GK-EK-51 Christmas Tree Kit
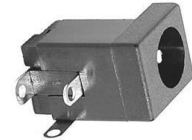

geeekÜs

Parts List

x37 RGB LED_____

x1 Power Jack_____

x7 100Ω Resistor_____

x6 4.7kΩ Resistor_____

x6 47μF Capacitor_____
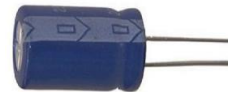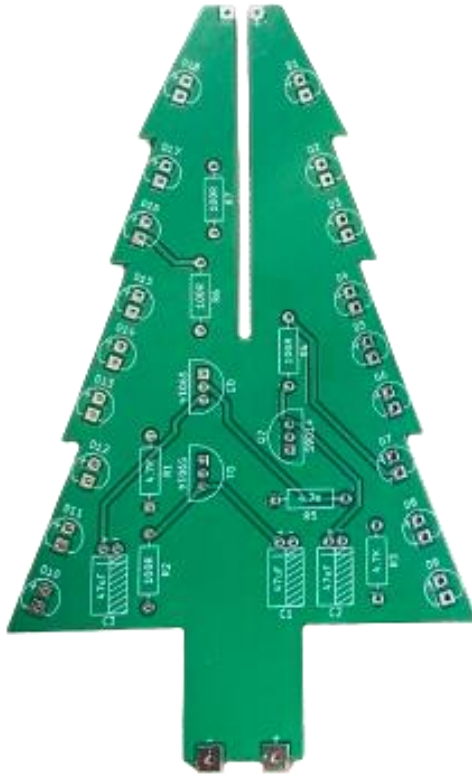
x6 9014 NPN Transistor_____
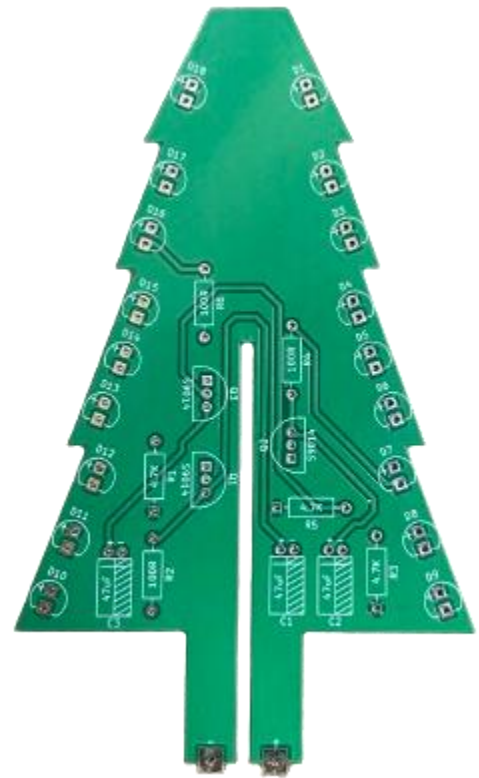
x1 2.1mm Jack Cable_____

Printed Circuit Boards

"Top Cut" Side

**"Bottom Cut" Side**

Snow

Introduction

GK-EK-51 is a soldering practice kit resembling a Christmas tree. The tree is composed of three PCBs: Two sides of a spruce tree and the snow beneath. The RGB LEDs are pre-programmed with a tiny MCU inside each, hence the lack of MCUs in this kit. Through careful handling, the capacitors, transistors and RGB LEDs are capable to bend up to 90 degrees.

