

Christmas Tree

Introduction

This soldering kit features programmable RGB LEDs operated by the ATtiny microcontroller in multiple blinking modes.

The modes can be switched using a button—creating decorative Christmas lighting.

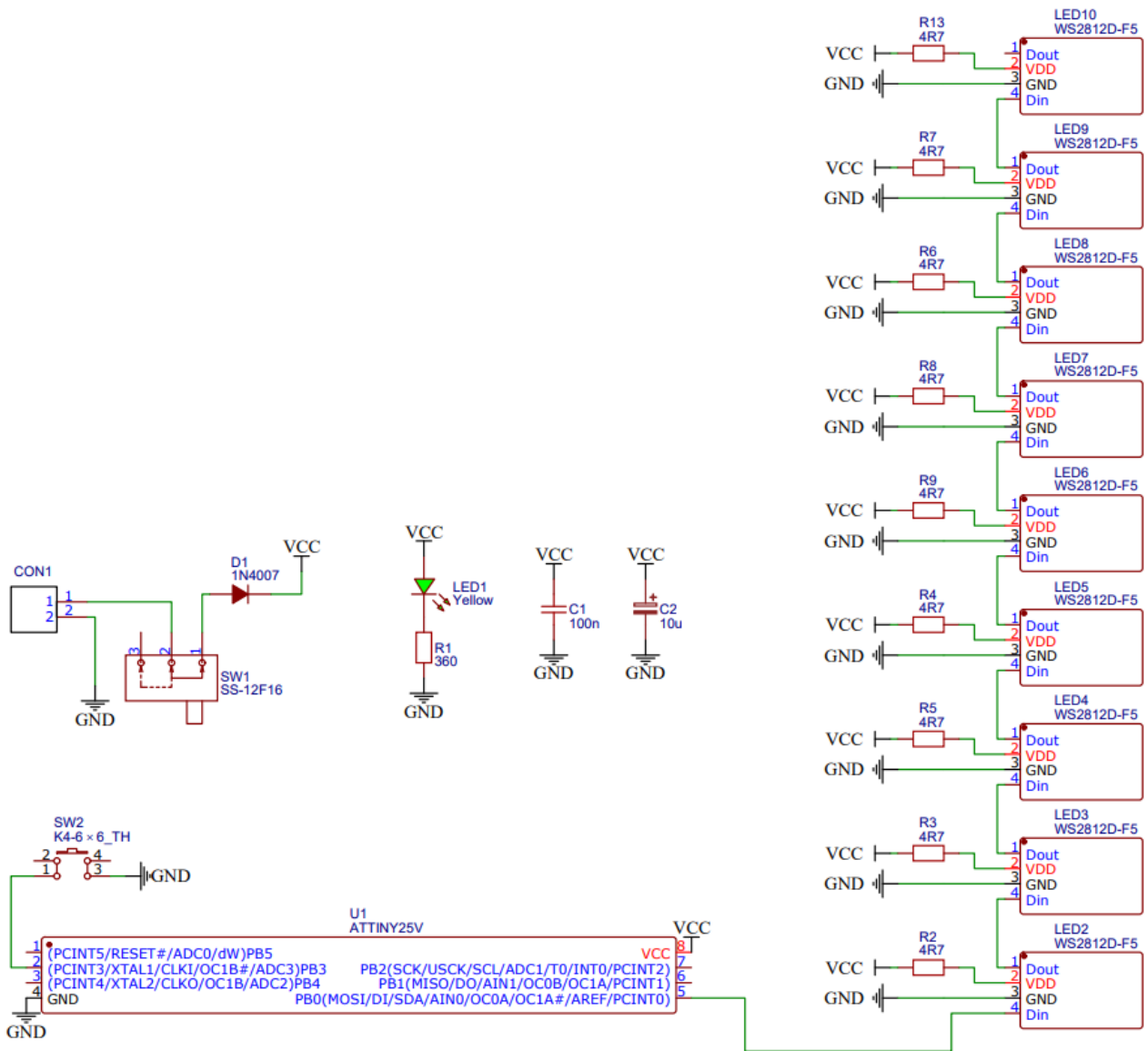
Use a soldering iron or soldering station for assembly.

