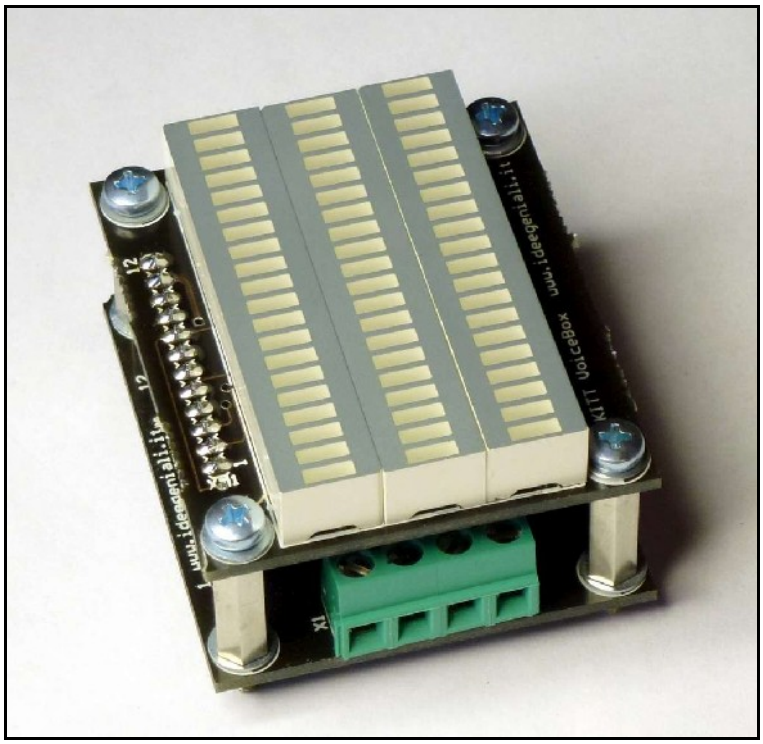
Mini VoiceBox

Hardware revision: no version number shown on serigraphy
User manual revision: 1.0



K.I.T.T. Miniature Voicebox

Parts List

R1	Axial resistor 1/4W 470Ω
VR1	Horizontal trimmer 100kΩ
C1	Electrolytic capacitor 10µF/25V
T1	Audio coupling transformer
D1	Diode 1N4007
D2	Zener Diode 2,4V
D3	Zener Diode 6,2V
IC1	Integrated Circuit LM3915 with its DIP-18 socket
LB1-LB3	20-segments Led bargraph
X1	Low profile screw terminals, 5.0mm pitch, 4 ways
XF1	PinHeader 0,100” pitch, female, 12 ways
XM1	PinHeader 0,100” pitch, male, 12 ways (mount on bottom/traces side)
N/A	4 hex spacers 15mm, 8 M3 screws, 16 M3 washers

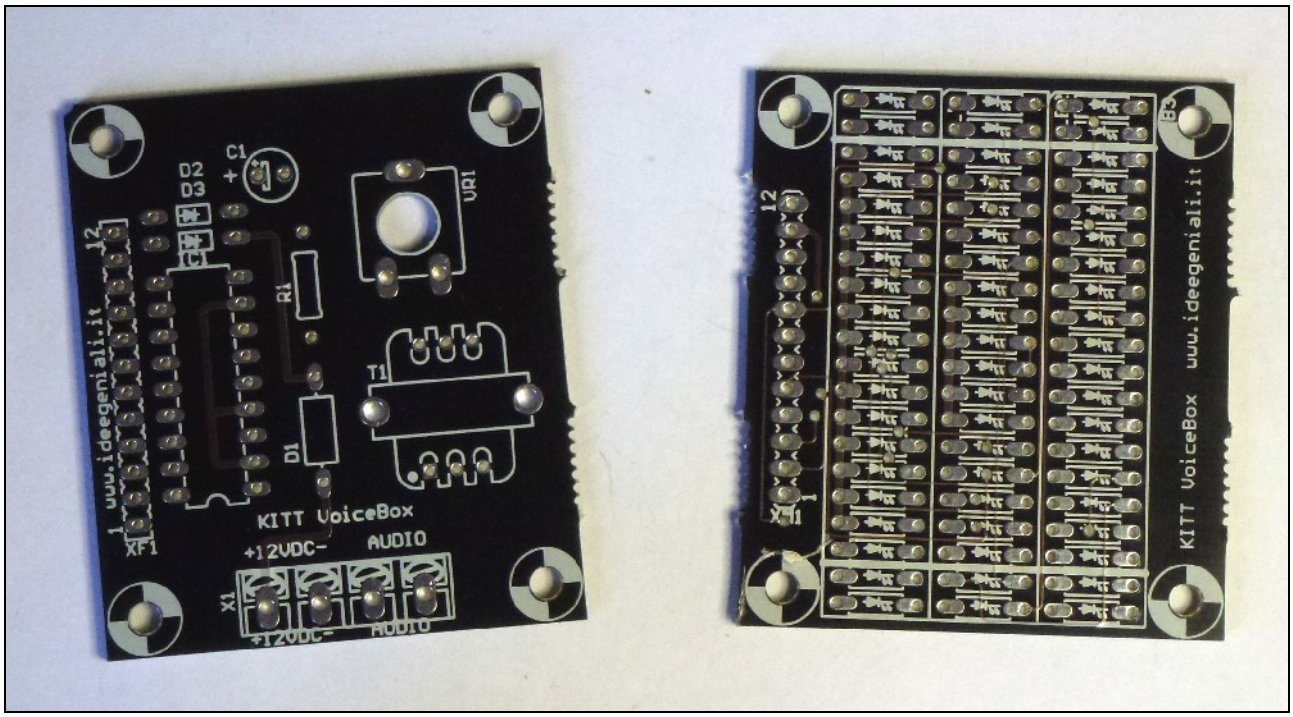
Assembly notes

Please mind correct orientation for led bargraphs LB1, LB2, LB3. Please notice a corner is marked on serigraphy and on part.
C1 is a polarized part as well. On part body please notice a line of minus signs "- - - -" for the negative terminal. In serigraphic overlay you have instead a plus sign "+" marking the positive terminal. Please also note positive terminal is longer than negative terminal. While mounting this part, please bend it to the side to reduce its vertical occupied space.
D1, D2, D3 are polarized parts: please note the line/bar marking cathode side both on part body and on serigraphic overlay. D2 and D3 are very similar to each other, please pay attention not to mount one in the place of the other.
IC1 must be oriented correctly. Please note the U marking on overlay, and match it with the U sign on socket, and on integrated circuit chip.
T1 has a primary and a secondary side. Primary side is marked with a dot on overlay, and with a stamped P letter on part.
XM1 mounts on bottom/traces side. This product closes like a sandwich. To correctly orient XF1 and XM1 so that they match each other, we suggest closing the product in sandwich fashion prior to soldering XM1 and XF1. Solder these parts while the product is closed in sandwich shape.
Always use provided washers between spacers and p.c.b (printed circuit board) and between screws and p.c.b. If you don't use washers, p.c.b. can get damaged by screws or spacers against it.

