


## Data Sheet

### High Reliability Glass Epoxy Multi-layer Materials (High Tg & Low CTE type)

# HiPER V

Laminate R-1755V  
Prepreg R-1650V

UL/ANSI	FR-4	
IPC-4101	Primary:/126	
Slash Sheet	Secondary:/21/24/26 /97/98/99/101 /121/124/129	

Jul. 2013 No.13070136

Partnering to go beyond.

**Electronic Materials**  
Panasonic Corporation

# Specification / Laminate R-1755V

Property		Units	Test Method	Condition	Value	
THERMAL	Glass Transition Temp ( Tg )	°C	DSC	As received	173	
			TMA	As received	165	
			DMA	As received	190	
	Thermal Decomposition Temp ( Td )		°C	TGA	As received	350
	Time to Delam ( T288 )	Without Cu	min	IPC TM-650 2.4.24.1	As received	> 120
		With Cu	min	IPC TM-650 2.4.24.1	As received	20
	CTE : $\alpha 1$	X - axis	ppm / °C	IPC TM-650 2.4.24	< Tg	11 - 13
		Y - axis	ppm / °C	IPC TM-650 2.4.24	< Tg	13 - 15
		Z - axis	ppm / °C	IPC TM-650 2.4.24	< Tg	44
CTE : $\alpha 2$	Z - axis	ppm / °C	IPC TM-650 2.4.24	> Tg	255	
ELECTRICAL	Volume Resistivity		M $\Omega$ - cm	IPC TM-650 2.5.17.1	C-96/35/90	1 x 10 <sup>9</sup>
	Surface Resistivity		M $\Omega$	IPC TM-650 2.5.17.1	C-96/35/90	1 x 10 <sup>8</sup>
	Dielectric Constant ( Dk )	@1MHz	-	IPC TM-650 2.5.5.9	C-24/23/50	4.7
		@ 1GHz	-	IPC TM-650 2.5.5.9	C-24/23/50	4.4
	Dissipation Factor ( Df )	@1MHz	-	IPC TM-650 2.5.5.9	C-24/23/50	0.013
		@ 1GHz	-	IPC TM-650 2.5.5.9	C-24/23/50	0.016
PHYSICAL	Water Absorption		%	IPC TM-650 2.6.2.1	D-24/23	0.12
	Peel Strength	1oz	kN / m	IPC TM-650 2.4.8	As Received	1.5
	Flammability		-	UL	C-48/23/50	94V-0

Sample thickness ; 32 mil ( 0.8 mm )

\*The data above show actual values and are not guaranteed.

# Specification / Laminate R-1755V

1MHz - 1GHz ; IPC TM650-2.5.5.9

Nominal Thickness		Cloth Style	Typical Resin Content	ply	Typical Dk			Typical Df		
mil	mm				1MHz	100MHz	1GHz	1MHz	100MHz	1GHz
2	0.05	106	71%	1	4.2	4.1	4.0	0.015	0.017	0.019
2.5	0.07	1080	60%	1	4.4	4.2	4.1	0.015	0.017	0.018
3.5	0.08	3313	49%	1	4.7	4.5	4.4	0.014	0.015	0.016
3.5	0.09	106	67%	2	4.3	4.1	4.0	0.015	0.017	0.019
4	0.10	2116	46%	1	4.7	4.6	4.5	0.013	0.015	0.016
4	0.10	106	71%	2	4.2	4.1	4.0	0.015	0.017	0.019
4	0.11	1067	66%	2	4.3	4.1	4.0	0.015	0.017	0.019
5	0.13	1504	41%	1	4.9	4.7	4.6	0.013	0.014	0.014
5	0.13	1080	60%	2	4.4	4.2	4.1	0.015	0.017	0.018
6	0.15	1501	44%	1	4.8	4.6	4.5	0.013	0.014	0.014
7	0.18	3313	52%	2	4.5	4.4	4.3	0.014	0.015	0.016
8	0.20	2116	46%	2	4.7	4.6	4.5	0.013	0.015	0.016
8	0.20	3313	56%	2	4.4	4.3	4.2	0.014	0.016	0.017
8	0.20	7628	46%	1	4.7	4.6	4.5	0.013	0.015	0.016
12	0.30	1501	44%	2	4.8	4.6	4.5	0.013	0.014	0.014

