2.xD/次世代先端載板材料「MCL-E-795G,E795UC,TYPE-F Core」

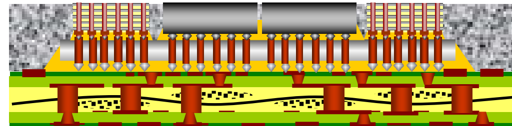
Advanced Substrate Materials for 2.xD/Next-Gen. Package「MCL-E-795G, E-795UC, TYPE-F Core」

用途 / Application

2.xD/次世代先端載板材料

Substrate materials for 2.xD/Next-Gen. package

PKG substrate



技術内容 / Technical Information

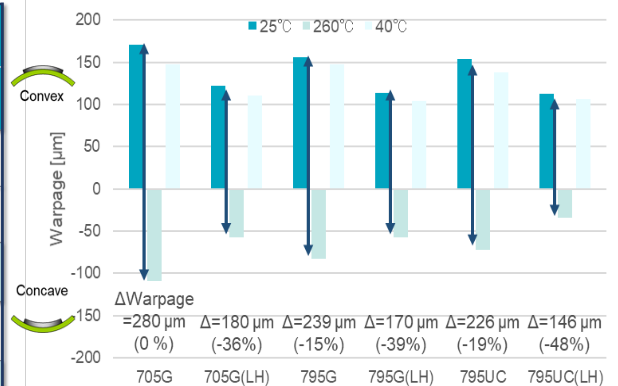
MCL-E-795G, MCL-795UC

■ **Larger package, minimum warpage**
12% lower warpage with our new low CTE resin system.

・General properties

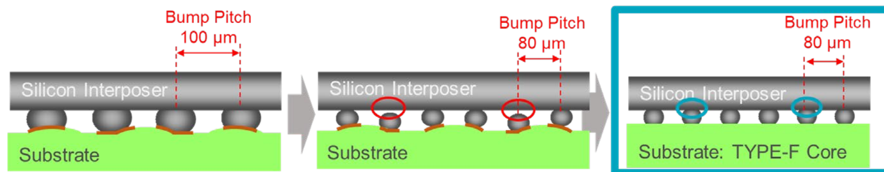
Item	Conditions		E-705G	E-705G (TYPE LH)	E-795G	E-795G (TYPE LH)	E-795UC	E-795UC (TYPE LH)
			E-glass	S-glass	E-glass	S-glass	E-glass	S-glass
Tg	TMA	°C	260	260	280	280	280	280
	DMA		300	300	330	330	330	330
CTE α1 (X)	TMA Comp.	ppm/°C	9.5	7.2	8.0	5.6	7.5	4.9
Peel Strength	12 μm	kN/m	0.9	0.9	0.9	0.9	0.7	0.7
Flexural Modulus	Lengthwise	GPa	33	38	36	41	33	38

・Warpage



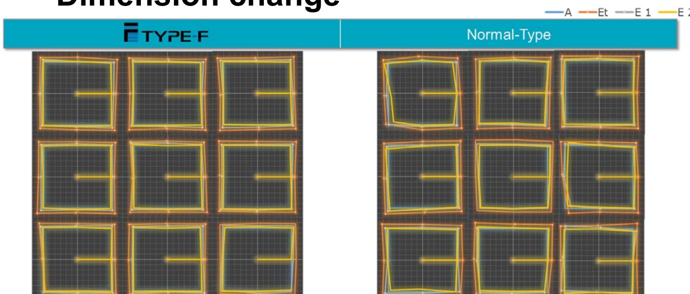
- Substrate: 2-2-2 construction (Core:1000 μm, BU 30 μm)
- Package size: 40 x 40 mm - Die size: 20 x 20 mm x t775 μm

TYPE-F Core



■ **Outstanding 1st Level Connection Reliability**
50% less thickness variation with superfine flat TYPE-F Core.

