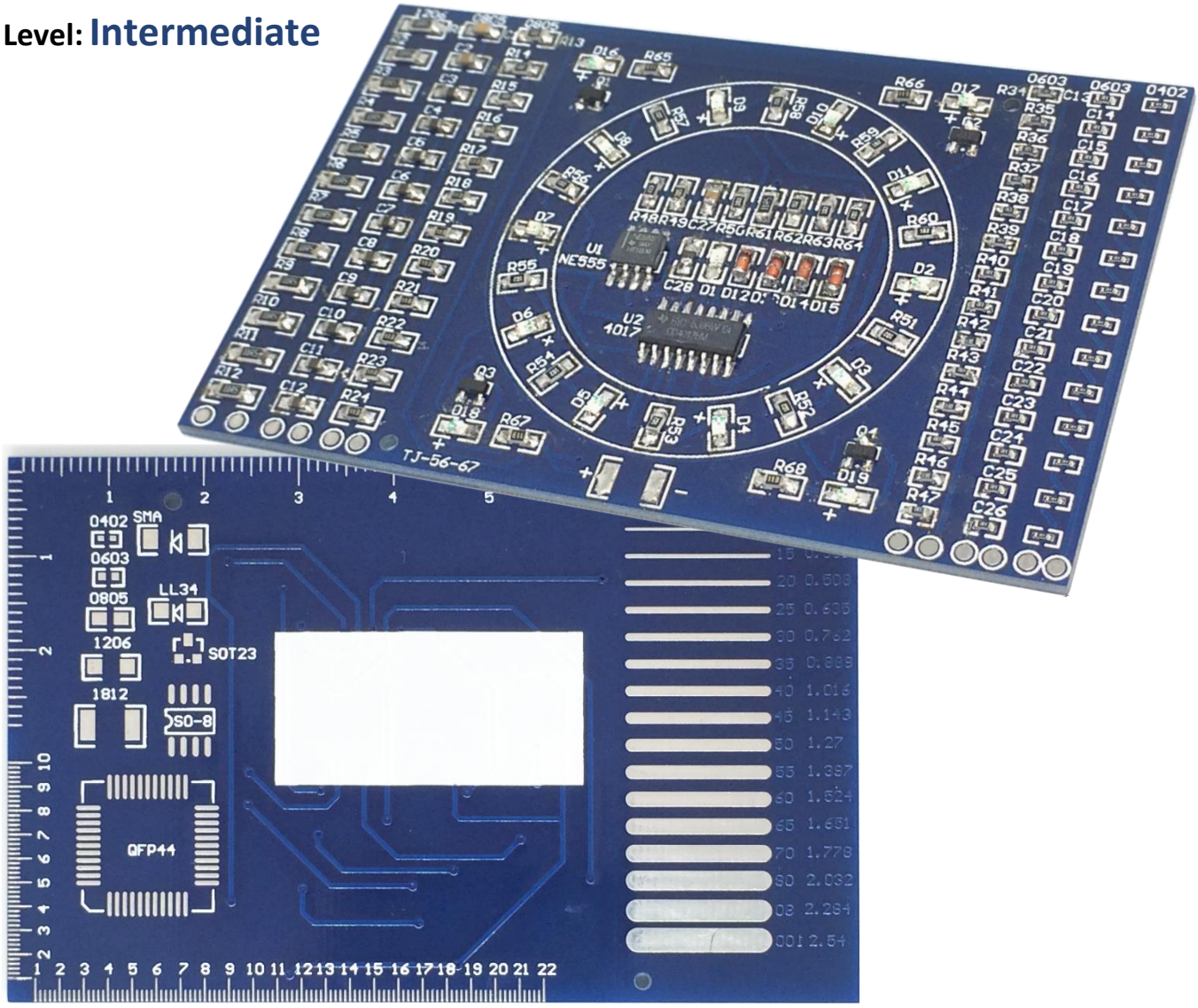
Surface-Mount Device (SMD) Soldering Practice Board D.I.Y. Kit

“Practice makes perfect!”

