

PRINTED CIRCUIT BOARD

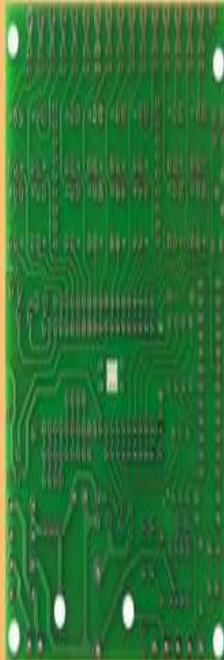
by

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PRINTED BOARD CIRCUIT DESIGN (PCB)

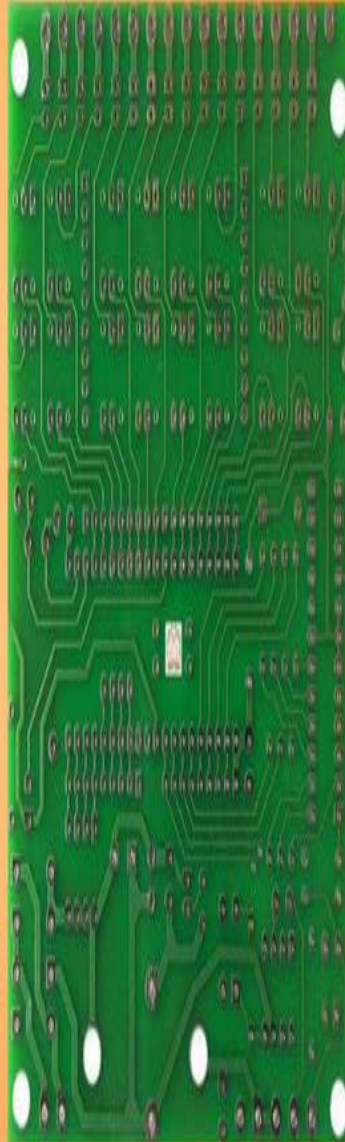
CONTENT

1. INTRODUCTION
2. TYPES OF PCB
3. PCB TERMINOLOGY
4. PCB FLOW
5. PLACEMENT RULES
6. INTRODUCTION TO DESIGN RULE
7. FABRICATED PCB BOARD
8. SUMMARY



INTRODUCTION

- Printed circuit board can be shortly called PCB.
- PCB were first developed by an australian engineer Paul Eisler.
- PCB is a non conductive substrate that mechanically support and electrical connects the electronic components using track pads and other features etched on a laminated copper sheet.



