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Impact of Oxidation on Elastomer Contact

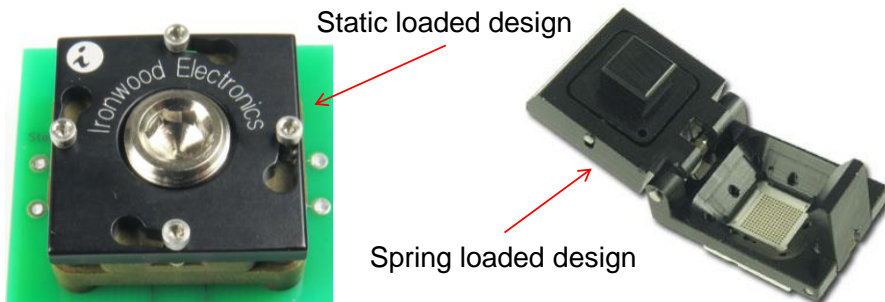
Ila Pal, Ironwood Electronics

Introduction

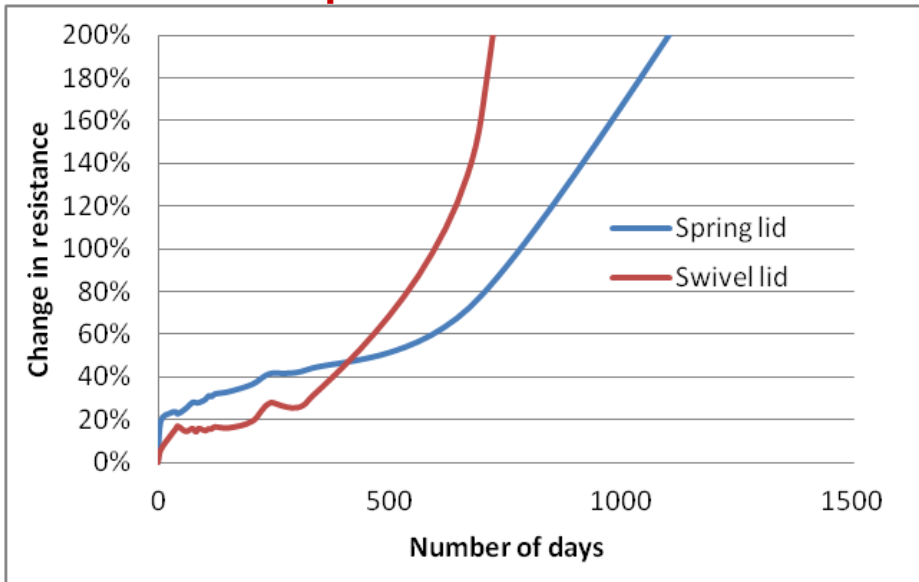
- A production socket is a carrier for semiconductor device in the finished product that electrically connects IC device to PCB.
- Biggest constraint comes from the oxidation effect of solder balls/leads of the IC devices.
- Tin reacts with oxygen in the environment and forms tin oxide which is an insulator. This insulator restricts electric current/signal to pass through.
- Thicker the oxide layer, higher the resistance will be and this causes functional issues and premature failure in the field.

Experimental Setup

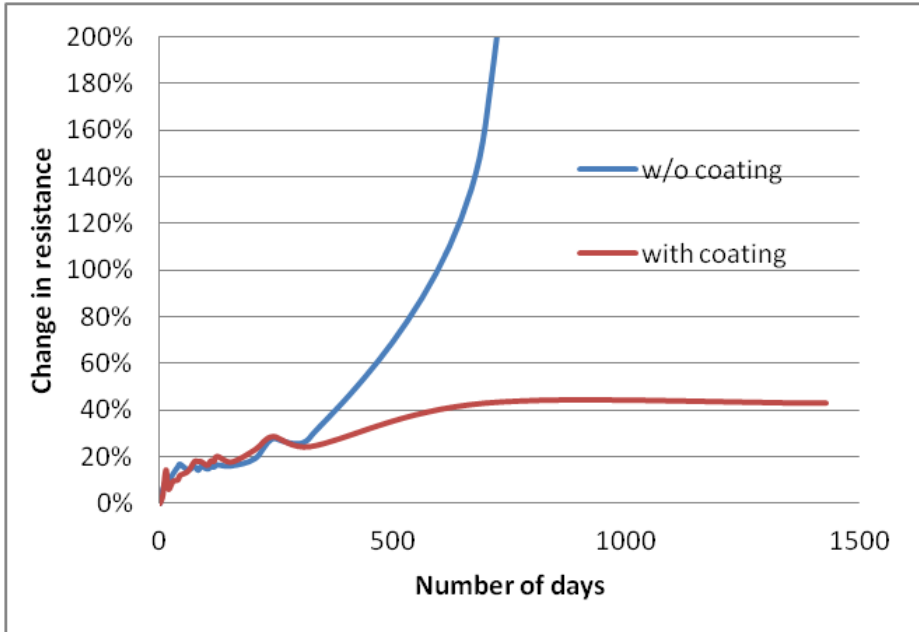
- Solder oxide starts building up over the period and causing the resistance to go up resulting in functional failure of the system.
- Cleaning is not an option as it disrupts field function.
- Experiments were conducted with various oxide solvents and a solution was identified.
- The below experiment compares an elastomer socket without coating and with oxide solvent coating.
- Sockets with screw top lid (static load) and spring loaded lid were used as a variable in the experiment as well.



