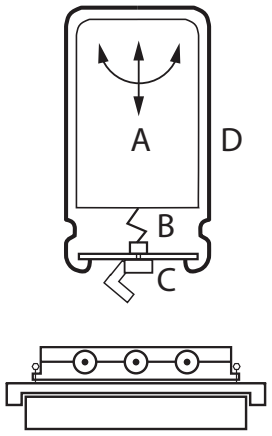
DID YOU KNOW?

VIBRATION RESISTIVITY

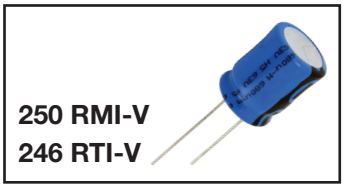
THE ART AND SCIENCE OF USING ALUMINUM ELECTROLYTIC CAPACITORS

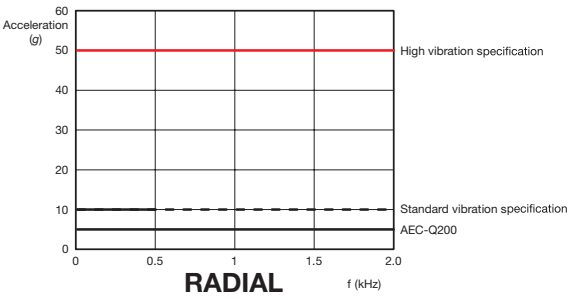
Aluminum capacitors large, heavy, and sensitive to mechanical vibration. In the drawing below you can see where the winding element A is connected to the soldering terminals C via small aluminum strips (tabs) B. Apart from normal “push-pull” forces during vibration testing, these tabs can also experience torque due to rotational forces. Long term mechanical stress on these tabs could lead to breakage, resulting in the open circuiting of the capacitor.

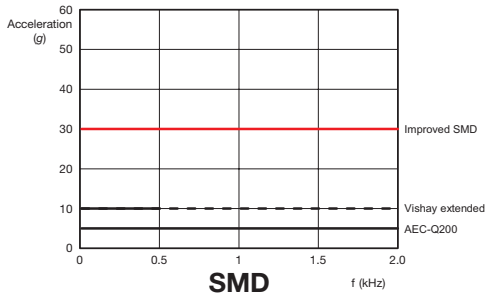


For this reason IEC has defined standard vibration tests for electrolytic capacitors. The cans of the device are clamped to a vibration frame and subjected to forces in two or three perpendicular directions, with a typical amplitude of 0.75 mm and acceleration of 10 g. These tests have predictive power for movement of the winding relative to the can (D), meaning the stiffness of the internal construction. But they do not say anything about what could occur when the PCB material is too weak, or in the case of resonances.

Improvements to the internal robustness of the capacitor can be made by providing a more rigid axial or radial fix for the winding element. Some Vishay series improve the vibration sensitivity capability up to 50 g, which is five times the requirement of the IEC test.







During vibrations, the heavy parts could easily break loose from the PCB. Therefore, care has to be taken in regards to PCB thickness and fixation of the capacitor to the board. Relatively unknown is the appearance of resonances during vibrations. Cases have been reported in which the actual measured vibrational accelerations at the capacitor location gained up to a factor of 50 relative to the pre-set test conditions.

Therefore, care has to be taken in regards to the rigidness of the construction around the capacitor area on the PCB, e.g. with the help of screws to fixate the PCB to the housing. Here, the use of damping material between the PCB and housing could also help to prevent the appearance of resonances.

For more details on solving vibration issues, contact your local Vishay sales account.

aluminumcaps1@vishay.com