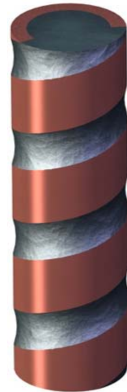
TopLine®

Space Parts Working Group
22~23 April 2014

Presented by
Martin Hart

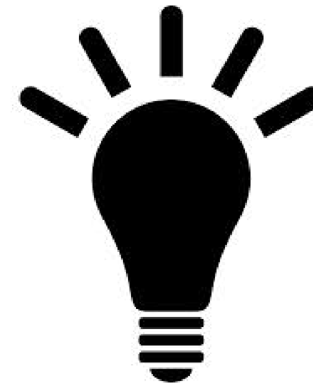
Solder Columns For CCGA Ceramic Substrates

Pb90/Sn10
Plain



Pb80/Sn20
Copper Wrap

Micro-Coil
Spring



New Types
Innovation

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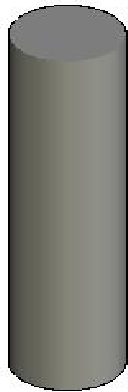
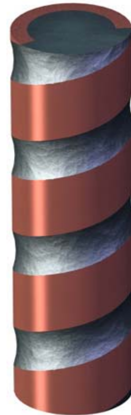
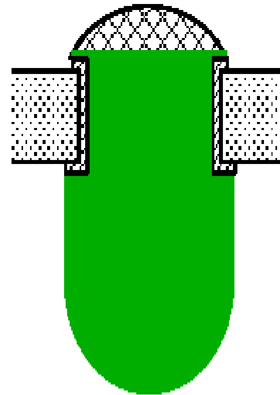
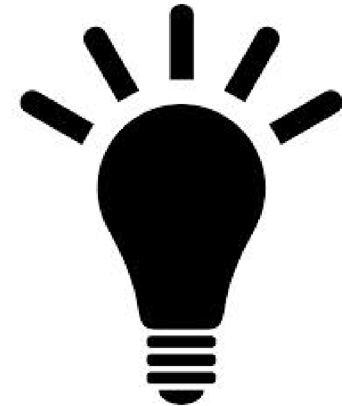
History of Solder Column Development

1980's	1982	1999	2012	2014
				
IBM **Pb90/Sn10** **Wire & Cast**	**Raychem** **Pb80/Sn20** **Copper Wrap**	**NGK** **Pb90/Sn10** **Interposer**	**NASA** **Micro-Coil** **Spring**	**TOPLINE** **New** **Columns**

Brief review 34-years of solder column development.

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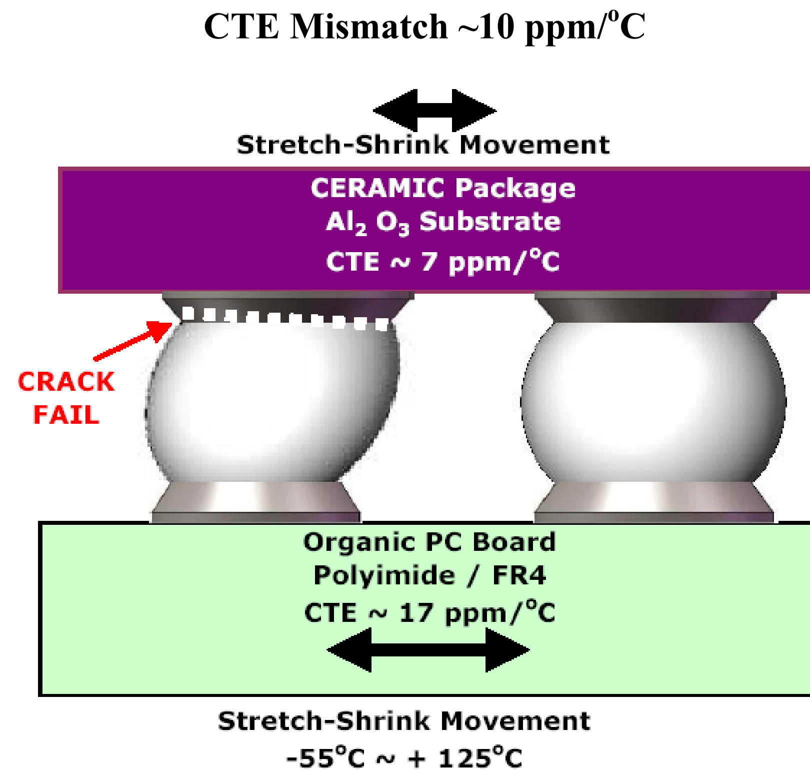
Poor Reliability with Solder Ball

Large temperature swings - create major stress between large ceramic array and PCB board.

