



Capability

Cape Town Factory

Capability – ICAPE -TraX factory, South Africa

Basic Information	Standard	Prototype	Comments
Maximum number of layers	16	24	
Minimum track	100µm (4mil)	75µm (3mil)	Depending on min Cu thickness req.
Minimum gap	100µm (4mil)	75µm (3mil)	Depending on min Cu thickness req.
Smallest mechanically drilled holes	250µm (10mil)	200µm (8mil)	PCB thickness dependent
Smallest mechanically drilled blind holes	150µm (6mil)	150µm (6mil)	PCB thickness dependent
Smallest buried holes	250µm (10mil)	200µm (8mil)	PCB thickness dependent
Aspect ratio maximum - through holes	10:1	16:1	
Aspect ratio maximum - blind holes	0.8:1	1:1	
Drilled hole edge to copper (M/L rigids)	250µm (10mil)	175µm (7mil)	
Controlled Impedance	+/- 10%	+/- 5%	
Vias in surface mount pads	Yes	Yes	
Buried capacitance	Yes	Yes	
Edge plating	Yes	Yes	
Edge plated half holes (castellation)	Yes	Yes	
Mechanical drilling method	Yes	Yes	
HDI (High Density Interconnect)	Not Available	Not Available	Can be done via ICAPE South Africa
Laser drilling	Not Available	Not Available	Can be done via ICAPE South Africa
Flexi-Rigid	Not Available	Not Available	Can be done via ICAPE South Africa
Countersunk holes	Yes	Yes	
Plated or non-plated slanted routing	Special requirement	Special requirement	On request
Edge plated fingers	Yes	Yes	
Edge beveling of gold-plated fingers	Yes	Yes	30° angle
Resin filled vias	Yes	Yes	
Polar stack-up assistance provided	Yes	Yes	For local production at ICAPE Trax

Base Material	Standard	Prototype	Comments
FR4 Standard TG 140°C, DK – 4.2	Yes	Yes	In Stock
FR4 Mid TG 150°C Multilayer Substrate, DK – 4.2	Yes	Yes	In Stock
FR4 Hi TG 170 - 185	Yes	Yes	Various Types in Stock
TACONIC TLX PTFE, DK - 2.5	Yes	Yes	Depending on Availability
NELCO NY9220ST PTFE, DK - 2.0	Yes	Yes	Depending on Availability
NELCO NX9250ST PTFE, DK - 2.5	Yes	Yes	Depending on Availability
METEORWAVE 4000 (TG200) High Speed Digital / Low Loss, DK - 3.4	Yes	Yes	In Stock
ROGERS RO4003C RF, DK - 3.38	Yes	Yes	In Stock
ROGERS RT/DUROID RT5880, DK - 2.20	Yes	Yes	Depending on Availability
ROGERS RO4233, DK - 3.33	Yes	Yes	Depending on Availability
ARLON MICROWAVE TC350, DK - 3.50	Yes	Yes	Depending on Availability
ROGERS TMM6, DK - 6.00	Yes	Yes	Depending on Availability
ROGERS TMM10, DK - 9.20	Yes	Yes	Depending on Availability
ROGERS RT6002, DK - 2.94	Yes	Yes	Depending on Availability
MERCURYWAVE 9350, DK - 3.5 RF	Yes	Yes	In Stock
Nominal thicknesses			IPC-4101B
0.50mm	Yes	Yes	+/- 0.075mm tolerance Class A/K
0.80mm	Yes	Yes	+/- 0.165mm tolerance Class A/K
1.55mm	Yes	Yes	+/- 0.190mm tolerance Class A/K
2.40mm	Yes	Yes	+/- 0.230mm tolerance Class A/K
3.20mm	Yes	Yes	+/- 0.300mm tolerance Class A/K

NB. These tolerances apply to multilayer panels as well as to standard laminate. For Class A materials, the given thickness is measured without copper cladding. This applies mostly to multilayer core laminates. For Class K materials, the given thickness measurement includes copper cladding. This applies mostly to double-sided PTH and single layered boards.



