

**MULTI-FUNCTIONAL FR-4.0 LAMINATE Tg >135°C**

Mar, 2018

<b>Approvals</b>	<b>UL</b> : File No. E123995	<b>Designation</b> : KB6160 / KB6160A
<b>Description</b>	<p>Multi-functional FR-4.0 Laminates Tg &gt; 135°C with single - or double-sided copper-clad manufactured by using precise blend of tetrafunctional and difunctional epoxy resin with flame retardant property , reinforced with Electrical grade (E-glass) glass fabric to provide the exceptional printed wiring board (PWB) performance.</p> <p>Superior low coefficient of Thermal Expansion ( CTE Z-axis ) to be advantage to lead free PCBA assembly process.</p>	
<b>Type</b>	Epoxy/Woven E-Glass Fabric - Flammability class UL V-0 , NEMA FR4.0 ,	
<b>Copper Foil</b>	<p>Electrodeposited (ED type) , standard ductility , HTE type.</p> <p>Thickness : 18 , 35 , 70 and 105 <math>\mu</math> m</p> <p>other thickness and foil types upon request</p>	
<b>Surface Quality</b>	Class A of IPC-4101	
<b>Thickness</b>	<p>Range : 0.1 mm ~ 1.6 mm ( 4 mil ~ 63 mil )</p> <p>Tolerance : In accordance with IPC-4101 Class B/L</p> <p>Special tolerance upon request.</p>	
<b>Size</b>	<p>Full sheet : 939 mm x 1244 mm ( 37" x 49" )</p> <p>1041 mm x 1244 mm ( 41" x 49" )</p> <p>1092 mm x 1244 mm ( 43" x 49" )</p> <p>Tolerance : -0 mm , <math>\leq</math> + 2 mm</p> <p>Cut-to-size panels also available upon request. Panel Tolerance : -0 mm , <math>\leq</math> + 2 mm</p>	
<b>Special Feature</b>	<p>UV Block effects to prevent shoot through ( Mirror effect )</p> <p>Laser Fluorescence effect for better AOI performance.</p> <p>Open Filamen Fabric Glass</p>	
<b>Applications</b>	<p>Communications, Measuring Instruments, Digital home appliances, Computers and Peripherals, Insustrial controls, and automotive.</p>	

**LAMINATE SPECIFICATION**

Description	IPC-TM-650 Method	Unit	Requirement	Typical value ( as 59 mils )
Peel Strength After thermal stress (< 20 mil / ≥ 20 mil)				
A. Low profile Copper foil	2.4.8	lb / inch	3.9 / 3.9	<b>6.80 / 6.69</b>
B. STD Foil	2.4.8	lb / inch	4.5 / 5.9	<b>11.2 / 12.60</b>
Water Absorption	2.6.2.1	%	≤ 0.8	<b>0.10</b>
Glass Transition Temperature (8 x 7628) by DSC	2.4.25	°C	≥ 135	<b>140.28-140.63</b>
Dimensional Stability ( ≤ 20 mil )	2.4.39	mil / inch	≤ 0.5	<b>0.15</b>
Thermal stress, Float @ 288°C/10 sec (unetched)	2.4.13.1	sec	Pass Visual	<b>Pass ( Max , 180 sec )</b>
Volume Resistivity After moisture resistance	2.5.17.1	MΩ cm.	≥ 10 <sup>6</sup>	<b>7.8 x 10<sup>8</sup></b>
Surface Resistivity After moisture resistance	2.5.17.1	M Ω	≥ 10 <sup>4</sup>	<b>4.0 x 10<sup>8</sup></b>
Permittivity at 1 MHz	2.5.5.4	-	≤ 5.4	<b>4.52</b>
Dissipation Factor at 1 MHz	2.5.5.4	-	≤ 0.035	<b>0.018</b>
Permittivity at 1 GHz	2.5.5.4	-	N/A	<b>4.30</b>
Dissipation at 1 GHz	2.5.5.4	-	N/A	<b>0.019</b>
Electric Strength ( < 20 mil )	2.5.6.2	kV / mm	≥ 30	<b>32.5</b>
Dielectric Breakdown ( ≥ 20 mil )	2.5.6	kV	≥ 40	<b>52.1</b>
Flexural Strength ( ≥ 20 mil )				
A. Length Direction	2.4.4	Kg / M <sup>2</sup>	4.23 x 10 <sup>7</sup>	<b>5.48 x 10<sup>7</sup></b>
B. Cross Direction			3.52 x 10 <sup>7</sup>	<b>4.52 x 10<sup>7</sup></b>
Flammability	UL 94	-	V-0	<b>V-0</b>
Comparative Tracking Index	IEC 112	Volt	UL Approved	<b>175</b>
Coefficient Thermal Expansion ( x,y axis )	2.4.24	ppm / °C	N/A	<b>15 , 17</b>
Coefficient Thermal Expansion ( Z-axis )				
- Pre Tg		ppm / °C		<b>58.29</b>
- Post Tg	2.4.24	ppm / °C	N/A	<b>286.45</b>
- 50 °C to 260 °C		%		<b>3.77</b>
Thermal degradation temperature , Td	2.4.24.6	Deg.C	N/A	<b>309.64</b>
Time to Delamination , T260	2.4.24.1	Minutes	N/A	<b>17.65</b>
Time to Delamination , T288	2.4.24.1	Minutes	N/A	<b>1.11</b>