QICK System RF In board

Daughter board for the QICK system

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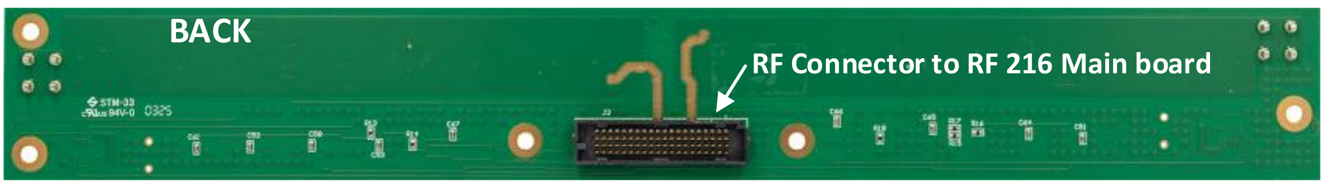
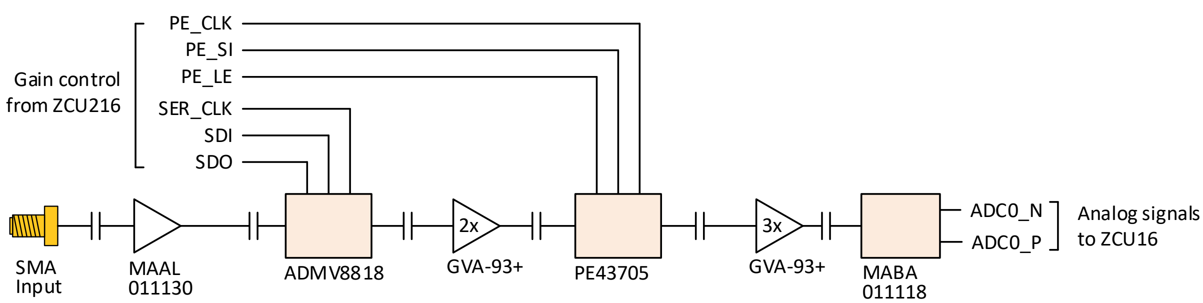
The **RF In** is an accessory daughterboard for the QICK system that mounts directly onto the QICK RF216 Main Board, providing two user-configurable RF input channels to enable flexible signal acquisition for quantum control applications. In a typical setup, the RF In board is installed on the RF Main Board within a QICK enclosure, with its SMA input connectors routed to the enclosure's front panel SMA ports using the included coaxial cables.



The RF In board features a highly configurable analog signal chain with user-programmable gain and filtering, enabling precise RF signal conditioning over a broad frequency range. These configurable elements are controlled through a software interface provided with the QICK system, allowing for seamless integration and straightforward user control.



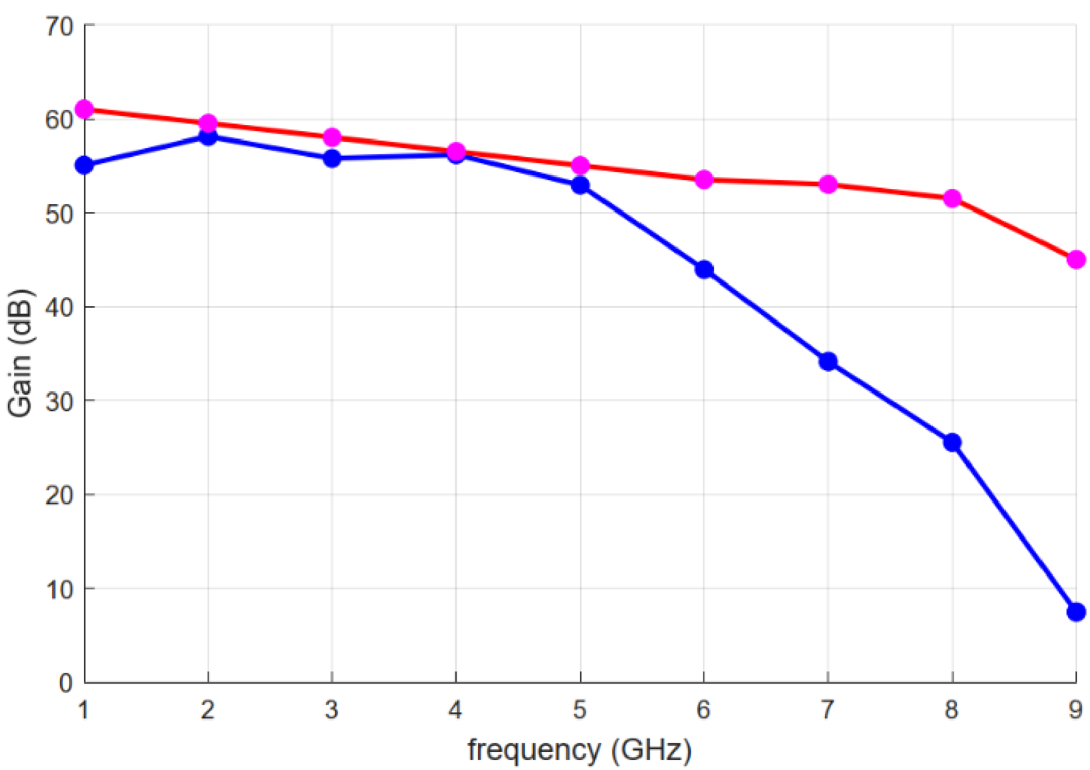
From input to output, the analog signal processing chain includes:

- A Macom MAAL-011130 low noise amplifier that provides a 50-ohm input and a fixed gain of approximately 19 dB for input frequencies up to 18 GHz
- An Analog Devices ADMV8818 digitally tunable filter that contains four independently controlled high-pass and four low-pass filters, and that can achieve tunable band-pass, low-pass, high-pass, all-pass, or all reject responses from 2GHz to 18GHz

- Two Mini-Circuits GVA-93+ low-noise amplifiers that each provide 15 dB of gain from 0.05-9 GHz
- A pSemi PE43705 programmable attenuator that provides up to 32 dB of programmable attenuation in monotonic .25, .5 or 1 dB steps across a range of 50MHz to 8GHz.
- Three Mini-Circuits GVA-93+ low-noise amplifiers that each provide 15 dB of gain from 0.05-9 GHz
- A Macom MABA-011118 balun that converts the single-ended RF signal to a differential signal for delivery to the ZCU216 board.

This signal chain offers a wide 30 dB control range for incoming analog signals, with total gain spanning from 60 to 90 dB, depending on the signal frequency.

The plot below was produced with the step attenuator set to its maximum of 30dB, and shows the measured transfer function of the overall signal chain in blue, and the theoretical transfer function in red. The difference between the red and blue traces is due to the ADC response and losses from the long PCB traces.



For more information and additional performance plots, see the QICK system whitepaper (see link on Real Digital's QICK webpage).