Resistor Color Coding
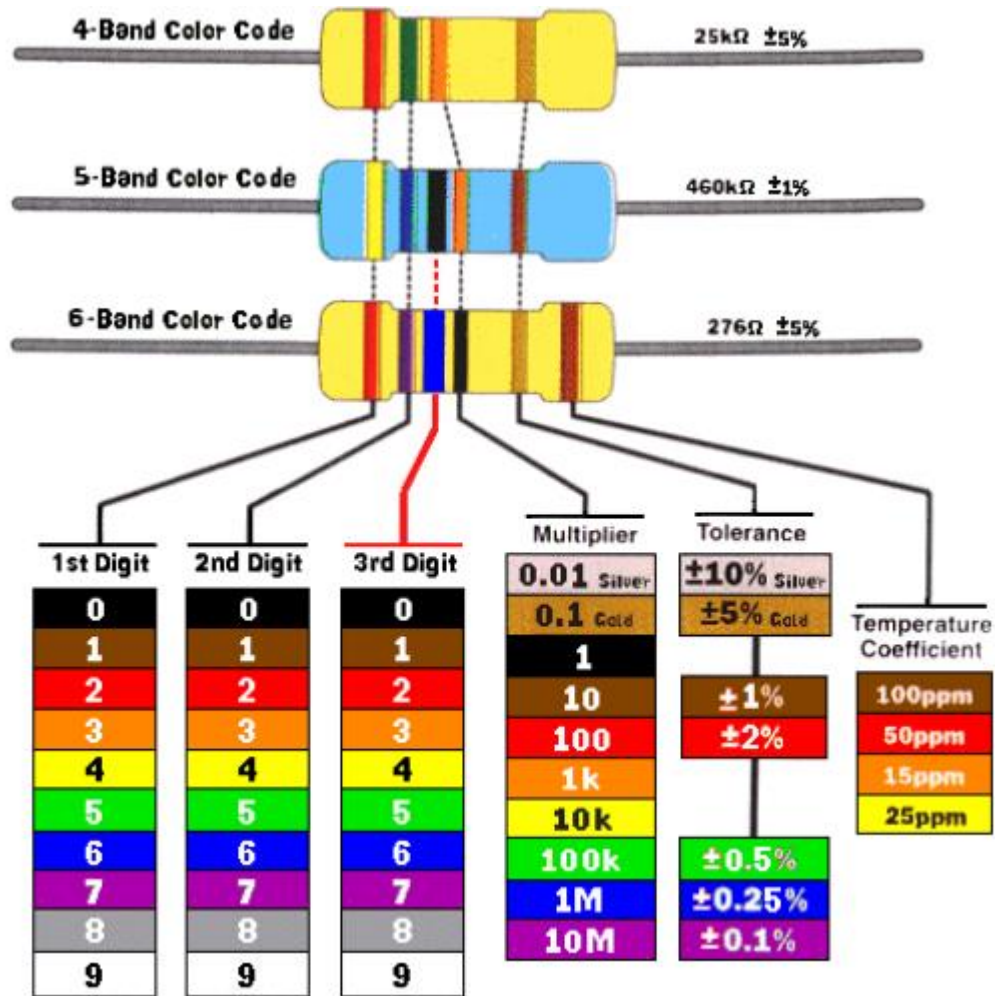
Resistors can have a different number of bands. Refer to the chart above to identify the value of your resistor. For example, [brown – black – black – red – brown] sequence of colors gives values [1 – 0 – 0 – 100 – 1%], which represents a 10kΩ resistor with 1% tolerance.

Soldering/Assembly Guide

When soldering with lead-free solder, the recommended temperature typically falls within the range of <u>370 to 400 degrees Celsius</u> (700 to 750 degrees Fahrenheit). For leaded solder, the recommended temperature range is generally between <u>330 and 370 degrees Celsius</u> (626 to 698 degrees Fahrenheit). Leaded solder melts at a lower temperature than lead-free solder. Those temperatures are approximated values. Be <u>very</u> careful handling the soldering iron because the tip can get <u>very</u> hot when powered on. Don't touch it.

It's a good idea to clean the tip of the iron before turning it on. Clean iron tip allows for smooth flow of the solder onto the pad. It's also a good idea to clean the PCB with flux paste for even better flow, which is typically applied in areas where you intend to solder. Get a sponge and soak it in water for use.

