

■General properties <Typical values>

As of August, 2024

					Multi-layer circuit board materials																					
					XPEDION1	XPEDION T1	MEGTRON 8	MEGTRON 8	MEGTRON 7	MEGTRON 7	MEGTRON 7	Halogen-free MEGTRON6	Halogen-free MEGTRON6	MEGTRON6	MEGTRON6	MEGTRON4	MEGTRON4S	MEGTRON M	Halogen-free MEGTRON2	HIPER V	Halogen-free	Halogen-free	HIPER D	HIPER M	HIPER E	
Product number					R-5515	R-5575	R-5795(U)	R-5795(N)	R-5785(N)	R-5785(GN)	R-5785(GE)	R-5375(N)	R-5375(E)	R-5775(N)	R-5775(K) R-5775(G)	R-5725	R-5725S	R-5735	R-1577	R-1755V	R-3566D	R-1566S	R-1755D	R-1755M	R-1755E	
Item		Test method	Condition	Unit																						
Glass Transition Temperature(Tg)		DSC	A	℃	-	-	-	-	200	200	200	-	-	185	185	176	200	195	170	173	175	175	163	153	133	
		TMA			170	205	190	190	-	190	190	210	210	-	-	170	190	185	165	165	170	170	154	150	133	
		DMA			200	245	220	220	210	210	210	250	250	210	210	210	215	210	190	190	195	195	185	175	153	
Thermal Decomposition Temperature(Td)		TGA	A	℃	410	440	370	370	400	400	400	435	435	410	410	360	360	360	380	350	355	355	345	355	370	
Time to Delam (T288)	Without Cu	IPC-TM-650 2.4.24.1	A	min	(>120)	>120	>120	>120	>120	>120	>120	>120	>120	>120	>120	>120	>120	>120	>120	>120	>120	>120	-	110	>120	
	With Cu				(>120)	>120	>120	>120	>120	>120	>120	>120	>120	>120	>120	30	50	35	25	20	10	10	15	18	25	
CTE : α1	Warp	IPC-TM-650 2.4.24	A	ppm /℃	19-21	13-16	17-20	17-20	14-16	14-16	14-16	14-16	14-16	14-16	14-16	12-14	12-14	12-15	14-16	11-13	11-13	11-13	10-12	11-13	11-13	
	Fill				19-21	13-16	17-20	17-20	14-16	14-16	14-16	14-16	14-16	14-16	13-15	13-15	12-15	14-16	13-15	13-15	13-15	12-14	13-15	13-15		
	Z - axis	IPC-TM-650 2.4.24			(50)	20	50	50	42	42	42	39	39	45	45	35	32	31	34	44	40	40	43	40	42	
CTE : α2	Z - axis	IPC-TM-650 2.4.24	A	ppm /℃	(300)	155	270	270	280	280	280	200	200	260	260	265	250	240	200	255	180	180	236	240	250	
Thermal Conductivity		Laser Flash	25℃	W/m·K	(0.35)	0.60	-	-	0.40	0.40	0.40	0.37	0.37	0.42	0.42	0.60	0.60	-	0.50	0.53	0.62	0.62	0.63	0.57	0.55	
Dielectric Constant(Dk)	@ 1GHz	IPC-TM-650 2.5.5.9	C-24/23/50	-	-	3.73	-	-	3.37	3.37	3.63	3.42	3.72	3.40	3.71	3.83	3.83	3.92	4.14	4.44	4.7	4.7	4.4	4.6	4.6	
	@ 10GHz	IPC-TM-650 2.5.5.5			(3.0*1)	-	-	-	-	-	-	-	-	-	3.61	-	-	-	-	-	-	-	-	-		
	-	Balanced-type circular disk resonator method			3.06 [14GHz]	3.60 [13GHz]	3.08 [14GHz]	3.13 [14GHz]	3.31 [14GHz]	3.31 [14GHz]	3.60 [13GHz]	3.36 [13GHz]	3.66 [13GHz]	3.34 [13GHz]	-	-	-	-	-	-	-	-	-	-		
Dissipation Factor(Df)	@ 1GHz	IPC-TM-650 2.5.5.9	C-24/23/50	-	-	0.002	-	-	0.001	0.001	0.002	0.001	0.002	0.002	0.002	0.005	0.005	0.005	0.010	0.016	0.011	0.011	0.016	0.014	0.013	
	@ 10GHz	IPC-TM-650 2.5.5.5			(0.002*1)	-	-	-	-	-	-	-	-	-	0.004	-	-	-	-	-	-	-	-	-		
	-	Balanced-type circular disk resonator method			0.0021 [14GHz]	0.0045 [13GHz]	0.0012 [14GHz]	0.0016 [14GHz]	0.0023 [14GHz]	0.0023 [14GHz]	0.0034 [13GHz]	0.0029 [13GHz]	0.0037 [13GHz]	0.0037 [13GHz]	-	-	-	-	-	-	-	-	-	-		
Water Absorption		IPC-TM-650 2.6.2.1	D-24/23	%	0.19	0.23	0.06	0.06	0.06	0.06	0.06	0.23	0.22	0.14	0.14	0.14	0.14	0.14	0.14	0.12	0.18	0.18	0.11	0.11	0.11	
Flexural Modulus	Warp/MD	JIS C 6481	A	GPa	9.3	-	-	-	19	19	20	20	19	19	20	25	25	25	25	24	24	24	23	24	24	
	Fill/TD				10	-	-	-	18	18	19	19	18	18	19	23	23	23	23	22	22	22	21	22	22	
Peel Strength		1oz	IPC-TM-650 2.4.8	A	kN/m (lb/inch)	0.6(3.4) (HVP2 Hoz)	0.8(4.6) (RT)	0.7(4.0) (H-VLP3)	0.7(4.0) (H-VLP3)	0.8(4.6) (H-VLP)	0.8(4.6) (H-VLP2)	0.8(4.6) (H-VLP2)	0.6(3.4) (H-VLP2)	0.6(3.4) (H-VLP2)	0.8(4.6) (H-VLP)	0.8(4.6) (H-VLP)	1.2(6.9)	1.4(8.0)	1.3(7.4)	1.3(7.4)	1.5(8.6)	1.6(9.1)	1.6(9.1)	1.3(7.4)	1.5(8.6)	1.6(9.1)
The Sample thickness					0.13mm (0.5mm)	0.76mm	0.75mm	0.75mm	0.75mm	0.75mm	0.75mm	0.75mm	0.75mm	0.75mm	0.75mm	0.8mm	0.8mm	0.8mm	0.8mm	0.8mm	0.8mm	0.8mm	0.8mm	0.8mm	0.8mm	

