Panasonic
INDUSTRY

LEXCM

Semiconductor Device Materials

Innovative semiconductor device materials to meet the challenges of leading-edge devices

LEXCM

[l é k s i m]

Panasonic is proud to launch LEXCM brand semiconductor packaging materials. Innovation through collaboration is our path to developing advanced IC Substrates and IC Encapsulants ready for the demands of next-generation devices.

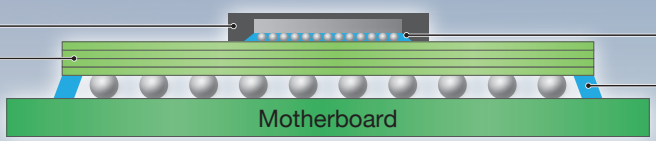
Semiconductor package

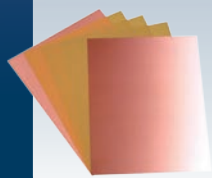
Semiconductor encapsulation materials (Overmold)

LEXCM CF

Semiconductor encapsulation materials (Underfill)

LEXCM LF





LEXCM GX

IC substrate materials (Core/Prepreg)

LEXCM for Assembly*

Liquid materials for board level underfill

*Tentative name

Halogen -free

Circuit board materials for IC substrate

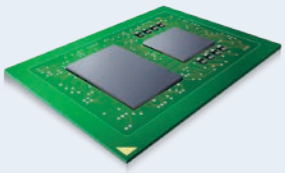
LEXCM GX Series

Enables thinner and smaller IC substrates with lower warpage.

Line-up

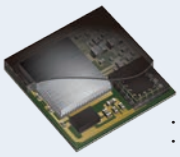
Package Application

FC-xGA



- CPU for Sever/ Desktop/Laptop
- GPU for AI/ADAS/ Gaming
- FPGA

Module

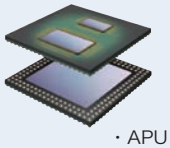


- AiP
- PAM
- FEM

CSP

- DRAM
- NAND/PMIC
- Mini LED

FC-CSP



- APU
- RF-IC

Product

LEXCM GX

Ultra Low CTE / High Reliability

R-1515V / R-1515K
- Low warpage
- Stress release

R-G535S / R-G535E
- Low warpage
- High modulus

Low CTE / High Heat Resistance

R-1515W
- Low warpage
- High modulus

R-1515A
- Low warpage
- High heat resistance

Low Dk / Low Df

R-G545L / R-G545E
- Excellent transmission loss
- Excellent low Dk/Df performance in wide frequency
- Low warpage

Low CTE / Ultra Thin Material

R-G515S / R-G515E
- Low warpage
- Fine laminate-ability
- Ultra thin prepreg line-up

R-1515E
- Low warpage
- High modulus

General properties

Item	Glass transition temp.(Tg)	CTE x-axis	CTE y-axis	Dielectric constant(Dk)*1	Dissipation factor(Df)*1	Flexural modulus*1		Peel strength	Product thickness line-up
		α1		1GHz				1/3oz(12μm)	
Test method	DMA*2	Internal method		IPC-TM-650 2.5.5.9		JIS C 6481		IPC-TM-650 2.4.8	
Condition	A	A		C-24/23/50		25℃	250℃	A	
Unit	℃	ppm /℃		–		GPa		kN/m(lb/inch)	mm
R-1515V	260	3-5	3-5	4.4	0.016	30	14	0.6(3.4)	0.20～1.8
R-1515K	260	7	7	4.6	0.015	27	12	0.6(3.4)	0.20～1.8
R-G545L	230	10	10	3.6	0.002	23	10	0.6(3.4)	0.04～0.2
R-G545E	230	10	10	4.1	0.002	27	13	0.6(3.4)	0.04～0.2
R-1515E	270	9	9	4.7	0.011	33	18	0.9(5.1)	0.04～0.2
R-G535S	260	4-6	4-6	4.4	0.015	32-34	20-22	0.7(4.0)	0.20～1.8
R-G535E	260	7-8	7-8	4.6	0.015	28-30	18-20	0.7(4.0)	0.20～1.8
R-G515S	220-240	4-6	4-6	4.2	0.008	28	–	0.7(4.0)	0.03～0.1
R-G515E	220-240	6-8	6-8	4.4	0.008	24	–	0.7(4.0)	0.03～0.1
R-1515W	250	9	9	4.8	0.015	35	21	0.9(5.1)	0.20～0.8
R-1515A	205	12	12	4.8	0.015	27	10	0.9(5.1)	0.10～0.8

The sample thickness is 0.1 mm.
*1 0.8mm *2 Measurement in tensile mode. R-1515W, R-1515A: Measurement in bending mode.

Our Halogen-free materials are based on JPCA-ES-01-2003 standard and others.
The above data are typical values and not guaranteed values.

