COPPER BONDING WIRE

Today copper wire is one of the preferred materials for wire bonding interconnects in many semiconductor and microelectronic applications. The advantages of using copper are well documented and because of these advantageous characteristics it is being used for fine wire ball bonding (size up to .003"). It has the ability of being used at smaller diameters producing the same performance as gold without the high material cost.

Copper wire up to .010" diameter can be successfully wedge bonded with the proper set-up parameters. Large diameter copper wire can and does replace aluminum wire where high current carrying capacity is needed or where there are problems with complex geometry. The annealing and process steps used by SPM enhance the ability to use large diameter copper wire to wedge bond to silicon without damage occurring to the die.

Copper wire does pose some challenges in that it is harder than both gold and aluminum, so bonding parameters must be kept under tight control. Oxides are inherent with this material so storage and shelf life are issues that must be considered. SPM uses special packaging in order to protect the wire and achieve a longer shelf life.

Property	Cu	Au	Al	Ag
Electric Conductivity (%IACS)	103.1	73.4	64.5	108.4
Electric Resistivity (n()	16.7	20.1	16.7	14.7
Thermal Conductivity (W/m K)	398.0	317.9	243.0	428.0
Thermal Expansion Coeff.(µm/m K)	16.5	14.2	23.6	19.0
Tensile Elastic Modulus (GPa)	115	78	62	71

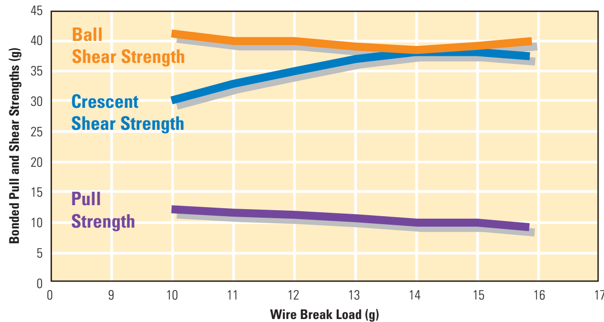
	Hard Wire		Annealed Wire	
Diameter (inches)	Elongation (%)	Tensile Strength (grams)	Elongation (%)	Tensile Strength (grams)
0.0007	0.5 - 4	10 - 20	6 - 20	5 - 12
0.001	0.5 - 4	20 - 30	10 - 25	10 - 20
0.00125	0.5 - 4	35 - 45	10 - 25	15 - 25
0.0015	0.5 - 4	45 - 75	10 - 25	25 - 35
0.002	0.5 - 4	80 - 120	10 - 25	45 - 55
0.003	0.5 - 4	200 - 270	10 - 30	95 - 115
0.004	0.5 - 4	350 - 450	10 - 30	175 - 225
0.005	0.5 - 4	600 - 700	10 - 30	260 - 310
0.010	0.5 - 4	2200 - 2600	10 - 30	1040 - 1240

Note: Other specification requirements can be achieved upon request

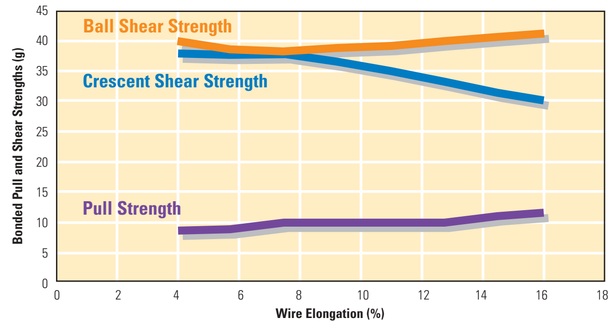
(OVER)

SPM
SEMICONDUCTOR PACKAGING MATERIALS

Correlations of Fine Cu Wire Bonding Strength

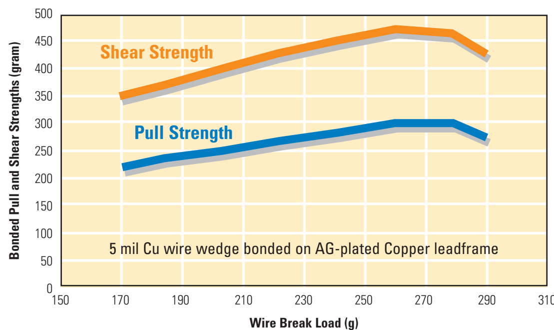


Wirebonding Pull and Shear Strengths
vs. Wire Break load

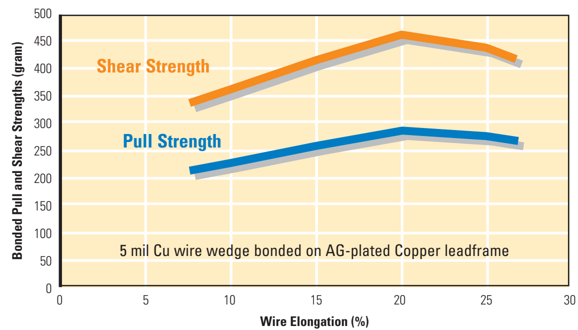


Wirebonding Pull and Shear Strengths
vs. Wire Elongation.

Correlations of Heavy Cu Wire Bonding Strength



Wirebonding Pull and Shear Strengths
vs. Wire Break Load



Wirebonding Pull and Shear Strengths
vs. Wire Elongation

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