Ironwood Electronics

Test socket

Mechanical Cycle and Temperature Test

Measurement Results

Objective

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

Performance Characterization

The test examines the relationship between contact resistance over contact life cycle count. An actual handler was used for this experiment. Contact set consists of 44 leads + 16 ground leads (QFN configuration) was mounted on the test board which was then 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 SM contact. 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. Test setup includes cycle speed ~2,500 actuations / hour, Dwell time:~0.7Sec, and ambient temperature. Test vehicle was designed for 7x7mm 44 lead x .5mm MLF shorted device simulator. No cleaning was performed to gold plated DUT or to contacts. Contact resistance data collected at different cycle intervals was shown in Figure 1. It can be seen from the graph that the average contact resistance is less than 25mOhms over 250,000 cycles. Standard deviation was also shown to provide an understanding of the data spread. Based on the graph, it can be concluded that the contact operates over 250,000 cycles with 25mOhms average contact resistance. The experiment was repeated with different lot (#2, #3) manufactured at different time (Figure 2, Figure 3). The data is consistent except the average is shifted down by 5mOhms. This shows that the process variations can cause shift in contact resistance within 5mOhms.

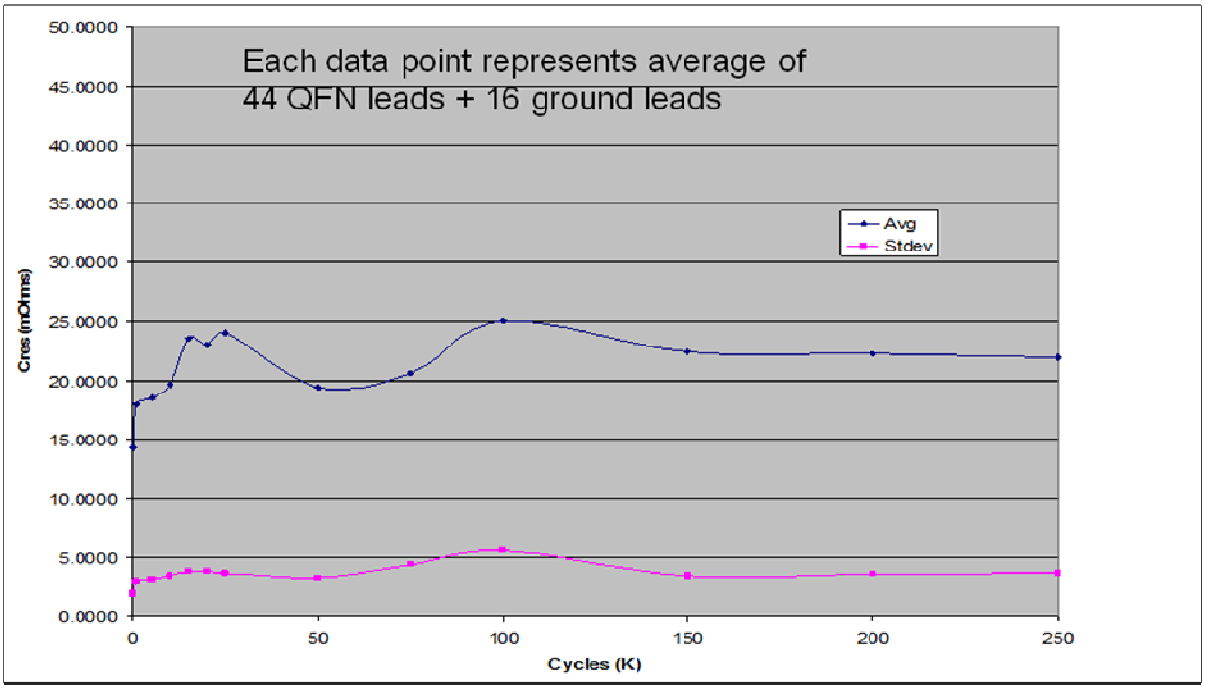

Figure 1: Life cycle data – Lot 1

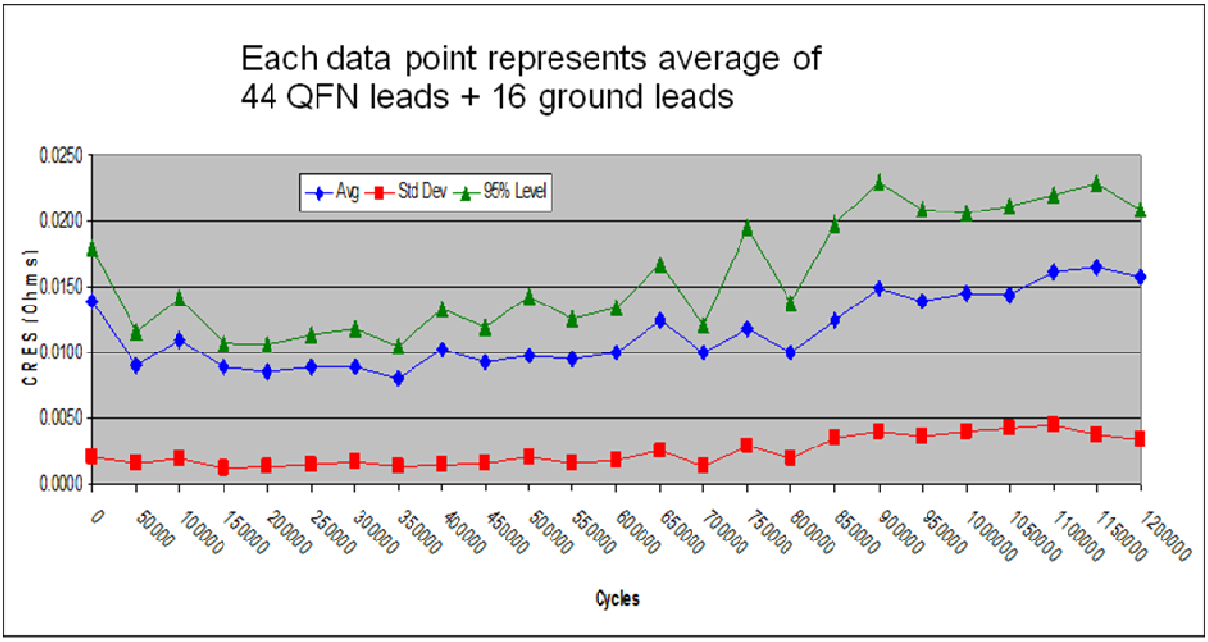

Figure 2: Life cycle data – Lot 2

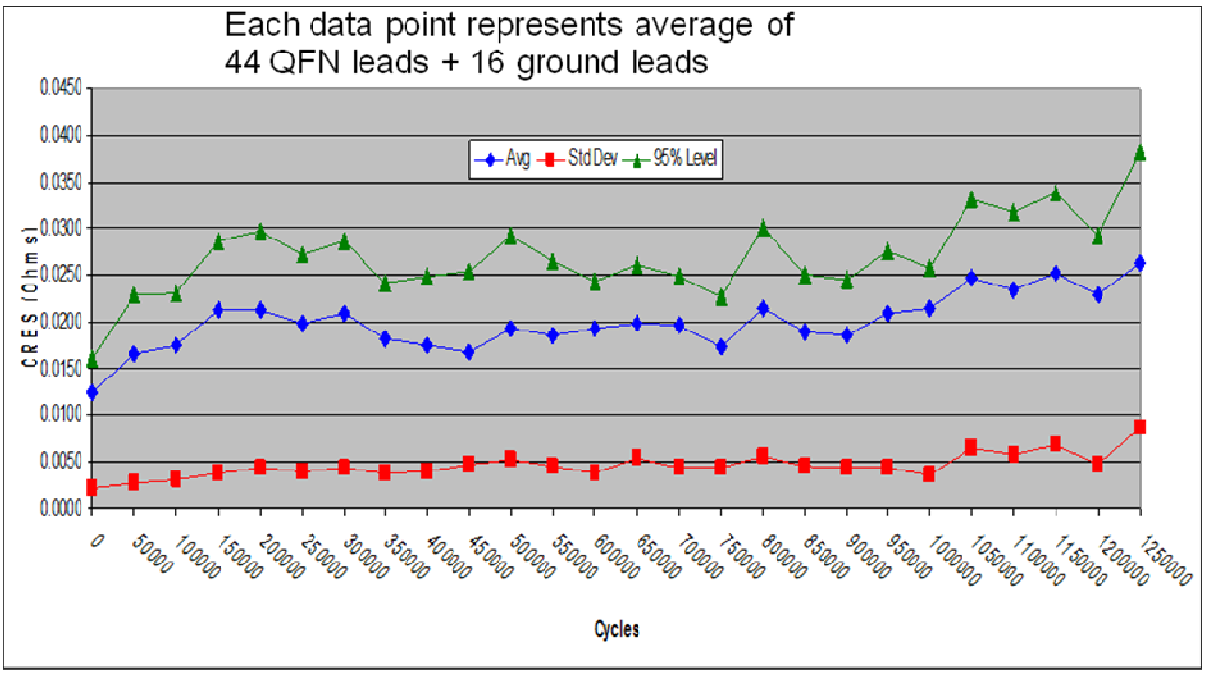

Figure 3: Life cycle data – Lot 3

The next experiment involves temperature testing where the test board and socket were exposed to 150C and -50C while the device simulator was being cycled by the ATE. Experimental results were shown in the Figure 4 and 5. Average contact resistance is under 10 mOhms and the standard deviation is less than 3 mOhms for 150C test. Average contact resistance is under 15 mOhms and the standard deviation is less than 5 mOhms for -50C test.