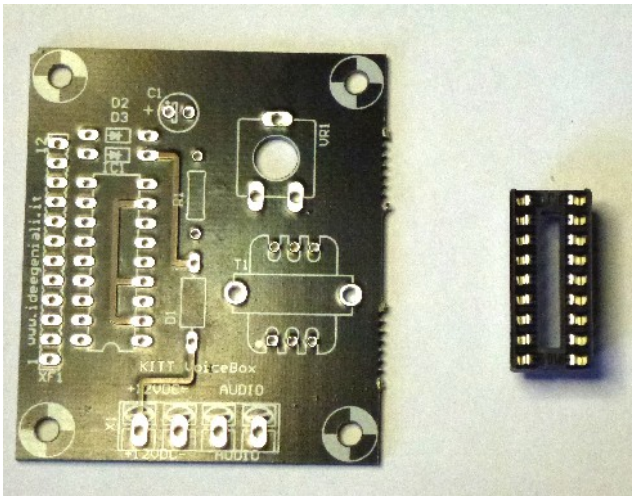
Connections

Please connect a power supply rated 12VDC or 13,8VDC between +12V and GND screw terminals. Please mind the correct polarity! We suggest using red wire for +12V and black wire for GND. This color scheme is standard among the industry. Please connect a audio source at speaker level, to AUDIO screw terminals. We suggest green wire for this connection. Typically you just connect in parallel to the left speaker of your car audio system. Trimmer SENSITIVITY will adjust the input sensitivity of audio input. Have fun!

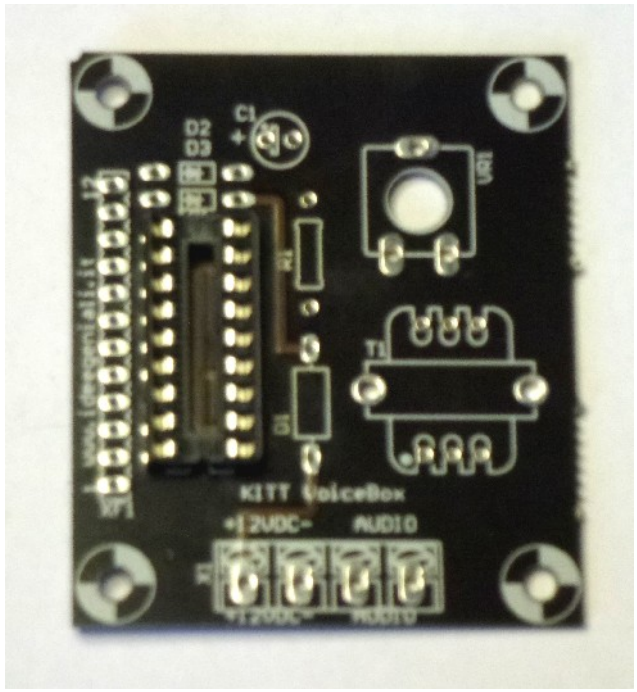
Step-by-step assembly instructions



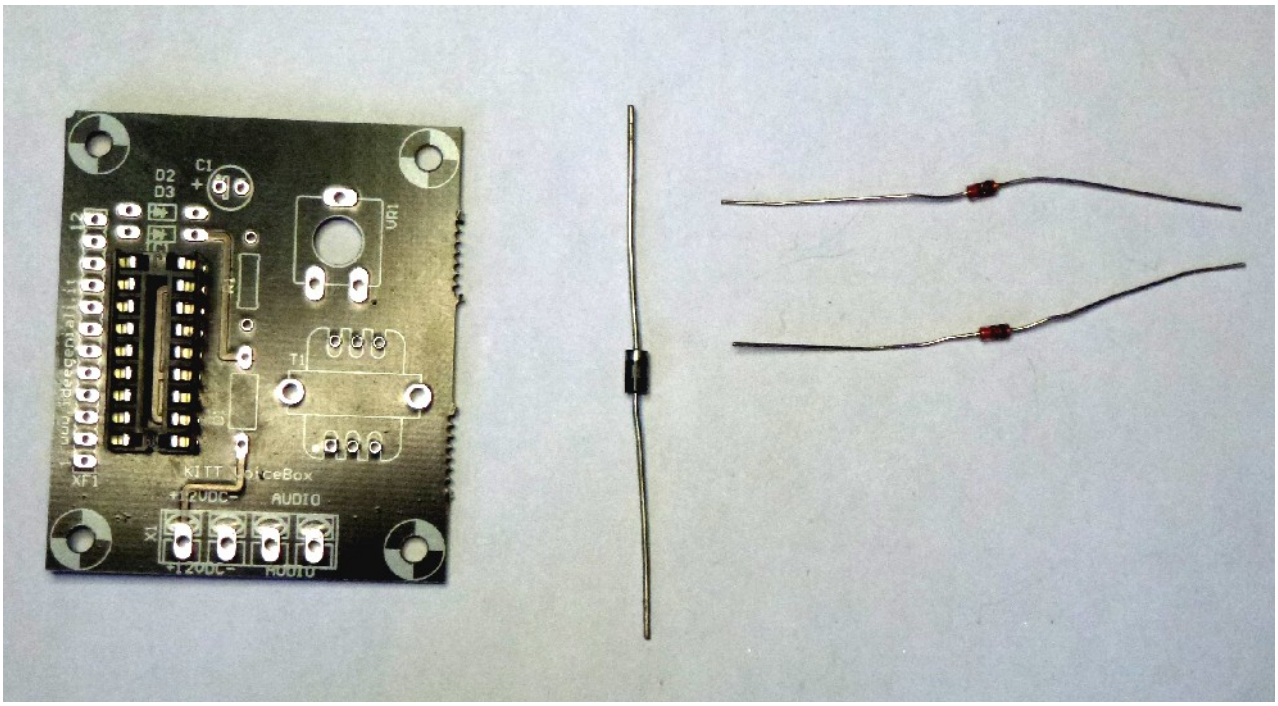
Circuit is spread on two p.c.b., that will be linked together like a sandwich. Let's start populating parts on the left p.c.b. The side you see in photo is called “component side” and will hold the parts. The bottom side, not shown in photo, is called “traces side”. This is a double-sided p.c.b., and has traces on both sides, but we still call “component side” the side which will be populated with parts and “traces side” the other side, on which we will use solder and soldering iron.