CTE Mismatch ~10 ppm/°C



A better way is needed.

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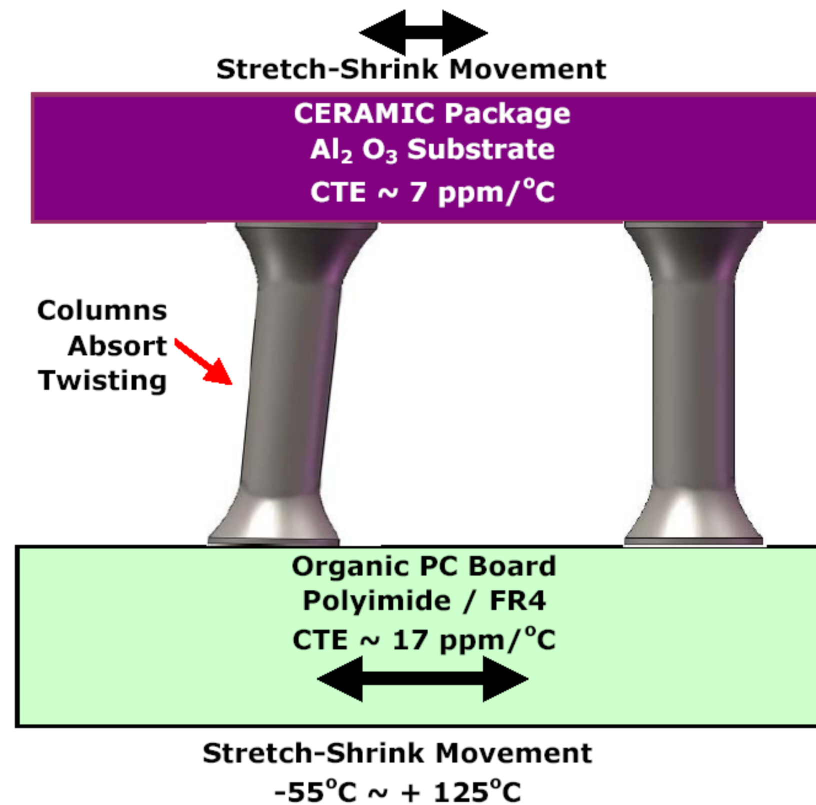
Pb90 Columns Absorb Stress Caused by CTE Mismatch

CTE Mismatch ~10 ppm/°C



Solder columns are more reliable than solder-balls.

