General Properties of R-F777 (2-layer double side FCCL)

Panasonic

Properties		Test Condition	Unit	R-F777 13EJ 12-25-12(ED)	R-F777 12EJ 18-25-18(ED)	R-F777 11ED 35-25-35(ED)	R-F777 23EJ 12-50-12(ED)	R-F777 22EJ 18-50-18(ED)	R-F777 21ED 35-50-35(ED)	R-F777 13RV 12-25-12(RA)	R-F777 12RV 18-25-18(RA)	R-F777 11RV 35-25-35(RA)	R-F777 23RV 12-50-12(RA)	R-F777 22RV 18-50-18(RA)	R-F777 21RV 35-50-35(RA)	R-F777 8HE9 70-20-18(ED)	R-F777 33RV 12-75-12(RA)	Applicable Standard
Composition				ED Copper 12um PI 25um ED Copper 12um	ED Copper 18um PI 25um ED Copper 18um	ED Copper 35um PI 25um ED Copper 35um	ED Copper 12um PI 50um ED Copper 12um	ED Copper 18um PI 50um ED Copper 18um	ED Copper 35um PI 50um ED Copper 35um	RA Copper 12um PI 25um RA Copper 12um	RA Copper 18um PI 25um RA Copper 18um	RA Copper 35um PI 25um RA Copper 35um	RA Copper 12um PI 50um RA Copper 12um	RA Copper 18um PI 50um RA Copper 18um	RA Copper 35um PI 50um RA Copper 35um	ED Copper 70um PI 20um ED Copper 18um	RA Copper 12um PI 75um RA Copper 12um	
Copper		—	—	5EJ	5EJ	HD	5EJ	5EJ	HD	GHY5-HA-V2	GHY5-HA-V2	GHY5-HA-V2	GHY5-HA-V2	GHY5-HA-V2	GHY5-HA-V2	T9DA-STD	GHY5-HA-V2	
Total products thickness		—	μm	49	61	90	74	86	120	49	61	95	74	86	120	108	99	Micrometer
Peel Strength	90°	A	N/mm	1.1	1.5	1.2	1.1	1.5	1.2	1.3	1.0	1.2	1.0	1.0	1.2	1.3	1.0	JIS C 6471
	90°	260℃ Solder 5sec		1.1	1.5	1.2	1.1	1.5	1.2	1.3	1.0	1.2	1.0	1.0	1.2	1.3	1.0	
Dimensional Stability	MD	After Etching	%	−0.047	−0.028	−0.037	−0.030	−0.048	−0.037	0.004	−0.029	−0.040	0.027	−0.002	−0.018	−0.037	0.022	IPC-TM-650
	TD			−0.010	0.011	−0.014	−0.026	−0.035	−0.034	−0.009	0.007	−0.005	0.010	−0.009	−0.026	−0.008	0.011	
	MD	E-0.5/150		−0.071	−0.047	−0.068	−0.070	−0.090	−0.073	−0.017	−0.060	−0.070	−0.024	−0.057	−0.063	−0.056	−0.016	
	TD			−0.030	−0.003	−0.043	−0.066	−0.077	−0.068	−0.040	−0.022	−0.038	−0.028	−0.051	−0.076	−0.022	−0.032	
Soldering Resistance		A	℃	350	350	350	350	350	350	350	350	350	330	350	350	350	350	JIS C 6471
		C-96/40/90		310	310	310	300	300	300	300	300	300	290	290	290	310	280	
MIT Test		0.38R×4.9N	MD	210	190	110	50	45	40	290	220	250	70	40	45	110	35	JIS C 6471
			TD	250	150	110	35	35	40	290	250	240	70	50	45	10	35	
Tensile Modulus			GPa	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2	IPC-TM-650
Coefficient of Thermal Expansion	MD		ppm/K	19.7	19.7	19.7	18.5	18.5	18.5	19.7	19.7	19.7	18.5	18.5	18.5	19.7	19.7	TMA 100℃→250℃, 5℃/min
	TD			18.5	18.5	18.5	18.3	18.3	18.3	18.5	18.5	18.5	18.3	18.3	18.3	18.5	18.5	