TYPES OF PCB

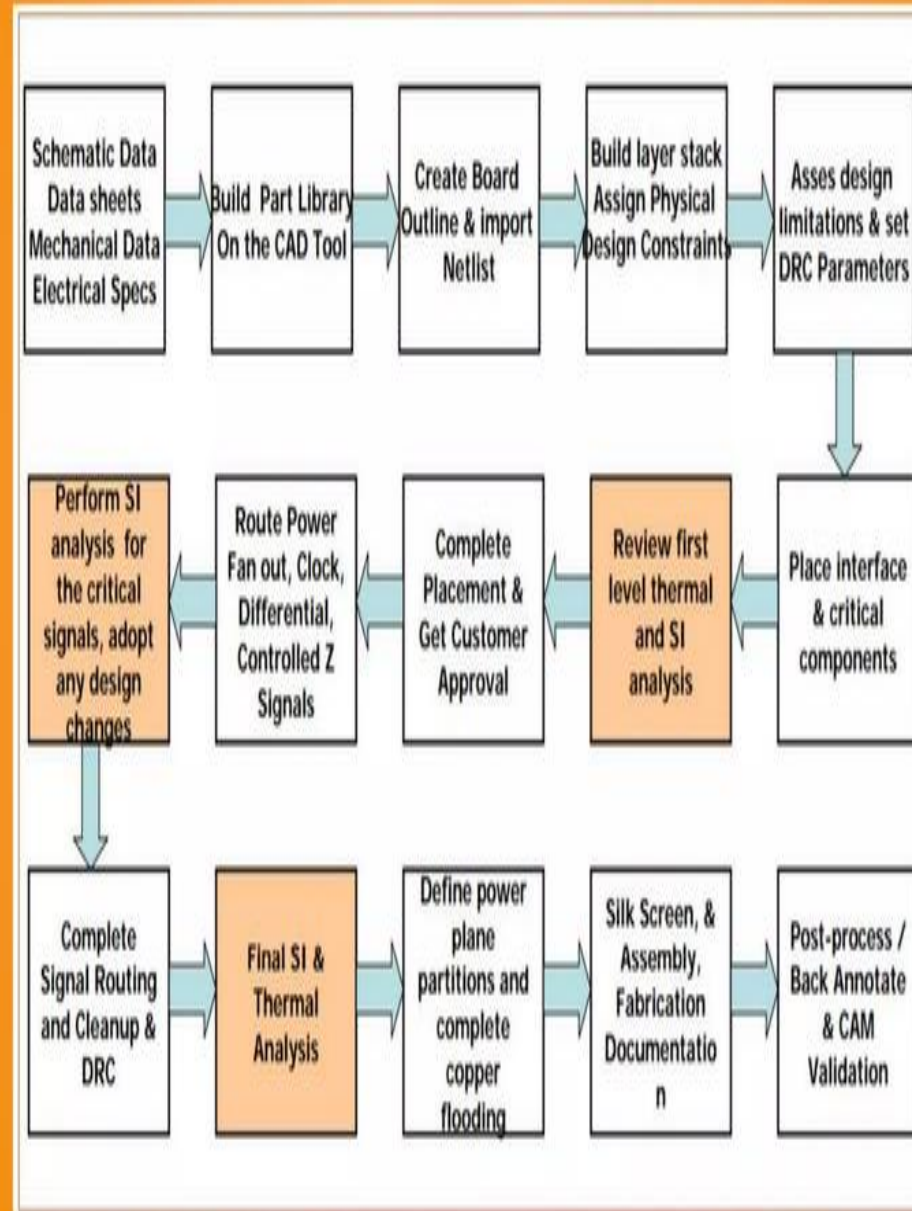
There are mainly three types of PCBs

1. Single-sided PCB----- Component placement/Routing only on one side (TOP/BOTTOM)
2. Double-sided PCB--- Component placement/Routing only on both side (TOP & BOTTOM)
3. Multilayer PCB----Component placement on both side and Routing also internal layers.

PRINTED CIRCUIT BOARD TERMINOLOGY

1. Bare board : This term refers to a circuit board with no components mounted on it.
2. Trace : This term refers to the copper width of the PCB wires.
3. Via : Interconnection of signal between different layers of a PCB.
4. Pad : This is one of the most basic units of PCB. A pad is a contact point used to connect components with a via and is the point to which the components are soldered.

PCB FLOW



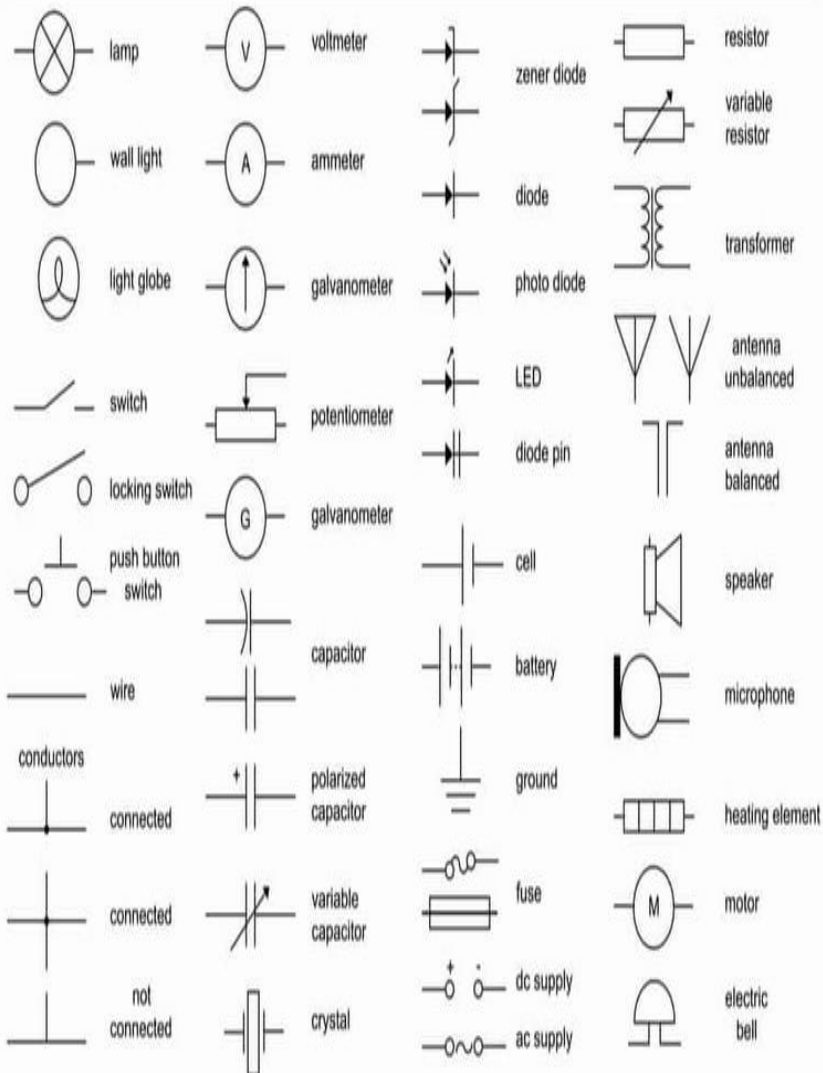
Ten Rules for Components Placement on PCB Design

