

Microwave Laminates Comparison Chart

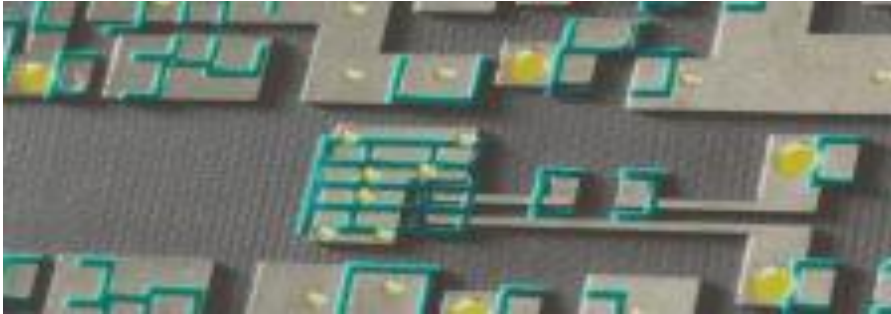
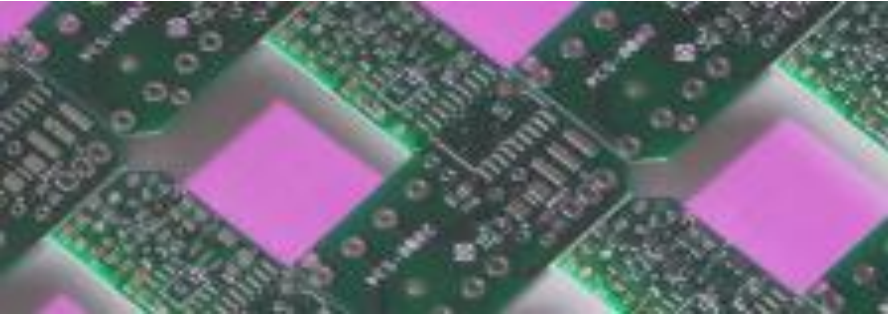
Below is a comparison chart sorted by Dielectric Constant values. This chart provides the basic properties of the various laminates available. Other data such as: volume resistivity, surface resistivity, arc resistance, tensile modulus, tensile strength, compressive modulus, flexural modulus, dielectric breakdown, specific gravity, water absorption, thermal conductivity, and UL flammability rating are available by contacting eng@standardpc.com or the laminate manufacturer.

Dk@10GHz	Supplier	Name	Type	D.F.	CTE-X	CTE-Y	CTE-Z	MIL REF	IPC
1.96 +/- 0.04	Rogers	RT/Duroid 5880LZ	P,F	0.0019	See mfg.	See mfg.	41.5	-	-
2.08 +/- 0.02	Nelco	NY9208	P,W	0.0006	25	35	260	GY	4103/05
2.05 +/- 0.05	Polyflon	CuFlon	P	0.00045 @18GHz	129	129	129	N/A	N/A
2.10 +/- 0.02	Taconic	TacLamplus	P	0.0004	-	-	-	-	-
2.17, 2.20 +/- 0.02	Arlon	CuClad 217LX	P,W,CP	0.0009	29	28	246	GY	4103/05
2.17, 2.20 +/- 0.02	Arlon	DiClad 880	P,W	0.0009	25	34	252	GY	4103/05
2.17,	Arlon	DiClad 880-PIM	P,W	0.0009	25	34	252	GY	4103/05
2.17, 2.20 +/- 0.04	Arlon	IsoClad 917	P,R	0.0013	46	47	236	GP,GR	4103/03,04
2.17 +/- 0.02	Nelco	NY9217	P,W	0.0008	25	35	260	GY	4103/05
2.17 +/- 0.02	Taconic	TLY-5A & -5AL	P,W	0.0009	26	15	217	-	-
2.17 +/- 0.03	Taconic	TLP-5A	P,W	0.0009	20	20	280	-	-
2.20 +/- 0.02	Nelco	NY9220	P,W	0.0009	25	35	260	GY	4103/05
2.20 +/- 0.02	Rogers	RT/Duroid 5880	P,R	0.0009	31	48	237	GP,GR	125/04
2.20 +/-0.02	Taconic	TLY-5 & -5-L	P,W	0.0009	26	15	217	-	-
2.20 +/- 0.03	Taconic	TLP-5	P,W	0.0009	20	20	280	-	-
2.320 +/- 0.005	Polyflon	Polyguide	Poly-olefin	0.0005	108	108	108	N/A	N/A
2.33 +/- 0.02	Arlon	CuClad 233LX	P,W,CP	0.0013	23	24	194	GY	4103/05
2.33 +/- 0.02	Arlon	DiClad 870	P,W	0.0013	17	29	217	GY	4103/05
2.33 +/- 0.04	Arlon	IsoClad 933	P,R	0.0016	31	35	203	GP,GR	4103/03,04
2.33 +/- 0.02	Nelco	NY9233	P,W	0.0011	25	35	260	GY	4103/05
2.33 +/- 0.02	Rogers	RT/Duroid 5870	P,R	0.0012	22	28	173	GP,GR	125/04
2.33 +/- 0.02	Taconic	TLY-3 & -3F	P,W	0.0012	26	15	217	-	-
