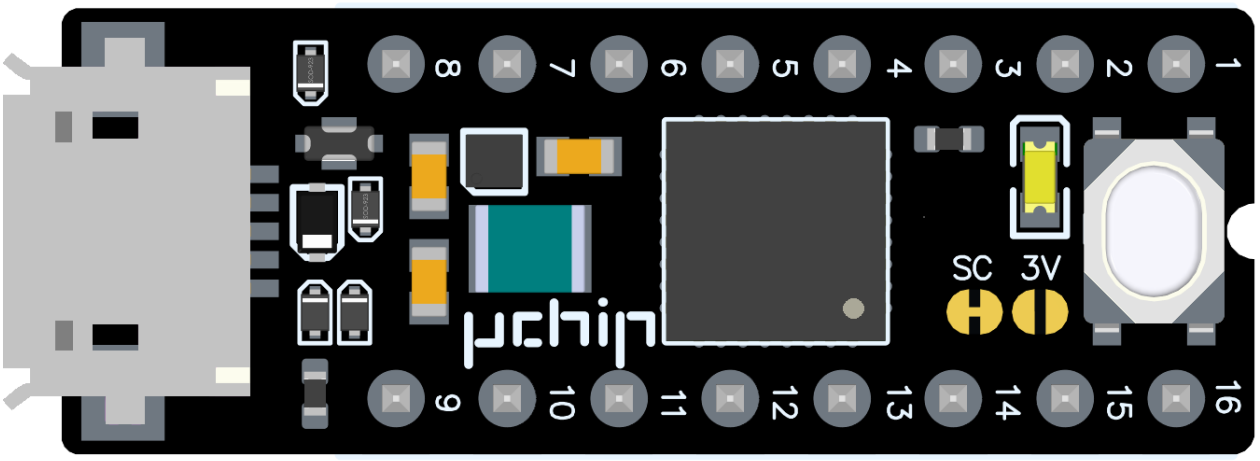
µchip Kit quick start manual



Document Version 1.0 – 17/05/2020

Table of contents

INTRODUCTION

Thank you for buying a uChip kit!

In this document you will find the basics required to mount your uChip Kit!

uChip is a small, open-source, Arduino[1]-compatible development board, which can fit a low cost 16-pin socket. The uChip Kits provide a fast way to test uChip potentialities and, why not, have some fun!

These kits are designed to be very easy to mount. Surface mount devices, where present[2], are already soldered onboard, and you only need to solder pin-through-hole components!

uChip Kits contain all the required components, the PCB and one uChip. Not included in the package are:

- Cables (in particular USB B and micro USB cables, audio cables, power cables).
- Memory cards.
- Power supply.
- Batteries.

These must be provided by the user, paying attention to get the suitable specification shown in the particular kit description (with particular reference to batteries and power supply!).

The full source code of these kits, as well as the updated schematics and PCB layout (KiCad format) are available on the website.

ESD Warning! uChip contains electrostatic sensitive devices. Electrostatic charge might permanently damage uChip. Observe precautions when handling it. Itaca Innovation is not responsible for any damage caused by ESD or improper handling/usage. Please note that other components (e.g. MOSFETs, ICs, etc.) provided in the kit might be electrostatic sensitive devices.

[1] Arduino is a trademark of Arduino s.r.l. There is no connection between Arduino s.r.l. and Itaca Innovation S.R.L.
[2] We may also offer complete unsoldered kit, for experts!

GETTING STARTED

Please find all the components shown in the bill of materials (BOM), and make sure that none is missing!

Try to keep everything well-organized, so that you can quickly find everything when you need!

If you have a good expertise in soldering, you can safely skip this section. If it is one of the first kit you are soldering, then following these steps will ensure the success!

All the components are clearly indicated on the silkscreen of the board! We suggest to follow the bill of materials, which is arranged with the following criteria:

- All the components with the same specifications are grouped.
- The components are listed in order of height, to facilitate soldering.

