Chameleon

Manual Chameleon kit

A project of the Service Kring JOTA-JOTI.

Do you like Chameleon, do you have great ideas?
Let us know, read how on the last page.

Chameleon

Contents

Note:

We would like to advise you to read this entire document carefully in advance. It is sufficient to print only pages 5 to 7 or 8 to 10 for the purpose of building itself, depending on the method of assembly.
TIP: Assembling a copy yourself before the building activity is not only fun but also very useful.

Introduction:

It turns out, and we only applaud this, that soldering activities are not only limited to the JOTA-JOTI, but that soldering is also done furiously on group weekends, summer camps and schools. Because of the continuing demand for electronics projects, we think we have released another nice kit. With sufficient guidance, soldering can even be done with children from 5 years old! For tips see the chapter "Soldering with children" on the last page. For more of our kits, check out kitbuilding.org.
The Chameleon is a nice circuit of an animal that is recognizable to everyone. But it can even really change color! Moving the Chameleon or pressing the switch changes the color of the light coming from the Chameleon.
Have fun building the Chameleon!

Chameleon

Contents of the kit:

The table below can be used to check the contents of the kit. Solder tin, a battery and any safety pins must be provided by yourself.

Component	Value	Quantity	Place on print	Notes
Resistance	330 Ω	4	R1, R2, R3, R4	orange, orange, brown, gold
Resistance	10 kΩ	4	R5, R6, R7, R8, R9	brown, black, orange, gold
Capacitor	100 nF	4	C1, C2, C3, C5	inscription 104
LED multicolor	LED	1	D1	Pay attention to correct placement
IC foot	16 pins	1	U1	Pay attention to correct placement
IC	74HC4520	1	U1	Pay attention to correct placement
Switch	Push button	1	SW1	
Switch	Vibration switch	1	SW2	
Switch	On/off switch	1	SW3	
Battery Holder	CR2032	1	BT1	
Printed circuit board	PCB1	1		Chameleon print
Printed circuit board	PCB2	1		Assembly Tool

Component numbering and component values:

Print print	Component	Print print	Component	Print print	Component
R1	330 Ω	C1	100 nf	SW1	Push button
R2	330 Ω	C2	100 nf	SW2	vibration switch
R3	330 Ω	C3	100 nf	SW3	On/off switch
R4	330 Ω	C4	100 nf		
				BT1	Battery Holder
R5	10 kΩ	D1	LED		
R6	10 kΩ			N/A	PCB1
R7	10 kΩ	U1	IC foot	N/A	PCB2
R8	10 kΩ	U1	74HC4520		
R9	10 kΩ				

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Construction description of the Chameleon:

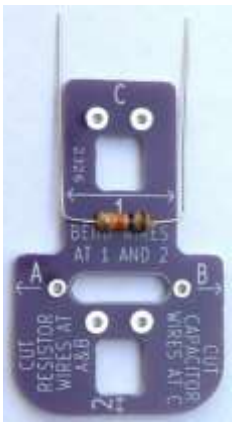
It's been a while but with the Chameleon we have another kit that we can wear when it's finished! Hang the Chameleon on or pin it on your uniform, for example. Where in previous kits the threads of the parts still stuck through the PCB and could get caught on clothing, we now also have the option to mount the parts in such a way that the PCB remains completely smooth at the bottom. This is a different way of assembling the parts and perhaps also a nice change for the experienced builders.

As described above, the PCB can be built in 2 ways.

- In the traditional way, bending connecting wires, putting the component through the holes, soldering the component and cutting the wires. The description of this can be found on pages 5 to 7.
- SMD or surface mounting, the connecting wires of the components are not bent, with the exception of the IC foot because they are now bent. The parts lie flat on the PCB and are then soldered. The description of this can be found on pages 8 to 10.

Regardless of the method of assembly, the parts are placed in the same place with both methods.

