


Data Sheet

Halogen-free Glass Epoxy Multi-layer Materials

Laminate R-1566(W)(R-1566)

Prepreg R-1551(W)(R-1551)

UL/ANSI	FR-4	
IPC-4101	Primary:/94	
Slash Sheet	Secondary:/95	

Core Material Specifications

Nominal Thickness		Laminate Construction	Typical Dk	Typical Df	Typical Resin Content
(mil)	(mm)	-	(@ 1GHz)	(@1GHz)	(%)
2.5	0.06	1-1080	4.4	0.011	58
4	0.1	1-2116	4.6	0.010	47
6	0.15	1-1501	4.7	0.010	44
8	0.2	1-7628	4.6	0.010	46
12	0.3	2-1501	4.7	0.010	44
16	0.4	2-7628	4.6	0.010	46
20	0.5	2-7628/1-2116	4.6	0.010	46
24	0.6	3-7628	4.6	0.010	46

Standard Availability

Copper Foil Cladding : 0.012, 0.018, 0.035 and 0.070 mm (0.5, 0.7, 1.4 and 2.8 mil)

The above are reference values only.

Laminate Specifications

Property		Units	Test Method	Condition	Value	
THERMAL	Glass Transition Temp	°C	DSC	As received	148	
			TMA	As received	145	
	Thermal Decomposition Temp	°C	TGA	As received	350	
	Time to Delam (T260 with Cu)	min	IPC TM-650 2.4.24.1	As received	110	
	Time to Delam (T288 with Cu)	min	IPC TM-650 2.4.24.1	As received	3	
	CTE (α_1) z-axis	ppm/°C	IPC TM-650 2.4.24	below Tg	40	
ELECTRICAL	Volume Resistivity	MΩ-cm	IPC TM-650 2.5.17.1	C-96/35/90	1x10 ⁹	
	Surface Resistivity	MΩ	IPC TM-650 2.5.17.1	C-96/35/90	1x10 ⁸	
	Dielectric Constant (Dk)	@ 1GHz	IPC TM-650 2.5.5.9	C-24/23/50	4.6	
	Dissipation Factor (Df)	@ 1GHz	IPC TM-650 2.5.5.9	C-40/23/50	0.010	
PHYSICAL	Water Absorption	%	IPC TM-650 2.6.2.1	D-24/23	0.14	
	Peel Strength 1 oz(35 μm)	ST	kN/m	IPC TM-650 2.4.8	As Received	1.8
	Flammability	-	UL	C-48/23/50	94V-0	

The above are reference values only.

Prepreg Specifications

Glass Style	Typical Resin Content	Typical Thickness	Typical Dk	Typical Df
-	(%)	(μm)	(@1GHz)	(@1GHz)
1037	70	45	4.1	0.012
1067	70	60	4.1	0.012
	72	65	4.1	0.012
	75	73	4.0	0.013
106	72	51	4.1	0.012
	74	56	4.0	0.013
	77	64	4.0	0.013
1078	65	78	4.2	0.012
	67	84	4.2	0.012
	70	93	4.1	0.012
1080	62	69	4.3	0.011
	65	76	4.2	0.012
	70	91	4.1	0.012
2116	47	102	4.6	0.010
	50	110	4.6	0.010
	54	122	4.5	0.011
1504	46	142	4.6	0.010
	50	157	4.6	0.010
1501	46	159	4.6	0.010
	50	175	4.6	0.010
	54	194	4.5	0.011
7628	47	207	4.6	0.010
	50	223	4.6	0.010
	52	234	4.5	0.010

The above are reference values only.

Line Up/Laminate R-1566(W)

1MHz-1GHz : IPC TM-650 2.5.5.9

Nominal Thickness		Cloth Style	Typical Resin Content	ply	Typical Dk			Typical Df		
mil	mm				1M Hz	100M Hz	1GHz	1MHz	100MHz	1GHz
2.5	0.06	1080	58	1	4.7	4.5	4.4	0.011	0.011	0.011
4	0.1	2116	47	1	4.9	4.7	4.6	0.010	0.010	0.010
6	0.15	1501	44	1	5.0	4.8	4.7	0.010	0.010	0.010
8	0.2	7628	46	1	4.9	4.7	4.6	0.010	0.010	0.010
12	0.3	1501	44	2	5.0	4.8	4.7	0.010	0.010	0.010
16	0.4	7628	46	2	4.9	4.7	4.6	0.010	0.010	0.010
20	0.5	7628 / 2116	46	2 / 1	4.9	4.7	4.6	0.010	0.010	0.010
24	0.6	7628	46	3	4.9	4.7	4.6	0.010	0.010	0.010

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Line Up/Laminate R-1566(W)

2GHz-10GHz : IPC TM-650 2.5.5.5

Nominal Thickness		Cloth Style	Typical Resin Content	ply	Typical Dk					Typical Df				
mil	mm	-	-	-	2GHz	4GHz	6GHz	8GHz	10GHz	2GHz	4GHz	6GHz	8GHz	10GHz
2	0.06	1080	58	1	4.4	4.4	4.3	4.3	4.3	0.013	0.013	0.013	0.014	0.017
4	0.1	2116	47	1	4.6	4.6	4.6	4.6	4.6	0.012	0.012	0.012	0.013	0.016
6	0.15	1501	44	1	4.7	4.7	4.7	4.7	4.7	0.012	0.012	0.012	0.013	0.015
8	0.2	7628	46	1	4.6	4.6	4.6	4.6	4.6	0.012	0.012	0.012	0.013	0.016
12	0.3	1501	44	2	4.7	4.7	4.7	4.7	4.7	0.012	0.012	0.012	0.013	0.015
16	0.4	7628	46	2	4.6	4.6	4.6	4.6	4.6	0.012	0.012	0.012	0.013	0.016
20	0.5	7628 / 2116	46	2 / 1	4.6	4.6	4.6	4.6	4.6	0.012	0.012	0.012	0.013	0.016
24	0.6	7628	46	3	4.6	4.6	4.6	4.6	4.6	0.012	0.012	0.012	0.013	0.016

The above are reference values only.

