PCB Probes

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VIEW IN BROWSER

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Summary

Probes for debugging modern high-density printed circuit boards.

12.48 hrs	11 pcs	0.30 mm	0.40 mm	PET	138 g	Prusa MK3S/S+ & MMU2S/3

Hobby & Makers > Electronics

Tags: pcb oscilloscope pogopin probes debugging

Modern high-density printed circuit boards (PCBs) are difficult to debug using regular oscilloscope probes. Keeping good contact with a trace, chip leg, or test-point is barely possible. If you need to measure more than 1 or 2 signals then you quickly run out of hands.

Here is a method for mounting a PCB on a frame of aluminum T-slot extrusions. A set of 9 clearly labelled pogo-pin probes with 3 different lengths can be moved about on the T-slot frame. The probes make good contact with the board and won't shift if you move your oscilloscope leads around or bump into the board.

I have been using these probes professionally since March 2021. This is the third version. They have increased my productivity and reduced my debugging headaches.

When you put together the T-slot frame look carefully at the pictures. You want an open end on each section so you can slide in the T-nut of the probes and move them around.

T-slot that I used is 30x30 6-series:
https://us.misumi-ec.com/vona2/detail/110302686450/?ProductCode=HFS6-3030

M4 x 12 mm socket head cap screws are used to mount the post to the T-slot,
you also need M4 T-nuts that match the profile of your T-slot extrusions. These are also used on the part that mounts the PCB to the frame.
https://www.grainger.com/product/Socket-Head-Cap-Screw-M4-0-22UC47

For each probe you will need three M3 x 10mm socket head screws and 3 brass heat set inserts size M3. These are also used on the PCB Mounts (1 each).
https://www.adafruit.com/product/4255

Pogo pins are also from AdaFruit, these are the smallest ones I could find:
https://www.adafruit.com/product/2430

After printing, clean up any rough edges and remove support material. Then add your brass heat set inserts. Assemble the Post, Arm1, Arm2, and Arm3. Use a pin to clear out the slots where your pogo-pins will go and then carefully insert them.

Use 22 AWG stranded hook-up wire. Route the wire first, then wrap the end around the pogo pin below Arm3 and solder it in place. This will prevent the pogo-pin from moving up the slot when its spring is compressed. Check the pictures to see how the wire is stripped and routed.

OpenSCAD source files are included so you can modify the parts to fit your particular PCB. The part called “Mount” is most likely to need adjustment since not all PCBs will have holes in the same location.

I print these parts in PetG, use 2 or 3 perimeters, 20% triangular infill, 0.3 mm layers. Be careful how you orient the parts on the build plate! Notes on each file show which ones need support.

Model files

arm1-40mm.stl

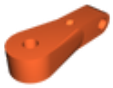
❑ Single Arm1 with 40 mm length, no support required

arm1-50mm.stl

❑ Single Arm1 with 50 mm length, no support required

arm1-60mm.stl

❑ Single Arm1 with 60 mm length, no support required



arm2.stl

❑ Single Arm2, use support, place with larger heat set hole facing up, use support

arm3.stl

❑ Single Arm3, place with pogo pin slot leaning back, use support

posts1-3.stl

❑ Posts 1-3, place with big numbers facing down, no support required

posts4-6.stl

❑ Posts 4-6, place with big numbers facing down, no support required

posts7-9.stl

❑ Posts 7-9, place with big numbers facing down, no support required

mount.stl

❑ Lay this with the T-slot side down, use support

washers.stl

❑ Easy one! Use 5 perimeters to get a solid print, no support

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tplug.stl

❑ Optional plugs for raw ends of T-slot, print with big side down, no support

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arm2x9.3mf

❑ Project file for 9x Arm2, uses support

arm3x9.3mf

❑ Project file for 9x Arm3, uses support

posts1-3.3mf

❑ Project file for Posts 1-3 and 3x Arm1 40 mm

posts4-6.3mf

❑ Project file for Posts 4-6 and 3x Arm1 50 mm

posts7-9.3mf

❑ Project file for Posts 7-9 and 3x Arm1 60 mm

washers.3mf

❑ Project file for Washers

mount-x6.3mf

❑ Project file for Mounts

tplugs.3mf

❑ Project file for T-plugs

posts1-3-multi.3mf

MultiColor Project file for Posts 1-3, Colors 1 and 2, 3x Arm1 40mm

posts4-6-multi.3mf

MultiColor Project file for Posts 4-6, Colors 1 and 3, 3x Arm1 50mm

posts7-9-multi.3mf

MultiColor Project file for Posts 7-9, Colors 1 and 4, 3x Arm1 60mm

pcbprobe.scad

Source code for the Probes

tslot.scad

Source code for the T-slot and corner braces

rounder.scad

Source code for rounding corners, making bevels and fillets

tplug.scad

Source code for end plugs that fit the T-slot

Print files

posts1-3_2h17m.gcode

PET 0.40 mm 0.30 mm 2.28 hrs 27 g

Prusa MK3S/S+ & MMU2S/3

Single color, Posts 1-3, and 3x 40mm Arm1, no support

posts4-6_2h21m.gcode

PET 0.40 mm 0.30 mm 2.36 hrs 28 g

Prusa MK3S/S+ & MMU2S/3

Single color, Posts 4-6, and 3x 50mm Arm1, no support

posts7-9_2h29m.gcode

PET 0.40 mm 0.30 mm 2.48 hrs 29 g

Prusa MK3S/S+ & MMU2S/3

Single color, Posts 7-9, and 3x 60mm Arm1, no support

arm2x9_1h14m.gcode

PET 0.40 mm 0.30 mm 1.23 hrs 11 g

Prusa MK3S/S+ & MMU2S/3

Nine copies of Arm2, uses support

arm3x9_43m.gcode

PET 0.40 mm 0.30 mm 0.72 hrs 5 g

Prusa MK3S/S+ & MMU2S/3

Nine copies of Arm3, uses support

mount-x6_1h44m.gcode

PET 0.40 mm 0.30 mm 1.73 hrs 17 g

Prusa MK3S/S+ & MMU2S/3

Mounting brackets to attach the PCB to the frame, six copies

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washers_6m.gcode

PET 0.40 mm 0.30 mm 0.11 hrs 1 g

Prusa MK3S/S+ & MMU2S/3

tplugs_1h34m.gcode

PET 0.40 mm 0.30 mm 1.57 hrs 20 g

Prusa MK3S/S+ & MMU2S/3

Optional plugs for the raw ends of the T-slots, 4 copies

posts1-3-multi_2h23m.gcode

PET 0.40 mm 0.30 mm 2.38 hrs 27 g

Prusa MK3S/S+ & MMU2S/3

Colors 1 and 2, Posts 1-3, and 3x 40mm Arm1

posts4-6-multi_2h28m.gcode

PET 0.40 mm 0.30 mm 2.46 hrs 28 g

Prusa MK3S/S+ & MMU2S/3

Colors 1 and 3, Posts 4-6, and 3x 50mm Arm1

posts7-9-multi_2h35m.gcode

PET 0.40 mm 0.30 mm 2.59 hrs 30 g

Prusa MK3S/S+ & MMU2S/3

Colors 1 and 4, Posts 7-9, and 3x 60mm Arm1

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