Traditional assembly of the parts:



The 9 resistors are mounted in the familiar way. To do this, bend both wires at a 90-degree angle, taking into account the distance between the holes on the PCB. An easy tool for bending is the small PCB, the assembly tool. The capacitors, the IC and the LED are also soldered in the normal way. Insert the resistor or capacitor through the PCB and carefully bend the wires on the underside of the PCB slightly apart. The PCB can now be flipped to solder the part without it falling out of the PCB. After soldering, cut off the connecting wires just above the soldering. If in doubt about the correct placement, look at the photo of the built Chameleon in this building description.

Tip 1: The dots at the beginning of the line can be colored in to indicate which parts have already been assembled.
Tip 2: When in doubt about the assembly of a component, look at the photo of the built-up PCB, once soldered incorrectly, repair can sometimes be very difficult.
Tip 3: Use the narrowest part of the small PCB to bend the resistors.

Install the resistors:

- R1, R3, R3, R4: 330 Ω (orange, orange, brown, gold)
  NOTE: these are not next to each other on the PCB!
- R5, R6, R7, R8, R9: 10 kΩ (brown, black, orange, gold)

Assemble the capacitors:

- C1, C2, C3, C4: 100 nF (heading 104)

Install the IC foot:

- U1

Make sure it is flush against the print. It is easiest to first solder 2 diagonally opposite connecting wires on the corners and then see if the foot is right. In this way, the placement is still easy to correct.
NOTE: there is a notch in one of the ends of the IC feet, which must match the drawing on the print. Make sure all pins are well through the PCB before soldering, at the top all connections should be flat and aligned.

Install the push button:

- SW1

This will lie flat on the PCB, solder it to one of the corners. If the switch is not quite in place yet, you can heat the soldered corner again and carefully correct the position. After that, the switch can be completely soldered tight.

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Install the motion switch:

- SW2

This will be placed in the slot in the PCB. Cut both wires so that they lie nicely on the solder island, the remaining length is then ± 5 mm per leg. Then solder it on.

Install the on/off switch:

- SW3

This will also be placed in the slot in the PCB. Solder it back on one side first and when it is in place it can be soldered further. It does not have to be cut to size.

NOTE: if you clean the PCB after soldering, make sure that none of the cleaning agent gets into this switch.

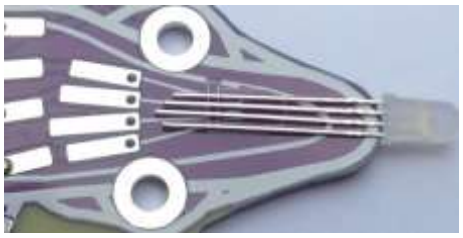
Assemble the battery holder:

- BT1

Look carefully at how it should be placed on the PCB, one corner is not straight but slanted, that is clearly visible on the PCB. There is also a + sign on the battery holder and on the PCB. Solder the battery holder on one side first and when it is in place it can be soldered further. The slanted edge and the marking are clearly visible in the photo.

Mount the LED:

- D1



As you can see in the photos, the connection wires (connecting wires) of the LED all have a different length. The solder islands for the LED also have different lengths, these correspond to the connecting wires of the LED. The longest connecting wire should be at the longest solder island. You can bend the connecting wires in advance or insert the LED into the PCB but in such a way that it sticks out a bit and then bend the connecting wires just above the PCB. Think this out so that when the LED is bent, it ends up exactly on the drawing of the LED on the PCB. If necessary, remove the LED from the PCB and then bend the connecting wires further to an angle of 90 degrees. Place the LED back in the PCB and solder it to one leg from the top. You can now position the LED properly after which you solder all connections, on the top or bottom. The connecting wires can then be cut off at the bottom.

Make the connection:
We also have to lay a "solder bridge", this is to set the sensitivity of the motion switch. To do this, we have to ensure that the two islands at A, B, C or D are connected to each other. We do this by soldering them together, you need a little more solder than when soldering a normal part. The chosen connection affects the sensitivity of the motion switch. A is the most sensitive, D the least sensitive. In the least sensitive setting, you have to move/shake more to make the color change. A or B is usually a good choice to start with. Make only one transfer!