Part Number: **AK-170**

Level: **Intermediate**



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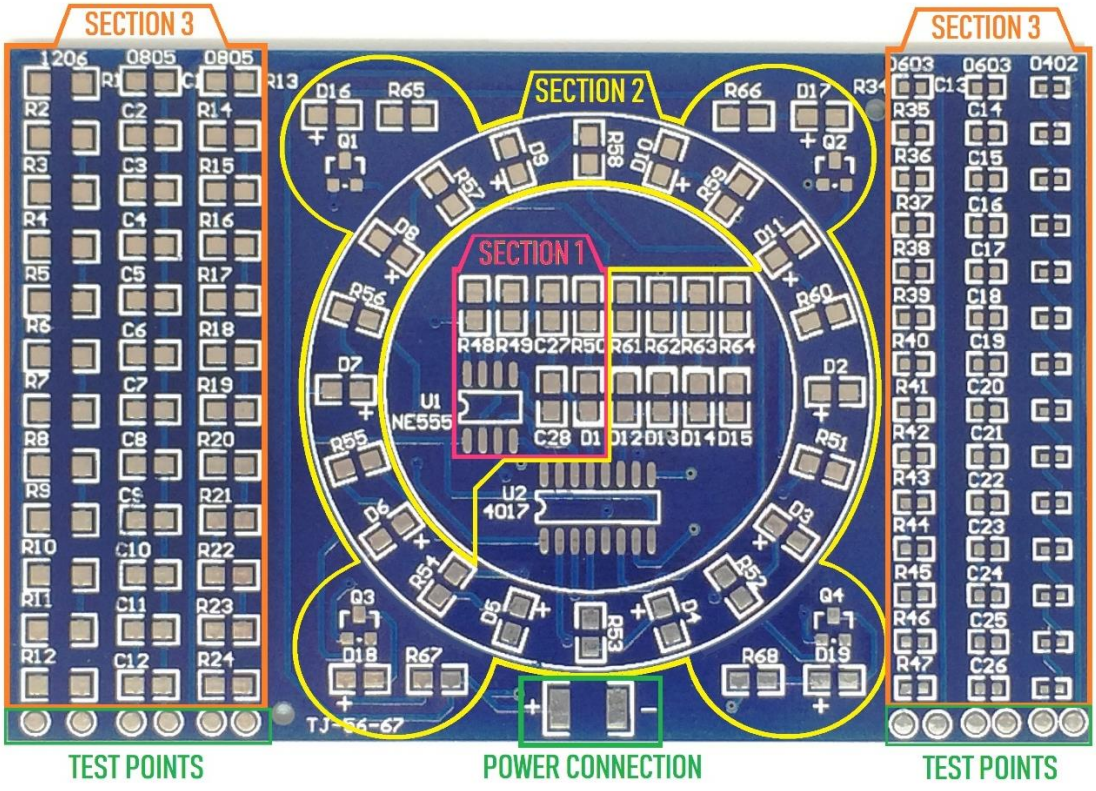
1. Description:

Surface Mount Technology (SMT) is the current worldwide fabrication standard for electronic devices. The electronic components used are called Surface Mount Devices (SMD). Learning how to solder Surface Mount Devices is an essential skill to master for the prototyping and repairing modern electronic products.

The **AK-170** is considered to be a starter kit for electronics enthusiasts who want to learn new skills or practice surface-mount soldering. The kit includes the most popular SMD component packages such as **1206**, **0805**, **0603**, **0402**, **LL34**, **SOT23**, **SOP8** and **SOP16**. On the back side of the PCB, a series of additional footprints can be found such as **1812**, **SMA** and **QFP44**. The components for these three packages are not included in the kit.