2.33 +/- 0.03	Taconic	TLP-3	P,W	0.0009	20	20	280	-	-
2.4 - 2.6 +/- 0.04	Arlon	CuClad 250GX	P,W,CP	0.0018	18	19	177	GX	4103/02
2.4 - 2.6 +/- 0.05	Arlon	DiClad 522	P,W	0.0018	14	21	173	GT	4103/01
2.4 - 2.6 +/- 0.04	Arlon	DiClad 527	P,W	0.0018	14	21	173	GX	4103/02
2.4 - 2.6 +/- 0.04	Rogers	Ultralam 2000	P,W	0.0019	15	15	200	GX	125/02
2.40 +/- 0.04	Nelco	NX9240	P,W	0.0016	12	18	150	GX	4103/02
2.45 +/- 0.04	Nelco	NX9245	P,W	0.0016	12	18	150	GX	4103/02
2.45 +/-0.04	Taconic	TLX-0	P,W	0.0019	9	12	140	GX	125/02
2.45 +/-0.05	Taconic	TLT-0	P,W	0.0019	9	12	140	-	-
2.4 – 2.6 +/-0.05	Arlon	CuClad 250GT	P,W,CP	0.0018	18	19	177	GT	4103/01
2.50	Arlon	AD250	P,W	0.0018	12	15	95	N/A	4103/02
2.50	Arlon	AD250-PIM	P,W	0.0018	12	15	95	N/A	4103/09
2.50 +/- 0.04	Arlon	AD250C	P,C,W	0.0014	16	16	50	N/A	N/A
2.50 +/- 0.04	Arlon	AD250A	P,C,W	0.0015	12	15	95	N/A	N/A
2.50 +/- 0.04	Nelco	NX9250	P,W	0.0017	12	18	150	GX	4103/02
2.50 +/-0.04	Taconic	TLX-9	P,W	0.0019	9	12	140	GX	125/02
2.50 +/-0.05	Taconic	TLT-9	P,W	0.0019	9	12	140	-	-
2.55	Arlon	AD255	P,W	0.0018	12	15	95	N/A	4103/02
2.55 +/- 0.04	Arlon	AD255A	P,C,W	0.0015	16	16	80	N/A	4103/02
2.55 +/- 0.04	Arlon	AD255C	P,C,W	0.0014	16	16	50	N/A	N/A
2.55 +/- 0.05	Polyflon	NorClad	See mfg.	0.0011 @3GHz	53	53	53	N/A	125/02
2.55 +/- 0.04	Nelco	NX9255	P,W	0.0018	12	18	150	GX	4103/02
2.55 +/- 0.04	Taconic	TLX-8	P,W	0.0019	9	12	140	GX	125/02
2.55 +/- 0.05	Taconic	TLI-8	P,W	0.0019	9	12	140	-	-
2..6	Sheldahl	ComClad HF	T	0.0025 - 0.0040	59	59	59	Copper Clad Norel	N/A
2.60 +/- 0.04	Arlon	AD260A	P,C,W	0.0017	16	16	80	N/A	N/A
2.60 +/- 0.04	Nelco	NX9260	P,W	0.0019	12	18	150	GX	4103/02

Dk@10GHz	Supplier	Name	Type	D.F.	CTE-X	CTE-Y	CTE-Z	MIL REF	IPC
2.60 +/- 0.05	Taconic	TSM-26	P,C,W	0.0014	23	28	78	-	-
2.60 +/-0.04	Taconic	TLX-7	P,W	0.0019	9	12	140	GX	125/02
2.60 +/-0.05	Taconic	TLT-7	P,W	0.0019	9	12	140	-	-
2.62	Taconic	TLA-6	P,W	0.0017	9	12	140	-	-
2.65 +/-0.04	Taconic	TLX-6	P,W	0.0019	9	12	140	GX	125/02
2.65 +/-0.05	Taconic	TLT-6	P,W	0.0019	9	12	140	-	-
2.70	Arlon	AD270	P,W	0.0023	12	15	95	N/A	4103/09
