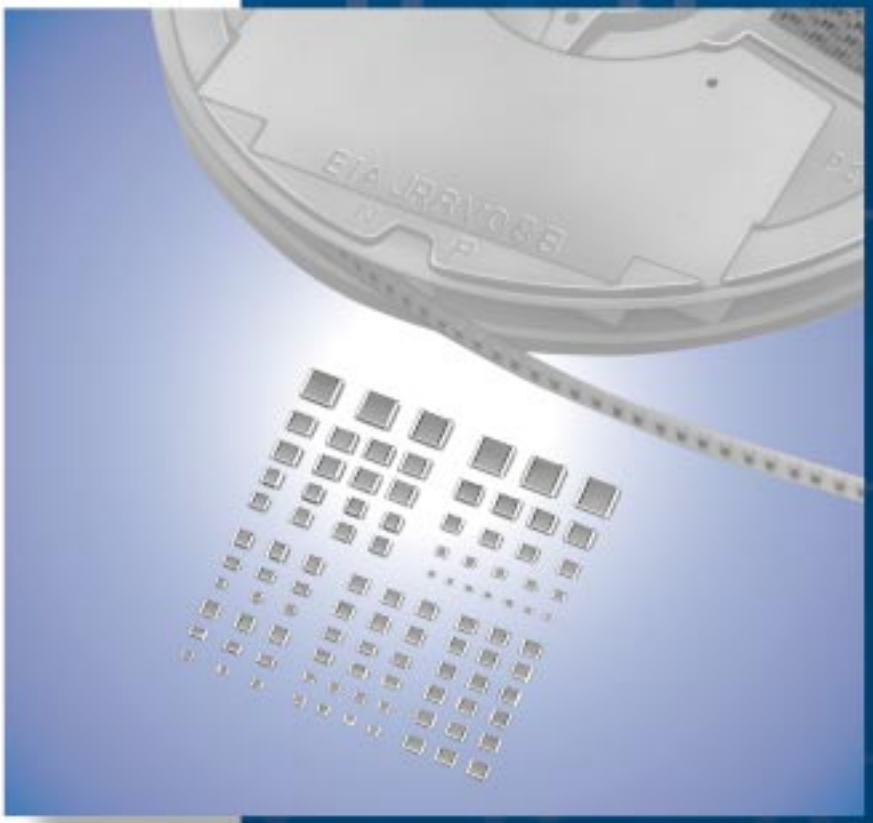
Chip Monolithic Ceramic Capacitors



muRata Innovator in Electronics

Murata Manufacturing Co., Ltd.

Cat.No.C02E-16

Part Numbering

Chip Monolithic Ceramic Capacitors

(Part Number)

GR	M	18	8	B1	1H	102	K	A01	D
❶	❷	❸	❹	❺	❻	❼	❽	❾	❿

❶Product ID

❷Series

Product ID	Code	Series
GR	J	Soft Termination Type
	M	Tin Plated Layer
	4	Only for Information Devices / Tip & Ring
	7	Only for Camera Flash Circuit
GQ	M	High Frequency for Flow/Reflow Soldering
GM	A	Monolithic Microchip
	D	For Bonding
GN	M	Capacitor Array
LL	L	Low ESL Type
	R	Controlled ESR Low ESL Type
	A	8-termination Low ESL Type
	M	10-termination Low ESL Type
GJ	M	High Frequency Low Loss Type
GA	2	For AC250V (r.m.s.)
	3	Safety Standard Certified Type

❸Dimensions (L×W)

Code	Dimensions (L×W)	EIA
02	0.4×0.2mm	01005
03	0.6×0.3mm	0201
05	0.5×0.5mm	0202
08	0.8×0.8mm	0303
0D	0.38×0.38mm	015015
0M	0.9×0.6mm	0302
15	1.0×0.5mm	0402
18	1.6×0.8mm	0603
1M	1.37×1.0mm	0504
21	2.0×1.25mm	0805
22	2.8×2.8mm	1111
31	3.2×1.6mm	1206
32	3.2×2.5mm	1210
42	4.5×2.0mm	1808
43	4.5×3.2mm	1812
52	5.7×2.8mm	2211
55	5.7×5.0mm	2220

❹Dimension (T) (Except **GNM**)

Code	Dimension (T)
2	0.2mm
3	0.3mm
5	0.5mm
6	0.6mm
7	0.7mm
8	0.8mm
9	0.85mm
A	1.0mm
B	1.25mm
C	1.6mm
D	2.0mm
E	2.5mm
F	3.2mm
M	1.15mm
N	1.35mm
Q	1.5mm
R	1.8mm
S	2.8mm
X	Depends on individual standards.

❹Elements (**GNM** Only)

Code	Elements
2	2-elements
4	4-elements

Continued on the following page.

Please check the MURATA home page (http://www.murata.com/) if you cannot find the part number in the catalog.

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❺Temperature Characteristics

