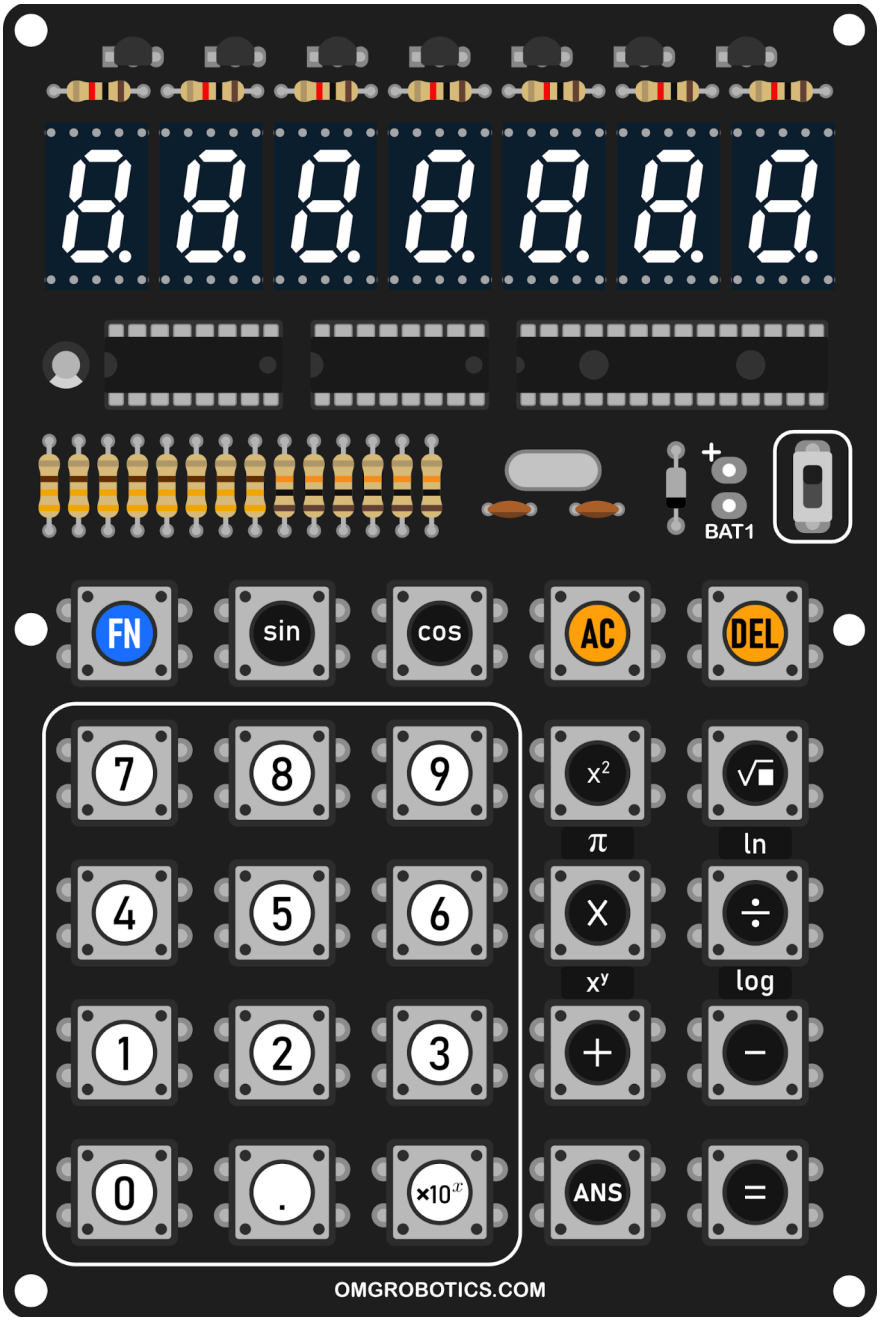
OMGROBOTICS

Calculator

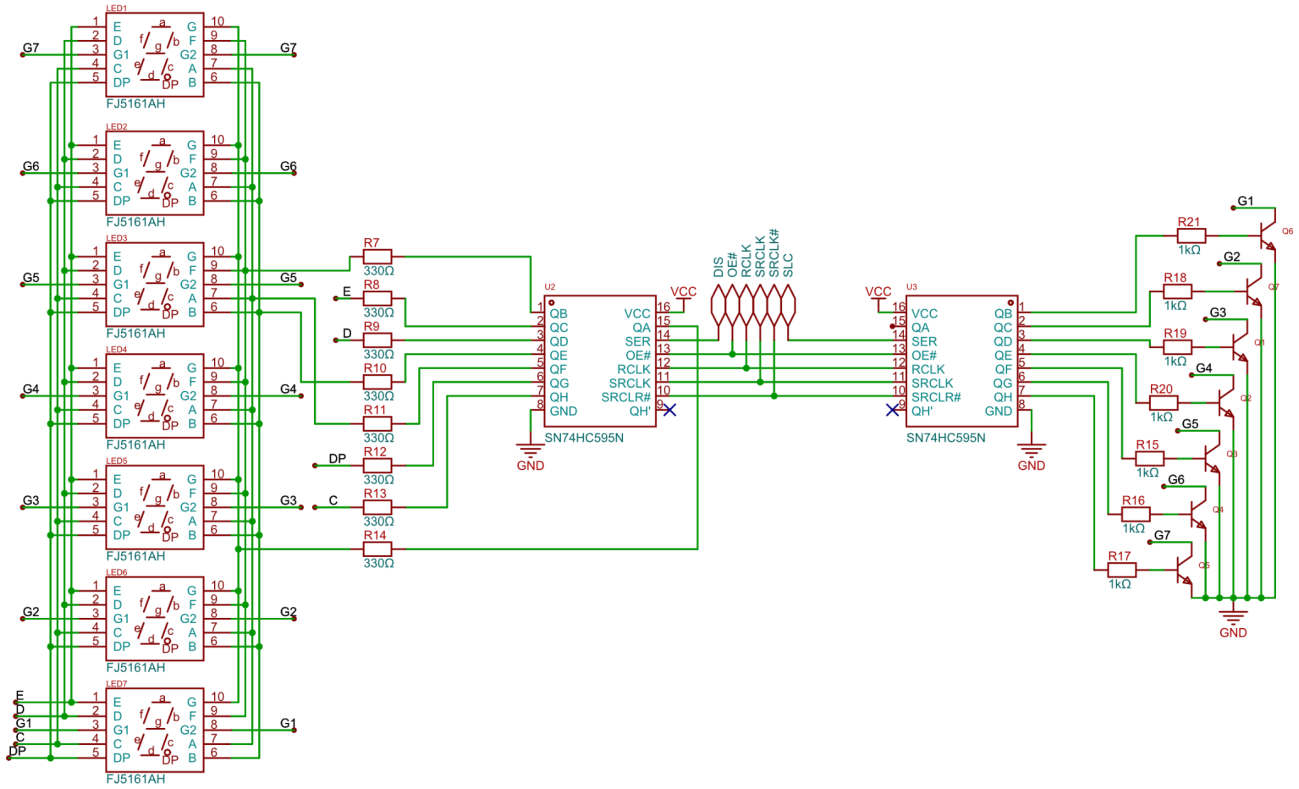
Info

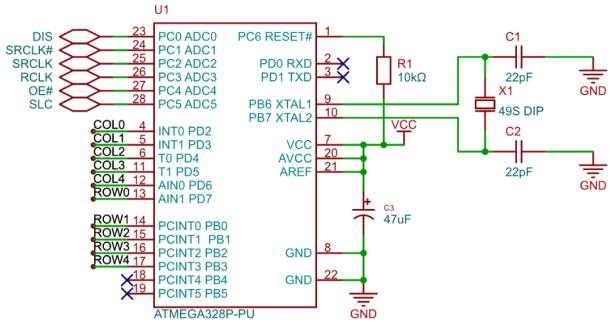
The calculator soldering kit allows assembly of a functional device with multiple useful features for school use.

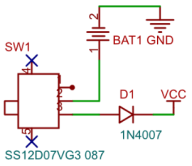
Assembly is performed using a soldering station or soldering iron, where solder is melted at temperatures of 250–350 °C. Therefore, increased caution is required to avoid burns.