Melt the solder at temperatures between 250–350 °C.

Exercise special caution to avoid burns.



Circuit Diagram



Parts List

Before starting, verify that all listed components are included.

Designation	Component	Details	Qty
R1	Resistor	1k	1 pc
R2-R10	Resistor	4R7	9 pcs
D1	Diode	1n4007	1 pc
C1	Capacitor (ceramic)	100nF	1 pc
C2	Electrolytic Capacitor	10uF	1 pc
LED1	THT LED	Yellow	1 pc
LED2-LED10	THT RGB LED	WS2812	9 pcs
SW1	Switch	-	1 pc
SW2	Push Button	-	1 pc
U1	Microcontroller	ATtiny25v	1 pc
DIL8	IC Socket	-	1 pc
J1	Battery Holder	-	1 pc
PCB	Printed Circuit Board	Christmas Tree	1 pc



R1

Resistor

1 pc

1k



R2-R10

Resistor

9 pcs

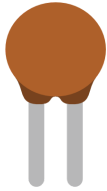
4R7



D1

Diode

1 pc



C1

Capacitor (ceramic)

1 pc

100nF



C2

Electrolytic Capacitor

1 pc

10uF

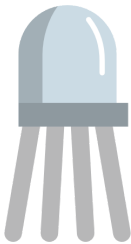


LED1

THT LED

1 pc

Yellow



LED2-LED10

THT RGB LED

9 pcs

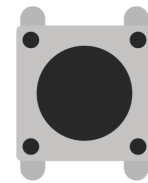
RGB



SW1

Switch

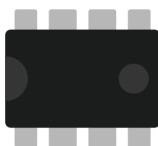
1 pc



SW2

Push Button

1 pc



U1

Microcontroller

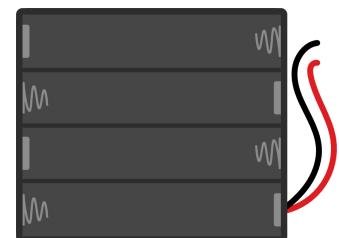
1 pc



DIL8

IC Socket

1 pc



J1

Battery Holder

1 pc

Assembly

Resistors

The first components to place on the printed circuit board are **resistors R1–R10**. Resistor orientation does not matter—they work the same in both directions.



R1
1k



R2-R10
4R7



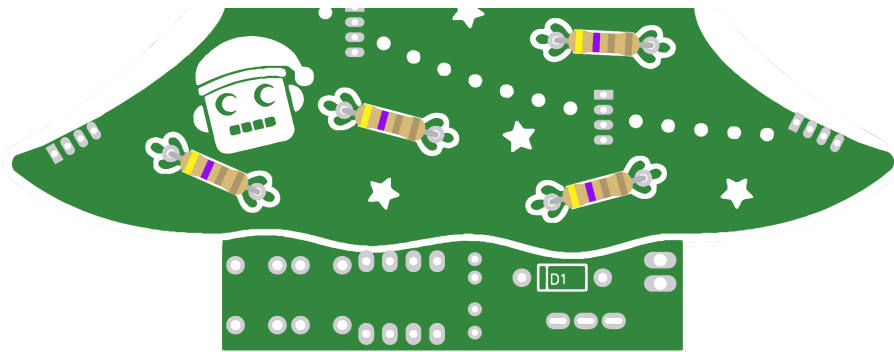
Diode

Observe **correct polarity when soldering D1**.

The diode has a marking stripe on one side, which is also visible on the PCB.
This stripe helps with correct orientation.



