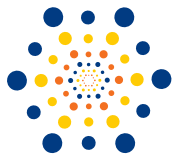


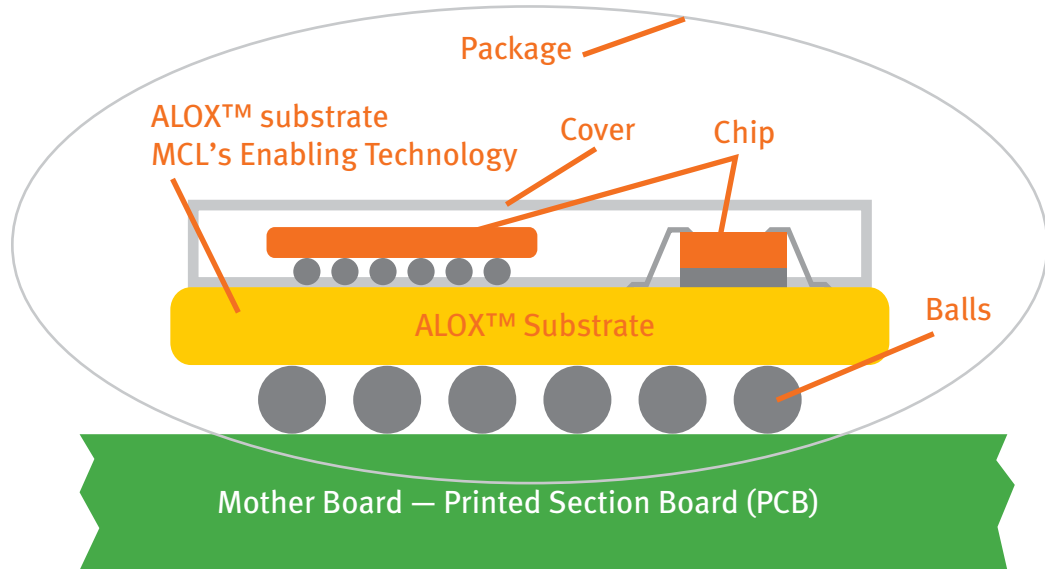
3L-ALOX™ THREE LAYER SUBSTRATE

Technical Specification

Parameter	Units	Value	Comment / Advantage
Geometrical & Finish Parameters			
Total Thickness	µm	100-500	Typical 150-300. Very low profile!
Internal aluminum layer minimum Line/space	µm	100/100	Used for ground and power layers. Very fine resolution for the application!
Internal aluminum layer Thickness	µm	30-140	Option for very heavy ground and power layers.
Top & Bottom layers line/space	µm	25/25	Current Minimum value, Cutting edge resolution!
Top Copper layer thickness	µm	6-20-35	Typical values. Heavier copper traces can be fabricated
Via width/Pitch (min)	µm	140/250	For substrate thick of 125µm. Current cutting edge resolution for Core applications
Via Pad (= Land size) (min) (For Substrate. Thickness of 125µm.)	µm	40	Land size equal to pad is impossible to achieve in conventional technology. Typically for conventional boards land size is three times the pad size. Dramatic advantage for ALOX in terms of routing density!
Finish Parameters (Typical)	Nickel/Gold 5/0.2 µm & Solder mask		Typical
Mechanical and Thermal Parameters			
Young Modulus (E)	Gpa	130	Very high and clear advantage over plastics
Poison Ratio (ν)	--	0.29	
Thermal Coefficient of Expansion (TCE)	ppm/deg	8 - 12	This value is adjustable and controllable. Value is ranging from 8-12. Great advantage over plastics in matching properties to the silicon die.
Flexural Strength	GPa	60,000	
Thermal Conductivity of the Dielectric	Watt/mxdeg	12-20	Property of the Dielectric. Significant advantage. Integral Heat Sink option !
Thermal Conductivity of Aluminum	Watt/mxdeg	240	
Operating temperatures	Deg.	<350°C	
Reliability			
1000 thermal cycles test, 1000 vias chain, 0,5 mm pitch	% chain resistance change	< 3% Pass	55°C to +125°C JESDC 22-A104-B / PASS!