This is a more interesting package compared to our **SMD-COMP-KIT** kit that only offers footprints and test points. The top side of this board has 3 main sections. The first section inside the circular pattern of components is the main circuit with an NE555 timer and a single blinking LED. This circuit is surrounded by a series of diodes and resistors that are controlled by the main circuit and an additional CD4017 logic IC. The components on the left and the right borders are only used for soldering purposes and do not contribute into the functionality of the board. The bottom side of the board has some measuring templates and additional footprints which might come in handy.



2. Specifications:

- **Required Input Voltage:** 5VDC
- **PCB Dimensions:** 89 x 58mm (3.5 x 2.3")
- **SMD Components Included:** 1206, 0805, 0603, 0402, LL34, SOT23, SOP8, SOP16

3. Advantages and Features:

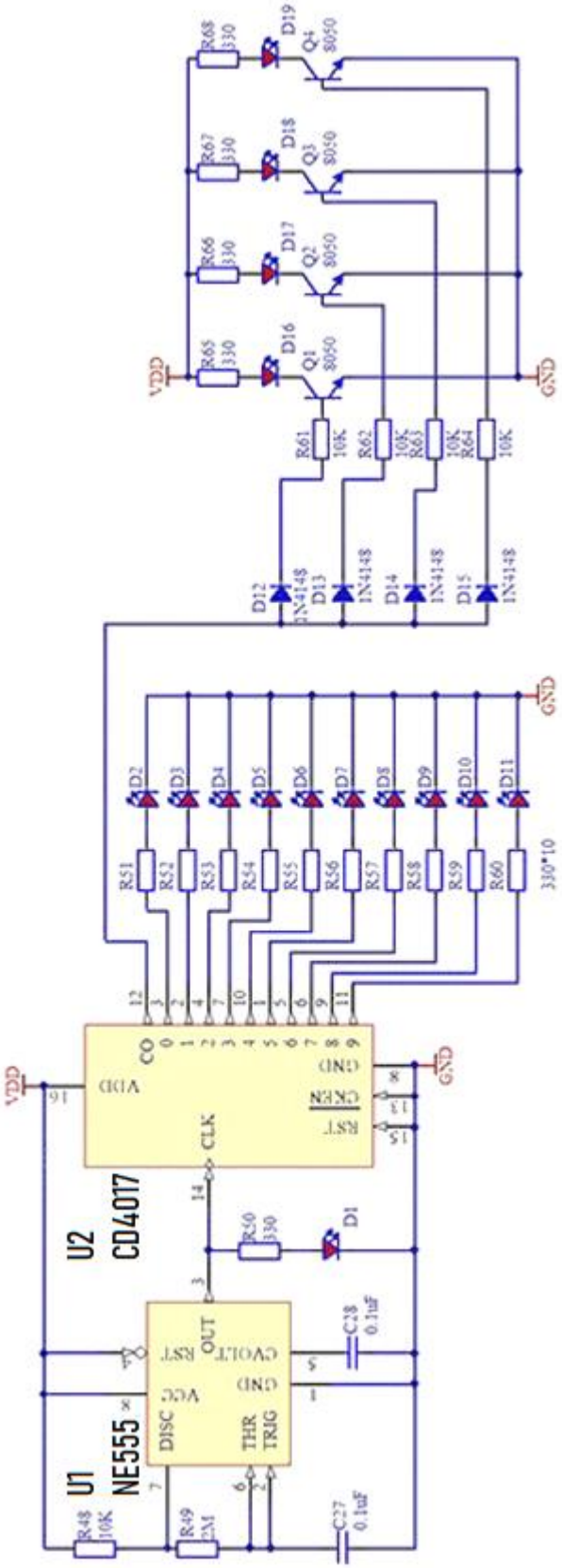
- Includes the most common SMD packages
- A very good learning tool
- Affordable

4. Bill of Materials

This package includes the components listed in the table below. Please note that there might be a slight variation in quantity and component values. Also, there might be some spare components included in the kit.