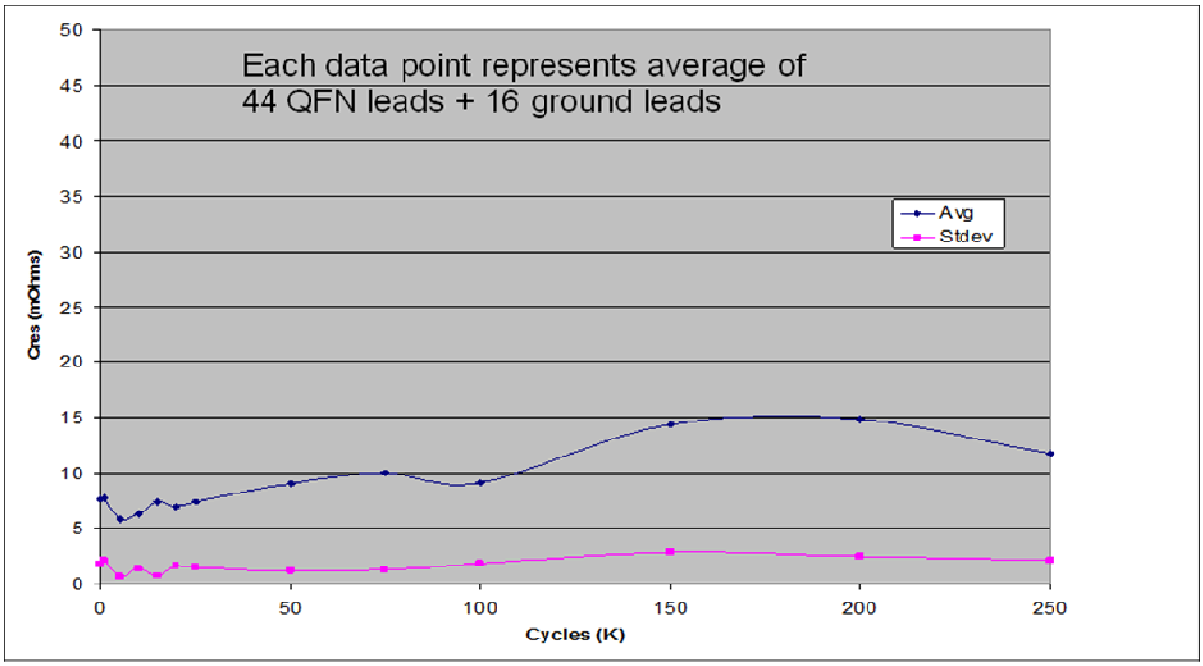

Figure 4: Life cycle data – Lot 4, 150C

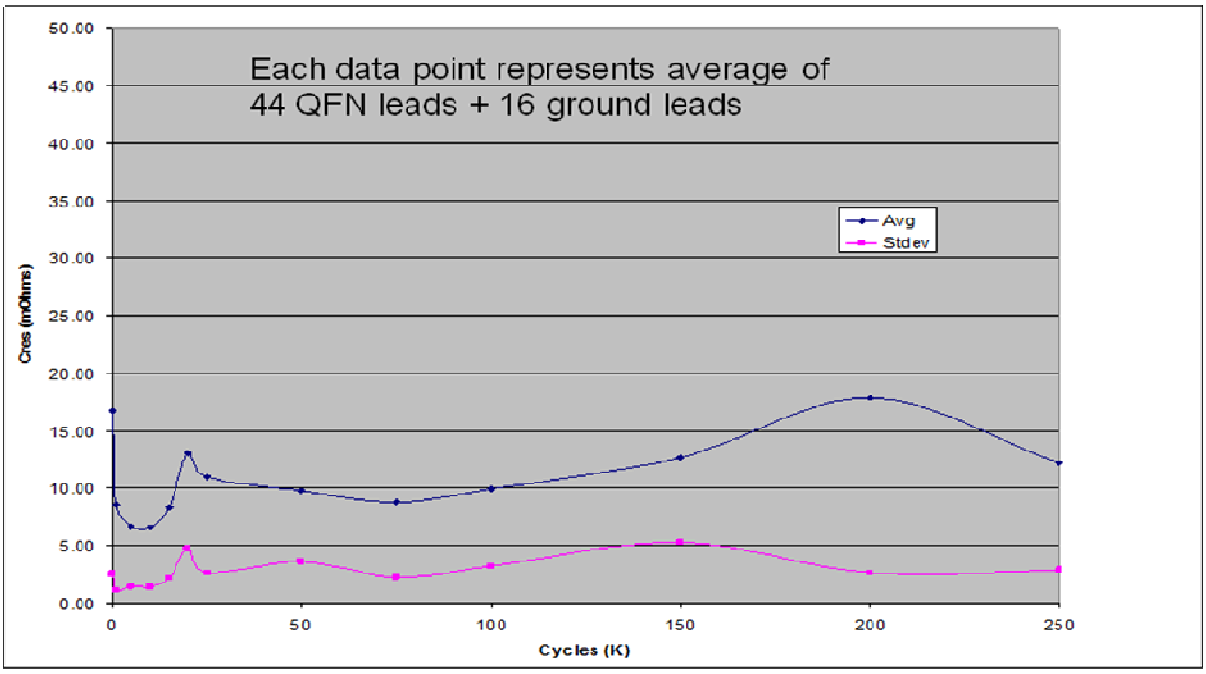

Figure 5: Life cycle data – Lot 5, -50C

Another experiment was conducted using BGA479 contact to understand contact resistance variations due to high pin count. The results were shown in Figure 6.

Average contact resistance is under 8 mOhms and the standard deviation is less than 1 mOhms.