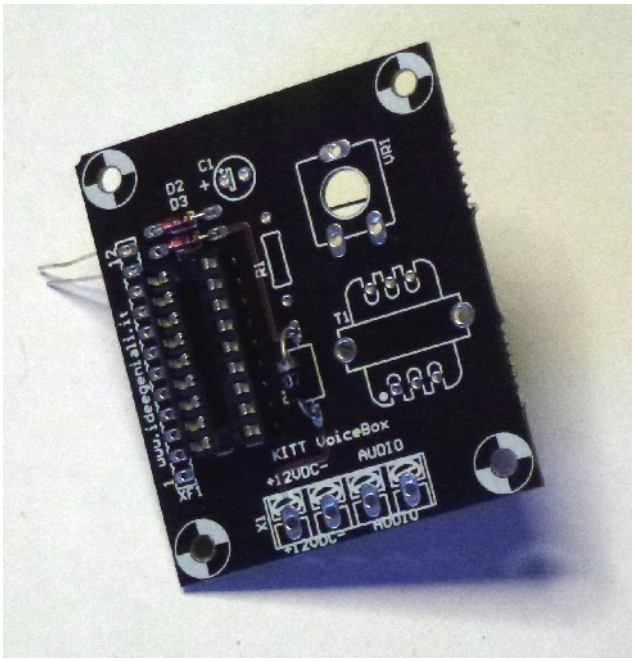
Let's start with the DIP-18 socket IC1. Plesae mind the U-shaped reference sign on overlay, and match with U-shaped reference on socket. Be aware NOT to mount this part 180° rotated. U-shape is downside in photo.



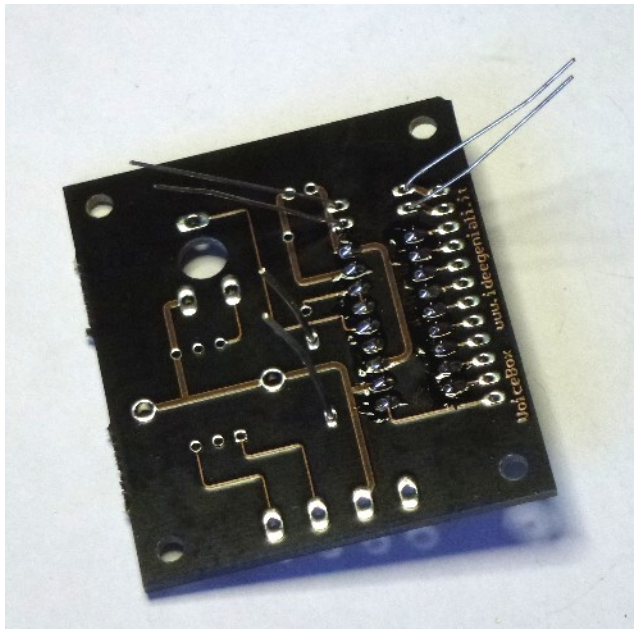
We suggest soldering two opposite corners pins. When you have only two solder joints, it's still feasible to rearrange and better align the part. If you already did many soldering, it's harder. So after soldering two pins, check alignment. If you're confident it's right, proceed and solder each pin. Please mind NOT to bridge two adjacent pins with solder.



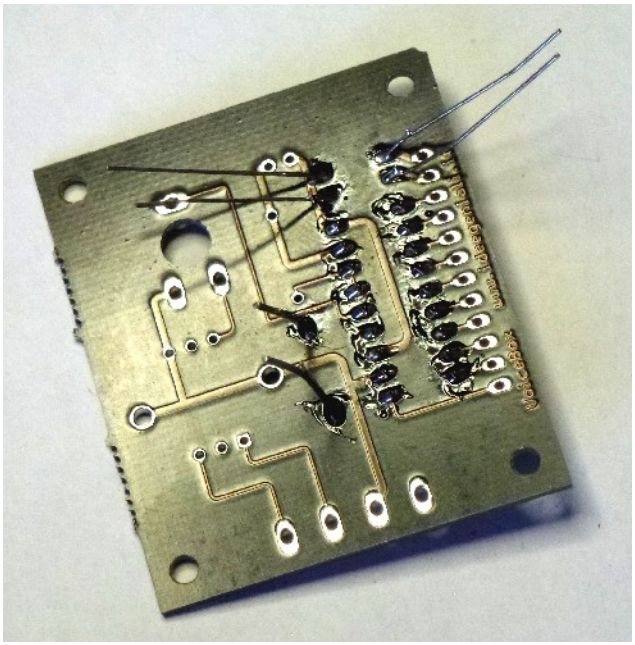
Let's mount diodes D1 D2 D3. Please mind the bar identifying cathode, which must match with the bar on printed overlay.
D1 is 1N4007 kind, is bigger in size, black body, and silver bar. Silver bar goes upwards in respect to this photo.
D2 and D3 are zener diodes. These are smaller, have orange body and black bar. Black bar goes to the right side in respect to this photo.
Pay extreme attention not to exchange D2 with D3, these are very similar. But D2 is 2,4V and D3 is 6,4V. If you misplace them, many parts will get damaged (burn!) once you power up the circuit.



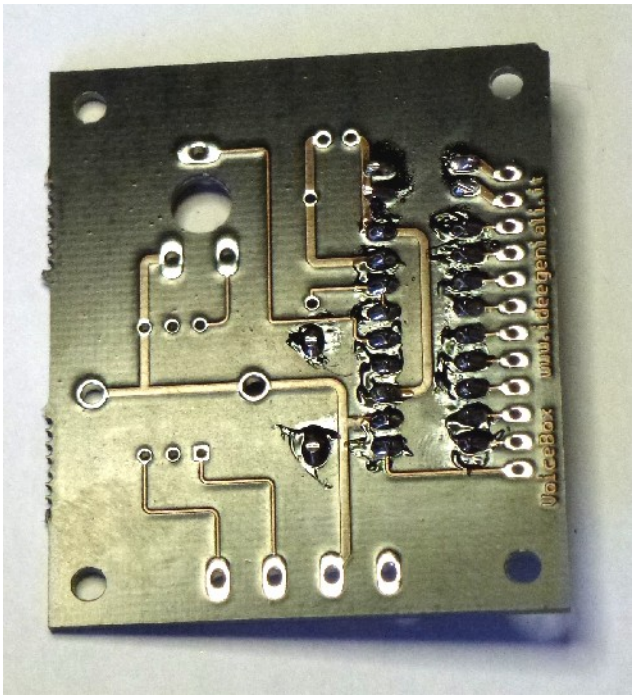
Insert diodes in the PAD holes on p.c.b.