D1



IC Socket

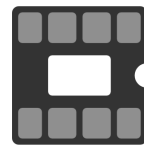
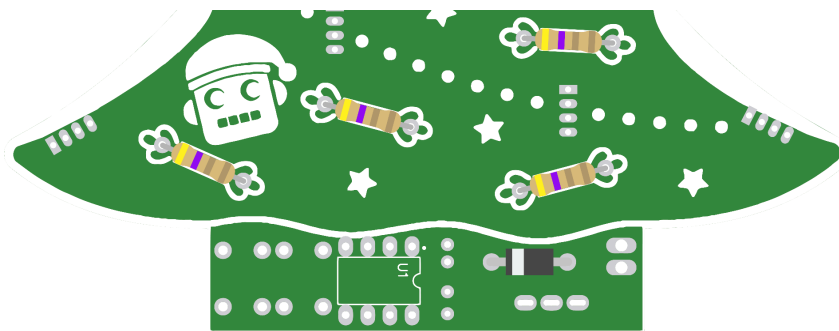
The microcontroller U1 is a sensitive component and can be easily damaged by heat.

Therefore, it is not soldered directly but placed into an **IC socket**.

When soldering the socket, pay attention to the notch on one side.

This **notch indicates the correct orientation** and must align with the marking on the PCB.

Do not insert the microcontroller at this stage!



DIL8

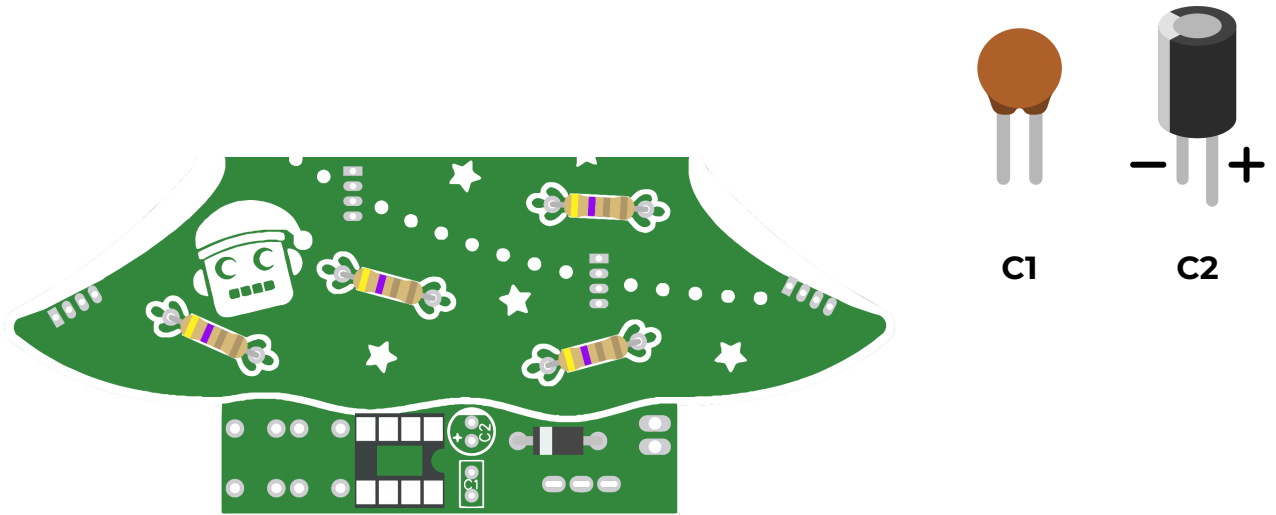


Capacitors

C1 is a **ceramic capacitor**—orientation does not matter.

C2 is an **electrolytic capacitor and must be soldered with correct polarity.**

Correct orientation is indicated by markings on both the PCB and the capacitor.



