Thermal Resistance Measurement through Socket Interconnect

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Introduction

•Peripheral leaded devices have center pad that acts as electrical ground as well as path for heat dissipation through system PCB planes

•Devices placed inside the socket have to dissipate through socket interconnect medium

- •Spring pin
- •Elastomer

Thermal Resistance

•Thermal resistance is the temperature difference, at steady state, between two defined surfaces that induces a unit heat flow rate through a unit area

•Directly proportional to thickness and inversely proportional to thermal conductivity of the material

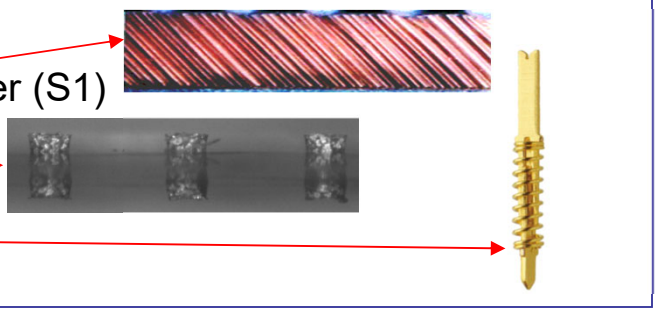
Tr = (T1-T2)/P
Where:
Tr = Thermal resistance of the socket contact in degree C/watt
T1 = Top side temperature in degree C
T2 = Bottom side temperature in degree C
P = Power dissipation in watts

Socket Interconnect

•Embedded gold-plated wire elastomer (S1)

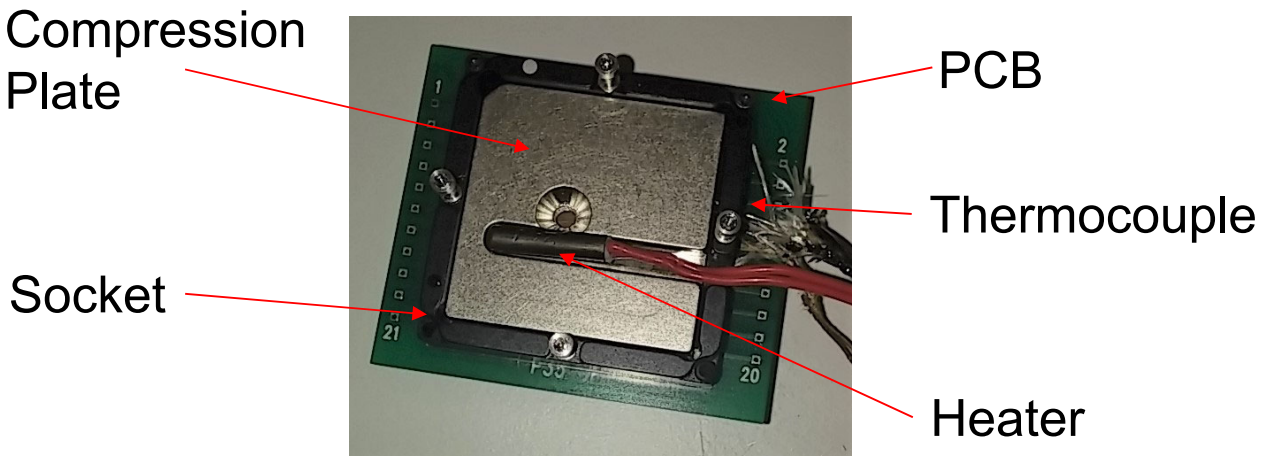
•Silver Particle Elastomer (S2)

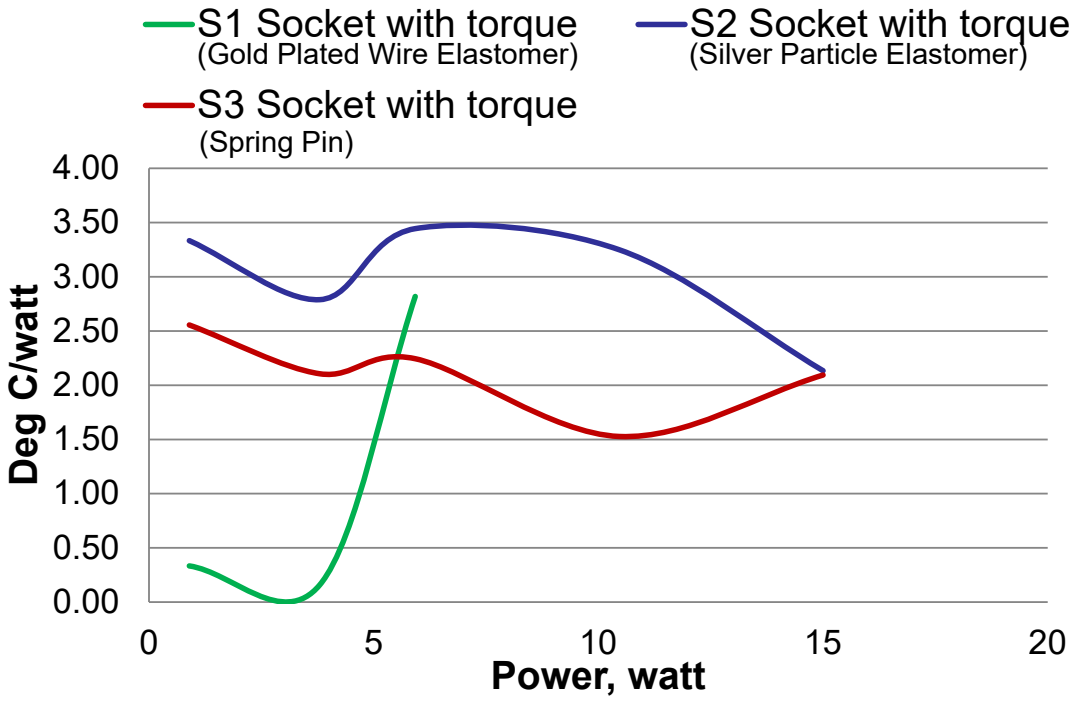
•Spring Pin (S3)