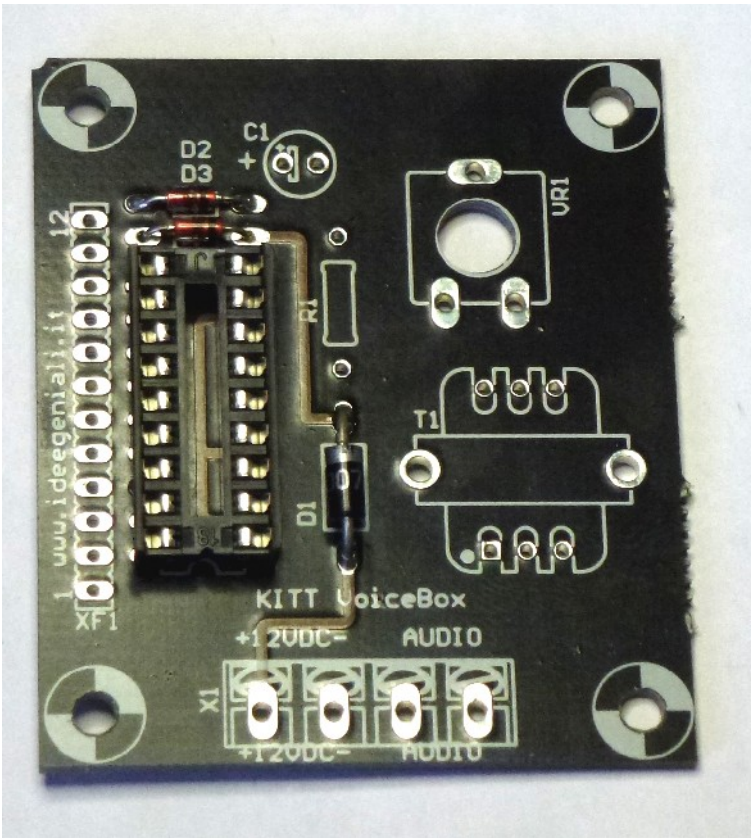
Flip p.c.b. and bend slightly outside pins, so that part don't get out by gravity while soldering.



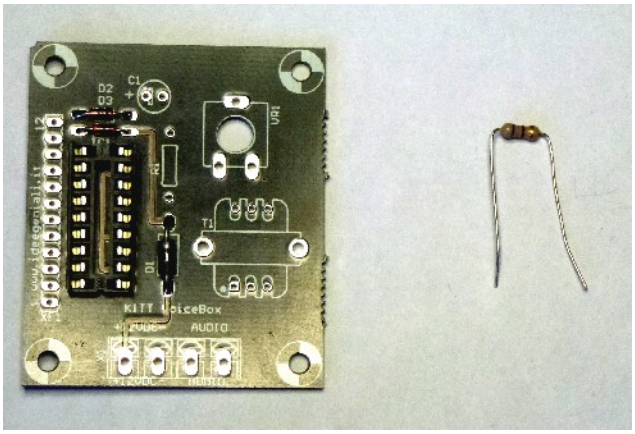
Do the soldering. Cut the excess pin.



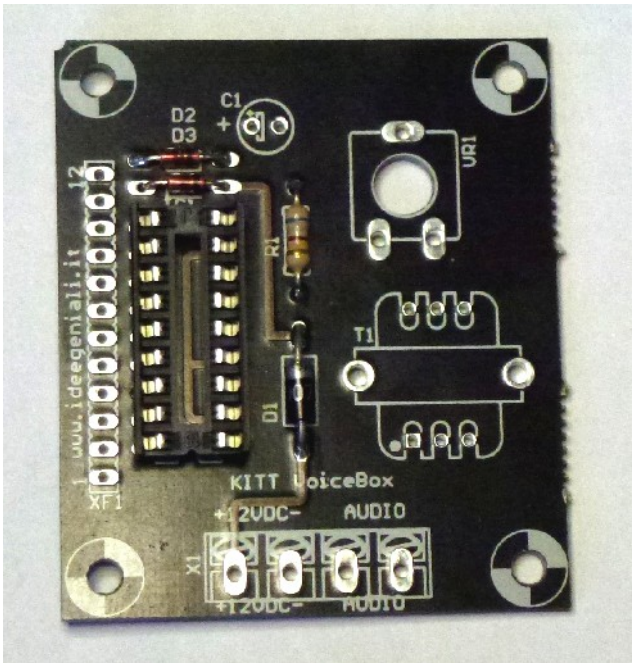
Result: diodes has been soldered into place.

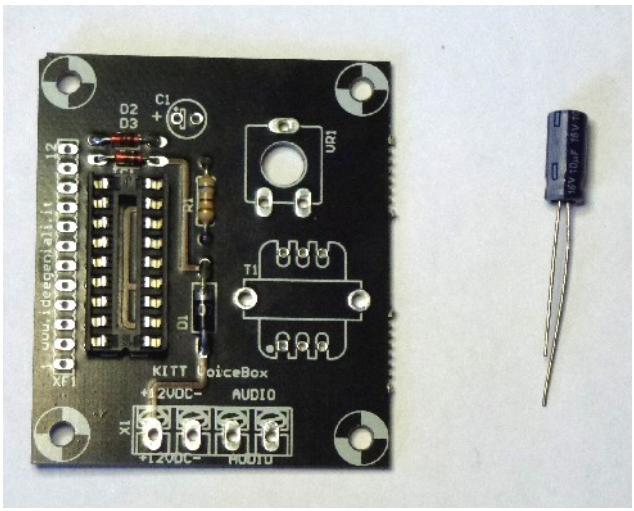


As the board looks like with socket, and the three diodes soldered into position.

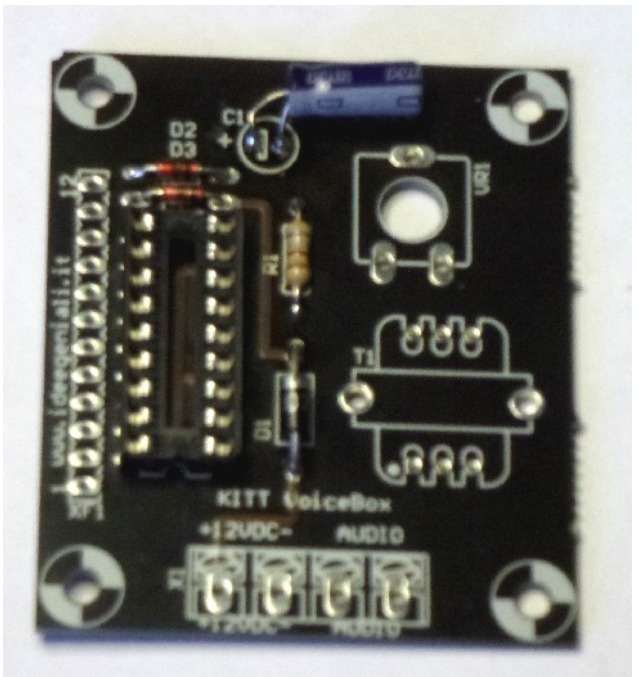


Let's solder R1 resistor.
Give shape to pins, bending them. Insert part. Bend slitghly outwards. Solder. Cut excess pin. Observe your result: must match with the photo.