Experiment Set#1

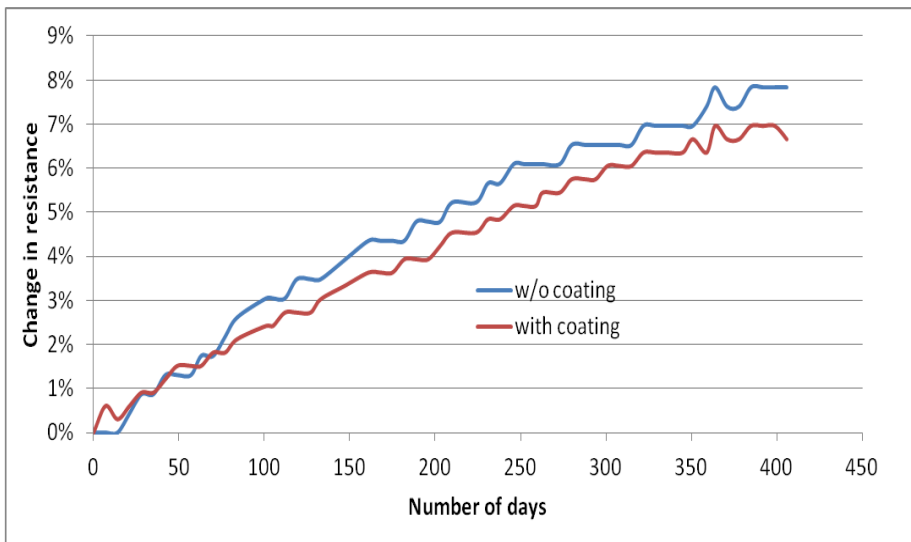
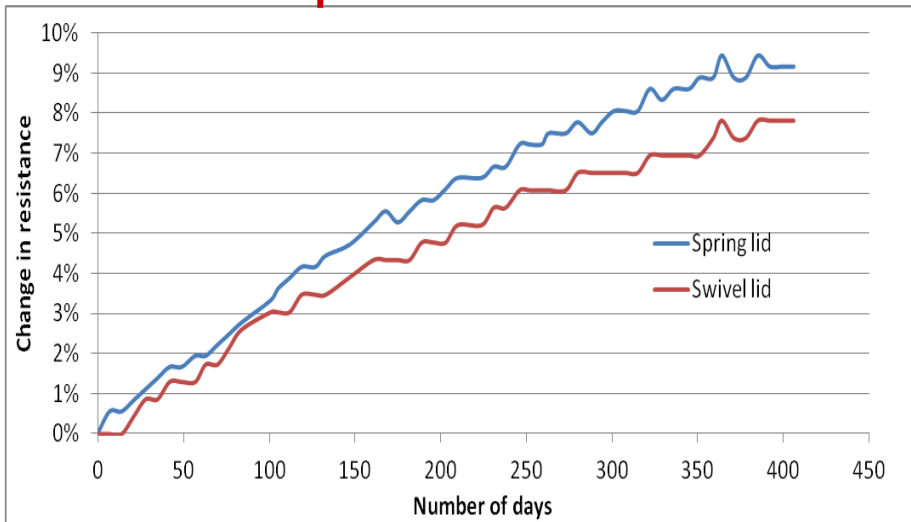


Without coating, both (swivel & spring lid) design failed around 500 days



With coating, socket is working more than 4 years in the field.

Experiment Set#2



Conclusion

- Socket lid design (static or spring loaded) did not have much influence over long term use.
- Oxide prevention coating on elastomer provides 3x improvement in the field for a socket under static compression.
- Elastomer with coating has lower, stable contact resistance when compared with elastomer without coating.