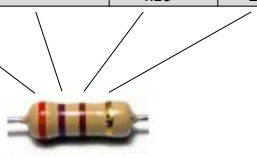
RESISTORS

The resistance is not explicitly marked with a number on a resistor. Instead, a series of colored rings/bands are shown. The resistors found in our kit might have 4 or 5 color bands. Each band have different meaning: the first N-1 bands show the resistor value. The last one, which is typically more spaced with respect the other, show the resistor tolerance.

The resistance value is calculated with the following table. The first N-2 bands determine the first N-2 digits. The value corresponding to these digits must be multiplied by the value indicated by the (N-1)th band (i.e. the 3rd or the 4th band).

4 -band resistors

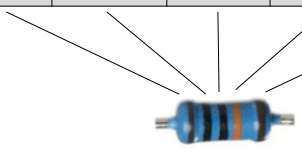
Color	1st Band (first digit)	2nd Band (second digit)	3rd band (multiplier)	4th band (tolerance)
Black	0	0	$x10^0$	±20%
Brown	1	1	$x10^1$	±1%
Red	2	2	$x10^2$	±2%
Orange	3	3	$x10^3$	±3%
Yellow	4	4	$x10^4$	-0, 100%
Green	5	5	$x10^5$	±0.5%
Blue	6	6	$x10^6$	±0.25%
Violet	7	7	$x10^7$	±0.1%
Gray	8	8	$x10^8$	±0.05%
White	9	9	$x10^9$	±10%
Gold	-	-	$x10^{-1}$	±5%
Silver	-	-	$x10^{-2}$	±10%



Red, violet, brown, gold: (2 7) x 10^1 = 270 Ohm ± 5%

5 -band resistors

Color	1st Band (first digit)	2nd Band (second digit)	3rd band (third digit)	4th band (multiplier)	5th band (tolerance)
Black	0	0	0	$x10^0$	±20%
Brown	1	1	1	$x10^1$	±1%
Red	2	2	2	$x10^2$	±2%
Orange	3	3	3	$x10^3$	±3%
Yellow	4	4	4	$x10^4$	-0, 100%
Green	5	5	5	$x10^5$	±0.5%
Blue	6	6	6	$x10^6$	±0.25%
Violet	7	7	7	$x10^7$	±0.1%
Gray	8	8	8	$x10^8$	±0.05%
White	9	9	9	$x10^9$	±10%
Gold	-	-	-	$x10^{-1}$	±5%
Silver	-	-	-	$x10^{-2}$	±10%



Brown, black, black, orange, brown: (1 0 0) x 10^3 = 100k Ohm ± 1%

In the example above on the left, you find a resistor with red, violet, brown and gold bands. The first two bands correspond to the digit 2 and 7, i.e. they form the number 27. This must be multiplied by 10, so the resistor is a 270 Ohm. On the right, there are brown, black, black, orange and brown bands. This corresponds to digits 1, 0, 0 (i.e. 100) which must be multiplied by 1000, i.e. 100kOhm.

In our kits, you will find only two types of resistors:

- Carbon Resistors (like the example on the left). These have typically a brown-beige color, and they have only four bands. In our case, the last band is always gold-colored (when not specifically specified in the project), indicating a 5% tolerance.
- Metal film resistors. These resistors are blue (like the resistor on the right), and have 5 colored bands. The last band is always brown, as metal-film resistor provided in uChip Kits have a 1% tolerance.

Note! While for carbon resistors it is very easy to determine which band is the first one, and which one is the last (the gold one!), on metal film resistor, sometimes the bands are too tightly packed to clearly identify which one is the last. In fact, in many cases, both the first and the last color of the band might be brown (think of a 1% 1.5 kOhm resistor – brown – green – black – red – brown, which might be confused with a 12 MOhm resistor: brown, red, black, green, brown !).

