



ALUMINUM/SILICON ALUMINUM WIRE PRODUCTS

SPM wire is widely used in the manufacturing of microelectronic devices as an electrical interconnect, either between a chip and substrate or between two chips. The materials described below are of the highest quality, refined and alloyed by SPM to produce the demanding properties of finished wire and ribbon products.

Alloyed aluminum wires are generally preferred to pure aluminum wire except in high-current devices because of greater drawing ease to fine sizes and higher pull-test strengths in finished devices. Pure aluminum and 0.5% magnesium-aluminum are most commonly used in sizes larger than .004". All aluminum systems in semiconductor device fabrication eliminate the "purple plague" (brittle gold-aluminum intermetallic compound) sometimes associated with pure gold bonding wire. Aluminum is particularly suitable for ultrasonic bonding.

In order to assure that uniform high quality bonds can be obtained at high production speeds, special controls are used in the manufacture of 1% silicon-aluminum wire. One of the most important characteristics of high grade bonding wire of this type is homogeneity of the alloy system. Homogeneity is given special attention at SPM. Microscopic checks of the alloy structure of finished lots of 1% silicon-aluminum wire are performed routinely. Processing is also carried out under conditions which yield the ultimate in surface cleanliness and smooth finish and permits entirely snag-free de-reeling.

SILICON ALUMINUM

Type	Diameter		Elongation (%)	Tensile Strength (g)	Temper Condition
	Inches	Microns			
1% Si Al	0.0007	18	0.5 - 2.5	8 min.	HARD
			0.5 - 3.0	4 - 6	ANNEALED
			1 - 4	16 - 18	ANNEALED
1% Si Al	0.001	25	0.5 - 2.5	20	HARD
			1 - 4	14 - 16	ANNEALED
			1 - 4	19 - 21	ANNEALED
1% Si Al	0.00125	32	0.5 - 3.0	28 min.	HARD
			1 - 4	23 - 25	STRESS RELIEVED
			1 - 4	21 - 23	ANNEALED
			1 - 4	19 - 21	ANNEALED
1% Si Al	0.0015	38	0.5 - 3.0	38 min.	HARD
			1 - 4	33 - 38	STRESS RELIEVED
			1 - 4	26 - 33	ANNEALED
1% Si Al	0.002	50	1 - 4	65 min.	HARD
			2 - 6	55 - 65	STRESS RELIEVED
			2 - 6	45 - 55	ANNEALED

HEAVY ALUMINUM



Nearly all heavy aluminum wire for microelectronics is drawn from one of the three materials: 5/9's pure aluminum, 4/9's pure aluminum, or 0.5% Mg/Al alloy. Of the three principle types of aluminum wires, 5/9's grade exhibits the greatest variation of properties and is very sensitive to the fabrication time cycle due to its extreme purity. 5/9's, 4/9's and 0.5% Mg/Al each exhibit unique properties which can be used to overcome any unusual bonding conditions you may experience. Anticipated mechanical properties for the three main heavy aluminum wires are noted below.

PROPERTIES OF TYPICAL HEAVY ALUMINUM TYPES

Types	Diameter		Tensile Elongation (%)	Temper Strength (g)	Condition
	Inches	Microns			
99.999% Al	0.010	250	10 - 18	200	ANNEALED
	0.012	300	5 - 12	200	OVER ANNEAL
			10 - 18	300	ANNEALED
	0.015	375	8 - 15	350	OVER ANNEAL
			10 - 18	450	ANNEALED
	0.020	500	8 - 15	625	OVER ANNEAL
99.99% Al+Ni	0.005	125	5 - 12	100	ANNEALED
			8 - 15	300	ANNEALED
	0.010	250	10 - 18	425	ANNEALED
			12 - 20	600	ANNEALED
	0.015	375	15 - 25	900	ANNEALED
			20 - 30	1300	ANNEALED
0.020	500	20 - 30	1300	ANNEALED	
0.5% Mg/Al+Ni	0.005	125	7 - 12	150	ANNEALED
	0.007	175	10 - 16	300	ANNEALED
			10 - 16	400	ANNEALED
	0.010	250	10 - 16	550	ANNEALED

Note: The addition of nickel to pure aluminum makes the wire Corrosion Resistant. Special temper requirements may be needed for a particular application, and various diameters can be custom made to order. All material produced at SPM is analyzed for chemical properties; impurity levels are measured in PPM. Please request additional details to see how SPM can best serve you.

ALUMINUM RIBBON

Aluminum ribbon is utilized in many microwave and other electronic applications. 1% Si/Al can be rolled as fine as .0005 thick and also can be delivered in a slit form when ratios exceed the standards for forms. Pure aluminum is available as fine as .001 thick and once again can be provided in slit form when specifications dictate.

Rolled Type	Typical Parameter	Rolled and Slit Type	Dimensional Range
SiAl	.0005 x .010	SiAl	.001 - .010 x .040 - .100
SiAl	.001 x .020	Pure Al	.001 - .010 x .040 - .100
SiAl	.002 x .040	SiAl and Pure Al can be produced to your custom specifications upon request.	
Pure Al	.001 x .020		
Pure Al	.002 x .040		

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