LEDs

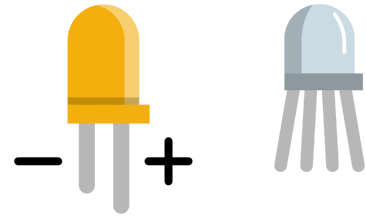
Now install the **THT LEDs LED1-LED10**.

Pay close attention to correct polarity.

LED1:

The shorter leg is negative (-), the longer leg is positive (+).

Insert the longer leg into the round hole, with the flat side of the LED facing up.



LED1

LED2-LED10

LED2-LED10 (WS2812):

These programmable RGB LEDs are installed so that the leg on the flat side goes into the square hole.

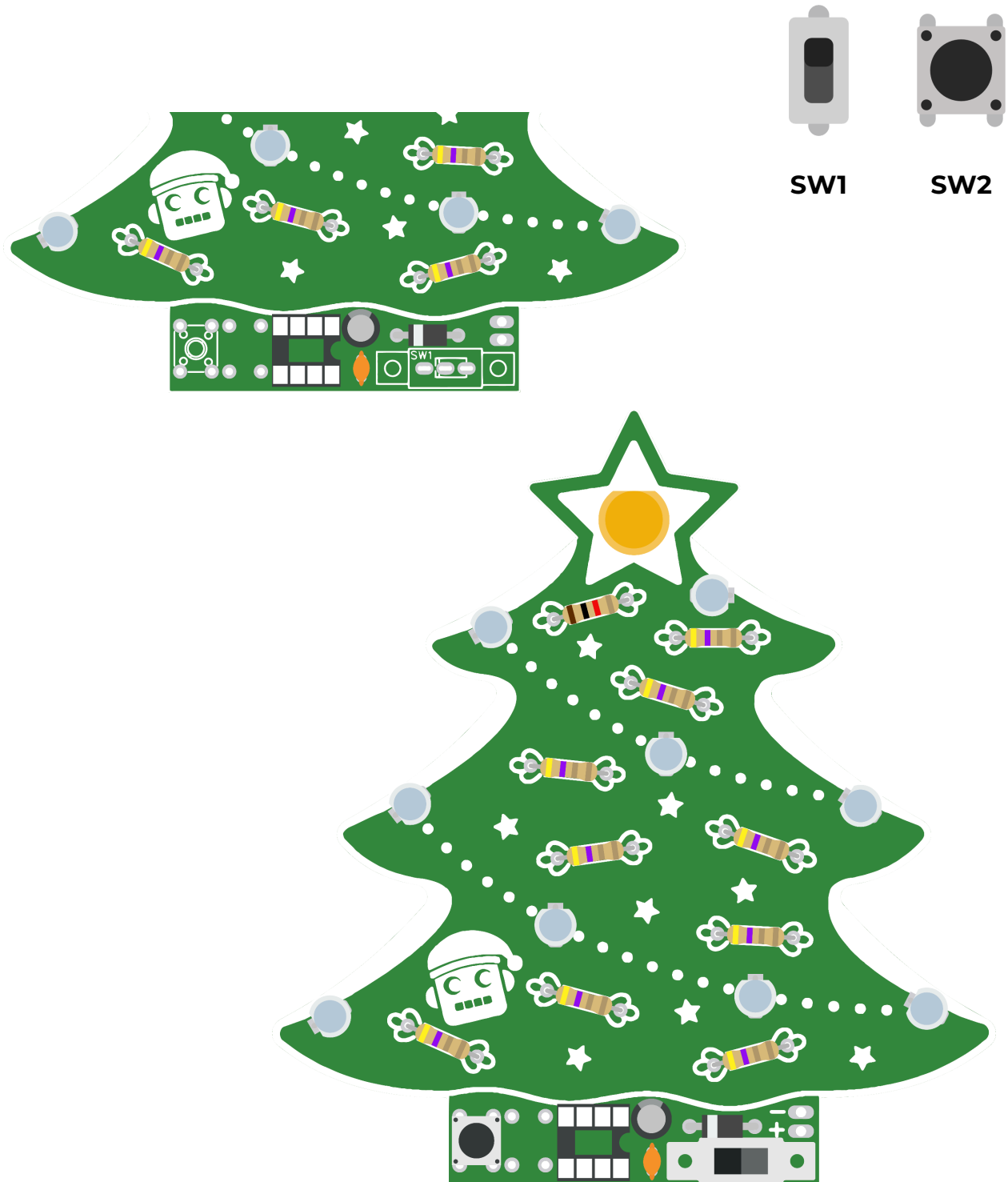


Push Button and Switch

Install the **switch SW1** according to the marking on the PCB.
It is non-polarized and can be installed in any orientation.

Next, solder the **push button SW2**.

Orientation does not affect functionality—the push button works the same in both directions.



Battery Holder

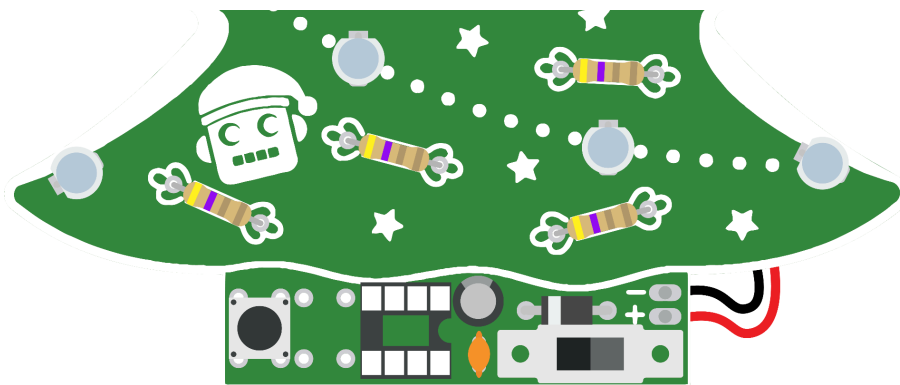
Mount **battery holder J1** on the backside of the PCB.

Exercise special caution when soldering to avoid damaging nearby components.

Solder the red wire into the hole marked with a plus (+) sign.

The battery holder can be attached to the underside of the board with double-sided tape or a hot glue gun.

Do not insert the battery at this stage.



J1



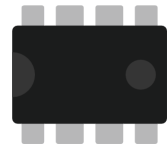
Integrated Circuit

Now insert the **microcontroller U1**.

As when soldering the socket, **pay attention to the component's orientation.**

The IC package has a notch on one side.

This notch must align with the notch on the socket.



U1



Testing

Now insert the **microcontroller U1** (ATtiny25v) into the socket.

Next, connect the batteries.

Use the switch to turn the tree on, and use the push button to cycle through the lighting modes.

Have fun building and Merry Christmas!



Tips & Troubleshooting

Power-Up

If all steps have been followed correctly, the Christmas tree should work immediately after inserting the batteries and switching it on.

Possible Issues

- **Short circuits** – Two adjacent pins may be accidentally connected, creating an unwanted conductive path.
- **Cold solder joints** – A solder connection may not have been completed properly and lacks electrical contact.
- **Incorrect orientation** – Components may be installed in the wrong direction; check all positions and polarities according to the manual.
- **Misplaced components** – Components may have been installed in the wrong positions (e.g., resistors in incorrect locations).
- **Heat-damaged components** – Some parts may have been damaged by excessive heat during soldering. Identify and replace the affected component.

How It Works

The heart of the circuit is the ATtiny25v microcontroller.

It is programmed to switch between different blinking modes.

The user interface consists of a single button, which cycles through six different effects.

The LEDs on the tree are special because they can be digitally controlled.

This allows them to be easily connected and enables an almost unlimited number of color combinations. However, if the data connection between the LEDs is interrupted—e.g., by an incorrectly installed LED—all subsequent LEDs will not light up.