Temperature Characteristic Codes			Temperature Characteristics			Operating Temperature Range
Code	Public STD Code		Reference Temperature	Temperature Range	Capacitance Change or Temperature Coefficient	
1X	SL *1	JIS	20°C	20 to 85°C	+350 to -1000ppm/°C	-55 to 125°C
2C	CH *1	JIS	20°C	20 to 125°C	0±60ppm/°C	-55 to 125°C
2P	PH *1	JIS	20°C	20 to 85°C	-150±60ppm/°C	-25 to 85°C
2R	RH *1	JIS	20°C	20 to 85°C	-220±60ppm/°C	-25 to 85°C
2S	SH *1	JIS	20°C	20 to 85°C	-330±60ppm/°C	-25 to 85°C
2T	TH *1	JIS	20°C	20 to 85°C	-470±60ppm/°C	-25 to 85°C
3C	CJ *1	JIS	20°C	20 to 125°C	0±120ppm/°C	-55 to 125°C
3P	PJ *1	JIS	20°C	20 to 85°C	-150±120ppm/°C	-25 to 85°C
3R	RJ *1	JIS	20°C	20 to 85°C	-220±120ppm/°C	-25 to 85°C
3S	SJ *1	JIS	20°C	20 to 85°C	-330±120ppm/°C	-25 to 85°C
3T	TJ *1	JIS	20°C	20 to 85°C	-470±120ppm/°C	-25 to 85°C
3U	UJ *1	JIS	20°C	20 to 85°C	-750±120ppm/°C	-25 to 85°C
4C	CK *1	JIS	20°C	20 to 125°C	0±250ppm/°C	-55 to 125°C
5C	C0G *1	EIA	25°C	25 to 125°C	0±30ppm/°C	-55 to 125°C
5G	X8G *1	EIA	25°C	25 to 150°C	0±30ppm/°C	-55 to 150°C
6C	C0H *1	EIA	25°C	25 to 125°C	0±60ppm/°C	-55 to 125°C
6P	P2H *1	EIA	25°C	25 to 85°C	-150±60ppm/°C	-55 to 125°C
6R	R2H *1	EIA	25°C	25 to 85°C	-220±60ppm/°C	-55 to 125°C
6S	S2H *1	EIA	25°C	25 to 85°C	-330±60ppm/°C	-55 to 125°C
6T	T2H *1	EIA	25°C	25 to 85°C	-470±60ppm/°C	-55 to 125°C
7U	U2J *1	EIA	25°C	25 to 125°C *6	-750±120ppm/°C	-55 to 125°C
B1	B *2	JIS	20°C	-25 to 85°C	±10%	-25 to 85°C
B3	B	JIS	20°C	-25 to 85°C	±10%	-25 to 85°C
C7	X7S	EIA	25°C	-55 to 125°C	±22%	-55 to 125°C
C8	X6S	EIA	25°C	-55 to 105°C	±22%	-55 to 105°C
D7	X7T	EIA	25°C	-55 to 125°C	+22, -33%	-55 to 125°C
D8	X6T	EIA	25°C	-55 to 105°C	+22, -33%	-55 to 105°C
E7	X7U	EIA	25°C	-55 to 125°C	+22, -56%	-55 to 125°C
F1	F *2	JIS	20°C	-25 to 85°C	+30, -80%	-25 to 85°C
F5	Y5V	EIA	25°C	-30 to 85°C	+22, -82%	-30 to 85°C
L8	X8L	*3	25°C	-55 to 150°C	+15, -40%	-55 to 150°C
R1	R *2	JIS	20°C	-55 to 125°C	±15%	-55 to 125°C
R3	R	JIS	20°C	-55 to 125°C	±15%	-55 to 125°C
R6	X5R	EIA	25°C	-55 to 85°C	±15%	-55 to 85°C
R7	X7R	EIA	25°C	-55 to 125°C	±15%	-55 to 125°C
R9	X8R	EIA	25°C	-55 to 150°C	±15%	-55 to 150°C
W0	-	-	25°C	-55 to 125°C	±10% *4	-55 to 125°C
					+22, -33% *5	

*1 Please refer to table for Capacitance Change under reference temperature.
*2 Capacitance change is specified with 50% rated voltage applied.
*3 Murata Temperature Characteristic Code.
*4 Apply DC350V bias.
*5 No DC bias.
*6 Rated Voltage 100Vdc max : 25 to 85°C

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●Capacitance Change from each temperature

JIS Code

Murata Code	Capacitance Change from 20°C (%)					
	–55°C		–25°C		–10°C	
	Max.	Min.	Max.	Min.	Max.	Min.
1X	–	–	–	–	–	–
2C	0.82	–0.45	0.49	–0.27	0.33	–0.18
2P	–	–	1.32	0.41	0.88	0.27
2R	–	–	1.70	0.72	1.13	0.48
2S	–	–	2.30	1.22	1.54	0.81
2T	–	–	3.07	1.85	2.05	1.23
3C	1.37	–0.90	0.82	–0.54	0.55	–0.36
3P	–	–	1.65	0.14	1.10	0.09
3R	–	–	2.03	0.45	1.35	0.30
3S	–	–	2.63	0.95	1.76	0.63
3T	–	–	3.40	1.58	2.27	1.05
3U	–	–	4.94	2.84	3.29	1.89
4C	2.56	–1.88	1.54	–1.13	1.02	–0.75

EIA Code

Murata Code	Capacitance Change from 25°C (%)					
	–55°C		–30°C		–10°C	
	Max.	Min.	Max.	Min.	Max.	Min.
5C/5G	0.58	–0.24	0.40	–0.17	0.25	–0.11
6C	0.87	–0.48	0.59	–0.33	0.38	–0.21
6P	2.33	0.72	1.61	0.50	1.02	0.32
6R	3.02	1.28	2.08	0.88	1.32	0.56
6S	4.09	2.16	2.81	1.49	1.79	0.95
6T	5.46	3.28	3.75	2.26	2.39	1.44
7U	8.78	5.04	6.04	3.47	3.84	2.21

❻Rated Voltage

Code	Rated Voltage
0E	DC2.5V
0G	DC4V
0J	DC6.3V
1A	DC10V
1C	DC16V
1E	DC25V
YA	DC35V
1H	DC50V
2A	DC100V
2D	DC200V
2E	DC250V
YD	DC300V
2H	DC500V
2J	DC630V
3A	DC1kV
3D	DC2kV
3F	DC3.15kV
BB	DC350V (for Camera Flash Circuit)
E2	AC250V
GC	X1/Y2; AC250V (Safety Standard Certified Type GC)
GF	Y2, X1/Y2; AC250V (Safety Standard Certified Type GF)
GD	Y3; AC250V (Safety Standard Certified Type GD)
GB	X2; AC250V (Safety Standard Certified Type GB)

❼Capacitance

Expressed by three-digit alphanumerics. The unit is picofarad (pF). The first and second figures are significant digits, and the third figure expresses the number of zeros which follow the two numbers.If there is a decimal point, it is expressed by the capital letter "**R**." In this case, all figures are significant digits.

Ex.)

Code	Capacitance
R50	0.5pF
1R0	1.0pF
100	10pF
103	10000pF

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❽Capacitance Tolerance

Code	Capacitance Tolerance	TC	Series	Capacitance Step	
W	±0.05pF	CΔ	**GRM/GJM**	≦9.9pF	0.1pF
B	±0.1pF	CΔ	**GRM/GJM**	≦9.9pF	0.1pF
			GQM	≦1pF	0.1pF
				1.1 to 9.9pF	1pF Step and E24 Series
C	±0.25pF	CΔ	**GRM/GJM**	≦9.9pF	0.1pF
		except CΔ	**GRM**	≦5pF	* 1pF
		CΔ	**GQM**	≦1pF	0.1pF
				1.1 to 9.9pF	1pF Step and E24 Series
D	±0.5pF	CΔ	**GRM/GJM**	5.1 to 9.9pF	0.1pF
		except CΔ	**GRM**	5.1 to 9.9pF	* 1pF
		CΔ	**GQM**	5.1 to 9.9pF	1pF Step and E24 Series
G	±2%	CΔ	**GJM**	≧10pF	E12 Series
		CΔ	**GQM**	≧10pF	E24 Series
J	±5%	CΔ, SL, U2J	**GRM/GA3**	≧10pF	E12 Series
		CΔ	**GQM/GJM**	≧10pF	E24 Series
K	±10%	B, R, X7R, X5R, ZLM	**GRJ/GRM/GR7/GA3**	E6 Series	
		C0G	**GNM**	E6 Series	
		B, R, X7R, X5R, ZLM	**GR4, GMD**	E12 Series	
M	±20%	B, R, X7R, X7S	**GRM/GMA**	E6 Series	
		X5R, X7R, X7S	**GNM**	E3 Series	
		X7R	**GA2**	E3 Series	
		X5R, X7R, X7S, X6S	**LLL/LLR/LLA/LLM**	E3 Series	
Z	+80%, -20%	F, Y5V	**GRM**	E3 Series	
R	Depends on individual standards.				