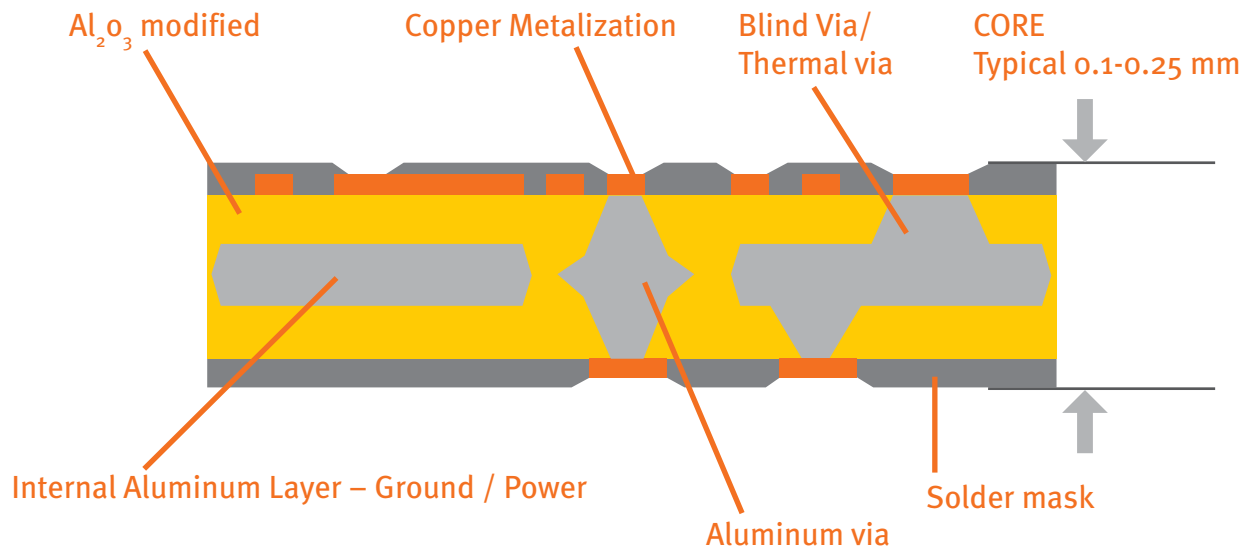


MCL SYSTEM IN PACKAGE (SIP) SUPERPAK™



Note: Cross section drawing not to scale

ALOX™ SUBSTRATE, CROSS SECTION



Note: Cross section drawing not to scale

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Electrical Data

Parameter	Conditions/std.	Units	Value	Comments
Dielectric Constant	50 Mhz - 20 GHz		6.6	Outsource measure
Dissipation Factor	50 Mhz - 20 GHz		To be measured	
Withstand Voltage	@75 μ m	Volts	> 2500	MCL measurement
Via Series Resistance	Via chain		< 10m Ω	MCL measurement
Via inductance	Dtop=50 μ m H=200 μ m Dcenter =250 μ m	pH	8.4 \pm 10%	Calculation
Blind Via inductance		pH	4.2 \pm 10%	Calculation
Via Capacitance				
Resistivity of Cu traces	@ 20 μ m and 10 μ m respectively	Ω /square.	0.0017-0.0025	MCL measurements
Type of Impedance Line		NA	Microstrip Strip lines, differncial	
Options		NA	Split in ground /voltage layer, large vias	
Characteristic impedance for transmission line			25-100 Ω	Outsource measure + estimate
Impedance line tolerance			\pm 10%	Estimated
Delay		ps/inch	To be measured!!	Outsource measure
Optional – Integral Coils			Integral Coils	
Leakage current (Rvia-g)	@500Volts	Amp	10exp(-13)	TV2 (Outsource)
Leakage current (Rz)	@150Volts	Amp	3*10exp(-12)	TV2 (Outsource)