・Dimension change



Material: MCL-E-795G(TYPE LH) 1.0mm with 12μm Copper
Process (A → ET → E1:180°C, 60min. baking → E2:180°C, 60min. baking)

・Thickness variation

Item		795G(LH)_TYPE-F	795G(LH)_Type-N
Contour diagram LTV (0 ~ 5 μm / 6 ~ 10 μm / >11 μm)			
LTV (μm)	Max	8	15
	Ave	3.05	6.38
	σ	1.55	2.84

Material: MCL-E-795G(Type LH) 1.4mm with 12μm Copper
* LTV (Local area thickness variation) : Thickness difference between 4 points of 40x40mm

多功能與超薄載板材料「TYPE-F PP 與 MCF 系列」

High Functionality and Ultra Thin Laminate Materials for Mobile Devices「TYPE-F Prepreg and MCF series」

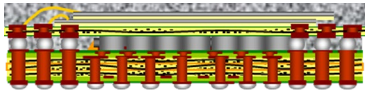
RESONAC
Chemistry for Change

用途 / Application

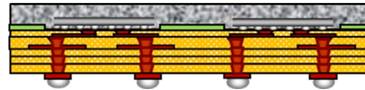
薄型化封裝材料

For miniaturization of package material

PoP(AP+memory)



RF Modules



Next generation PKG

特長 / Advantage

多功能與超薄化的封裝設計

High functionality and ultra thin for package

技術內容 / Technical Information

TYPE-F prepreg

Thickness reduction by applying ultra thin glass cloth to meet market trend for SiP module

Low CTE, High Elastic Modulus

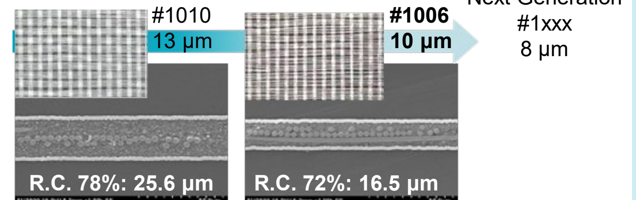
⇒ GEA-795G(F) / GEA-795G(LF)

・General properties

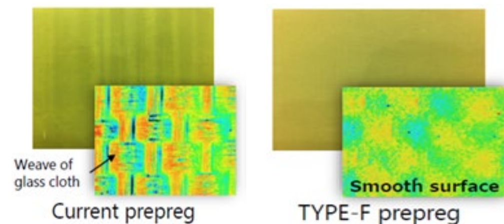
Item		Unit	GEA-770G(F)* E-glass #1010	GEA-795G(F)* E-glass #1010	GEA-795G(LF)* Low CTE glass #1010
Tg	DMA	ºC	306	349	348
CTE (X-axis) (TMA :Tensile)	α1(<Tg)	ppm/ºC	11.2	7.4	6.0
Modulus (DMA :Tensile)	30ºC	GPa	14.3	16.3	18.1
	250ºC		9.8	12.4	14.9
Peel strength (12 µm/LP)	A	kN/m	0.50	0.60	0.60
Dk	SPDR @10 GHz	-	3.8	3.8	3.7
Df		-	0.0070	0.0060	0.0060

*Resin content (R.C.): 78-80%

・Thickness



・Flatness

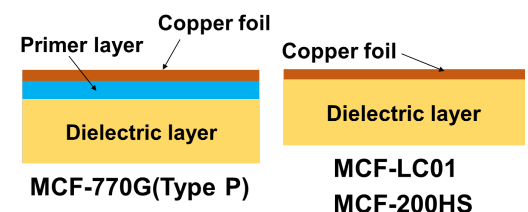


MCF series

・General properties

Item			Unit	Low CTE MCF		Low Dk MCF
				MCF-770G(P)	MCF-LC01	MCF-200HS
Thickness			-	*12µm~*	*10µm~*	*10µm~*
Tg	DMA			*290*	*300*	*260*
CTE	α1(<Tg)		ppm/ºC	*18*	*19*	*40*
Modulus DMA	30ºC		GPa	*9.1*	*6.8*	*5.2*
	250ºC			*2.3*	*1.7*	*0.7*
Dk/Df SPDR	Dk	10 GHz	-	*3.5*	*3.0*	*3.0*
	Df			*0.010*	*0.008*	*0.004*