CTE x,y-axis 3-5ppm/℃
(Low CTE glass cloth)

Stress relaxation

Good thickness variation

Applications
IC Package
FC-BGA (CPU, GPU, FPGA, ASIC)

Halogen -free

LEXCM GX

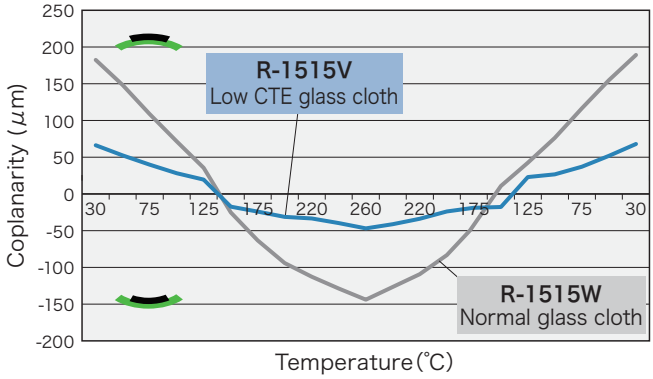
Laminate
R-1515V*
*Low CTE glass cloth type

Laminate
R-1515K

Low CTE IC substrate materials designed to improve reliability

Low CTE reduces warping and addresses a critical challenge with the IC packaging process. Flexibility and buffering features improve the reliability of the assembly process. Offers excellent thickness tolerances.

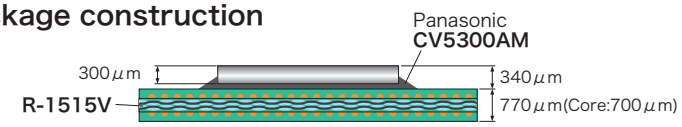
IC package warpage
Result



Sample

Core thickness	700μmt (12-12μm)
Package size	35 x 35mm (Die size 15 x 15mm)

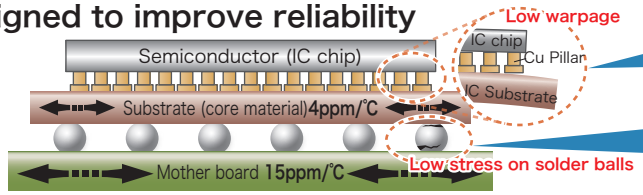
Package construction



A wide range of thickness options

R-1515V (Low CTE glass cloth)	**0.21～1.8mm**
R-1515K (Normal glass cloth)	

Designed to improve reliability



Low CTE
Low thermal expansion coefficient (CTE): close to that of silicon IC chips, which reduces warping and addresses a critical challenge with the IC chip packaging process.

Stress relaxation
Combines flexibility and buffering features while retaining low thermal expansion properties through a stress relaxation technology, improving the reliability of the assembly process.

General properties

Item		Test method	Condition	Unit	LEXCM GX R-1515V Low CTE glass cloth	LEXCM GX R-1515K Normal glass cloth	Conventional Normal glass cloth
Glass transition temp.(Tg)		DMA*2	A	℃	260	260	260
CTE x-axis	α1	TMA*2	A	ppm/℃	3-5	7	8-10
CTE y-axis					3-5	7	8-10
Dielectric constant(Dk)*1	1GHz	IPC-TM-650 2.5.5.9	C-24/23/50	–	4.4	4.6	4.8
Dissipation factor(Df)*1					0.016	0.015	0.015
Elastic modulus*1		IPC-TM-650 2.4.4*3	25℃	GPa	30	27	33
			250℃		14	12	21
Peel strength	1/3oz(12μm)	IPC-TM-650 2.4.8	A	kN/m(lb/inch)	0.6(3.4)	0.6(3.4)	0.9(5.1)

The sample thickness is 100μm. *1 700μm *2 Measurement in tensile mode.
*3 The IPC standard determines the test sample size, methods and conditions, etc. but there is no formula for calculating the elastic modulus. Therefore, we quantified it according to JIS C 6481.

Our Halogen-free materials are based on JPCA-ES-01-2003 standard and others.
The above data are typical values and not guaranteed values.

CTE x,y-axis 4-6ppm/℃
(Low CTE glass cloth)

Low warpage

Ultra-thin
excellent moldability

Applications
IC Package
CSP (PoP-Bottom, Flip-Chip, Memory, Module)

Halogen -free

LEXCM GX

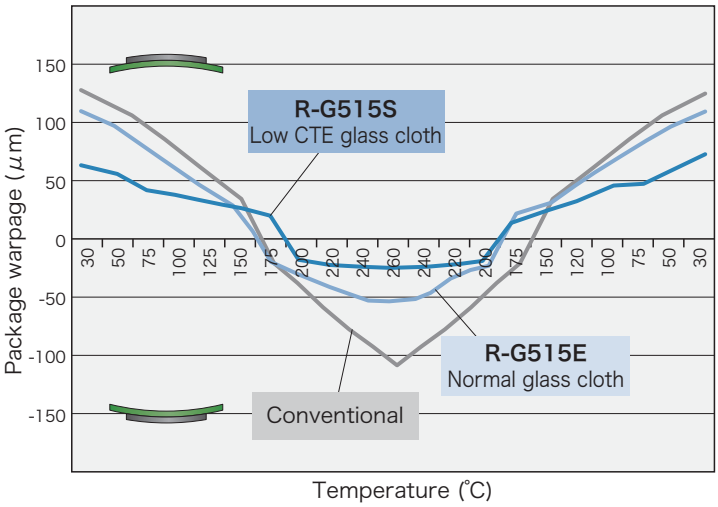
Laminate
R-G515S* R-G515E
Prepreg
R-G510S* R-G510E
*Low CTE glass cloth type