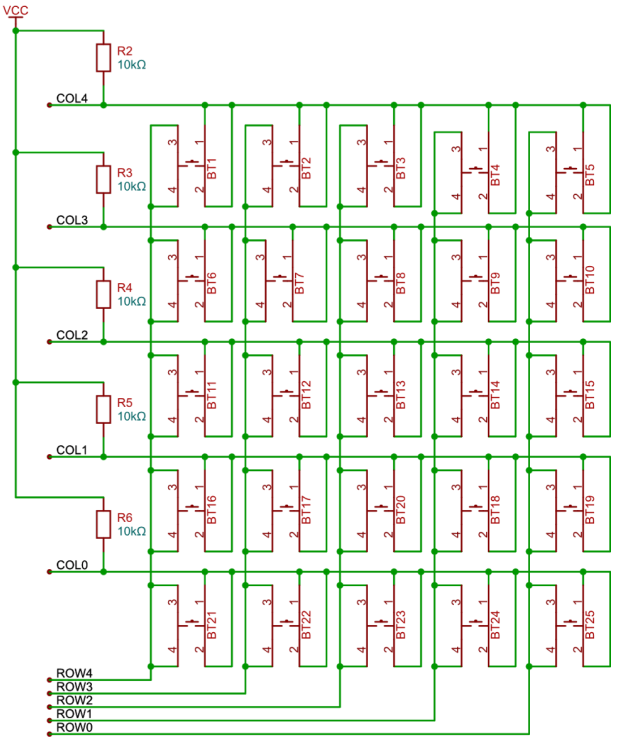


Circuit Diagram









Parts List

Before starting the assembly, verify that all components are available in the correct quantities according to the table below.

Designation	Component	Info	Qty
R1-R6	Resistor	10k	6
R7-R14	Resistor	330R	8
R15-R21	Resistor	1k	7
C1-C2	Capacitor	22pF	2
C3	Capacitor	10uF	1
Q1-Q7	Transistor	BC547	7
LED1-LED7	7-segment display	-	7
D1	Diode	-	1
SW 1	Switch	-	1
BT1-BT25	Button	-	25
DIL28	IC Socket	-	1
DIL16	IC Socket	-	2
U1	Microcontroller	ATmega	1
U2-U3	Counter	SN74hc595	2
X1	Crystal	-	1
BAT1	Battery holder	-	1
DPS	PCB	Calculator	1
-	Sticker	Sheet	1

R1-R6

Resistor

6 pcs

10k

R7-R14

Resistor

8 pcs

330R

R15-R21

Resistor

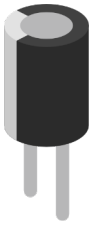
7 pcs

1k

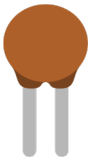
D1

Diode

1 pc

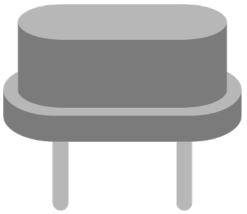


C3
Capacitor
1 pc
10uF



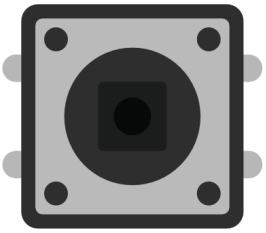
C1-C2
Capacitor
2 pcs
22pF

Q1-Q7
Transistor
7 pcs
BC547



X1
Crystal
1 pc

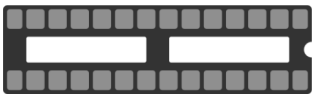
SW 1
Switch
1 pc



BT1-BT25
Button
25 pcs

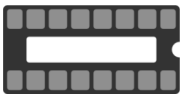
LED1-LED7
7-segment display
7 pcs

BAT1
Battery holder
1 pc



DIL28
IC Socket
1 pc

U1
Microcontroller
1 pc



DIL16
IC Socket
2 pcs

U2-U3
Counter
2 pcs

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Assembly

Resistors

As the first components, insert resistors R1–R21 into the PCB.

The orientation of the components is not important; they function identically in both directions.

