ADVANCED CIRCUITS
Leading the PCB Industry in Quality & Innovation

Revised April 2014
www.4pcb.com

Advanced Circuits Capabilities

Material

FR-4	
Standard FR4	40 Layers
Isola FR406	40 Layers
RoHS	
ITEQ IT-180A	30 Layers
Isola 185HR	30 Layers
Isola 370HR	40 Layers
Isola IS410 (CAF Resistant)	40 Layers
Isola FR408 and FR408HR	40 Layers
Isola BT-IS620	30 Layers
Nelco BT-N5000	30 Layers
Nelco 4000-29	40 Layers
Nelco 4000-13 and 13SI	40 Layers
Nelco 4000-13EP and EPSI	40 Layers
Isola IS415 (CAF Resistant)	40 Layers
GETEK	40 Layers
Polyimide	40 Layers
Cynate Ester	20 Layers
RF Materials	
Rogers 3000 Series	Max. 20 lyr. FR-4 w/ RO3000 Caps
Rogers 4000 Series (4003 and 4350)	20 Layers
Rogers 5870/5880	8 Layers
Taconic RF Materials	2 Layers
Advanced RF Materials	
Nelco 9000 Series (PTFE)	2 Layers
Rogers 6000 Series	4 Layers
Rogers 5000 Series	2 Layers
Arlon Diclad 880, AD300A, CuClad 250 & 233, CTLE	10 Layers
Arlon Genclad 280, LX250, GYN 2.17 Dk	10 Layers
New Expanded Materials Used For Signal Integrity, Advanced HDI, Stacked Microvia	
Panasonic Megtron 6	Yes
Zeta Lam SE	Yes
3M ECM (Embedded Capacitance Material)	Yes
ROHACELL	Yes 12 Layer
Rogers 2929 Bondply	Yes
Arlon 6700 and 6250 Bondply	Yes

Maximum Useable Panel Area

For 12” x 18” Panel	10” x 16”
For 18” x 24” Panel	16” x 22”
For 21” x 24” Panel	19” x 22”
For 21” x 60” Panel	18” x 58” (Up to 8 Layer Max)

Special Products/Unique Capabilities

Heavy Copper up to 20 oz.	Available
Heatsinks	Available
Backplates	Available
2 Layers up to 37” x 120”	Available
ROHACELL Foam Bonding	Available
Buried Chips and Resistors	Available
Light Hand Assembly	Available
Resistance and Conductance Test Equipment	Available
Drill and Rout Capabilities up to 38” x 120”	Available

Stack-Ups

Overall Thickness Range and Tolerances	
Overall Board Thickness	0.010” - 0.250”
Overall Board Thickness Tolerance	
< 0.020”	Standard +/- 0.004” Special +/- 0.003”
0.031”	Standard +/- 0.004” Special +/- 0.003”
0.062”	Standard +/- 0.006” Special +/- 0.004”
0.093”	Standard +/- 0.009” Special +/- 0.006”
0.125”	Standard +/- 0.012” Special +/- 0.009”
0.187”	Standard +/- 0.018” Special +/- 0.014”
0.250”	Standard +/- 0.025” Special +/- 0.018”
Thinnest Dielectric Finished	
Thin Board Overall Thickness:	0.010” (2 Layer) 0.015” (4 Layer)
Thinnest Plated Core:	0.004”

Mechanical Capabilities

Machining Drill Capabilities	
Primary Drilled Hole Location Tolerance to Datum (Hole) Zero (DTP)	0.005”
2nd Drill Hole Location Tolerance to Datum Zero (DTP)	0.005”
Minimum Clearance from Copper Conductor to Mechanical Drilled Hole	0.006”
Minimum Clearance from Copper Conductor to a Laser Drilled Hole	0.004”

Plated Through Hole Capabilities	
Smallest Plated Through Hole Size with 0.001” Minimum Average Copper Requirement	
Finished Panel Thickness < 0.020”	0.003” Finished Hole
Finished Panel Thickness 0.031”	0.003” Finished Hole
Finished Panel Thickness 0.062”	0.004” Finished Hole
Finished Panel Thickness 0.093”	0.008” Finished Hole
Finished Panel Thickness 0.125”	0.010” Finished Hole
Finished Panel Thickness 0.187”	0.012” Finished Hole
Finished Panel Thickness 0.250”	0.018” Finished Hole (Excluding HAL Finish)
Plated Hole Size Tolerance	+/- 0.003” Standard; Special +/- 0.002
Plated Hole Size Press Fit Applications	+/- 0.002” Typical
Aspect Ratio (With 0.010” Drill)	18:1 (0.007” Finish in 0.130” Thick)
Plated Hole Spacing Minimum (Drilled Hole to Hole)	0.008”

