



Design of a radiation hard and low power 16-bit digital-to-analog converter based on sigma-delta modulation

W. Magnes (1), D. Fischer (1), A. Valavanoglou (1) and G. Fremuth (1)

(1) Space Research Institute, Austrian Academy of Sciences, Graz, Austria

Radiation hard digital-to-analog converters (DACs) with more than 12-bit output precision and moderate power consumption - which are at the same time tolerant to more than 100 krad of total ionizing dose (TID) - are of special interest in many applications aboard space missions either orbiting in the midst of the planet's radiation belts (especially for the Earth and Jupiter) or flying towards the Sun (e.g. BepiColombo to Mercury and Solar Orbiter). There is just the problem that such DACs are practically not available on the space components market. This fact triggered the development of a discrete fifth-order sigma-delta DAC based on radiation hard components from Actel (FPGA), Intersil (analog switch) and Linear Technology (voltage reference and operational amplifier). The presentation comprises the system level and FPGA design, Matlab based simulations as well as test results from a laboratory model.