



**TYPICAL MATERIAL PROPERTIES**

Test Properties		TR			HR			UR			QR		
Physical properties	Colour	Gray/Green			Brown			Gray			Black		
	Hardness (JIS-A)	75			85			79			55		
	Tensile strength (kg/cm <sup>2</sup> )	55			50			26			23		
	Enlogation (%)	100			60			110			250		
	Tear Streangth (kg/cm)	9B			7B			8B			13B		
Heat aging (Aging test by heating in air, to 200° C)	Change in hardness (Point)	3days	10days	20days	3days	10days	20days	3days	10days	20days	3days	10days	20days
		+/-0	+/-5	+9	+1	+1	+3	+8	+11	+15	+/-0	+1	+5
	Change in tensile strength (%)	+/-0	+/-0	+6	-12	-12	-12	+19	+42	+62	+/-0	+14	+24
	Change in elongation (%)	-16	-26	-34	-18	-24	-35	-46	-49	-49	-7	-15	-27
Electrical properties	Volume resistivity (Ω-cm)	1.0 x 10 <sup>15</sup>			1. x 10 <sup>15</sup>			1.0 x 10 <sup>15</sup>			1.0 x 10 <sup>15</sup>		
	Dielectric breakdown streangth (kV/mm)	20			19			17			22		
	Dielectric constant	50Hz 10 <sup>3</sup> Hz 10 <sup>6</sup> Hz			50Hz 10 <sup>3</sup> Hz 10 <sup>6</sup> Hz			50Hz 10 <sup>3</sup> Hz 10 <sup>6</sup> Hz			50Hz 10 <sup>3</sup> Hz 10 <sup>6</sup> Hz		
		4.9	4.9	4.9	5.7	5.4	4.9	5.34	5.32	5.33	4.67	.61	4.62
Thermal properties	Dielectric dissipation factor	0.002	0.001	0.002	0.004	0.002	0.002	0.0026	0.0014	0.0010	0.0031	0.0015	0.0008
	Thermal conductivity (W/m-K)	1.20			1.70			2.60			1.10		
	Flame retardant (UL94)	V-0			V-0			V-0			V-0		

**TYPICAL PRODUCT PROPERTIES**

Properties	Unit	TR			HR			UR			QR		
		30T	45T	85T	30H	45H	85H	30U	45U	85U	30Q	45Q	85Q
Colour		Gray/Green			Brown			Gray			Black		
Thickness	mm	0.30 <sup>+0.1</sup>	0.45 <sup>+0.05</sup>	0.85 <sup>+0.05</sup>	0.30 <sup>+0.1</sup>	0.45 <sup>+0.05</sup>	0.85 <sup>+0.05</sup>	0.30 <sup>+0.</sup>	0.45 <sup>+0.05</sup>	0.85 <sup>+0.05</sup>	0.30 <sup>+0.1</sup>	0.45 <sup>+0.05</sup>	0.85 <sup>+0.05</sup>
Material	Binder	Silicone			Silicone			Silicone			Silicone		
	Filler	Alumina			Alumina+ALN			Alumina			Alumina		
	Reinforce-ment	n/a			n/a			n/a			n/a		
Thermal Resistance w/ PSA	°Cin <sup>2</sup> /W	0.36	0.46	0.90	0.18	0.29	0.51	0.09	0.15	0.32	0.39	0.55	1.01
Specific Gravity	G/cm <sup>3</sup>	2.29			2.44			2.57			2.20		
Hardness	JIS-A	75			85			79			55		
Tensile Strength	Kg/cm <sup>3</sup>	1.7	2.3	4.3	1.7	2.3	4.3	0.8	1.0	2.0	0.9	1.2	2.2
Elongation	%	100			60			110			250		
Tear Strength	Kg	0.3	0.4	0.8	0.2	0.3	0.6	0.5	0.6	1.1	0.3	0.4	0.7
Volume Resistivity	Ω-cm	2.9x10 <sup>15</sup>	2.1x10 <sup>15</sup>	6.7x10 <sup>15</sup>	2.8x10 <sup>15</sup>	1.8x10 <sup>15</sup>	1.0x10 <sup>15</sup>	9.5x10 <sup>14</sup>	7.7x10 <sup>14</sup>	7.7x10 <sup>14</sup>	5.6x10 <sup>14</sup>	4.1x10 <sup>14</sup>	4.6x10 <sup>14</sup>
Withstand Voltage	kV	10	11	15	9	10	14	11	12	16	9	12	16
Dielectric Constant	1KHz	4.4	4.5	4.9	4.9	4.5	5.7	5.3			4.6		
Maximum Use Temperature	°C	-60°C to +180°C			-60°C to +180°C			-60°C to +180°C			-60°C to +180°C		
Adhesive coating		n/a			n/a			n/a			n/a		