Non Plated Through Holes	
Smallest Non-Plated Hole Size (Finished)	0.006”
Largest Non-Plated Hole Size Routed	No Limit
Non-Plated Routed Hole Tolerance	+/- 0.005” Typical +/- 0.003” Special
Minimum NPTH to Edge of Board Spacing	0.010”

Blind/Buried Vias (Sequential Lamination)	
Minimum FINISHED Via Hole Diameter - Epoxy Filled	0.008”
Maximum FINISHED Via Hole Diameter - Epoxy Filled	0.018”
Maximum Aspect Ratio for Epoxy Filled Via Holes	10:1
Available Epoxy Fill Types	Conductive & Non-Conductive

Laser Microvia (µVia) Capabilities	
Smallest (as ablated) Laser Via	0.003”
Largest (as ablated) Laser Via	0.010”
Via Aspect Ratio (Depth to Diameter)	0.75:1 Standard 1:1 Advanced
Capture Pad Size	µVia + 0.008” Std µVia + 0.006” Adv
Landing Pad Size	µVia + 0.008” Std µVia + 0.006” Adv
Stacked Via	Yes
Type I Capabilities	Yes
Type II Capabilities	Yes
Type III Capabilities	Design Dependent
Copper Filled Microvia	Yes

Control Depth Drill Capabilities	
Backdrill - PTH Stub Removal	PTH + 0.010” Diameter (Typical)
Minimum Backside Dielectric Separation	0.010”
Control Depth Drill Depth Tolerance	+/- 0.004”
Back Drilling Capabilities	0.005” Typical, 0.004” Minimum
Minimum Back Drill Drilled Diameter	0.014”
Drilled Hole Over Finished Hole Size	0.010” (Typical)
Drill Depth Tolerance	0.005” Typical, 0.004” Minimum

Scoring Capabilities	
Angles	Standard 30°, Available 20°, 45°, and 60°
Offset Tolerance	+/- 0.005”
Optimum Remaining Web Thickness	1/3 of Thickness (0.014” Typical for 0.062”)
Remaining Web Tolerance	+/- 0.005”
True Position Tolerance	+/- 0.005”

Edge Connector Bevel Capabilities	
Finger Tip Angle	15°, 20°, 30°, 45°
Bevel Depth Tolerance	+/- 0.005”

Profile Capabilities	
Standard Router Bit Diameter	0.093” , 0.062”, 0.031” (Router Bits) Special 0.020”
Routed Profile Tolerance	+/- 0.005” Standard +/-0.004” Special
Minimum Internal Rout Radius	0.015”
Minimum Routed PTH Slot Width	0.022” Typical with 0.015” Minimum

Feature Size Capabilities

Internal Layer Capabilities	
Minimum Conductor Width and Spacing	
Internal Starting Copper Weight ½ oz.	0.00275” Line / 0.003” Space
Internal Starting Copper Weight 1 oz.	0.00375” Line / 0.0045” Space
Internal Starting Copper Weight 2 oz.	0.005” Line / 0.006” Space
Internal Starting Copper Weight 3 oz.	0.009” Line / 0.011” Space
Internal Starting Copper Weight 4 oz.	0.012” Finished
External Layer Capabilities	
Minimum Conductor Width and Spacing	
External Copper Finished Thickness 1.0 oz.	0.00275” Finished
External Copper Finished Thickness 1.5 oz.	0.004” Finished
External Copper Finished Thickness 2.0 oz.	0.005” Finished
External Copper Finished Thickness 3.0 oz.	0.009” Finished
External Copper Finished Thickness 4.0 oz.	0.011” Finished
External Copper Finished Thickness 5.0 oz.	0.020” Finished
External Copper Finished Thickness 6.0 oz.	0.030” Finished
External Copper Finished Thickness 7.0 oz.	0.045” Finished
External Copper Finished Thickness 8.0 oz.	0.060” Finished
Pad Diameter to Drilled Hole Size	***IPC-6012 Class 2***
Component Holes	Drilled Size Plus 0.010”
Via Holes	Drilled Size Plus 0.008”
Pad Diameter to Drilled Hole Size	***IPC-6012 Class 3***
Component Holes	Drilled Size Plus 0.012”
Via Holes	Drilled Size Plus 0.010”
Pad Diameter to Laser Ablated Hole Size	
Minimum	Drilled Size Plus 0.004”
Standard	Drilled Size Plus 0.008”

Military

Etch Back	***Yes***
IPC Class 3 Etchback Specification	0.0002” - 0.002”