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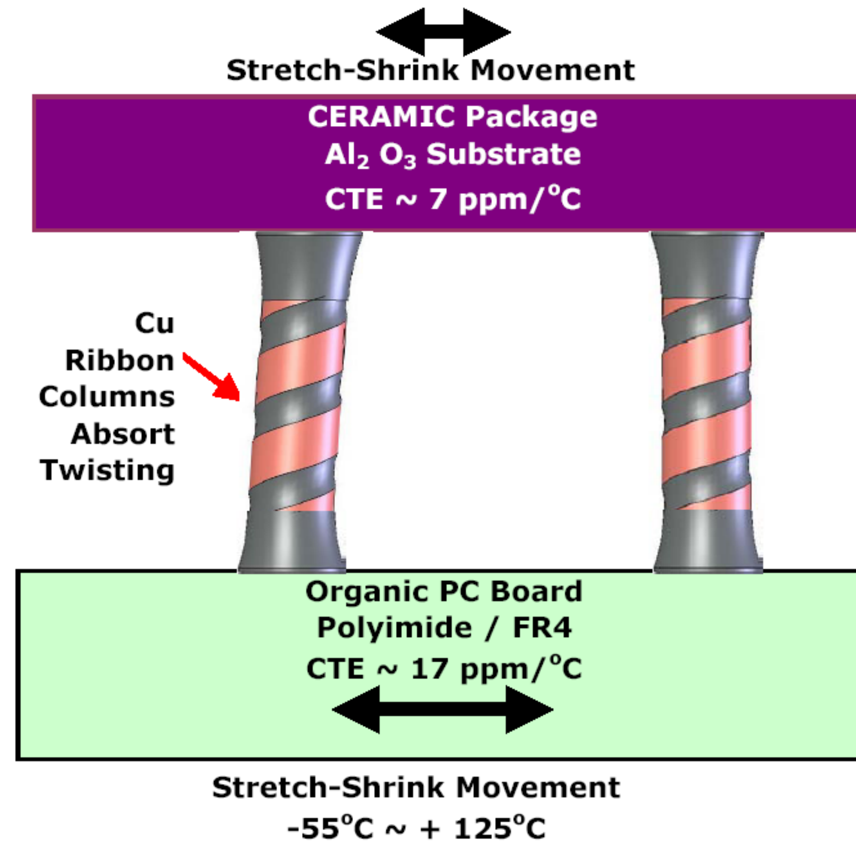
Pb80 Columns with Cu Ribbon Absorb Stress Caused by CTE Mismatch



Copper ribbon adds additional support.

Pb80 Columns with Cu Ribbon Produced by TopLine

Photo provided by TopLine

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Micro-Coil Springs Test Vehicle survived 50,000g shock 8-times in the lab before failure versus 4-times for Pb90/Sn10 Column

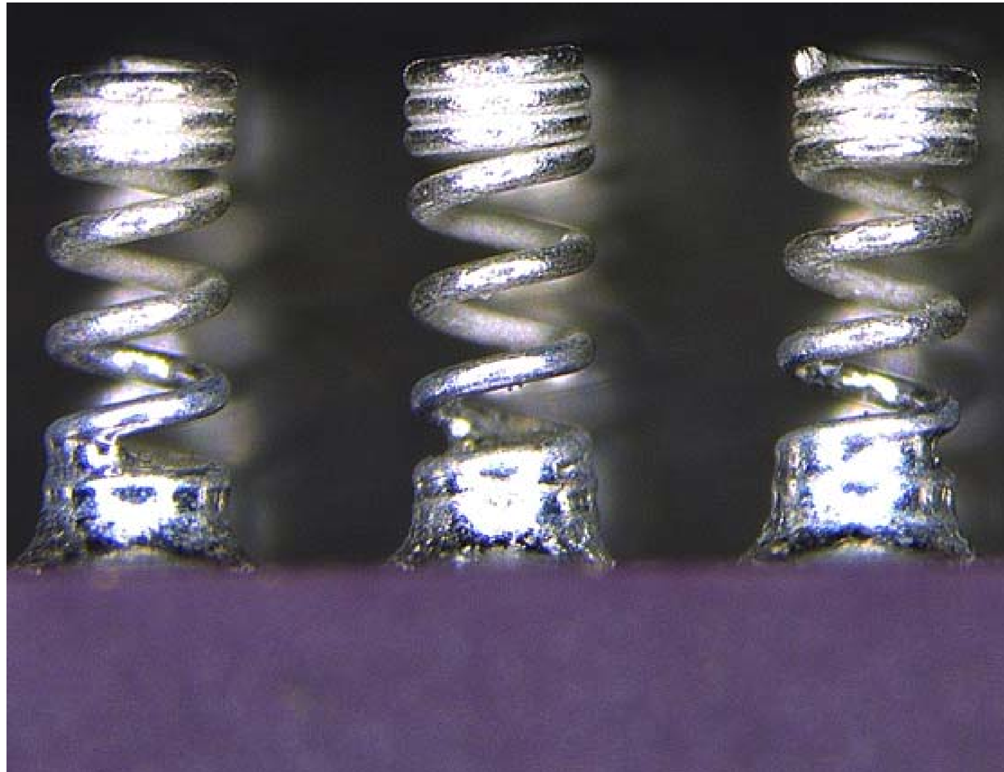

Photo provided by NASA

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Micro-Coil Springs Attached to CCGA Daisy Chain

