Standard materials

		Q series			F series		
		Qxx-02512	Qxx-05012	Qxx-10012	Fxx-02512	Fxx-05012	Fxx-10012
Dielectric Layer	Material	LCP Film "Vecstar™" CTQ			LCP Film "Vecstar™" CTF		
	Thickness	25μm	50μm	100μm	25μm	50μm	100μm
Copper Foil Layer	Material	ED Copper Foil			ED Copper Foil		
	Thickness	12μm			12μm		

Roll Width : 250mm or 520mm

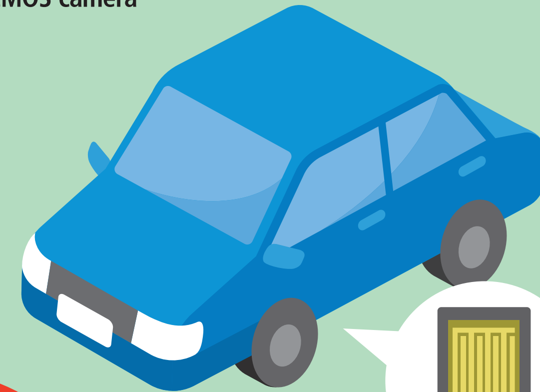
Applications

Smartphone

NFC
WiGig
USB Type C

Automotive・Self-driving

CMOS camera



Millimeter wave radar

Communication
Mobility
5G
Infrastructure・IoT
Healthcare

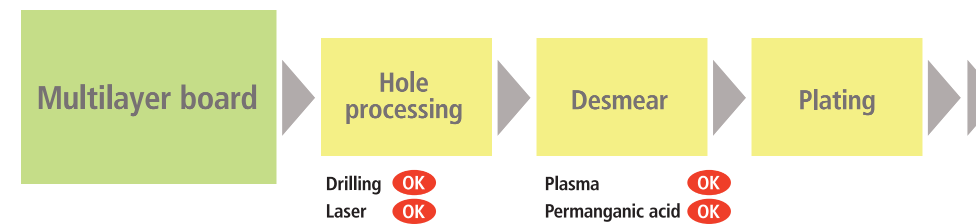
Higher data rate &
Higher System capacity
Massive device Connectivity
Reduce Latency

Drone
Base station
Data center
Optical network
Remote medical device

Properties of dielectric layer after removing copper foil

Property	Test condition	Unit	Q series	F series
Tensile strength	Kuraray method	MPa	180	190
Elongation	Kuraray method	%	30	40
Tensile modulus	Kuraray method	MPa	3,600	3,100
Melting temperature	Kuraray method (DSC)	℃	310	280
Breakdown voltage	IEC60243-1	kV/mm	200	200
Moisture absorption	Kuraray method (23℃, 50%RH)	%	0.04	0.04
Dielectric constant (Dk)	Fabry-Perot method (25℃, 28GHz, xy direction)	-	3.3	3.3
Dielectric dissipation factor (Df)		-	0.002	0.002
Chemical resistance	Kuraray method (HCl, 2mol/L, 23℃, 5min)	-	Pass	Pass
	Kuraray method (NaOH, 2mol/L, 23℃, 5min)	-	Pass	Pass
	Kuraray method (IPA, 23℃, 5min)	-	Pass	Pass

Manufacturing process



● By choosing suitable pretreatment chemicals and conditions, it is possible to functionalize and improve the surface roughness of Via Hole for better adhesion.

【Cross-section observation of coupon】

	After plating	After hot-oiling reliability test
Condition A	OK	OK
Condition B	Open Failure	

● The data in this brochure presents typical values that are not guaranteed. Feel free to contact the following department for more details.
● Before using the information and data, be sure to conduct a sufficient examination under your operating conditions and check if the performance meet your requirement.
● When using Kuraray's FCCL, please confirm the related law and regulations for your applications.
● Precautions should be taken in handling and storing. Please refer to the Safety Data Sheet (SDS) for further safety information.
● Kuraray's FCCL should not be applied for human body and food contact applications, including devices for medical and healthcare. Especially, Kuraray's FCCL should not be applied to any devices intended for implantation in the human body.
● The information contained herein could change without notice.

