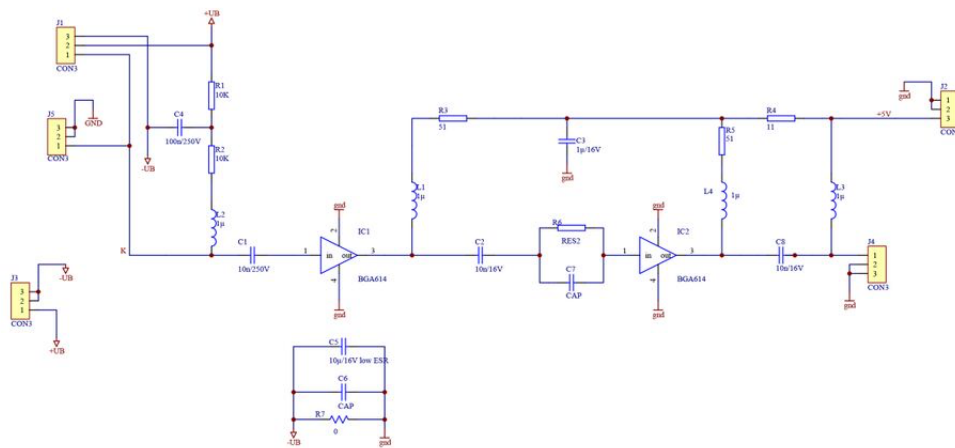


Preamplifier

The preamplifier boosts the SiPM's very small signal amplitude by $\sim 20\text{dB}$ and should be located as close as possible to the SiPM itself in order to maintain an acceptable signal-to-noise ratio (SNR). Therefore, a plug-on PCB for the SiPM board in the same form factor was designed, which shall be as versatile as possible in order to adapt for different read-out concepts with the following properties:

- supply of the SiPM bias voltage through the preamp including bias filter
- AC-coupling of the preamp input
- based on low-noise Infineon MMIC BGA614 (<https://www.infineon.com/cms/en/product/rf-wireless-control/low-noise-amplifier-lna-ics/general-purpose-lnas/bga614/>)
- mounting option for one (default, positive output) or two MMIC stages (negative output)
- options for preamp voltage supply (+5V): either via separate connector (J2) or remote powering via output signal (default)



Preamplifier schematic

For the different operation modes, the following **mounting options** are offered (unmentioned components are identical as indicated in the schematic or as in the default option):

Default (single-stage, remote powering)

- do not mount: IC2, C5, C6, L4, R5, C7, J2, J5
- mount: R7 (0R), R6 (0R), C2 (0R), connect IC2 pins 1 to 3 (e.g. with edge mounted 0R resistor)

Dual-stage

- mount: IC2, R6/C7 = pole-zero-cancellation network (e.g. 47R/22p)

Separate power supply connection

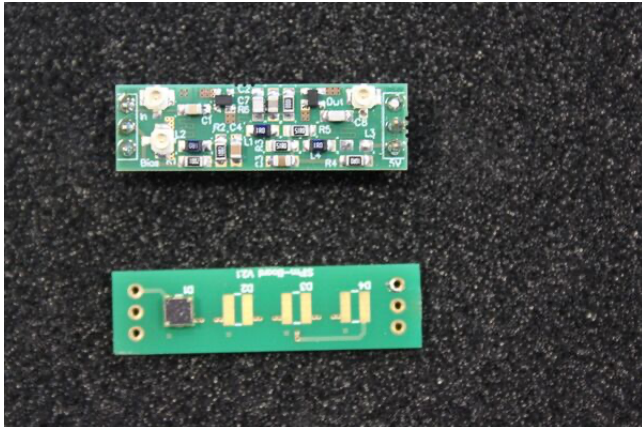
- do not mount: L3
- mount: J2

Floating bias voltage supply (galvanically isolated from signal GND)

- dnm: R7
- mount C5, C6

General purpose 50 Ω RF amplifier (no SiPM, signal input via u.Fl socket J5)

- dnm: J1, J3, R1, R2, L2
- mount: J5



mounted preamp (top) and photosensor PCBs (bottom) with one instrumented SiPM



Mounted preamp plugged on the pin headers of the SiPM board of an assembled detector plate

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