G10 Carrier Board for RMD 8x8 mm^2 APDs

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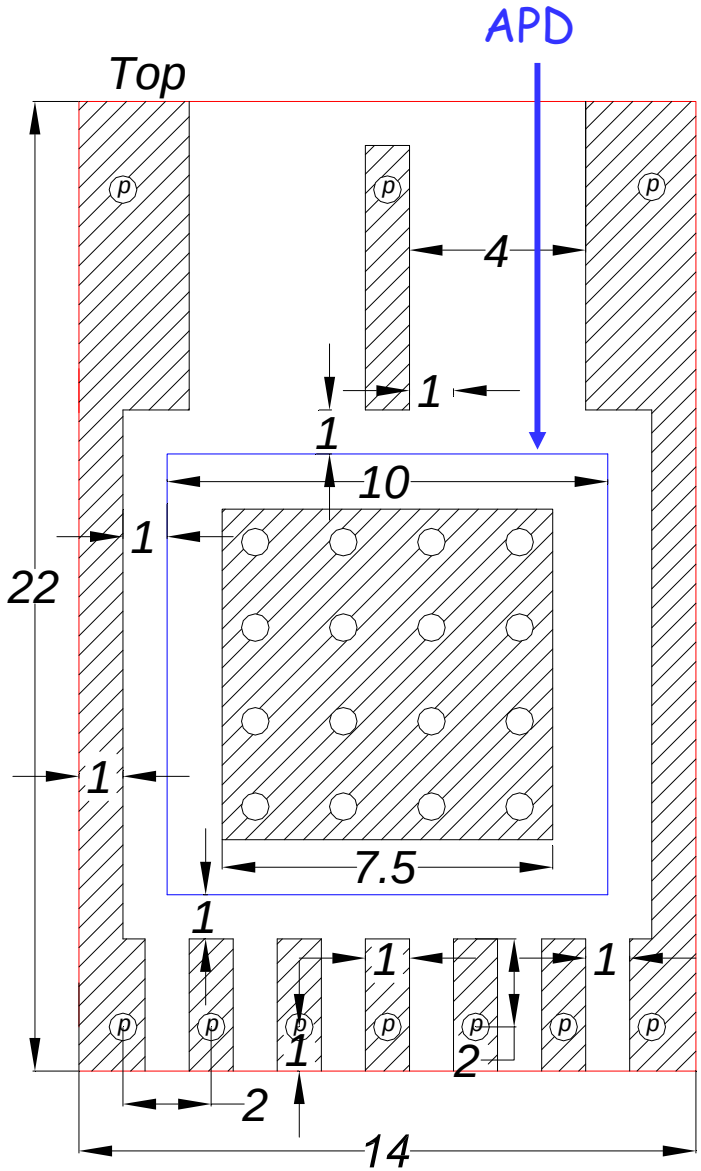
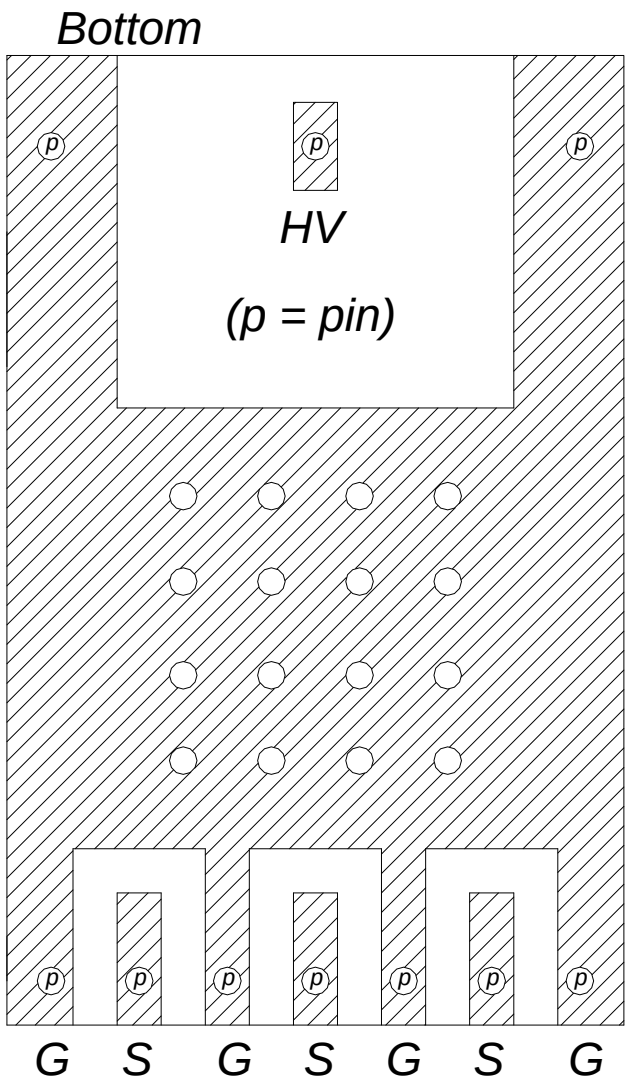
First try at a layout, 3/22/17:





