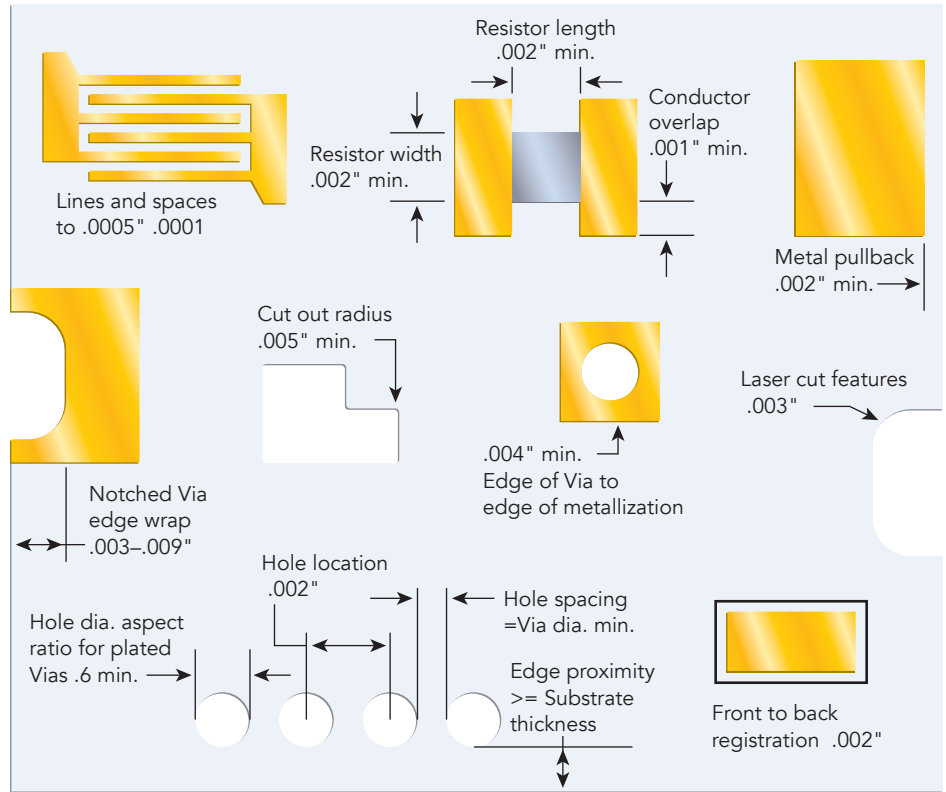


SemiGen's ion beam milling technology produces thin film circuit traces and spaces with the tightest tolerances. We can etch complex, high performance microwave and millimeter-wave circuits on a variety of materials, including:

- Alumina
- Aluminum Nitride
- Ferrite
- Silicon
- Beryllium
- Fused Silica
- Glass

Custom metallization capabilities allow us to provide titanium (Ti), platinum (Pt), and gold (Au) as a standard metal which provides excellent eutectic value and a robust bond strength. Many other metal schemes are available and used throughout our processing. We deposit films internally using sputtered or evaporated vacuum systems and add gold plating for optimal bonding. We specialize in producing:

- Couplers
- Filters
- Inductors
- Stand-offs
- Terminations
- Custom Circuits



Substrate Material Properties

Material	CLA Surface Roughness (μ -inches)	Thickness Tolerance (inches)	Dissipation Factor at 1 MHz	Dielectric Constant (k)	Thermal Conductivity (W/mK)	Thermal Expansion (μ "/inch/ $^{\circ}$ C)
As Fired 99.6% Alumina	<3	\pm 10%	.0001	9.9	30	7.1
Polished 99.6% Alumina	<1	\pm .0005	.0001	9.9	30	7.1
Polished 99.5% Beryllium Oxide	<3	\pm .0005	.0004	6.5	250	6.4
Polished Aluminum Nitride	<3	\pm .0005	.0005	8.6	170	4.6
Polished Fused Silica	<1	\pm .0005	.000015	3.8	1	.56
Polished Titanates	<3	\pm .0005	.0004	38-200	1.8	5.8

Metal Functions

Material Function	Types of Material	Range of Values	Comments
Resistor	Tantalum-Nitride (TaN) Nickel-Chromium (NiCr)	10-150 Ω /sq (max) 20-350 Ω /sq (max)	50-100 Ω /sq (std) 50-250 Ω /sq (std)
Adhesion	Titanium-Tungsten (Ti or TiW)	250-750 Angstroms	Ideal for High Temp.
Barrier	Nickel (Ni) Sputtered Palladium or Platinum Sputtered	750-2000 Angstroms 40-100 μ in (1-2.5 μ m)	Standard Barrier Solderable
Conductor	Gold (Au)	10-200 μ in (0.25-5 μ m)	Tight Tolerance Fine Lines