Placement	Component	Label on PCB	Value / Type	Quantity
Functional Circuit	**IC Chip**	**U1**	**SOP8 NE555 Timer IC**	**1**
		U2	**SOP16 CD4017 Logic IC**	**1**
	Diode	**D1-D11 D16-D19**	**0805 LED** (random color)	**15**
		D12-D15	**LL34 1N4148 Zener**	**4**
	Transistor	**Q1-Q4**	**SOT32 S8050 J3Y NPN**	**4**
	Capacitor	**C27-C28**	**0805 0.1µF**	**2**
	Resistor	**R48**	**0805 205 2MΩ**	**1**
		R49	**0805 103 10KΩ**	**1**
		R50-R60	**0805** (random values i.e. **331** or **471**)	**11**
		R61-R64	**0805 103 10KΩ**	**4**
		R65-R68	**0805** (random values i.e. **331** or **471**)	**4**
Practice Section	**Resistor**	**R1-R12**	**1206** (random values)	**12**
		R13-R24	**0805** (random values)	**12**
		R34-R47	**0603** (random values)	**14**
	Capacitor	**C1-C12**	**0805** (random values)	**12**
		C13-C26	**0603** (random values)	**14**
	Resistor/Capacitor	**Unlabelled**	**0402** (random values)	**14**

5. Circuit Schematic:



6. Pre-Assembly:

1) In order to assemble the module, you need the following tools:

Must Have

Temperature Adjustable Soldering Iron
A variety of soldering tips
Brass wool
Wet sponge

60/40 or 63/37, Tin-Lead Solder

Needle Nose Plier or Tweezers

Wire Stripper

Lint Free Cloth

Recommended

Isopropyl Alcohol

Soldering Brush

Rosin Flux Pen or Paste

***It is recommended to have some isopropyl alcohol and a fine soldering brush handy to clean off the excess flux on the circuit board when the soldering is done.**
***ATTENTION* DO NOT USE RUBBING ALCOHOL FOR CLEANING AS IT WILL DAMAGE THE COMPONENTS.**

2) Open the package and verify the components. (refer to section **4. Bill of Materials**)

3) Lay down all the components on your workbench and proceed to the next step.
***ATTENTION* SURFACE MOUNT COMPONENTS ARE VERY SMALL AND CAN EASILY BE LOST, KEEP THEM IN A SAFE PLACE.**

4) Prepare your soldering tools.

a) Use an appropriate tip for the application. Also, make sure the soldering tip is clean. Gently use a brass wool or a brush to clean the tip when needed. Another way of cleaning the soldering tip is to use a wet sponge.

b) The soldering iron temperature depends on the type of solder used. If you are using a typical **60/40 lead solder**, depending on the thickness the temperature should be set anywhere between **374 to 626 °F (190 to 330 °C)**. If you are using a lead-free solder, **increase** above temperatures **by 40 to 60 °F (5 to 15 °C)**.

***ATTENTION* HIGHER TEMPERATURES WILL DAMAGE THE COMPONENTS ALONG WITH THE CIRCUIT BOARD.**

***ATTENTION*DO NOT TOUCH THE SOLDERING IRON WHEN IT IS HOT.**

c) It is recommended that you clean the board with a fine brush, isopropyl alcohol and lint-free cloth to get rid of any pre-existing residue, glue or dirt. This way the solder will create a better joint with the pad surface.

d) Have your flush cutter, needle nose plier or tweezers handy.

e) Having a roll of paper tape helps you to keep the components in place when soldering.

f) Have a rosin flux pen or paste handy. Adding flux to the pads before soldering the components makes the wetting process easier by letting the molten solder to flow better on the pad and create a better joint.

***ATTENTION* SOLDERING SHOULD BE DONE IN A VENTILATED AREA. BREATHING SOLDER FUMES WILL HARM YOU.**

7. Assembly:

Learning the tips and tricks of surface mount soldering requires practice. Numerous documents and videos can be found online that explain how each SMD package is soldered.