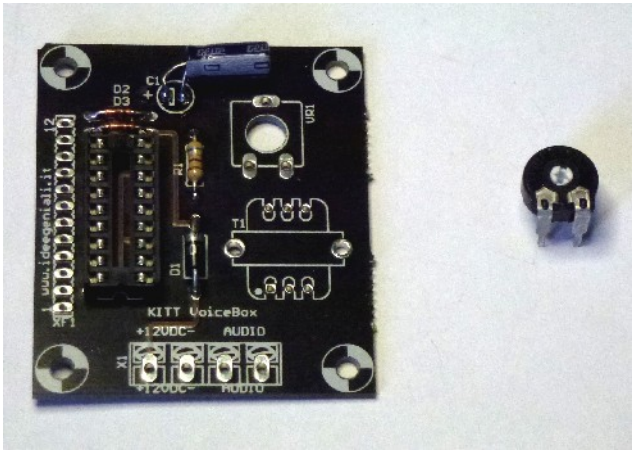




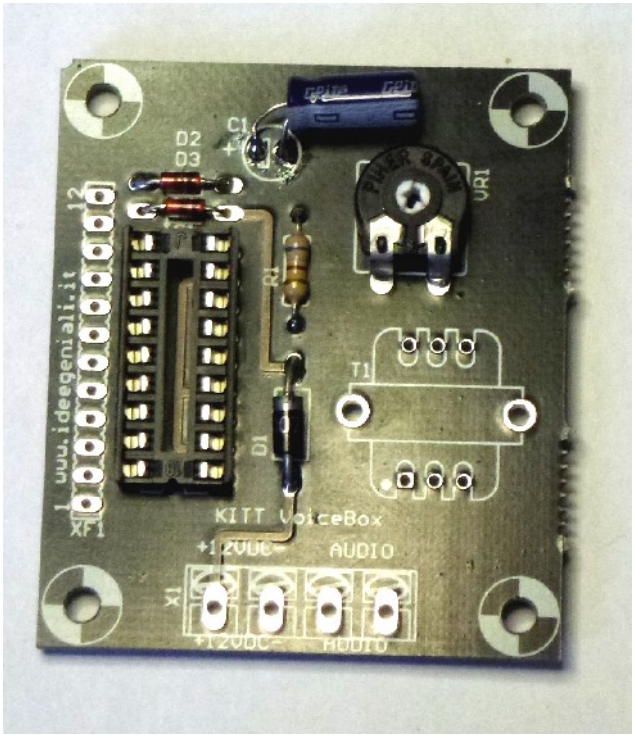
Electrolytic capacitor C1 is a polarized part. Longer pin is positive, shorter is negative. Negative pin can be identified also from the stripe of minus sign printed on part body "- - - -". On printed overlay on p.c.b. it's the positive terminal identified by a printed plus sign "+".

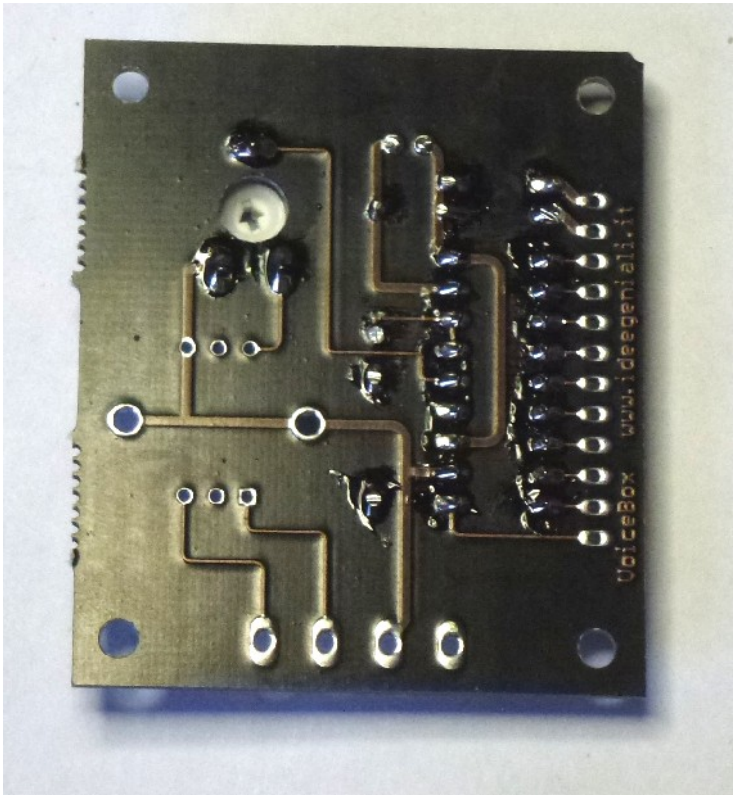


Once you mount the electrolytic capacitor, please bend it to the side, so to reduce the vertical room it takes.

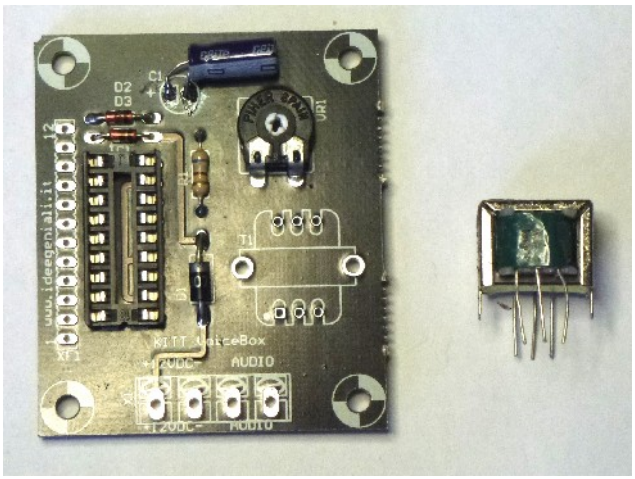


Let's solder VR1.
This part has three pins.