Low CTE ultra-thin IC substrate materials

With an insulation layer thickness of 15μm or less, these low-profile materials enable thinner IC package designs. The low CTE reduces warpage and increases reliability.

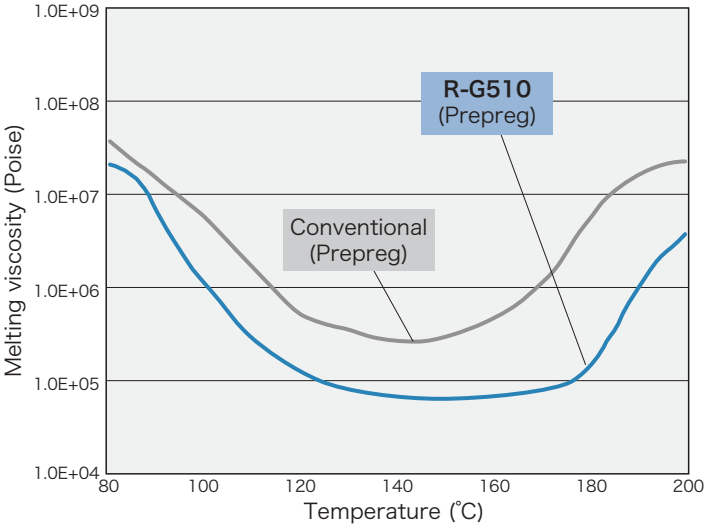
IC package warpage
R-G515S, with low CTE glass cloth, reduces warpage to about half that of conventional Panasonic materials.

Result

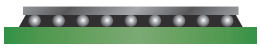


Melting and curling behavior
R-G510 has a wider melting area and higher moldability than conventional Panasonic materials.

Result



Package construction



Package size	12.5 x 12.5mm
Die size	10 x 10 x 0.10mmt
CUF material	Panasonic CV5300AM
Substrate thickness	0.2mmt (2L Cu:12μm)

General properties

Item		Test method	Condition	Unit	LEXCM GX R-G515S Low CTE glass cloth	LEXCM GX R-G515E Normal glass cloth
Glass transition temp.(Tg)		DMA*	A	℃	220-240	220-240
CTE x-axis	α1	Internal method	A	ppm/℃	4-6	6-8
CTE y-axis	α1	Internal method	A	ppm/℃	4-6	6-8
Young's modulus		ASTM D3039	25℃	GPa	23-28	22-27
Peel strength	1/3oz	IPC-TM-650 2.4.8	A	kN/m(lb/inch)	0.7(4.0)	0.7(4.0)

The sample thickness is 0.1mm.
* DMA: Measurement in tensile mode

Our Halogen-free materials are based on JPCA-ES-01-2003 standard and others.
The above data are typical values and not guaranteed values.

Dk 3.5 Df 0.003
@12GHz

CTE x,y-axis10ppm/℃
CTE z-axis 22ppm/℃

Tg(DMA) 230℃

Applications

IC Package

IC Package for base station application, Module part

Halogen -free

LEXCM GX

Laminate

R-G545L* R-G545E

Prepreg

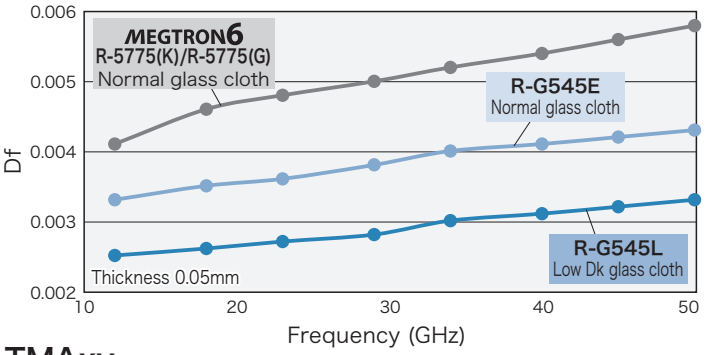
R-G540L* R-G540E

*Low Dk glass cloth type

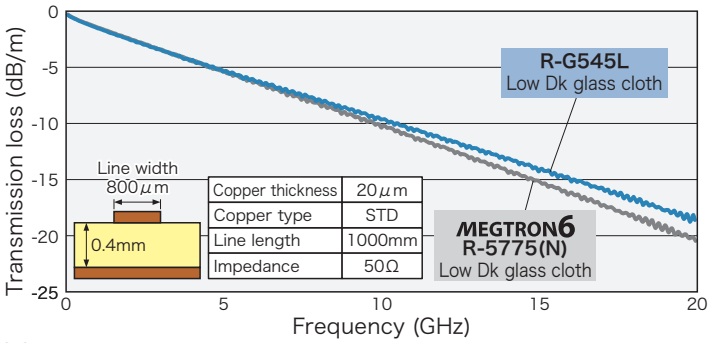
Ultra-low transmission loss circuit board materials for IC substrate/Module

Low Dk/Df coupled with low CTE enables devices to evolve and keep pace with changing demands.