※1 Test method:Cavity resonance

■General properties <Typical values>

					Halogen-free	Halogen-free	Halogen-free	Glass epoxy multi
Product number					R-A555(W)	R-1566(W)	R-1566(WN)	R-1766(GH)
Item	Test method	Condition	Unit					
Glass Transition Temperature(Tg)	DSC	A	℃	-	148	148	140	
	TMA			160	145	145	140	
	DMA			200	170	170	150	
Thermal Decomposition Temperature(Td)		TGA	A	℃	380	350	355	315
Time to Delam (T288)	Without Cu	IPC-TM-650 2.4.24.1	A	min	> 60	>120	>120	5
	With Cu				> 60	3	10	1
CTE : α1	Warp	IPC-TM-650 2.4.24	A	ppm /℃	11-13	11-13	11-13	11-13
	Fill				13-15	13-15	13-15	13-15
	Z - axis	IPC-TM-650 2.4.24			37	40	40	65
CTE : α2	Z - axis	IPC-TM-650 2.4.24	A	ppm /℃	170	180	180	270
Thermal Conductivity		Laser Flash	25℃	W/m·K	0.40	0.62	0.62	0.38
Dielectric Constant(Dk)	@ 1GHz	IPC-TM-650 2.5.5.9	C-24/23/50	-	3.4 (RC:70%)	4.6	4.6	4.3
	@ 10GHz	IPC-TM-650 2.5.5.5			3.2 (RC:70%)	-	-	-
	-	Balanced-type circular disk resonator method			-	-	-	-
Dissipation Factor(Df)	@ 1GHz	IPC-TM-650 2.5.5.9	C-24/23/50	-	0.008 (RC:70%)	0.010	0.010	0.016
	@ 10GHz	IPC-TM-650 2.5.5.5			0.011 (RC:70%)	-	-	-
	-	Balanced-type circular disk resonator method			-	-	-	-
Water Absorption		IPC-TM-650 2.6.2.1	D-24/23	%	0.07	0.14	0.14	0.14
Flexural Modulus	Warp/MD	JIS C 6481	A	GPa	26	24	24	23
	Fill/TD				24	22	22	21
Peel Strength	1oz	IPC-TM-650 2.4.8	A	kN/m (lb/inch)	-	1.8(10.3)	1.8(10.3)	2.0(11.4)
The Sample thickness					0.8mm	0.8mm	0.8mm	0.8mm

