Supervisor's Report on Diploma Thesis

Influence of mechanical stress on properties of conductive adhesive joints

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Usman Tariq has processed a diploma thesis focused on the area of investigation of properties of nature friendly joining conductive materials for electronics, especially electrically conductive adhesives. He has investigated the changes of electrical properties of adhesive joints after their long-time exposition under static mechanical load, and, in lower volume, on changes of electrical properties of the joint caused by mechanical load generated by ultrasound as well. Investigation of these materials is very significant, especially at the time, when using of lead-tin alloys for conductive joining in electronic is strongly limited by RoHS (Restriction on Hazardous Substances) Directive of EU.

Area of electrically conductive adhesives has not been unknown to Mr. Tariq, because he has successfully passed through the course "Materials for power electrical engineering". On the other the student has also had to become acquainted with the technology of adhesive assembly of SMT passive components, with measurement of the adhesive joints resistance and measurement of nonlinearity of the current-voltage characteristic of the joints. Theory as well as practical using of these measurements are not simple and have been absolutely new for him. From this point of view I mean that as for the difficulty of the topic the thesis has overflowed the level of a standard diploma thesis.

Mr. Tariq has fabricated high number of adhesive joints by assembly of SMT resistors on test PC boards. He had to handle the fitting of electronic components by adhesive assembly, especially by stencil printing and by mounting of the resistors using a pick-and-place machine. Then he has measured the starting values of the adhesive joints resistance and nonlinearity and the assembled test boards he has divided in two groups. First group has been deflected. Two levels of deflection have been chosen to be simulated the possible real conditions in using of boards. Second group of the boards has been loaded by ultrasound mechanical load.

The diploma thesis is logically structured. It is written without grammatical errors and the figures complete the text very good. It is also necessary to appreciate the activity of the student during processing of the diploma thesis.

All the time of processing of his diploma thesis Mr. Tariq has been highly active. He has demonstrated that he is able to solve practical as well as theoretical problems on high level and with sufficient quality. Results of the diploma thesis, especially from measurement of properties of the joints after their loading by ultrasound, are new.

Conclusions

Usman Tariq has demonstrated very good theoretical as well as technical skills to solve complicated technical problems on a good level. He has been able to work very good with the literature and to solve many problems independently, although these problems have been absolutely new for him in many cases. All the time of processing of the diploma thesis he has been very active in theoretical as well as practical area. It is also necessary to appreciate the effort of the student to explain measured results in Discussion. The results the thesis from the area of loading of the adhesive joints by ultrasound are new and has opened a new way for next research in the field.

I recommend the diploma thesis of Mr. Usman Tariq for defense and evaluate the thesis by the grade

A (EXCELLENT)

Assoc. Prof. Dr. Pavel Mach,
Prague, August 10, 2017