KURARAY CO., LTD.
Vecstar Business Promotion Department, Research and Development Division
https://www.kuraray.com/

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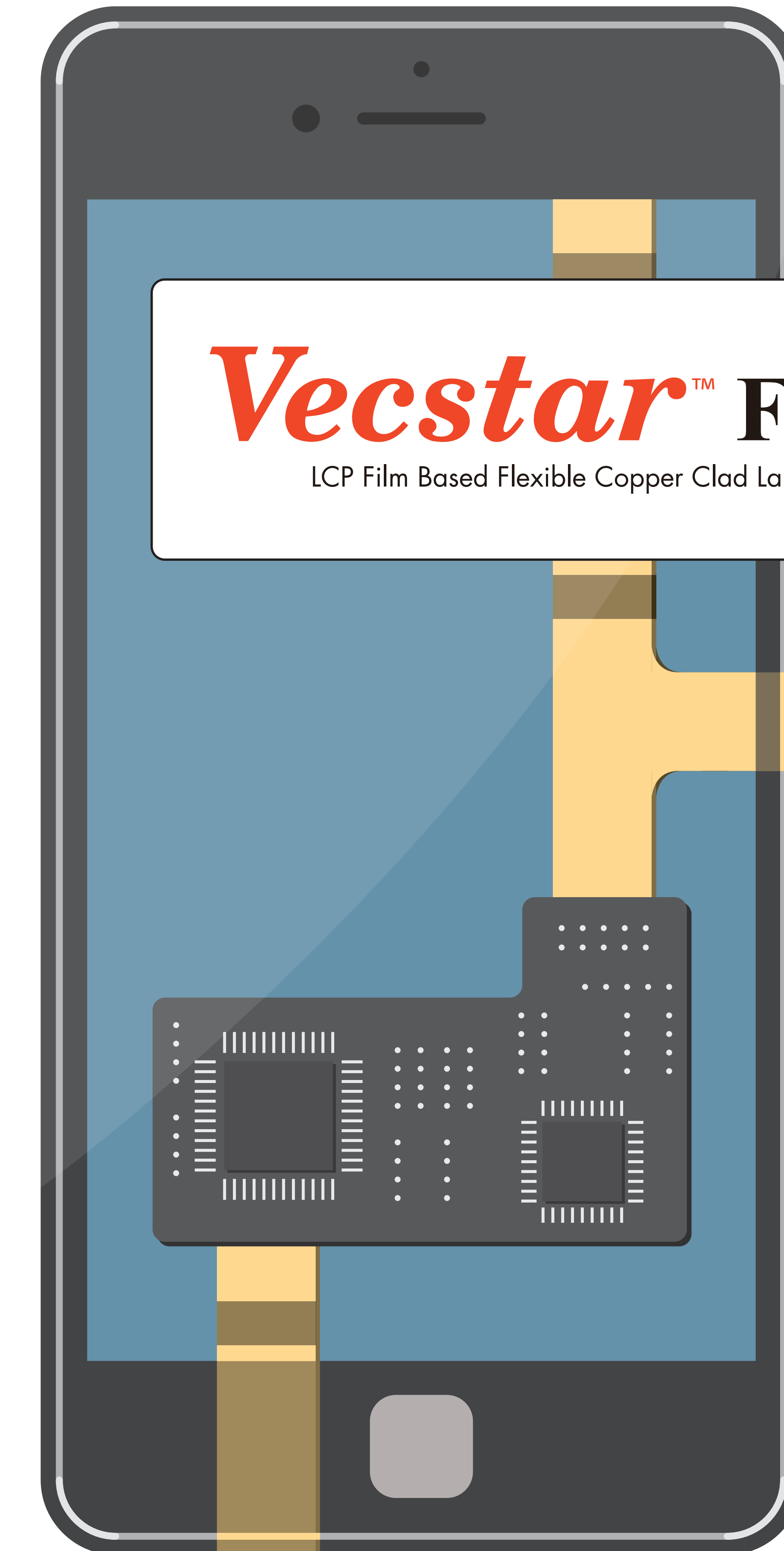
Date of revision : December 2019