R1-R6

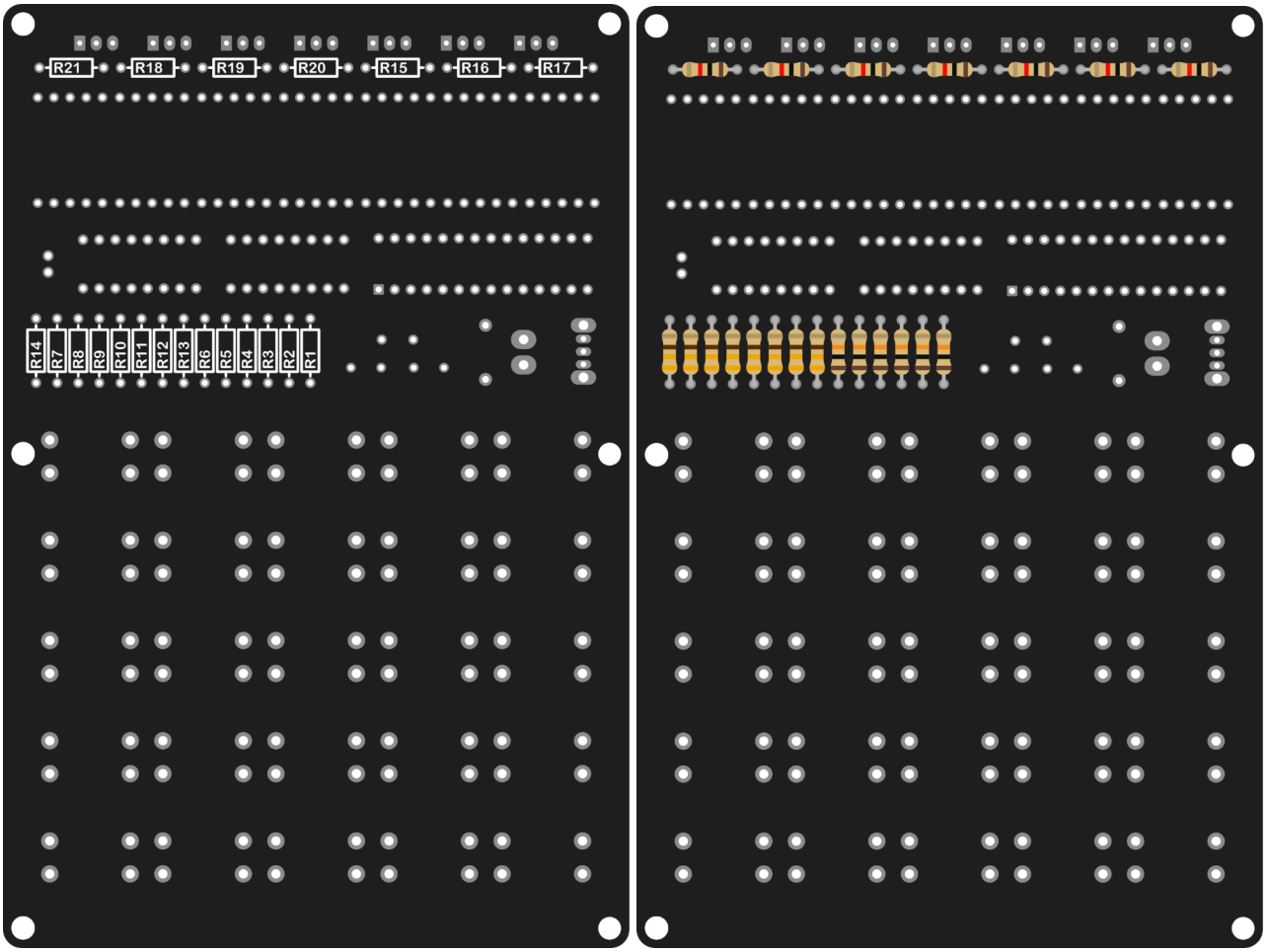
10k

R7-R14

330R

R15-R21

1k



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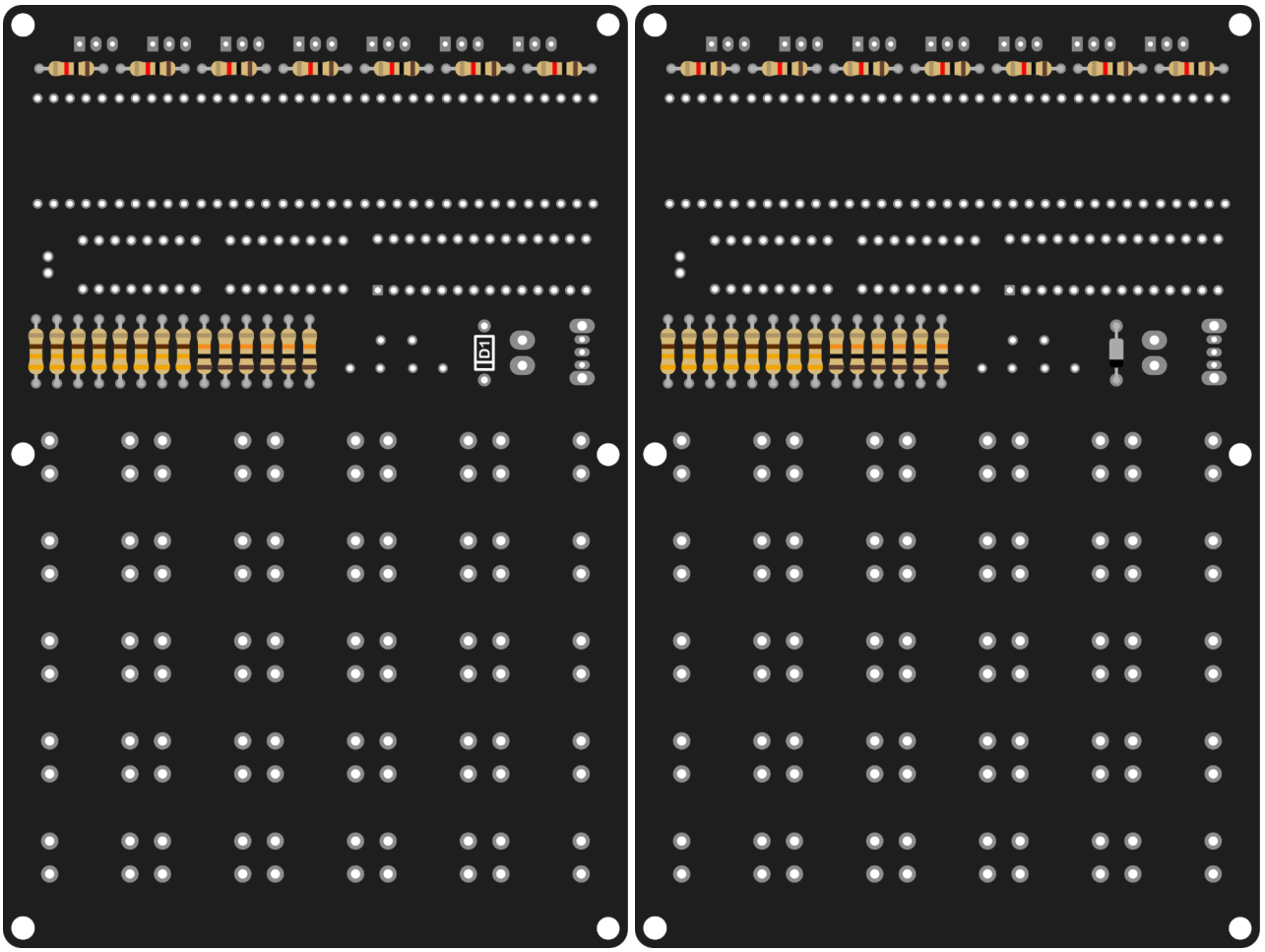
Rectifier Diode

When assembling D1, ensure correct orientation of the diode, i.e. the polarity must be respected.

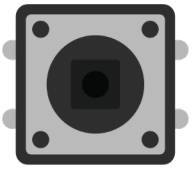
The diode has a stripe on one side, which is also marked on the PCB.

D1

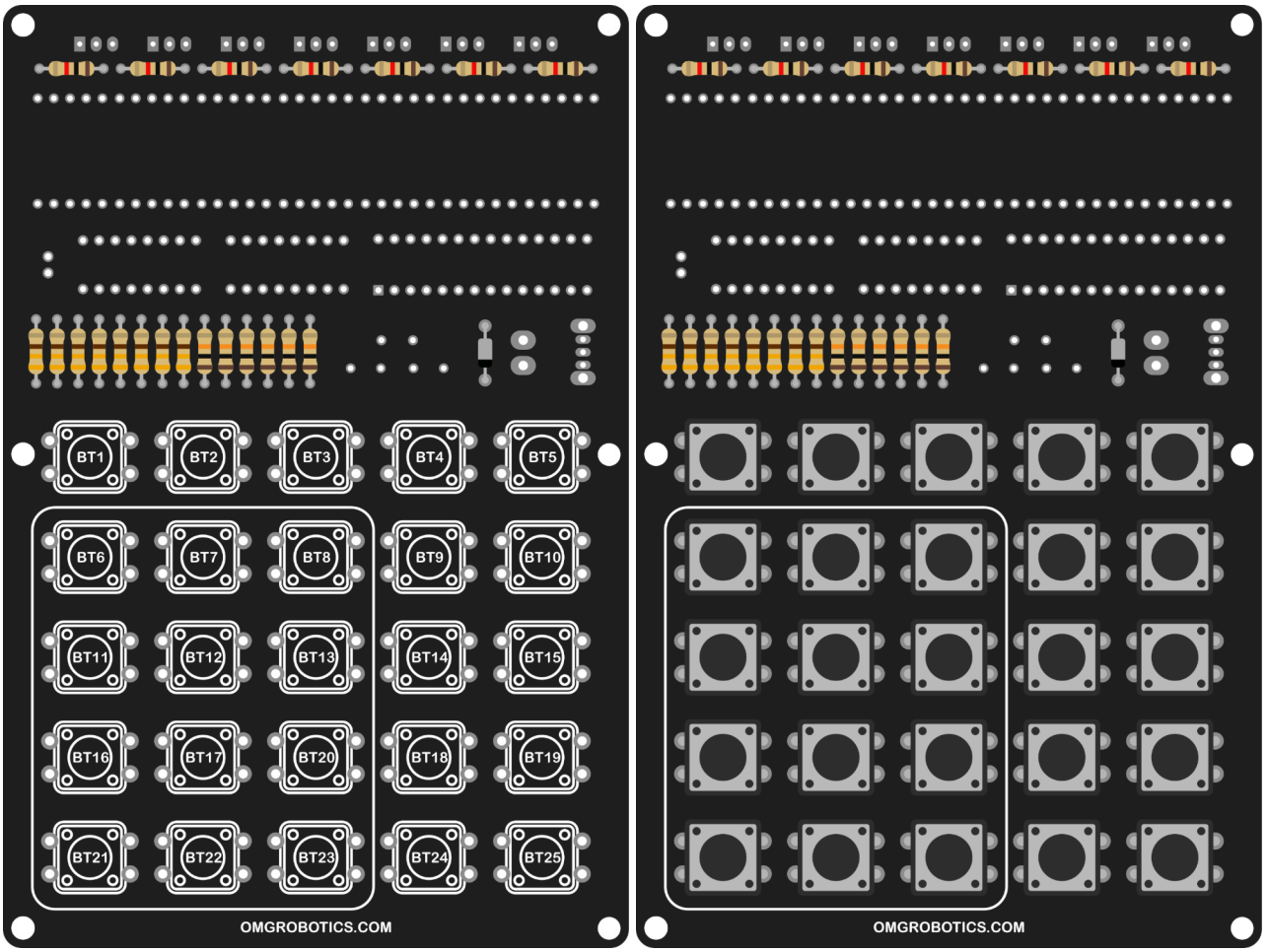


Buttons

Insert buttons BT1–BT25 according to the PCB layout.
The orientation of the buttons does not affect their functionality.