・Structure



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Chemistry for Change

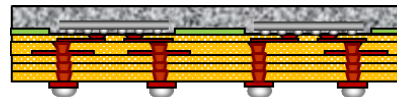
低損耗,低熱膨脹係數多層對應材料「MCL-HS200」
Low Transmission Loss & Low CTE Multilayer Material 「MCL-HS200」

用途 / Application

對應多層結構之材料,可應用在天線封裝(AiP), 射頻模組
Multilayer materials suitable for 5G RFFE modules and AiP (Antenna-in-Package)

Antenna in Package

RF Modules



特長 / Advantage

- **低損耗效果** Excellent dielectric properties (low Dk, low Df) realize low transmission loss.
- **降低板彎翹** Improves mounting reliability by reducing board warpage.
- **可對應SAP製程** Possible to form fine patterns by semi-additive process(SAP).

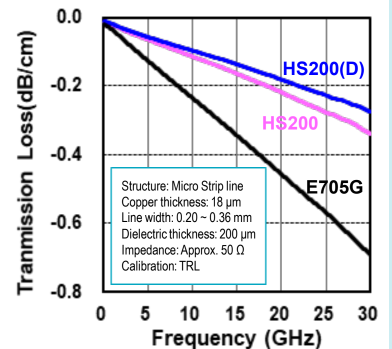
技術內容 / Technical Information

・General properties

Glass cloth style :1017

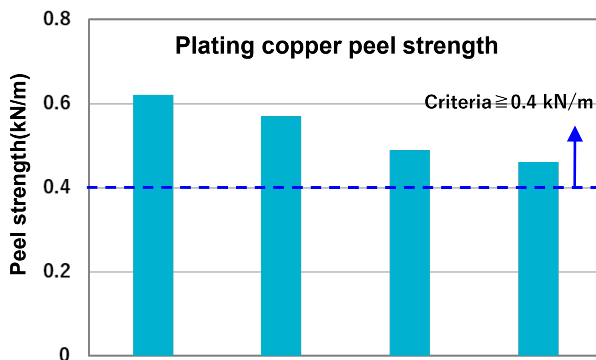
Item		Condition	Unit	HS200	HS200(D)	E-705G
				E-glass	Low Dk glass	E-glass
CTE (X)	α1	TMA expansion	ppm/°C	14-16	13-15	9-11
Tg		TMA	°C	220-240	220-240	250-270
		DMA	°C	250-270	250-270	295-305
Dk	SPDR	10 GHz	-	3.5-3.7	3.2-3.4	3.7-3.9
Df	SPDR	10 GHz	-	0.003-0.005	0.002-0.004	0.007-0.009

・Transmission Loss

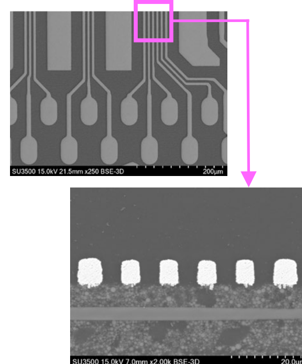


・Applicability of SAP

Good copper peel strength regardless of the processing solution.

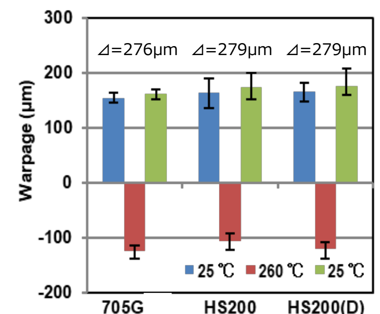


Prepreg: GH-200(D), Copper foil: MT18FL, Plating thickness: 25 ~ 30 µm



L/S=5/5 µm
(Exposure LDI)