2.70 +/- 0.04	Nelco	NX9270	P,W	0.0020	25	35	260	GX	125/02
2.75 +/-0.05	Taconic	TLC-27	P,W	0.0030	9	12	70	-	-
2.80 +/- 0.05	Isola	IS680 2.80	See Mfg.	0.0030	12	12	44.7	N/A	N/A
2.85 +/- 0.05	Taconic	TSM-DS	P,C,W	0.0010	11	18	57	-	-
2.87	Taconic	TLG-29	P,C,W	0.0027	22	23	135	-	-
2.90	Rogers	Ultralam 3850	LCP	0.0025	17	17	150	-	-
2.90 - 3.00 +/- 0.04	Rogers	RT/Duroid 6202PR	P,C,W	0.0020	15	15	30	-	-
2.94 +/- 0.04	Rogers	RT/Duroid 6002	P,C	0.0012	16	16	24	-	-
2.94 +/- 0.03	Arlon	CLTE-XT	P,C,W	0.0012	8	8	20	N/A	4103/06
2.94	Arlon	CLTE-LC	P,C,W	0.0025	10	12	35	N/A	4103/06
2.94 +/- 0.04	Nelco	NX9294	P,W	0.0022	25	35	260	N/A	4103/09
2.94 +/- 0.07	Nelco	NH9294	P,C,W	0.0022	9	12	71	N/A	4103/06
2.94 +/- 0.04	Rogers	RT/Duroid 6202	P,C,W	0.0015	15	15	30	-	-
2.94 +/- 0.05	Taconic	TSM-29	P,C,W	0.0013	23	28	78	-	-
2.95 +/- 0.05	Taconic	TLE-95	P,W	0.0028	9	12	70	-	-
2.96 +/- 0.04	Arlon	CLTE	P,C,W	0.0023	10	12	34	N/A	4103/06
2.97 +/- 0.05	Arlon	AD300C	P,C,W	0.0020	12	12	50	N/A	4103/09
2.97 +/- 0.07	Taconic	RF-301	P,C,W	0.0018	17	20	150	-	-
3.00	Arlon	AD300	P,W	0.0030	12	15	95	N/A	4103/09
3.00	Arlon	AD300-PIM	P,W	0.0030	12	15	95	N/A	4103/09
3.00 +/-0.04	Arlon	AD300A	P,C,W	0.0020	12	12	125	N/A	4103/09
3.00 +/- 0.04	Arlon	CLTE-AT	P,C,W	0.0013	8	8	20	N/A	4103/06
3.00 +/- 0.05	Isola	IS680 3.00	See Mfg.	0.0030	12	12	44.7	N/A	N/A
3.00 +/- 0.04	Nelco	NX9300	P,W	0.0023	25	35	260	N/A	4103/09
3.00 +/- 0.07	Nelco	NH9300	P,C,W	0.0023	9	12	71	N/A	4103/06
3.00	Nelco	N9300-13 RF	ME	0.0040	13	20	67	N/A	N/A
3.00 +/- 0.04	Rogers	RO3003	P,C	0.0011	17	16	25	GX	125/02
3.00 +/- 0.06	Rogers	RO3730	P,C	0.0016	11	12	65	-	-
3.00 +/- 0.08	Rogers	RO4730	H,C	0.0033	19	17	40		
3.00 +/- 0.05	Taconic	TSM-DS3	P,C,W	0.0011	10	16	23	-	-
3.00 +/- 0.05	Taconic	TSM-30	P,C,W	0.0013	23	28	78	-	-
3.00 +/- 0.05	Taconic	TLC-30	P,W	0.0030	9	12	70	-	-
3.00	Taconic	TLG-30	P,C,W	0.0038	22	23	135	-	-
3.00 +/- 0.10	Taconic	RF-30	P,C,W	0.0019	11	21	125	-	-
3.02 +/- 0.04	Rogers	RO3203	P,C,W	0.0016	13	13	58	-	-
3.05	Polyflon	Copper Clad ULTEM	Poly-ether-mide	0.003	56	56	56	N/A	N/A
