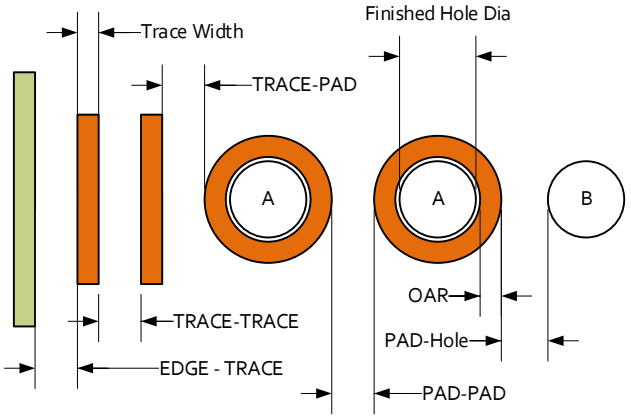
Introduction

The ever-increasing requirements for small volume envelopes contribute to integrating electronics to the mechanical design. Although there are numerous solutions this sheet provides the JPE standard in designing PCB's.

Electrical layout characteristics

- Guidelines for outer layers (top/bottom), but also suitable for inner layers
- Copper base thickness: 18 um
- Suitable for PCB thickness of: $\leq 2.4\ mm$



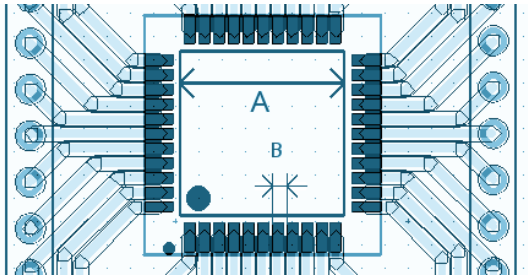
A = Plated Through Hole (PTH)
B = Non-Plated Through Hole (NPTH)
OAR = Outer Annular Ring

Type	Minimal	Recomm.	Note
Trace Width	0.15 mm		Recommended values: see "PCB trace widths"
Edge-Trace	0.45 mm	1.0 mm	
Trace-Trace	0.15 mm	0.35 mm	
Trace-Pad	0.15 mm	0.35 mm	
Pad-Pad	0.15 mm	0.5 mm	
Pad-Hole	0.20 mm	0.5 mm	Also for Trace-Hole
Finished hole ø for PTH	0.25 mm		Initial drill hole ø will be $+0.1\ mm$ to accommodate through hole plating
Finished hole ø for NPTH	0.35 mm		
OAR PTH	0.125 mm	0.35 mm	
OAR NPTH	0.30 mm	0.5 mm	For non-plated hole but with pad on top/bottom
Via ø	0.45 mm	0.6 mm	A PTH to connect traces from/to different layers

PCB trace widths

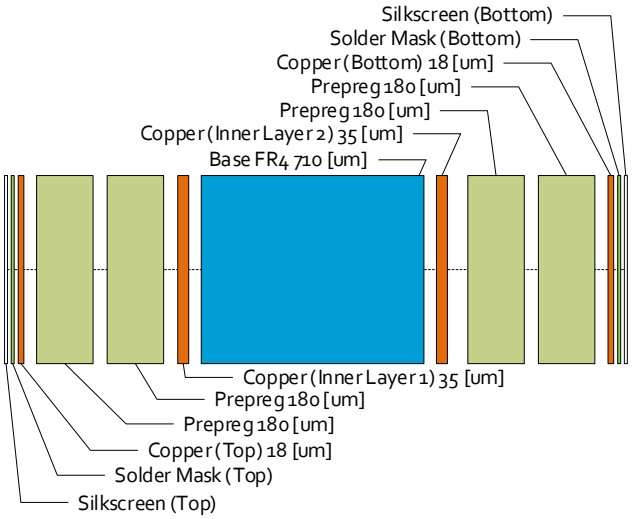
- Copper base thickness: 18 um
- Temperature rise of trace: ≤ 15℃
- Ambient temperature: ~25℃
- For outer layer traces only (top/bottom)

Signal type	Minimal	Recommended	Application
Low current	0.5 mm	1.0 mm	Low voltage DC power supply lines
High current	1.5 mm	$\geq 2.5\ mm$	Mains, high power DC
Digital	0.2 mm	0.5 mm	I/O, logic, microcontroller, CPLD
Analog	0.5 mm	0.8 mm	ADC, low power op-amps



PCB build up

A standard buildup of a 4-layer, thickness of 1.55 mm:



In a 2-layer design, the Copper Inner and Prepreg layers are left out but the base FR4 is thicker.

Mechanical design characteristics

Type	Value	Note
PCB Dimensions	min: 5 x 5 mm	PCB does not have to be rectangular!
	max: 425 x 425 mm	
Board thickness	1.55 mm	Industry standard
	1.00 mm	Also a standard for ceramic PCBs
	2.00 mm	Heavy components
Width for slots	$min.$ 0.5 mm	
Radius inside corners PCB edge	$min.$ 1.0 mm	
Drill size increments	0.05 mm	
Standard tolerances	End-size drill ø NPTH: $\pm 0.05\ mm$	
	End-size drill ø PTH: $\pm 0.1\ mm$	
	Contour dim. : $\pm 0.2\ mm$	
	Position contour / holes: $\pm 0.2\ mm$	
	Slot dimensions: width: $\pm 0.1\ mm$ length: $\pm 0.2\ mm$	
Surface finish on solderable pads and traces	HAL Lead-free	Good solderability, for standard PCB thickness
	ENIG (chem. Ni/Au)	Flat surface, for connectors and contacts, expensive
	Immersion Silver (chem. Ag)	Flat surface, long shelf life, cheap