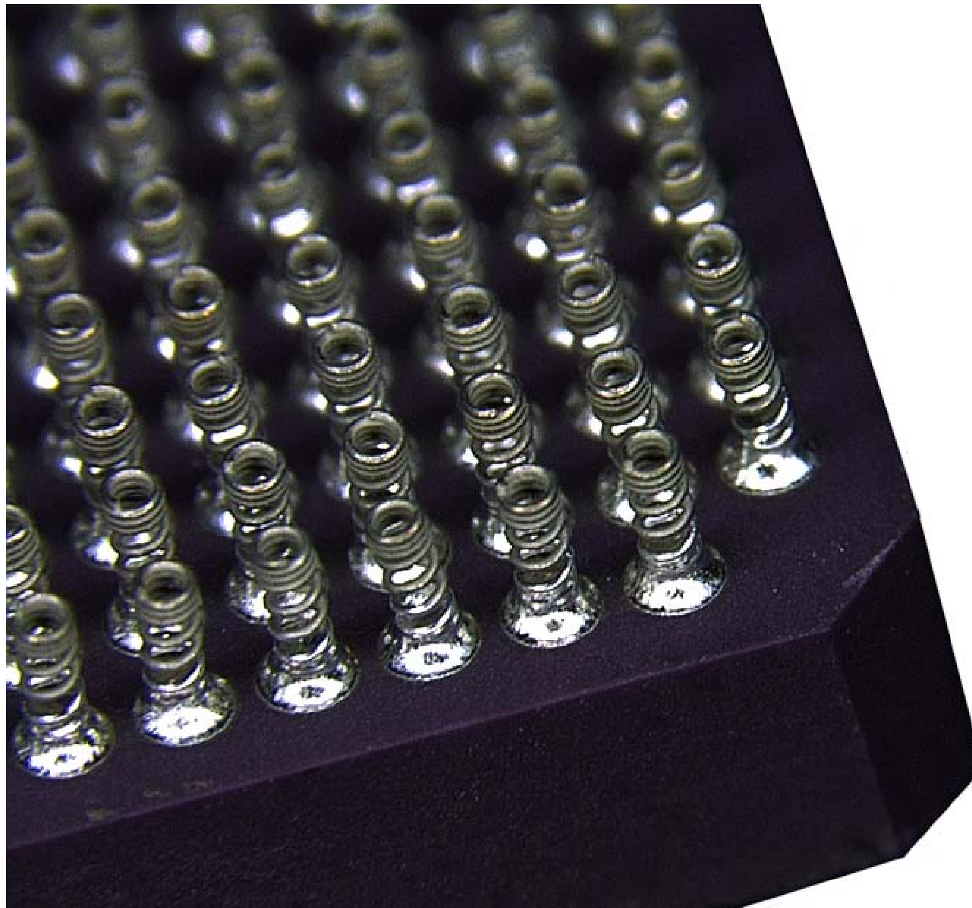

Photo provided by NASA

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Micro-Coil Springs Size Comparison

Size
0.020” x 0.050”
0.51 x 1.27mm

Photo provided by TopLine

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Micro-Coil Springs Survive PCB Deflection At 1500g Drop Test

