TOLERANCES

>>> Now ITAR Registered <<<

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| <p>LAMINATES <i>RoHS Compliant - EU Directive 2002/95/EC</i> NEMA FR-4 / IPC-4101/21/24/26 CTI ≥ 175 UL796 DSR and 94V-0 Rated 130° - 170°Tg External Base Copper - 0.25 to 3 oz Rogers -- 4350B series Internal Base Copper - 0.5 to 3. oz.</p> | <p>SOLDERMASK TYPE Liquid Photoimageable (LPI) IPC-SM-840 Class 2 and 3 0.004" Minimum Solder Dam Web</p> |
| <p>STANDARD BOARD THICKNESS & TOLERANCE PER IPC-4101 class B par. 3.8.4.2 (glass to glass) .020 +/- .003 .093 +/- .007 .031 +/- .004 .125 +/- .009 .062 +/- .005</p> | <p>ANNULAR RING REQUIREMENTS FOR SOLDERMASK (TO ACHIEVE A NO MASK ON PADS CONDITION) Liquid Photoimageable Minimum Annular Ring = 0.003"</p> |
| <p>BOARD FLATNESS PER IPC-6012 par. 3.4.4 SURFACE MOUNT PRODUCT 0.75% of PCB diagonal measurement = 0.0075 inch / inch ALL OTHER PRODUCT 1.5% of PCB diagonal measurement = 0.015 inch / inch</p> | <p>LAYER-TO-LAYER REGISTRATION Films generated by Triangle CAM system = +/- 0.003" Other films = +/- 0.005"</p> |
| <p>STANDARD CORE DIELECTRIC SELECTION .005", .008", .014", .021", .028" Other sizes, special order</p> | <p>ANNULAR RING REQUIREMENTS (TO ACHIEVE IPC-A-600 CLASS 3 - NO BREAKOUT) Minimum = 0.005" (TO ACHIEVE IPC-A-600 CLASS 2 - 90 DEG. BREAKOUT) Minimum = 0.004"</p> |
| <p>MAXIMUM NUMBER OF LAYERS = 14 Blind and Buried vias available</p> | <p>HOLE LOCATION TOLERANCES PER IPC-2615 12 inches or less = +/- 0.003" Over 12 inches = +/- 0.004"</p> |
| <p>CONDUCTOR WIDTH, SPACING AND THICKNESS TOLERANCES FOR FINISHED PRODUCT PER IPC-6012 pars. 3.5.1, 3.5.2, 3.5.3 Conductor width not to exceed 20% reduction from original films. Conductor spacing not to exceed 20% reduction from original films. Conductor thickness not to exceed 20% reduction from required finished thickness (inclusive of base copper and copper plating)</p> | <p>LOCATION TOLERANCES FOR CUTOUTS, SLOTS AND NOTCHES PER IPC-2615 12 inches or less = +/- 0.006" Over 12 inches = +/- 0.008"</p> |
| <p>MINIMUM FINISHED HOLE DIAMETER Plated through holes = 0.006" Nonplated through holes = 0.009"</p> | <p>FINAL OUTSIDE BOARD DIMENSIONAL TOLERANCES PER IPC-2615 +/- 0.005"</p> |
| <p>FINISHED HOLE DIAMETER TOLERANCE FOR NONPLATED HOLES PER IPC-2615 0.010 - 0.032" Tol. = +/- 0.002" 0.033 - 0.063" Tol. = +/- 0.003" 0.064 - 0.250" Tol. = +/- 0.004" Over 0.250" Tol. = +/- 0.005"</p> | <p>MINIMUM CONDUCTOR WIDTH / SPACE (As measured on original film) Line Width = 0.004" Space = 0.004"</p> |
| <p>FINISHED HOLE DIAMETER TOLERANCE FOR PLATED HOLES PER IPC-2615 0.008 - 0.032" Tol. = +/- 0.003" 0.033 - 0.063" Tol. = +/- 0.004" 0.064 - 0.250" Tol. = +/- 0.005" Over 0.250" Tol. = +/- 0.006"</p> | <p>MINIMUM SURFACE MOUNT PITCH = 0.015"</p> |
| <p>INTERNAL SLOTS KEYWAYS Minimum - 0.031 Minimum - 0.031</p> | <p>STANDARD PLATING THICKNESS COPPER = 0.001" - 0.002" SOLDER = Coverage and Solderable to J-STD-003 NICKEL = 50 - 200 micro inches HARD GOLD = 30 - 80 micro inches Knoop = 120 - 200 IMMERSION GOLD (ENIG) per IPC-4552 Knoop = < 90 IMMERSION SILVER per IPC-4553</p> |
| <p>QUALITY SYSTEM STANDARDS ISO-9001-2008 Registered by QM/ SAI GLOBAL ACCEPTABILITY CRITERIA IPC-A-600 (latest revision) Class 2 and 3 PERFORMANCE SPECIFICATION IPC-6012 (latest revision) Class 2 and 3 UL 796, 94V-0 File# E76719M (see page 2) CERTIFICATIONS AND REPORTS AVAILABLE Base laminates to IPC-4101 EDAX, SEM by request Microsection evaluation Impedance Thermal stress evaluation AA unit Electrical Test to IPC-9252 Ionic Contamination to IPC-6012 Solderability to J-STD-003 Xray Fluorescence and Capacitance plating thickness</p> | <p>ALTERNATIVE SURFACE COATINGS Enthone OSP - ENTEK PLUS Immersion White Tin Immersion Gold (ENIG) and Hard Gold Immersion Silver Lead Free Hot Air Leveling (SN100)</p> |
| <p>INTERNAL SLOTS KEYWAYS Minimum - 0.031 Minimum - 0.031</p> | <p>ELECTRICAL TEST CAPABILITIES Gerber Netlist testing standard Comparison to IPC-356A Single or Dual sided simultaneous, fine pitch (15 mil) surface mount. Everett Charles Trace 9090 dual grid Tester Mania Speedy Flying Probe Tester Mania Loc8 Flying Probe Tester</p> |
| <p>INTERNAL SLOTS KEYWAYS Minimum - 0.031 Minimum - 0.031</p> | <p>TEST RANGES STANDARD Continuity Resistance = 50 - 10K Ohm 50 Ohms Isolation Resistance = 0 - 100 Megohms 2M Ohms Voltages = 0 - 250 VDC 100 VDC</p> |
| <p><i>Controlled Impedance +/- 10%</i></p> | |