1. Start placement of big/main/critical components(this could be MCU,DSP,FPGA,DDR, clock devices) and then place support component like resistors, capacitors around them.
2. Use 50 or 100mil as component grid to place these big components (QFP, BGA, SOP, SOIC, or through hole connectors). Use 25mil as component grid for these SMT resistors/capacitors or other small passive components.
3. Isolate the analog, digital and power supply section.
4. Clock driver/synchronizer should be located close to clock oscillator.
5. Arrange components in rows and columns, and oriented uniformly for ease of installation, inspection and rework. When possible, all polarized components such as tantalum capacitor and diodes in the same direction. Polarity of these components should be indicated on the silkscreen.

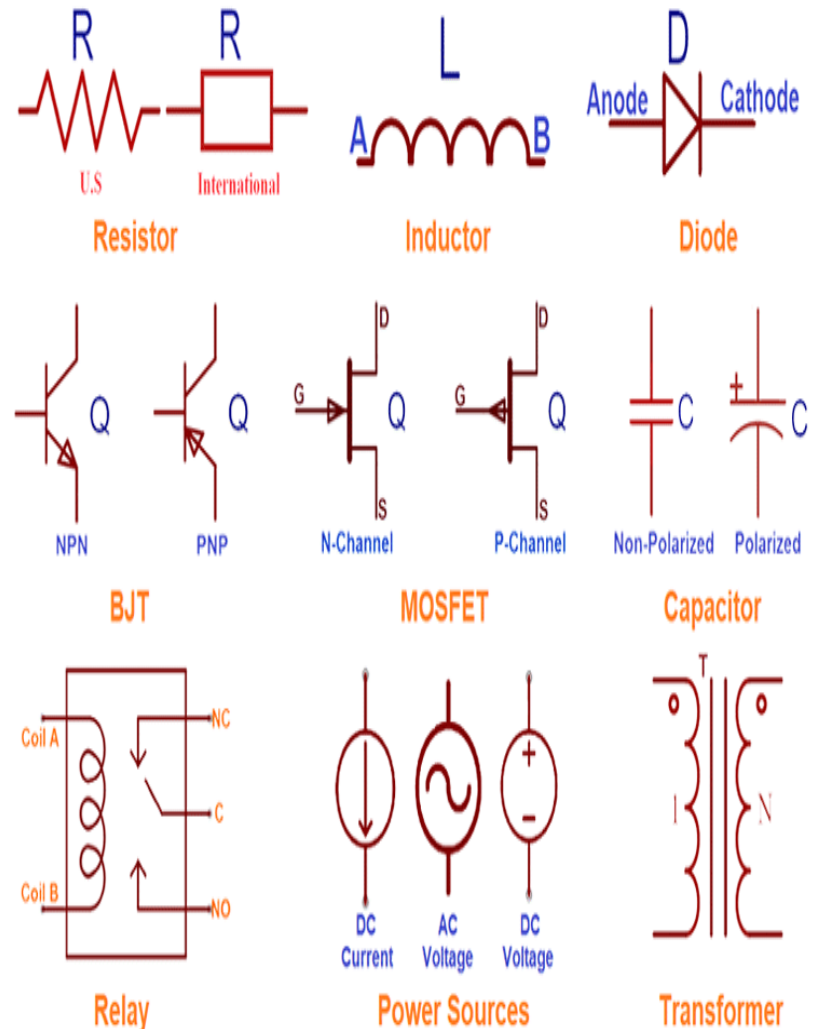
6. Keep at least 40mil space between components and 100mil space from component to board edge. Locate connectors on one edge or one corner of the board.
7. Try to place all components on the top side only. If not possible, only these low profile, small size and low thermal dissipation component (like SMD passive parts) can be on bottom side.
8. Place decoupling capacitors close as much as possible to VCC pin on active components.
9. Keep at least 200mil clearance from transformer to electrolytic capacitor.
10. Locate indication LEDs, test points, switches, jumpers and adjustable components for easy access.

