

**Evaluation of Thermo-Mechanical Stability of COTS Dual-Axis
MEMS Accelerometers for Space Applications**

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Dual-axis, surface micromachined accelerometers ADXL250 were subjected to multiple temperature cycles in the range from $-65\text{ }^{\circ}\text{C}$ to $+150\text{ }^{\circ}\text{C}$ and to mechanical shocks of 2000 G in X and Z directions. Parameters of the parts were measured periodically during the testing. No failures or any changes in the parameters were observed after 1000 temperature cycles and 30,000 shocks in Z direction. All parts except one withstood 10,000 shocks in X direction. Subsequent analysis of the failed part showed that the failure was due to a small particle, which chipped out from the package and wedged the fingers of the capacitor sensor. SEM examinations of the sensors did not reveal any microcracks or other fatigue related defects in the failed or normal parts after thermo-mechanical testing. The results demonstrated that mechanical robustness of the micromachined accelerometers is adequate for most aerospace applications, provided a proper control and qualification of the packaging materials and processes is performed. Additional thermo-mechanical evaluation testing has been under progress for Motorola MMA1201P single-axis MEMS accelerometers and the effect of extreme cold temperature thermal cycling (-125°C to 90°C) on the ADXL 250 characteristics will be reported.