・Warpage properties



Substrate: Core 45 µm,
PPG 45 µm × 2 stack
Package size: 14 mm × 14 mm
Chip size : 7.3 mm × 7.3 mm × 0.1 mm

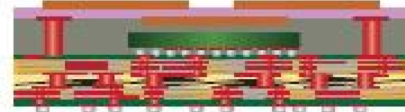
次世代低損耗,低熱膨脹係數多層對應材料「MCL-HS300」
Next Generation Low Transmission Loss, Low CTE Multilayer Material「MCL-HS300 series」

RESONAC
Chemistry for Change

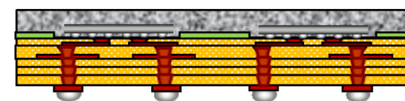
用途 / Application

天線封裝(AiP)材料, 射頻模組
Substrate materials for Antenna in Package, RF Module

Antenna in Package



RF Modules



特長 / Advantage

低熱膨脹係數與優異板彎俏特性 Low CTE and excellent warpage performance

低傳送損失 Low transmission loss

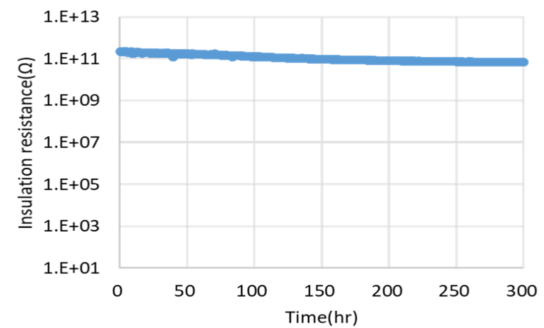
優異絕緣信賴性 Excellent insulation reliability

技術内容 / Technical Information

・General Properties

Item		Unit	Core		Prepreg		
			E-705G	HS305(D)	GEA-705G	GH-300(D)	GH-305(D)
Glass cloth style		-	*#2116 E-glass*	*#3313 LD-glass*	*#1017 E-glass*	*#1017 LD-glass*	*#1017 LD-glass*
Tg	DMA	°C	*300*	*260*	*300*	*280*	*260*
CTE	α1(<Tg)	ppm/°C	*6*	*9*	*9*	*21*	*13*
Dk/Df SPDR	Dk 10 GHz	-	*4.5*	*3.4*	*3.9*	*3.0*	*3.2*
	Df 10 GHz	-	*0.010*	*0.002*	*0.009*	*0.003*	*0.002*

・Insulation Reliability

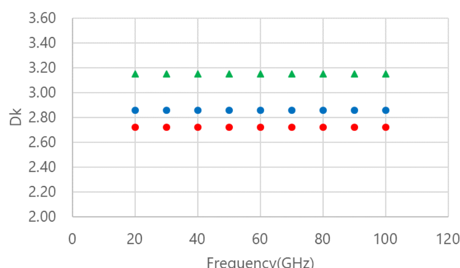


<Test condition>
- Sample: Core MCL-HS200(D) t0.2mm,
  PP GH-300(D) 1017 RC:76%
- Pre-treatment : JEDEC Level 2 (60oC/60%rH 120hr + 260oC reflow 6 cycle)
- Evaluation condition : 130oC/85%RH, 6V
- Criteria: Insulation resistance > 1 x 107 Ω

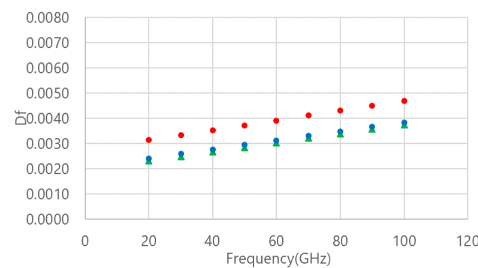
・Dielectric Properties

Sample

Core 1) MCL-HS305(D) 200µm
Prepreg 2) GH-300(DF) 1017 RC:76%
3) GH-305(DF) 1017 RC:76%