Dielectric Constant at 100MHz		A	—	3.2	3.2	3.2	3.3	3.3	3.3	3.2	3.2	3.2	3.3	3.3	3.3	3.2	3.3	IPC-TM-650 2.5.5.5
Dielectric Constant at 1GHz		A	—	3.2	3.2	3.2	3.3	3.3	3.3	3.2	3.2	3.2	3.3	3.3	3.3	3.2	3.3	IPC-TM-650 2.5.5.5
Dissipation Factor at 100MHz		A	—	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	IPC-TM-650 2.5.5.5
Dissipation Factor at 1GHz		A	—	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	IPC-TM-650 2.5.5.5
Insulation resistance		A	Ω	$>1.0\times10^{14}$	$>1.0\times10^{14}$	$>1.0\times10^{14}$	$>1.0\times10^{14}$	$>1.0\times10^{14}$	$>1.0\times10^{14}$	$>1.0\times10^{14}$	$>1.0\times10^{14}$	$>1.0\times10^{14}$	$>1.0\times10^{14}$	$>1.0\times10^{14}$	$>1.0\times10^{14}$	$>1.0\times10^{14}$	$>1.0\times10^{14}$	JIS C 6471
		C-96/40/90		$>1.0\times10^{14}$	$>1.0\times10^{14}$	$>1.0\times10^{14}$	$>1.0\times10^{14}$	$>1.0\times10^{14}$	$>1.0\times10^{14}$	$>1.0\times10^{14}$	$>1.0\times10^{14}$	$>1.0\times10^{14}$	$>1.0\times10^{14}$	$>1.0\times10^{14}$	$>1.0\times10^{14}$	$>1.0\times10^{14}$	$>1.0\times10^{14}$	
Water absorption		D-24/23	%	0.9	0.9	0.9	1.2	1.2	1.2	0.9	0.9	0.9	1.2	1.2	1.2	0.9	1.2	JIS C 6471
Moisture Absorption		C-24/23/50	%	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	
Tg		A	℃	350	350	350	350	350	350	350	350	350	350	350	350	350	350	DMA
Flammability		A	—	V-0	V-0	V-0	V-0	V-0	V-0	V-0	V-0	V-0	V-0	V-0	V-0	VTM-0	V-0	UL 94

Properties		Test Condition	Unit	R-F777 32RV 18-75-18(RA)	R-F777 42RV 18-100-18(RA)	R-F777 33EJ 12-75-12(ED)	R-F777 32EJ 18-75-18(ED)	R-F777 41EM 35-100-35(ED)	R-F777 52RV 18-12.5-18(RA)	R-F777 12R5 18-25-18(RA)	R-F777 21ED 35-25-35(ED)	R-F777 53RV 12-12.5-12(RA)	R-F777 31RV 35-75-35(RA)	R-F777 41RV 35-100-35(RA)	R-F777 20RV 70-50-70(RA)			Applicable Standard
Composition				RA Copper 18um PI 75um RA Copper 18um	RA Copper 18um PI 100um RA Copper 18um	ED Copper 12um PI 75um ED Copper 12um	ED Copper 18um PI 75um ED Copper 18um	ED Copper 35um PI 100um ED Copper 35um	RA Copper 18um PI 12.5um RA Copper 18um	RA Copper 18um PI 25um RA Copper 18um	ED Copper 35um PI 50um ED Copper 35um	RA Copper 12um PI 12.5um RA Copper 12um	RA Copper 12um PI 50um RA Copper 12um	RA Copper 9um PI 50um RA Copper 9um	RA Copper 70um PI 50um RA Copper 70um			
Copper		—	—	GHY5-HA-V2	GHY5-HA-V2	5EJ	5EJ	HD	GHY5-HA-V2	GHY5-HA	HD	GHY5-HA-V2	GHY5-HA-V2	GHY5-HA-V2	GHY5-HA-V2			
Total products thickness		—	μm	111	136	99	111	170	49	61	120	37	145	170	190			Micrometer
