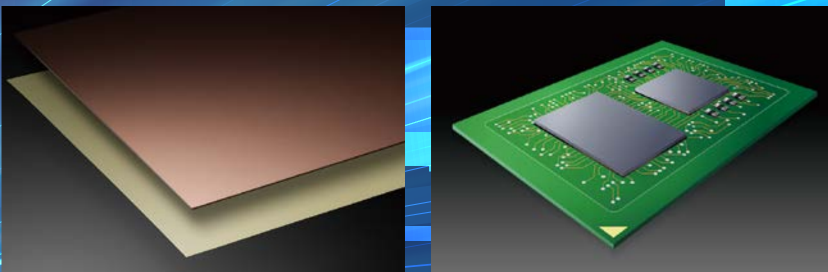
Panasonic INDUSTRY

Your Committed Enabler

Electronic Materials



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Dk 3.08 Df 0.0012 @14GHz

Tg (DMA) 220℃

T288 (with copper) >120min

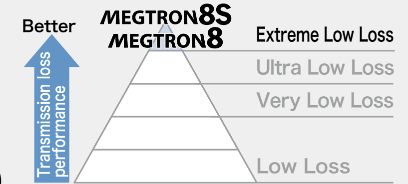
Applications
Network / Wireless
Routers, Switches, Optical Transmission Equipment, Servers, AI Servers, Base Stations, Semiconductor Test Equipment, Probe Cards.

MEGTRON8S	MEGTRON8
Laminate **R-579YS(U)/(N)**	Laminate **R-579Y(U)/(N)**
Prepreg **R-569YS(U)/(N)**	Prepreg **R-569Y(U)/(N)**

(U): Ultra-low Df glass cloth type
(N): Low Dk glass cloth type

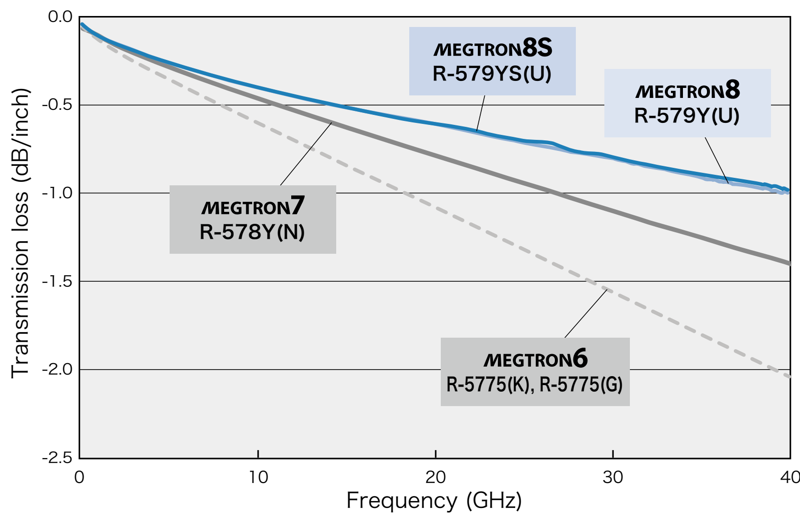
Ultra-low transmission loss, highly heat-resistant multi-layer circuit board materials

The new materials support 800GbE used for next-generation high-speed communication technology.
Comparison of MEGTRON8 R-579Y(U) and MEGTRON7 R-578Y(N), improving transmission loss by about 30% (@28GHz).



Frequency dependence by transmission loss

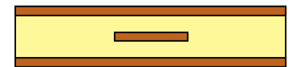
About 30% improvement in transmission loss compared to MEGTRON8 R-579Y(U), MEGTRON7 R-578Y(N)*



* Improvement at 28GHz

$$\frac{\Delta \text{Transmission loss (MEGTRON7–MEGTRON8)}}{\text{Transmission loss (MEGTRON7)}} \times 100 \fallingdotseq 30(\%)$$

Evaluation sample (cross section)



PCB construction	3L PCB Strip line
Copper thickness	18 μm (IL)
Core	0.13mm
Prepreg	0.15mm
Z_0 Impedance	50Ω
Inner treatment	No-surface treatment
Measurement method	2 port S-parameter
Frequency range	0.2 - 40GHz
De-embedded	Multiline TRL method

The above data are typical values and not guaranteed values.