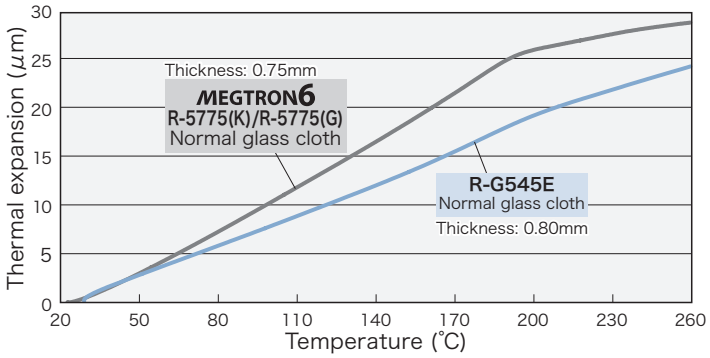
Df at wide-frequency band



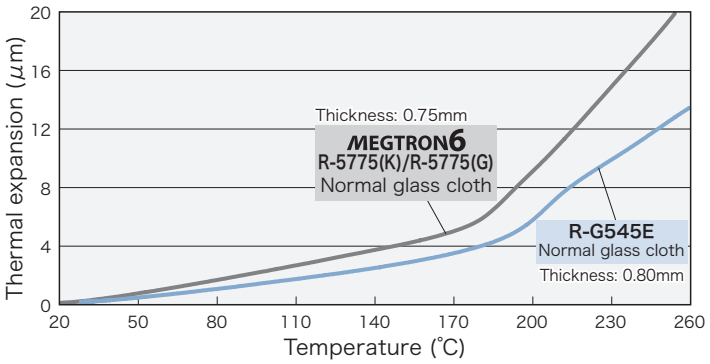
Frequency dependence by transmission loss



TMAxy



TMAz

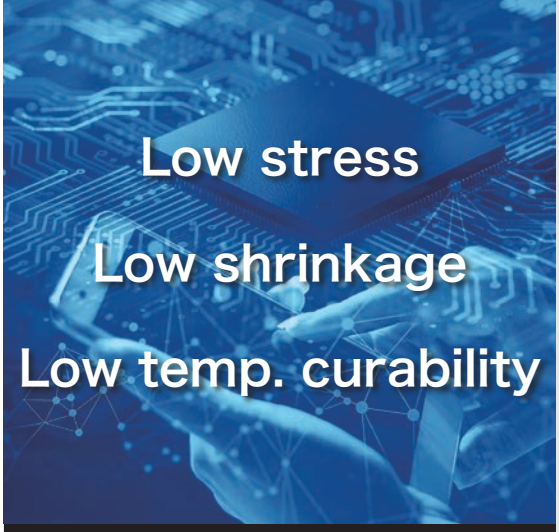


General properties

Item		Test method	Condition	Unit	LEXCM GX R-G545L Low Dk glass cloth	LEXCM GX R-G545E Normal glass cloth
Glass transition temp.(Tg)		DMA*	A	℃	230	230
CTE x, y-axis	α1	Internal method	A	ppm/℃	10	10
CTE z-axis	α1	IPC-TM-650 2.4.24	A	ppm/℃	22	22
Dielectric constant(Dk)	12GHz	Balanced type circular disk resonator	A	–	3.5	4.0
Dissipation factor(Df)	12GHz	Balanced type circular disk resonator	A	–	0.003	0.004
Water absorption		IPC-TM-650 2.6.2.1	D-24/23	%	0.06	0.06

The sample thickness is 0.1mm
* DMA: Measurement in tensile mode

Our Halogen-free materials are based on JPCA-ES-01-2003 standard and others.
The above data are typical values and not guaranteed values.



Applications

IC Package/Mobile

Overmolding and wafer backside coating of advanced semiconductor packages such as WLPs (FOWLPs and FIWLPs) and PLPs, for sophisticated mobile and wearable devices.