Properties	Unit	GTR			ESP	GHR			GSR			
		15GTR	20GTR	30GTR	13ESP	15GHR	20GHR	30GHR	20GSR	30GSR	45GSR	85GSR
Color	-	Green/Gray			Redbrown	Redbrown			White			
Thickness	mm	0.15 <sup>+0.02/-0.04</sup>	0.20 <sup>+0.02/-0.04</sup>	0.30 <sup>+0.06/-0.</sup>	0.13 <sup>+0.03</sup>	0.15 <sup>+0.02/-0.04</sup>	0.20 <sup>+0.02/-0.04</sup>	0.30 <sup>+0.06/-0.</sup>	0.20 <sup>+0.05</sup>	0.30 <sup>+0.1/-0.</sup>	0.45 <sup>+0.05</sup>	0.85 <sup>+0.05</sup>
Material	Binder	Silicone			Silicone	Silicone			Silicone			
	Filler	Alumina			Alumina	Alumina+ALN			Boron Nitride			
	Reinforce-ment	Fiberglass			PEN-Film	Fiberglass			Fiberglass			
Thermal Resistance	°Cin <sup>2</sup> /W	0.21	0.35	0.48	0.45	0.22	0.22	0.26	0.11	0.10	0.20	0.32
W/ PSA	°Cin <sup>2</sup> /W	0.54	0.55	0.86	0.61	0.39	0.41	0.56	0.24	0.25	0.30	0.48
Specific Gravity	g/cm <sup>3</sup>	2.18			1.70	2.36	2.36	2.38	1.71	1.69	1.68	1.68
Hardness	JIS-A	87	87	92	85	92	92	95	85	85	85	85
Tensile Strength	Kg/cm <sup>3</sup>	11	11	11	19	8	8	8	14	15	18	15
Elongation	%	2	2	2	2	2	2	2	2	2	2	2
Tear Strength	Kg	-			-	-			-			
Volume Resistivity	Ω-cm	1.0x10 <sup>15</sup>	1.0x10 <sup>15</sup>	1.0x10 <sup>15</sup>	2.1x10 <sup>7</sup>	1.0x10 <sup>15</sup>	1.0x10 <sup>15</sup>	1.0x10 <sup>15</sup>	1.0x10 <sup>15</sup>	1.0x10 <sup>15</sup>	1.0x10 <sup>15</sup>	1.0x10 <sup>15</sup>
Withstand Voltage	kV	4	6	7	>6	4	6	8	3	5	7	10
Dielectric Constant	1KHz	2.5	3.2	3.5	2.15	3.0	3.3	3.9	2.6	2.97	3.22	3.67
Maximum Use Temperature	°C	-60°C to +180°C			-60°C to +180°C	-60°C to +180°C			-60°C to +180°C			
Adhesive coating	-	Available			Available	Available			Available			

All materials shown on this page (except ESP) are listed under UL File E58126/CTI class 1 (>600)  
 ESP is listed under UL File E170327/CTI class 1 (>600)