General properties

Item		Test method	Condition	Unit	MEGTRON8S R-579YS(U) Ultra-low Df glass cloth	MEGTRON8S R-579YS(N) Low Dk glass cloth	MEGTRON8 R-579Y(U) Ultra-low Df glass cloth	MEGTRON8 R-579Y(N) Low Dk glass cloth
Tg		DMA	A	℃	220	220	220	220
CTE z-axis	α1	IPC-TM-650 2.4.24	A	ppm/℃	35	35	50	50
	α2				240	240	270	270
T288(with copper)		IPC-TM-650 2.4.24.1	A	min	>120	>120	>120	>120
Dk	14GHz	Balanced-type circular disk resonator method	C-24/23/50	–	3.19	3.22	3.08	3.13
Df					0.0012	0.0015	0.0012	0.0016
Peel strength	1oz(35μm)	IPC-TM-650 2.4.8	A	kN/m	0.7 [H-VLP3]	0.7 [H-VLP3]	0.7 [H-VLP3]	0.7 [H-VLP3]

The sample thickness is 0.75mm.

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Dk 3.31 Df 0.0023 @14GHz

Tg (DSC) 200℃

T288 (with copper) >120min

Applications

Network / Wireless

ICT Infrastructure Equipment, Supercomputer, Measuring Instrument, Antenna (Base Station, Automotive Millimeter-Wave Radar)

MEGTRON7

Laminate

R-578Y(N)* R-578Y(GN)* R-578Y(GE)

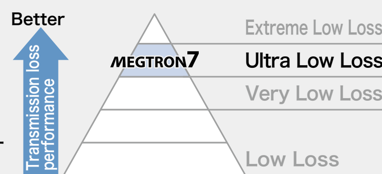
Prepreg

R-568Y(N)* R-568Y(GN)* R-568Y(GE)

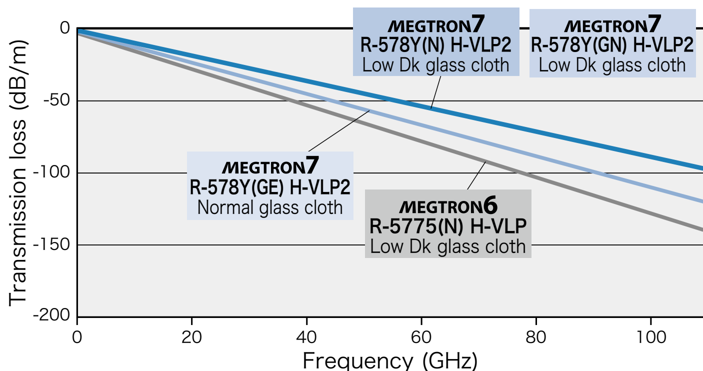
*Low Dk glass cloth type

Ultra-low transmission loss, highly heat-resistant multi-layer circuit board materials

Due to our industry leading low dielectric constant and dissipation factor, these materials are suitable for high-speed data transmission by servers and routers using high-layer-count, large-size PCB designs.

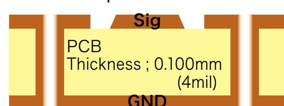


Frequency dependence by transmission loss



Construction

Microstrip line



Measurement	2 port S-Parameter
Frequency	10MHz-110GHz
De-embedded	TRL method
Measurement line	adjust to 50Ω(Zo)

Layer1: Signal line (line width: 270μm, Cu thickness: 24μm)
Layer2: GND plane (Cu thickness: 24μm)

Heat resistance of high multi-layered

Result

Drill diameter	ϕ0.3mm		
Wall to wall distance	0.4mm	0.5mm	0.6mm
R-578Y(N) Low Dk glass cloth/H-VLP2	pass	pass	pass
R-578Y(GN) Low Dk glass cloth/H-VLP2	pass	pass	pass

Condition

260℃ reflow x 20times

Construction

32 Layers
Board thickness: 4.5mm

R-578Y(N)

R-578Y(GN)

General properties

Item		Test method	Condition	Unit	MEGTRON7 R-578Y(N) Low Dk glass cloth	MEGTRON7 R-578Y(GN) Low Dk glass cloth	MEGTRON7 R-578Y(GE) Normal glass cloth
Tg		DSC	A	℃	200	200	200
CTE z-axis	α1	IPC-TM-650 2.4.24	A	ppm/℃	42	42	42
	α2				280	280	280
T288(with copper)		IPC-TM-650 2.4.24.1	A	min	>120	>120	>120
Dk	13, 14GHz	Balanced-type circular disk resonator method	C-24/23/50	-	3.31 [14GHz]	3.31 [14GHz]	3.60 [13GHz]
Df					0.0023 [14GHz]	0.0023 [14GHz]	0.0034 [13GHz]
Peel strength*	1oz(35μm)	IPC-TM-650 2.4.8	A	kN/m	0.8	0.8	0.8

