TC350 and TC600

Microwave Materials

TC350 and TC600 Fabrication Guidelines

TC350 and TC600 are ceramic powder filled, woven fiberglass, PTFE composites engineered to produce laminates with a nominal dielectric constant of 3.50 and 6.15 respectively. The ceramic fill and ceramic styles used in TC350 and TC600 typically reduce drill life compared to conventional PTFE/glass substrate. But, the ceramic reduces smear when compared to typical PTFE/glass substrates.

TC350 and TC600 materials used in stripline or microstrip applications can be processed using conventional PTFE ceramic board fabrication processes and techniques.

Process Guidelines for TC350 and TC600 Materials

Storage: Store the material flat in a cool dry area away from direct sunlight, avoiding copper oxidation and material contamination.

Bonding: Stripline or Buried Microstrip bonding can be accomplished using Arlon's 6700 or 6250 bonding films or FR-4 prepregs. Copper oxide treatments can be used when bonding with FR-4 prepregs. It is best to laminate directly after copper etching. Adhesion to the laminate surface can be improved with sodium or plasma etch prior to bonding. Adhesion to the copper surface can be improved with a micro-etch prior to bonding. Contact Arlon for process parameters for use with 6700 or 6250 bonding films.

Drilling: Drill TC350 and TC600 materials using highly polished carbide tools. It is not recommended to use repointed tools. Panels can be drilled in stacks based on total thickness. The use of rigid entry (.020"-.030") and exit (.060"-.093") material is recommended. The following feeds and speeds are recommended as a beginning point to develop specific process parameters.

Chip load:	0.002-0.003 inch/revolution
Surface speed:	400-450 surface feet/minute
Retract rate:	500-600 inch/minute
Tool life:	500-1000 hits (depending on stack height)

Deburring: Optimization in drilling will eliminate the need for aggressive deburring. If deburring is necessary, properly support the back side of the panel and apply light circular motion with wet 600 grit sandpaper. Use a high pressure spray to remove loose debris in the holes.

TC350 and TC600 Fabrication Guidelines (continued)

Through Hole Preparation:

Hole wall resin activation is necessary to ensure coverage with electroless copper deposition. This can be done with plasma or sodium etchants. The following is a typical plasma cycle for PTFE materials:

Step	Gas Mixture	Time/Power
Heat-up	80% O_2/20% N_2	To reach 70-90ºC Material temp
Surface Etch	80% H_2/20% N_2 or 80% N_2/20% O_2	30 minutes @ 75% of full power
O_2 Burn	100% O_2	50% power / 5 min to remove residue

Hold time after plasma is limited. The plasma process should be repeated if hold time extends beyond 12 hours.

Commercially available sodium etchants are commonly used. Contact the following suppliers to obtain the processing guidelines for their products:

Acton Technologies, Inc.	**Product: Fluoroetch®**	Phone: 717-654-0612
Matheson Gas Products	**Product: Poly-Etch® and Poly-Etch W®**	Phone: 978-283-7700
W.L. Gore & Associates	**Product: Tetra-etch® and Tetra-Prep®**	Phone: 800-344-3644

It is important to rinse the TC350 and TC600 products using an organic solvent and hot water, following the sodium vendor process guidelines. Arlon recommends a bake step to thoroughly dry the product after rinsing. This bake should be performed in a vented oven for 90 minutes at 225°-250°F (110°-120°C).

Surface Prep: Standard chemical cleaning techniques are recommended. It is not recommended to mechanically scrub PTFE materials, due to the dimensional change that may occur when force is applied to the surface of the copper.

Copper Plating: Conventional electroless or direct plate technologies and electrolytic copper chemistries may be used.

Etching: Conventional ammoniacal or cupric etchants may be used to remove unwanted copper. Rinse thoroughly with warm water after processing.

Resist Strip: Conventional resist strippers may be used to remove unwanted resist.

Soldermask: For SMOBC parts it is recommended that soldermask coating take place within 12 hours after copper etching for best adhesion. To improve soldermask adhesion, sodium or plasma etch will prepare the laminate surface, and a micro etch will prepare the copper surface. If required, bake TC350 and TC600 for one hour at 225°-250°F (110°-120°C) to remove residual moisture before soldermask processing.

Hot Air Leveling: Bake TC350 and TC600 boards for one to two hours at 225°-250°F (110°-120°C) prior to solder leveling. It is recommended that boards be racked to ensure proper air circulation around the parts to fully dissipate any residual moisture.

Electroless Gold: It is important to employ adequate rinsing procedures, according to the chemical vendor processing guidelines, to ensure reliable process yields for chemical plating.

Routing: It is recommended to use commercially available two-flute, slow spiral, micro-grain carbide, upcut endmills. Support the PTFE product with rigid entry and back-up materials. It is important for the router pressure foot to exert sufficient clamping pressure to the material stack.

Typical rout parameters for an 0.062" cutting tool are:
Spindle Speed: 15,000 rpm Table Feed Rate: 15 inches/minute

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