FET Shield workshop – VHS, June 2014

Thanks for coming out tonight for the fet shield workshop. This is the 8th SMD workshop I've run at vhs and it's possibly the most useful. With these notes you should have also received a bag of components and photo(s). Please read this right through before starting.

First a word on safety. You're using lead based solder. Lead is bad for you.   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, the photo(s) and the markings on the pcb silkscreen 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".

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	Device	Colour	Parts
2		FERRITE-0805	Green (not on photo)	L1 L2
12		M03	Cream	JP1 JP2 JP3 JP4 JP5 JP6 JP7 JP8 JP9 JP10 JP11 JP12
12	332R	RR0603	Purple	R13 R14 R15 R16 R17 R18 R19 R20 R21 R22 R23 R24
12	1k	RR0603	Lime Yellow	R1 R2 R3 R4 R5 R6 R7 R8 R9 R10 R11 R12
2	47uF	CPOL-EUD/7343-31W	Dark Yellow in clear pkg *	C1 C2
1	ARDUINO-NOHOLE	ARDUINO-NOHOLE	*Arduino Only*	ARDUINO
1	CON_TERMINAL_BLOCK_03-5MM	CON_TERMINAL_BLOCK_03-5MM	Lime Green	VIN
6	LTV826S	LTV826S	Large 8 pin *	OK1 OK3 OK5 OK7 OK9 OK11
1	PI-GPIO-PTH	PI-GPIO-PTH	*Raspberry Pi Only*	SK1
12	SI4850EY-FET	SI4850EY-FET	Small 8 pin *	Q1 Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10 Q11 Q12

* check polarity

Suggested order of assembly

Start on the underside (with the public domain OSHW logo)
- R1-R12, R13-R24
- Solder jumpers as per photo

Turn the board over
- Solder jumpers along edge as per photo – **omit 5V enable and VIN enable for now (see below)**
- C1, C2, check the orientation against the photo.
- OK1,OK3,OK5,OK7,OK9,OK11 these are nice and big, easy to solder. As always start with just one pin to get the placement correct and check the orientation with the photo.
- Q1 – Q8 (take care with Q1 that there is room for the VIN connector). There are heat sinks on many of the pins. For initial placement is it best to use pin 4, the other pins will take a lot of heat to move the part once soldered. As always verify the orientation with the photo, once you are happy solder pins 5-8, then pins 1-3.
- Q9-Q12 if you want a 12 output board, do not install if you want to use JP9-JP12 as inputs.
- JP1-JP12, switch to thick solder for these and take off your SMD hat.
- VIN, again stick with the thick solder. You may need to nudge Q1 slightly on the green PCBs.

Raspberry Pi
- Install the 26 pin connector and solder away, again stick to the thick solder

Arduino
- You'll need a jig to hold the connector straight while soldering them. I have a couple of shields you can use. Insert the connectors into the PCB as per the photo then stack the shield on top to hold them in place.

Connectivity and Top Side Solder Jumpers

The VIN connector is shown here, the + signed indicated the VIN pin, the centre is ground and the far pin is 5V.

There are a number of solder jumpers on this board to provide for flexibility. The VIN-Enable and 5V-ENABLE jumpers are for advanced use. If in doubt, do not connect them.


Arduino

Connect an external supply to VIN (eg 12V) and GND only, do not connect to 5V if 5V-ENABLE is set.

VIN-ENABLE   Enable power to the attached Arduino from the VIN connector + terminal (12V max)
5V-ENABLE   Enable 5V to FET board from Arduino for low current use

Raspberry Pi

Connect and external supply to VIN and optionally 5V if 5V-ENABLE is set.

VIN-ENABLE   Unused
5V-ENABLE   Enable 5V to Raspberry Pi from Green connector, no protection, use with care
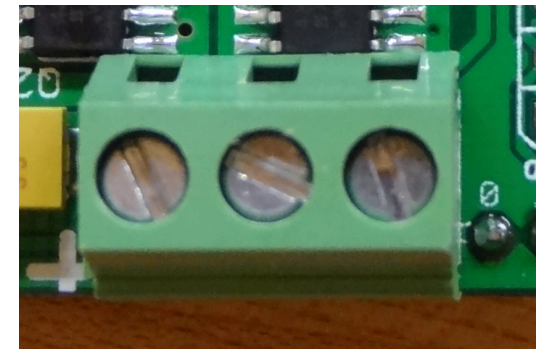
Underside Solder Jumpers

There are 8 solder jumpers on the underside for advanced use. As shown in the photos they are configured for outputs to create a 12 channel output only board. Reversing ALL the solder jumpers and omitting Q9-Q12 will allow JP9-JP12 to be used as opto isolated inputs. You will need to
- reverse all the underside solder jumpers
- omit Q9-Q12 (these will be hard to desolder without destroying them due to the heatsinking)
- Join the pads for pins 3 and 4 in place of Q9-Q12.