The sample thickness is 0.75mm.
* R-578Y(GN), R-578Y(GE): H-VLP2, R-578Y(N): H-VLP Copper

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Dk 3.36 Df 0.0029 @13GHz

Tg (DMA) 250℃

T320 (with copper) >120min

Applications

Network / Wireless

ICT Infrastructure Equipment, High Speed Networking (High-End Server/Router, Optical Network, Switch), High-Layer-Count PCB

Halogen-free MEGTRON6

Laminate

R-537Y(N)* R-537Y(E)

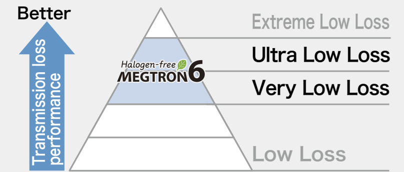
Prepreg

R-527Y(N)* R-527Y(E)

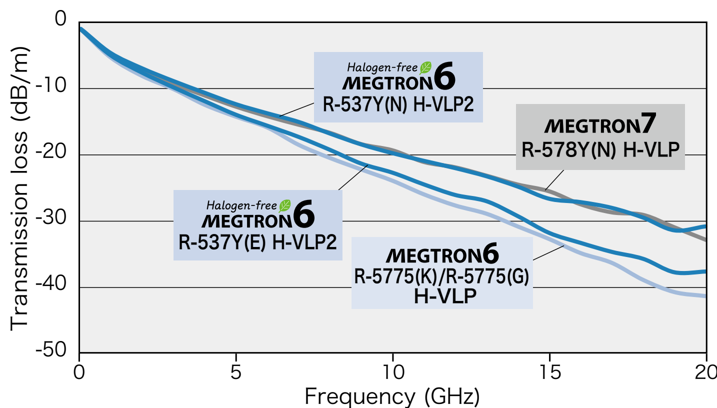
*Low Dk glass cloth type

Halogen-free ultra-low transmission loss multi-layer circuit board materials

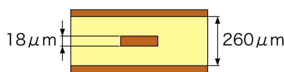
The industry standard high-speed, ultra-low loss material.
Transmission loss is between MEGTRON6 R-5775(K)/R-5775(G) and MEGTRON7 R-578Y(N).
Excellent HDI and thermal performance.



Frequency dependence by transmission loss



Construction



Line length	200mm , 100mm
Line width	125μm
Impedance	50Ω
Inner Cu treatment	No-surface treatment
Core	0.13mm
Prepreg	#2116 56% x 1ply

Heat resistance of high multi-layered

Result

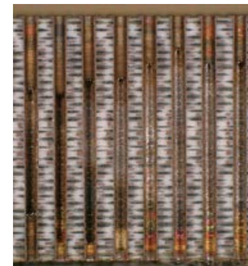
Drill diameter	ϕ0.3mm	
Wall to wall distance	0.3mm	0.5mm
Halogen-free MEGTRON6 R-537Y(E)	pass	pass

Condition

260℃ reflow x 10times

Construction

32 Layers
Board thickness: 4.5mm



General properties

Item		Test method	Condition	Unit	Halogen-free MEGTRON6 R-537Y(N) Low Dk glass cloth	Halogen-free MEGTRON6 R-537Y(E) E glass cloth	MEGTRON6 R-5775(K)/R-5775(G) E glass cloth
Tg		DMA (1Hz)	A	℃	250	250	210*1
CTE z-axis	α1/α2	IPC TM-650 2.4.24	A	ppm/℃	39/200	39/200	45/260
T288(with copper)		IPC-TM-650 2.4.24.1	A	min	>120	>120	>120
T320(with copper)					>120	>120	50
Dk	13GHz	Balanced-type circular disk resonator method	C-24/23/50	-	3.36	3.66	3.62
Df					0.0029	0.0037	0.0046
Peel strength	1oz(35μm)	IPC-TM-650 2.4.8	A	kN/m	0.6*2	0.6*2	0.8*3