kuraray

Developing Materials



Vecstar™ FCCL

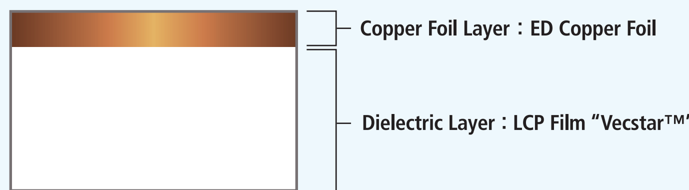
LCP Film Based Flexible Copper Clad Laminates

Vecstar™ FCCL

LCP Film Based Flexible Copper Clad Laminates

Vecstar™ FCCL is single side Flexible Copper Clad Laminates (FCCL) made of Kuraray's Liquid Crystal Polymer (LCP) film "Vecstar™" developed by Kuraray's proprietary technology. It shows excellent electrical properties suitable for high speed transmission line and high frequency electric devices.

Structure



Advantages

1. Excellent Dimensional stability
2. Excellent adhesion to low-profile copper foil
3. Excellent adhesion to other materials in multilayer stack up

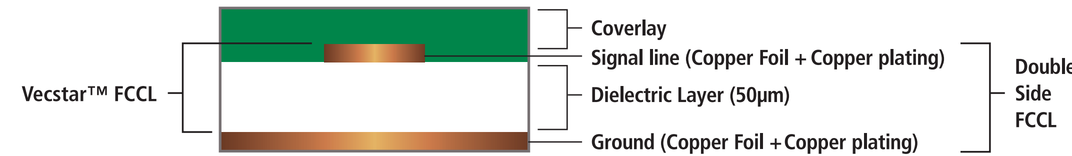
Properties

Property	Test condition		Unit	Q series			F series
				Qxx-02512	Qxx-05012	Qxx-10012	Fxx-05012
Dimensional stability	Kuraray method	After Etching, MD	%	-0.02	0.00	0.01	-0.02
		After Etching, TD		-0.01	0.00	0.00	-0.01
		After Baking (150℃, 30min), MD		-0.04	-0.01	0.01	-0.13
		After Baking (150℃, 30min), TD		0.02	0.02	0.01	-0.02
Peel strength	Kuraray method	90°peel	N/mm	1.0			0.8
Flammability	—	UL94	—	VTM-0			VTM-0
Solder heat resistance	Kuraray method	Solder float at 288℃ 30sec	—	Pass			Pass *260℃, 30sec
		Solder float at 288℃ 30sec after C-96/40/90	—	Pass			Pass *260℃, 30sec
Volume resistance	JIS C6471	At ambient temperature	Ω·cm	$>1.0\times10^{16}$			$>1.0\times10^{16}$
		C-96/40/90		$>1.0\times10^{16}$			$>1.0\times10^{16}$
Surface insulation resistance	JIS C6471	At ambient temperature	Ω	$>1.0\times10^{12}$			$>1.0\times10^{12}$
		C-96/40/90		$>1.0\times10^{12}$			$>1.0\times10^{12}$
Bending resistance	JIS C6471	Without coverlay	times	>9,600	>1,400	>140	>1,800

