

CCGA Solder Column - Novel Solutions for Long Life Missions

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Large sized area array packages found in aerospace and defense applications encounter significant stresses due to the inherent mismatch of the material coefficient of thermal expansion (CTE) between the IC module and FR4 circuit board.

Solder balls on massively large Ball Grid Arrays (BGA) may creep 2.0 to 4.0 mils (50~100um), or more, ultimately resulting in delamination, as temperatures swing 1000C from hot to cold in repeated cycles.

While this amount of travel may seem small - about the thickness of a sheet of paper - such strain leads to catastrophic failure as solder balls delaminate and electrical connection is lost between the chip and the PC board.

One solution for overcoming CTE mismatch is to replace solder balls with solder columns, making a device known as a Column Grid array (CGA) - particularly suitable for large processors, ASIC packages, and Field Programmable Gate Arrays (FPGA) and RadHard devices.

Solder columns are compliant and absorb stresses caused by stretching and pulling in applications involving CTE mismatch under widely varying temperatures.

While CGA technology has been used for decades to promote long life missions, an emerging market involving extremely large sized heterogeneous packages (70x70mm up to 120x120mm) can also benefit by using Solder Columns rather than solder balls in fields such as down-hole electronics, large silicon antennas, 5G and A.I. massive data computing centers.

This presentation addresses commercially available solder column solutions using traditional copper wrapped Pb80/Sn20 columns as well as a new generation of columns that provide better heat transfer as well as compliancy.

Examples are given for using traditional and novel solder columns to absorb stresses from CTE mismatch using graphite tooling-fixtures particularly suitable for BGA to CGA conversion in high-mix, low-volume environments.

Keywords: CCGA, column grid array, solder columns, Micro-Coil Spring, copper braided column, copper core column.