LEXCM CF CV8511C

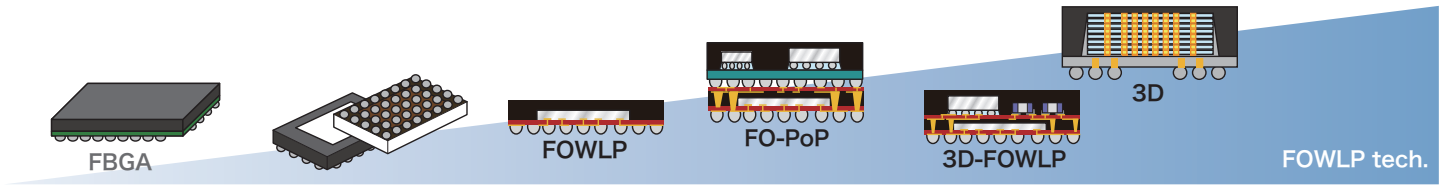
LEXCM LF CV5788

Encapsulation materials for FOWLP/PLP

Various delivery formats (granule, tablet, liquid and sheet) are offered for different molding processes (compression, transfer and lamination). Each material is matched to the required encapsulation design and performance requirements. Responsive to demands of larger and thinner package size as well as low warpage, these materials contribute to the increased productivity of advanced semiconductor packages.

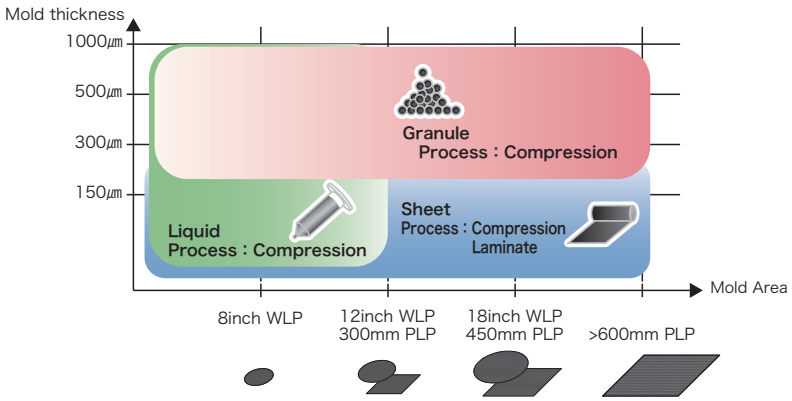
FOWLP technology trend

Contribute to low warpage and thinner product

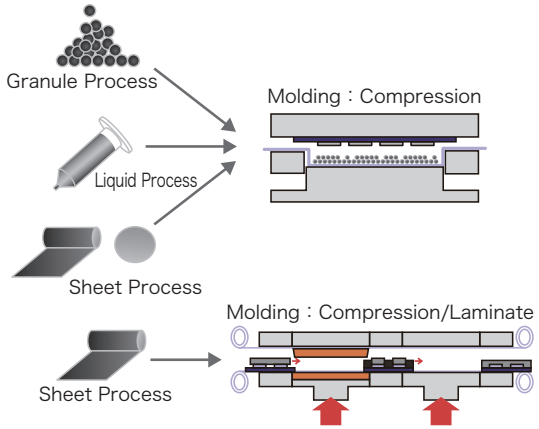


Each material and corresponding package

We have wide range of encapsulation line-up for WLP/PLP



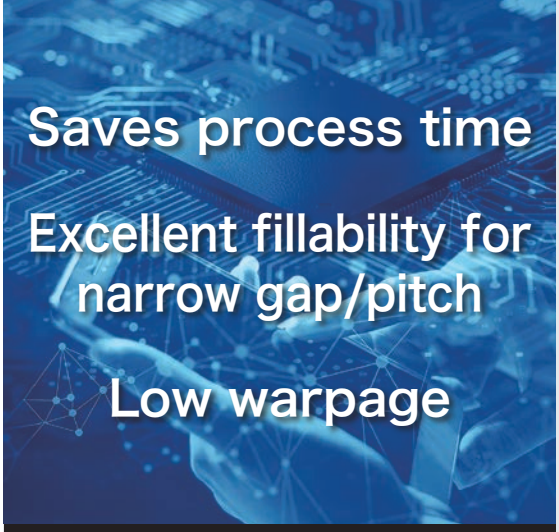
Encapsulation method



General properties

Item	Unit	LEXCM CF CV8511C	LEXCM LF CV5788
Mold Size	–	Wafer Level / Panel Level	
Process	–	Chip First / Chip Last	
Form	–	Granule	Liquid
Mold shrinkage	%	0.1	0.06
Tg	℃	210	180
C.T.E.1	ppm/℃	9	10
C.T.E.2	ppm/℃	52	49
F.Modulus (R.T.)	GPa	9	18

The above data are typical values and not guaranteed values.



