

PHO-TRONICS MANUFACTURING STANDARDS

Annular Ring

- Multilayer Boards: *Nominal hole size + .014 + 2 x the annular ring = the required pad size.
- Double Sided Bds: *Nominal hole size + .013 + 2 x the annular ring = the required pad size.
- Teardrops: Add teardrops when necessary to maintain annular rings at trace/pad junction.

*Add .002 to the process tolerance for every ounce of copper over one ounce. This only applies to layers over one ounce.

Drill

Plated Thru Holes: Determine nominal hole size (taking tolerance into consideration) and drill .005 over (.004 min. and .006 max.)

Aspect Ratio: 7:1 max
(Drilled Hole)

Etching (Overall Line Loss)

	.5 oz	1 oz	2 oz
Line Loss Cupric (I/L's):			
Impedance Lines:	.00050	.00100"	.00200"
Non-Impedance Lines:	.00075"	.00125"	.00225"
Line Loss Ammonia (O/L's):			
Impedance Lines:	.00100"	.00200"	.00400"
Non-Impedance Lines:	.00125"	.00225"	.00425"

Line Width

I/L's and O/L's: .005 min. starting line width.
Adjust line width as needed to meet finished minimum requirements (based on copper thickness and type of etchant used).

Nomenclature

Silk Screened: .005 min. line width.
Check for ink on pads and if necessary (clip .003 from solder mask clearance) merge the silkscreen with the solder mask. Make sure silkscreen nomenclature is legible after merging.

Nonfunctional Pads

I/L's only: NOTE: If nonfunctional pads have been removed by the customer, CAM must measure the spacing between traces and the plated and non-plated holes for a distance of not less than .013 on all inner layers.

Outer Layer Tenting

The following is acceptable per Sally Beechtree 4/18/03
Maximum hole size is .250.
Minimum area between edge of non-plated hole and conductive feature is .007.

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Panel

All Sizes: .750 min. plating border.

Plane Layer Clearances

PTH's & NPT's: .026 over nominal finished hole size (taking tolerance into consideration) (.013/side)

Board Edge: .015 min.

Pad To Plane Edge: .005 min.

Post Etch Punch If:

- 10 layers or more
- .005 starting line width and .005 starting space
- Questionable annular ring

Solder Mask Clearances

LPI: .003/side min.

Dry Film: .003/side min.

Landless PTH .003/side min. from edge of drilled hole (not the finished hole size)

Solder Mask Laydown

Between SMD's: .003 min. (Contact customer if laydown is less than .003)

Over Traces: .002 min. on either side of traces.

Spacing

Feature To Feature: .0045 min starting spacing.

Feature To Brd Edge: .015 min.

Tab Plating (Strip/Panel Requirements)

- Minimum width of strip (double or single) must be 5.000 inches. (See Plating Supervisor for exceptions)
- Maximum distance from edge of strip/panel to top of tabs is 3.000 inches. (Example: tabs are recessed into board) (See Plating Supervisor for exceptions).

Via Plug Parameters

A/W TYPE	CREATE TOOLING FOR WHAT DEPARTMENT	SIZE OF PAD	FILM TYPE: Silver or Diazo (if for silver print, add fiducials for punch)	POLARITY	COMMENT
SILVER PLUG VIA	PRINT	.004" - .005"/side over finished hole size	SILVER	POSITIVE	Create solid block pads for holes that are clustered together. If in doubt, make block
LPI VIA PLUG	SCREEN	At least .007"/side over finished hole size	SILVER	POSITIVE	
LPI SILVER PLUG	S/M PRINT	.001" - .002"/side under finished hole size	DIAZO	NEGATIVE	To harden epoxy in holes
SR1000 VIA PLUG	SCREEN	At least .007"/side over finished hole size	SILVER	POSITIVE	

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Artwork Compensation Factors by Core Thickness & Material Type

CORE THICKNESS/MATERIAL TYPE	X MILS "f"	Y MILS "f"	COMMENTS
.004" FR-4	0.2	1	7/18/05
.005" - .006" FR-4	0.2	0.7	
.007" - .008" FR-4	0.2	0.6	
.009" - .010" FR-4	0.2	0.5	
.011" - .016" FR-4	0.2	0.4	
.017" - .059" FR-4	0.2	0.3	
.005" - .007" BT	0.2	0.7	PER RE 5/26/06
.008" BT	0.2	0.8	PER NICK 6/18/02
.010" BT	0.2	0.7	12/22/03
.014" BT	0.2	0.6	10/23/03
.008" POLYIMIDE	0.4	1.0	8/24/04
.010" ROGERS	0.2	0.5	7/18/05