***** E24 series is also available.

❾Individual Specification Code (Except **LLR**)

Expressed by three figures.

❾ESR (**LLR** Only)

Code	ESR
E01	100mΩ
E03	220mΩ
E05	470mΩ
E07	1000mΩ

❿Packaging

Code	Packaging
L	ø180mm Embossed Taping
D	ø180mm Paper Taping
E	ø180mm Paper Taping (LLL15)
K	ø330mm Embossed Taping
J	ø330mm Paper Taping
F	ø330mm Paper Taping (LLL15)
B	Bulk
C	Bulk Case
T	Bulk Tray

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Chip Monolithic Ceramic Capacitors

Low ESL LLL/LLR/LLA/LLM Series

Reversed Geometry Low ESL Type

■ Features
1. Low ESL, good for noise reduction for high frequency
2. Small, high cap

■ Applications
Decoupling solution for "chip sets", such as Mobile/FPD TV

Part Number	Dimensions (mm)		
	L	W	T
LLL153	0.5 ±0.05	1.0 ±0.05	0.3 ±0.05
LLL185	0.8 ±0.1	1.6 ±0.1	0.6 max.
LLL215	1.25 ±0.1	2.0 ±0.1	0.5 +0/-0.15
LLL216			0.6 ±0.1
LLL219			0.85 ±0.1
LLL315	1.6 ±0.15	3.2 ±0.15	0.5 +0/-0.15
LLL317			0.7 ±0.1
LLL31M			1.15 ±0.1
LLR185	0.8 ±0.15	1.6 ±0.15	0.5 +0.05/-0.1

Controlled ESR Low ESL Type

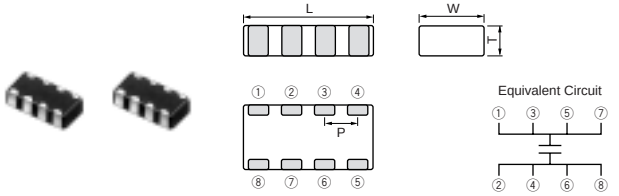
■ Features
1. Good solution for anti resonance reduction with Controlled ESR.
2. Suitable for high speed IC decoupling due to low inductance type.
3. 4 types of ESR are available.

■ Applications
1. All kind of IC package (network processor, media processor, etc)
2. Circuit that has anti-resonance

Eight Terminals Low ESL Type

■ Features
1. Low ESL (100pH), suitable to decoupling capacitor for 1GHz clock speed IC.
2. Small, high cap

■ Applications
High speed IC package (FPGA, network processor, etc)

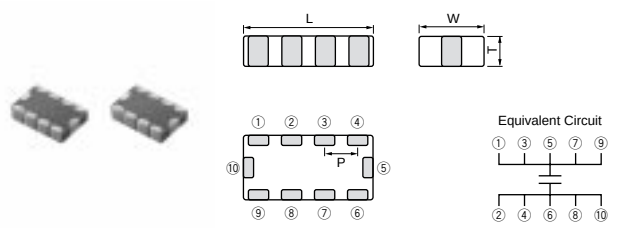


Part Number	Dimensions (mm)			
	L	W	T	P
LLA185	1.6 ±0.1	0.8 ±0.1	0.5 +0.05/-0.1	0.4 ±0.1
LLA215	2.0 ±0.1	1.25 ±0.1	0.5 +0.05/-0.1	0.5 ±0.05
LLA219	2.0 ±0.1	1.25 ±0.1	0.85 ±0.1	0.5 ±0.05
LLA315	3.2 ±0.15	1.6 ±0.15	0.5 +0.05/-0.1	0.8 ±0.1
LLA319	3.2 ±0.15	1.6 ±0.15	0.85 ±0.1	0.8 ±0.1
LLA31M	3.2 ±0.15	1.6 ±0.15	1.15 ±0.1	0.8 ±0.1

Ten Terminals Low ESL Type

■ Features
1. Low ESL (45pH), suitable to decoupling capacitor for 2GHz clock speed IC.
2. Small, high cap

■ Applications
High speed IC package (FPGA, network processor, etc)



Part Number	Dimensions (mm)			
	L	W	T	P
LLM215	2.0 ±0.1	1.25 ±0.1	0.5 +0.05/-0.1	0.5 ±0.05
LLM315	3.2 ±0.15	1.6 ±0.15	0.5 +0.05/-0.1	0.8 ±0.1

Capacitance Table

Reversed Geometry Low ESL Type X7R(R7)/X7S(C7)/X6S(C8)/X5R(R6) Characteristics

5 ex.5: T Dimension [mm]

Capacitance \ LxW [mm]	0.5x1.0 (**15**) <0204>		0.8x1.6 (**18**) <0306>					1.25x2.0 (**21**) <0508>					1.6x3.2 (**31**) <0612>				
Rated Voltage [Vdc]	6.3 (**0J**)	4 (**0G**)	50 (**1H**)	25 (**1E**)	16 (**1C**)	10 (**1A**)	4 (**0G**)	50 (**1H**)	25 (**1E**)	16 (**1C**)	10 (**1A**)	4 (**0G**)	50 (**1H**)	25 (**1E**)	16 (**1C**)	10 (**1A**)	6.3 (**0J**)
2200pF(**222**)			**5**														
4700pF(**472**)			**5**														
10000pF(**103**)				**5**				**6**					**7**				
22000pF(**223**)				**5**				**6**					**7**				
47000pF(**473**)					**5**				**6**				**7**				
0.10μF(**104**)	**3**					**5**			**6**				**M**	**7**			
0.22μF(**224**)	**3**					**5**				**9**	**6**			**M**	**7**		
0.47μF(**474**)		**3**					**5**				**9**			**M**	**7**		
1.0μF(**105**)							**5**				**9**				**M**	**7**	
2.2μF(**225**)							**5**					**9**				**M**	**7**
4.7μF(**475**)																	**M**
10μF(**106**)																	**M**