LEXCM CF

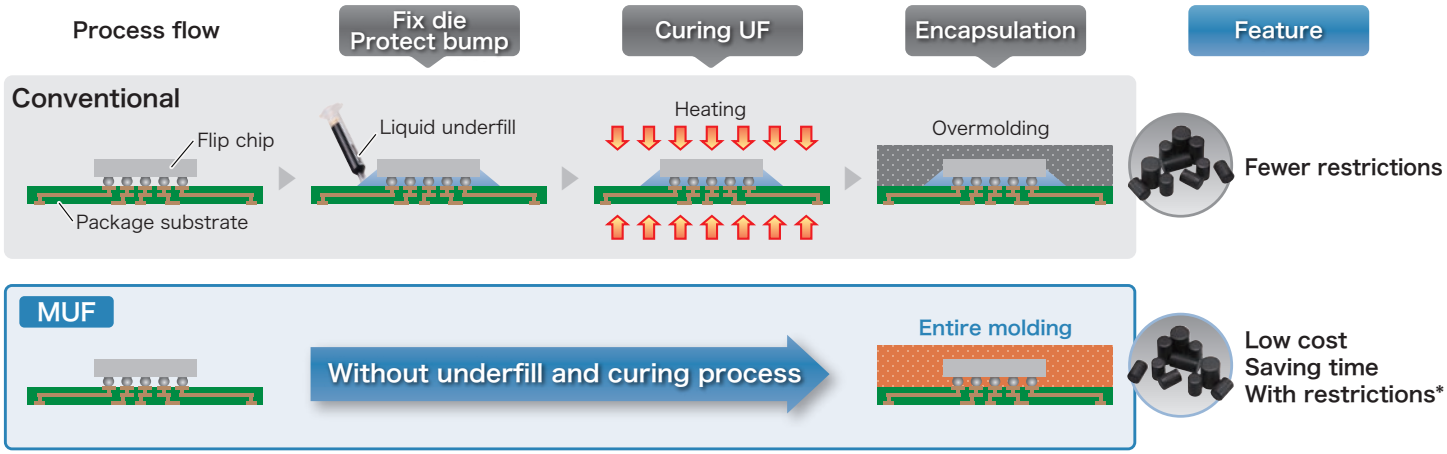
CV8710 CV8713

Molded underfill (MUF) semiconductor encapsulation molding compounds

MUF technology is a process that can fill the narrow gap under the flip-chip without voids and overmold the die in one-step. Panasonic proprietary high filler loading and resin design technologies are the features of this material.

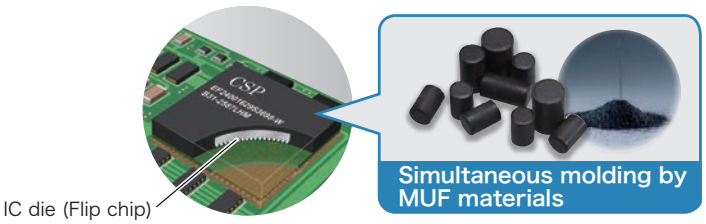
Applications
IC Package/Mobile
Advanced IC Packages (Flip-chip package such as FC-CSP, FC-SiP module)

Process comparison



* Depends on package structure (Die size, gap size, bump pitch, etc.)

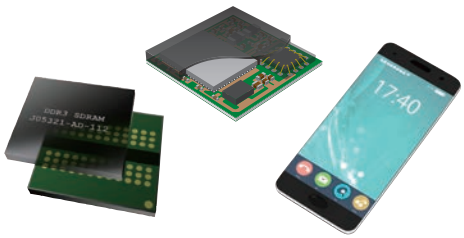
Excellent fillability for narrow gap and narrow pitch



Application

Flip-chip package
- FC-CSP
- FC-SiP module

Other

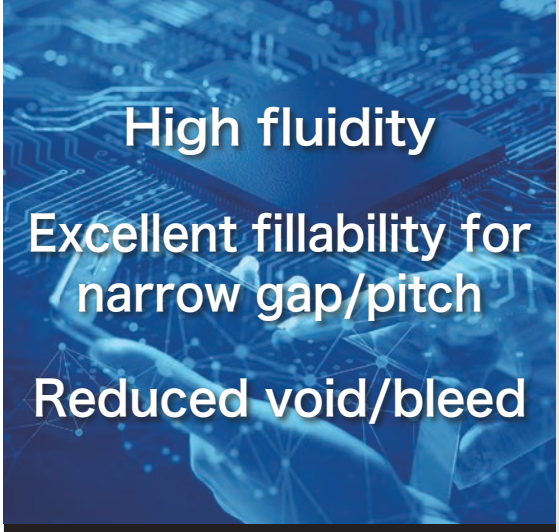


We have various options of MUF materials proven for many packages. Please contact us.

General properties

Item	Unit	LEXCM CF CV8710TAC	LEXCM CF CV8710TLC	LEXCM CF CV8710U	LEXCM CF CV8715BU	LEXCM CF X8710U-F1	LEXCM CF CV8713
EMC type	–	Green	Green	Green	Green	Green	Green
Filler cut point	μm	30		20		10	20
Flexural modulus (R.T.)	GPa	24	20	25	12	25	25
Tg (TMA)	℃	135	150	143	140	156	145
C.T.E.1	ppm/℃	10	13	10	21	10	10
Mold shrinkage	%	0.20	0.30	0.21	0.55	0.19	0.20

The above data are typical values and not guaranteed values.



