



GETEK® LAMINATES
EPOXY/POLYPHENYLENE OXIDE RESIN

TYPE: NEMA FR-4 (IPC-4101/25)

UL FILE NO.: E35132

NOMINAL THICKNESS (INCHES)	THICKNESS TOLERANCE (INCHES)	DOUBLE-SIDED			SINGLE-SIDED		
		GE GRADE	E GLASS CONSTRUCTION	Dk @ 1 MHz	GE GRADE	E GLASS CONSTRUCTION	Dk @ 1 MHz
.0027	+/- .0005	ML200D	1080	3.8	-	-	-
.004	+/- .0005	ML200D	2313	3.9	-	-	-
.005	+/- .0007	ML200M	2313/106	3.8	-	-	-
.006	+/- .0007	ML200D	2313/1080	3.9	-	-	-
.007	+/- .0010	ML200M	(2) 2313	3.8	-	-	-
.008	+/- .0010	ML200D	2313/2116	3.9	-	-	-
.010	+/- .0010	ML200D	(2) 2116	3.9	-	-	-
.012	+/- .0010	ML200D	1080/7628/1080	3.9	-	-	-
.014	+/- .0015	ML200D	(2) 7628	4.2	-	-	-
.018	+/- .0015	ML200D	7628/2313/7628	4.1	-	-	-
.021	+/- .0020	ML200D	(3) 7628	4.2	-	-	-
.024	+/- .0020	ML200C	2116/(2) 7628/2116	4.1	-	-	-
.028	+/- .0020	ML200D	(4) 7628	4.2	-	-	-
.028, Alt	+/- .0020	ML200C	1080/2313/(3) 2116/2313/1080	3.8	-	-	-
.031	+/- .0030	ML200C	2116/(3) 7628/2116	4.1	-	-	-
.031 ③	+/- .0040	RG200D	(4) 7628	4.2	-	-	-
.044 ③	+/- .0050	RG200D	(6) 7628	4.2	-	-	-
.059 ③	+/- .0050	RG200D	(8) 7628	4.2	RG200D	(8) 7628	4.2

TYPICAL LAMINATE PROPERTIES

PROPERTY	TEST METHOD	CONDITION	VALUE
THERMAL			
Glass Transition Temp (° C)	DMA	A	175-185
Z-Expansion (%)	IPC-TM-650 2.4.41 (TMA)	A	3.8 ①
ELECTRICAL			
Electrical Strength (Volts/Mil)	IPC-TM-650 2.5.6.2	D-48/50	1000-1200
Volume Resistivity (Megohm-CM)	IPC-TM-650 2.5.17.1	C-96/35/90	> 10 ⁶
Surface Resistivity (Megohm)	IPC-TM-650 2.5.17.1	C-96/35/90	> 10 ⁴
ARC Resistance (Sec.)	IPC-TM-650 2.5.1	D-48/50	> 60
Dielectric Constant @ 1 MHz	IPC-TM-650 2.5.5.3	C-24/23/50	3.6-4.2
Dissipation Factor @ 1 MHz	IPC-TM-650 2.5.5.3	C-24/23/50	.010-.015
PHYSICAL			
Moisture Absorption (%)	IPC-TM-650 2.6.2.1	D-24/23	.12 ①
Peel Strength 1 oz./Ft. ² Cu.(Lb/In)	IPC-TM-650 2.4.8	A	8-9
After Thermal Stress		10 Sec @ 550° F	8-9
Dimensional Stability (Mils/Inch)	IPC-TM-650 2.4.39		< .5
Flammability ②	UL 94		VO

① Typical value listed is for an .028 (4 ply 7628) core.

② This rating is not intended to reflect hazards presented by this or any other material under actual fire conditions.

