Makey Makey SMD workshop – VHS, July 2014

Thanks for coming out tonight for the smd star workshop. This is the 10th SMD workshop I've run at vhs and it's a bunch of fun. With these notes you should have also received components and photos. Please read this right through before starting.

First a word on safety. You're using lead based solder. Lead is somewhat poisonous. Please don't consume food or drink while you're working and wash your hands with soap afterwards. Please use some form of eye protection while soldering, solder splatters can cause permanent damage to your eyes.

To make identifying the components easier many of them are colour coded. The colours are shown in the parts list later in these notes along with the component values and their schematic reference. Using the colour codes and the photo(s) you will match up the components with their location and solder them in place. A suggested order of assembly is given below, this is based on height of the components and their proximity to each other. Most of the components can be installed in either orientation, exceptions to this are noted in both the order of assembly below and the parts list on the reverse.

If you haven't looked the suggested youtube video, please do so now. It shows a technique I suggest for mounting SMD components - http://www.youtube.com/watch?v=P_6XJR3D27Y or search for "I (heart) SMT vancouver.hackspace.ca". The basic strategy I used it use a little solder to hold the part in place, solder the other pins and then touch up the first pin.

When soldering always remember accurate placement is important. It is easy to move components around when only one pin is soldered. **If in doubt ask for advice before soldering more than one pin.**

Parts list

Qty	Value	Colour	Parts
3	0.1uF	Blue	C1, C5, C8
2	1uF	Yellow	C2, C6
2	22pF	Red	C3, C4
1	10uF	Black	C7
1	500mA		F1
4			JP3, JP12, JP13, JP14
6	GREEN	Green T	LED1, LED2, LED3, LED4, LED5, LED6
5	GREEN	White Dashed	LED7, LED8, LED9, LED10, LED11
2	22R	Green	R1, R2
3	1k	YellowPurple	R16, R19, R23
5	330R	Purple	R17, R18, R20, R21, R22
1	10K	GreenBlue	R3
18	22M	No Colour (white)	R4, R5, R6, R7, R8, R9, R10, R11, R12, R13, R14, R15, R24, R25, R26, R27, R28, R29
1	ATMEGA32U4TQFP		U1
1	USBSMD		X1
1	16MHz		Y1

* check polarity

Suggested order of assembly

There are a lot of part on this board. Take your time, it takes a few hours to build. You have more parts than you need, the spares are in case you lose some.

1. C7 (black in clear packaging)
2. F1 (green body as per picture)
3. C1, C5, C8 (blue)
4. C2, C6 (yellow)
5. C3, C4 (red)
6. R1, R2 (green dashes on photo, plain green on parts)
7. R16, R19, R23 (yellow and purple stripes)
8. R17, R18, R20, R21, R22 (purple)
9. R3 (green and blue stripes)
10. R4, R5, R6, R7, R8, R9, R10, R11, R12, R13, R14, R15, R24, R25, R26, R27, R28, R29 (no colour)
11. Y1 crystal (is easier to put the part on the board first and then solder both the edges)
12. U1 usb jack (solder the conductor pins first as once you solder the tabs it is hard to move. Try not to use too much solder as it can be difficult to get the solder out from inside the socket).
13. LED1, LED2, LED3, LED4, LED5, LED6 (green T – these hang down through the holes and shine out the front).
14. LED7, LED8, LED9, LED10, LED11 (these are very small and the pads on the pcb are small too. Take your time – the triangle on the back needs to match the black triangle on the photo).
15. U1 – square IC. I recommend treating these like any other part. Tin one pad, with the iron heating that pad, slide the pin into the solder and move around until you are happy with the alignment. Don't attempt to move it without heating the solder, be gentle, the pins bend easily. Make sure the part is flat against the board. Feel free to check with me before soldering any more pins. Once you are happy solder a pin on the opposite and work your way around. Don't worry too much about shorts, you can clean the up with flux at the end. Try not to use too much solder. Use a flux pen if you wish, they can help the solder flow better. Apply sparingly and gently.

Programming

Do the following steps with an AVR programmer like stk500v2.

Bootloader

avrdude -F -c stk500v2 -p m32u4 -P <serialport> flash:w:~/git/sparkfun/MaKeyMaKey/firmware/Arduino/hardware/MaKeyMaKey/bootloaders/caterina/Caterina-makeymakey.hex

Fuses

avrdude -F -c stk500v2 -p m32u4 -P <serialport> -U efuse:w:0xcb:m
avrdude -F -c stk500v2 -p m32u4 -P <serialport> -U hfuse:w:0xd8:m
avrdude -F -c stk500v2 -p m32u4 -P <serialport> -U lfuse:w:0xff:m

Patching your computer

To use MakeyMakey with the Arduino gui follow the directions at https://learn.sparkfun.com/tutorials/makey-makey-advanced-guide/installing-the-arduino-addon

Download the default sketch

Using the patched Arduino gui load the sketch from github (eg. ~/git/sparkfun/MaKeyMaKey/firmware/Arduino/makey_makey/makey_makey.ino) and download it by selecting MaKeyMaKey as the board and the appropriate serial port.

Tom Keddie VHS, July 25, 2014, V1.1