AGC
Your Dreams, Our Challenge

ELL

General Processing Guidelines

Extreme Low Loss Materials

ELL high speed / extreme low loss materials offer advanced electric performance and high reliability for use in the next generation of internet infrastructure and digital / RF hybrid designs. It is designed for use in high frequency core routers, high speed switches, supercomputers and applications where low signal attenuation and high data transfer rates are critical.

Material Handling & Storage

Store laminates flat in a dry environment. Do not bend, scratch, or dent laminate.
Store prepreg flat, in a cool, dry environment per IPC-4101E Condition 2 [less than 72°F (23°C) and ≤50% RH].
For extended shelf life, store per IPC-4101E Condition 1 [less than 5°C (41°F)].
Reseal opened bags of unused prepreg.

Copper & Surface Preparation

Prepare copper surface for photo resist application with a mild micro-etch.

Bond Enhancing Treatments

ELL products are meant for high-speed signal integrity circuitry. Brown and black oxide may be used but are not recommended for signal integrity. Oxide treatment with organic coating using a peroxide sulfuric etch is preferred.

Inner Layer Drying

Inner layers should be oven dried to remove adsorbed moisture prior to re-lamination. Adsorbed moisture in the inner layer can affect the curing properties of the prepreg. Conveyorized warm air drying is usually not effective in removing adsorbed moisture from the etched layer.

	Recommendations
Signal layers	230°F (110°C) in vertical racks with minimum 0.5" (12mm) separation for 30 minutes
Plane layers and plated sub-lam layers	230°F (110°C) in vertical racks with minimum 0.5" (12mm) separation for 60 minutes

Note: 1) If cores are not used within 24 hours, they should be re-baked.
2) Baking cores in stacks does not provide an effective airflow to remove entrapped moisture from the cores and should be avoided.
3) Cores with thickness greater than 100 mils (2.54mm) may require greater than 30 minutes baking.

Sub-Assembly Baking

Post oxide bake is also recommended for each sub-assembly before relamination. The same recommendations outlined above in Inner Layer Drying should be followed.

Lay-up

For best results, use inner layers within 2 hours after drying. Rebake inner layers if not used within 24 hours.

Lamination

For best results, fully cure in vacuum assisted hydraulic press.

	Recommendations
Vacuum Gauge Pressure	A minimum of 28.5" Hg (965 mbars) for 20 minutes before applying heat & pressure. Maintain vacuum throughout press cycle
Heat Up Rate[1]	5 - 11°F (3 - 6 °C) per minute
Critical Range	180 – 330°F (82 – 165°C)
Pressure	450 - 500 psi (27 - 35 bar)
Cure Time, Temp[2]	>120 minutes @ 420 °F (216 °C)
Cool Down Rate	<6ºF (3°C) per minute or less until stack reaches 260°F (127°C)
Breakdown	After panels have cooled below 150°F (65 °C)

Note: 1) Heat rise is usually controlled by using an acceptable thermal lagging such as kraft paper or press pads. Alternately the heat rise can be controlled by ramping the platen temperature about 5 – 10 °F (5 °C) higher than book temperatures and controlling the heat up rate through the critical temperature range. 2) Lamination pressure is based on 1/2oz and 1oz copper. Heavier copper weights may require higher pressure.

Note: 2) The curing system of ELL requires close control of cure time and temperature. A minimum of 210°C (410°F) must be achieved to initiate proper cure and achieve full thermal reliability.

Drilling

Typical Drill Parameters	Recommendations	
Drill Sizes	0.010" - 0.018" (0.25 - 0.46 mm)	0.020" - 0.040" (0.5 - 1.0 mm)
Surface Speed	300 - 400 SFM (96 - 122 m/min.)	350 - 450 SFM (91 - 122 m/min.)
Chip Load	0.5 - 1.5 mils (0.012 - 0.030 mm/rev)	1.0 - 2.5 mils (0.025 - 0.063 mm/rev)
Maximum Hit Count	500 - 750	500 - 1000
Typical Stack Height	0.045" - 0.100" (1.1 - 2.5 mm)	0.045" - 0.100" (1.1 - 2.5 mm)

Note: Undercut drills are recommended for small hole drills less than 0.020" (0.5 mm). Peck drilling is recommended for panel thicknesses greater than .100" (2.5 mm). Lubricated entry and/or back-up materials may be used to reduce the heat generation during drilling.

Drilling parameters should be adjusted depending on hole size, layer count, panel thickness, copper content and stack height. For specific feed and speed parameters, contact your drill supplier or AGC's technical representative. Detailed typical drilling parameters are available for many products. Please contact www.agc-ml.info-maltimaterial@agc.com.

Hole Cleaning (Resin Smear Removal)

Plamsa desmear is preferred. Plasma desmear followed by a mild chemical desmear can be used. If a chemical desmear only is used, the dewell times should be reviewed with your tech service rep.

Plasma: Typical desmear conditions

Temperature	Gas mixture	Power	Time
80± 2°C	10%CF_4, 80% O_2, 10% N_2	4000 W	15-20 min

Note: Depending on the amount of resin removal required, a preheat cycle and an oxygen burn cycle for ash removal may be necessary.

Chemical Desmear:

Type	Temp (°F /°C)	Time
Cyclic Amine 50%	173 ± 5 / 78 ± 2	4 - 6 min.
Alkaline Permanganate oxidizer	175 ± 5 / 80 ± 2	8 - 12 min.

Panels > 0.180" (4.6 mm): Desmear process must be evaluated to insure adequate solution transfer through vias. It may be necessary to use a very light plasma cycle followed by chemical desmear on very thick panels with high aspect ratio vias. Due to variations in plasma equipment, proper process times and equipment settings should be evaluated for effectiveness when desmearing ELL material.

Final Finish

If using nickel plating such as ENIG panels should be baked for a minimum of 1 hour at 250°F (120°C).

Routing

Typical Drill Parameters	Recommendations
Stack Height	0.250" (6 mm)
Tool Size	0.093" (2.4 mm)
Feed Rate	60 IPM (1.5 m/min.)
Speed	24K RPM

These guidelines can provide only basic and reference information for PCB fabricators. Because of different environment, equipment, tooling and so on, in all instances, the user shall determine suitability in any given conditions or applications. For more detailed processing information, please contact with the AGC engineer or sales representative.