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Statistical approach for determination of usage environments

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Tiivistelmä-Referat-Abstract
The objective of the thesis was to utilize the measured temperature- and relative humidity data in order to determine the usage environment of mobile phones. New statistical method for lifetime prediction of solder joint is represented in this study. Two fundamental theories of statistics that are the basis for the method are also represented. The data were also utilized for three physical lifetime estimating models. The measured temperature data were parametrized for the lifetime estimations. The effects of three usage environments to the lifetime of solder joint were studied by using represented models and the results were compared.

The average values and standard deviations were calculated from the temperature- and relative humidity data. The Measured data were also presented in 3D-figures of the temperature and relative humidity. Average values of temperature varied between 22 – 30 ˚C and values of relative humidity between 30 – 50 %. The measured usage environments were also divided into meteorological regions, and global coverage of measurements was also discussed.

The measured temperature data was simplified by linearization and parameters for lifetime estimations were calculated. Four moments of the original and the modified data were calculated and compared in order to check the representativeness of the modified data. The information of the modified data corresponded with the original data, and therefore, it could be utilized in the lifetime estimation models.

The severity of usage environments was studied by estimating the lifetime of the solder joint. The fatigue of the solder joint caused by climatic temperature variation was observed to be the most severe in the low temperature environment. Severity of the temperature cycling environment was higher than than that of the high temperature environment, which was observed to be the least severe environment.

Results from this study can be utilized in developing of testing- and design guidelines, as a stress factor in simulation models, in usage environment profiling and in international standardization work.

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