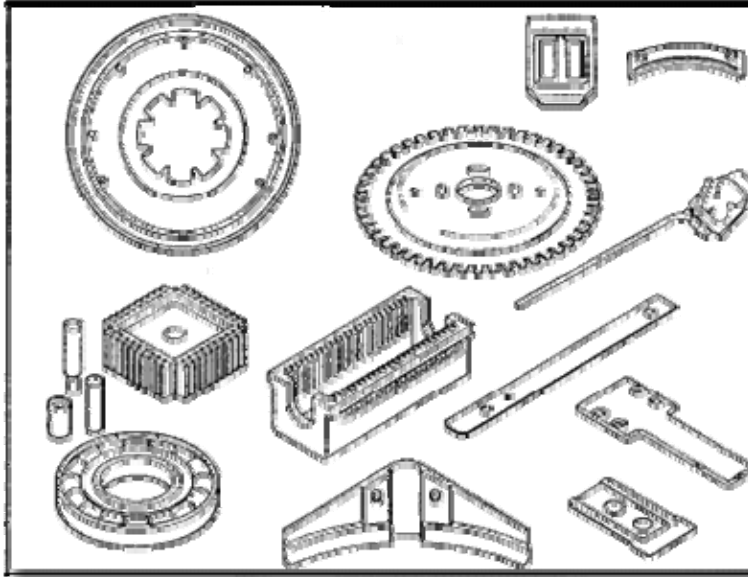


P84HP Polyimide Parts for the Semiconductor Industry



FEATURES:

- High purity
- Non- meltable
- Dimensionally stable at elevated temperatures
- Machinable into finished parts
- Excellent wear resistance

Physical Properties

P84HP is a high purity polyimide specifically developed to meet the demanding needs of the chip manufacturing industry. P84 is a unique polyimide that can be fabricated into machined parts without the need for a secondary, post-curing step. The finished parts exhibit uniform imidization from the outer skin to the inner layers. The fully imidized material shows extremely good chemical resistance to various acids and plasma gases used in the processing of silicon wafers into integrated chips. Listed below are some of the important properties of P84 Polyimide.

Property	ASTM method	Unit	Vespel SP1	P84HP
Mechanical				
Tensile Strength	D-638	psi	12,500	20,000
Tensile Strength @ 500°F	D-638	psi	6,000	10,150

Elongation	D-638	%	7.5	9
Flex Strength	D-790	psi	21,000	29,750
Flex Modulus	S-790	psi	450,000	550,000
Compressive Strength @ 10% strain	D-695	psi	19,300	34,800
Deformation @2000 psi - 24 hrs	D-621	%	0.14	0.1