Take either tree side PCB and solder the resistors. Since they do not have a polarity, they can be placed on the board facing either direction. Any component with R# on the board is a resistor. Refer to the resistor diagram if you're unsure about the identification of resistor values. When placing the resistor on the board, spread its leads apart to keep it from falling out when you flip the board to solder it.
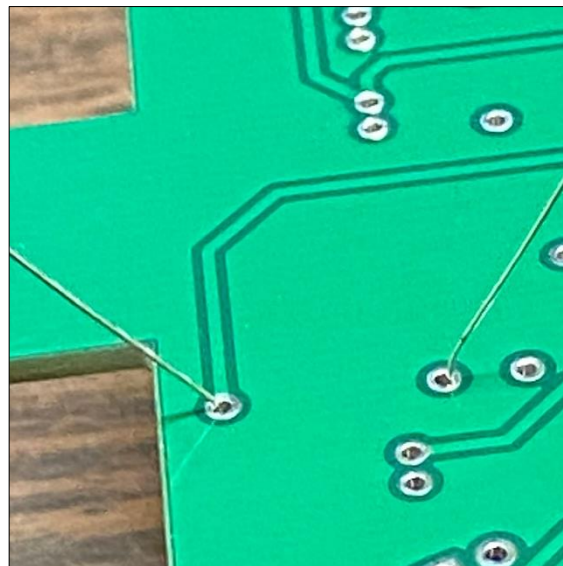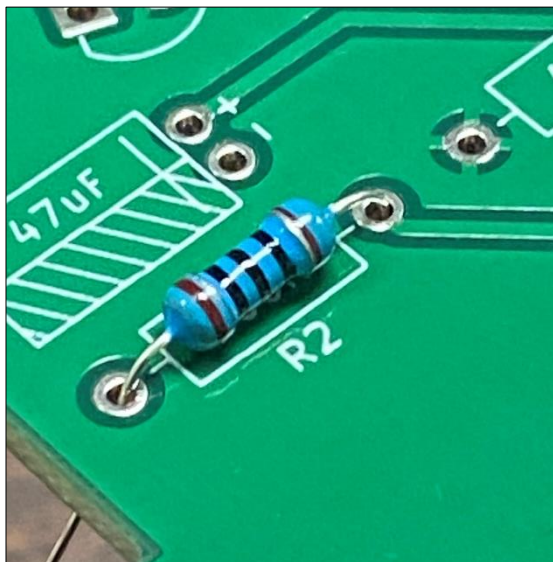
When you're all prepared, power on your soldering iron and adjust the temperature based on the type of solder you'll be using. Hold the solder in one hand and the iron by the handle in the other. Place the iron tip against one of the pads the resistor is in and quickly (because the pad will burn if the tip is touching it for too long), but carefully, touch the tip with the solder for just a second. With previously mentioned preparations, the solder will melt and flow in the pad. After that one second, move the tip and the solder away. Before soldering the second pad, be sure to clean the tip with the soaked sponge by pressing it against it at different angles.

If your soldered pin looks like a volcano or a cone, it's a job well done! If it looks like a bubble, you have applied too much solder. That excess solder can be removed by just drawing it away with the hot iron tip. Make sure to not leave the leads trimmed too long as they may interfere with leads of the components you'll be soldering nearby in the future.