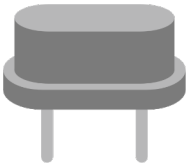
BT1-BT25



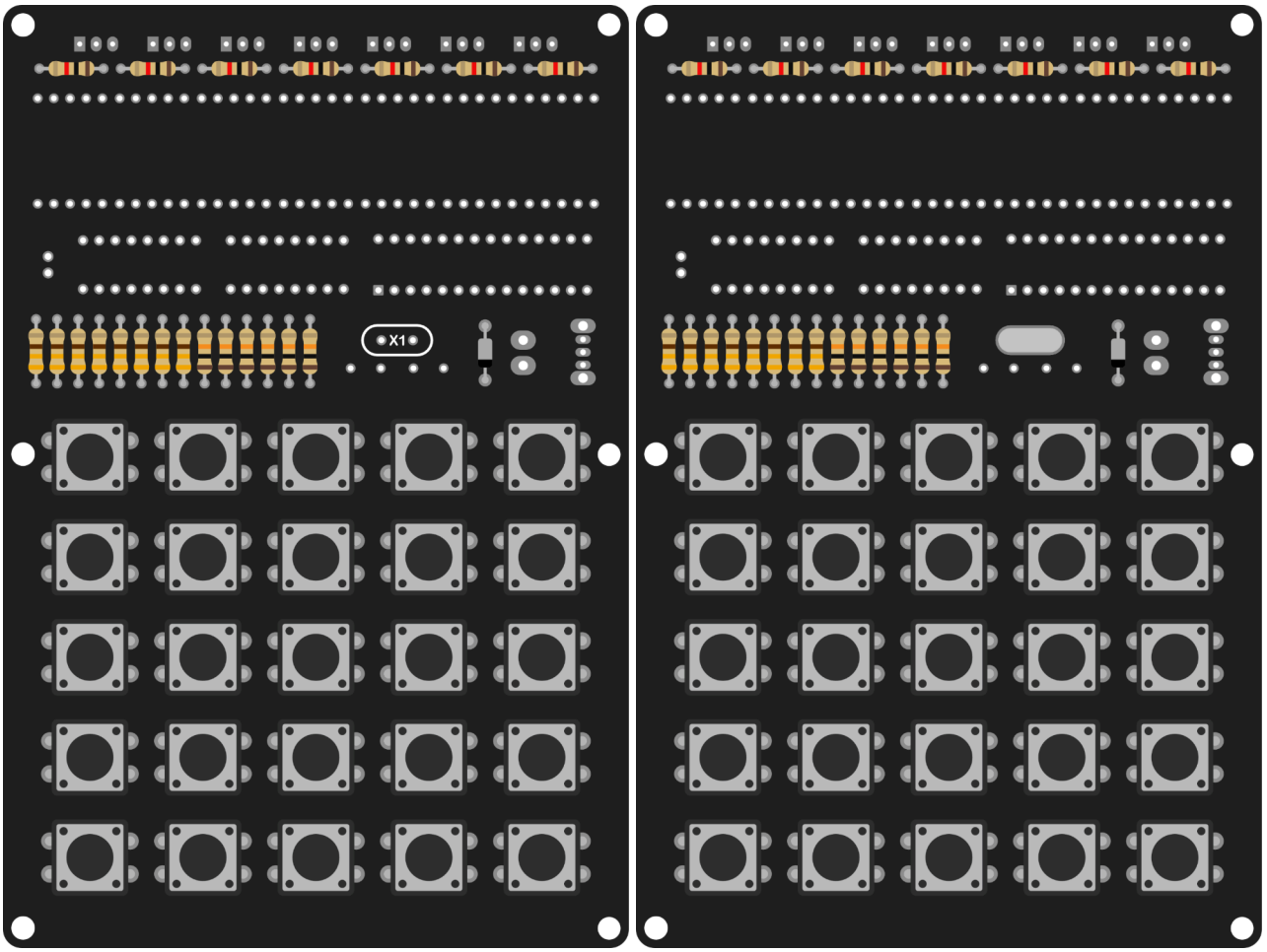
Crystal

Component X1 is sensitive to heat; solder it carefully and only in short intervals.

The orientation of the component is not important; it functions identically in both directions.

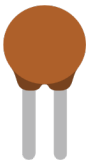


X1

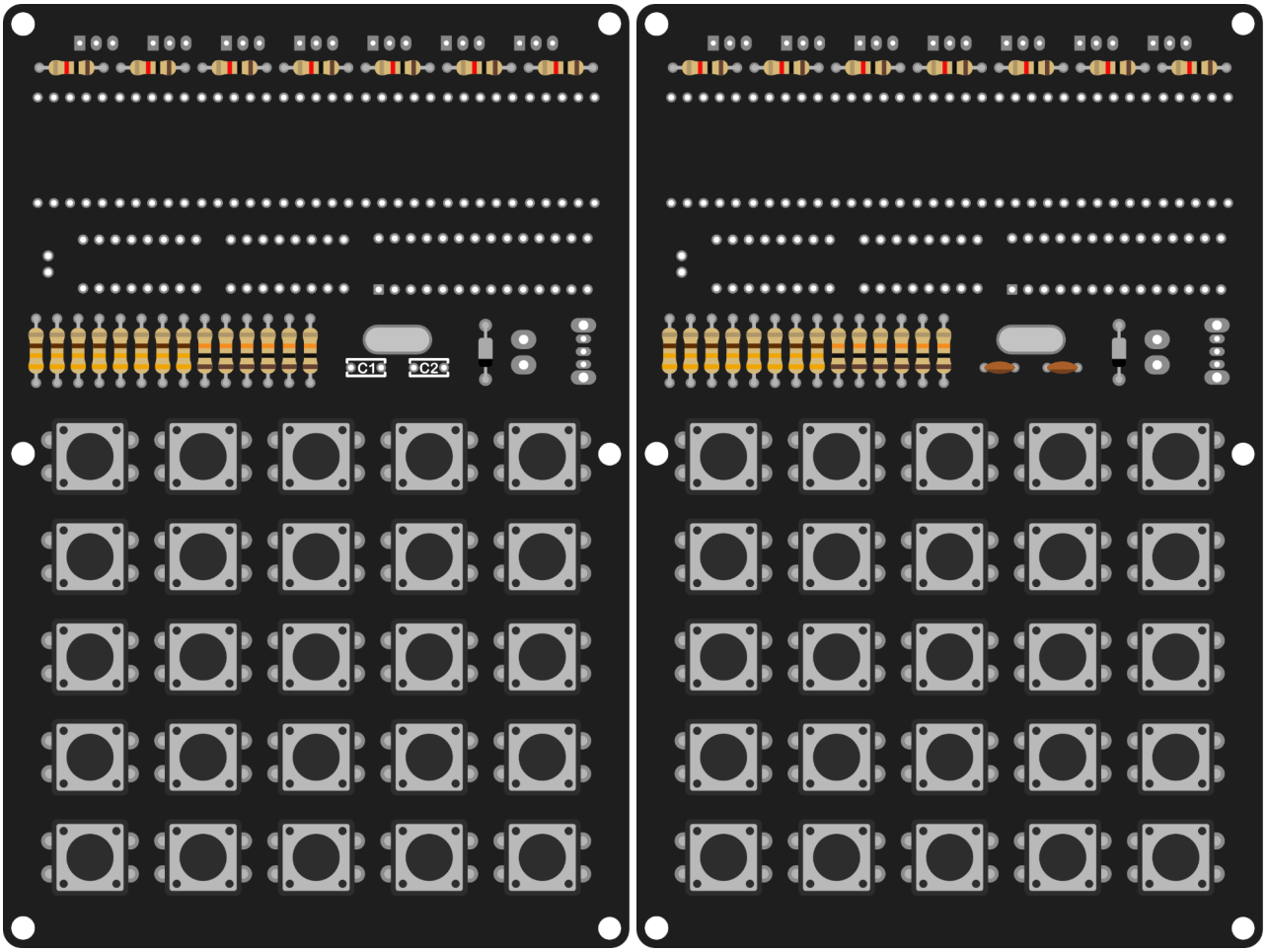


Ceramic capacitors

Capacitors C1–C2 are ceramic; their orientation does not affect functionality.