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

Reversed Geometry Low ESL Type X7R(R7)/X7S(C7) Characteristics-Low Profile

5 ex.5: T Dimension [mm]

Capacitance \ LxW [mm]	0.8x1.6 (**18**) <0306>				1.25x2.0 (**21**) <0508>						1.6x3.2 (**31**) <0612>			
Rated Voltage [Vdc]	25 (**1E**)	16 (**1C**)	10 (**1A**)	4 (**0G**)	50 (**1H**)	25 (**1E**)	16 (**1C**)	10 (**1A**)	6.3 (**0J**)	4 (**0G**)	50 (**1H**)	25 (**1E**)	16 (**1C**)	10 (**1A**)
10000pF(**103**)	**5**				**5**						**5**			
22000pF(**223**)		**5**				**5**					**5**			
47000pF(**473**)		**5**					**5**					**5**		
0.10μF(**104**)			**5**				**5**					**5**		
0.22μF(**224**)				**5**				**5**					**5**	
0.47μF(**474**)									**5**					**5**
1.0μF(**105**)										**5**				

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

Controlled ESR Low ESL Type X7S(C7) Characteristics

5 ex.5: T Dimension [mm]

Capacitance \ LxW [mm]	0.8x1.6 (**18**) <0306>			
Rated Voltage [Vdc]	4 (**0G**)			
ESR [mΩ]	100 (**E01**)	220 (**E03**)	470 (**E05**)	1000 (**E07**)
1.0μF(**105**)	**5**	**5**	**5**	**5**

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

Capacitance Table

Eight Terminals Low ESL Type X7S(C7)/X7R(R7) Characteristics

5 ex.5: T Dimension [mm]

Capacitance \ LxW [mm]	1.6x0.8 (**18**) <0603>	2.0x1.25 (**21**) <0805>					3.2x1.6 (**31**) <1206>		
Capacitance \ Rated Voltage [Vdc]	4 (**0G**)	25 (**1E**)	16 (**1C**)	10 (**1A**)	6.3 (**0J**)	4 (**0G**)	16 (**1C**)	10 (**1A**)	4 (**0G**)
10000pF(**103**)		**9**							
22000pF(**223**)		**9**							
47000pF(**473**)		**9**							
0.10µF(**104**)	**5**		**9**				**9**		
0.22µF(**224**)	**5**		**9**				**9**		
0.47µF(**474**)	**5**			**9**			**9**		
1.0µF(**105**)	**5**				**9**		**M**	**9**	
2.2µF(**225**)	**5**					**9**		**M**	**9**
4.7µF(**475**)						**9**			

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

Eight Terminals Low ESL Type X7R(R7)/X7S(C7) Characteristics-Low Profile

5 ex.5: T Dimension [mm]

Capacitance \ LxW [mm]	2.0x1.25 (**21**) <0805>					3.2x1.6 (**31**) <1206>		
Capacitance \ Rated Voltage [Vdc]	25 (**1E**)	16 (**1C**)	10 (**1A**)	6.3 (**0J**)	4 (**0G**)	16 (**1C**)	10 (**1A**)	6.3 (**0J**)
10000pF(**103**)	**5**							
22000pF(**223**)	**5**							
47000pF(**473**)		**5**						
0.10µF(**104**)		**5**						
0.22µF(**224**)			**5**			**5**		
0.47µF(**474**)				**5**			**5**	
1.0µF(**105**)					**5**			**5**
2.2µF(**225**)					**5**			**5**
4.7µF(**475**)					**5**			

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

Ten Terminals Low ESL Type X7R(R7)/X7S(C7) Characteristics-Low Profile

5 ex.5: T Dimension [mm]

Capacitance \ LxW [mm]	2.0x1.25 (**21**) <0805>				3.2x1.6 (**31**) <1206>		
Capacitance \ Rated Voltage [Vdc]	25 (**1E**)	16 (**1C**)	6.3 (**0J**)	4 (**0G**)	16 (**1C**)	10 (**1A**)	6.3 (**0J**)
10000pF(**103**)	**5**						
22000pF(**223**)	**5**						
47000pF(**473**)		**5**					
0.10µF(**104**)		**5**			**5**		
0.22µF(**224**)			**5**		**5**		
0.47µF(**474**)			**5**			**5**	
1.0µF(**105**)				**5**			
2.2µF(**225**)				**5**			**5**

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

Reversed Geometry Low ESL Type X7R(R7)/X7S(C7)/X6S(C8) Characteristics

LxW [mm]		0.5x1.0(**15**)<0204>	
Rated Volt. [Vdc]		6.3(**0J**)	4(**0G**)
Capacitance	Tolerance	Part Number	
0.10µF(**104**)	±20%(**M**)	**LLL153C80J104ME01E***	
0.22µF(**224**)	±20%(**M**)	**LLL153C80J224ME14E***	
0.47µF(**474**)	±20%(**M**)		**LLL153C70G474ME17E***

LLL153 Series 4V/0.47µF(L: 0.5+0.07/-0.03mm)

LxW [mm]		0.8x1.6(**18**)<0306>			
Rated Volt. [Vdc]		50(**1H**)	25(**1E**)	16(**1C**)	10(**1A**)
Capacitance	Tolerance	Part Number			
2200pF(**222**)	±20%(**M**)	**LLL185R71H222MA01L**			
4700pF(**472**)	±20%(**M**)	**LLL185R71H472MA01L**			
10000pF(**103**)	±20%(**M**)		**LLL185R71E103MA01L**		
22000pF(**223**)	±20%(**M**)		**LLL185R71E223MA01L**		
47000pF(**473**)	±20%(**M**)			**LLL185R71C473MA01L**	
0.10µF(**104**)	±20%(**M**)				**LLL185R71A104MA01L**
0.22µF(**224**)	±20%(**M**)				**LLL185R71A224MA01L**

LxW [mm]		0.8x1.6(**18**)<0306>
Rated Volt. [Vdc]		4(**0G**)
Capacitance	Tolerance	Part Number
0.47µF(**474**)	±20%(**M**)	**LLL185C70G474MA01L**
1.0µF(**105**)	±20%(**M**)	**LLL185C70G105ME02L***
2.2µF(**225**)	±20%(**M**)	**LLL185C70G225ME01L***