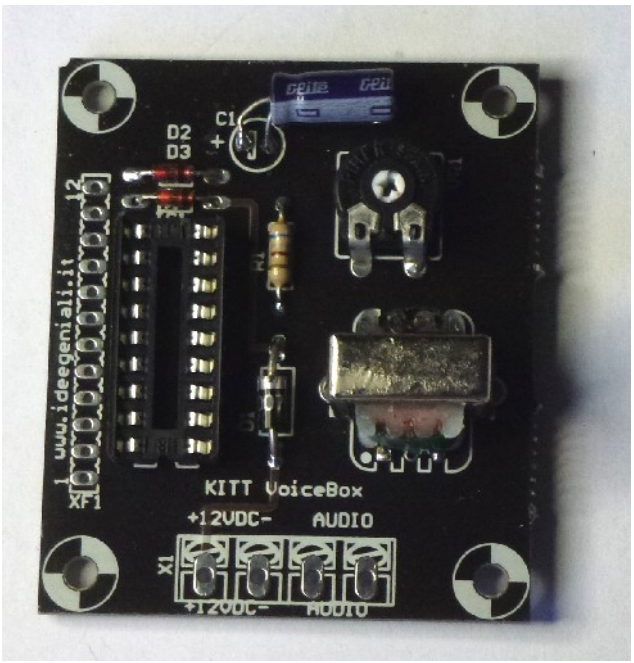




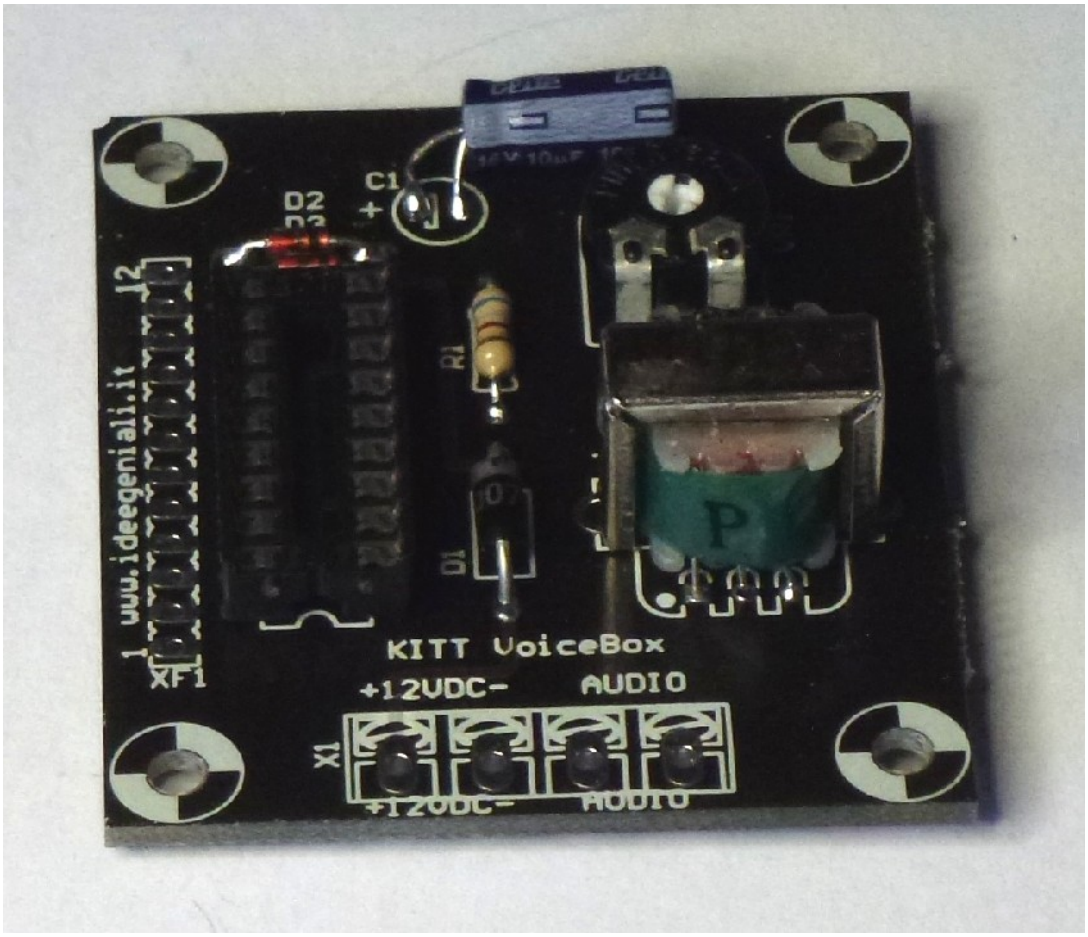
P.c.b. has a hole where the trimmer goes, so you can adjust position from the back.
Please use a small screwdriver and low force, don't push heavily, or you'll damage the part.
Once you close the voicebox in sandwich shape, this feature will be extremely useful!



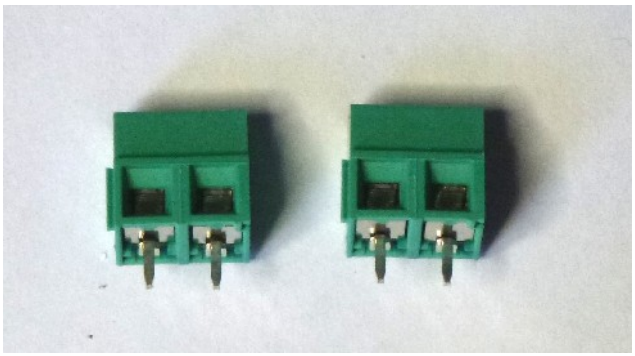
Audio coupling transformer T1.
Primary side is marked with a small dot on printed overlay on p.c.b. On part body identify the primary side by a stamped capital “P”.
Please insert all of the 6 pins, plus solder the 2 frame pins as well, to give better mechanical stability to the part.

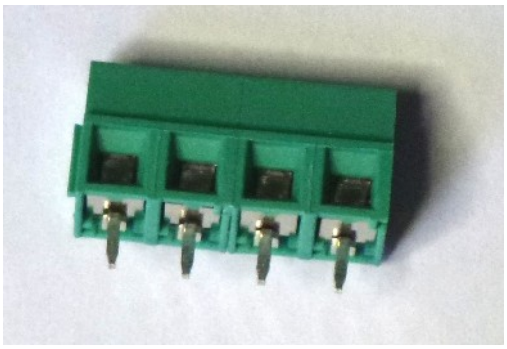


This photo is shot from the top, you don't see the “P” on transformer.

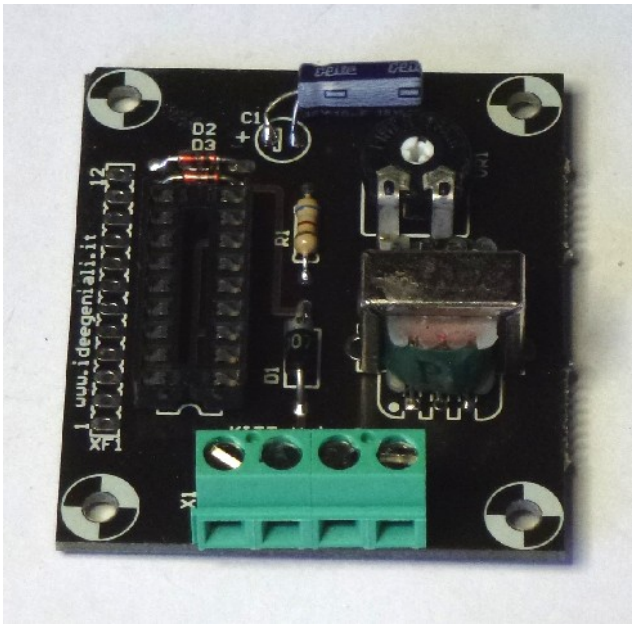


This photo is shot with an angle, so you see the P stamped on transformer side.
This primary side must match the side with the small dot on printed overlay on p.c.b.

