



Soldering knowledge

1. Introduction

Nowadays, components in electronic devices are secured using printed circuit boards (PCBs).

- The purpose of a PCB is to secure components and establish electrical connections.
- PCBs consist of a substrate (synthetic resin) and conductive tracks (copper).
- Patterns can be created using a variety of processes.
- Components are attached to the panel by soldering (soft soldering, below 450°C).

2. Classification of PCBs

By layers

- single-sided
- double-sided
- multi-layer

By substrate

- rigid substrate
- flexible substrate
- hybrid substrate

3. Soldering

Soldering is a material-based joint: the joint is created by solder, a material with a lower melting point than the elements to be joined.

The surfaces to be soldered are heated using the tip of a soldering iron, and then the solder is applied. The flux in the solder melts because its melting point is lower than that of the solder and wets the surfaces. It also degreases and flows the solder. Once the solder has flowed, filling the available space, remove the tip of the iron. The joint is formed as it solidifies.

4. Soldering materials

When soldering, the temperature of the soldering iron is approx. 300°C. The solder used for this task is a tin-lead alloy. Lead is a heavy metal and is toxic! Wash your hands after work and before eating!

Types:

- Eutectic tin-lead solder: 63% Sn, 37% Pb, melting point = 183°C
- Lead-free solder, for example: 95.5% Sn, 3.8% Ag, 0.7% Cu, melting point = 217°C

5. Fluxes

They help the solder spread over the surface and moisten it.

Types:

- Pine resin, which is soluble in alcohol, non-corrosive, prone to oxidation, difficult to remove
- RMA= Rosin Mildly Activated (acid-treated) pine resin (or synthetic substitute)



6. Assembly technologies

6.1. Through Hole Technology (THT)

The leads of through-hole components are inserted into the holes in the mounting board and soldered on the opposite side. This is why we distinguish between the component side and the solder side.

The standard spacing between pins is 2.54 mm (0.1") (1 grid).

Disadvantages of through-hole technology:

- it takes up both sides of the mounting plate,
- the components take up a lot of space due to the holes
- in the case of a large number of leads (>40), mechanization of the installation is not possible.

Through-hole mounting is increasingly used only for high-performance or other large components. It is usually combined with surface mounting, which is referred to as mixed mounting. The connection process after assembly is manual soldering or wave soldering. The components are inserted into a drill-mountable, usually double-sided, drill-punched printed wiring board either completely manually or semi-automatically.

6.2. Surface Mounting Technology (SMT)

Surface mountable components (SMDs) are electrically connected to contact surfaces (pads) formed on the surface of the mounting board. In most cases, the connection technology is soldering, rarely, e.g., for heat-sensitive components, conductive bonding.

Technological steps:

- Application of solder paste to the contact surfaces
- Application of adhesive (for wave soldering or heavy components)
- insertion of components
- curing of adhesive (with heat or UV light)
- soldering with reflow or wave soldering
- cleaning of mounting plate

7. Soldering errors

- Holes in solder joints due to insufficient tin
- Risk of short circuits due to excessive tin
- Air pockets may form during cold soldering

During circuit construction, hole-mounted components must be secured to the carrier surface by soldering.