C1-C2



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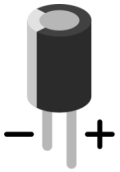
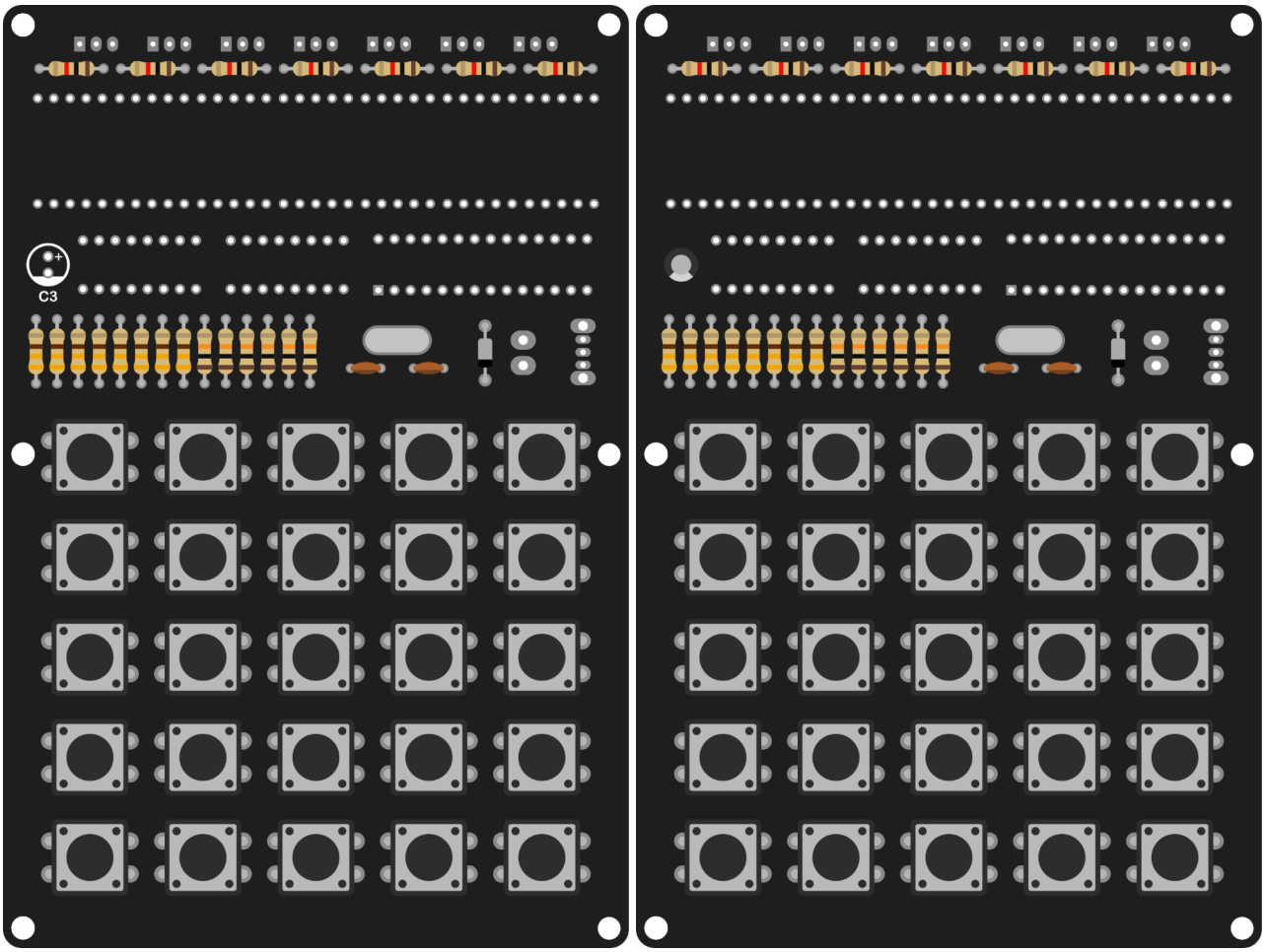
Electrolytic capacitor

Capacitor C3 is electrolytic. Correct orientation must be ensured.

The correct polarity is indicated by markings on both the PCB and the capacitor.



C3



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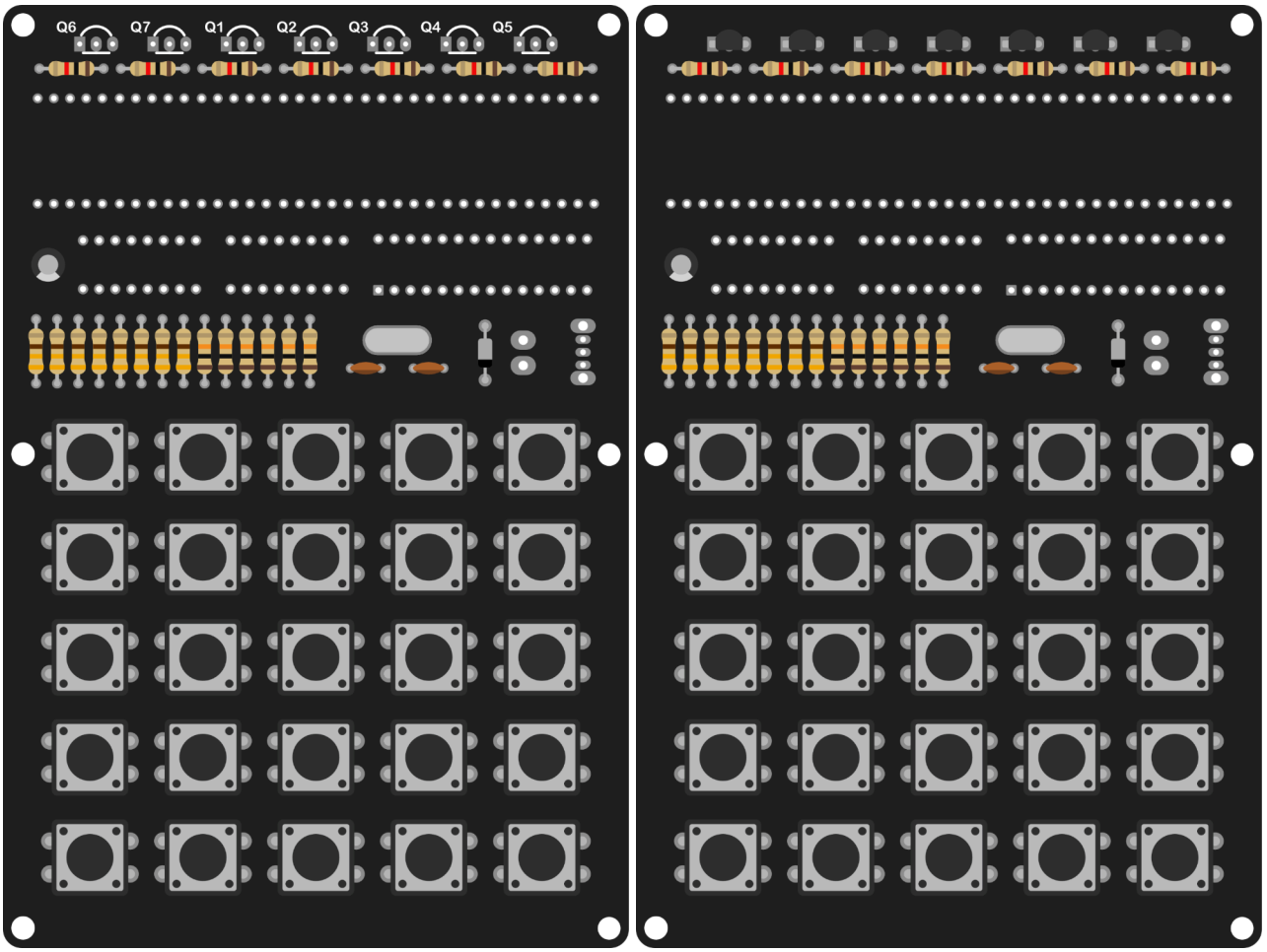
Transistors

Transistors Q1–Q7 are sensitive to heat; solder the pins one by one with longer pauses between soldering.

The polarity is indicated on the PCB by a curved outline, which must match the shape of the transistor.