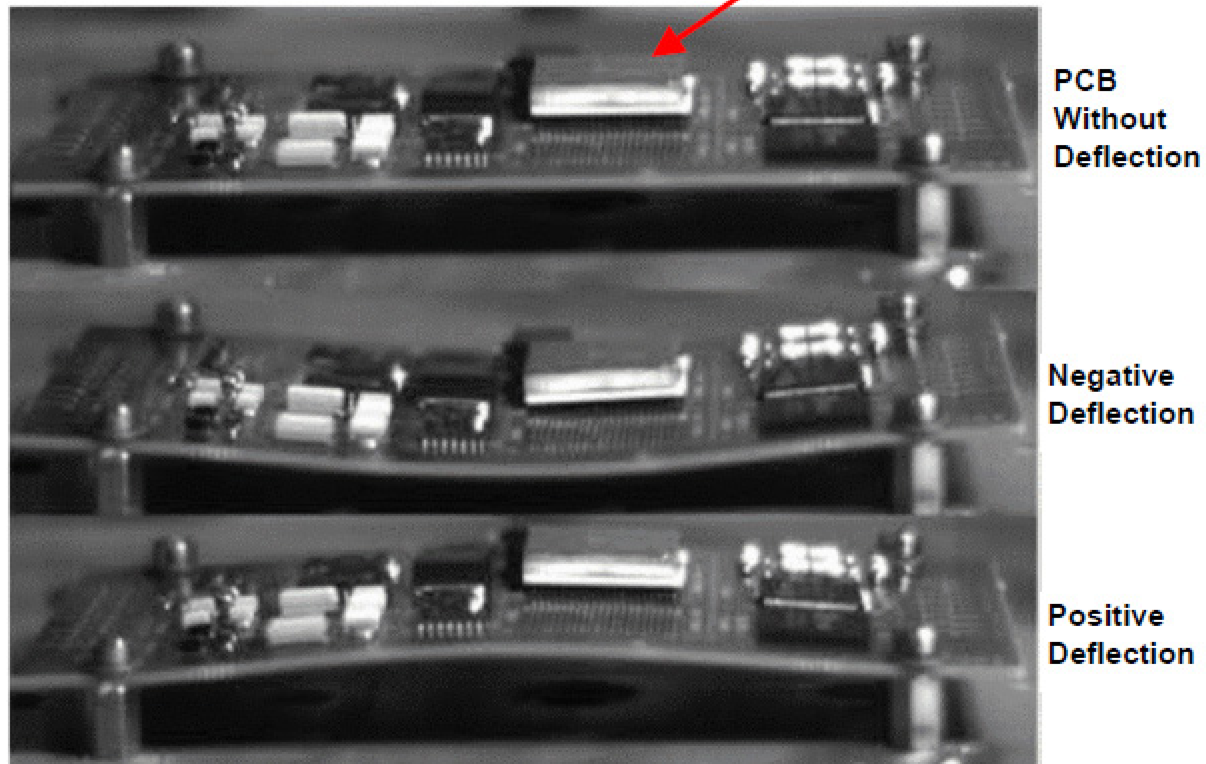


Photo provided by NASA

NASA Micro-Coil Spring Technology Transfer to TopLine

National Aeronautics and Space Administration

George C. Marshall Space Flight Center
Marshall Space Flight Center, AL 35812

July 15, 2013

Reply to Attn of: ZP30

Mr. Martin Hart
Topline Corporation
17595 Harvard Ave., Suite 509
Irvine, CA 92614 USA

RE: Exclusive License Agreement DE-469, NASA Case Number MFS-32744-1 entitled Interconnect Device and Assemblies Made Therewith.

Dear Mr. Hart,

Please find enclosed the executed Exclusive License Agreement (DE-469) between NASA and Topline Corporation. The effective date of the license agreement is July 1, 2013. The exclusive license covers the NASA invention described as the Micro-coil Spring "*Interconnect Device and Assemblies Made Therewith.*" The U.S. Patent Application Serial Number 13/800,692 filed on March 13, 2013.

We look forward to working with Topline Corporation regarding this license. We wish you much success in commercializing the invention. Please call me if you have any questions, my telephone number is (256) 544-5226.

