

## Fine Pitch Copper Pillar Flip Chip

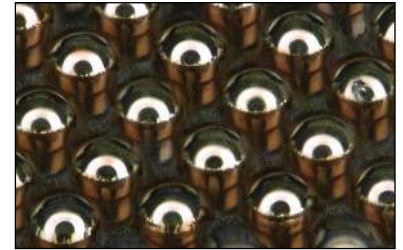
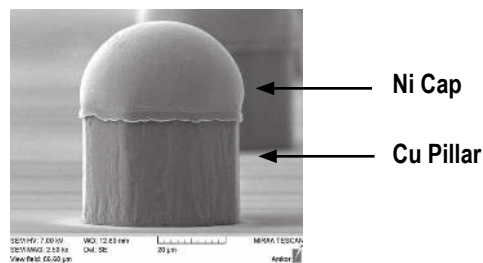
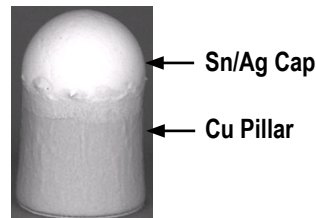
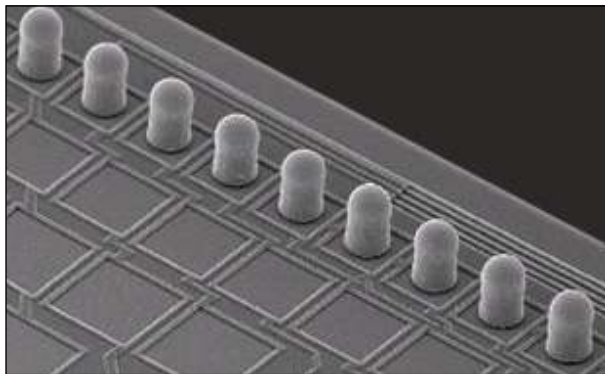


Copper pillar bump is a next generation flip chip interconnect which offers advantages in many designs while meeting current and future ROHS requirements. It is an excellent interconnect choice for applications such as

transceivers, embedded processors, application processors, power management, baseband, ASICs and SOCs where some combination of fine pitch, ROHS/Green compliance, low cost and electromigration performance are required.

### Copper Pillar Benefits

- Fine pitch capable down to 50  $\mu\text{m}$  in-line and 40/80  $\mu\text{m}$  staggered
- Cost reduction achievable in many designs by reducing substrate layer counts
- Superior electromigration performance for high current carrying capacity applications
- Electrical test at wafer level prior to copper pillar bump
- Compatible with bond pad opening/pitch and pad metallization of die designed for wire bond which enables quick time-to-market for conversion to flip chip



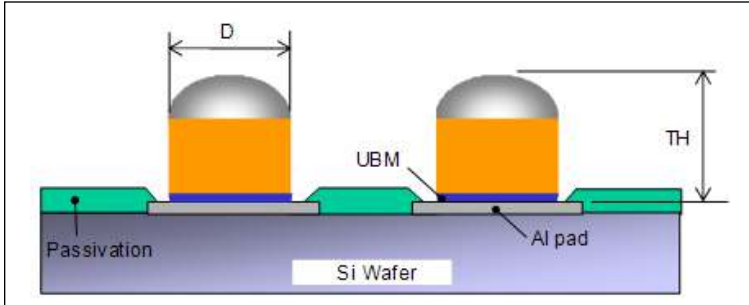
- Lower cost fine pitch flip chip (FFFC) interconnect versus Au stud bump for high bump density designs
- Lead free bump cap on copper pillar for green solutions
- Available with and without re-passivation
- Qualified for advanced silicon node Low-k devices
- Small fillet requirement for underfill enables more aggressive die-to-package design rule/smaller package footprint
- Extreme Fine Pitch on Silicon Package down to 40  $\mu\text{m}$  for Thru Silicon Via (TSV) and Chip On Chip (CoC)
- Large installed capacity for turnkey FFC copper pillar bump, assembly and test

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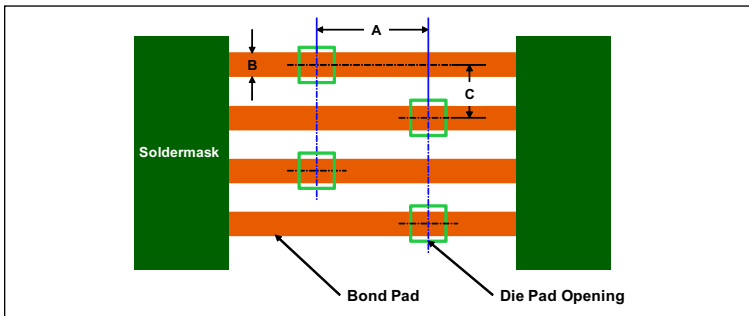
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### Copper Pillar Bump Design Rules



