

Reliability of CGA Solder Columns for Extreme Cold Applications

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BGA Solder balls are subject to fracture strain when operated in extremely cold applications. This presentation examines the reliability of ceramic column grid array (CGA) assemblies by comparing two types of solder columns subjected to sequential thermal cycling.

It includes CGA with newly developed braided columns in comparison with heritage copper-wrap columns. CGA are widely used for high-reliability electronics applications including warfighters and space exploration. There is increasing interest in the use of CGA for extremely cold applications, especially at temperatures encountered on the Lunar surface. This presentation also compares the material and mechanical characteristics of the two column types, including pull and bending strengths. Cycling was performed between -55°C and $+125^{\circ}\text{C}$ for 200 cycles. Subsequently, the cold-side temperature was reduced to -100°C to evaluate the effect of extreme cold temperature on solder-joint failure mechanisms and reliability. Daisy-chain continuity was verified after 200 cycles within the -100°C to $+125^{\circ}\text{C}$ range. Results of thermal cycling and inspections are presented with failures identified by wear out mechanisms for the two CGA types. Failure locations were established via five-zone daisy chain patterns to determine cycles to failure dependency on the distance from the neutral point (DNP) and identifying potential shifts in failure mechanisms under extreme cold cycling conditions. QML column attachment services for class Q, V and Y is available in cooperation with VPT Components.

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