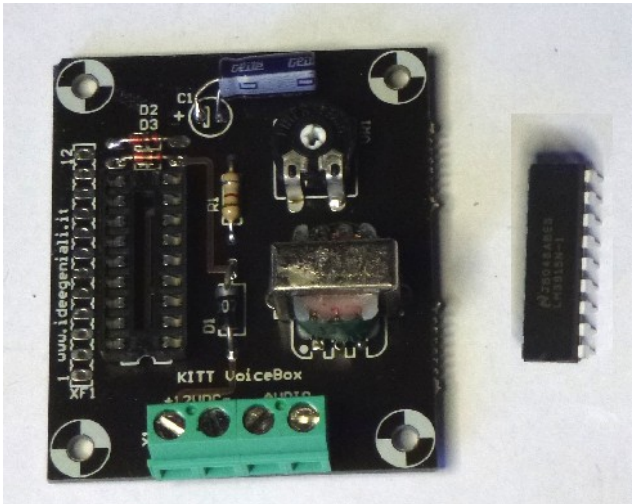




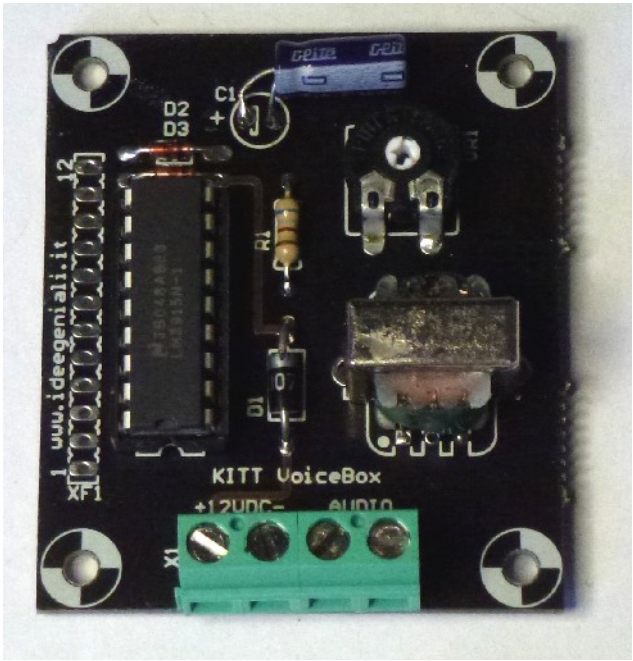
The 2 two-ways screw-terminals must be assembled with each other, to provide a 4-ways screw terminal. This part will be inserted in X1 position on p.c.b.



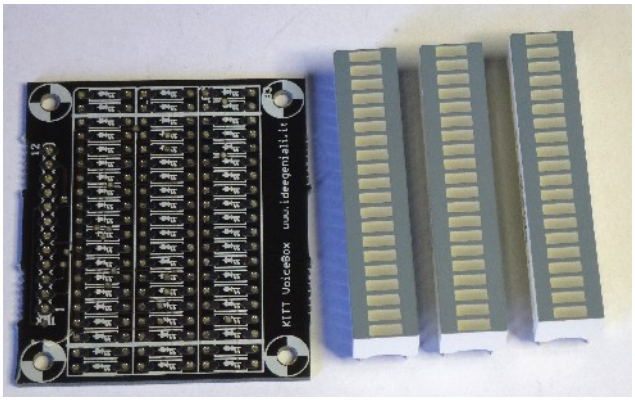
Please mind that inserting side for wires must face outwards!!!



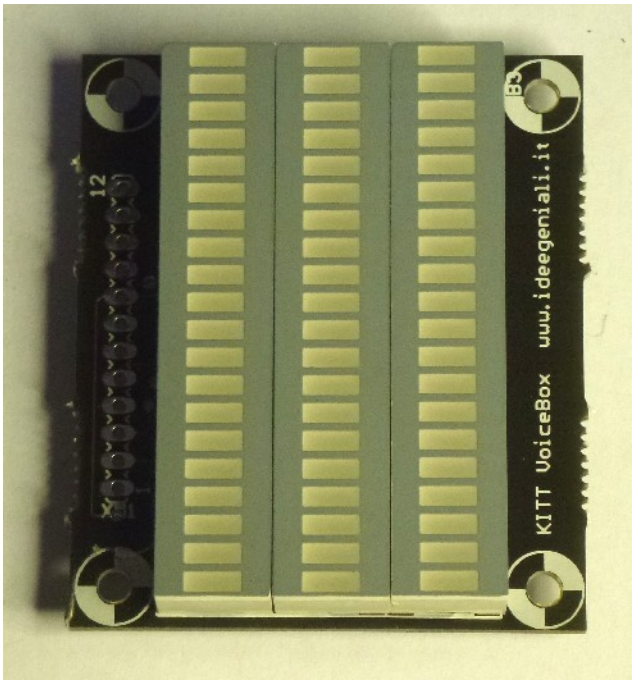
Insert IC1 integrated circuit into its socket. Please match the U-marking on the part with the U-marking on socked and printed overlay.



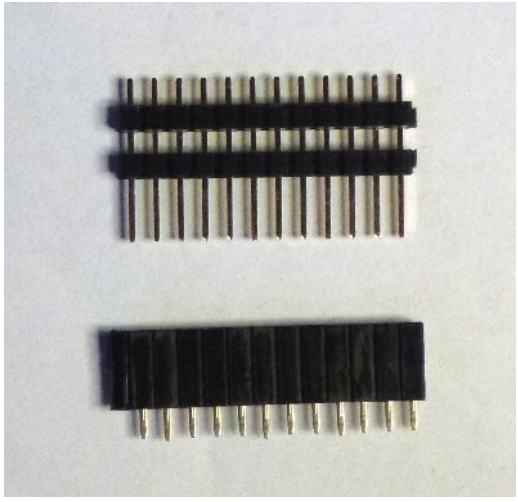
Let's put away the left p.c.b. we populated with parts, and let's populate the right p.c.b.

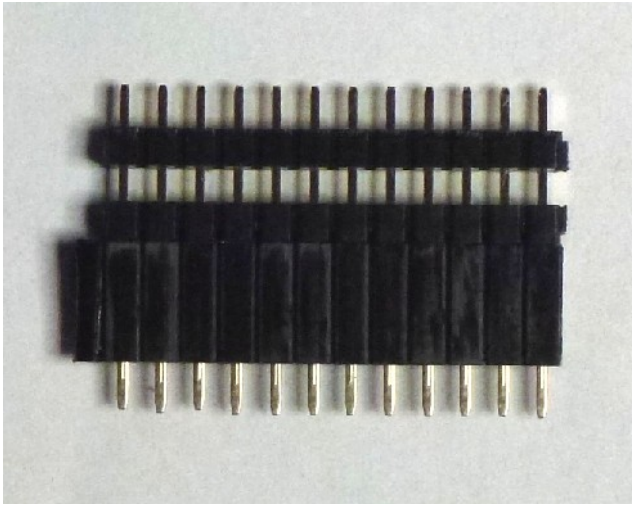


Let's mount the three bargraphs LB1 LB2 LB3. These are polarized parts, you must NOT place them 180° rotated, or voicebox won't work.
It's extremely hard, if not totally impossible, to desolder and resolder a wrong-oriented bargraph. So pay extreme attention and check twice or three times before soldering!