One more rule, it's always good to double check analog, high frequency, RF, high voltage, high profile, heavy or high heat components before starting trace routing.

ELECTRONIC CIRCUIT SYMBOLS



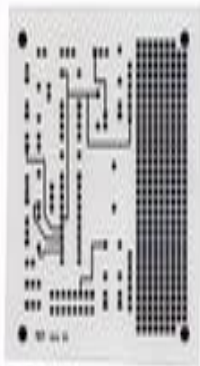
Electronic Component Symbols



Electronic Component Symbols

Steps in PCB design

1. Film Generation



2. Shear Raw Material



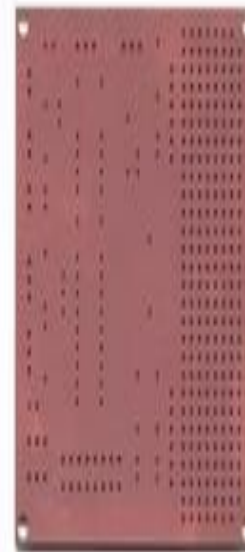
3. Drill Holes



Industry standard
0.059" thick, copper
clad, two sides

Steps in PCB design

4. Electroless copper



Apply copper in hole barrels

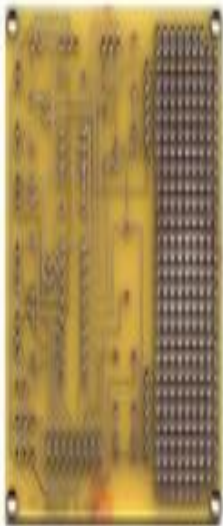
5. Apply Image



Apply Photosensitive Material to
develop selected areas from
panel

Steps in PCB Design

6. Strip and Etch



- Remove dryfilm, then etch exposed copper
- Tin protects the copper circuitry from being etched

7. Solder Mask



Apply solder mask area to entire board with the exception of solder pads

Steps in PCB Design

8. Solder Coat



Apply solder to pads

9. Silkscreen

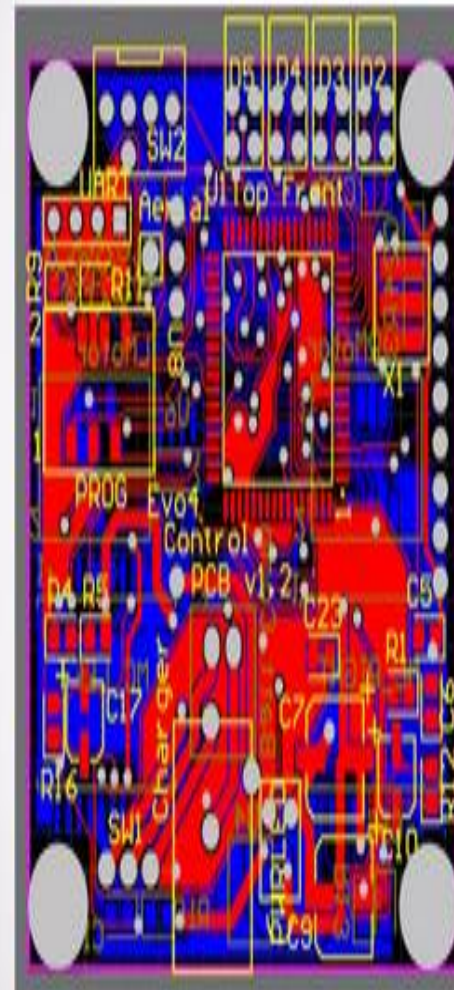


Apply white letter marking using screen printing process

Parts of a PCB

- Components
- Pads
- Traces
- Vias
- Top Metal Layer
- Bottom Metal Layer

PCB Design Presentation



Components

- Components are the actual devices used in the circuit.
- This includes input/output connections.
- I/O ports, including power supply connections, are also important in the PCB design.

Pads

- Location that components connect to.
- You will solder components to the pads on the PCB.
- Pads will connect to traces.
- Pads have an inner diameter and outer diameter.