G10 carrier board is 14x22 mm^2.

APDs have 10x10 mm^2 total area, mounted on the top of the carrier board.

APD bottom contact is 7.5x7.5 mm^2.

All vias are plated thru, and have pins, soldered on the bottom side.

Wire bonds connect the HV and S (signal) solder pads to the APD.

The HV pad, and the HV wire bond, are encased in conformal coating, on both top and bottom of the carrier board.

Pins

Pins to be Mill-Max 4184-0-00-15-00-33-0 "nail head" type, for 0.014" holes.
https://www.mill-max.com/assets/new_products/PCB%20Pins.pdf

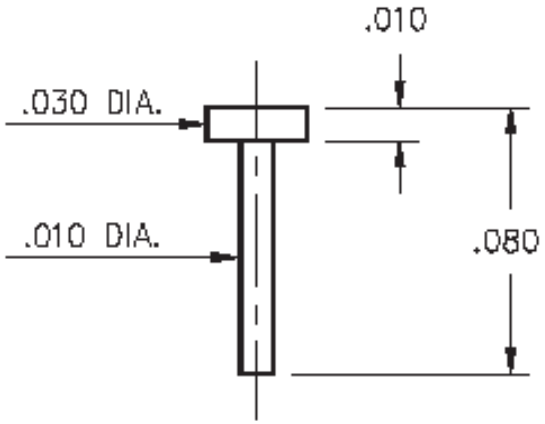
Wire bonds will be made to the flat top of the pin.

Soldering of the pins to the carrier board should be done on its bottom (so no solder on top.)

4184

4184-0-00-XX-00-00-33-0

Solder mount in .014 mounting hole



SPECIFICATIONS:

Pin Material: Brass Alloy 360, 1/2 Hard
(Except where noted)