Our Halogen-free materials are based on JPCA-ES-01-2003 standard and others.
The above data are typical values and not guaranteed values.

As of August, 2024

IC substrate materials					Double sided circuit	Flexible circuit board materials		
LEXCM GX	LEXCM GX	LEXCM GX	LEXCM GX	LEXCM GX	ECOOOL	FELIOS LCP	FELIOS FRCC	FELIOS
R-G545L	R-G545E	R-1515E	R-1515W	R-1515A	R-1787	R-F705S	R-FR10	R-F775
-	-	-	-	-	140	-	-	-
190	190	240※3	220	180	140	-	190 (Ad)	-
230※4	230※4	270※4	250	205	155	-	210※4 (Ad)	>340※4 (TPI 240)
420	420	390	390	390	345	482	-	577
-	-	>120	>120	>120	-	-	-	-
-	-	>120	>120	>120	-	-	-	-
10※2	10※2	8-10※2	8-10	11-13	18-23	17-19	80 (Ad)	18-20
10※2	10※2	8-10※2	8-10	11-13	20-25	17-19	80 (Ad)	16-19
22	22	22	22	30	50	-	80 (Ad)	-
120	120	95	97	140	240	-	580 (Ad)	-
0.52	0.52	0.7	0.7	0.7	1.10	0.40	-	0.16
3.6	4.1	4.7	4.8	4.8	4.8	-	3.0(Ad)/ 3.3(PI)	3.2
-	-	-	-	-	-	3.3※6	-	3.2※6
3.5	4.0	-	-	-	-	2.9 (14GHz)	-	3.1 (14GHz)
0.002	0.002	0.011	0.015	0.015	0.008	-	19(Ad)/0.010	0.002
-	-	-	-	-	-	0.002※6	-	0.006※6
0.003	0.004	-	-	-	-	0.002 (14GHz)	-	0.006 (14GHz)
0.06	0.06	0.3	0.12	0.12	-	0.04※7	1.2※10	0.9※7
-	-	35	35	29	18	-	-	-
-	-	33	33	27	17	-	-	-
-	-	-	-	-	-	0.8(4.6) (ED:18μm)	0.8(4.6) (ED:12μm)	1.3(7.4) (ED:18μm)
The sample thickness is depending on the test method.					1.6mm	0.05mm	0.032mm (Cu:12μm, PI:5μm, Ad:15μm)	0.025mm

※2 Test method:TMA

※6 Test method:Cavity resonance

※3 Glass transition temp.(TMA)
Measurement in tensile mode. Others: Measurement in compression mode

※7 Test method:Internal method
※8 Condition:C-96/20/65, Unit:MQ·m
※9 Condition:C-96/20/66
※10 Condition:E-24/50+D-24/23
※11 Measured by R-FR10/R-F775 25μm/R-FR10 construction

The above data are typical values and not guaranteed values.