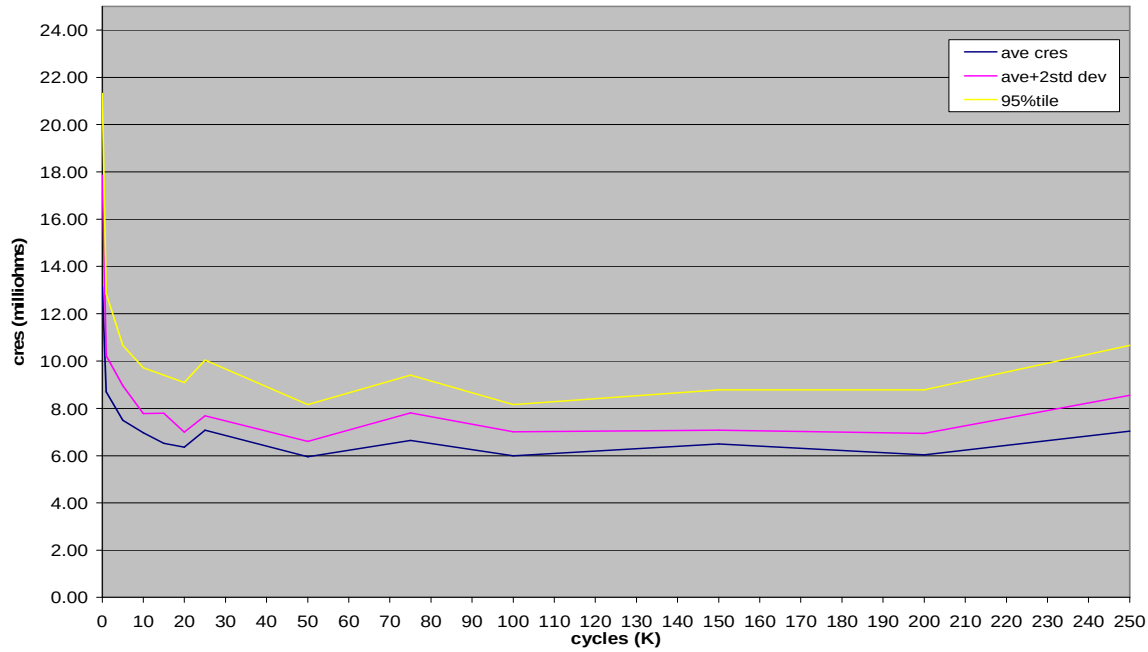

Figure 6: Life cycle data – BGA479

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 elastomer contact that can be used in test applications. Cycle test validates the number cycle up to which the elastomer contact will perform without degradation. This means reduced ATE downtime and increased throughput for customer.