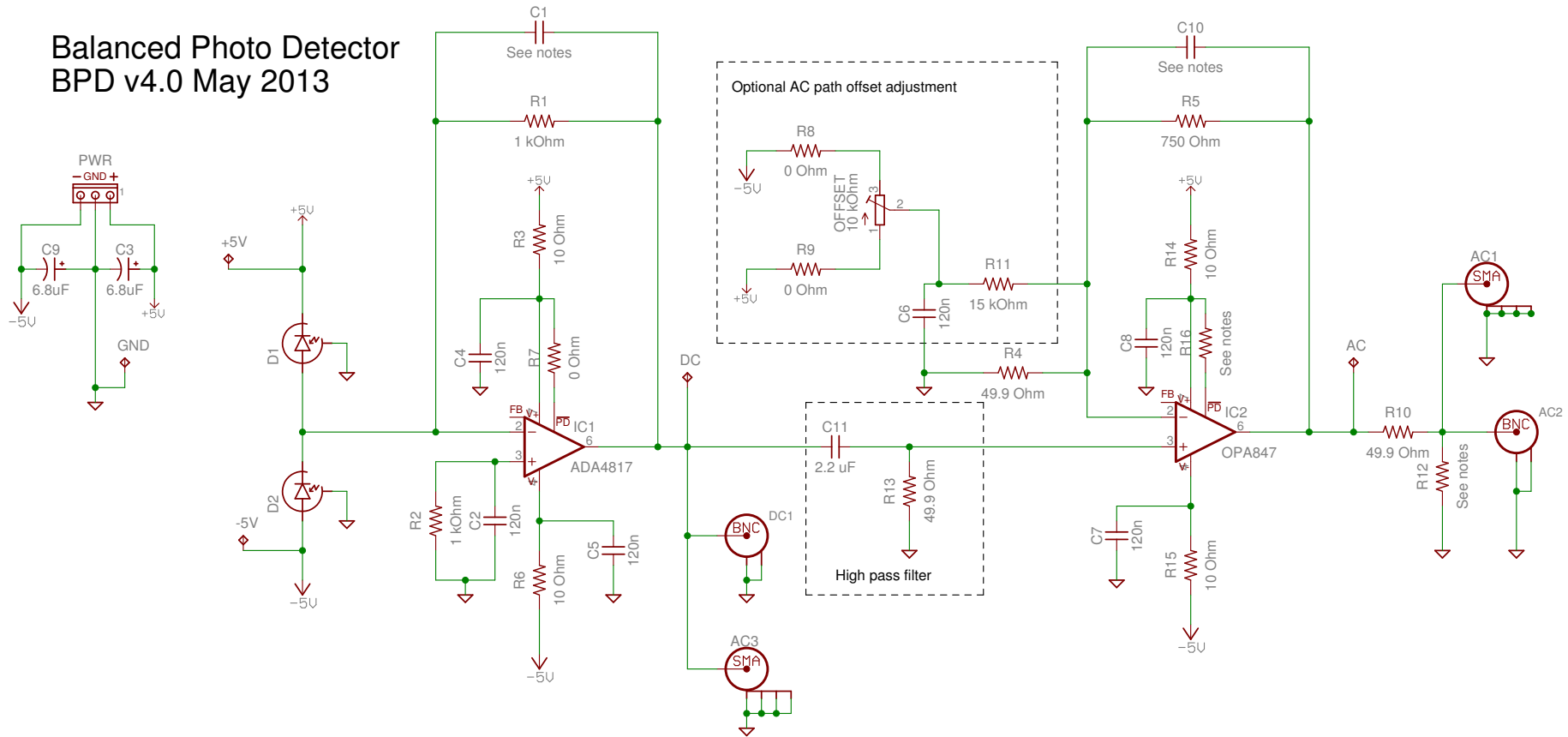


Balanced Photo Detector BPD v4.0 May 2013



Notes:

- Note1: The most critical is a choice of the photo diodes (look for the smallest capacitance) this will define the choice of 1st stage amplifier and feedback resistor/capacitor combos.
 Note2: Once PDs are chosen think about BW or speed of the circuit. Looks like ADA4817 is an excellent choice for a first stage, but if higher gain and thus slower speed is required, OPA27 or OPA37 are great too.
 OPA27 and OPA37 could be used instead of ADA4817 but note that it will drop the bandwidth by about factor of 10. But OPA27 and OPA37 have smaller quiescent current so they will have longer work time when hooked to the batteries.
 Note3: Read the spec of you amplifiers! Some have power on pin which need to be tight to high. For example ADA4817 MUST have R7 installed (this just a jumper), OPA847, strictly speaking, should have it too, but it works without it just fine.
 But if you use OPA27 or OPA37 make sure that they R7 and R16 are removed, i.e. jumpers are open.
 Note4: Note 10 Ohm resistors R3, R6, R14, R15, numbers should be kept relatively small and 0 Ohm (jumper) is fine as well, higher values provide better high frequency power noise rejection.
 Note5: Values of all but feedback capacitors are for guidance. These values can be easily changed by factor of 2 or more.
 Note6: With shown choices of components C10 do not need to be installed. If second stage oscillate put the appropriately chosen capacitor.
 Note7: R12 does not need to be installed. But in some designs we see misbehaviour of OPA847 which was fixed by R12=1 kOhm suggested by the datasheet.

Some tried and proven to work circuits
 Devices #1 and #2
 Built for Yanhong group.
 Photodiodes: Hamamatsu S3883 (6pF capacitance with 5V biasing)
 R1=R2=1 kOhm and C1=3.9 pF, the rest according to schematic.
 R12, R16, and C10 are not installed.

Device #3
 BPD based on Hamamatsu S5106 (~40pF capacitance)
 R1=R2=10 kOhm, C1=1.9 pF, the rest according to schematic.
 R12, R16, and C10 are not installed.
 Note: Circuit seems to be stable regardless of hook up to the DC output
 Note: First stage might oscillate if DC output directed to high impedance load with long high capacitance cable. Think Oscilloscope connected by long BNC cable.
 To avoid this terminate the cable with 50 Ohm or switch input impedance to 50 Ohm on the scope. Will behave fine if hooked to spectrum analyzer which generally have input impedance of 50 or 75 Ohm.

TODO:
 Add 50 Ohm resistor between 1st amplifier and DC output