MD : Machine Direction, TD : Traverse Direction

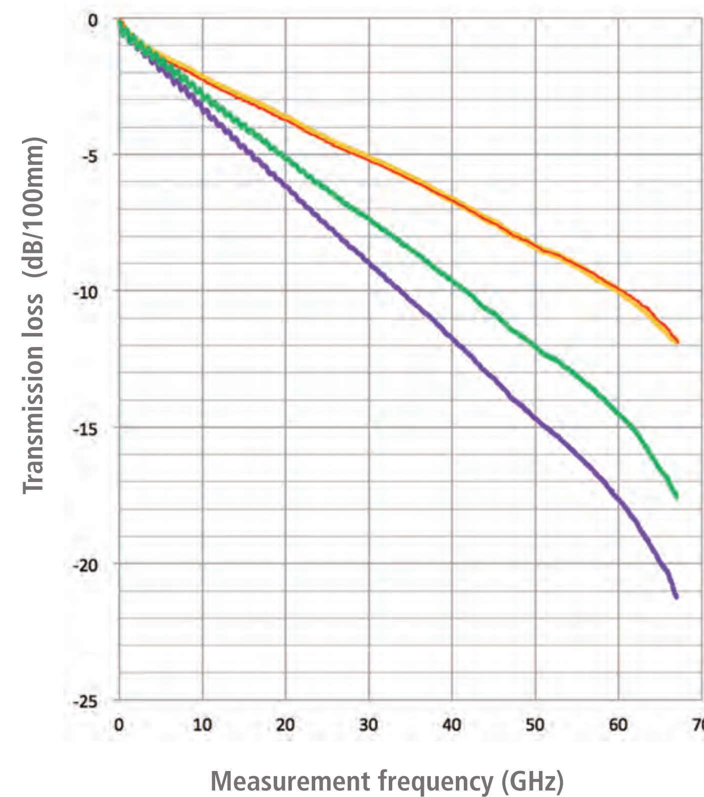
Transmission

Test Coupon Microstrip line based on Vecstar™ FCCL [Line width : 110μm]



▶ Comparison of transmission loss with microstrip line using polyimide film

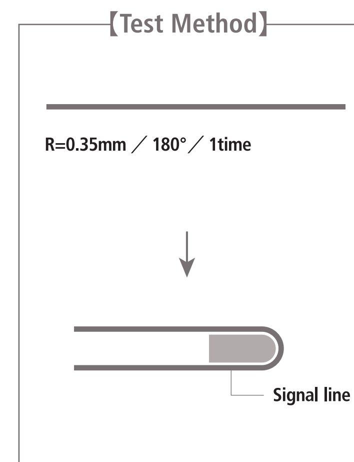
- Vecstar™ FCCL is a low transmission loss material in high frequency range.
- Transmission loss is stable under high humidity conditions.

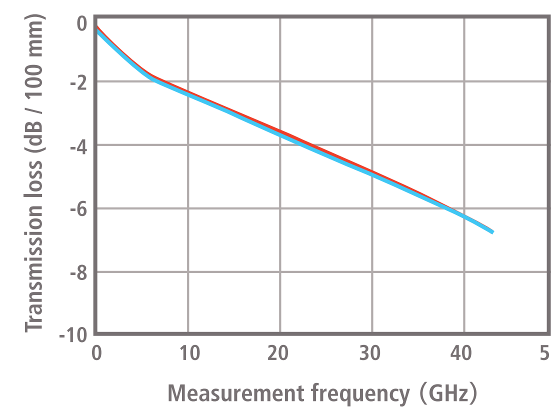


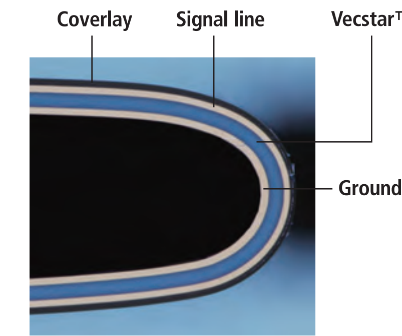
No.	Test Coupon		Pretreatment conditions
	Double Side FCCL	Coverlay	
1	Double Side FCCL based on Vecstar™ FCCL	Vecstar™	25℃ 50%RH
2	Double Side FCCL based on Vecstar™ FCCL	Vecstar™	40℃ 90%RH 48hrs
3	Double Side FCCL based on polyimide film	Polyimide	25℃ 50%RH
4	Double Side FCCL based on polyimide film	Polyimide	40℃ 90%RH 48hrs

▶ Change in transmission loss in bending condition

- Transmission loss is very stable in bending condition.