LEXCM LF

CV5300 series

Capillary underfill (CUF) semiconductor encapsulation materials

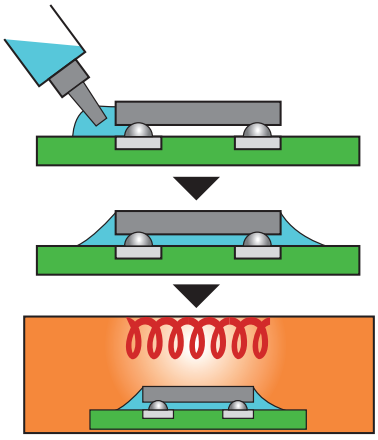
High capillary flow rate fills narrow gaps without voiding.

Applications
IC Package/Mobile
High-density advanced IC packages (BGA, CSP)

Line-up

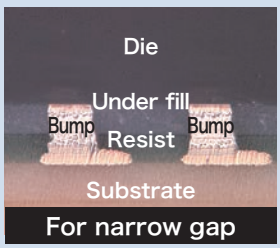
Conventional

1. Compatible with narrow gap
2. Uniform penetration
3. High-speed fillability
4. Compatible with low-k film
5. High moisture reflow resistance

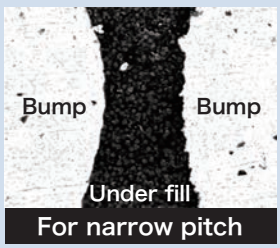


Part Number	Features
CV5300 series	High fluidity, Short-time curing

Excellent fillability for narrow gap/pitch

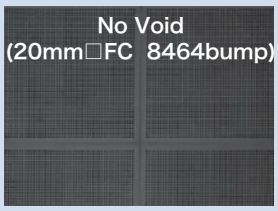


For narrow gap



For narrow pitch

Reduced void/bleed



General properties

Item	Unit	LEXCM LF CV5300 series
Filler size Max	μm	1
C.T.E.	ppm/℃	33
Tg (TMA)	℃	110
Modulus	GPa	7

The above data are typical values and not guaranteed values.

Applications

IC Package/Automotive

Mount reinforcement of semiconductor packages and electronic parts for automotive camera modules, millimeter-wave radar modules, ECU.

LEXCM for Assembly*

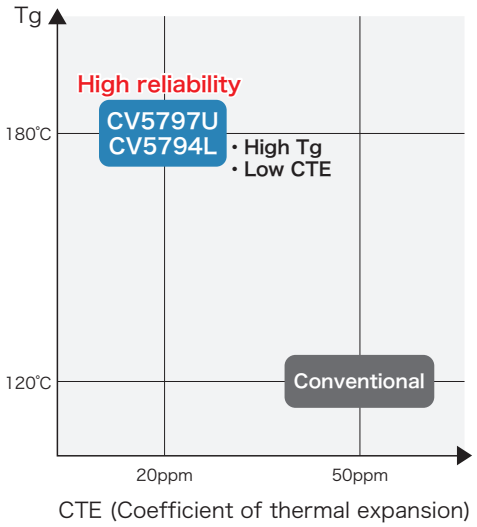
*Tentative name

CV5797 series CV5794 series

High heat resistance secondary mounting sidefill/underfill materials

Achieves automotive grade assembly-level reliability requirements with the industry's highest heat resistance and low CTE. Package periphery (edge and corner) reinforcement materials available. RoHS compliant.

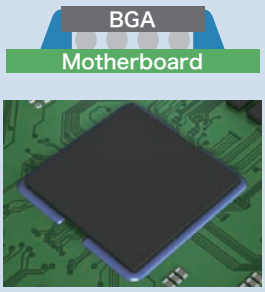
Concept



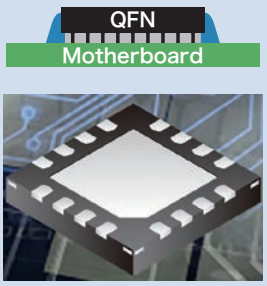
Reinforcement type (Applicable IC package)

Sidefill

For large-size package
(e.g. 25 mm square or more)

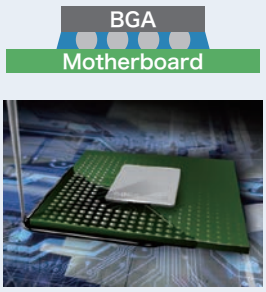


For QFN package



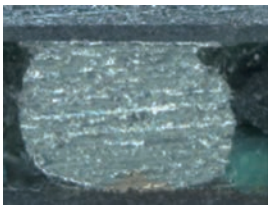
Underfill

For small and medium size package
(e.g. 20 mm square or less)