Line Up/Prepreg R-1551(W)

1MHz-1GHz ; IPC TM-650 2.5.5.9

Cloth	Resin Content	Typical Thickness	TypicalDk			TypicalDf		
			1MHz	100MHz	1GHz	1MHz	100MHz	1GHz
Style	(%)	(μ m)						
1037	70	45	4.4	4.2	4.1	0.012	0.012	0.012
1067	70	60	4.4	4.2	4.1	0.012	0.012	0.012
	72	65	4.4	4.2	4.1	0.012	0.012	0.012
	75	73	4.3	4.1	4.0	0.013	0.013	0.013
106	72	51	4.4	4.2	4.1	0.012	0.012	0.012
	74	56	4.3	4.1	4.0	0.013	0.013	0.013
	77	64	4.3	4.1	4.0	0.013	0.013	0.013
1078	65	78	4.5	4.3	4.2	0.012	0.012	0.012
	67	84	4.5	4.3	4.2	0.012	0.012	0.012
	70	93	4.4	4.2	4.1	0.012	0.012	0.012
1080	62	69	4.6	4.4	4.3	0.011	0.011	0.011
	65	76	4.5	4.3	4.2	0.012	0.012	0.012
	70	91	4.4	4.2	4.1	0.012	0.012	0.012
2116	47	102	4.9	4.7	4.6	0.010	0.010	0.010
	50	110	4.8	4.7	4.6	0.010	0.010	0.010
	54	122	4.7	4.6	4.5	0.011	0.011	0.011
1504	46	142	4.9	4.7	4.6	0.010	0.010	0.010
	50	157	4.8	4.7	4.6	0.010	0.010	0.010
1501	46	159	4.9	4.7	4.6	0.010	0.010	0.010
	50	175	4.8	4.7	4.6	0.010	0.010	0.010
	54	194	4.7	4.6	4.5	0.011	0.011	0.011
7628	47	207	4.9	4.7	4.6	0.010	0.010	0.010
	50	223	4.8	4.7	4.6	0.010	0.010	0.010
	52	234	4.8	4.6	4.5	0.010	0.010	0.010

The above are reference values only.

Line Up/Prepreg R-1551(W)

2GHz-10GHz ; IPC TM-650 2.5.5.5

Cloth	Resin Content	Typical Thickness	TypicalDk					TypicalDf				
			2GHz	4GHz	6GHz	8GHz	10GHz	2GHz	4GHz	6GHz	8GHz	10GHz
Style	(%)	(μ m)	2GHz	4GHz	6GHz	8GHz	10GHz	2GHz	4GHz	6GHz	8GHz	10GHz
1037	70	45	4.1	4.1	4.1	4.1	4.1	0.014	0.014	0.014	0.015	0.018
1067	70	60	4.1	4.1	4.1	4.1	4.1	0.014	0.014	0.014	0.015	0.018
	72	65	4.1	4.1	4.0	4.0	4.0	0.014	0.014	0.014	0.015	0.018
	75	73	4.0	4.0	4.0	4.0	4.0	0.015	0.015	0.015	0.016	0.019
106	72	51	4.1	4.1	4.0	4.0	4.0	0.014	0.014	0.014	0.015	0.018
	74	56	4.0	4.0	4.0	4.0	4.0	0.015	0.015	0.015	0.016	0.019
	77	64	4.0	4.0	4.0	4.0	4.0	0.015	0.015	0.015	0.016	0.019
1078	65	78	4.2	4.2	4.2	4.2	4.2	0.014	0.014	0.014	0.015	0.018
	67	84	4.2	4.2	4.1	4.1	4.1	0.014	0.014	0.014	0.015	0.018
	70	93	4.1	4.1	4.1	4.1	4.1	0.014	0.014	0.014	0.015	0.018
1080	62	69	4.3	4.3	4.3	4.3	4.3	0.013	0.013	0.013	0.014	0.017
	65	76	4.2	4.2	4.2	4.2	4.2	0.014	0.014	0.014	0.015	0.018
	70	91	4.1	4.1	4.1	4.1	4.1	0.014	0.014	0.014	0.015	0.018
2116	47	102	4.6	4.6	4.6	4.6	4.6	0.012	0.012	0.012	0.013	0.016
	50	110	4.5	4.5	4.5	4.5	4.5	0.012	0.012	0.012	0.013	0.016
	54	122	4.5	4.5	4.4	4.4	4.4	0.013	0.013	0.013	0.014	0.017
1504	46	142	4.6	4.6	4.6	4.6	4.6	0.012	0.012	0.012	0.013	0.016
	50	157	4.5	4.5	4.5	4.5	4.5	0.012	0.012	0.012	0.013	0.016
1501	46	159	4.6	4.6	4.6	4.6	4.6	0.012	0.012	0.012	0.013	0.016
	50	175	4.5	4.5	4.5	4.5	4.5	0.012	0.012	0.012	0.013	0.016
	54	194	4.5	4.5	4.4	4.4	4.4	0.013	0.013	0.013	0.014	0.017
7628	47	207	4.6	4.6	4.6	4.6	4.6	0.012	0.012	0.012	0.013	0.016
	50	223	4.5	4.5	4.5	4.5	4.5	0.012	0.012	0.012	0.013	0.016
	52	234	4.5	4.5	4.5	4.5	4.5	0.012	0.012	0.012	0.013	0.016

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