The sample thickness is 0.75mm.
*1 10Hz *2 H-VLP2 Copper *3 H-VLP Copper

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DK 3.34 Df 0.0037 @13GHz

Tg (DSC) 185℃

T288 (with copper) >120min

Applications

Network / Wireless

ICT Infrastructure Equipment, Supercomputer, Measuring Instrument, Antenna (Base Station, Automotive Millimeter-Wave Radar)

MEGTRON6

Laminate

R-5775(N)* R-5775(K) R-5775(G)

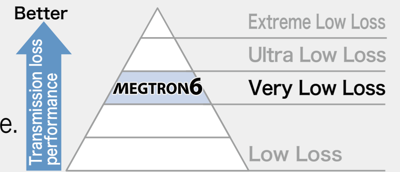
Prepreg

R-5670(N)* R-5670(K) R-5670(G)

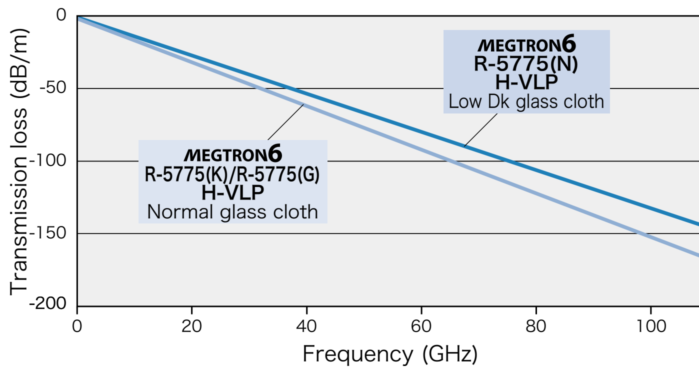
*Low Dk glass cloth type

Ultra-low transmission loss, highly heat-resistant multi-layer circuit board materials

The industry standard for high speed, ultra-low loss PCB material.
Excellent HDI and thermal performance.

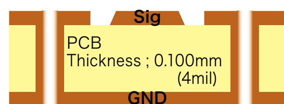


Frequency dependence by transmission loss



Construction

Microstrip line



Measurement	2 port S-Parameter
Frequency	10MHz-110GHz
De-embedded	TRL method
Measurement line	adjust to 50Ω(Zo)

Layer1: Signal line (line width: 270μm, Cu thickness: 24μm)
Layer2: GND plane (Cu thickness: 24μm)

Heat resistance of high multi-layered

Result

Drill diameter	ϕ0.3mm	
Wall to wall distance	0.5mm	0.6mm
MEGTRON6 (Low Dk glass cloth)	pass	pass

Condition

260℃ reflow x 10times

Construction

32 Layers
Board thickness: 4.5mm

General properties

Item		Test method	Condition	Unit	MEGTRON6 R-5775(N) Low Dk glass cloth	MEGTRON6 R-5775(K)/R-5775(G) Normal glass cloth
Tg		DSC	A	℃	185	185
CTE z-axis	α1	IPC-TM-650 2.4.24	A	ppm/℃	45	45
	α2				260	260
T288(with copper)		IPC-TM-650 2.4.24.1	A	min	>120	>120
Dk	13GHz	Balanced-type circular disk resonator method	C-24/23/50	-	3.34	3.62
Df					0.0037	0.0046
Peel strength*	1oz(35μm)	IPC-TM-650 2.4.8	A	kN/m	0.8	0.8

The sample thickness is 0.75mm.
* H-VLP Copper

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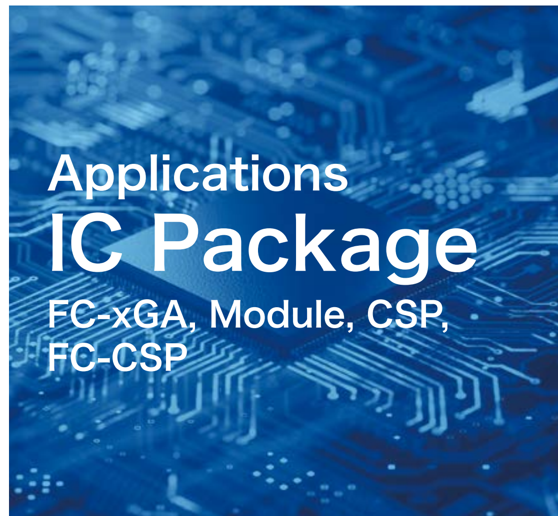

Circuit board materials for IC substrate
LEXCM GX Series

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-G635 New
- Low warpage
- Stress release
- Processability