At this regards, the quickest way is to use a multimeter to get the resistance value (be aware of the tolerance! A 1% 10kOhm resistor might read as low as 9.9 kOhm or 10.1 kOhm – you must then consider your multimeter tolerance, therefore you might read even smaller or higher values!).

Another way is to decode the bands in one direction, and try to find the decoded value in the BOM list (the BOM list also include the color sequence, so you do not have to manually decode the values!). If you cannot find the resistor in the BOM, then you should read the resistor in the opposite direction.

Yet another way, is to use common sense! Let us consider a 18 kOhm resistor. This has brown, grey, black, red, brown bands. If you decode those bands in the opposite way, you would achieve 120 * 10^8 Ohm = 12 GOhm. While this value is still standard, it is insanely huge, and very unlikely that such a resistor would be included in our kits!

Still, there might be some cases in which the value is “reasonable” when you read the color code in both ways. In particular, with the 15 kOhm example, both 15 kOhm and 12 MOhm are quite reasonable values. However, uChip Kits are designed so that in such case there would be either just 15 kOhm resistor, or 12 MOhm resistor, but not both values!

CAPACITORS

There are fundamentally two types of capacitors. Polarized (electrolytic capacitors) and unpolarized (ceramic disc capacitors, polyester capacitors, etc.).

Electrolytic Capacitors

EXTREME care should be paid to put the capacitor with the correct orientation, otherwise they will heat-up and they might even explode.

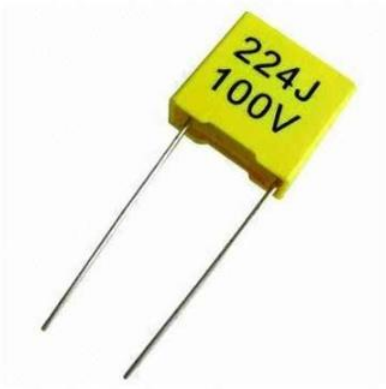
In such capacitors, the capacitance value and the working voltage are explicitly written on the side of the body. Furthermore, the negative terminal (typically the shorter one) is shown as a strip of minus (“-“).

Ceramic Capacitors

The capacitance value is shown numerically, but not explicitly: the value is encoded in a similar way used for resistors. That is, the first two digit make the numerical value of the capacitor, and the third digit shows how many zeroes you must add to the right of the first two numbers. The final number you get is the capacitance in PicoFarad (10^{-12} F)

For instance, in the picture above, 105 means 10 x 10^5 pF = 10^6 pF = 1 microFarads, while 331 means 33 x 10^1 pF = 330 pF.

Polyester Capacitor



The value might be either shown in an explicit way either on the side, or on the top of the component, or like the ceramic capacitors. For instance, 220n stands for 220 nF. The value 224 means 220nF as well. Sometimes, instead of 1.5n, you might find 1n5. In other words, the decimal place is removed and changed with the multiplication factor (typically n).

DIODES

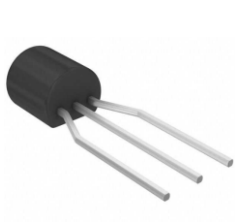

Diodes are polarized devices, and must be inserted correctly. In particular, there is always one band close to one of the two terminals, which indicates the cathode. The diode should be placed with the band as indicated in the silkscreen.

LEDs


LEDs are Light Emitting Diodes, and like normal diodes, they are polarized. Unfortunately, different manufacturers use different standards for indicating the Cathode position. In the particular Kit user manual, we explicitly indicate which terminal is the correct one.

Warning! Never connect an LED directly to a battery or power supply!