- Connection soldered at A, B, C or D.

NOTE: if you forget to make this connection, the circuit will not work.

Assembly of the IC:

- Place the IC, U1, in the foot.

NOTE: in one of the ends of the IC there is a notch (slot), this must match the drawing on the PCB and the notch in the previously mounted IC foot. The connecting wires must be bent slightly straighter, towards each other, otherwise it is difficult to get the IC into the foot. Be careful, the ICU is sensitive to static electricity!

Battery Placement:

- Insert the battery, a CR2032, into the battery holder.

CAUTION: In order not to damage the battery holder, it must be inserted at an angle. First, insert the battery on the + terminal side into the battery holder and make sure the battery is against the terminals. Then gently push the other side of the battery down into the holder until the battery is properly seated.

Your Chameleon is now ready to use!

SMD or surface mounting of the parts:

The 9 resistors and 4 capacitors are soldered flat on the PCB, the connecting wires do not need to be bent for this. With the help of the small PCB, the wires of the resistors and capacitors can be cut to the correct length. Place the resistor in the slot, hold it firmly and cut off the connecting wires on both sides of the PCB. The photo clearly shows this. The resistor then has exactly the right size to be soldered onto the PCB. In the same way, the connection wires of the capacitors are also made to measure.

Place the resistor or capacitor in the right place on the PCB and solder first one side and then the other, you can correct some more if necessary. The photo shows that well.

Tip 1: The dots at the beginning of the line can be colored in to indicate which parts have already been assembled.
Tip 2: When in doubt about the assembly of a component, look at the photo of the built-up PCB, once soldered incorrectly, repair can sometimes be very difficult.

Install the resistors:

- R1, R3, R3, R4: 330 Ω (orange, orange, brown, gold)
  NOTE: these are not next to each other on the PCB!
- R5, R6, R7, R8, R9: 10 kΩ (brown, black, orange, gold)

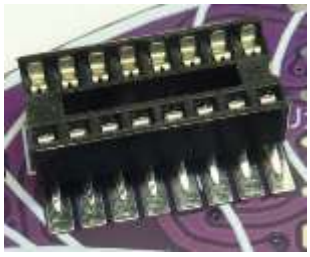
Assemble the capacitors:

- C1, C2, C3, C4: 100 nF (heading 104)

Install the IC foot:

- U1

Make sure that all the connections at the top are flat and aligned. Then carefully bend all connecting wires outwards, then you can press the IC foot flat on the table to get all connecting wires as flat as possible. Before soldering, check that all connecting wires are flush against the PCB. It is easiest to first solder 2 diagonally opposite connecting wires on the corners and then see if the foot is right. In this way, the placement is still easy to correct.
NOTE: there is a notch in one of the ends of the IC feet, which must match the drawing on the print.



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Install the push button:

- SW1

This will lie flat on the PCB, solder it to one of the corners. If the switch is not quite in place yet, you can heat the soldered corner again and carefully correct the position. After that, the switch can be completely soldered tight.

Install the motion switch:

- SW2

This will be placed in the slot in the PCB. Cut both wires so that they lie nicely on the solder island, the remaining length is then ± 5 mm per leg. Then solder it on.

Install the on/off switch:

- SW3

This will also be placed in the slot in the PCB. Solder it back on one side first and when it is in place it can be soldered further. It does not have to be cut to size.

NOTE: if you clean the PCB after soldering, make sure that none of the cleaning agent gets into this switch.

Assemble the battery holder:

- BT1

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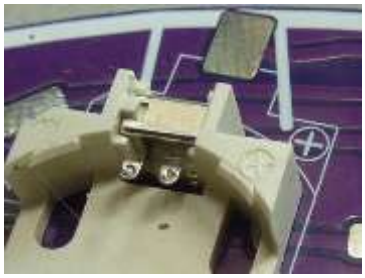

Mount the LED:

- D1

As can be seen in the photo, the connection wires (connecting wires) of the LED all have a different length. The solder islands for the LED also have different lengths,
these correspond to the connecting wires of the LED. The longest connecting wire should be at the longest solder island. Bend the connecting wires of the LED diagonally downwards and then horizontally again just after the thickening in the connecting wires. Cut the connecting wires to size and solder the LED as shown in the photo.

