

## Electrical contact reliability in a magnetic MEMS switch

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A magnetically actuated microswitch, hermetically packaged and fully SMT-compatible is developed at Schneider Electric. The device is a dry ohmic contact switch fabricated in MEMS technology. A ferromagnetic membrane actuated by means of an external moving magnet allows the electrical contact to be established with a contact resistance  $R_c < 1\Omega$ .

Reliability of gold and ruthenium sputtered contacts has been studied under different voltage and current loads. Operational lifetime in excess of several  $10^6$  cycles has been observed for 5V/1mA hot switching conditions. 14V/10mA hot switched lifetime is slightly reduced to several  $10^4$  cycles, while mechanical lifetime is quasi infinite. Failure modes have been clearly identified: under low load, contact carbonation and bridge transfer generate a huge  $R_c$ ; higher load leads to arc erosion and a death by welding of the contacts. Work is in progress to further enhance device lifetime.

Such a device presents unique advantages over traditional solutions: ultra small size, zero electrical consumption and highly repeatable operating point. This makes the Schneider Electric microswitch highly attractive for replacing traditional reed switches or hall sensors in detection applications.

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