Capability

Cape Town Factory

Capability – ICAPE -TraX factory, South Africa

Panel Dimensions	Standard	Prototype	Comments
B: 12" x 18" (305 x 457 mm)			
Double sided, PTH boards	275 x 427 mm	275 x 427 mm	Area available to customers
4 layer boards	255 x 407 mm	255 x 407 mm	Area available to customers
6 to 16 layer boards	245 x 397 mm	245 x 397 mm	Area available to customers
Hybrid boards	245 x 397 mm	245 x 397 mm	Area available, Mixed laminate
C: 16" x 18" (406 x 457 mm)			
Double sided, PTH boards	376 x 427 mm	376 x 427 mm	Area available to customers
4 layer boards	356 x 407 mm	356 x 407 mm	Area available to customers
6 to 16 layer boards	346 x 397 mm	346 x 397 mm	Area available to customers
Hybrid boards	346 x 397 mm	346 x 397 mm	Area available, Mixed laminate
Finished Board Tolerances			
CNC routed boards	+/- 0.1mm	+/- 0.1mm	
Boards in V-score panels	+/- 0.1mm	+/- 0.1mm	Before snapping
Boards in V-score panels	+/- 0.2mm	+/- 0.2mm	After snapping
Other Machining Tolerances			
Preferred internal corner radius	1.5mm	1.5mm	
Minimum internal corner radius	0.5mm	0.5mm	
BC routed cut-outs	+/- 0.1mm	+/- 0.1mm	
Thinnest V scorable material	0.80mm	0.80mm	Refer to page 3
Thickest V scorable material	2mm	2mm	Refer to page 3
Bow and Twist			
Max bow & twist SMT panels	0.75%	0.75%	
Max bow & twist non-SMT panels	1.5%	1.5%	IPC-6012 Section 3.4, measured using IPC-TM-650

Surface Finishes	Standard	Prototype	Comments
HASL (lead containing)	Yes	Yes	Selectively applied over bare copper by "Hot Air Solder Levelling"
HASL (lead-free)	Yes	Yes	From beginning of March 2023
Electroless Nickel/Immersion Nickel-Gold (ENIG)	Yes	Yes	Deposit thickness are to IPC-4552
Autocatalytic Silver Immersion Gold (ASIG)	Yes	Yes	Silver is 0.15µM minimum and Gold is 0.03µM minimum
Electroplated Gold over Nickel (for edge connectors)	Yes	Yes	1 micron of electroplated hard gold alloy over 3 microns of electroplated nickel
Immersion Tin	Yes	Yes	From beginning of July 2023
OSP Conductive Carbon	Not available	Not available	Can be done via ICAPE South Africa

Soldermask	Standard	Prototype	Comments
Default colour	Dark green matt	Dark green matt	Photo imageable / air spray,
Optional colours	Black, blue, gloss red, white semi-matt	Black, blue, gloss red, white semi-matt	Photo imageable / manually screened / air spray
Nominal coating thickness	25 microns	25 microns	
Preferred Solder Mask oversize	150 microns	150 microns	Mask defined pads are allowed
Component Legends (Silk-screens)	White, black (on white Solder mask)	White, black (on white Solder mask)	Minimum legend line width 0.10mm



Capability

Cape Town Factory

Capability – ICAPE -TraX factory, South Africa

Outer & Inner Layers	Preferred	High-tech*	Comments
<u>12μ Base Copper</u>			
Spacing	0.09mm	0.075mm	
Minimum trace width	0.10mm	0.075mm	
Annular ring	0.10mm	0.10mm	
			Final Cu 30μ with additional 5μ for Ipc3 - Refer to page 5
<u>18μ Base Copper</u>			
Spacing	0.13mm	0.10mm	
Minimum trace width	0.125mm	0.10mm	
Annular ring	0.10mm	0.10mm	
			Final Cu 37μ with additional 5μ for Ipc3 - Refer to page 5
<u>35μ Base Copper</u>			
Spacing	0.15mm	0.125mm	
Minimum trace width	0.15mm	0.125mm	
Annular ring	0.10mm	0.10mm	
			Final Cu 55μ with additional 5μ for Ipc3 - Refer to page 5
<u>70μ Base Copper</u>			
Spacing	0.20mm	0.18mm	
Minimum Trace width	0.23mm	0.20mm	
Annular ring	0.10mm	0.10mm	
			Final Cu 90μ with additional 5μ for Ipc3 - Refer to page 5
<u>105μ Base Copper</u>			
Spacing	0.24mm	0.21mm	
Minimum trace width	0.30mm	0.25mm	
Annular ring	0.10mm	0.10mm	
			Final Cu 125μ with additional 5μ for Ipc3 - Refer to page 5
Maximum allowable conductor width reduction	20% of artwork	20% of artwork	Inspection tolerance
Maximum conductor width reduction from nicks etc.	20% of minimum width	20% of minimum width	Inspection tolerance
Maximum spacing reduction from roughness, nodules, etc.	25% of minimum spacing	25% of minimum spacing	Inspection tolerance

* These capabilities are experimental and are possible under certain parameters (design specific!)