LxW [mm]		1.25x2.0(**21**)<0508>			
Rated Volt. [Vdc]		50(**1H**)	25(**1E**)	16(**1C**)	10(**1A**)
Capacitance	Tolerance	Part Number			
10000pF(**103**)	±20%(**M**)	**LLL216R71H103MA01L**			
22000pF(**223**)	±20%(**M**)	**LLL216R71H223MA01L**			
47000pF(**473**)	±20%(**M**)		**LLL216R71E473MA01L**		
0.10µF(**104**)	±20%(**M**)		**LLL216R71E104MA01L**		
0.22µF(**224**)	±20%(**M**)			**LLL219R71C224MA01L**	**LLL216R71A224MA01L**
0.47µF(**474**)	±20%(**M**)				**LLL219R71A474MA01L**
1.0µF(**105**)	±20%(**M**)				**LLL219R71A105MA01L**

LxW [mm]		1.25x2.0(**21**)<0508>
Rated Volt. [Vdc]		4(**0G**)
Capacitance	Tolerance	Part Number
2.2µF(**225**)	±20%(**M**)	**LLL219C70G225MA01L**

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code
* Please refer to LLL/LLR/LLA/LLM Series Specifications and Test Method (2).

(Part Number) **LL** ❶ | **L** ❷ | **15** ❸ | **3** ❹ | **C8** ❺ | **0J** ❻ | **104** ❼ | **M** ❽ | **E01** ❾ | **E** ❿

❶Product ID ❷Series ❸Dimensions (LxW) ❹Dimension (T)
❺Temperature Characteristics ❻Rated Voltage ❼Capacitance
❽Capacitance Tolerance ❾Individual Specification Code ❿Packaging

Packaging Code in Part Number shows STD 180mm Reel Taping.

Reversed Geometry Low ESL Type X7R(R7)/X5R(R6) Characteristics

LxW [mm]		1.6x3.2(**31**)<0612>			
Rated Volt. [Vdc]		50(**1H**)	25(**1E**)	16(**1C**)	10(**1A**)
Capacitance	Tolerance	Part Number			
10000pF(**103**)	±20%(**M**)	**LLL317R71H103MA01L**			
22000pF(**223**)	±20%(**M**)	**LLL317R71H223MA01L**			
47000pF(**473**)	±20%(**M**)	**LLL317R71H473MA01L**			
0.10µF(**104**)	±20%(**M**)	**LLL31MR71H104MA01L**	**LLL317R71E104MA01L**		
0.22µF(**224**)	±20%(**M**)		**LLL31MR71E224MA01L**	**LLL317R71C224MA01L**	
0.47µF(**474**)	±20%(**M**)		**LLL31MR71E474MA01L**	**LLL317R71C474MA01L**	
1.0µF(**105**)	±20%(**M**)			**LLL31MR71C105MA01L**	**LLL317R71A105MA01L**
2.2µF(**225**)	±20%(**M**)				**LLL31MR71A225MA01L**

LxW [mm]		1.6x3.2(**31**)<0612>
Rated Volt. [Vdc]		6.3(**0J**)
Capacitance	Tolerance	Part Number
2.2µF(**225**)	±20%(**M**)	**LLL317R70J225MA01L**
4.7µF(**475**)	±20%(**M**)	**LLL31MR70J475MA01L**
10µF(**106**)	±20%(**M**)	**LLL31MR60J106ME01L***

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code
* Please refer to LLL/LLR/LLA/LLM Series Specifications and Test Method (2).

Reversed Geometry Low ESL Type X7R(R7)/X7S(C7) Characteristics-Low Profile

LxW [mm]		0.8x1.6(**18**)<0306>			
Rated Volt. [Vdc]		25(**1E**)	16(**1C**)	10(**1A**)	4(**0G**)
Capacitance	Tolerance	Part Number			
10000pF(**103**)	±20%(**M**)	**LLL185R71E103MA11L**			
22000pF(**223**)	±20%(**M**)		**LLL185R71C223MA11L**		
47000pF(**473**)	±20%(**M**)		**LLL185R71C473MA11L**		
0.10µF(**104**)	±20%(**M**)			**LLL185R71A104MA11L**	
0.22µF(**224**)	±20%(**M**)				**LLL185C70G224MA11L**

LxW [mm]		1.25x2.0(**21**)<0508>			
Rated Volt. [Vdc]		50(**1H**)	25(**1E**)	16(**1C**)	10(**1A**)
Capacitance	Tolerance	Part Number			
10000pF(**103**)	±20%(**M**)	**LLL215R71H103MA11L**			
22000pF(**223**)	±20%(**M**)		**LLL215R71E223MA11L**		
47000pF(**473**)	±20%(**M**)			**LLL215R71C473MA11L**	
0.10µF(**104**)	±20%(**M**)			**LLL215R71C104MA11L**	
0.22µF(**224**)	±20%(**M**)				**LLL215R71A224MA11L**

LxW [mm]		1.25x2.0(**21**)<0508>	
Rated Volt. [Vdc]		6.3(**0J**)	4(**0G**)
Capacitance	Tolerance	Part Number	
0.47µF(**474**)	±20%(**M**)	**LLL215R70J474MA11L**	
1.0µF(**105**)	±20%(**M**)		**LLL215C70G105MA11L**

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

(Part Number) LL | L | 31 | 7 | R7 | 1H | 103 | M | A01 | L
❶ ❷ ❸ ❹ ❺ ❻ ❼ ❽ ❾ ❿

❶Product ID ❷Series ❸Dimensions (LxW) ❹Dimension (T)
❺Temperature Characteristics ❻Rated Voltage ❼Capacitance
❽Capacitance Tolerance ❾Individual Specification Code ❿Packaging

Packaging Code in Part Number shows STD 180mm Reel Taping.

Reversed Geometry Low ESL Type X7R(R7) Characteristics-Low Profile

LxW [mm]		1.6x3.2(**31**)<0612>			
Rated Volt. [Vdc]		50(**1H**)	25(**1E**)	16(**1C**)	10(**1A**)
Capacitance	Tolerance	Part Number			
10000pF(**103**)	±20%(**M**)	**LLL315R71H103MA11L**			
22000pF(**223**)	±20%(**M**)	**LLL315R71H223MA11L**			
47000pF(**473**)	±20%(**M**)		**LLL315R71E473MA11L**		
0.10μF(**104**)	±20%(**M**)		**LLL315R71E104MA11L**		
0.22μF(**224**)	±20%(**M**)			**LLL315R71C224MA11L**	
0.47μF(**474**)	±20%(**M**)				**LLL315R71A474MA11L**

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

Controlled ESR Low ESL Type X7S(C7) Characteristics

LxW [mm]		0.8x1.6(**18**)<0306>			
Rated Volt. [Vdc]		4(**0G**)			
ESR [mΩ]		100(**E01**)	220(**E03**)	470(**E05**)	1000(**E07**)
Capacitance	Tolerance	Part Number			
10000pF(**103**)	±20%(**M**)	**LLR185C70G105ME01L***	**LLR185C70G105ME03L***	**LLR185C70G105ME05L***	**LLR185C70G105ME07L***

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code
* Please refer to LLL/LLR/LLA/LLM Series Specifications and Test Method (2).