Familiarize yourself with LED polarities before soldering them to the board. On it, they're identified with D#. Polarity is important because of the unidirectional flow of current through it. The LED will become ruined if the board is powered and it's soldered backwards. The diagram below provides ways to differentiate an anode from a cathode. It is recommended to slightly lift and carefully bend the LED before soldering it because the board itself will obstruct it from bending full 90 degrees. Do <u>not</u> solder the LED on top of the Christmas tree until both tree sides are fully soldered and assembled with the base. Be mindful of solder bridges.
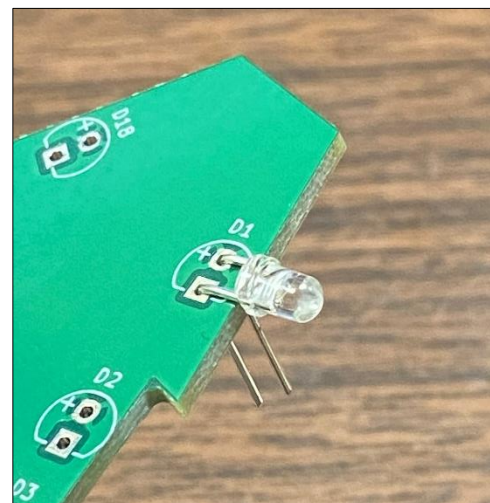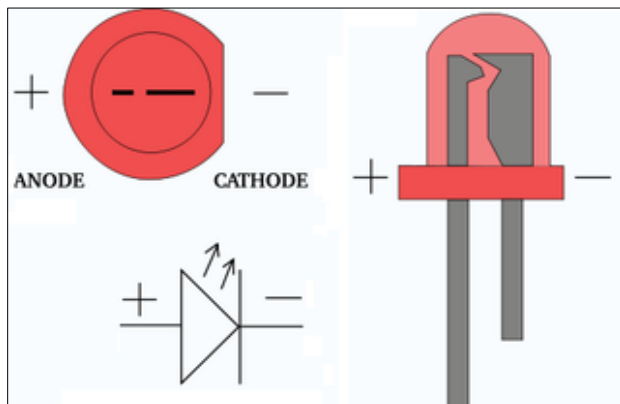
A very similar approach is applied to the capacitors. A capacitor also has polarities, which are identified via the length of pins and/or a silver stripe on either side to indicate a negative polarity. On the board, the capacitors are identified with C#. It is recommended to slightly lift and carefully bend the capacitor before soldering it because the board itself will obstruct it from bending full 90 degrees. Be mindful of solder bridges – they can be drawn away by running the hot iron tip through. If the pins are shorted, the component will break.
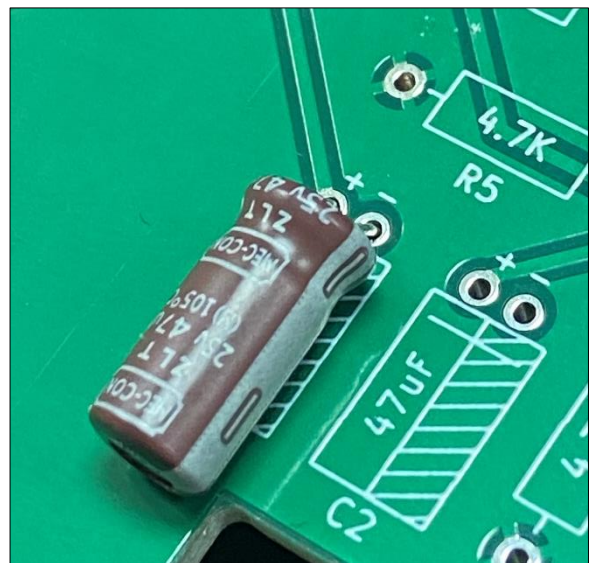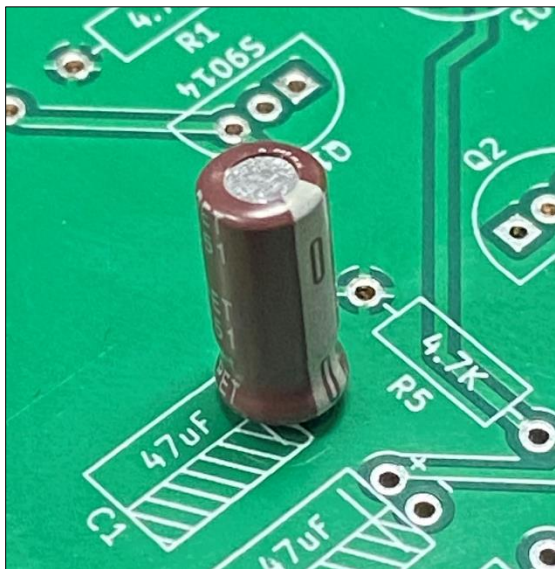
The transistors must be placed on the board as shown in the picture below – the flat side of it in respect with the flat side of the transistor's silkscreen component. They are identified with Q# and should also be bent before soldering. Be mindful of solder bridges.
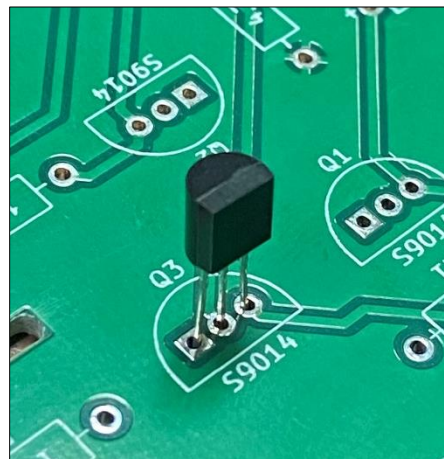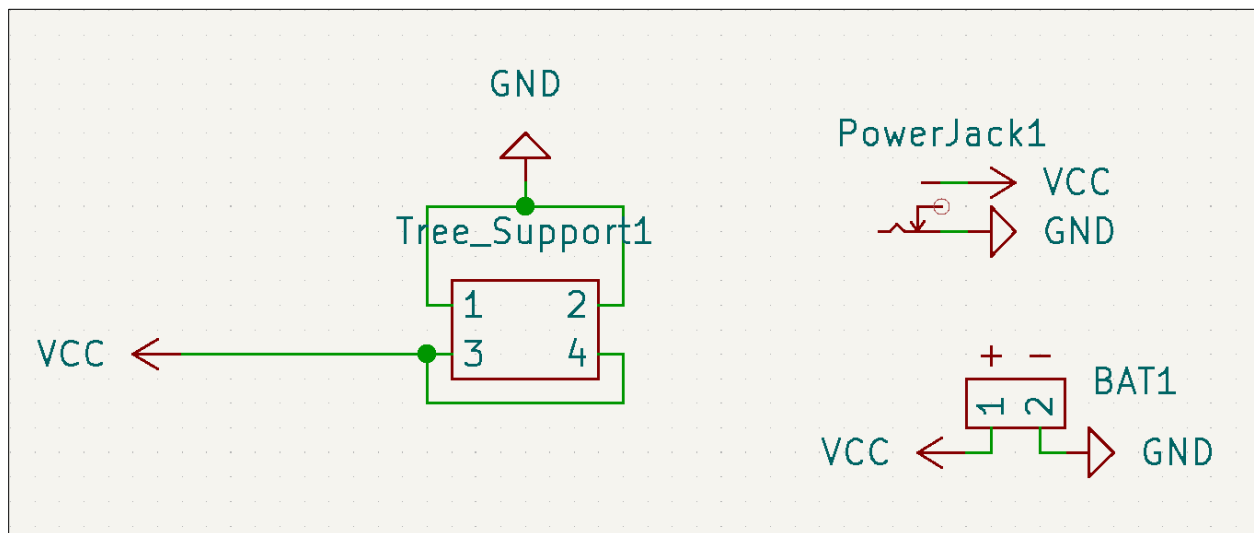
Assuming you have soldered both sides of the tree completely (excluding the LED on top), it's time to solder them onto the base. The basic procedure involves placing one side of the tree over the other and identifying where the tree must be facing when on the base. That can be figured out by looking at the plusses and minuses. As long the tree's signs correspond with the base's signs when next to each other, it is a correct assembly, and the soldering may commence. Once the bases are soldered, the top LED may be soldered along with the DC jack located on the base (DC5V) and the Christmas Tree is complete!