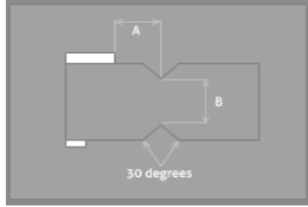
Scoring	Standard	Prototype	Comments
<u>PCB thickness</u>			
0.80mm	0.35mm	0.35mm	Min. clearance from Cu - A mm
1.00mm	0.40mm	0.40mm	Min. clearance from Cu - A mm
1.55mm	0.50mm	0.50mm	Min. clearance from Cu - A mm
2.00mm	0.60mm	0.60mm	Min. clearance from Cu - A mm
Cutting Angle	30°	30°	
Remaining board thickness - B mm	0.4mm	0.4mm	
Minimum V-score thickness	0.8mm	0.8mm	
Maximum V-score thickness	2.0mm	2.0mm	

Minimum distance from edge to any feature excludes edge connector finger.

Capability

Cape Town Factory

Capability – ICAPE -TraX factory, South Africa



Routing	Standard	Prototype	Comments
Router to Cu	0.2mm	0.2mm	
Router size	0.70mm to 3mm	0.70mm to 3mm	Increments of 0.1mm
Preferred router sizes	2mm, 2.4mm and 3mm	2mm, 2.4mm and 3mm	3mm (default)
Compensation	Right	Right	

Note: Any board that requires the **UL mark** may not have a conductor to edge distance of less than 0.33 mm.

CNC Drilled Holes	Standard	Prototype	Comments
Design recommendations	Finished hole diameter to be the specified pin or lead diameter plus 0.2mm		
Minimum drill size	0.25mm	0.25mm	
Maximum drill size	6.20mm	6.20mm	
Drill to Cu minimum	0.20mm	0.18mm	Preferred max 0.25mm
NPTH to Cu minimum	0.20mm	0.18mm	Preferred max 0.25mm
Drills <2.0mm size increments	0.05mm	0.05mm	
Drills ≥2.00mm size increments	0.1mm	0.1mm	
Slots ≥ 0.5mm increments	0.1mm	0.1mm	
Larger diameter drills >6.2mm	Routed	Routed	
Aspect ratio	Yes	Yes	Pulse Plating 10:1
Breakaway tab	0.8mm general	0.8mm general	Customer requirement
Mousebite tab (perforated)	0.33mm between holes	0.33mm between holes	Customer requirement
Minimum DHS on 1.55mm material	0.25mm	0.25mm	Drill hole size before plating
Minimum PTH (1.55mm material & less)	0.15mm	0.15mm	Finish diameter

Finished Hole Sizes	Standard	Prototype	Comment
Drill blow-up <2.0mm			
HASL, PTH	0.15mm	0.15mm	-0.0mm +0.15mm tolerance
HASL, NPTH	0.05mm	0.05mm	-0.05mm +0.10mm tolerance
ENIG, PTH	0.10mm	0.10mm	-0.0mm +0.15mm tolerance
ENIG, NPTH	0.05mm	0.05mm	-0.05mm +0.10mm tolerance
ASIG, PTH	0.10mm	0.10mm	-0.0mm +0.15mm tolerance
ASIG, NPTH	0.05mm	0.05mm	-0.05mm +0.10mm tolerance
Drill blow-up ≥2.0mm			
HASL, PTH	0.20mm	0.20mm	-0.0mm +0.20mm tolerance
HASL, NPTH	0.10mm	0.10mm	-0.05mm +0.15mm tolerance
ENIG, PTH	0.20mm	0.20mm	-0.0mm +0.20mm tolerance
ENIG, NPTH	0.10mm	0.10mm	-0.05mm +0.15mm tolerance
ASIG, PTH	0.20mm	0.20mm	-0.0mm +0.20mm tolerance
ASIG, NPTH	0.10mm	0.10mm	-0.05mm +0.15mm tolerance

The above table applies unless otherwise stated by the customer.