Low CTE / High Heat Resistance

R-1515W
- Low warpage
- High modulus

Low Dk / Low Df

R-G740M Under development
- Low Dk RCC
- Thinner

R-G645 Under development
- Excellent Low Dk/Df
- Thinner

Low CTE / Ultra Thin Material

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

R-151YE
- Low warpage
- High modulus

R-1515H
- High Tg

General properties

Item	Glass transition temp.(Tg)	CTE x,y-axis	Dielectric constant(Dk)*1	Dissipation factor(Df)*1	Flexural modulus*1	
		α1	1GHz			
Test method	DMA*2	TMA	IPC-TM-650 2.5.5.9		JIS C 6481	
Condition	A	A	C-24/23/50		25℃	250℃
Unit	℃	ppm /℃	–		GPa	
R-1515V	260	3-5	4.4	0.016	30	14
R-1515K	260	7	4.6	0.015	27	12
R-151YE	270	9	4.7	0.011	33	18
R-G515S	220-240	4-6	4.2	0.008	28	–
R-G515E	220-240	6-8	4.4	0.008	24	–
R-1515W	250	9	4.8	0.015	35	21
R-G740M	240 (60μm: DMA Tensile)	40-60 (60μm: TMA Tensile)	2.6*3 (60μm: 10GHz)	0.003*3 (60μm: 10GHz)	1.0-2.0 (60um: DMA Tensile)	–
R-G645(L)	230-250	10	3.5*3 (10GHz)	0.0026*3 (10GHz)	25	–
R-G645(E)	230-250	10	4.0*3 (10GHz)	0.0045*3 (10GHz)	29	–
R-1515H	270	12	4.8	0.015	27	–

The sample thickness is 0.1 mm.
*1 0.8mm *2 Measurement in tensile mode. R-1515W: Measurement in bending mode.
*3 Cavity resonator method
Please see our website for Notes before you use.

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Panasonic Industry LEXCM GX

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

Stress relaxation

Good thickness variation

Applications

IC Package

FC-BGA (CPU, GPU, FPGA, ASIC)

LEXCM GX

Laminate R-1515V* / Laminate R-1515K

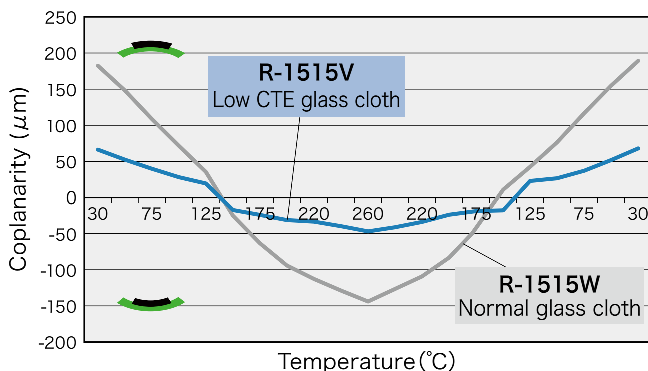
*Low CTE glass cloth type

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

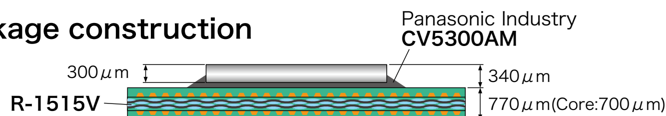
Result



Sample

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

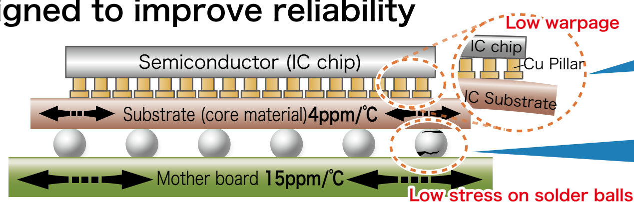
Package construction



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

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.

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Flexural modulus 25℃ 33GPa

CTE x, y-axis 9ppm/℃

Tg(DMA) 270℃

Applications
IC Package
CSP (DRAM, NAND/ PMIC, Mini LED, etc.), FC-CSP (APU, RF-IC, etc.)