Correspond to temperature cycle test under automotive environment

CV5797U/ CV5794L



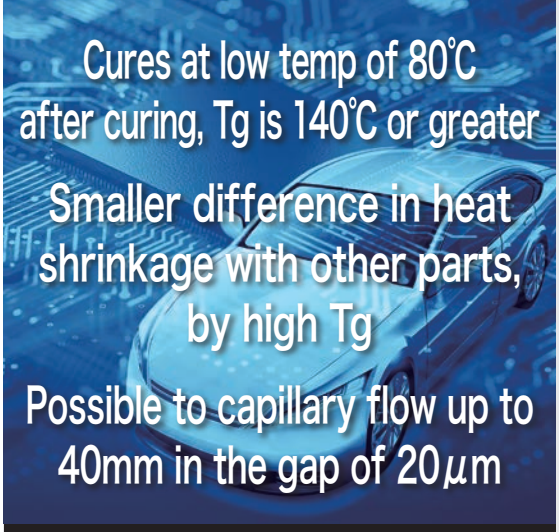
Conventional

Item	CV5797U	Conventional
Temperature cycling test (TCT) -55℃⇔125℃ 30min	6000 cycles Pass	3000 cycles Pass

General properties

Item	Unit	LEXCM for Assembly CV5797 series Sidefill (Corner glue)	LEXCM for Assembly CV5794 series Underfill
Glass transition temp. (Tg)	℃	160	160
C.T.E.1	ppm/℃	14	21
Elastic modulus (25℃)	GPa	18	15
Storage condition	–	-20℃/ 6months	

The above data are typical values and not guaranteed values.



Applications

IC Package/Automotive

Mount reinforcement of semiconductor packages and electronic parts for automotive camera modules, millimeter-wave radar modules, ECU.

LEXCM for Assembly*

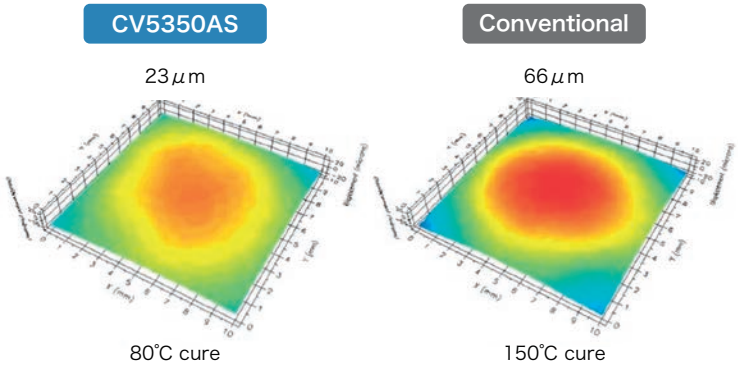
*Tentative name

CV5350AS

Low-temperature curing secondary mounting underfill materials

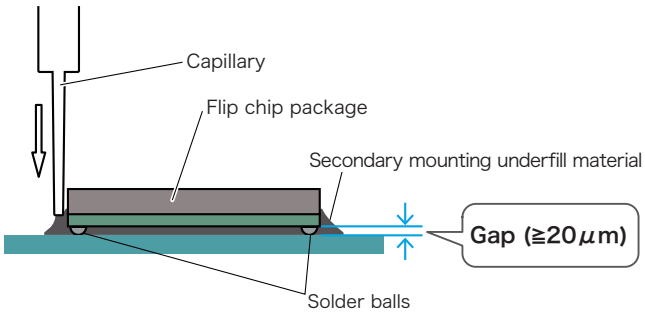
Cures at low temperature; provides high temperature reliability. Ideal for the reinforcement of precision components. Improves the reliability of automotive assemblies where high bonding strength is required.

Moire data at room temperature

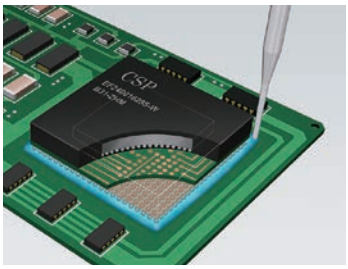


Suitable for mounting in areas with small gaps

Cross section of a circuited board being mounted



Correspond to temperature cycle test under automotive environment



Item	CV5350AS	Conventional
Temperature cycling test (TCT) -55℃ ⇔125℃	1000 cycles Pass	300 cycles Pass

We also have "Corner reinforce type" suitable for partial reinforcement

General properties

Item	Unit	LEXCM for Assembly CV5350AS
Minimum flow gap	μm	20
Viscosity (25℃)	mPa·s	4000
Glass transition temp. (Tg)	℃	150
C.T.E.1	ppm/℃	30
Elastic modulus (25℃)	GPa	10
Potential for reworking	–	Not possible

The above data are typical values and not guaranteed values.

Notes before you use

- User must verify the suitability and fitness for intended application by quality testing, evaluation or other means at your own option before any adoption, use or change of use conditions of a product listed in this catalog.
- We would like to have a delivery specifications mutually agreed for the product that you have decided to use. The agreements defined in the delivery specifications are assigned higher priority.
- Please note that images shown may differ from the actual product in color.
- Please note that specifications and external design are subject to change without notice.
- For details on products in this catalog, please contact your distributor or our sales department.

Safety Information

- Before using the product, please read the delivery specifications carefully or contact the distributor from which you purchased the product or our sales department.
- The products in this catalog are Electronic circuit board materials for electronic and electrical devices. Do not use them for other than specified use.

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