

Polytronics TCB Material Characteristics

Material Characteristic		Test Method	Material Type						
			PTTC	TCB-2L	TCB-2AL	TCB-3	TCB-EPS	TCB-4	TCB-8
THERMAL PROPERTIES									
Product Thermal Conductivity [W/m-K]		TO-220	2	2.7	3	3	4	8	12
Product Thermal Impedance [°C/W]		TO-220	0.5	0.37	0.33	0.33	0.25	0.13	0.08
Dielectric Thermal Conductivity [W/m-K]		D5470	1.5	1.65	1.7	1.60	2.5	2.75	3.2
Dielectric Thermal Resistance [°C-in ² /W]	100um	D5470	<0.15	<0.13	<0.12	<0.13	<0.11	<0.08	<0.06
Tg (Glass Transition Temperature) [°C]		IPC-TM-650 2.4.25	110	130	140	55	150	150	180
Decomposition Temperature (Td) [°C]	2%	IPC-TM-650 2.4.24.6	350	350	350	350	350	350	370
	5%	IPC-TM-650 2.4.24.6	400	380	400	380	400	400	400
Specific Heat [J/gK]		ASTM E1269	0.948	0.929	0.925	0.934	0.904	0.894	0.876
Thermal Stress	T260 (mins)	IPC TM-650 2.4.13.1	>60	>60	>60	>60	>60	>60	>60
	T288 (mins)	IPC TM-650 2.4.13.1	>30	>30	>30	>30	>30	>30	>30
RTI (Relative Temperature Index) (MOT)		UL746	90	110	130	-	110	130	130
Solder Limit		UL746	300°C/60sec	300°C/60sec	300°C/60sec	-	300°C/60sec	300°C/60sec	300°C/60sec
ELECTRICAL PROPERTIES									
Dielectric Constant		IPC-TM-650 2.5.5.3	4.6	4.8	5.1	7.9	4.9	5.2	8.27
Dissipation Factor (Dielectric Loss Tangent)		IPC-TM-650 2.5.5.3	0.021	0.021	0.023	0.025	0.022	0.024	0.022
Capacitance [pF/m ²]		IPC-TM-650 2.5.5.3	0.41	0.43	0.45	0.70	0.43	0.46	0.73
Volume Resistance [Ω · cm]		IPC-TM-650 2.5.17.1	>10 ¹⁵	>10 ¹⁵	>10 ¹⁵	>10 ¹⁵	>10 ¹⁵	>10 ¹⁵	>10 ¹³
Surface Resistance [Ω]		IPC-TM-650 2.5.17.1	>10 ¹³	>10 ¹³	>10 ¹³	>10 ¹³	>10 ¹³	>10 ¹³	>10 ¹³
Breakdown Voltage (kv AC)	50um	ASTM D149	-	-	3	-	-	3	-
	60um		-	-	-	-	-	3	
	80um		5	5	5	5	4	4	4
	100um		7	6	6	7	5	5	5
	150um		9	8	8	9	7	7	7
MECHANICAL PROPERTIES									
Typical Peeling Strength [Kg/cm]		IPC TM-650 2.4.8	>1.4	>1.4	>1.4	>1.4	>1.4	>1.4	>1.3
Thermal Expansion CTE [PPM/°C]	>Tg	IPC-TM-650 2.4.24.5	37	30	32	37	25	35	18
	<Tg	IPC-TM-650 2.4.24.5	24	20	25	24	16	28	15
Storage Modulus (Gpa)		ASTM 4065	-	-	-	0.5	-	-	-
Poisson's ratio		ASTM D638	0.07	0.04	0.06	0.1	0.04	0.08	0.13
CHEMICAL PROPERTIES									
Water Absorption [%]		IPC-TM-650 2.6.2.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Out-Gassing Total Mass Loss [%]		ASTM E595	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Collect Volatile Condensable Material [%]		ASTM E595	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Specific Gravity [g/cm ³]		ASTM D792	2.54	2.70	2.70	2.66	2.93	3.02	2.78
AGENCY RATINGS AND DURABILITY									
Relative Temperature Index (MOT)		UL746	90	110	130	-	110	130	130
Flammability		UL 94	V-0	V-0	V-0	-	V-0	V-0	V-0
Comparative Tracking Index (CTI)		UL 746E	600	600	600	-	600	600	600
Solder Limit		UL746	300°C/60sec	300°C/60sec	300°C/60sec	-	300°C/60sec	300°C/60sec	300°C/60sec