Traces

- Traces connect pads together.
- Traces are essentially the wiring of the PCB.
- Equivalent to wire for conducting signals
- Traces sometimes connect to vias.
- High current traces should be wide.
- Signal traces usually narrower than power or ground traces

Vias

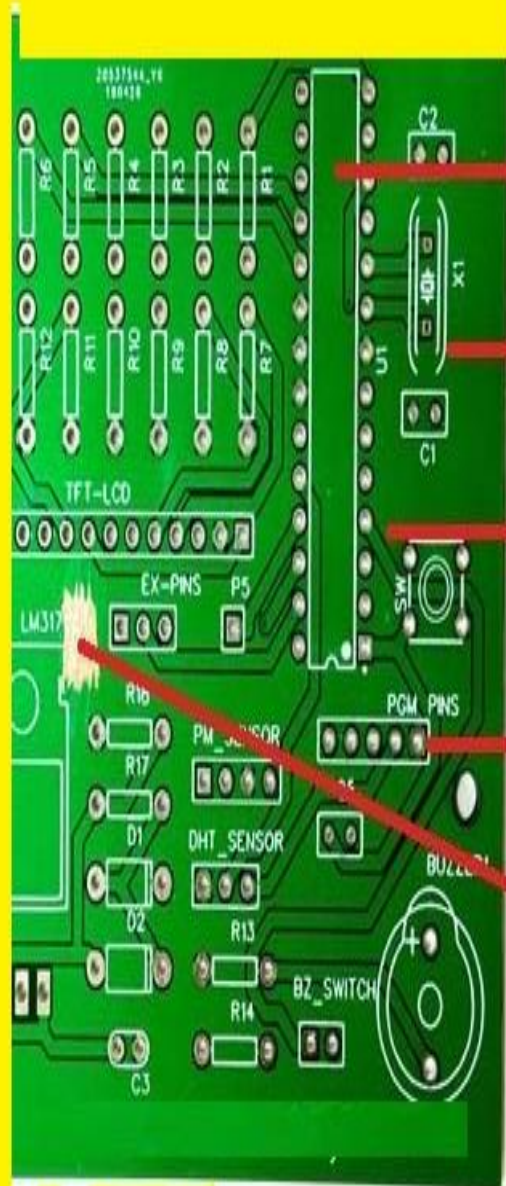
- Pad with a plated hole connecting traces from one layer of board to other layers.
- Attempt to minimize via use in your PCBs.
- Some component leads can be used as vias.

Top Metal Layer

- Most of the components reside on the top layer
- Fewer traces on the top layer
- Components are soldered to the pads on the top layer of PCB
- Higher circuit densities