THIS CHART REPRESENTS OUR STANDARD MANUFACTURING PROCESS CAPABILITIES AND TOLERANCES. TIGHTER TOLERANCES ARE AVAILABLE WITH PRIOR MANUFACTURING APPROVAL.

Production Manager:  QA Manager:  Date: 8-4-09

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MANUFACTURING PROCESS CAPABILITIES AND TOLERANCES**

UNDERWRITERS LABORATORIES APPROVALS - FILE NUMBER E76719

| Designation | PCB Type | Solder | | Min. Width | Conductor | | Max. Operating Temp | Conductor Thickness | | Minimum Total PCB | | Meets UL 94 UL796 DSR |
|-------------|------------|--------|---------|------------|----------------|-----------------|---------------------|---------------------|-----------|-------------------|--------|-----------------------------|
| | | Temp | Time | | Max. Area Dia. | Min. Edge Width | | Int. Max. | Ext. Min. | Thickness | Rating | |
| 1-0 | S/D sided | 260C | 15 sec. | 0.004" | 3.0" | 0.004" | 130C | | 0.0007" | 0.025" | 94V-0 | ALL |
| 5-0 | Multilayer | 260C | 15 sec. | 0.004" | 3.0" | 0.004" | 105C | 0.0042" | 0.0007" | 0.055" | 94V-0 | ALL |
| 5-1 | Multilayer | 274C | 15 sec. | 0.004" | 3.0" | 0.004" | 130C | 0.0042" | 0.00034" | 0.020" | 94V-0 | ALL |
| M-1 | Multilayer | 274C | 15 sec. | 0.004 | 3.0" | 0.004 | 130C | 0.0042" | 0.00034 | 0.020" | 94V-0 | ALL |

Multilayer Material (Normally stocked)

Shengyi S1170 Laminate / SO701 Prepreg U.L. File number E109769

Isola/Polyclad PCL-FR-370HR Laminate / PCL-FRP-370HR Prepreg
U.L. File number E41625

Double side Materials (Normally stocked)

Kingboard KB-616(X) U.L. File number E123995

Shengyi S1141 U.L. File number E109769

Shengyi S1170 U.L. File number E109769

Other Materials are available, but not stocked.

Rogers RO4350 Laminate / RO4450B Prepreg can be processed without
U.L. approval.