Solder Mask and Legend

Solder Mask	
Min. LPI Solder Mask Clearance (LPI Photoimaged)	0.002”/Side (Pad Size + 0.004”)
Min. LPI Solder Mask Clearance (LDI Imaged)	1:1 (Design Dependent)
Pad Size Larger than NPTH	0.005”/Side (Pad Size + 0.010”)
Web Between Surface Mount Pads	0.004” Preferred, 0.003” Minimum (Green)
Solder Mask Colors	Green, Blue, Red, Black, Yellow, White, Orange, Purple, Pink, Brown, Clear
Solder Mask Type	Liquid Photo Imageable (LPI)
Solder Mask Type	Laser Direct Imaging (LDI) Special
Minimum Mask Defined Pad Diameter	0.005”
Solder Mask Plugged Vias	Yes
Legend	
Printed Legend Minimum Stroke/Width	0.005”
LPI Legend Capability	Yes
LPI Legend Minimum Stroke/Width	0.002”
LPI Legend Colors	White, Black, Yellow, Red, Blue
Serialization /Unique Serialization	Yes

Surface Finish Options

Surface Finish Selection	
Hot Air Solder Level (lead free, lead based)	Yes
Immersion Silver	Yes
OSP	Yes (Outsource)
Electroless Nickel Immersion Gold	Yes
ENEPIG	Yes (Outsource)
Full Body Gold	Yes
Bondable Gold	Yes (Outsource)
Plated Nickel	Yes
Electroless Nickel	Yes
Copper	Yes
Mixed Finishes	
HASL with Selective Gold	Yes
Dual Gold Plating	Yes
Immersion Gold with Selective Hard Gold	Yes
Recessed Fingers	Yes

Via-in-Pad and HDI

Epoxy Filled – Non Conductive	
Epoxy Filled Thru Hole Capability	Yes
Epoxy Filled Thru Hole Minimum	0.008” FHS
Epoxy Filled Thru Hole Maximum	0.018” FHS
Minimum Board Thickness	0.020”
Maximum Board Thickness	0.125”
Via Fill Aspect Ratio	10:1
Conductive VIP Options	Yes
Non-Conductive VIP Options	Yes
Copper Plated/Filled	
Copper Filled µVia Process	Yes
Copper Filled µVia Hole Minimum	0.003” Laser Drilled
Copper Filled µVia Hole Maximum	0.010” Laser Drilled
Via Fill Aspect Ratio	0.5:1 Standard 1:1 Advanced

Data & Documentation

Tooling Formats	
Film Data Formats	DXF, RS-274-X, RS-274-D,ODB++
Drill Data Formats	ASCII, Excellon Format; RS-274-X, RS-274-D
Electrical Test Formats	IPC-D356
Netlist Compare Formats	IPC-D356
Tooling Communication	
Media Types & Data Transfer	Email, FTP
Compression Formats	ZIP, TAR, TGZ
Secured Data Transfer Methods	Secure Data Transfer, PGP

Electrical Performance

TDR Test Tolerance (Print and Etch)	Standard 10%, Advanced 5%
TDR Test Tolerance (Plated Copper)	Standard 10%, Advanced 5%
TDR Test Tolerance Differential Measurements	Standard 10%, Advanced 5%
TDR Tolerance Single Ended Tolerance	Standard 10%, Advanced 5%
HiPot Testing (AC & DC)	Yes

Testing Capabilities

Minimum Test Continuity Resistance	.1 Ohms
Maximum Test Voltage	1000 Volts
Maximum Test Isolated Resistance	25 Mohm - 2 Gohm
Largest Test - Fixtured	16” x 22”
Largest Test - Flying Probe	27” x 24”
Electrical Test Pitch (Fixture Test)	0.020”
Electrical Test Pitch (Flying Probe Test)	0.004”
DC Line Resistance Testing	Yes

The above is subject to change without prior notice.

DOD Contracts; MIL-PRF-31032, MIL-PRF-55110G, AS9100C, and ISO 9001:2008 Certified; JCP Registered; IPC-6012 Class 2-3A Qualified; ITAR Registered; UL Certified

Tempe Division
229 S. Clark Drive
Tempe, AZ 85281
Phone: (800) 678-0233
Fax: (480) 966-5896

Aurora Division
Corporate Headquarters
21101 E. 32nd Pkwy
Aurora, CO 80011
Phone: (800) 979-4722
Fax: (888) 224-3291

Maple Grove Division
8860 Zachary Lane North
Maple Grove, MN 55369
Phone: (763) 424-3788
Fax: (763)425-0999

www.4pcb.com