3.20	Arlon	AD320	P,W	0.0038	12	15	95	N/A	4103/09
3.20	Arlon	AD320-PIM	P,W	0.0030	12	15	95	N/A	4103/09
3.20 +/- 0.04	Arlon	AD320A	P,C,W	0.0032	14	14	128	N/A	4103/09
3.20 +/-0.05	Isola	IS680 3.20	See Mfg.	0.0030	12	12	44.7	N/A	N/A
3.20	Nelco	N8000Q	CEQ	0.006	N/A	N/A	70 (2)	N/A	4101B/61
3.20 +/- 0.04	Nelco	NX9320	P,W	0.0024	25	35	260	N/A	4103/09
3.20 +/- 0.07	Nelco	NH9320	P,C,W	0.0024	9	12	71	N/A	4103/16
3.20	Nelco	N9320-13 RF	ME	0.0045	13	20	67	N/A	N/A
3.20 +/- 0.05	Taconic	TLC-32	P,W	0.0030	9	12	70	-	-

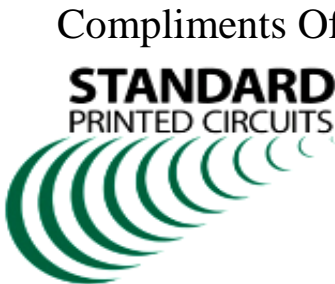
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P = PTFE, C = Ceramic, W = Woven, T = Thermoset Resin, R = Random Glass, ME = Modified Epoxy Resin, CE = Cyanate Ester, F = Filled Composite
CEQ = Cyanate Ester w/Quartz Fabric, LCP = Liquid Crystalline Polymer, CP = Cross Plied, H = Hydrocarbon
D.F. = Dissipation Factor @10GHz, CTE = Coefficient of Expansion ppm/C, IPC = Spec. Sheet IPC-L125A, (1) = 130-145, (2) = [50° C to Tg]



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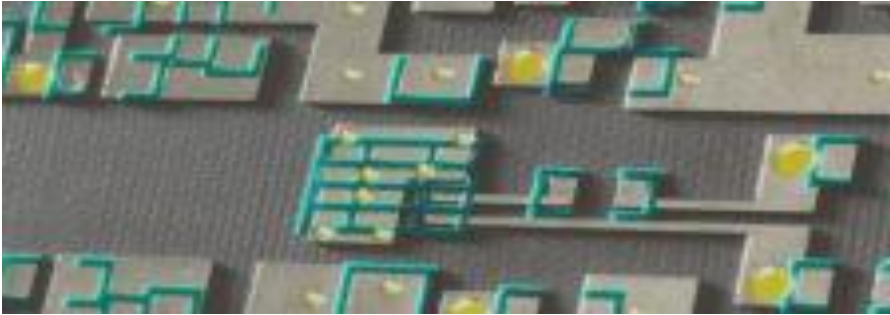
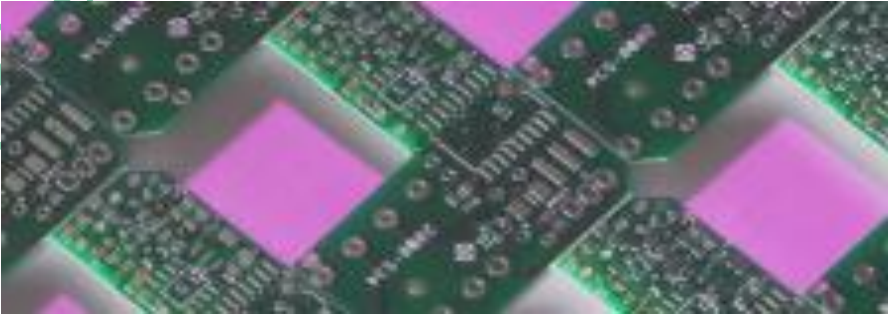
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Dk@10GHz	Supplier	Name	Type	D.F.	CTE-X	CTE-Y	CTE-Z	MIL REF	IPC
3.23 +/- 0.05	Rogers	XT/Duroid 8000 0.002" Thick	See mfg. data sht.	0.0035max.	18	23	68	-	-
3.27 +/- 0.032	Rogers	TMM-3	C,T	0.0020	15	15	23	-	-
3.30 +/- 0.08	Rogers	RO4533	H,C	0.0025	13	11	37	-	-
3.32 +/- 0.05	Rogers	XT/Duroid 8100 0.004" Thick	See mfg. data sht.	0.0038	19	21	76	-	-
3.33 +/- 0.05	Isola	IS680 3.33	See Mfg.	0.0030	12	12	44.7	N/A	N/A
3.38 +/- 0.06	Arlon	25N	C,W,T	0.0025	15	15	52	N/A	4103/10
3.38 +/- 0.05	Isola	IS680 3.38	See Mfg.	0.0032	12	12	44.7	N/A	N/A
3.38 +/- 0.10	Nelco	NH9338	P,C,W	0.0025	9	12	71	N/A	4103/16
3.38 +/- 0.05	Rogers	RO4003C	H,C	0.0029	11	14	46	-	-
3.39 max.	Rogers	SYRON 7100 0.004" thick.	T	0.005max.	19	21	76	-	-
3.38 +/- 0.05	Taconic	TLC-338	P,W	0.0034	9	12	70	-	-
3.38	Nelco	N9338-13 RF	ME	0.0046	13	20	67	N/A	N/A
3.40 +/- 0.08	Rogers	RO4534	H,C	0.0027	11	14	46	-	-