Q1-Q7

BC547



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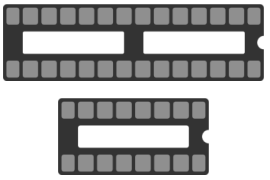
IC Sockets

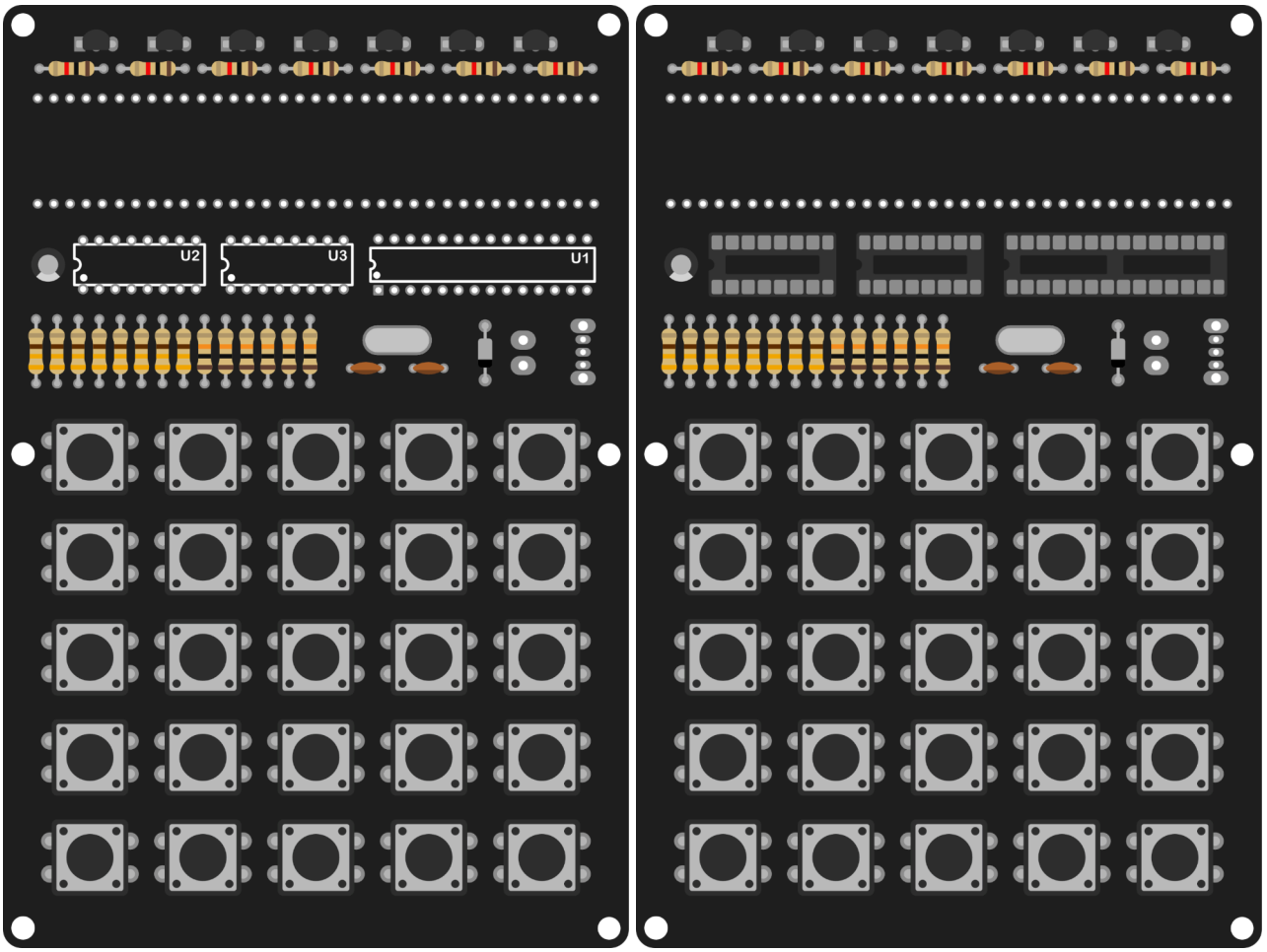
Integrated circuits U1–U3 are sensitive components and can be easily damaged; therefore, DIL16 and DIL28 sockets are used, into which the components are inserted after soldering.

During assembly, check the notch on one side of the socket. This determines the correct orientation for placement.

Do not insert the integrated circuits into the sockets yet.



DIL16, DIL28



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Segment Display

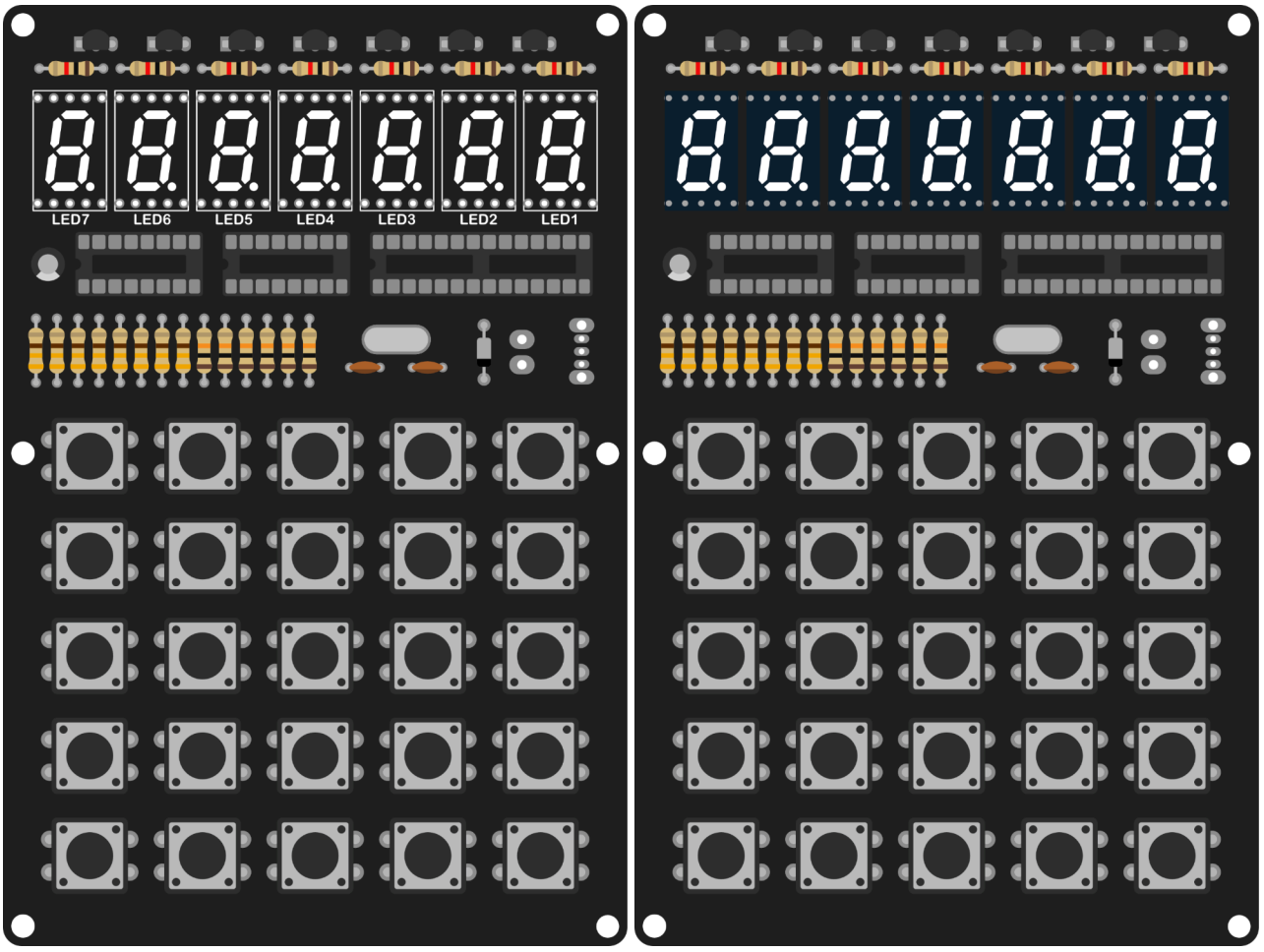
Solder displays LED1–LED7 in a similar way as IC sockets.

First, place the component into the PCB so that it sits flat on the surface. Then begin soldering the pins.

It is recommended to start with the top-left and bottom-right pin to secure the component and prevent movement during soldering of the remaining pins.

Ensure correct orientation of the display.

