

High Dk Multilayer Material

MCL-HD60/HD80/HD90

Product

- CCL MCL-HD60/HD80/HD90
- Prepreg GD-60/GD-80/GD-90

Applications

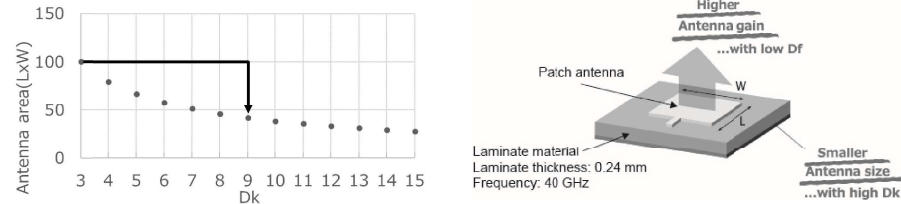
- Antenna-in-package

Features

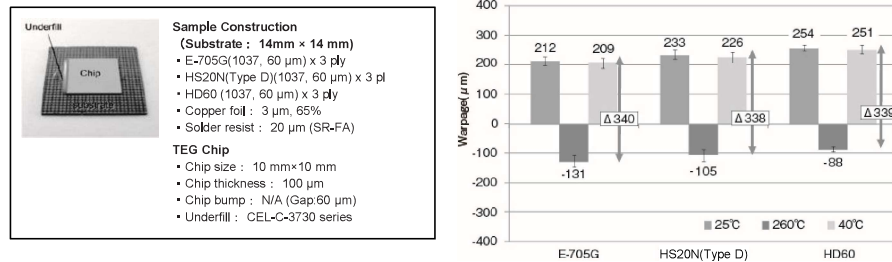
- Enables miniaturization and higher antenna gain of antenna-in-package.
- High Dk and low Df substrate material.
- High Dk with low transmission loss.
- Excellent reliability (heat resistance, insulation, connection)

Characteristics

- Antenna size simulation



- Mounting warpage characteristic evaluation results



- Heat resistance test results (reflow resistance test)

Test sample : 4L construction, 35 mm x 35 mm

- L1, L4 copper thickness: 1.5 μm
- L2, L3 copper thickness: 18 μm Cu Coverage : 15-90% surface treatment : t CZ8401

Test Condition

Condition1 =Pre-condition : 144 hrs 60°C/60% RH =Test condition : 260°C reflow x 30 times

Condition2 =Pre-condition : PCT-4 hrs =Test condition : 260°C reflow x 5 times

Item	#1	#2	#3	#4
Construction	Core	HS20N(Type D)	HD60	HS20N(Type D)
Reflow resistance	60°C/60%RH 144h	30 pass	30 pass	30 pass
	PCT-4h	5 pass	5 pass	5 pass

• Copper Clad Laminates

Item	Unit	Actual Value					Reference Standards (JPC-TM-650)
		HD60	HD60HD90(Type D)	HD80	HD90	HD90HD90(Type D)	
Glass cloth	Glass type	-	E	Low Dk	E	Low Dk	-
	Style	-	2116	2116	2116	2116	-
Tg	DMA	°C	230 ~ 240	230 ~ 240	230 ~ 240	230 ~ 240	-
	XY ¹⁾	ppm/°C	8 ~ 10	8 ~ 10	9 ~ 11	9 ~ 11	-
Copper Peel Strength	12 μm (LP)	kN/m	0.5 ~ 0.6	0.5 ~ 0.6	0.5 ~ 0.6	0.5 ~ 0.6	2.4.8
Elastic Modulus		GPa	19 ~ 23	18 ~ 22	18 ~ 22	17 ~ 21	-
Dielectric Constant	10 GHz ²⁾	-	6.0 ~ 6.2	5.8 ~ 6.0	8.0 ~ 8.2	9.0 ~ 9.2	8.2 ~ 8.4
	20 GHz ²⁾	-	6.1 ~ 6.3	5.9 ~ 6.1	8.0 ~ 8.2	9.0 ~ 9.2	8.2 ~ 8.4
	36 GHz ²⁾	-	6.1 ~ 6.3	5.9 ~ 6.1	8.0 ~ 8.2	9.0 ~ 9.2	8.2 ~ 8.4
	50 GHz ²⁾	-	6.1 ~ 6.3	5.9 ~ 6.1	8.0 ~ 8.2	9.0 ~ 9.2	8.2 ~ 8.4
	60 GHz ²⁾	-	6.1 ~ 6.3	5.9 ~ 6.1	8.0 ~ 8.2	9.0 ~ 9.2	8.2 ~ 8.4
Dissipation Factor	10 GHz ²⁾	-	0.0050 ~ 0.0060	0.0040 ~ 0.0050	0.0050 ~ 0.0060	0.0045 ~ 0.0055	-
	20 GHz ²⁾	-	0.0055 ~ 0.0065	0.0045 ~ 0.0055	0.0055 ~ 0.0065	0.0050 ~ 0.0060	-
	36 GHz ²⁾	-	0.0060 ~ 0.0070	0.0050 ~ 0.0060	0.0060 ~ 0.0070	0.0055 ~ 0.0065	-
	50 GHz ²⁾	-	0.0065 ~ 0.0075	0.0055 ~ 0.0065	0.0065 ~ 0.0075	0.0060 ~ 0.0070	-
	60 GHz ²⁾	-	0.0065 ~ 0.0075	0.0055 ~ 0.0065	0.0065 ~ 0.0075	0.0060 ~ 0.0070	-

*1) Heating Rate: 10°C/min, (Tensile) *2) SPDR method, Drying: 105°C / 1h, *3) Cut-off circular waveguide method, Drying: 105°C / 1h, *Above data are experimental results and not guaranteed.