Follow the provided links to watch a few How-to videos:

YouTube https://youtu.be/5uiroWBkdFY
https://youtu.be/8Q6YNmBKjiU

The assembly process can be broken down into the following steps:

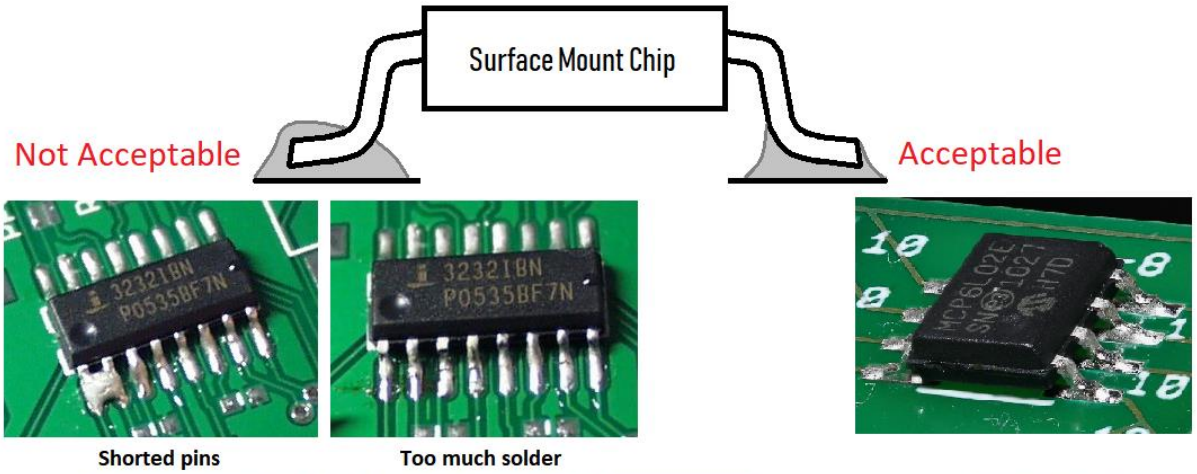
Step 1: Soldering the **section 1** components onto the board.

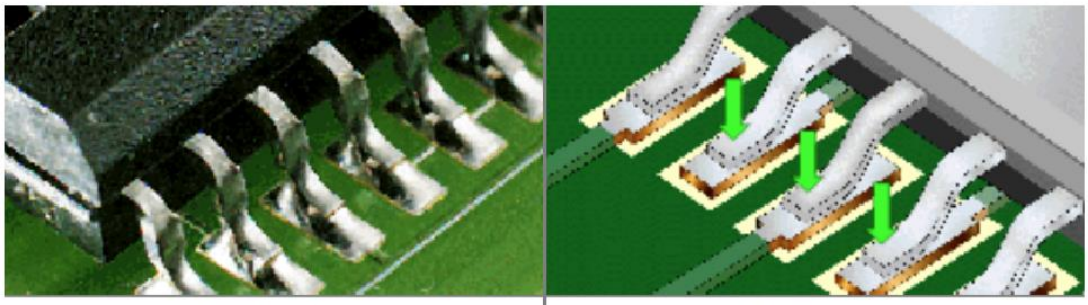
Step 2: Adding a pair of wires to the power connection pads and verifying the functionality of section 1 by powering up the circuit.

Step 3: Soldering the **section 2** components onto the board.

Step 4: Powering up the circuit once more to verify the functionality of the completed circuit.

Step 5: Soldering the components on the practice area of the PCB (**section 3**).