Eight Terminals Low ESL Type X7R(R7)/X7S(C7) Characteristics

LxW [mm]		1.6x0.8(**18**)<0603>
Rated Volt. [Vdc]		4(**0G**)
Capacitance	Tolerance	Part Number
0.10μF(**104**)	±20%(**M**)	**LLA185C70G104MA01L**
0.22μF(**224**)	±20%(**M**)	**LLA185C70G224MA01L**
0.47μF(**474**)	±20%(**M**)	**LLA185C70G474MA01L**
1.0μF(**105**)	±20%(**M**)	**LLA185C70G105ME01L***
2.2μF(**225**)	±20%(**M**)	**LLA185C70G225ME16L***

LxW [mm]		2.0x1.25(**21**)<0805>			
Rated Volt. [Vdc]		25(**1E**)	16(**1C**)	10(**1A**)	6.3(**0J**)
Capacitance	Tolerance	Part Number			
10000pF(**103**)	±20%(**M**)	**LLA219R71E103MA01L**			
22000pF(**223**)	±20%(**M**)	**LLA219R71E223MA01L**			
47000pF(**473**)	±20%(**M**)	**LLA219R71E473MA01L**			
0.10μF(**104**)	±20%(**M**)		**LLA219R71C104MA01L**		
0.22μF(**224**)	±20%(**M**)		**LLA219R71C224MA01L**		
0.47μF(**474**)	±20%(**M**)			**LLA219R71A474MA01L**	
1.0μF(**105**)	±20%(**M**)				**LLA219R70J105MA01L**

LxW [mm]		2.0x1.25(**21**)<0805>
Rated Volt. [Vdc]		4(**0G**)
Capacitance	Tolerance	Part Number
2.2μF(**225**)	±20%(**M**)	**LLA219C70G225MA01L**
4.7μF(**475**)	±20%(**M**)	**LLA219C70G475ME01L***

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code
* Please refer to LLL/LLR/LLA/LLM Series Specifications and Test Method (2).

Eight Terminals Low ESL Type X7R(R7) Characteristics

LxW [mm]		3.2x1.6(**31**)<1206>		
Rated Volt. [Vdc]		16(**1C**)	10(**1A**)	4(**0G**)
Capacitance	Tolerance	Part Number		
0.10μF(**104**)	±20%(**M**)	**LLA319R71C104MA01L**		
0.22μF(**224**)	±20%(**M**)	**LLA319R71C224MA01L**		
0.47μF(**474**)	±20%(**M**)	**LLA319R71C474MA01L**		
1.0μF(**105**)	±20%(**M**)	**LLA31MR71C105MA01L**	**LLA319R71A105MA01L**	
2.2μF(**225**)	±20%(**M**)		**LLA31MR71A225MA01L**	**LLA319R70G225MA01L**

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

Eight Terminals Low ESL Type X7R(R7)/X7S(C7) Characteristics-Low Profile

LxW [mm]		2.0x1.25(**21**)<0805>			
Rated Volt. [Vdc]		25(**1E**)	16(**1C**)	10(**1A**)	6.3(**0J**)
Capacitance	Tolerance	Part Number			
10000pF(**103**)	±20%(**M**)	**LLA215R71E103MA14L**			
22000pF(**223**)	±20%(**M**)	**LLA215R71E223MA14L**			
47000pF(**473**)	±20%(**M**)		**LLA215R71C473MA14L**		
0.10μF(**104**)	±20%(**M**)		**LLA215R71C104MA14L**		
0.22μF(**224**)	±20%(**M**)			**LLA215R71A224MA14L**	
0.47μF(**474**)	±20%(**M**)				**LLA215R70J474MA14L**

LxW [mm]		2.0x1.25(**21**)<0805>	3.2x1.6(**31**)<1206>		
Rated Volt. [Vdc]		4(**0G**)	16(**1C**)	10(**1A**)	6.3(**0J**)
Capacitance	Tolerance	Part Number			
0.22μF(**224**)	±20%(**M**)		**LLA315R71C224MA14L**		
0.47μF(**474**)	±20%(**M**)			**LLA315R71A474MA14L**	
1.0μF(**105**)	±20%(**M**)	**LLA215C70G105MA14L**			**LLA315R70J105MA14L**
2.2μF(**225**)	±20%(**M**)	**LLA215C70G225ME11L***			**LLA315R70J225MA14L**
4.7μF(**475**)	±20%(**M**)	**LLA215C70G475ME19L***			

Ten Terminals Low ESL Type X7R(R7)/X7S(C7) Characteristics-Low Profile

LxW [mm]		2.0x1.25(**21**)<0805>			
Rated Volt. [Vdc]		25(**1E**)	16(**1C**)	6.3(**0J**)	4(**0G**)
Capacitance	Tolerance	Part Number			
10000pF(**103**)	±20%(**M**)	**LLM215R71E103MA11L**			
22000pF(**223**)	±20%(**M**)	**LLM215R71E223MA11L**			
47000pF(**473**)	±20%(**M**)		**LLM215R71C473MA11L**		
0.10μF(**104**)	±20%(**M**)		**LLM215R71C104MA11L**		
0.22μF(**224**)	±20%(**M**)			**LLM215R70J224MA11L**	
0.47μF(**474**)	±20%(**M**)			**LLM215R70J474MA11L**	
1.0μF(**105**)	±20%(**M**)				**LLM215C70G105MA11L**
2.2μF(**225**)	±20%(**M**)				**LLM215C70G225ME11L***

LxW [mm]		3.2x1.6(**31**)<1206>		
Rated Volt. [Vdc]		16(**1C**)	10(**1A**)	6.3(**0J**)
Capacitance	Tolerance	Part Number		
0.10μF(**104**)	±20%(**M**)	**LLM315R71C104MA11L**		
0.22μF(**224**)	±20%(**M**)	**LLM315R71C224MA11L**		
0.47μF(**474**)	±20%(**M**)		**LLM315R71A474MA11L**	
2.2μF(**225**)	±20%(**M**)			**LLM315R70J225MA11L**

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

* Please refer to LLL/LLR/LLA/LLM Series Specifications and Test Method (2).