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# Specification / Laminate R-1755V

2GHz-10GHz ; IPC TM650-2.5.5.5

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	0.05	106	71%	1	3.9	3.8	3.8	3.8	3.8	0.020	0.021	0.022	0.023	0.024
2.5	0.07	1080	60%	1	4.1	4.0	4.0	4.0	3.9	0.019	0.020	0.021	0.022	0.023
3.5	0.08	3313	49%	1	4.3	4.3	4.3	4.3	4.2	0.017	0.018	0.019	0.020	0.021
3.5	0.09	106	67%	2	4.0	3.9	3.9	3.9	3.9	0.020	0.021	0.022	0.023	0.024
4	0.10	2116	46%	1	4.4	4.4	4.4	4.3	4.3	0.016	0.017	0.018	0.019	0.020
4	0.10	106	71%	2	3.9	3.8	3.8	3.8	3.8	0.020	0.021	0.022	0.023	0.024
4	0.11	1067	66%	2	4.0	3.9	3.9	3.9	3.9	0.020	0.021	0.022	0.023	0.024
5	0.13	1504	41%	1	4.6	4.5	4.5	4.5	4.4	0.016	0.017	0.018	0.019	0.020
5	0.13	1080	60%	2	4.1	4.0	4.0	4.0	3.9	0.019	0.020	0.021	0.022	0.023
6	0.15	1501	44%	1	4.4	4.4	4.4	4.4	4.3	0.016	0.017	0.018	0.019	0.020
7	0.18	3313	52%	2	4.2	4.2	4.2	4.2	4.1	0.017	0.018	0.019	0.02	0.021
8	0.20	2116	46%	2	4.4	4.4	4.4	4.3	4.3	0.016	0.017	0.018	0.019	0.020
8	0.20	3313	56%	2	4.2	4.1	4.1	4.1	4.1	0.018	0.019	0.02	0.021	0.022
8	0.20	7628	46%	1	4.4	4.4	4.4	4.3	4.3	0.016	0.017	0.018	0.019	0.020
12	0.30	1501	44%	2	4.4	4.4	4.4	4.4	4.3	0.016	0.017	0.018	0.019	0.020

\*The data above show actual values and are not guaranteed.

# Specification / Prepreg R-1650V

1MHz - 1GHz ; IPC TM650-2.5.5.9

Cloth Style	Nominal Thickness ( mm )	Resin Content ( % )	Typical Thickness ( mm )	Typical Dk			Typical Df		
				1MHz	100MHz	1GHz	1MHz	100MHz	1GHz
106	0.04	72	51	4.2	4.0	3.9	0.015	0.017	0.019
		74	56	4.1	4.0	3.8	0.015	0.018	0.019
		77	64	4.0	3.9	3.7	0.015	0.018	0.019
		80	75	3.9	3.8	3.7	0.015	0.018	0.019
1067	0.04	68	56	4.3	4.1	4.0	0.015	0.017	0.019
		70	60	4.2	4.1	4.0	0.015	0.017	0.019
		72	65	4.2	4.0	3.9	0.015	0.017	0.019
1078	0.06	65	78	4.3	4.1	4.0	0.015	0.017	0.018
		70	93	4.2	4.1	4.0	0.015	0.017	0.019
1080	0.06	65	76	4.3	4.1	4.0	0.015	0.017	0.018
		67	82	4.3	4.1	4.0	0.015	0.017	0.019
		70	91	4.2	4.1	4.0	0.015	0.017	0.019
		72	99	4.2	4.0	3.9	0.015	0.017	0.019

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# Specification / Prepreg R-1650V