3.4 max.	Rogers	SYRON 7000 0.002" thk.	T	0.0045max.	18	23	68	-	-
3.40 +/- 0.07	Taconic	TLF-34	P,C,W	0.0020	21	23	85	-	-
3.45 +/- 0.05	Isola	IS680 3.45	See Mfg.	0.0035	12	12	44.7	N/A	N/A
3.48 +/- 0.10	Nelco	NH9348	P,C,W	0.0030	9	12	71	N/A	4103/16
3.48 +/- 0.05	Rogers	RO4350B	H,C	0.0037	14	16	35	-	-
3.48 +/- 0.05	Rogers	RO4350B -TX	H,C	0.0034	14	16	35	-	-
3.48	Nelco	N9350-13 RF	ME	0.0055	13	20	67	N/A	N/A
3.50	Arlon	AD350	P,W	0.003	12	15	95	N/A	4103/09
3.50	Arlon	AD350-PIM	P,W	0.0030	12	15	95	N/A	4103/09
3.50 +/- 0.05	Arlon	AD350A	P,C,W	0.0030	5	9	35	N/A	4103/09,16
3.50 +/- 0.05	Arlon	TC350	P,C,W	0.0020	7	7	23	N/A	4103/09,16
3.50	Isola	GETEK	W,T	0.0100	13	14	55	N/A	4103C/25
3.50	Nelco	Mercurywave 9350	ME	0.004	10	14	48(2)	N/A	4103/11
3.50 +/- 0.10	Nelco	NH9350	P,C,W	0.0030	9	12	71	N/A	4103/16
3.50	Nelco	N4350-13 RF	ME	0.0065	10	14	3.5%	N/A	4101B/29
3.50	Nelco	N8000	CE	0.011	11	13	2.5%	N/A	4101B/70,71
3.50 +/- 0.05	Rogers	RT/Duroid 6035HTC	P,C	0.0013	19	19	39	-	-
3.50 +/-0.05	Rogers	RO3035	P,C	0.0017	17	17	24	-	-
3.50 +/- 0.08	Rogers	RO4535	H,C	0.0037	14	16	35	-	-
3.50 +/- 0.05	Taconic	TLC-35	P,W	0.0037	9	12	70	-	-
3.50 +/- 0.07	Taconic	TLF-35	P,C,W	0.0020	21	23	85	-	-
3.50 +/- 0.05	Taconic	RF-35TC	P,C,W	0.0011	11	13	34	-	-
3.50 +/- 0.05	Taconic	RF-35A2	P,C,W	0.0015	10	13	106	-	-
3.50 +/- 0.10	Taconic	RF-35	P,C,W	0.0025	19	24	64	-	-
3.50 +/- 0.10	Taconic	RF-35P	P,C,W	0.0034	15	15	110	-	-

Dk@10GHz	Supplier	Name	Type	D.F.	CTE-X	CTE-Y	CTE-Z	MIL REF	IPC
3.54 +/- 0.05	Rogers	XT/Duroid 8100 0.002" Thick	See mfg. data sht.	0.0049	16.5	18	57	-	-
3.58 +/- 0.06	Arlon	25FR	C,W,T	0.0035	16.5	18	59	-	4103/11
3.61	Panasonic	Megtron6 R5775(K)	W,T	0.004	14-16	14.6	45	N/A	4101/102
3.61 max.	Rogers	SYRON 7100 0.002" thk.	T	0.006max.	16.5	18	57	-	-
3.70	Arlon	MULTICLAD HF	T	0.0045	14-16	14-16	-	-	-
3.8 - 4.2 @1MHz	GE	Getek	W,T	0.01	12	15	55	-	-
3.80	Nelco	N4380-13 RF	ME	0.007	10	14	3.5%	N/A	4101B/29
3.85 – 4.02	Rogers	Theta	See mfg. data sht.	0.0126 – 0.0120	N/A	N/A	~50	-	-
4.10	Arlon	AD410	P,C,W	0.003	9	9	40	-	4103/16
4.10 +/- 0.10	Nelco	NH9410	P,C,W	0.0030	9	12	71	N/A	4103/16