▲ 1) MCL-HS305(D) 200µm ● 2) GH-300(DF) 1017 RC:76%
● 3) GH-305(DF) 1017 RC:76%



▲ 1) MCL-HS305(D) 200µm ● 2) GH-300(DF) 1017 RC:76%
● 3) GH-305(DF) 1017 RC:76%

高Dk 多層材料「MCL-HD60/90」
High Dk Multilayer Materials「MCL-HD60/90」

RESONAC
Chemistry for Change

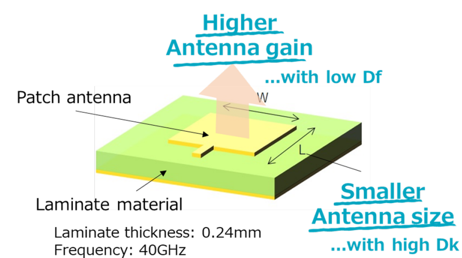
用途 / Application

天線封裝(AiP)材料
Substrate materials for Antenna in Package

Antenna in Package

特長 / Advantage

藉由我們的高Dk/低Df材料,可使AiP的天線尺寸縮小到60%大小
Miniaturization of AiP
60% smaller antenna size with our new high Dk and low Df material.



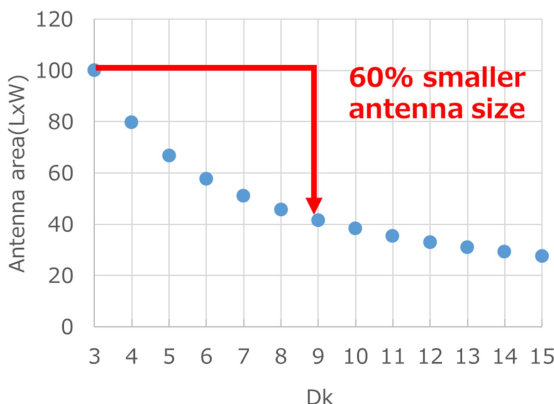
技術內容 / Technical Information

・General properties

Item		Unit	Actual Value			
			HD60	HD90	HD90(Type D)	HS200(Type D)
Glass cloth	Glass type		E	E	LD	LD
	Style		2116	3313	3313	3313
Tg	DMA	℃	240	240	240	340
CTE	α1(X,Y)*1	ppm/℃	11.0	12.0	12.0	9.0
Peel strength	12μm(VLP)	kN/m	0.6	0.5	0.5	0.5
Elastic modulus	A	GPa	18	15	14	17
Dk	10GHz*2	-	6.2	9.2	8.6	3.5
	60GHz*3	-	6.2	9.2	8.6	3.5
Df	10GHz*2	-	0.0056	0.0050	0.0038	0.0028
	60GHz*3		0.0080	0.0075	0.0056	0.0048

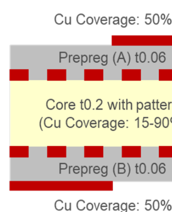
*1) Tensile method. *2) SPDR method, Drying:105℃/1h. *3) Cut-off circular waveguide method, Drying:105℃/1h.
*Above data are experimental results and not guaranteed.

・Antenna size simulation



・Heat resistance test results

<4L Construction>



Test Size : 35mm x 35mm
- L1,L4 copper thickness : 1.5 μm
- L2,L3 copper thickness : 18 μm
  Cu Coverage : 15-90 %
  surface treatment : CZ8401

Test Condition

Conditon1
- Pre-condition : 144hrs 60 °C/60RH
- Test condition : 260 °C reflow x 30 times

