Abstracts

Steady state thermal analysis and high-power reliability considerations of RF MEMS capacitive switches

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This paper presents a detailed steady-state thermal analysis of RF MEMS capacitive switches. In the up-state position, the maximum temperature on the bridge occurs at the center and is only 50/spl deg/ and 70/spl deg/C for 1 /spl mu/m-thick gold and aluminum membranes, respectively, for a power dissipation in the bridge of 20 mW. This corresponds to an incident RF power of 10 W for C/sub u/ = 100 fF at 12 GHz (or C/sub u/ = 35 fF at 35 GHz) and R/sub s/ = 0.5 /spl Omega/. In the down-state position, it is shown that the bridge temperature does not increase considerably for an incident power of 1 W, and therefore, does not contribute to the reliability problems at high RF powers. On the other hand, it is our opinion that the RF current density on the leading edge of the bridge membrane is the main factor of the failure of MEMS capacitive switches at high RF powers. Two-dimensional temperature measurements are currently being done at Rockwell Scientific, and will be presented at the conference.

❑ Return to main document.