Experimental Setup 1

- HT15W 1/8”x1/2”, 15 watt heating element rod
- Voltage is applied between the leads, heat is generated at the lead exits
- Heater element is calibrated by supplying 6, 12, 15, 20, and 24 V and corresponding wattage generated were documented
- Heater element is integrated to the top of compression plate slot inside the socket
- One thermocouple was installed on top of the socket contact and the other thermocouple was installed on the bottom of socket contact
- Temperature data is collected after steady state is reached from both the thermocouple





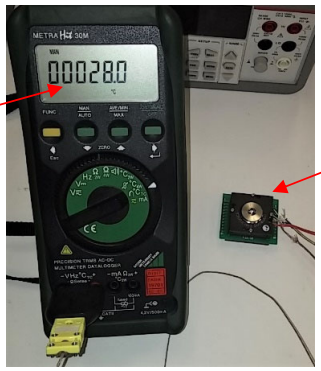
Experimental Setup 2

•When not compressed, there is some heat transferred due to radiation

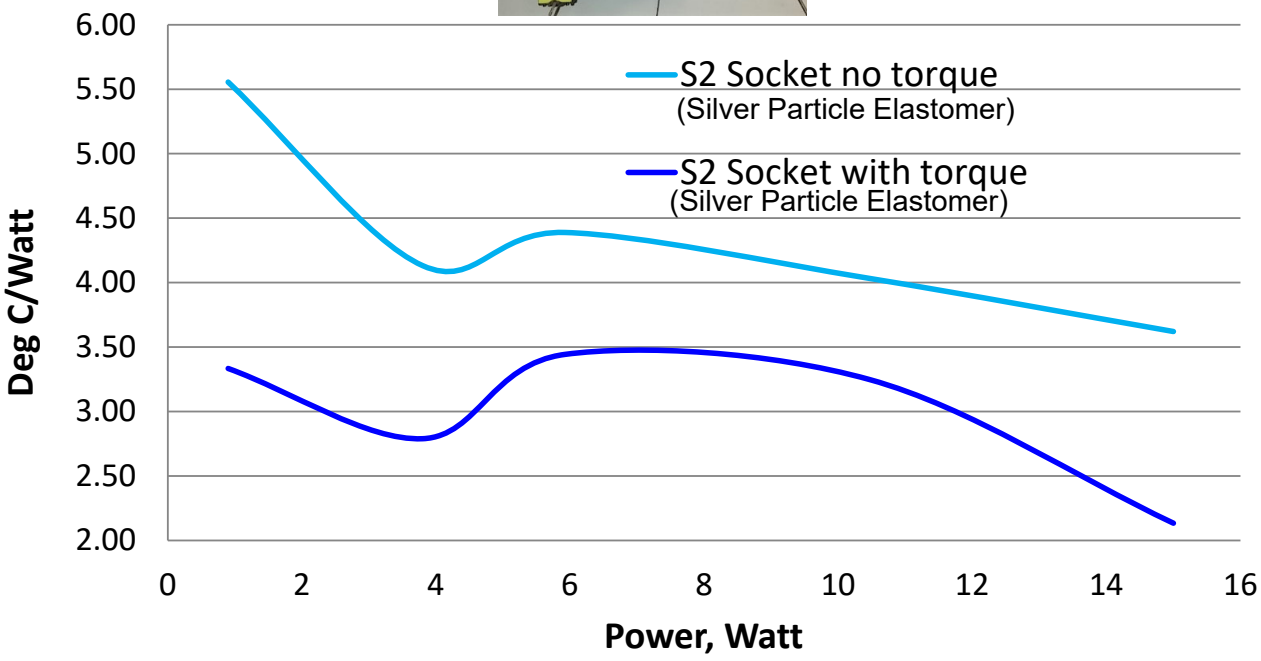
•S2 socket is compressed by applying recommended torque to the compression screw and the second S2 socket is not compressed

•Thermal resistance data is calculated for various wattages by changing applied voltage for both S2 sockets

Temperature readout after steady state via thermocouple



Socket with heater element compressed against interconnect



Conclusion

•Heat dissipation through various socket interconnect technologies were compared over a range of power dissipation

•Heat dissipation of socket interconnect is compared with conduction and radiation

•For high power, S2 (elastomer) and S3 (spring pin) provide better heat dissipation through PCB side

•For low power, S1 (elastomer) has lowest thermal resistance

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