

Drop Simulation of Disposable Elastomeric Pump Using COMSOL Multiphysics® Software

R. Kapuganti¹, S. Anbazhagan¹

¹HCL Technologies, CHennai

Abstract

Drop test simulation is one of the important tool used for the impact behaviour study of electronic components. It identifies the flaws in design. The reliability and performance of electronic consoles after the drop is a major concern. Devices are expected to continue functioning after suffering a drop.

The model is allowed to fall freely due to gravity load application. Drop test standard IEC 61010-1:2010 Section 8.3 is used in the analysis. "As per the standard, device has to be tilted about each bottom in turn, so that the distance between the test surface & opposite edge is 100 mm for equipment up to 20 Kg or the angle may be 30 degrees whichever is less severe." The drop test is performed on concrete surface and assembly is dropped at 5 different orientation.

The product-level drop test requires great effort in controlling the impact orientation, which is critical to ensure the consistency of test results. Several effects of test variables like PCB supports, casing shape, and battery weight distribution are carefully studied case by case.

Using a special drop tower with guiding frame for controlled-angle free-fall drop, products are dropped at different angles and the acceleration is recorded both on the outer case and on an internally-mounted plate.

A simplified analytical procedure, suitable for conceptual design purposes, is proposed for predicting the resulting dynamic response evaluated for their free-fall drop response. For this purpose, miniature accelerometer and strain gauges were attached to various locations on the component board inside the product covers.

Stress, deformation and strain plots for the components are analysed in order to understand the failure locations.

Energy plots (Kinetic energy, Impact force and Internal Energy) for the assembly are analysed to understand the energy distribution in various components.

Electronic package failure zone from simulation results were correlated with test data output.