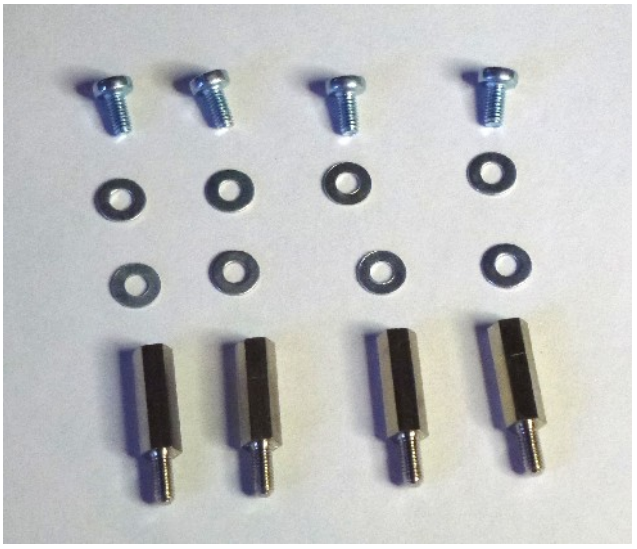


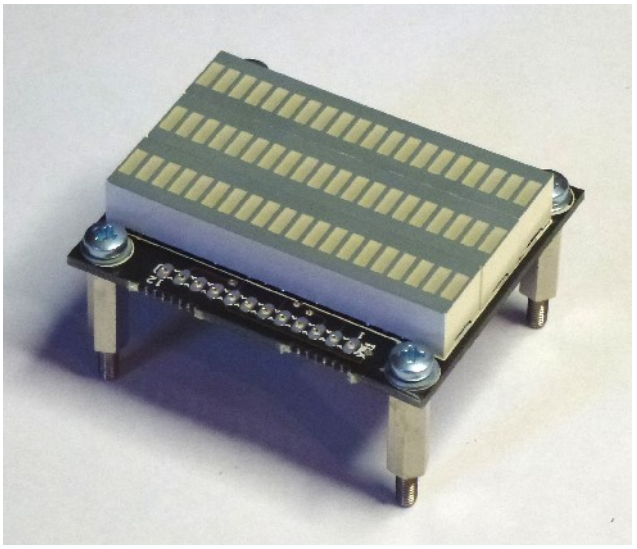
In printed overlay, please notice an angle with a marking. It's in the top left corner for each of the three bargraphs in the photo. On bargraph itself, you find a matching marking on one of the four corners. Please align the marking on part with the marking on printed overlay.
Solder just one corner pin. Flip board, check if the bargraph are well-aligned versus each other. These parts remain visible in the final voicebox and you want to align them as perfectly as possible so that your voicebox will look extremely cute! Don't you?
Once you're satisfied with alignment, solder opposite corner pin. Check again alignment and check again you matched corner marking on part with corner marking on printed overlay.
Ok! Now solder each and every pin, there is literally a forest of them! It's 40 per bargraph, 3 bargraphs, for a total of 120 pins :-) Check you did not put any bridge between adjacent pins.



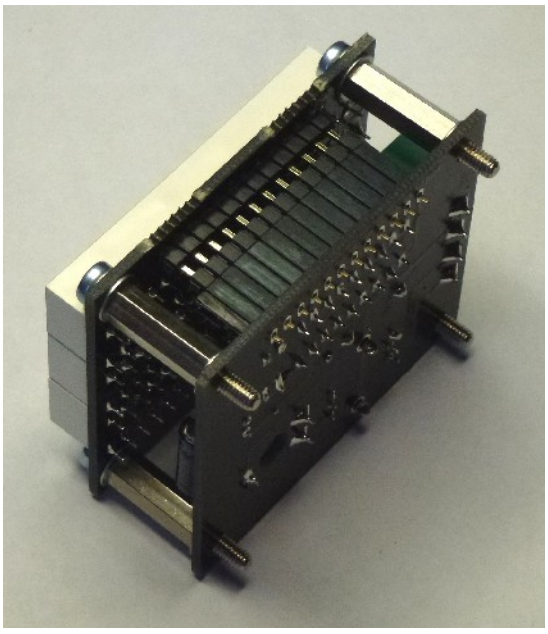


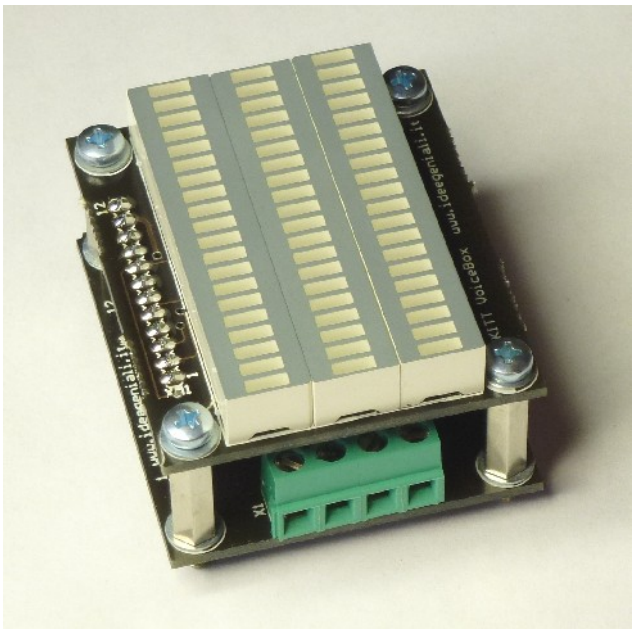
The two boards will be held together with male (up in photo) and female (down in photo) 12 ways pin-headers. We won't solder these now. We just prepare them inserting into each other. We will solder these parts only after completing the mechanical assembly of the sandwich. This way we make sure not to put mechanical force onto solder joints and that everything is perfect aligned.





The two parts of the sandwich are linked by hex spacers M3x15mm. Use washers between screw and p.c.b. and between spacer and p.c.b. A direct contact between screw and p.c.b. or spacer and p.c.b. will damage p.c.b. Please use provided flat washers. Don't use any kind of special washer that could damage the p.c.b. material. The washers are also needed to match the mechanical assembly height with the height of the male and female pin-headers.





Link the two boards mechanically with the spacers and screws. Please insert the male and female pin headers into the sandwich now. These are still not soldered. Please note female goes onto bottom part, on position marked XF1, while female goes towards the top part, that with bargraphs, in position marked XM1, and this male pin-header is the only part mounting on “traces side”, while all other parts mount on “component side”. Also on the bottom p.c.b. you are to use washers everywhere, i.e. between p.c.b. and spacer, and between p.c.b. and screw (or bolt, depends on the kind of spacers you find in the kit). All right, once you complete the mechanical assembly of the sandwich, can now solder the 12 pins of male and female pin-headers. Please avoid touching the bargraphs with the soldering iron, or you'll melt them!
Assembly is done, voicebox is complete! You'll want to open the sandwich to connect wires. We suggest red wire for +12V, black wire for GND and two green wires for AUDIO input. Enjoy!