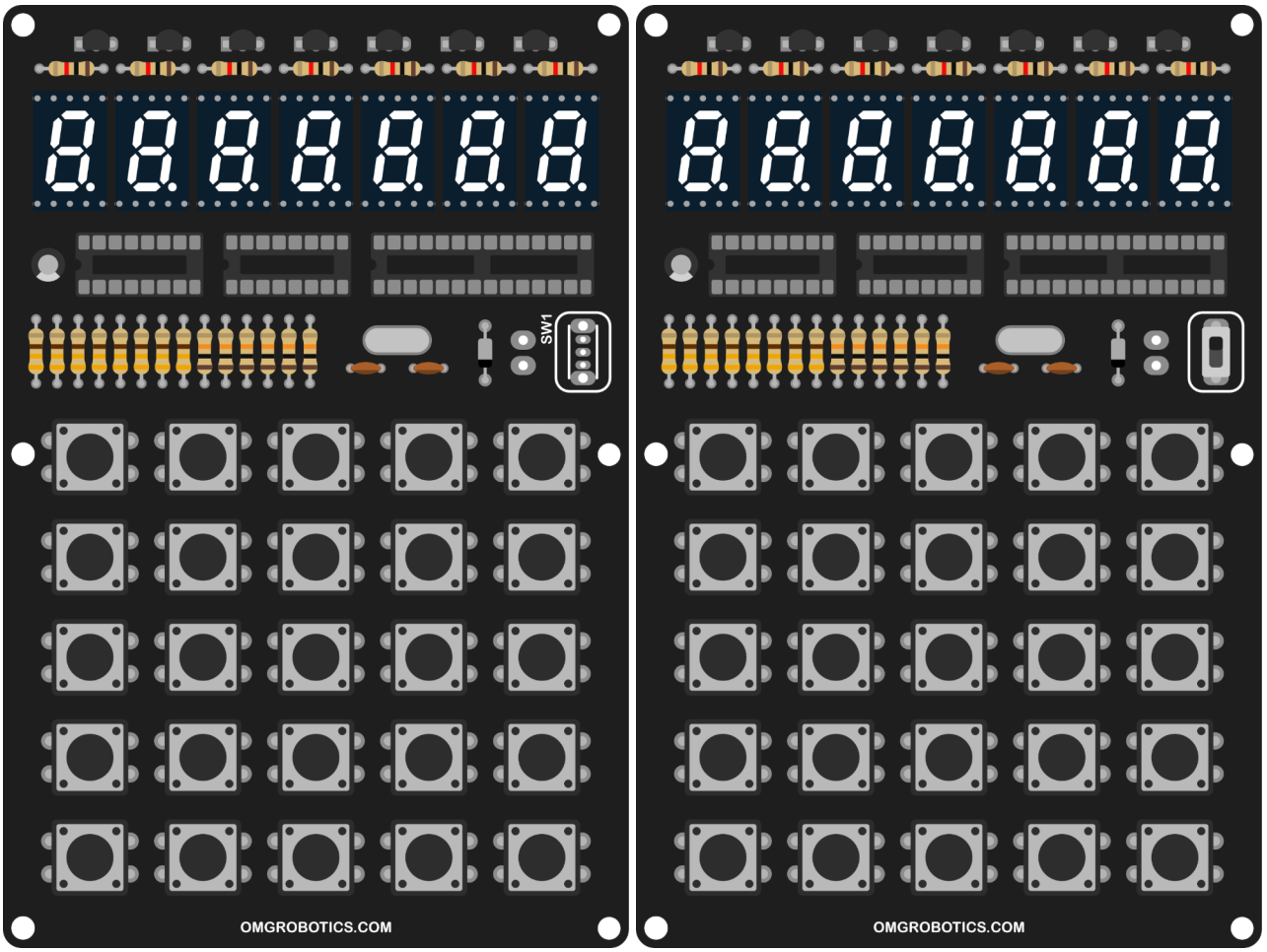
LED1-LED7



Switch

Next, solder switch SW1.
The switch has no defined polarity and can be soldered in any orientation.

SW 1



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Battery Holder

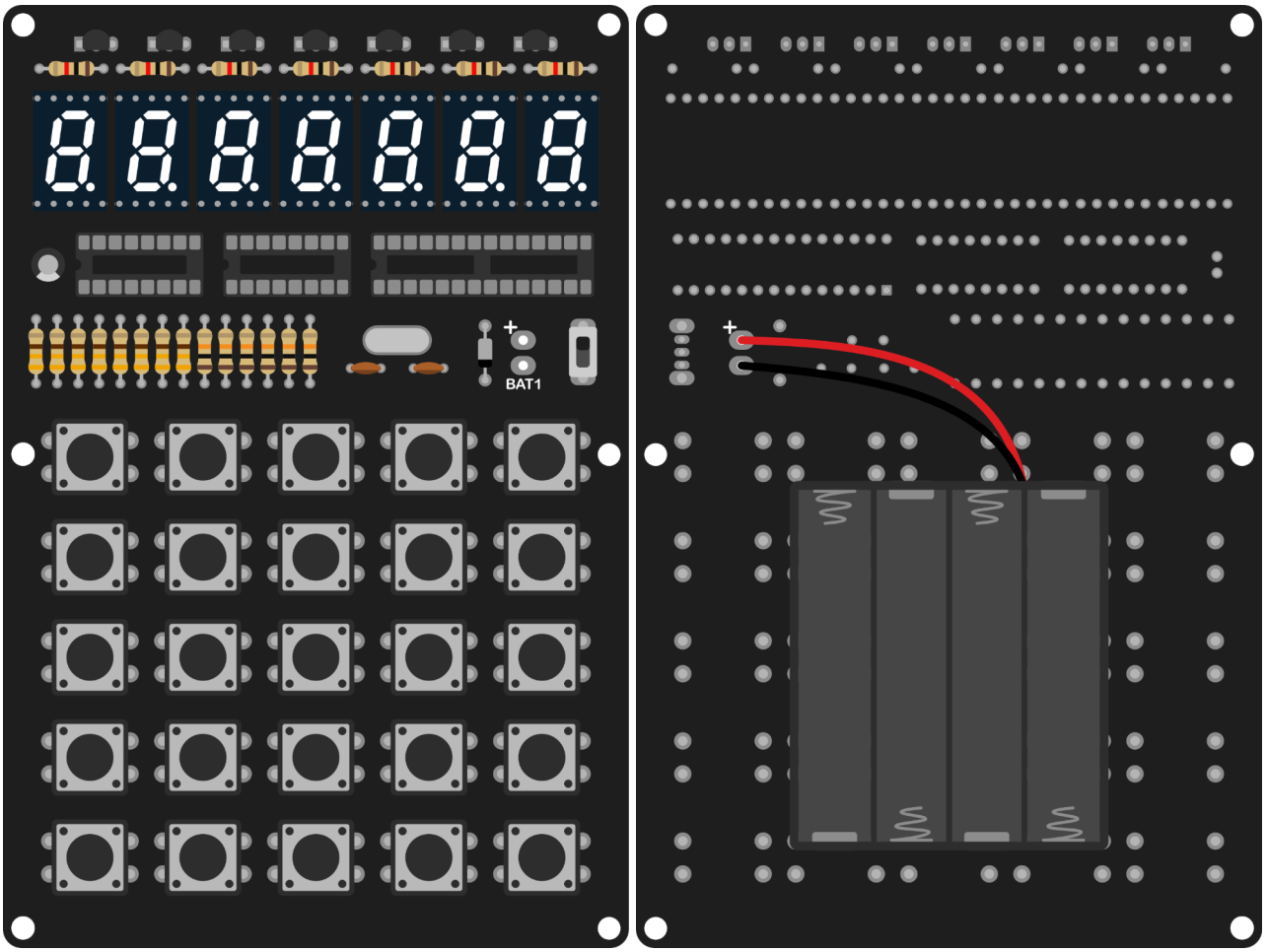
Mount the battery holder BAT1 from the backside of the PCB.

During soldering, pay special attention to surrounding components to avoid damage.

Solder the red wire to the hole marked with the plus (+) symbol.

Do not insert the batteries yet.