Snow Schematic

GND

PowerJack1

VCC

GND

Tree_Support1

1	2
3	4

VCC

+ −

BAT1

1 2

VCC

GND

Tree Schematics

"Bottom Cut" Side

"Top Cut" Side

(like "Bottom Cut", except with D19 and R7)

Powering the Christmas Tree

The Christmas Tree can be powered by <u>one</u> of the two following ways:

1. **USB Jack Cable (5V Total)**

This cable came included with your GK-EK-51 kit. If you have a 5V adapter block, you may safely connect it to a wall outlet (100-240V) and supply the tree with the appropriate voltage through the cable. The USB port on your computer will also suffice as a power supply if you do not have the adapter block. The tree will turn on as soon as it's plugged in.

2. **1.5V AAA Batteries (4.5V Total)**

Alternatively, a 3-slot AAA battery holder is a convenient way to turn the Christmas tree on and off as it comes with an integrated switch, not requiring taking the batteries out and putting them back in with every use. On the snow board, the BAT1 label shows + and – pads. The red wire of the battery holder is to be soldered to the + and black to the –. <u>It is strongly recommended</u> to solder the wires with the holder not having the batteries in them for your safety. Once the wires are soldered to the board, put the three 1.5V batteries in the holder and the tree will turn on as soon as you flip the switch on it.