Ironwood Electronics

Test socket
0.5 mm pitch

Measurement Results

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Objective

The objective of these measurements is to determine the mechanical performance of Ironwood Electronics test socket. Parameters to be determined are force, deflection, contact resistance and life cycle.

Performance Characterization

The first test examines the relationship between deflection of the spring probe, force and the contact resistance. Displacement – Force (DF) test station was used to measure the spring probe deflection and its corresponding force. Spring probe was assembled into a test fixture. The test fixture with pin was mounted on a board which is connected to a tester for contact resistance measurements. The return electrical path was connected to the force gauge plunger. Test was initialized by moving the force gauge plunger to the tip of the spring probe. Then, force gauge plunger was moved down in increments of 0.01mm and the corresponding force and contact resistance were recorded. Figure 1 shows the force vs deflection vs resistance curve. It can be seen from the graph that the force increases linearly as the displacement increases. Similarly contact resistance decreases as the displacement increases. A desired displacement was chosen based on the compliance requirement of each application. In this particular case, the desired displacement is 0.3mm. Force and average contact resistance corresponding to this displacement is 30g and 15mOhms respectively. This information is very important for test engineer to set up failure criteria when performing device test using this spring probe.

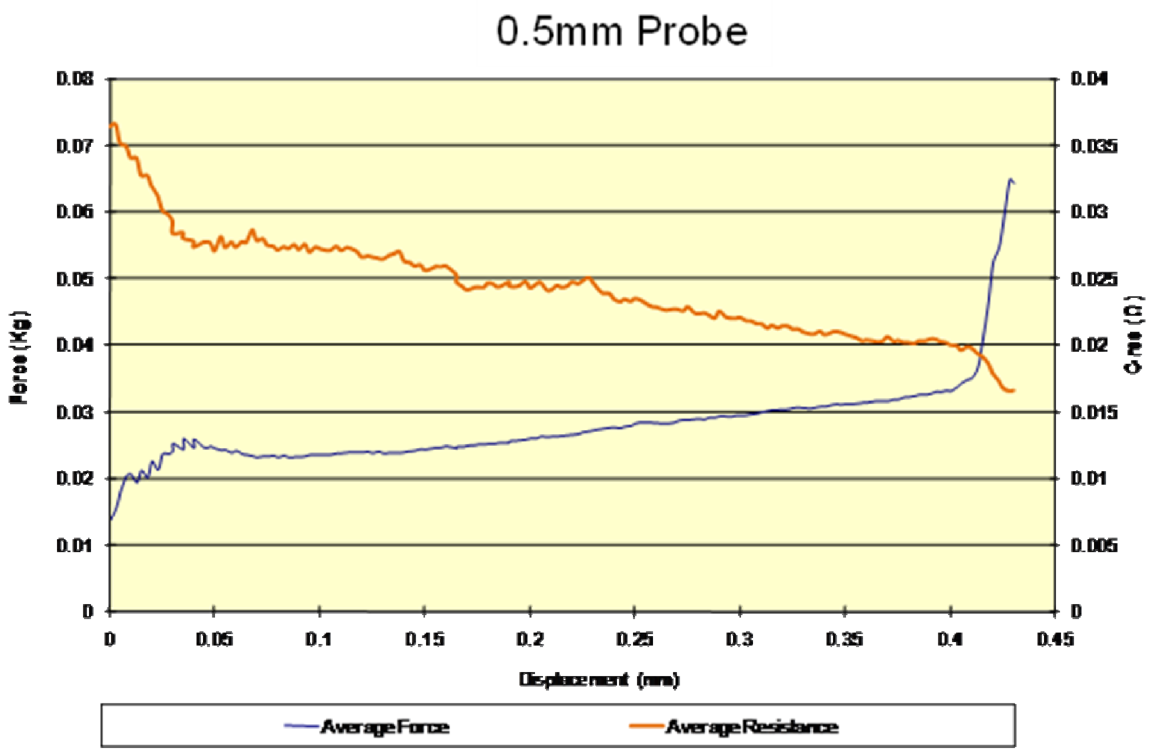

Figure 1: Force vs Displacement vs Contact resistance

The second test examines the relationship between contact resistance over spring probes life cycle count. An actual handler was used for this experiment. 500 pins were assembled onto a test fixture that was mounted on the test board which was connected to a tester. A gold plated shorted device simulator was mounted on the plunger head. The test set up was adjusted such that the head moves down 0.3mm which was the chosen travel for the spring probe. Initial contact resistance data was measured via tester and the ATE (Automatic Test Equipment) was turned on. This moves the plunger back and forth which in turn cycles the spring probe. A digital counter was inserted into the test setup to measure the cycle count. Contact resistance data collected at different cycle intervals was shown in Figure 2. It can be seen from the graph that the average contact resistance is less than 25mOhms over 150,000 cycles. Standard deviation and 95% level were also shown to provide an understanding of the data spread. Based on the graph, it can be concluded that the spring probe operates over 150,000 cycles with 25mOhms average contact resistance. The experiment was repeated with different lot

(#2) manufactured at different time (Figure 3). The data is consistent except the average is shifted by 5mOhms. This shows that the process variations can cause shift in contact resistance within 5mOhms.