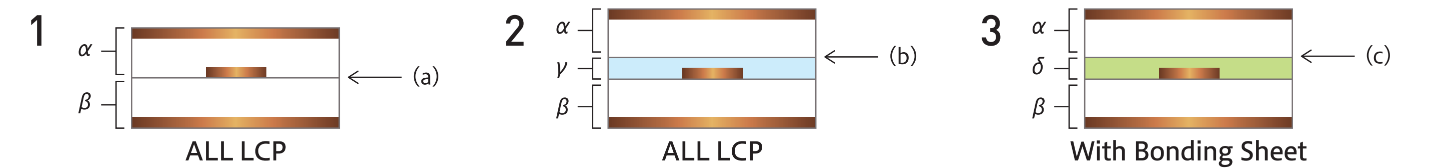


[Cross-section observation]

Lamination

- Vecstar™ FCCL shows excellent peel strength and dimensional stability in both ALL LCP multilayer stack up and multilayer stack up with low Dk Bonding Sheet.

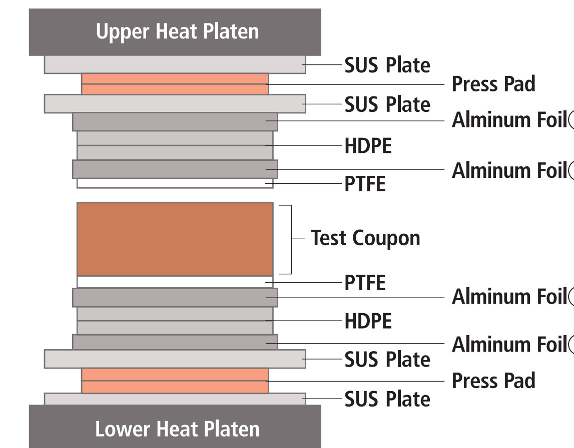
Test Coupon



α:Vecstar™ FCCL Qxx-05012 β: Double Side FCCL based on Vecstar™ FCCL
γ: Vecstar™ CTF-25 δ:Low Dk Bonding Sheet (25μm)

Test example using a high-temperature vacuum press

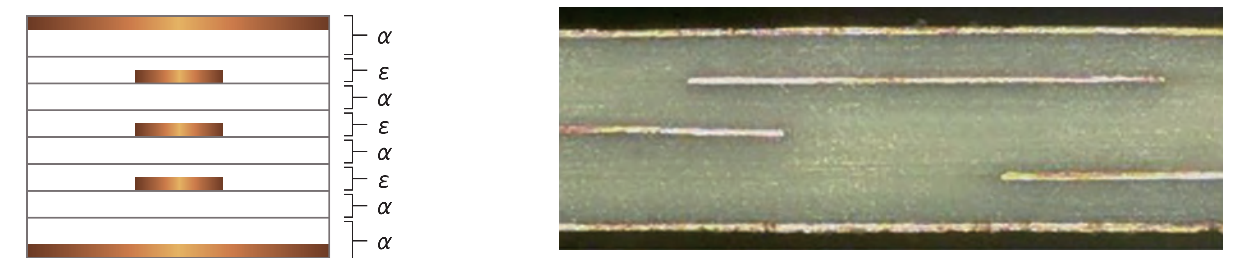
Test Coupon	Lamination Top Temp. (℃)	Peel Strength (N/mm)	Peeling interface	Solder Float 288℃, 30sec	Dimensional Stability (%)		
					After Lamination	After Etching	After Baking
1	300	≥0.8	(a)	Pass	0±0.15	0±0.10	0±0.10
2	300	≥0.8	(b)	Pass	0±0.15	0±0.10	0±0.10
3	180	≥0.8	(c)	Pass	0±0.15	0±0.10	0±0.10



Accessories	Effect
SUSPlate	Pressure uniformity of heat platen
Press Pad	
SUSPlate	
Aluminum Foil①	Release layer between HDPE and SUS
HDPE	Reducing resin flow
Aluminum Foi②	Cancel the shrinkage of HDPE in cooling process
PTFE	Release film

* Size of each accessories should be same for pressure uniformity. * Number of HDPE film depends on the coupon thickness.

Multilayer stack up example



α: Vecstar™ FCCL Qxx-05012 ε: Vecstar™ CTQ-50

- An example of 5L multilayer stack up by Vecstar™ FCCL (5 sheets)