TRANSISTORS

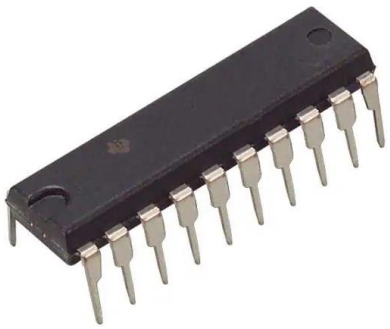



There are many transistor packages. On the left a “TO-92” package, on the right a TO220, and these are just two popular examples. Some 3-terminal integrated circuits (for instance linear voltage regulators) might have the same shape, so pay attention to the part number! In any case, always remember to read the part number, which is printed on the component! Also use the correct orientation in the silkscreen!

The transistor should be mounted with an adequate clearance with respect to the PCB (for a TO92, 3-5 mm are adequate). If a transistor requires an heatsink, we suggest to mount first the transistor to the heatsink, and THEN solder it on the PCB. Otherwise, you can solder it directly.

ESD Warning! Some transistors (MOSFETs) are electrostatic sensitive devices. Electrostatic charge might permanently damage these components. Observe precautions when handling them. Itaca Innovation is not responsible for any damage caused by ESD or improper handling/usage.

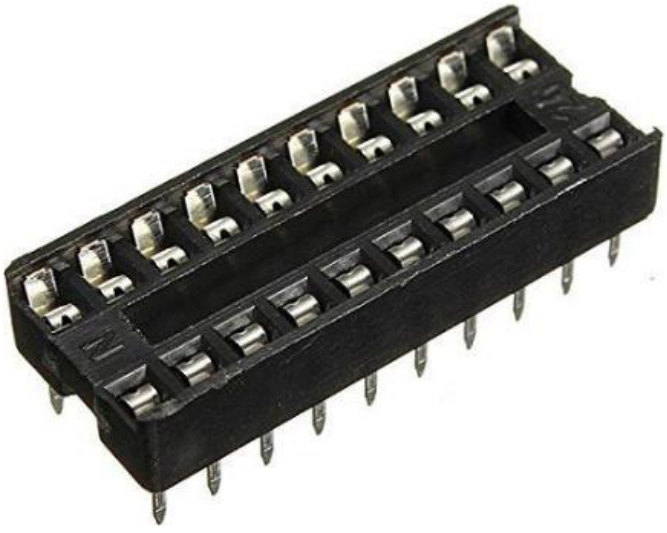
INTEGRATED CIRCUITs (ICs)



In our kit you will either find 3-terminal voltage regulators (they have the same package of transistors) or dual-in line package (DIP). ICs have a specific orientation which is shown either by a dot, or by a “D” slot.

ESD Warning! ICs are electrostatic sensitive devices. Electrostatic charge might permanently damage these components. Observe precautions when handling them. Itaca Innovation is not responsible for any damage caused by ESD or improper handling/usage.

Note! In our kits, we always provide you with IC sockets for DIP packages.



Of course, you must first solder the IC socket (pay attention to the notch, to match the IC pin 1 indicator!), and then, once you have finished soldering all the components, you can insert the IC.

Connectors, switches relay, etc.

There are so many other components! Particular components will be indicated in the kit manual, if required.

SOLDERING

We suggest a good a soldering iron with a decent power (e.g. 25W at least). Soldering irons with less power might be inadequate because they cannot easily melt the soldering wire and heat the pad/component wire, for a reliable joint.

We suggest to solder the components based on their height, therefore, as a rule of thumb:

- Diodes (not light emitting)
- Resistors
- IC Sockets
- Ceramic capacitors
- TO-92 components (transistors and IC regulator)
- Polyester capacitors
- Headers
- Connectors
- LEDs

The particular order might of course depend on the particular bill of materials of your kit!

Each kit might have its dedicated soldering section, especially if particular attention needs to be paid for some components. Furthermore, each guide might provide some other useful suggestions.

CONTACT US

For any question, bugs, support, suggestion, etc, contact info@itaca-innovation.com.

Due to the large number of emails, we kindly ask you to be very concise, clear, while being exhaustive in order for us to reproduce your issue.