Conditon2
- Pre-condition : PCT-4hrs
- Test condition : 260 °C reflow x 5 times

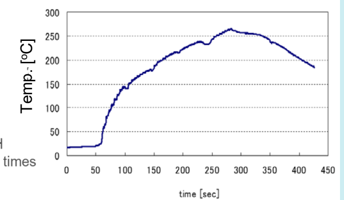


Fig. Reflow temp. profile

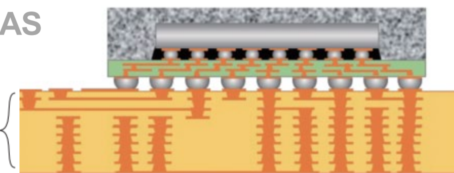
Item		#1	#2	#3	#4
Construction	Prepreg(A)	GH-200(D)	GH-200(D)	GD-60	GD-60
	Core	HS200(D)	HD60	HS200(D)	HD60
	Prepreg(B)	GH-200(D)	GH-200(D)	GD-60	GD-60
Reflow resistance	60 °C/60RH 144h	30 pass	30 pass	30 pass	30 pass
	PCT-4h	5 pass	5 pass	5 pass	5 pass

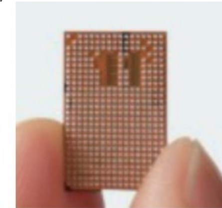
次世代ADAS 車用雷達先端材料「MCL-LW-990(Type RFD)」
Advanced laminate materials for Next-Gen. ADAS for automotive radar「MCL-LW-990(Type RFD)」

RESONAC
Chemistry for Change

用途 / Application

次世代ADAS 車用雷達先端材料
Substrate materials for Next Gen. ADAS for automotive radar





First 4D Digital Automotive Radar - By Uhnder Inc.

特長 / Advantage

極其可靠高頻產品可滿足次世代毫米波雷達(76-81GHz)
Extremely reliable high frequency product to satisfy next generation mmWAVE (76-81GHz) radars.

技術內容 / Technical Information

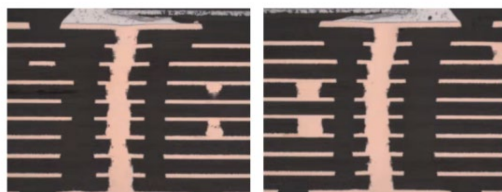
General properties

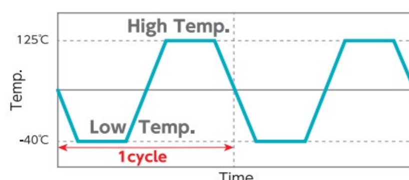
Item		Unit	MCL-LW-990 (Type RFD)	MCL-LW-910G	PTFE CCL
Category		—	Halogen	Halogen free	(Fluorine)
		—	Thermosetting	Thermosetting	Thermoplastic
Dk*	77GHz	—	3.0～3.3	3.1～3.3	3.00
Df*		—	0.0020	0.0029	0.0007
Tg	TMA	℃	185	200	>250
CTE (TMA)	X (30～120 ℃)	ppm/℃	5～10	12～15	17
	Z (30～120 ℃)		35～50	35～45	25
Elastic Modulus		GPa	7～11	10～13	0.9
Td (TGA, -5wt%)		℃	386	400	>500

*Micro Strip Line method

Board Level Reliability

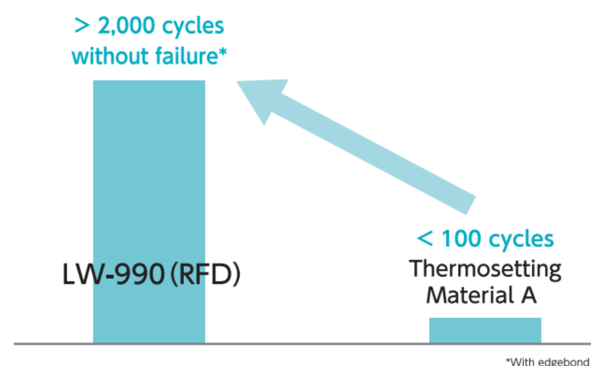
Measurement method





-40℃ ⇔ 125℃ thermal cycle test.
Measured until resistance exceeds specified value.