BAT1



Integrated Circuits

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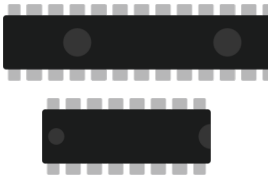
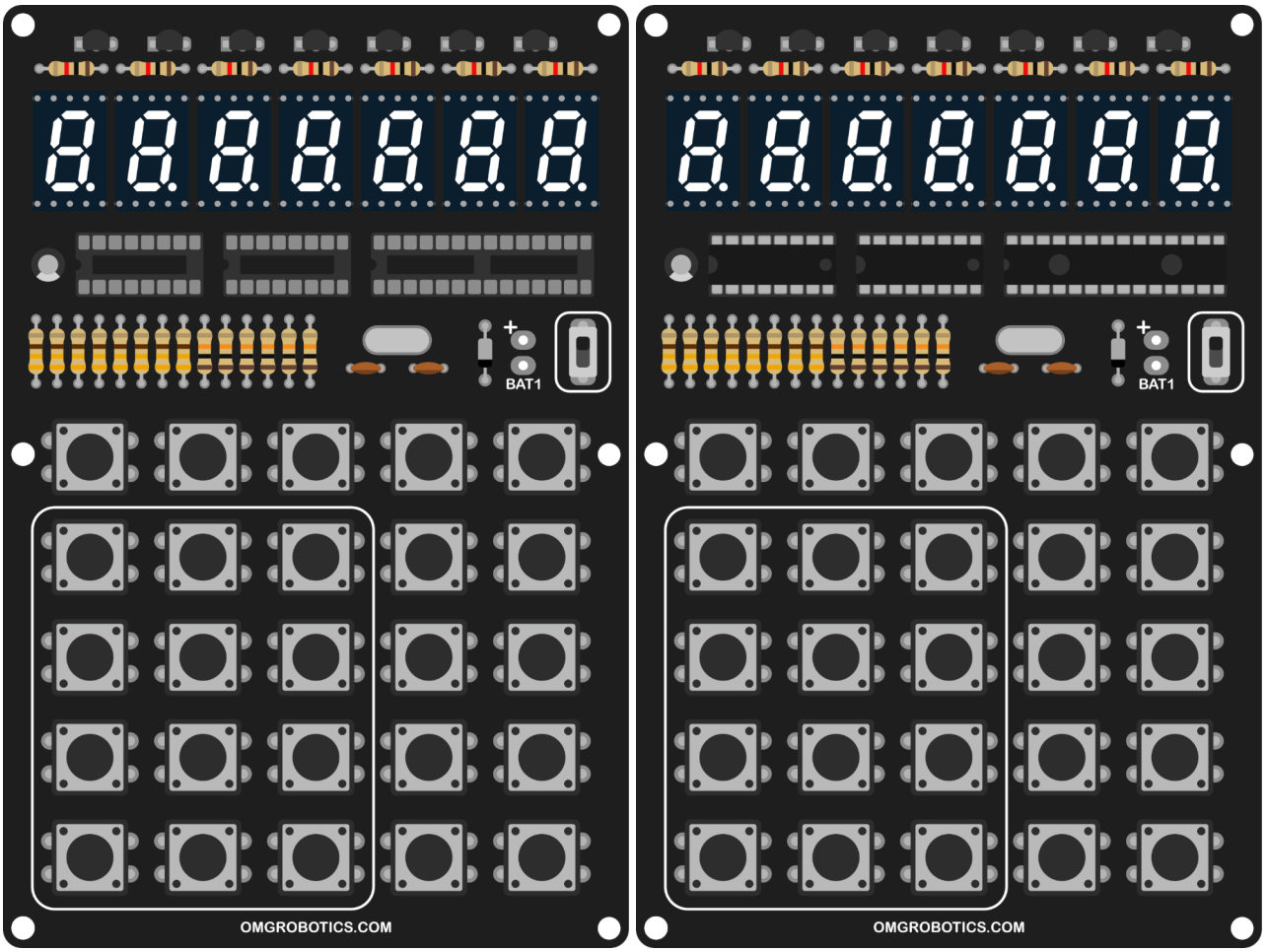
Insert integrated circuits U1–U3 into the sockets.

As with the sockets, ensure correct orientation of the components.

The IC package has a semicircular notch on one side, which must align with the notch on the socket.

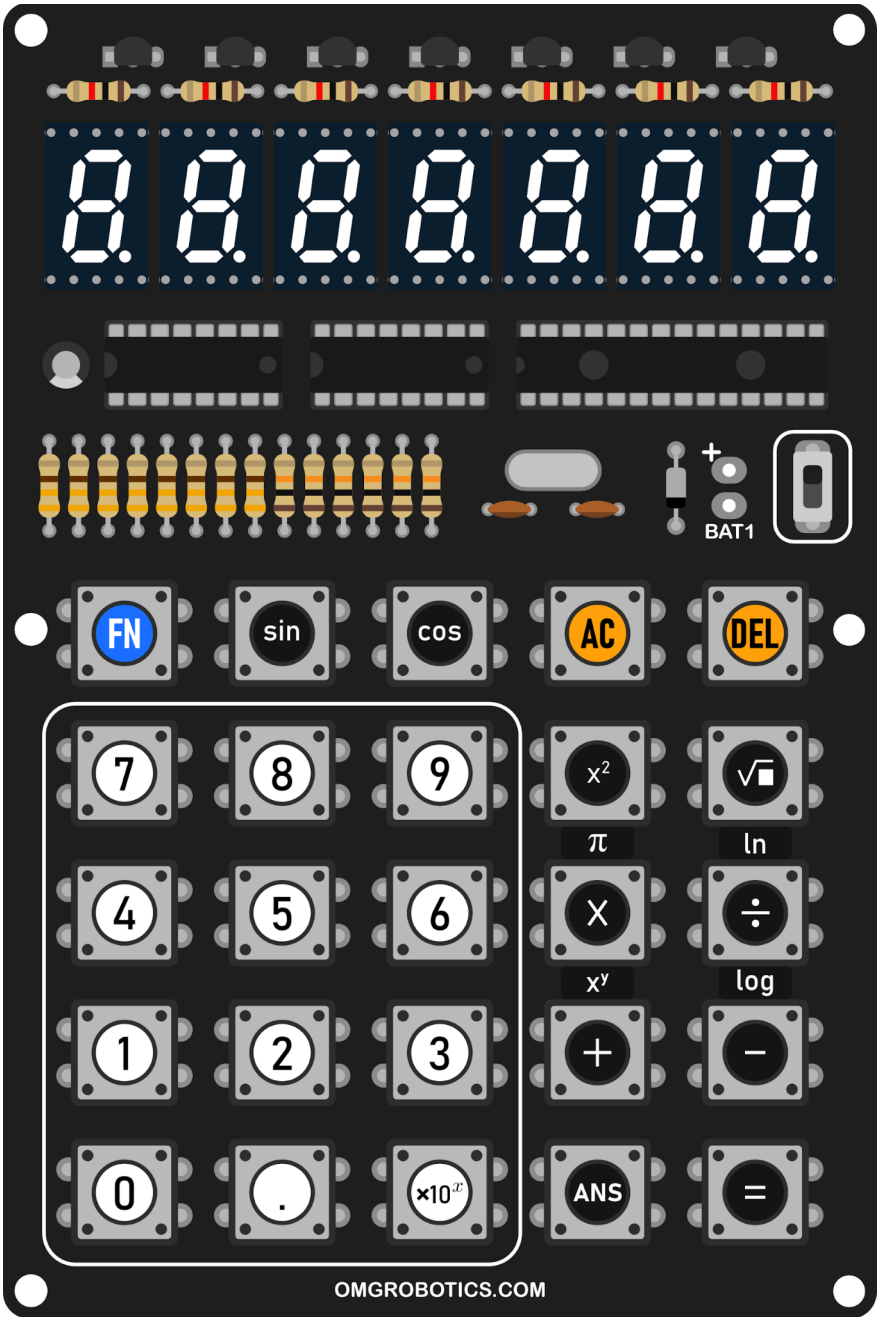


U1-U3



Stickers

Finally, apply stickers to all buttons according to the reference image.
Rectangular stickers are placed directly on the PCB above the corresponding buttons.
It is recommended to apply the stickers using tweezers.



Finally, insert the calculator into the included 3D-printed enclosure.

Testing

Insert the batteries and switch on the device using switch SW1.

Tips and Tricks

Startup

If all steps were followed correctly, the calculator should function after inserting the batteries and switching on.

Possible Issues

- Cold solder joints – connections were not properly soldered.
- Incorrect component orientation – verify orientation according to the manual.
- Incorrectly mounted components – components (e.g. resistors) may be placed in wrong positions.
- Damaged components due to soldering – identify and replace the faulty component.

Instructions

- After switching on, the display lights up and numbers can be entered.
- First enter a number, then select an operation (e.g. addition), and enter the next number.
- Press the equals button to display the result.
- Large numbers can be entered using x10^x notation.
- The maximum number of digits is 14.
- If the result exceeds 7 digits, it is displayed in scientific notation.
- For functions such as sin or cos, first enter the number, then press the corresponding function button.

FN Functions

For functions such as ln, log, x^y, and π: first enter the number, then press the FN button followed by the selected function.

Easter Egg

Press FN and then = to activate snake mode; a snake will move across the display.