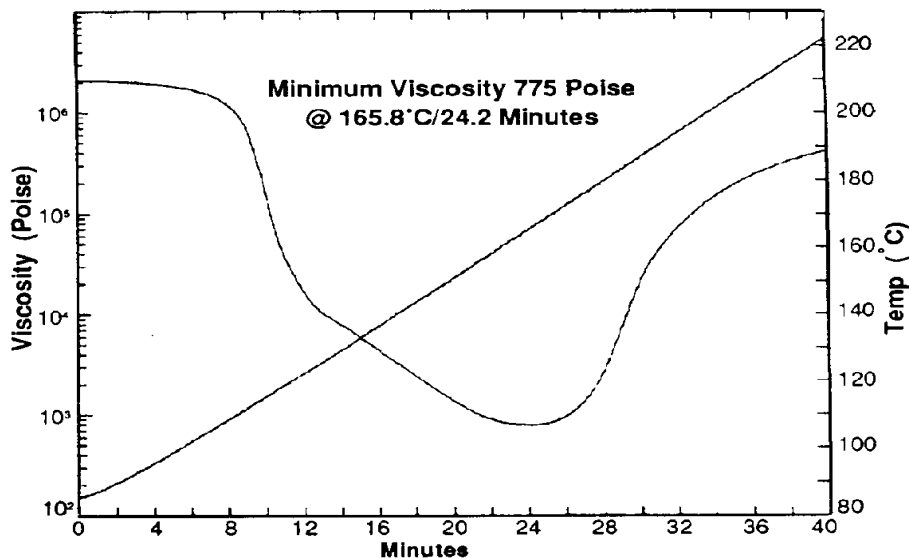
③ Nominal thickness includes copper cladding for RG200, Core only for ML 200.

GETEK® LAMINATES EPOXY/POLYPHENYLENE OXIDE RESIN

GRADE: GETEK® Prepreg (Bonding Sheet)
TYPE: NEMA FR-4 OR IPC-4101/25

UL File No.: E35132

GE Grade	Glass Style	Resin Content (%)	Minimum (2) Melt Viscosity (Poise)	Scales Flow Pressed Thickness (1) (Inches)	Volatile Content (%)
T017550X	106	75 +/- 3	500 - 2500	.0022 +/- .0003	.5 Max.
T416340X	1080	63 +/- 3	"	.0027 +/- .0003	"
T315530X	2313	55 +/- 3	"	.0036 +/- .0003	"
T615430X	2116	54 +/- 3	"	.0046 +/- .0003	"
T814225X	7628	42 +/- 3	"	.0067 +/- .0004	"



All GE Prepregs are rheology tested and controlled to minimum melt viscosity. This has proven to reduce material variation and is a more reliable test method for characterizing Prepreg performance.

TYPICAL LAMINATION CYCLES:

Press Cure Cycle

Oven Cure Cycle

Optional Low Pressure (Kiss) Cycle
(Applies to all Press Types)

25-75 PSI Kiss, Apply High Pressure Prior to Package Exterior Reaching 220° F

High Pressure - Hydraulic
- Vacuum Assist Hyd.
- Autoclave

275 - 325 PSI
175 - 225 PSI
125 - 175 PSI

275 - 325 PSI
175 - 225 PSI
125 - 175 PSI

Rate of Rise (175° F - 275° F)

6 - 9° F/Min (3)

6 - 9° F/Min (3)

Hold Time

375° F for 120 Minutes Minimum

60 Minutes at 350° F(4)

Maximum Laminate Temperature

395° F (4)

395° F(4)

Cool Down Rate

< 10° F/Min

<10° F/Min

Post Bake (Cure)

Not Required for Cure

Package at 375° F for 120 Minutes
Minimum for cure (4)

(These are typical lamination cycles being used for GETEK® materials. Users should perform their own tests to determine the optimum process cycle.)

- (1) Non standard IPC test - contact GE Tech Service for description of test method.
- (2) Minimum melt viscosity is measured using parallel plate method with a 3.5°C/min. rate of heat rise.
- (3) Lower rate of rise acceptable for autoclave presses.
- (4) Reference "GFTFK® Prepreg Regression Chart" for GFTFK® Prepreg Time/Temperature cure relationships