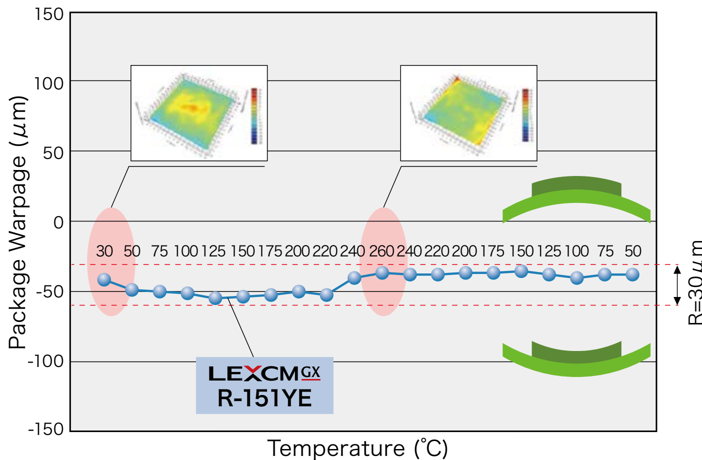
LEXCM GX

Laminate **R-151YE** Prepreg **R-141YE**

High elasticity Low CTE Ultra-thin IC substrate materials

Contribute to thin IC package by ultra-thin material and decrease the substrate warpage by low CTE property.

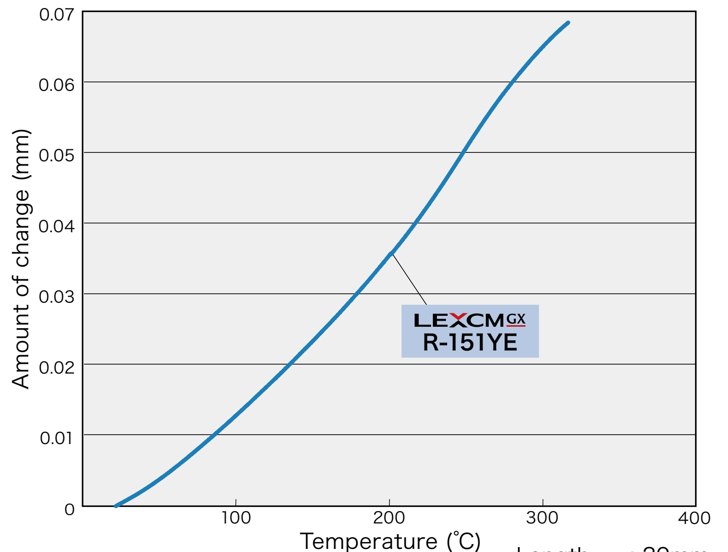
Package warpage (FBGA)



Construction

FBGA	14×14mm
Chip size	10×10×0.15mm
Substrate thickness	0.10mm (Core 0.04mm)

Thermal expansion (x-axis)



Length : 20mm
Thickness : 0.1mm
Method : TMA

General properties

Item		Test method	Condition	Unit	LEXCM GX R-151YE
Glass transition temp.(Tg)		DMA*2	A	℃	**270**
Thermal decomposition temp.(Td)		TGA	A	℃	**390**
CTE x-axis	α1	Internal method	A	ppm/℃	**9**
CTE y-axis	α1	Internal method	A	ppm/℃	**9**
CTE z-axis	α1	IPC-TM-650 2.4.24	A	ppm/℃	**22*1**
CTE z-axis	α2	IPC-TM-650 2.4.24	A	ppm/℃	**95*1**
Flexural modulus		JIS C 6481	25℃	GPa	**33*1**
Flexural modulus		JIS C 6481	250℃	GPa	**18*1**

The sample thickness is 0.1mm.
*1 0.8mm *2 measurement in tensile mode
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Flexural modulus 25℃ 35GPa

CTE x, y-axis 9ppm/℃

Tg(DMA) 250℃

LEXCM GX

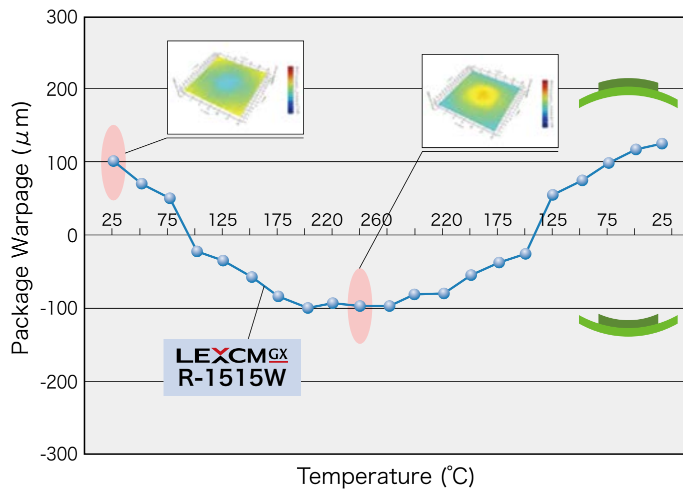
Laminate **R-1515W**   Prepreg **R-1410W**