Measurement Results



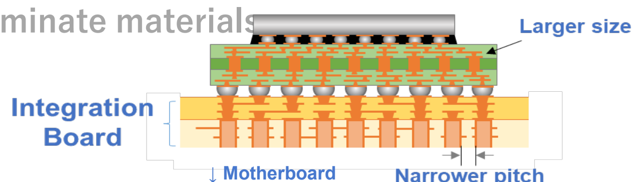
次世代複合板先端低損耗/低熱膨脹材料「Next ULL」

Advanced Low Loss and Low CTE Laminate Material for Next-Gen. Integration Boards「**Next ULL**」

RESONAC
Chemistry for Change

用途 / Application

次世代低損耗高連接信賴性先端材料
Low loss and high connection reliability laminate materials for next-gen. integration board.



特長 / Advantage

- **同時兼具低損耗與低熱膨脹係數**
  Achieves both low loss and low CTE.
- **在高溫時Dk/D依舊穩定**
  ・Stable Dk, Df at higher temperature (low temperature dependence).

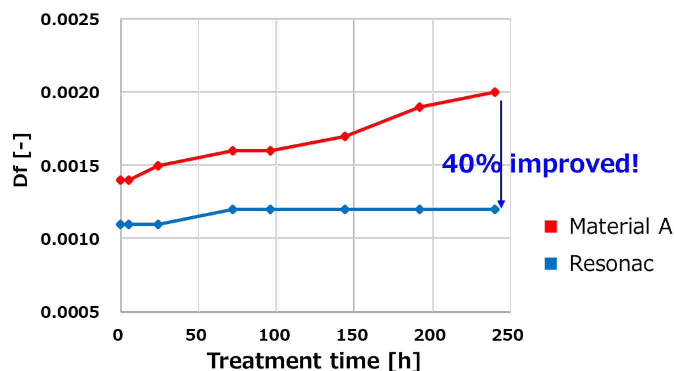
技術内容 / Technical Information

・General properties

Construction : #1078 1ply 62mm,
* CTE Tensile : 125μm thickness, Comp.: 600μm thickness

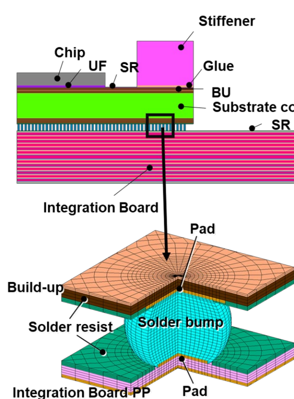
Item	Conditions		Resonac	
Glass type			Ultra LDk	Quartz
CTE $\alpha 1$ (X) Tensile	TMA *	ppm/°C	**10**	**9**
CTE $\alpha 1$ (X) Comp			13	12
CTE $\alpha 1$ (Z)			**20**	**20**
CTE $\alpha 2$ (Z)			150	150
Dk	SPDR 10GHz	-	**3.3**	**3.2**
Df		-	**0.0011**	**0.0009**
Df change (After 125°C/240hr)		-	**0.0012**	-
Dk temperature drift (25-90°C)		%	**<0.2**	-
Elastic modulus (30°C)	DMA	GPa	16	16
Tg	DMA	°C	210	210
Flammability	UL-94	-	V-0	V-0
Halogen-Free	-	-	Y	Y

・Df change (After 125°C / 240hr)



1. Evaluation sample was put in 125°C drying machine.
2. Take out sample at a set time.
3. Dk, Df measured at room temperature.

・BLR (Board Level Reliability) simulation



	Material A	Resonac	Material A	Resonac
Substrate	Conventional (60 mm x 60 mm)		Next Gen. (100 mm x 100 mm)	
CTE	17	10	17	10
Total equivalent plastic strain* (0.0 – 3.40)	Substrate side / Solder ball / Integration board side		Max strain	
Max. value	0.20	0.08	3.39	1.18

Test Condition: -55°C ~ 125°C, 30min x 10 cycle
Solder bump dia. : 600 μm, height : 400 μm
Substrate : Construction 8-2-8, Core 1400mm, BU 30mm,
Integration Board: Construction 28L, Core 130mm/200mm, Prepreg 60mm,