Aspect Ratios	Standard	Prototype	Comment
Maximum aspect ratio	10:1 Pulse Plating	16:1 Pulse Plating	Board thickness: drilled hole diameter
Maximum aspect ratio for mechanically drilled blind vias	0.8:1	1:1	Check with ITRAX engineering and ITRAX will provided stack-up
Hole location and photo tool registration tolerances	Yes	Yes	Remaining external annular ring after manufacturing will be IPC-A-600



Capability

Cape Town Factory

Capability – ICAPE -TraX factory, South Africa

Plating voids and hole imperfections	Yes	Yes	As per IPC-A-600
Acceptable visual imperfections	Yes	Yes	As per IPC-A-600
Minimum wall thickness between holes	0.3mm	0.3mm	
Min distance from hole to board edge or cut-out	1.0mm	1.0mm	
Castellation holes (plated holes routed through the center on the edge of the board)	0.5mm min diameter allowed	0.5mm min diameter allowed	Anything less must be discussed with ITRAX engineer
Back-drilling tool size	Drill size + 0.15mm	Drill size + 0.15mm (0.1mm experimental)	Customer's required target Depth / + 0mm - 0.15mm
Resin Filling	Standard	Prototype	Comment
Copper cap through hole & blind vias	Yes	Yes	
Epoxy fill	Yes	Yes	Taiyo THP-100DX1
Epoxy fill	Yes	Yes	High TG, Low CTE
Epoxy fill	Yes	Yes	Halogen free, RoHS compliant
Epoxy fill	Yes	Yes	IPC-6012, section 3.6.2.18
Aspect Ratio - Thorough holes	10:1	16:1	
Aspect ratio - Blind vias	1:0.8	1:1	
Board thicknesses	0.2mm to 4.0mm	0.2mm to 4.0mm	
Copper cap plating	Yes	Yes	IPC-6012, section 3.6.2.11.2
Important to note that ICAPE Trax offers non-conductive resin filling only.			
Manufacturing data pack should include a Gerber layer, drill file or mechanical drawing which indicate all holes requiring for resin filling.			

Land (Pad) Size	Standard	Prototype	Comments
Land diameter (or width)			See IPC-6012 Section 3.4
Component holes	Hole diameter + 0.4mm	Hole diameter + 0.4mm	Nominal minimum land width
Via holes	Hole diameter + 0.3mm	Hole diameter + 0.3mm	Nominal minimum land width
Inner layer copper clearance	Finished hole size + 0.4mm	Finished hole size + 0.4mm	

Plating Limits And Tolerances	Standard	Prototype	Comments
Plating thickness			
Average minimum plated Cu thickness	20µM	20µM	
Min gold over nickel thickness for edge connectors	1 over 3µM	1 over 3µM	
Base copper thickness			
17µ Base Cu, PTH, Multilayer (default)	20µ	20µ	37µ Final Cu thickness
35µ Base Cu, PTH, Multilayer (default)	20µ	20µ	55µ Final Cu thickness
70µ Base Cu, PTH, Multilayer (default)	20µ	20µ	90µ Final Cu thickness
35µ Base Cu, Single sided boards	0	0	35µ Final Cu thickness nominal
70µ Base Cu, Single sided boards	0	0	70µ Final Cu thickness nominal

Note: 1. Class 3 work is copper plated to minimum average of 25µ.

Note: 2. Non-essential narrow tracks, spacings and small holes increase prices.

Controlled Impedance	Standard	Prototype	Comment
Equipment and software	Yes	Yes	Polar Instruments CITS500S2a
Test coupons	Yes	Yes	Polar Instruments CITS500S2a
Capability	+/- 10%	+/- 10%	Tolerance

Verification & Compliance	Standard	Prototype	Comment
IPC specified requirements	Yes	Yes	IPC-TM-650, IPC-6012



Capability

Cape Town Factory

Capability – ICAPE -TraX factory, South Africa

First Article Inspection Report			
Acceptance test summary	Yes	Yes	Support documents, if required
Hole size verification	Yes	Yes	Support documents, if required
Dimensional measurement	Yes	Yes	Support documents, if required
PCB thickness & layup measurement	Yes	Yes	Support documents, if required
Micro section	Yes	Yes	Support documents, if required
Solderability test	Yes	Yes	Support documents, if required
Thermal test	Yes	Yes	Support documents, if required
Surface finish	Yes	Yes	Support documents, if required
Electrical and impedance testing	Yes	Yes	Support documents, if required