(Part Number)

LL	A	31	9	R7	1C	104	M	A01	L
❶	❷	❸	❹	❺	❻	❼	❽	❾	❿

❶Product ID ❷Series ❸Dimensions (LxW) ❹Dimension (T)
❺Temperature Characteristics ❻Rated Voltage ❼Capacitance
❽Capacitance Tolerance ❾Individual Specification Code ❿Packaging

Packaging Code in Part Number shows STD 180mm Reel Taping.

LLL/LLR/LLA/LLM Series Specifications and Test Methods (1)

When no "*" is added in PNs table, please refer to LLL/LLR/LLA/LLM Series Specifications and Test Methods (1).
When "*" is added in PNs table, please refer to LLL/LLR/LLA/LLM Series Specifications and Test Methods (2).

<table>
<tr><th>No.</th><th colspan="2">Item</th><th>Specifications</th><th>Test Method</th></tr>
<tr><td>1</td><td colspan="2">Operating Temperature Range</td><td>R7, C7: –55 to +125°C</td><td></td></tr>
<tr><td>2</td><td colspan="2">Rated Voltage</td><td>See the previous pages.</td><td>The rated voltage is defined as the maximum voltage that may be applied continuously to the capacitor.
When AC voltage is superimposed on DC voltage, V^{P-P} or V^{O-P}, whichever is larger, should be maintained within the rated voltage range.</td></tr>
<tr><td>3</td><td colspan="2">Appearance</td><td>No defects or abnormalities</td><td>Visual inspection</td></tr>
<tr><td>4</td><td colspan="2">Dimensions</td><td>Within the specified dimension</td><td>Using calipers</td></tr>
<tr><td>5</td><td colspan="2">Dielectric Strength</td><td>No defects or abnormalities</td><td>No failure should be observed when 250% of the rated voltage is applied between the terminations for 1 to 5 seconds, provided the charge/discharge current is less than 50mA.</td></tr>
<tr><td>6</td><td colspan="2">Insulation Resistance</td><td>C≦0.047μF: More than 10,000MΩ
C>0.047μF: More than 500Ω · F
C: Normal Capacitance</td><td>The insulation resistance should be measured with a DC voltage not exceeding the rated voltage at 25°C and 75%RH max. and within 2 minutes of charging.</td></tr>
<tr><td>7</td><td colspan="2">Capacitance</td><td>Within the specified tolerance</td><td rowspan="2">The capacitance/D.F. should be measured at 25°C at the frequency and voltage shown in the table.
Frequency: 1±0.1kHz
Voltage: 1±0.2Vrms
*For LLA185C70G474, the capacitance should be measured unsing a voltage of 0.5±0.1Vrms.</td></tr>
<tr><td>8</td><td colspan="2">Dissipation Factor (D.F.)</td><td>W.V.: 25V min.; 0.025 max.
W.V.: 16V/10V max.; 0.035 max.
W.V.: 6.3V max.; 0.05 max.</td></tr>
<tr><td>9</td><td colspan="2">Capacitance Temperature Characteristics</td><td><table><tr><th>Char.</th><th>Temp. Range (°C)</th><th>Reference Temp.</th><th>Cap.Change</th></tr><tr><td>R7</td><td>–55 to +125</td><td>25°C</td><td>Within ±15%</td></tr><tr><td>C7</td><td>–55 to +125</td><td>25°C</td><td>Within ±22%</td></tr></table></td><td>The capacitance change should be measured after 5 min. at each specified temperature stage.<table><tr><th>Step</th><th>Temperature (°C)</th></tr><tr><td>1</td><td>25±2</td></tr><tr><td>2</td><td>–55±3</td></tr><tr><td>3</td><td>25±2</td></tr><tr><td>4</td><td>125±3</td></tr><tr><td>5</td><td>25±2</td></tr></table>The ranges of capacitance change compared with the 25°C value over the temperature ranges shown in the table should be within the specified ranges.
• Initial measurement.
Perform a heat treatment at 150+0/-10°C for one hour and then set for 24±2 hours at room temperature. Perform the initial measurement.</td></tr>
<tr><td>10</td><td colspan="2">Adhesive Strength of Termination</td><td>No removal of the terminations or other defect should occur.</td><td>Solder the capacitor to the test jig (glass epoxy board) using a eutectic solder. Then apply 10N* force in parallel with the test jig for 10±1 sec. The soldering should be done either with an iron or using the reflow method and should be conducted with care so that the soldering is uniform and free of defects such as heat shock. *5N (LLL18 and LLA/LLM Series)</td></tr>
<tr><td rowspan="3">11</td><td rowspan="3">Vibration Resistance</td><td>Appearance</td><td>No defects or abnormalities</td><td rowspan="3">Solder the capacitor to the test jig (glass epoxy board) in the same manner and under the same conditions as (10). The capacitor should be subjected to a simple harmonic motion having a total amplitude of 1.5mm, the frequency being varied uniformly between the approximate limits of 10 and 55Hz. The frequency range, from 10 to 55Hz and return to 10Hz, should be traversed in approximately 1 minute. This motion should be applied for a period of 2 hours in each of 3 mutually perpendicular directions (total of 6 hours).</td></tr>
<tr><td>Capacitance</td><td>Within the specified tolerance</td></tr>
<tr><td>D.F.</td><td>W.V.: 25V min.; 0.025 max.
W.V.: 16V/10V max.; 0.035 max.
W.V.: 6.3V max.; 0.05 max.</td></tr>
<tr><td>12</td><td colspan="2">Solderability of Termination</td><td>75% of the terminations are to be soldered evenly and continuously.</td><td>Immerse the capacitor in a solution of ethanol (JIS-K-8101) and rosin (JIS-K-5902) (25% rosin in weight proportion). Preheat at 80 to 120°C for 10 to 30 seconds. After preheating, immerse in eutectic solder solution for 2±0.5 seconds at 230±5°C, or Sn-3.0Ag-0.5Cu solder solution for 2±0.5 seconds at 245±5°C.</td></tr>
<tr><td rowspan="5">13</td><td rowspan="5">Resistance to Soldering Heat</td><td>Appearance</td><td>No marking defects</td><td rowspan="5">Preheat the capacitor at 120 to 150°C for 1 minute. Immerse the capacitor in a eutectic solder or Sn-3.0Ag-0.5Cu solder solution at 270±5°C for 10±0.5 seconds. Let sit at room temperature for 24±2 hours, then measure.
• Initial measurement.
Perform a heat treatment at 150+0/–10°C for one hour and then let sit for 24±2 hours at room temperature. Perform the initial measurement.</td></tr>
<tr><td>Capacitance Change</td><td>Within ±7.5%</td></tr>
<tr><td>D.F.</td><td>W.V.: 25V min.; 0.025 max.
W.V.: 16V/10V max.; 0.035 max.
W.V.: 6.3V max.; 0.05 max.</td></tr>
<tr><td>I.R.</td><td>More than 10,000MΩ or 500Ω · F (whichever is smaller)</td></tr>
<tr><td>Dielectric Strength</td><td>No failure</td></tr>
</table>

Continued on the following page.