Peel Strength	90°	A	N/mm	1.3	1.3	1.3	1.4	2.0	1.6	1.0	2	1.6	1.2	1.2	2.0			JIS C 6471
	90°	260℃ Solder 5sec		1.3	1.3	1.3	1.4	2.0	1.6	1.0	2	1.6	1.2	1.2	2.0			
Dimensional Stability	MD	After Etching	%	0.002	0.002	−0.037	−0.018	−0.022	−0.016	0.005	−0.018	−0.004	−0.011	−0.009	0.013			IPC-TM-650
	TD			0.000	0.004	−0.028	−0.030	−0.049	0.010	0.023	−0.014	−0.001	−0.018	−0.008	−0.017			
	MD	E-0.5/150		−0.034	−0.045	−0.063	−0.049	−0.059	−0.014	−0.032	−0.056	−0.019	−0.046	−0.039	0.034			
	TD			−0.043	−0.041	−0.063	−0.067	−0.088	−0.004	−0.011	−0.059	−0.004	−0.051	−0.049	−0.015			
Soldering Resistance		A	℃	350	350	350	350	350	350	350	350	350	350	350	350			JIS C 6471
		C-96/40/90		280	270	280	280	280	280	300	300	300	280	280	290			
MIT Test		0.38R×4.9N	MD	25	17	26	21	12	−	260	46	−	18	12	47			JIS C 6471
			TD	42	16	40	16	12	−	260	42	−	18	12	44			
Tensile Modulus			GPa	7.2	7.2	7.2	7.2	7.2	6.5	7.2	7.2	7.2	7.2	7.2	7.2			IPC-TM-650
Coefficient of Thermal Expansion	MD		ppm/K	19.7	19.7	19.7	19.7	19.7	19.7	19.7	18.5	19.7	19.7	19.7	18.5			TMA 100℃→250℃, 5℃/min
	TD			18.5	18.5	18.5	18.5	18.5	18.5	18.5	18.3	18.5	18.5	18.5	18.3			
Dielectric Constant at 100MHz		A	—	3.3	3.3	3.3	3.3	3.3	3.2	3.2	3.3	3.2	3.3	3.3	3.3			IPC-TM-650 2.5.5.5
Dielectric Constant at 1GHz		A	—	3.3	3.3	3.3	3.3	3.3	3.2	3.2	3.3	3.2	3.3	3.3	3.3			IPC-TM-650 2.5.5.5
Dissipation Factor at 100MHz		A	—	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005			IPC-TM-650 2.5.5.5
Dissipation Factor at 1GHz		A	—	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005			IPC-TM-650 2.5.5.5
Insulation resistance		A	Ω	$>1.0\times10^{14}$	$>1.0\times10^{14}$	$>1.0\times10^{14}$	$>1.0\times10^{14}$	$>1.0\times10^{14}$	$>1.0\times10^{14}$	$>1.0\times10^{14}$	$>1.0\times10^{14}$	$>1.0\times10^{14}$	$>1.0\times10^{14}$	$>1.0\times10^{14}$	$>1.0\times10^{14}$			JIS C 6471
		C-96/40/90		$>1.0\times10^{14}$	$>1.0\times10^{14}$	$>1.0\times10^{14}$	$>1.0\times10^{14}$	$>1.0\times10^{14}$	$>1.0\times10^{14}$	$>1.0\times10^{14}$	$>1.0\times10^{14}$	$>1.0\times10^{14}$	$>1.0\times10^{14}$	$>1.0\times10^{14}$	$>1.0\times10^{14}$			
Water absorption		D-24/23	%	1.2	1.2	1.2	1.2	1.2	0.9	0.9	1.2	0.9	1.2	1.2	1.2			JIS C 6471
Moisture Absorption		C-24/23/50	%	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7			
Tg		A	℃	350	350	350	350	350	350	350	350	350	350	350	350			DMA
Flammability		A	—	V-0	V-0	V-0	V-0	V-0	VTM-0	V-0	V-0	VTM-0	V-0	V-0	V-0			UL 94

＊ These are observed data, not guaranteed performance.
＊ IPC 4204A/11