Standard Specifications

• Copper Clad Laminate

Part Number	Type	Copper Foil Thickness	Thickness Code	Laminate Thickness
MCL-HD60	-	1.5, 2, 3, 12, 18 μm (VLP)	0.11	0.10 mm
			0.21	0.20 mm
			0.24	0.24 mm
			0.31	0.30 mm
			0.41	0.40 mm
	(D)	1.5, 2, 3, 12, 18 μm (HVL)	0.51	0.50 mm
			0.11	0.10 mm
			0.21	0.20 mm
			0.24	0.24 mm
			0.31	0.30 mm
MCL-HD80	-	1.5, 2, 3, 12, 18 μm (VLP)	0.41	0.40 mm
			0.81	0.80 mm
			1.21	1.20 mm
			1.61	1.60 mm
			0.11	0.10 mm
	(D)	1.5, 2, 3, 12, 18 μm (HVL)	0.21	0.20 mm
			0.31	0.30 mm
			0.41	0.40 mm
			0.81	0.80 mm
			1.21	1.20 mm
MCL-HD90	-	1.5, 2, 3, 12, 18 μm (VLP)	0.24	0.24 mm
			0.31	0.30 mm
			0.41	0.40 mm
			0.81	0.80 mm
			1.21	1.20 mm
	(D)	1.5, 2, 3, 12, 18 μm (HVL)	0.11	0.10 mm
			0.21	0.20 mm
			0.24	0.24 mm
			0.31	0.30 mm
			0.41	0.40 mm

Note1) LP/HVLP: Low profile copper foil.
Note2) Laminate thickness means dielectric layer thickness.

• Prepreg

Part Number	Type	Glass Cloth			Properties	
		Style	Resin Content (%)	Dielectric Thickness after Lamination ¹⁾		
GD-60	-	0.025	(1017F80)	1017	80 ± 2	0.031 mm
			(1017F88)	1017	88 ± 2	0.033 mm
		0.030	(1027F74)	1027	74 ± 2	0.038 mm
			(1027F78)	1027	78 ± 2	0.045 mm
		0.040	(1037F79)	1037	79 ± 2	0.056 mm
	(D)	0.060	(1037F82)	1078	82 ± 2	0.065 mm
			(1078F67)	1078	67 ± 2	0.070 mm
		0.025	(D1017F82)	1017	73 ± 2	0.087 mm
			(D1017F90)	1017	76 ± 2	0.098 mm
		0.030	(D1027F78)	1027	82 ± 2	0.033 mm
GD-80	-	0.025	(D1017F82)	1017	90 ± 2	0.060 mm
			(D1017F90)	1017	76 ± 2	0.038 mm
		0.030	(D1027F80)	1027	80 ± 2	0.046 mm
			(D1037F81)	1037	81 ± 2	0.057 mm
		0.040	(D1037F84)	1037	84 ± 2	0.068 mm
	(D)	0.060	(D1078F69)	1078	69 ± 2	0.069 mm
			(D1078F75)	1078	72 ± 2	0.077 mm
		0.025	(D1078F78)	1078	78 ± 2	0.099 mm
			(1017F82)	1017	82 ± 2	0.034 mm
		0.030	(1017F90)	1017	90 ± 2	0.063 mm
GD-90	-	0.025	(1027F74)	1027	74 ± 2	0.037 mm
			(1027F78)	1027	78 ± 2	0.045 mm
		0.040	(1037F78)	1037	78 ± 2	0.052 mm
			(1037F82)	1037	82 ± 2	0.064 mm
		0.060	(1078F68)	1078	68 ± 2	0.071 mm
	(D)	0.025	(1078F72)	1078	72 ± 2	0.082 mm
			(1078F76)	1078	76 ± 2	0.097 mm
		0.030	(1017F82)	1017	82 ± 2	0.034 mm
			(1017F90)	1017	90 ± 2	0.063 mm
		0.040	(1027F74)	1027	74 ± 2	0.037 mm
GD-90	-	0.025	(1027F78)	1027	78 ± 2	0.044 mm
			(1037F78)	1037	78 ± 2	0.052 mm
		0.030	(1037F82)	1037	82 ± 2	0.064 mm
			(1078F68)	1078	68 ± 2	0.071 mm
		0.060	(1078F72)	1078	72 ± 2	0.081 mm
	(D)	0.025	(1078F76)	1078	76 ± 2	0.096 mm
			(D1017F84)	1017	84 ± 2	0.036 mm
		0.030	(D1017F92)	1017	92 ± 2	0.073 mm
			(D1027F76)	1027	76 ± 2	0.037 mm
		0.040	(D1027F80)	1027	80 ± 2	0.045 mm
GD-90	-	0.060	(D1037F80)	1037	80 ± 2	0.052 mm
			(D1037F84)	1037	84 ± 2	0.066 mm
		0.030	(D1078F70)	1078	70 ± 2	0.070 mm
			(D1078F74)	1078	74 ± 2	0.082 mm
		0.040	(D1078F78)	1078	78 ± 2	0.097 mm
	(D)	0.025	(D1078F82)	1078	82 ± 2	0.034 mm
			(D1078F86)	1078	86 ± 2	0.044 mm
		0.030	(D1078F90)	1078	90 ± 2	0.054 mm
			(D1078F94)	1078	94 ± 2	0.064 mm
		0.040	(D1078F98)	1078	98 ± 2	0.074 mm

*1) The dielectric thickness after lamination is defined as the thickness of one sheet of prepreg when the resin flow is 0 %, Values change depending on the press condition or inner layer pattern.