Dimensions: Inches

Tolerances On: Lengths: ± .005
Diameters: ± .002
Angles: ± 2°

RoHS-2 2011/65/EU

ORDER CODE: XXXX - X - 00 - XX - 00 - 00 - XX - 0

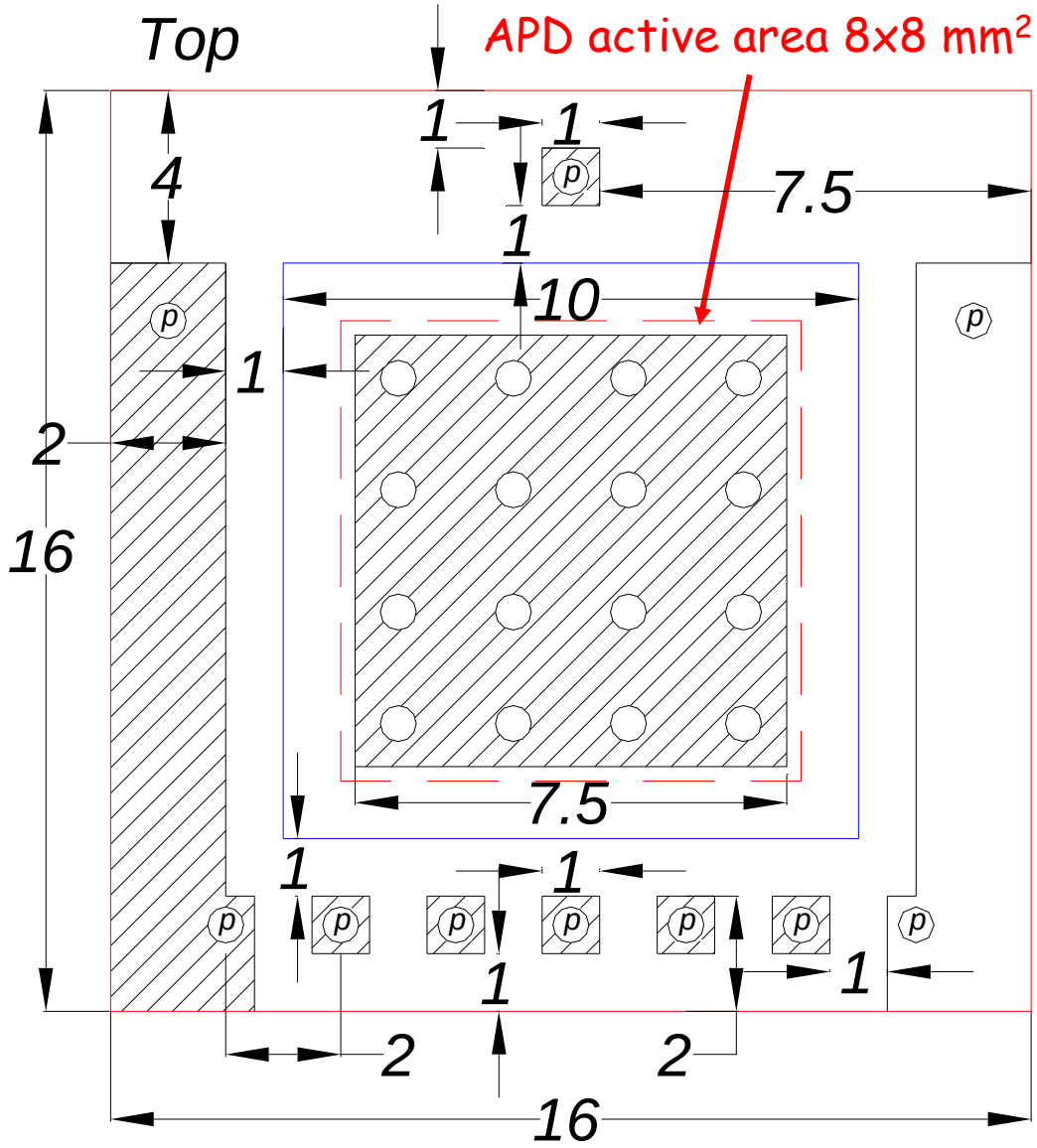
BASIC PART #

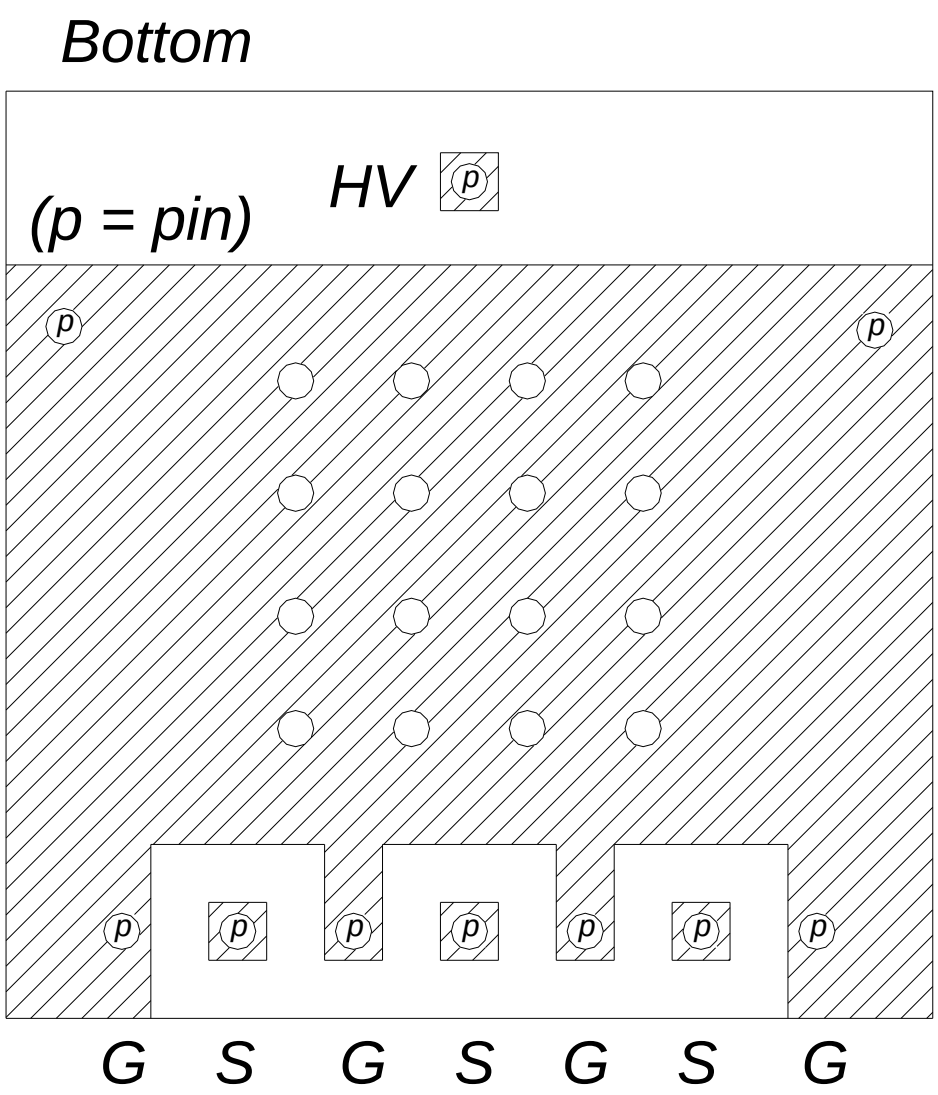
SPECIFY PIN FINISH:

- **01** 200 µ" TIN/LEAD OVER NICKEL
- **80** 200 µ" TIN OVER NICKEL (RoHS)
- **15** 10 µ" GOLD OVER NICKEL (RoHS)
- **21** 20 µ" GOLD OVER NICKEL (RoHS)
- **34** 50 µ" GOLD OVER NICKEL (RoHS)

Tiling

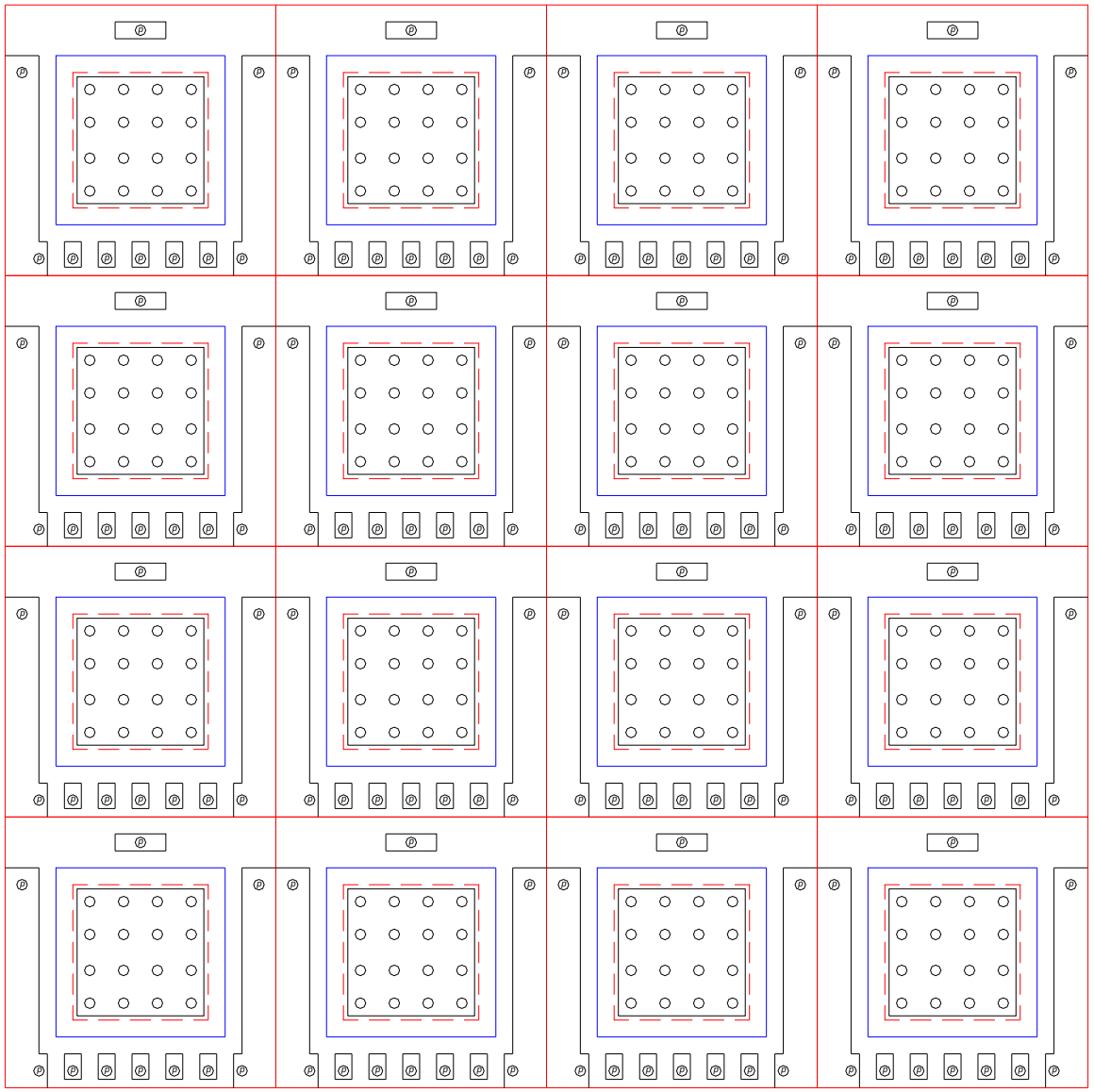
The active area of an APD is 8x8 mm^2.
So, to make a square tiling of such APDs, they could be on a carrier board that is 16x16 mm^2, with 25% active area per layer of tiling, and 4 tiling layers for 100% active area.
The carrier board:



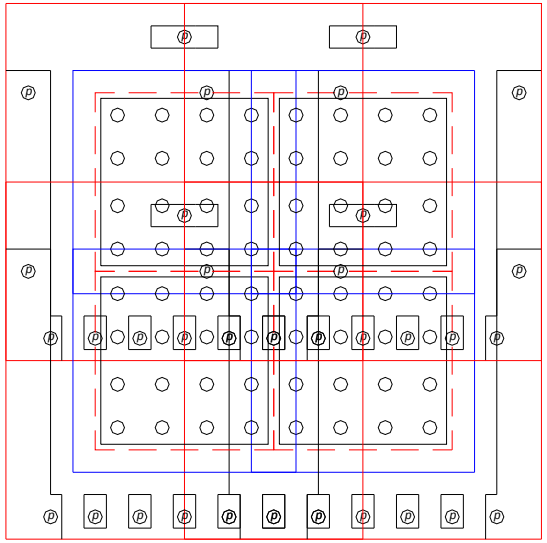


Tiling, II

A single tiling layer, with a 4x4 array of APDs; active area is 25%.



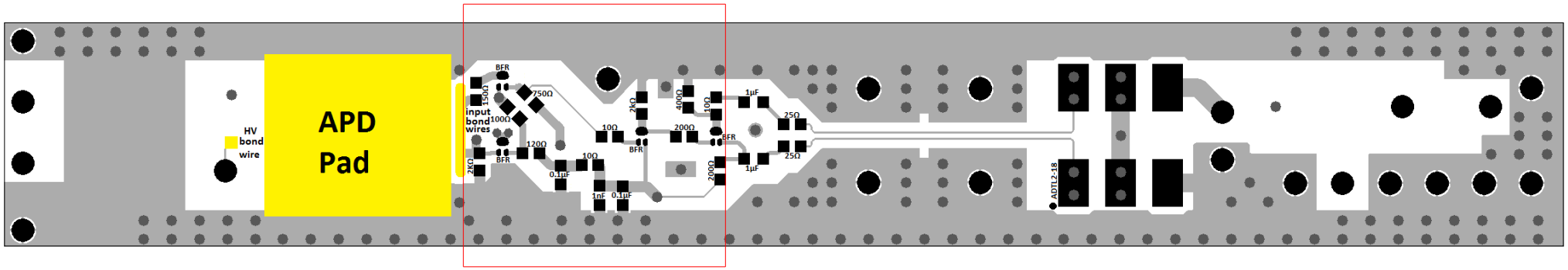
One APD on each of 4 tiling layers, showing how 100% coverage is thereby obtained



The Penn preamps would be laid in a similar array, with external HV, DC and signal connections along, say the left edge. A multilayer board would facilitate this.

Preamp

The present Penn preamp is shown below, together with an indication of the 16x16 mm^2 footprint of the proposed carrier board.



16x16 mm^2 footprint of proposed carrier board

The surface-mount components of the preamp should be rearranged to fit within this footprint on bottom side of the preamp board, with the HV connection (and the sockets for the pins of the carrier board) on the top side.

The low-voltage power conditioning, and the signal and HV connectors, will be outside the footprint of the preamp itself, as on the present board. This items should be on the top side of the new preamp to facilitate stacking of the preamp + APD units into a relatively compact 4-layer detector.

The new preamp will include diode protection, and a test-pulse input.