Make the connection:

We also have to lay a "solder bridge", this is to set the sensitivity of the motion switch. To do this, we have to ensure that the two islands at A, B, C or D are connected to each other. We do this by soldering them together, you need a little more solder than when soldering a normal part. The chosen connection affects the sensitivity of the motion switch. A is the most sensitive, D the least sensitive. In the least sensitive setting, you have to move/shake more to make the color change. A or B is usually a good choice to start with. Make only one transfer!

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Your Chameleon is now ready to use!

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Use of the Chameleon:

There are 3 switches on the Chameleon:

SW1: With this switch you can choose a color when switch SW3 is off. Press the button for the next color, there are 7 different colors possible, the eighth press turns off the Chameleon again.

SW2: This is the motion switch, it only works when switch SW3 is on. By moving the print, you can then change the color of your Chameleon. If you turn switch SW3 off again at the desired color, your Chameleon will remain in this color. Which movements SW2 is most sensitive to?

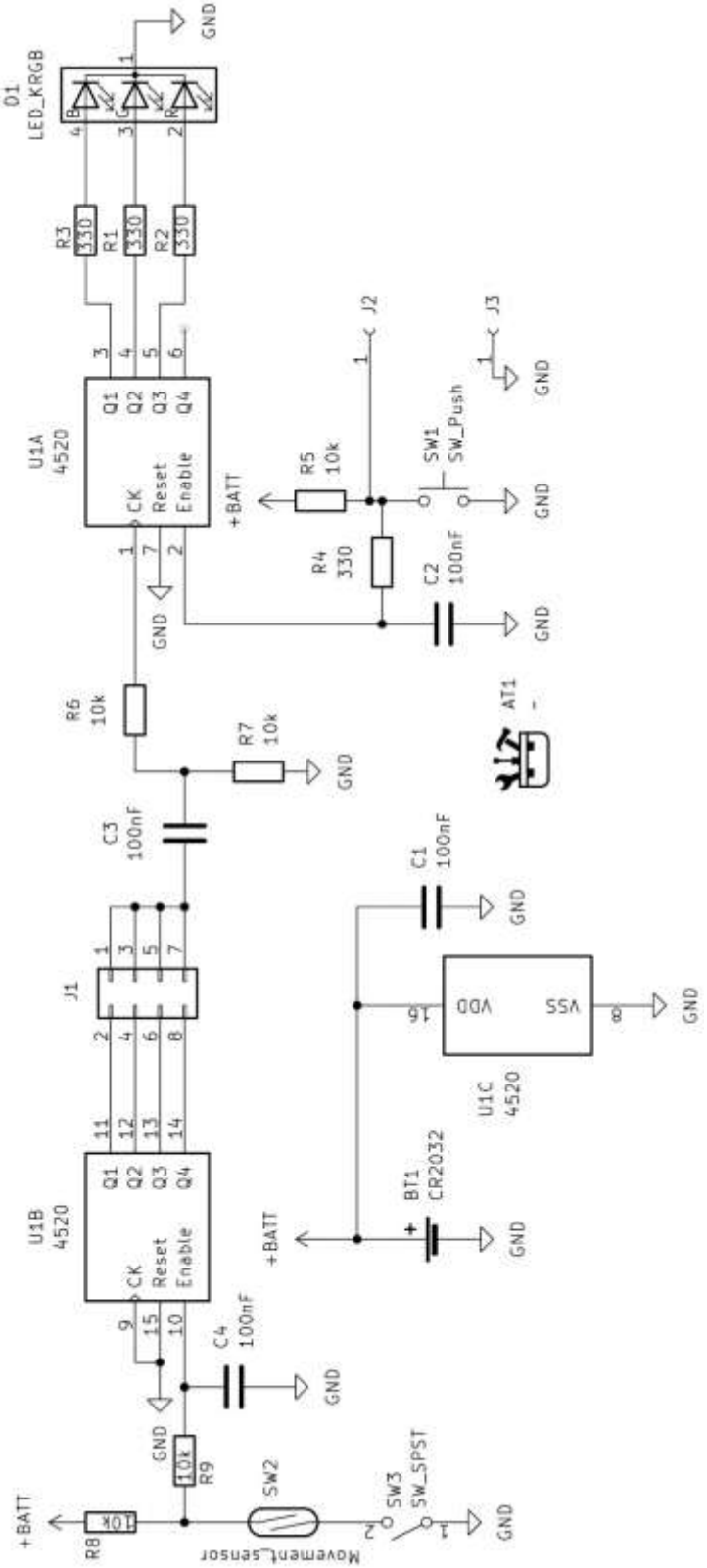
SW3: With this switch you choose whether you use the push button or the motion switch. The power consumption when the LED is off is so low that you can just leave the battery in place.