1MHz - 1GHz ; IPC TM650-2.5.5.9

Cloth Style	Nominal Thickness ( mm )	Resin Content ( % )	Typical Thickness ( mm )	Typical Dk			Typical Df		
				1MHz	100MHz	1GHz	1MHz	100MHz	1GHz
1280	0.06	66	89	4.3	4.1	4.0	0.015	0.017	0.019
3313	0.08	57	104	4.4	4.3	4.2	0.014	0.016	0.017
		59	110	4.4	4.3	4.2	0.015	0.017	0.018
		62	121	4.3	4.2	4.1	0.015	0.017	0.018
2116	0.10	50	110	4.6	4.5	4.4	0.014	0.015	0.016
		54	122	4.5	4.4	4.3	0.014	0.016	0.017
		57	133	4.4	4.3	4.2	0.014	0.016	0.017
		59	140	4.4	4.3	4.2	0.015	0.017	0.018
1501	0.15	50	175	4.6	4.5	4.4	0.014	0.015	0.016
7628	0.20	44	192	4.8	4.6	4.5	0.013	0.014	0.014
		47	206	4.7	4.5	4.4	0.013	0.015	0.016

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# Specification / Prepreg R-1650V

2GHz-10GHz ; IPC TM650-2.5.5.5

Cloth Style	Nominal Thickness ( mm )	Resin Content ( % )	Typical Thickness ( mm )	Typical Dk					Typical Df				
				2GHz	4GHz	6GHz	8GHz	10GHz	2GHz	4GHz	6GHz	8GHz	10GHz
106	0.04	72	51	3.9	3.8	3.7	3.7	3.7	0.020	0.021	0.022	0.023	0.024
		74	56	3.8	3.8	3.7	3.7	3.7	0.020	0.021	0.022	0.023	0.025
		77	64	3.7	3.7	3.7	3.6	3.6	0.020	0.021	0.022	0.023	0.025
		80	75	3.6	3.6	3.6	3.6	3.6	0.020	0.021	0.022	0.023	0.025
1067	0.04	68	56	3.9	3.9	3.8	3.8	3.8	0.02	0.021	0.022	0.023	0.024
		70	60	3.9	3.8	3.8	3.8	3.8	0.020	0.021	0.022	0.023	0.024
		72	65	3.9	3.8	3.7	3.7	3.7	0.02	0.021	0.022	0.023	0.024
1078	0.06	65	78	4.0	3.9	3.9	3.9	3.9	0.019	0.020	0.021	0.022	0.023
		70	93	3.9	3.8	3.8	3.8	3.8	0.02	0.021	0.022	0.023	0.024
1080	0.06	65	76	4.0	3.9	3.9	3.9	3.9	0.019	0.020	0.021	0.022	0.023
		67	82	4.0	3.9	3.9	3.9	3.9	0.020	0.021	0.022	0.023	0.024
		70	91	3.9	3.8	3.7	3.7	3.7	0.02	0.021	0.022	0.023	0.024
		72	99	3.9	3.8	3.7	3.7	3.7	0.02	0.021	0.022	0.023	0.024

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# Specification / Prepreg R-1650V

2GHz-10GHz ; IPC TM650-2.5.5.5

Cloth Style	Nominal Thickness ( mm )	Resin Content ( % )	Typical Thickness ( mm )	Typical Dk					Typical Df				
				2GHz	4GHz	6GHz	8GHz	10GHz	2GHz	4GHz	6GHz	8GHz	10GHz
1280	0.06	66	89	4.0	3.9	3.9	3.9	3.9	0.02	0.021	0.022	0.023	0.024
3313	0.08	57	104	4.1	4.1	4.1	4.1	4.0	0.018	0.019	0.020	0.021	0.022
		59	110	4.1	4.1	4.0	4.0	4.0	0.019	0.02	0.021	0.022	0.023
		62	121	4.0	4.0	4.0	3.9	3.9	0.019	0.02	0.021	0.022	0.023
2116	0.10	50	110	4.3	4.3	4.3	4.3	4.2	0.017	0.018	0.019	0.02	0.021
		54	122	4.2	4.2	4.1	4.1	4.1	0.018	0.019	0.020	0.021	0.022
		57	133	4.1	4.1	4.1	4.1	4.0	0.018	0.019	0.020	0.021	0.022
		59	140	4.1	4.1	4.0	4.0	4.0	0.019	0.02	0.021	0.022	0.023
1501	0.15	50	175	4.3	4.3	4.3	4.3	4.2	0.017	0.018	0.019	0.020	0.021
7628	0.20	44	192	4.4	4.4	4.4	4.4	4.3	0.016	0.017	0.018	0.019	0.020
		47	206	4.4	4.4	4.3	4.3	4.3	0.016	0.017	0.018	0.019	0.021

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