High elasticity Low CTE IC substrate materials

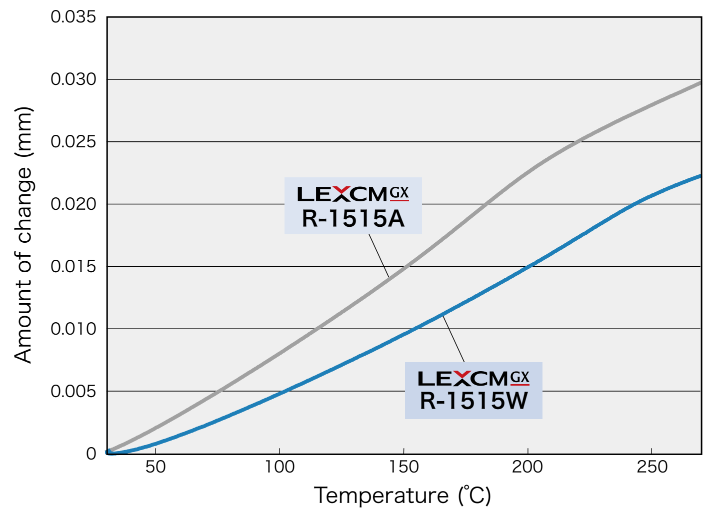
Applications
IC Package
IC substrate

Achieve more functionality (multi-pin and integrated circuit) the large-sized Package by excellent modulus and highly heat resistant property.

IC package warpage

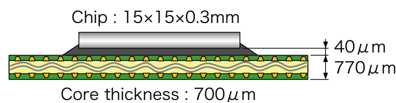


Thermal expansion (x-axis)



Length : 10mm
Thickness : 0.8mm (8ply)
Method : TMA

Construction



General properties

Item		Test method	Condition	Unit	LEXCM GX R-1515W
Glass transition temp.(Tg)		DMA*2	A	℃	250
Thermal decomposition temp.(Td)		TGA	A	℃	390
CTE x-axis	α1	Internal method	A	ppm/℃	9
CTE y-axis					9
CTE z-axis	α1	IPC-TM-650 2.4.24	A		22
	α2				97
Flexural modulus*1		JIS C 6481	25℃	GPa	35
			250℃		21

The sample thickness is 0.1 mm.
*1 0.8mm *2 Measurement in bending mode

Please see our website for Notes before you use.

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

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Any letters with parentheses ( ) at the end of a part number are for identification code in our company and are not included in the part numbers registered for UL certification.

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, etc.)

LEXCM GX

Laminate

R-G515S* R-G515E

Prepreg

R-G510S* R-G510E

*Low CTE glass cloth type

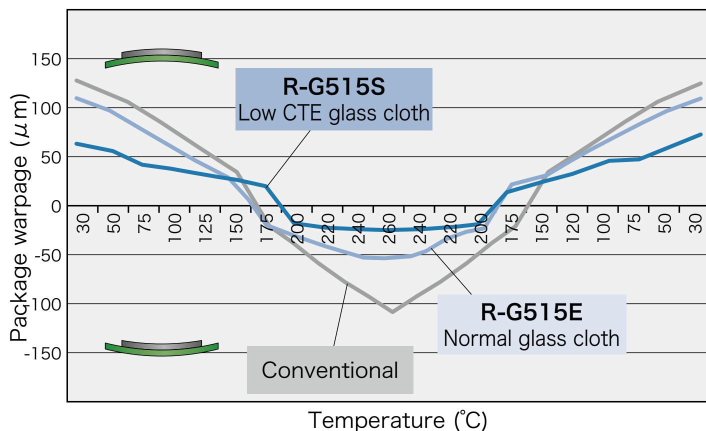
Low CTE ultra-thin IC substrate materials

With an insulation layer thickness of 15 μm 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



Temperature (℃)

