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Design and performance of the Majorana low-noise low-background front-end electronics¹ NICOLAS ABGRALL, Lawrence Berkeley National Laboratory, MAJORANA COLLABORATION — The Majorana Demonstrator will search for the neutrinoless double beta decay ($\beta\beta(0\nu)$) of the isotope ^{76}Ge . In view of the next generation of tonne-scale germanium-based $\beta\beta(0\nu)$ -decay searches, a major goal of the Majorana Demonstrator is to demonstrate a path forward to achieving a background rate at or below 1 cnt/(ROI-t-y) in the 4 keV region of interest (ROI) around the 2039-keV Q-value of the ^{76}Ge $\beta\beta(0\nu)$ -decay. Such a requirement on the background level significantly constrains the design of the read-out electronics which is further driven by noise performances. We present here the low-noise low-background front-end electronics developed for the low-capacitance P-type point-contact (PPC) germanium detectors of the Majorana Demonstrator. This resistive-feedback front-end, specifically designed to have low mass, is fabricated on a radioactivity-assayed fused silica substrate where the feedback resistor consists of a sputtered thin film of high purity amorphous germanium and the feedback capacitor is based on the capacitance between circuit Au traces. Performance studies of the front-end and associated back-end electronics in single and multi-detector systems, as well as on-site performances are reported.

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