The PCB islands next to the connecting wires of the LED, the "eyes" of the Chameleon, are connected to switch SW1, if these are connected to each other with, for example, a wire, the Chameleon will also change color.

Wearing the chameleon:

- There are also 2 holes between the front connecting wires and the head of the Chameleon, which you can use to put a string or ribbon through so that you can hang the Chameleon.
- Through the hole near the Chameleon's tail, you can put a carabiner to hang it on your pants or backpack.
- On the back of the Chameleon there are also 2 large silver-colored surfaces, you can solder safety pins on them so that you can also wear the Chameleon as a brooch.

Schedule:


D1
LED_KRGB
GND
R3 330
R1 330
R2 330
U1A
4520
Q1 Q2 Q3 Q4
CK Reset Enable
+BATT
R5 10k
SW1
SW_Push
J2
J3
R4 330
C2 100nF
R6 10k
R7 10k
AT1
C3 100nF
C1 100nF
J1
U1C
4520
VDD
VSS
U1B
4520
BT1
CR2032
C4 100nF
R9 10k
SW2
SW3
SW_SPST
R8 10k
+BATT
GND

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Component arrangement, not to scale:

Complete built-up PCB:

Soldering with children:

There are a number of pitfalls imaginable when soldering with children, by avoiding these the chance that the project will be completed successfully.

We regularly come across the following issues:

- Making the solder joint takes (much) too long, normally a solder connection is made in about 3 seconds. Preheat for about 1.5 seconds (with a little solder at the tip for good heat conduction), add solder, remove solder and soldering iron. Children do not yet have this skill and the materials are heated for too long and therefore too hot.
- Children often tend to put solder on the soldering iron and then "stick" it on the PCB, the flux is already burnt and bad soldering is the result. In an attempt to get it right, the soldering place is then heated for an extra long time with a risk of component defects, etc.
- Temperature-controlled soldering irons are set to too high a temperature, for lead-containing solder about 320 °C is a great temperature for soldering.
- Non-temperature-controlled soldering irons often have too high a power, the tip temperature can reach 450 – 500 °C. A bolt with a power of about 15 – 20 W is most suitable for this type.
- The guidance has not read the manual beforehand and does not know exactly what to do.
- There is too little guidance in relation to the number of participants. Especially the youngest children need a lot of guidance. A guideline is to assume 1 supervisor to 1 beaver, for cubs/gnomes 1 supervisor per soldering station (2 Scout members per soldering station). With Scouts and older 1 supervisor for 4 members. As the members become more experienced, this can of course be adjusted.
- It is recommended, in addition to the soldering guidance, to have one supervisor who checks the PCBs and (if applicable) places the ICs etc. In the quiet moments, he can also focus on prints that do not work immediately.

Feedback:

Do you have any comments or would you like to give feedback about the Chameleon?
Do you have any comments or questions about the JOTA-JOTI Service Circle?
Please contact us via the contact form on the site www.kitbuilding.org.
On behalf of the Service Kring JOTA-JOTI, we wish everyone a lot of construction and fun playing with the Chameleon!