Parts of PCB Board



Solder Mask

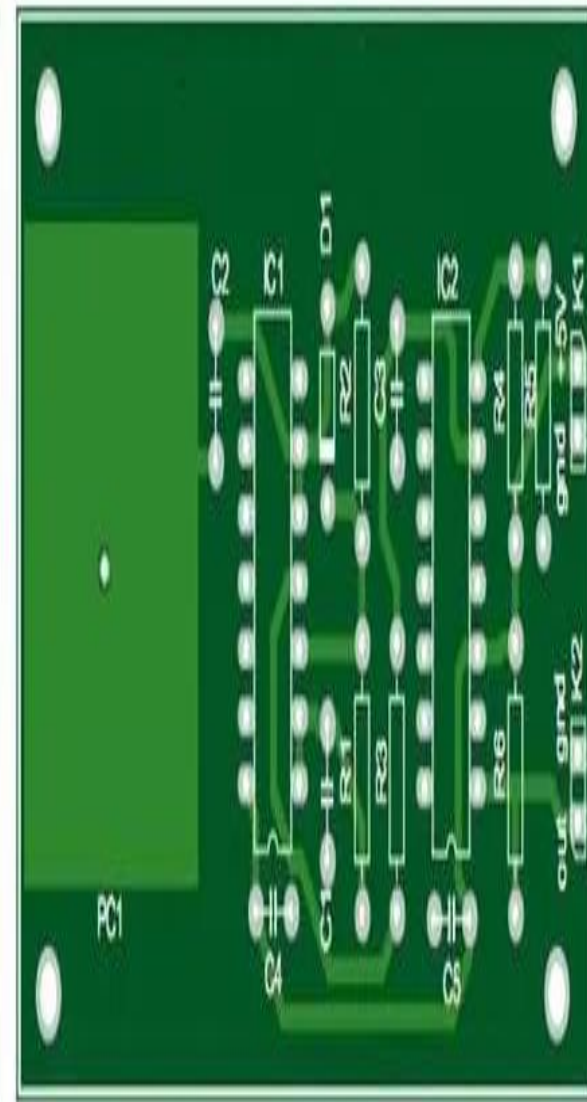
**Silk Layer
Trace**

Pad

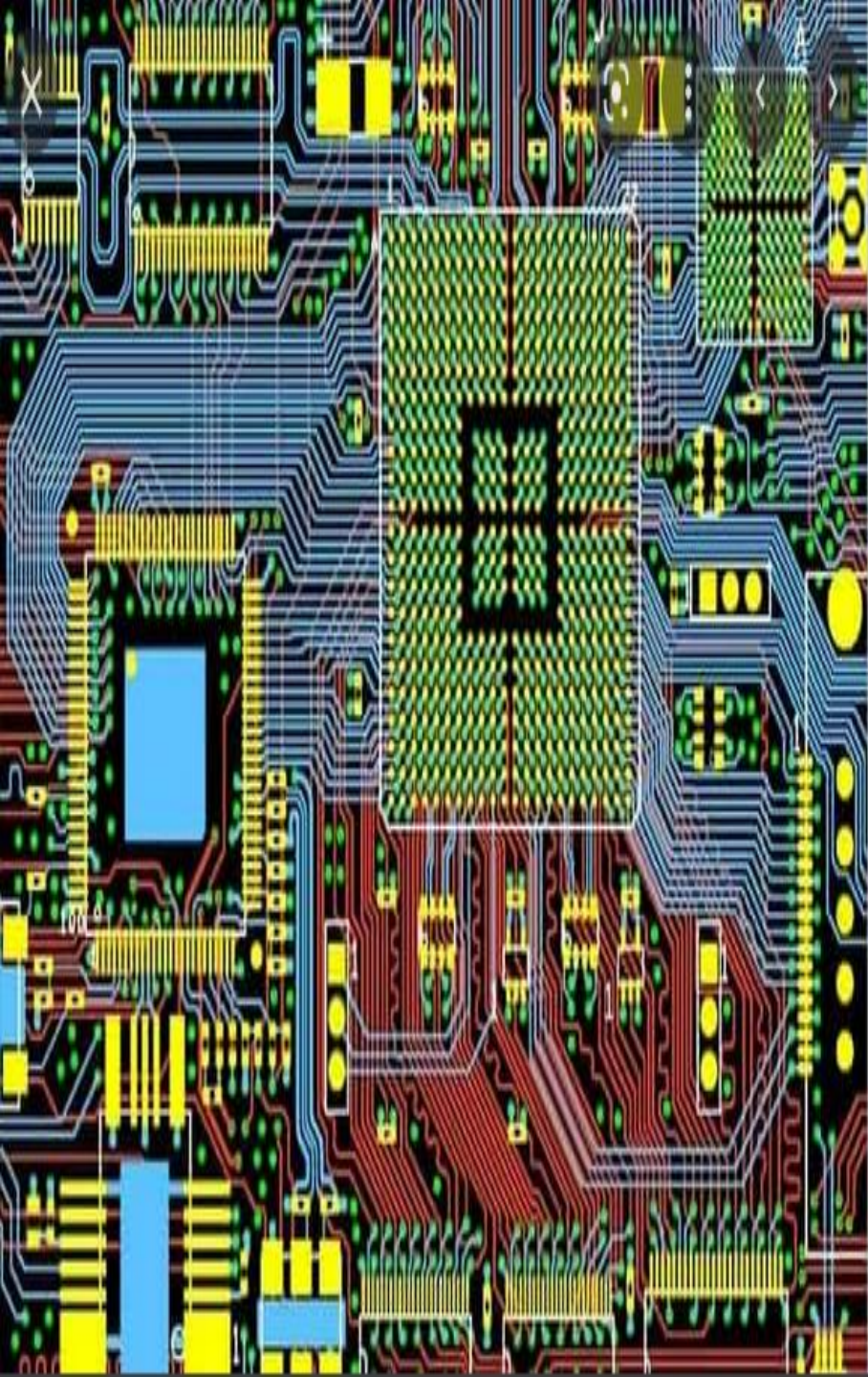
Copper Layer



Dotted PCB



Layout PCB



SUMMARY

- PCB were first developed by an Australian engineer Paul Eisler.
- Mainly 3 types of PCB.
- Schematic, Footprint creation, Placement, Routing are basic steps of PCB's.
- Analysis ensures signal to be recieved with proper strength.
- Gerber file is used for fabrication and assembly process.



Thank You