Thin Film Microcircuits - Design Guidelines

SUBSTRATES	Standard materials	Alumina 96%, 99.5%, 99.6% Aluminium nitride (AlN) Fused quartz
	Other materials	Ferrite Glass Sapphire Silicon Silicon carbide
	Standard thicknesses	0.127, 0.254, 0.381, 0.508, 0.635, 0.762, 1.016 mm
	Thickness tolerances	As fired ± 10% Polished ± 13 µm
	Standard sizes	50.8 x 50.8, 57.15 x 57.15, 76.2 x 76.2, 101.6 x 101.6, 114.3 x 114.3 mm
	Surface finish - Alumina Surface finish - AlN	As fired < 0.125 µm Ra Polished < 0.025 µm Ra As fired 1.6 µm Ra Polished < 0.05 µm Ra
	Camber	As fired 0.05 mm / 25 mm Polished 0.025 mm / 25 mm
IMAGING	Maximum circuit size Minimum pattern to substrate edge Typical pattern tolerance Typical layer alignment tolerance	127 x 100 mm 20 µm ± 20 µm ± 20 µm
CONDUCTORS	Minimum line width/space Typical line width/space	10 µm 25 µm
	Minimum line width tolerance Typical line width tolerance	± 3 µm ± 10 µm
	Minimum space tolerance Typical space tolerance	± 3 µm ± 10 µm
	Minimum metallisation around vias	100 µm
METALLISED THRU HOLES / FILLED VIAS	Minimum aspect ratio (Hole diameter : substrate thickness)	0.67:1
	Typical hole diameter Minimum hole diameter	Substrate thickness 67% of substrate thickness
	Minimum hole to hole web thickness or hole to edge web distance	Substrate thickness
RESISTORS	Nominal sheet resistance Preferred sheet resistance	10 - 200 ohms/sq 50 or 100 ohms/sq
	Non-trimmed tolerance Trimmed tolerance Pre-trimmed design value	± 20% ± 0.2% -20%
	Minimum length/width Minimum termination pad size Minimum distance between resistors	0.1 mm 0.1 mm x 0.1 mm 0.05 mm

LASER PROFILING	Maximum substrate thickness for profiling	1.0 mm
	Lasered feature tolerance Lasered feature position tolerance	± 30 µm ± 30 µm
	Minimum lasered feature to pattern gap Lasered feature to pattern tolerance	30 µm ± 30 µm
	Typical laser taper	± 50 µm / mm
	Minimum distance hole to hole/hole to edge	= Substrate thickness
	Maximum substrate size	150 x 150 mm
DIAMOND SAWING	Maximum substrate thickness for dicing	2.0 mm
	Maximum tile size	Rectangular: 127 x 127 mm Circular: 150 mm dia.
	Minimum distance pattern to edge Typical distance pattern to edge	0.030 mm 0.050 mm
	Minimum dicing tolerance Typical dicing tolerance	±0.025 mm ±0.050 mm
	Typical blade width	Substrate Thickness / Blade Width <0.5 mm / 0.2 mm 0.5-1.0 mm / 0.3 mm >1.0 mm / 0.4 mm
METALLISATIONS	Adhesion layers	Ti, TiW, NiCr, Cr
	Barrier layers	TiW, Pt, Pd, Ni
	Conductor layers	Cu, Au
	Resistive layers	NiCr, TaN
	Dielectrics/Passivations	Polyimide
	Pre-deposited solder	AuSn. Typically 3 - 5 µm thick
PLATINGS	Electrolytic	Cu, Ni, Au. Typically 1 - 6 µm thick
	Typical plating thickness tolerance	± 25%
DATA FORMAT	DWG, DXF, Gerber, GDSII	AutoCAD preferred
	Lines	Closed polylines
OTHER	Air bridges, multi-layers, double sided circuits, edge wrapovers, solid vias, fully sputtered or plated-up conductors, RIE or wet etched patterns, shadow masking, sputter up or down, evaporation, laser profiling/scribing/serial numbering, sub-assembly.	
GENERAL	Actual capabilities are application specific and will depend on the interactions between the substrate material, metallisation scheme, vias, apertures, line widths, line spacing, conductor thickness, resistor geometry, etc. Generally the more complicated the circuit and the tighter the tolerances the lower the yield and thus the higher the cost. Selection of metallisation schemes is dependant on requirements for solderability, wire bondability and temperature resistance as well as electrical and dimensional performance.	

LEW Techniques specialises in the manufacture of miniature components and microcircuits for mounting of semiconductor devices. Our in-house capabilities include thin-film, thick-film and refractory metallising of ceramics and metals, electroplating, laser machining and marking, precision dicing, atmosphere/vacuum brazing and solder assembly. Contact Technical Sales for further details.

To discuss your application in detail please contact our Technical Sales Department who will be pleased to assist you.

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