These features are untested, use with care, read the schematic first.

Pin Mapping for RPi and Arduino

Arduino Pin	RPi GPIO	Connector
2	GPIO7	JP1
3	GPIO11	JP2
4	GPIO8	JP3
5	GPIO25	JP4
6	GPIO9	JP5
7	GPIO10	JP6
8	GPIO24	JP7
9	GPIO23	JP8
10	GPIO22	JP9
11	GPIO21 [27]	JP10
12	GPIO18	JP11
13	GPIO17	JP12

RPi rev 2 changes are shown in []

Schematic
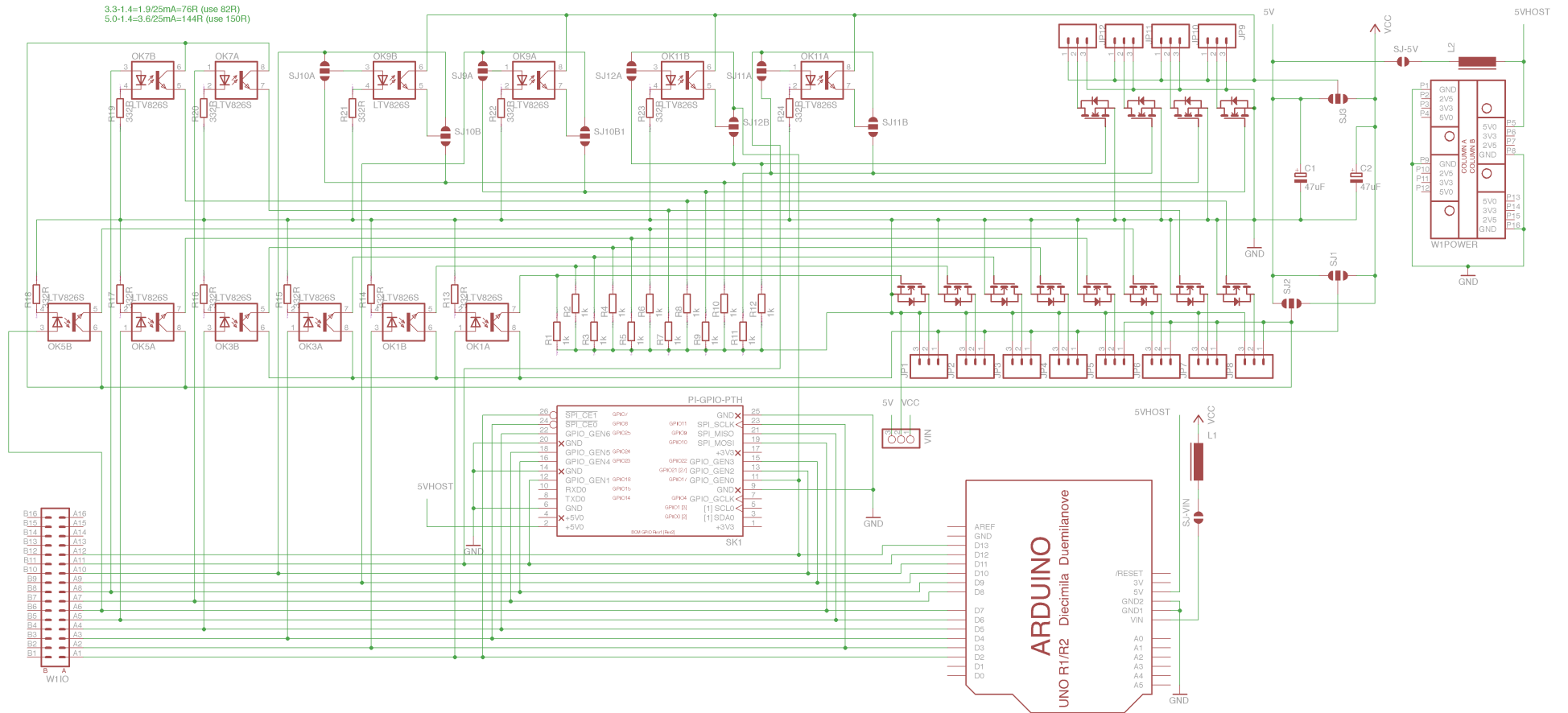
nb. the white PCB versions omit the papilio header, this is untested on the green boards.

Tom Keddie VHS, June 15, 2014, V1.0