4.10 +/- 0.15	Taconic	RF-41	P,C,W	0.0038	9	12	93	-	-
4.10 +/- 0.15	Taconic	TRF-41	P,C,W	0.0035	9	9	40	-	-
4.30	Arlon	AD430	P,C,W	0.0030	9	9	40	-	4103/16
4.30 +/- 015	Taconic	RF-43	P,C,W	0.0033	9	11	96	-	-
4.30 +/- 0.15	Taconic	TRF-43	P,C,W	0.0035	9	9	40	-	-
4.50	Arlon	AD450	P,C,W	0.0035	8	11	42	-	4103/16
4.50	Arlon	AD450A	P,C,W	0.0035	10	10	40	-	N/A
4.50 +/- 0.10	Nelco	NH9450	P,C,W	0.0030	9	12	71	N/A	4103/16
4.50 +/- 0.045	Rogers	TMM-4	C,T	0.0020	16	16	21	-	-
4.50 +/- 0.15	Taconic	RF-45	P,C,W	0.0037	9	13	96	-	-
4.50 +/- 0.15	Taconic	TRF-45	P,C,W	0.0035	9	9	40	-	-
5.10	Arlon	AD5	P,C,W	0.0030	15	15	45	N/A	4103/16
6.00 +/- 0.08	Rogers	TMM-6	C,T	0.0023	18	18	26	-	-
5.50-6.30	Arlon	AD600	P,C,W	0.0030	11	10	45	N/A	4103/07
6.15 +/- 0.15	Arlon	TC600	P,C,W	0.0020	9	9	35	-	4103/07
6.15 +/- 0.15	Rogers	RT/Duroid 6006	P,C	0.0027	47	34	117	-	125/07
6.15 +/- 0.15	Rogers	RO3006	P,C	0.0020	17	17	24	N/A	125/07
6.15 +/-0.15	Rogers	RO3206	P,C,W	0.0027	13	13	34	-	-
6.15 +/- 0.15	Rogers	RO4360	H,C	0.0038	16.6	14.6	30	-	-
6.15 +/- 0.25	Taconic	RF-60A	P,C,W	0.0038	9	8	69	-	-
9.20 +/- 0.23	Rogers	TMM-10	C,T	0.0022	21	21	20	-	-
9.80 +/- 0.245	Rogers	TMM-10i	C,T	0.0020	19	19-	20	-	-
9.80	Arlon	AR1000	P,C,W	0.003	14	16	37	N/A	4103/08
10.00 +/- 0.25	Taconic	CER-10	P,C,W	0.0035	13	15	46	-	-
10.20	Arlon	AD1000	P,C,W	0.0023	8	10	20	-	4103/08
10.20	Arlon	AD10	P,C,W	0.0078	5.6	5.8	8.2	N/A	N/A
10.2 +/- 0.30	Rogers	RO3010	P,C	0.0022	13	11	16	-	125/08
10.2 +/- 0.50	Rogers	RO3210	P,C,W	0.0027	13	13	34	-	-
10.2 +/- 0.25	Rogers	RT/Duroid 6010.2LM	P,C	0.0023	24	24	47	-	125/08

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P = PTFE, C = Ceramic, W = Woven, T = Thermoset Resin, R = Random Glass, ME = Modified Epoxy Resin, CE = Cyanate Ester, F = Filled Composite
CEQ = Cyanate Ester w/Quartz Fabric, LCP = Liquid Crystalline Polymer, CP = Cross Plied, H = Hydrocarbon
D.F. = Dissipation Factor @10GHZ, CTE = Coefficient of Expansion ppm/°C, IPC = Spec. Sheet IPC-L125A, (1) = 130-145, (2) = [50° C to Tg]



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