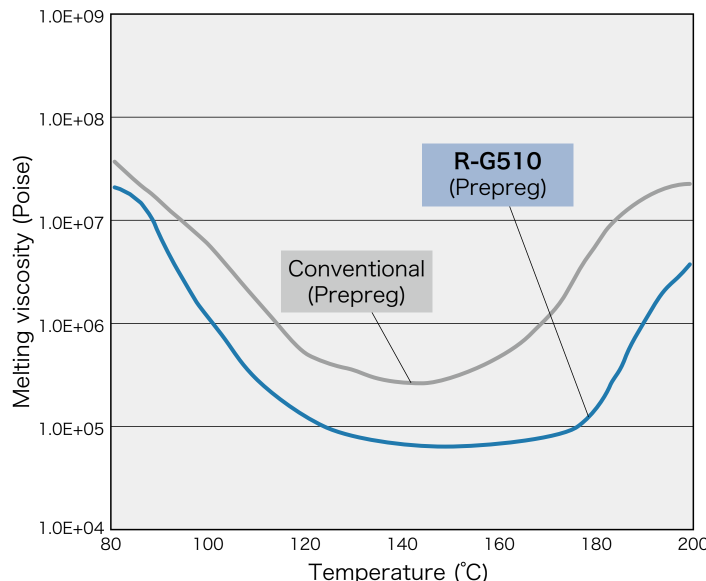
Package construction

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:12 μm)

Melting and curling behavior

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

Result



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*2	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
Dielectric onstant(Dk)*1	1GHz	IPC-TM-650 2.5.5.9	C-24/23/50	–	4.2	4.4
Dissipation factor(Df)*1	1GHz	IPC-TM-650 2.5.5.9	C-24/23/50	–	0.008	0.008
Flexural modulus*1		JIS C 6481	25℃	GPa	28	24

The sample thickness is 0.1mm.
*1 0.8mm *2 Measurement in tensile mode

Please see our website for Notes before you use.

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Panasonic INDUSTRY

Our Global Business

Panasonic Industry Co., Ltd.
Electronic Materials Business Division

Sales/Marketing R&D

Osaka(Headquarters)
- Sales & Marketing Business Unit
- Planning Center
- Technology Development Center
- SCM Center
- Advanced Materials SBU
- Manufacturing and Quality Innovation Center

Tokyo Nagoya
- Sales & Marketing Business Unit

Koriyama Plant

Manufacturing LAB R&D

- ● Multi-layer materials

Koriyama Plant (West Factory)

Manufacturing

- ● Multi-layer materials

Yokkaichi Plant

Manufacturing R&D

- ● Molding compounds

Yokkaichi Plant (South Factory)

Manufacturing LAB R&D

- ● Glass composite materials
- ● Flexible materials
- ● Encapsulation materials
- ● Advanced films

Panasonic Industrial Devices Materials (Guangzhou) Co., Ltd.

Manufacturing R&D Sales/Marketing

Electronic Materials China R&D Center
Electronic Materials China R&M Group

- ● Multi-layer materials

Panasonic Industrial Devices Materials (Suzhou) Co., Ltd.

Manufacturing

- ● Multi-layer materials
- ● Glass composite materials

Panasonic Industrial Devices Materials (Shanghai) Co., Ltd.

Manufacturing

- ● Molding compounds
- ● Encapsulation materials

Panasonic Industrial Devices Materials Taiwan Co., Ltd.

Manufacturing R&D Sales/Marketing

Taiwan Semiconductor Materials R&D Center

- ● Multi-layer materials

Panasonic Manufacturing Ayuthaya Co., Ltd.

<Thailand>

Manufacturing Sales/Marketing

- ● Paper phenolic materials
- ● Molding compounds
- ● Encapsulation materials

Electronic Materials South Asia R&D Center

<Singapore>

R&D

- ● Encapsulation materials

Panasonic Industrial Devices Materials Europe GmbH

<Austria>

Manufacturing Sales/Marketing

Electronic Materials European R&M Group

- ● Multi-layer materials

Panasonic Industrial Devices Sales Company of America

Sales/Marketing

Electronic Materials Division US R&M Group

*R&D: Research & Development
*R&M: Research & Marketing

Notes before you use

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- For details on products in this catalog, please contact your distributor or our sales department.
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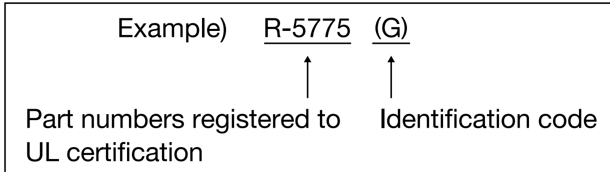

Safety Information

- 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.

Panasonic
INDUSTRY

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