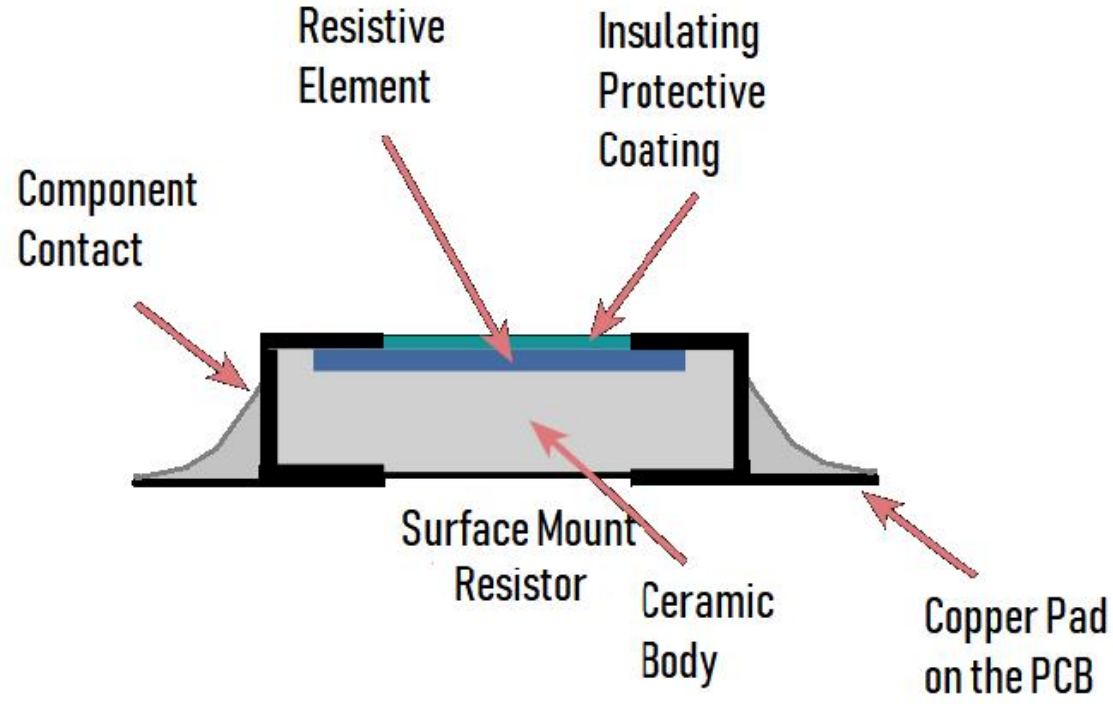


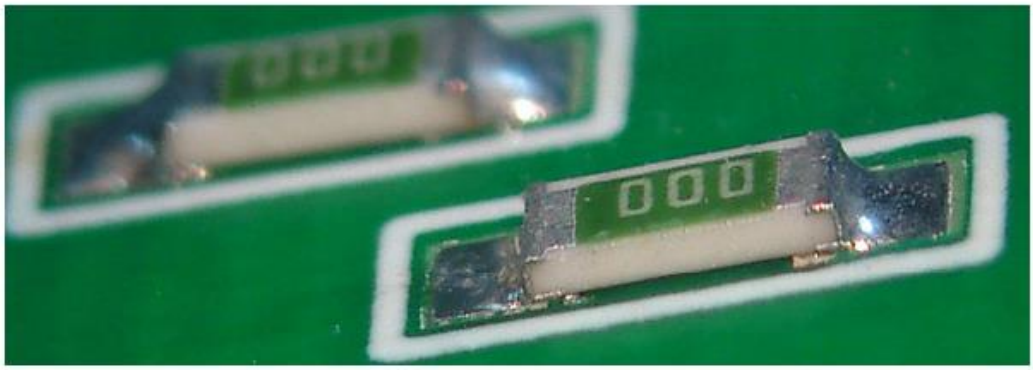
PREFERRED

The part is properly oriented to the land pattern, with each lead centered across the width of the land. Leads are planar, fillets are shiny and concave, and heel fillet is evident.

PREFERRED COPLANARITY

The preferred planarity of the lead to the land pattern area is with the foot parallel and in full contact with the pad.





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