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USA Phone (888) 995-7767 – Asia Phone +65-6266-6193

E-Mail: sales@proplas.com Website: www.professionalplastics.com

IPC-4101B Reference Chart

The table below is taken from IPC-4101B Specification for Base Materials for Rigid and Multilayer Printed Boards. The U.S. Department of Defense has adopted this specification upon cancellation of MIL-S-13949. Although the specification itself includes additional information, the table below will help identify certain laminates and their characteristics.

IPC Spec.	Reinforcement	Resin System	ID Ref.	Tg C° min.	Dk @ 1Mhz
IPC-4101B/00	Cellulose Paper	Phenolic	NEMA XPC, UL/ANSI XPC	NA	5.6
IPC-4101B/01	Cellulose Paper	Modified Phenolic	NEMA XXXPC, UL/ANSI XXXPC	NA	4.8
IPC-4101B/02	Cellulose Paper	Phenolic, Flame Resistant	NEMA FR1, UL/ANSI FR1	NA	6.0
IPC-4101B/03	Cellulose Paper	Phenolic, Flame Resistant	NEMA FR2, UL/ANSI FR1	NA	5.0
IPC-4101B/04	Cellulose Paper	Modified Epoxy, Flame Resistant	NEMA FR3, UL/ANSI FR3	NA	4.8
IPC-4101B/05	Cellulose Paper	Phenolic, Flame Resistant	UL/ANSI FR2	NA	NA
IPC-4101B/10	Woven E-Glass Surface, Cellulose Paper Core	Epoxy (1), Phenolic (2), Flame Resistant	NEMA CEM-1, UL/ANSI CEM-1	100°	5.4
IPC-4101B/11	Woven E-Glass Surface, Nonwoven E-Glass Core	Polyester, Flame Resistant	NEMA CRM-5, ANSI CRM-5/11	NA	4.1
IPC-4101B/12	Woven E-Glass Surface, Nonwoven E-Glass Core	Epoxy, Flame Resistant	NEMA CEM-3, UL/ANSI CEM-3	NA	5.4
IPC-4101B/13	Woven E-Glass	Polyester (1), Vinyl Ester (2), Flame Resistant	ANSI 4101/13	NA	NA
IPC-4101B/14	Woven E-Glass Surface, Nonwoven E-Glass Core	Epoxy, Flame Resistant	UL/ANSI CEM-3	NA	5.4
IPC-4101B/20	Woven E-Glass	Epoxy, Non Flame Resistant	NEMA G10, UL/ANSI G-10, MIL-S-13949/03 GE/GEN	100°	5.4
IPC-4101B/21	Woven E-Glass	Difunctional Epoxy (1) Multifunctional Epoxy (2), Flame Resistant	NEMA FR4, UL/ANSI FR-4/21, MIL-S-13949/04 GF/GFN/GFK/GFP/GFM	110°	5.4
IPC-4101B/22	Woven E-Glass	Epoxy, Hot Strength Retention, Non Flame Resistant	NEMA G11 – GB, UL/ANSI G-11, MIL-S-13949/02 GB/GBN/GP	135-175°	5.4
IPC-4101B/23	Woven E-Glass	Epoxy, Hot Strength Retention, Flame Resistant	NEMA FR5, UL/ANSI FR-5, MIL-S-13949/05 GH/GHN/GHP	135-185°	5.4
IPC-4101B/24	Woven E-Glass	Epoxy (1), Multifunctional Epoxy (2), Flame Resistant	NEMA FR4, UL/ANSI FR-4/24, MIL-S-13949/04 GF/GFG/GFN	150°	5.4
IPC-4101B/25	Woven E-Glass	Epoxy (1), Polyphenylene oxide (2), Flame Resistant	NEMA FR4, ANSI 4101/25, MIL-S-13949/04 GF/GFG/GFN	150-200°	4.4
IPC-4101B/26	Woven E-Glass	Epoxy (1), Multifunctional Epoxy (2), Flame Resistant	NEMA FR4, UL/ANSI FR-4/26, MIL-S-13949/04 GF/GFT	170°	5.4
IPC-4101B/27	Unidirectional E-Glass, Cross-piled	Epoxy (1), Multifunctional Epoxy (2), Flame Resistant	ANSI 4101/27	110°	5.4
IPC-4101B/28	Woven E-Glass	Epoxy (1), Non-Epoxy (2), Flame Resistant	ANSI 4101/28, MIL-S-13949/04 GN/GFT	170-220°	5.4
IPC-4101B/29	Woven E-Glass	Epoxy (1), Cyanate Ester (2), Flame Resistant	ANSI 4101/29, MIL-S-13949/04 GN/GFT	170-220°	4.4
IPC-4101B/30	Woven E-Glass	Bismaleimide/Triazine (BT) (1), Epoxy (2), Flame Resistant	UL/ANSI GPY, MIL-S-13949/26 – GIT/GMT	170-220°	4.8
IPC-4101B/31	N/A	Epoxy (1), Multifunctional Epoxy (2),	N/A	90°	7
IPC-4101B/32	Woven E-Glass	Epoxy (1), Multifunctional Epoxy (2),	N/A	90°	7
IPC-4101B/33	N/A	Epoxy (1), Multifunctional Epoxy (2),	N/A	150°	7
IPC-4101B/40	Woven E-Glass	Polyimide	UL/ANSI GPY, MIL-S-13949/10 GV/GIN/GJ/GIP/GIL	200°	5.4
IPC-4101B/41	Woven E-Glass	Polyimide	UL/ANSI GPY, MIL-S-13949/10 GIL/GIP	250°	5.4
IPC-4101B/42	Woven E-Glass	Polyimide (1), Epoxy (2),	UL/ANSI GPY, MIL-S-13949/10 GU	200°	5.4
IPC-4101B/50	Woven Aramid	Epoxy (1), Multifunctional Epoxy (2), Flame Resistant	ANSI 4101/50, MIL-S-13949/15 AF/AFN/AFG	150-200°	4.5
IPC-4101B/53	Non-Woven Aramid Paper	Polyimide	ANSI 4101/53, MIL-S-13949/31 BIN/BIJ	220°	4.5
IPC-4101B/54	Unidirectional Aramid Fiber /Cross-piled	Cyanate Ester	ANSI 4101/54	230°	4.2
IPC-4101B/55	Non-Woven Aramid Paper	Epoxy (1), Multifunctional Epoxy (2), Flame Resistant	ANSI 4101/55, MIL-S-13949/22 BF/BFN/BFG	150-200°	4.5
IPC-4101B/58	Non-Woven Aramid Paper	Multifunctional Epoxy (1), Non-Epoxy (2), Flame Resistant	ANSI 4101/58,	135-185°	4.5
IPC-4101B/60	Woven Quartz Fiber	Polyimide, Flame Resistant	ANSI 4101/60, MIL-S-13949/19 OIL	250°	3.4
IPC-4101B/70	Woven S-2 Glass	Cyanate Ester	ANSI 4101/70	230°	4.3
IPC-4101B/71	Woven E-Glass	Cyanate Ester	ANSI 4101/71, MIL-S-13949/29 GCN	230°	4.5
IPC-4101B/80	Woven E-Glass Surface, Cellulose Paper Core	Epoxy (1), Phenolic (2), Flame Resistant	NEMA CEM-1, UL/ANSI CEM-1	100°	5.4
IPC-4101B/81	Woven E-Glass Surface, Nonwoven E-Glass (chopped felt) Core	Epoxy (1), Multifunctional Epoxy (2), Flame Resistant	NEMA CEM-3, UL/ANSI CEM-3	NA	5.4
IPC-4101B/82	Woven E-Glass	Epoxy (1), Multifunctional Epoxy (2), Flame Resistant	NEMA FR4, UL/ANSI FR-4	110°	5.4
IPC-4101B/83	Woven E-Glass	Epoxy (1), Multifunctional Epoxy (2), Flame Resistant	UL/ANSI FR-4	150-200°	5.4
IPC-4101B/90	Woven E-Glass	Polyphenylene ether, Flame Resistant	ANSI 4101/90	175°	4.2
IPC-4101B/91	Woven E-Glass	Polyphenylene ether, Flame Resistant	ANSI 4101/91	175°	4.2
IPC-4101B/92	Woven E-Glass	Epoxy (1), Multifunctional Epoxy (2), Flame Resistant	UL/ANSI FR-4	110-150°	5.4
IPC-4101B/93	Woven E-Glass	Epoxy (1), Multifunctional Epoxy (2), Flame Resistant	UL/ANSI FR-4	110-150°	5.4
IPC-4101B/94	Woven E-Glass	Epoxy (1), Multifunctional Epoxy (2), Flame Resistant	UL/ANSI FR-4	150-200°	5.4
IPC-4101B/95	Woven E-Glass	Epoxy (1), Multifunctional Epoxy (2), Flame Resistant	UL/ANSI FR-4	150-200°	5.4
IPC-4101B/96	Woven E-Glass	Polyphenylene ether, Flame Resistant	ANSI 4101/96	175°	4.2
IPC-4101B/97	Woven E-Glass	Difunctional Epoxy (1) Multifunctional Epoxy (2), Flame Resistant	UL/ANSI FR-4, MIL-S-13949/04 GF/GFN/GFK/GFP/GFM	110°	5.4
IPC-4101B/98	Woven E-Glass	Epoxy (1), Multifunctional Epoxy (2), Flame Resistant	UL/ANSI FR-4, MIL-S-13949/04 GF/GFG/GFN	150°	5.4