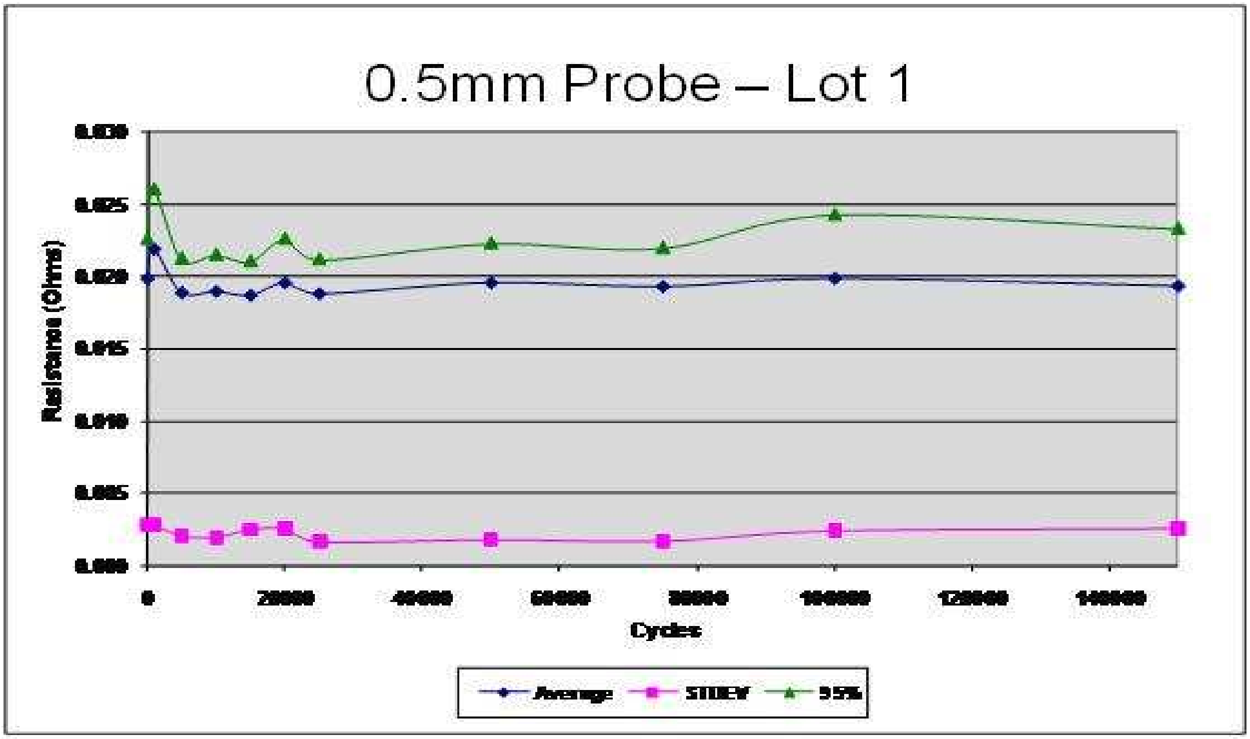

Figure 2: Life cycle data – Lot 1

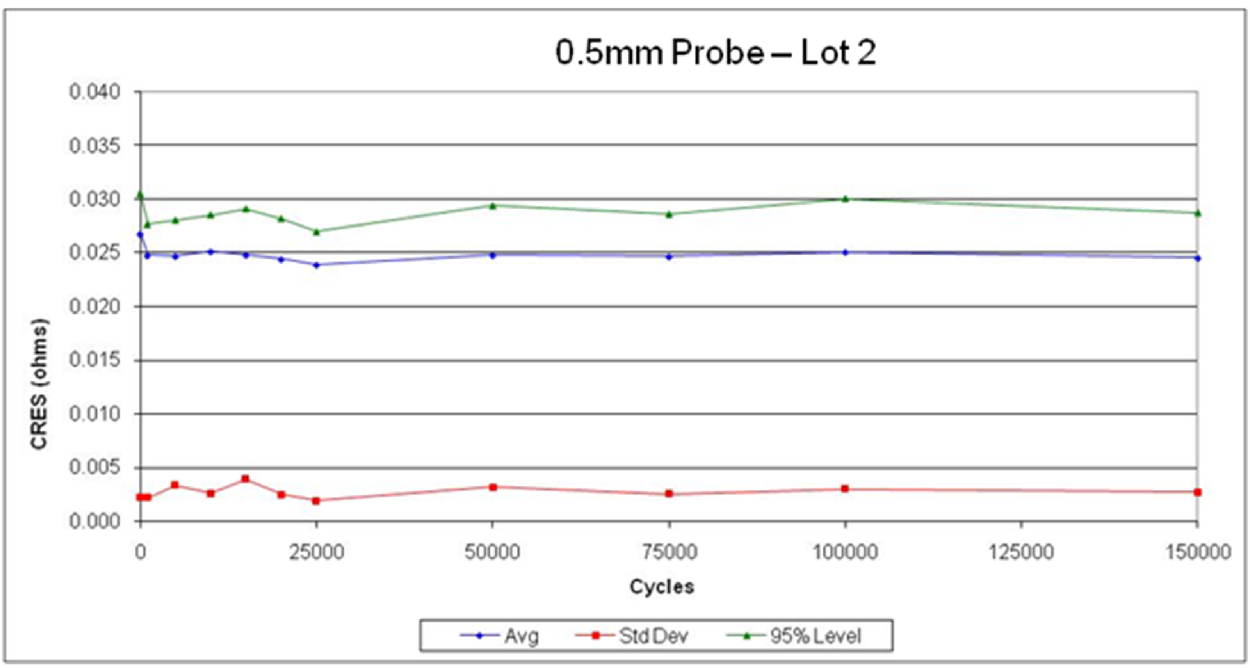

Figure 3: Life cycle data – Lot 2

Conclusion:

Reliability of test sockets is critical to ship products without defect. Validating performance of test socket gives confidence to test engineer in testing their end product. Different tests were performed to validate spring probe that can be used in test applications. FDR (Force Deflection Resistance) test validates the specification for force and contact resistance at recommended spring probe travel. Cycle test validates the number cycle up to which the spring probe will perform without degradation. This means reduced ATE downtime and increased throughput for customer.