

{111} Si Etched Planar Electrical Contacts for Power MEMS-relays

A.C. Weber, A.H. Slocum

Department of Mechanical Engineering, Massachusetts
Institute of Technology
77 Massachusetts Avenue, Room 3-470
Cambridge, MA, USA
aleweber@mit.edu

J.H. Lang

Department of Electrical Engineering and Computer
Science, Massachusetts Institute of Technology
77 Massachusetts Avenue, Room 10-176
Cambridge, MA, USA

Abstract— We presents the design, fabrication and testing of high-performance electrical contacts used in a MEMS-relay for power applications. Power handling and heat dissipation are important requirements for electrical contact surfaces including microsystems, probes and interconnects. Whereas low-power MEMS-based RF switches have been vigorously studied [1-5], few studies have been reported on high-power MEMS contacts. The MEMS device here presented is capable of make-break switching, has large contact travel, in the order of 10's of μm and low contact resistance, in the order of 120 $\text{m}\Omega$. Testing has demonstrated current carrying capacity in the order of several ampere and hot-switching of inductive loads, in the order of 10mH, without performance degradation.

The MEMS-relay is bulk micromachined in single crystalline silicon and bonded to a glass substrate. Anisotropic etching is used to fabricate smooth and parallel (111) contact surfaces having nanometer-scale surface roughness. The silicon contacts are evaporated with a conductive film. A thermal oxide layer provides insulation between the actuators and the contacts. The MEMS-relay features a compliant mechanism and a pair of rolling-point "zipper" [6,7] electrostatic actuators. The contacts are mechanically and electrically characterized

prior to, during and after "hot-switching" of resistive and inductive loads.

Note: Exact dimensions and detailed performance data will be reported at the Holm 2007 Conference upon approval from our project sponsors. Said approval is expected by January 18th of 2007.

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