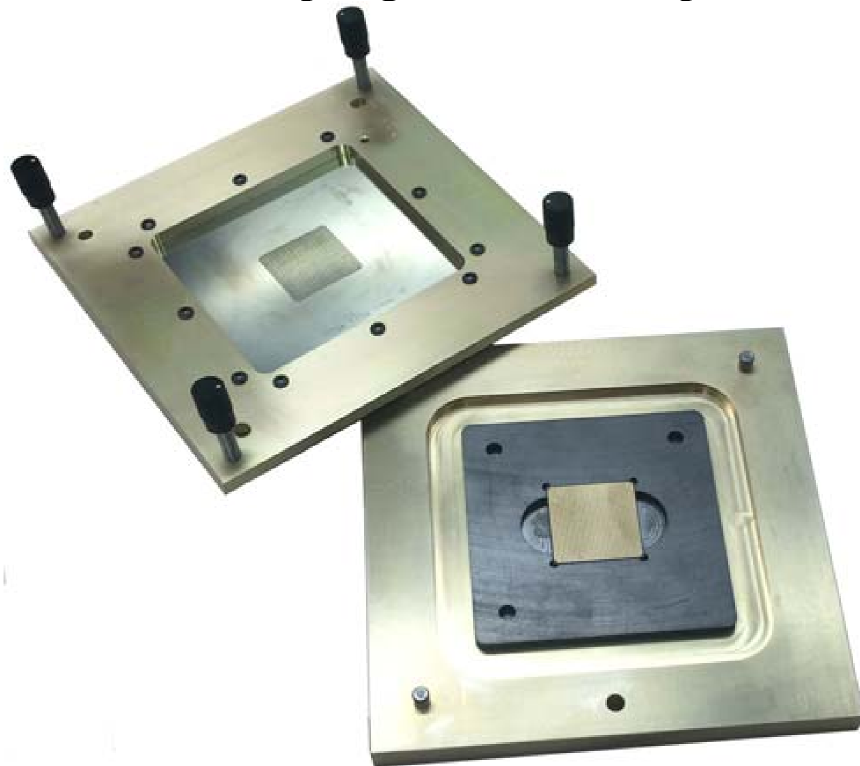
Cordially,

Sammy A. Nabors
Manager, Licensing and Commercialization

Enclosure (1)

Benchtop Tool-Set
Produced by TopLine

Simplified system for attaching solder columns and Micro-Coil Springs to ceramic or plastic LGA



Going into Reflow Oven

Pin-Pack™ Cassette System (*Patent Pending*) Loaded with Solder Columns or Micro-Coil Springs. Quick placement of columns.

Gravity Feed System.
Transfer 1752 Columns to CCGA substrate in 1 minute.
Without vacuum. Without vibration. Without power.

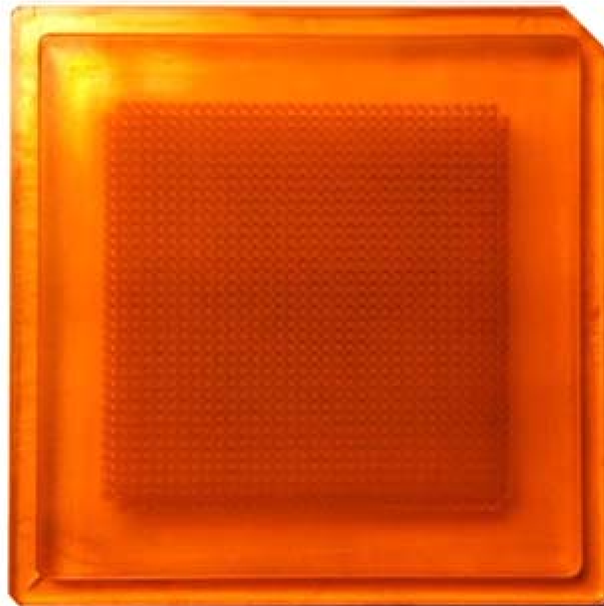


Photo provided by TopLine

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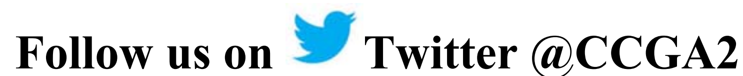
New Type Columns

	Application	Solution	Availability
1	Columns for small pitch arrays 0.5mm ~ 0.8mm	Small diameter ∅ .010-Inch (0.254mm)	Available Now
2	Columns with wider reflow process window for easier rework.	Cu Ribbon Wrap with Pb90/Sn10 Core (Better than Pb80/Sn20)	Available Now
3	Columns with enhanced thermal resistance. Heavy copper.	3x Improvement over Pb90/Sn10 Columns	Ready Q4- 2014



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