

Meteorwave® ELL 100 Series

ELL 101 / 102 / 103 / 105

High Speed, Extreme Low Loss Materials

Purpose

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

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 using standard chemistries and techniques.

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. Alternative oxides are the preferred treatment for high-speed and RF applications.

Inner Layer & Sub-assembly 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. Consult your oxide supplier for inner layer baking conditions so as to not reduce the intended adhesion properties.

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

Inner Layer Drying Notes:

For best results, use inner layers within 2 hours after drying. Rebake inner layers if not used within 24 hours. Baking cores in stacks does not provide an effective airflow to remove entrapped moisture from the cores and should be avoided. Post oxide baking is also recommended for each sub-assembly before relamination. The same recommendations outlined above should be followed. Cores and sub-assemblies greater than 100 mils (2.54mm) thick may require additional baking time.

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. Do not apply heat or pressure prior to vacuum dwell time. Maintain vacuum throughout press cycle.
Heat Up Rate^[1]	6 - 11°F (3 - 6°C) per minute
Critical Range	180 - 330°F (82 - 165°C)
Pressure^[2]	450 - 500 psi (27 - 35 bar) for ≤ 1 oz copper or standard filling 500 - 600 psi (35 - 42 bar) > 1oz copper or low-pressure areas
Single / Dual Stage	Single Stage: Apply pressure immediately after vacuum dwell time. Dual Stage: Apply full pressure after vacuum dwell time and prior to 150°F (65°C).
Cure Time, Temp^[3]	>120 minutes @ 420°F (216°C)
Cool Down Rate	<6°F (3°C) per minute or less until stack reaches 260°F (127°C)
Breakdown	After panels have cooled below 150°F (65 °C)

Lamination Notes:

[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.

[3] 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 ^[1] ELL 101 /102		Recommendations ^[2] ELL 105	
Drill Sizes	0.010" - 0.018" (0.25 - 0.46 mm)	0.020" - 0.040" (0.5 - 1.0 mm)	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)	250 - 380 SFM (63 - 96 m/min)	380 - 480 SFM (96 - 122 m/min)
Chip Load [per rev]	0.5 - 1.0 mil (0.013 - 0.025 mm)	1.2 - 1.5 mils (0.030 - 0.038 mm)	0.5 - 0.9 mils (0.013 - 0.023 mm)	1.0 - 1.1 mils (0.025 - 0.028 mm)
Maximum Hit Count	500 - 750	500 - 1000	250 - 500	250 - 500

Drilling

Notes:

[1] 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.

[2] High layer count or package substrate parallel flute drills (Union Tool MCW series) are recommended for drill sizes less than 0.022" (0.55 mm). Drills designed to as improved smear for multilayer boards Union Tool UM35 series) are recommended for drill sizes greater than 0.022" (0.55 mm). Peck drilling may be necessary 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.

Hole Cleaning (Resin Smear Removal)

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

Plasma Desmear: 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

Plasma Note: Depending on the amount of resin removal required, a preheat cycle and an oxygen burn cycle for ash removal may be necessary. Due to variations in plasma equipment, process times and equipment settings should be evaluated.

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

Chemical Desmear Notes: For panels > 0.180" (4.6 mm), the 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 thick panels with high aspect ratio vias.

Glass Etch: Standard fiberglass etch chemistries may not etch quartz glass bundles.

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, etc., the user shall determine suitability in any given conditions or applications. For more detailed processing information, please contact your local AGC technical service engineer or sales representative.