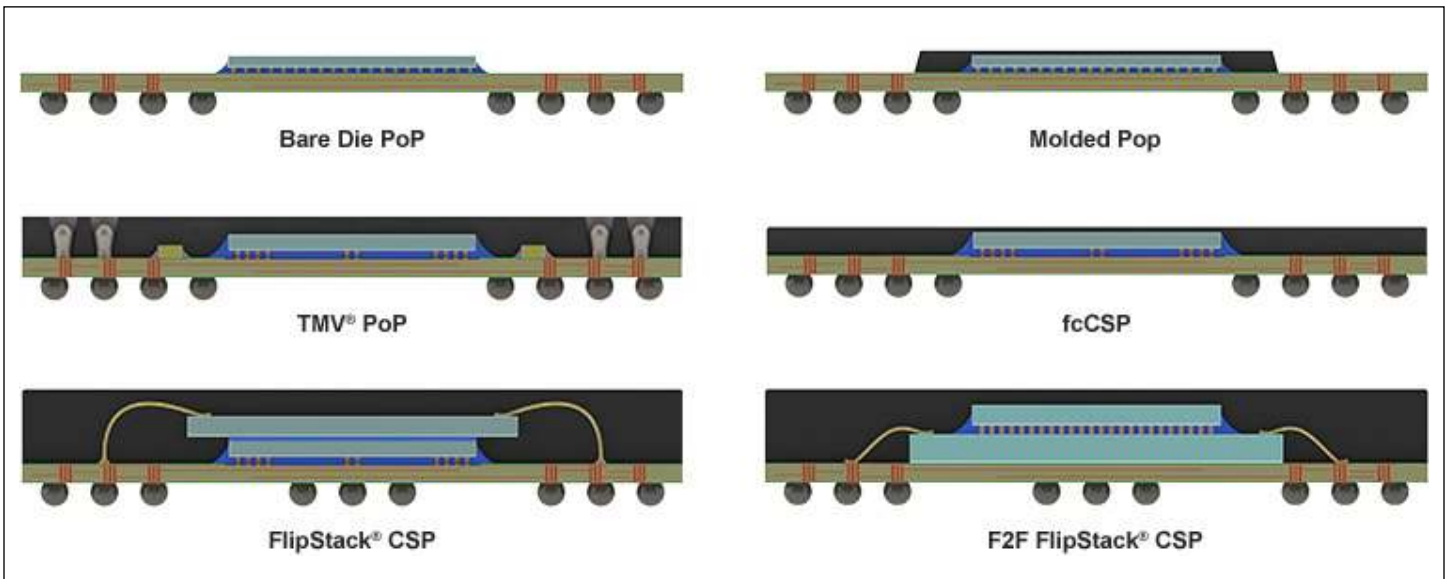
Feature	Dimension
Cu Pillar Diameter (D)	20-50 $\mu\text{m}$
Total Height (TH)	30-60 $\mu\text{m}$

### Pad Design Guidelines



General Design Rules	Pitch				
	60	50	45/90	40/80	30/60
A Row to Row Pitch	N/A	N/A	90	80	60
B Bond Pad Width	30	25	22	20	TBD
C Trace Pitch	60	50	45	40	30

### Cross Sections

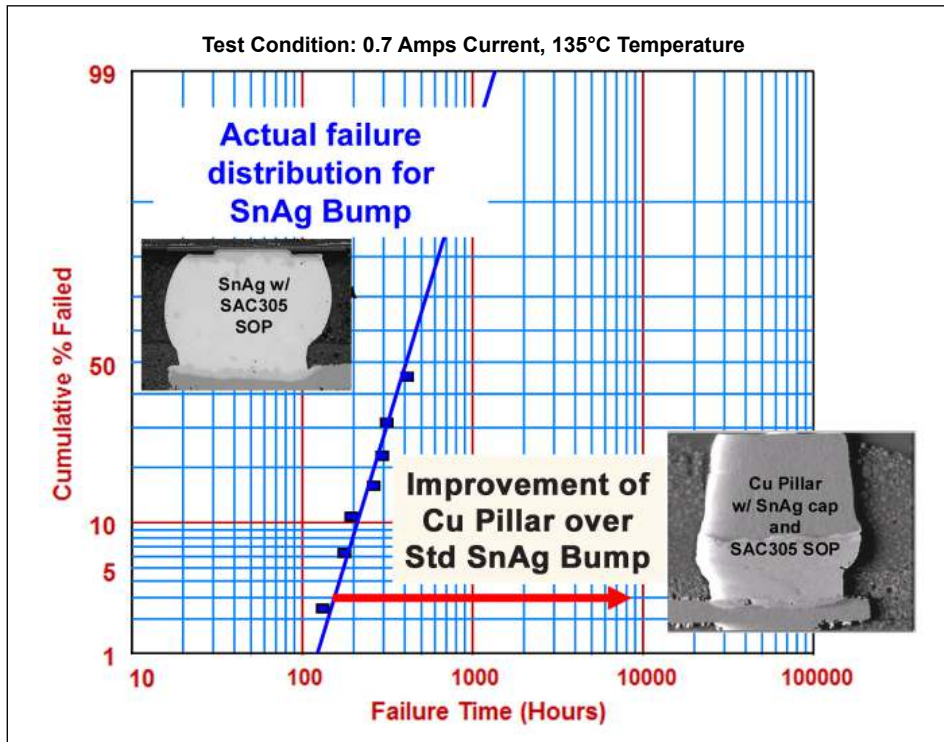


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### Electromigration Reliability Comparison of Cu Pillar with SnAg Bump



The above plot shows improvement in life for Cu pillar over SnAg bump for the same current/temperature condition and similar bump/UBM geometry. No failure was observed in Cu Pillar bump even after 8000 hours of testing at the same condition.

### SQB Results

Test	Test Cond.	Read Point	SS	Results
MSL3	30/60-192	260C 3X	77 x 12 lots	Pass
T/C B	-55°C/+125°C	1000X	77 x 3 lots	Pass
HAST	130°C/85%RH	96 hrs	77 x 3 lots	Pass
T&H	85°C/85%RH	1000 hrs	77 x 3 lots	Pass
HTS	150°C	1000 hrs	77 x 3 lots	Pass

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