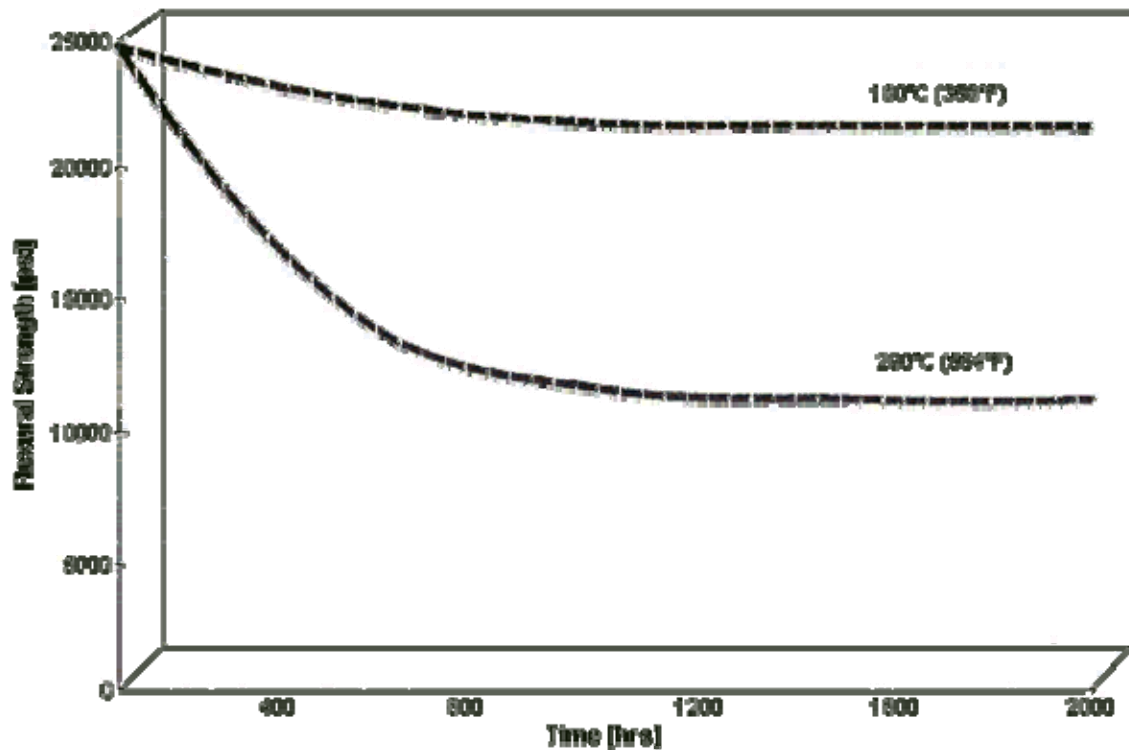
Other

Coefficient of expansion	TMA 10-6	in/in/F	30	27.8
Specific gravity			1.43	1.34
Hardness	Shore D			88
Dielectric strength		V/mil	560	500
Surface resistivity		Ohms	1.00E+17-18	1.00E+17
Volume resistivity		Ohms/cm	1.00E+15-16	1.00E+18

Thermal Stability

The long term thermal stability of P84 is excellent. The flex strength of P84 remains high especially at elevated temperatures. Since P84 is an amorphous plastic, the dimensional stability at elevated temperatures is very good. P84 is a non-meltable polymer, therefore, it has excellent creep under load at high exposure temperatures. This fact allows the material to be used in critical etching processes where chamber temperatures are high.

Retention of Flex Strength under Exposure to Elevated Temperatures



Chemical Resistance

The fully imidized nature of P84 yields excellent chemical resistance to various solvents, acids, and hydraulic fluids. P84 polyimide is produced using novel isocyanate technology

which yields a unique, fully imidized material without the need for curing.. Other polyimides must be molded and cured. The curing closes the imide rings and produces water as a by-product that migrates out through the surface. Fabricated parts made from P84 are non-porous, which minimizes the migration of fluids into the surface layers and greatly improves chemical resistance.

**Lenzing P84 Polyimide Resin
100 hour exposure - Temperature: 68° F**

Chemical	Concentration (%)	Weight Gain (%)	Residual Elongation (%)	Residual Strength (%)
H ₂ O ₂	30	1.02	100	100
HCl	20	0.67	110	100
HCl	conc.	0.13	70	100
HNO ₃	20	0.65	98	100
Acetic Acid	20	0.87	114	100
H ₂ SO ₄	6N	0.54	50	87
NaOH	1N	1.79	120	100
NaOH	10	3.84	170	98
NaOH	6N	6.87	146	87
KOH	10	4.18	175	95

Vespel SP1 Polyimide

Chemical	Concentration (%)	Temperature (F)	Exposure (Hr)	Residual Strength (%)
HNO ₃	70	73	120	40
Acetic Acid	15	210	1,900	20
HCl	5	73	120	70
HCl	conc.	73	120	70
NaOH	5	73	120	55

**Lenzing P84 Polyimide Resin
Chemical Resistance List after
1000 hour exposure at room temperature**

Chemical	Weight Gain (%)	Residual Elongation (%)	Residual Strength (%)
Antifreeze	1.37	90	92
Brake Fluid	1.64	90	98
Diesel	0.08	108	99
Gasoline (unleaded)	0.05	98	100
Hydraulic Fluid	0.33	99	96
Jet Fuel JP5	0.10	105	100
Jet Fuel JP4	0.05	104	100
Motor Oil	-0.40	98	99
Thermal Conduction Oil	-0.04	82	92
Skydrol 500B	-0.90	109	100
Acetone	-0.07	111	100
Freon TF	-0.13	94	99
Ethylacetate	-0.85	105	100
Isopropanol	-1.41	107	100
Methylethylketone	-1.16	112	100
Perchloroethylene	-0.11	96	98
Benzene	-0.10	90	93
Toluene	-0.16	104	100
Xylene	-0.10	95	98
Bleaching Agent (Clorox)	1.25	78	90
Dish Washing Detergent (Joy)	2.32	105	99
Deionized Water (100C/212F)	1.65	42	65
Coolant Liquid (120C/248F)	-1.44	63	86

Wear Resistance

P84 Polyimide exhibits excellent sliding and wear resistance especially at elevated temperatures. Typical fillers such as graphite powder provides P84 with very low wear rates which is useful in bushing and bearing applications.

Tribological Comparison of VESPEL and P84 Formulations