IPC-4101B/99	Woven E-Glass	Epoxy (1), Multifunctional Epoxy (2), Modified Epoxy or Non-Epoxy (max wt. 5%) (3), Flame Resistant	UL/ANSI FR-4/99	150°	5.4
IPC-4101B/101	Woven E-Glass	Difunctional Epoxy (1), Multifunctional Epoxy (2), Modified Epoxy or Non-Epoxy (max wt. 5%) (3), Flame Resistant	UL/ANSI FR-4/101	110°	5.4
IPC-4101B/121	Woven E-Glass	Difunctional Epoxy (1), Multifunctional Epoxy (2), Modified Epoxy or Non-Epoxy (max wt. 5%) (3), Flame Resistant	UL/ANSI FR-4/121	110°	5.4
IPC-4101B/124	Woven E-Glass	Epoxy (1), Multifunctional Epoxy (2), Modified Epoxy or Non-Epoxy (max wt. 5%) (3), Flame Resistant	UL/ANSI FR-4/124	150°	5.4
IPC-4101B/126	Woven E-Glass	Epoxy (1), Multifunctional Epoxy (2), Modified Epoxy or Non-Epoxy (max wt. 5%) (3), Flame Resistant	UL/ANSI FR-4/126	170°	5.4
IPC-4101B/129	Woven E-Glass	Epoxy (1), Multifunctional Epoxy (2), Modified Epoxy or Non-Epoxy (max wt. 5%) (3), Flame Resistant	UL/ANSI FR-4/129	170°	5.4

(1) Resin System Primary, (2) Resin System Secondary, (3) Resin System Secondary 2

Disclaimer: All data in these charts was derived from published documents made available by the manufacturers. We believe this data to be accurate, but Professional Plastics, Inc. is not liable for any inaccuracies that may exist in the data provided.

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