

Abstract—The ability to use CMOS devices at extreme cold temperatures is an enabling technology for micro spacecraft, which has the potential to lower per unit spacecraft costs. In almost all cases the benefit of the decrease of the volume, mass and power of a micro-spacecraft is completely lost by having to operate miniaturized systems at standard electronic component temperature ranges. While custom CMOS devices should be developed for cold temperature operation in some cases, the ability to take advantage of the economies of scale of currently available commercial and space CMOS devices allows one to utilize standard electronics capabilities in extreme cold temperatures environments. Through our previous work we have developed a design paradigm and component qualification method that allows for the use of commercial and space rated parts at LN₂ temperatures. Our current work is looking into lifetime reliability issues involved in operating CMOS devices at extreme temperatures, particularly hot carrier injection effects on MOSFET-based devices. Design methodology and results of operation and lifetime tests will be discussed.