LLL/LLR/LLA/LLM Series Specifications and Test Methods (1)

Continued from the preceding page.

When no "*" is added in PNs table, please refer to LLL/LLR/LLA/LLM Series Specifications and Test Methods (1).
When "*" is added in PNs table, please refer to LLL/LLR/LLA/LLM Series Specifications and Test Methods (2).

No.	Item		Specifications	Test Method
14	Temperature Cycle	Appearance	No marking defects	Fix the capacitor to the supporting jig in the same manner and under the same conditions as (10). Perform the five cycles according to the four heat treatments listed in the following table. Let sit for 24±2 hours at room temperature, then measure. Step 1: Temp. (°C) Min. Operating Temp. +0/–3; Time (min.) 30±3 Step 2: Temp. (°C) Room Temp.; Time (min.) 2 to 3 Step 3: Temp. (°C) Max. Operating Temp. +3/–0; Time (min.) 30±3 Step 4: Temp. (°C) Room Temp.; Time (min.) 2 to 3 • Initial measurement. Perform a heat treatment at 150+0/–10°C for one hour and then let sit for 24±2 hours at room temperature. Perform the initial measurement.
		Capacitance Change	Within ±7.5%	
		D.F.	W.V.: 25V min.; 0.025 max. W.V.: 16V/10V max.; 0.035 max. W.V.: 6.3V max.; 0.05 max.	
		I.R.	More than 10,000MΩ or 500Ω · F (whichever is smaller)	
		Dielectric Strength	No failure	
15	Humidity (Steady State)	Appearance	No marking defects	Set the capacitor at 40±2°C and 90 to 95% humidity for 500±12 hours. Remove and let sit for 24±2 hours at room temperature, then measure.
		Capacitance Change	Within ±12.5%	
		D.F.	W.V.: 10V min.; 0.05 max. W.V.: 6.3V max.; 0.075 max.	
		I.R.	More than 1,000MΩ or 50Ω · F (whichever is smaller)	
16	Humidity Load	Appearance	No marking defects	Apply the rated voltage at 40±2°C and 90 to 95% humidity for 500±12 hours. Remove and let sit for 24±2 hours at room temperature, then measure. The charge/discharge current is less than 50mA.
		Capacitance Change	Within ±12.5%	
		D.F.	W.V.: 10V min.; 0.05 max. W.V.: 6.3V max.; 0.075 max.	
		I.R.	More than 500MΩ or 25Ω · F (whichever is smaller)	
17	High Temperature Load	Appearance	No marking defects	Apply 200% of the rated voltage for 1000±12 hours at the maximum operating temperature ±3°C. Let sit for 24±2 hours at room temperature, then measure. The charge/discharge current is less than 50mA. •Initial measurement. Apply 200% of the rated DC voltage for one hour at the maximum operating temperature ±3°C. Remove and let sit for 24±2 hours at room temperature. Perform initial measurement.
		Capacitance Change	Within ±12.5%	
		D.F.	W.V.: 10V min.; 0.05 max. W.V.: 6.3V max.; 0.075 max.	
		I.R.	More than 1,000MΩ or 50Ω · F (whichever is smaller)	

LLL/LLR/LLA/LLM Series Specifications and Test Methods (2)

When no "*" is added in PNs table, please refer to LLL/LLR/LLA/LLM Series Specifications and Test Methods (1).
When "*" is added in PNs table, please refer to LLL/LLR/LLA/LLM Series Specifications and Test Methods (2).

No.	Item		Specifications	Test Method
1	Operating Temperature Range		R6: –55 to +85°C R7, C7: –55 to +125°C C8: –55 to +105°C	
2	Rated Voltage		See the previous pages.	The rated voltage is defined as the maximum voltage that may be applied continuously to the capacitor. When AC voltage is superimposed on DC voltage, V^{P-P} or V^{O-P}, whichever is larger, should be maintained within the rated voltage range.
3	Appearance		No defects or abnormalities	Visual inspection
4	Dimensions		Within the specified dimension	Using calipers
5	Dielectric Strength		No defects or abnormalities	No failure should be observed when 250% of the rated voltage is applied between the terminations for 1 to 5 seconds, provided the charge/discharge current is less than 50mA.
6	Insulation Resistance		50Ω · F min.	The insulation resistance should be measured with a DC voltage not exceeding the rated voltage at 25°C and 75%RH max. and within 1 minute of charging.
7	Capacitance		Within the specified tolerance	The capacitance/D.F. should be measured at 25°C at the frequency and voltage shown in the table. Capacitance / Frequency / Voltage C≦10μF (10V min.) / 1±0.1kHz / 1.0±0.2Vrms C≦10μF (6.3V max.) / 1±0.1kHz / 0.5±0.1Vrms C>10μF / 120±24Hz / 0.5±0.1Vrms
8	Dissipation Factor (D.F.)		R6, R7, C7, C8: 0.120 max.	
9	Capacitance Temperature Characteristics		Char. / Temp. Range (°C) / Reference Temp. / Cap. Change R6 / –55 to +85 / 25°C / Within ±15% R7 / –55 to +125 / 25°C / Within ±15% C7 / –55 to +125 / 25°C / Within ±22% C8 / –55 to +105 / 25°C / Within ±22%	The capacitance change should be measured after 5 min. at each specified temperature stage. The ranges of capacitance change compared with the 25°C value over the temperature ranges shown in the table should be within the specified ranges. • Initial measurement. Perform a heat treatment at 150+0/-10°C for one hour and then set for 24±2 hours at room temperature. Perform the initial measurement.
10	Adhesive Strength of Termination		No removal of the terminations or other defect should occur.	Solder the capacitor to the test jig (glass epoxy board) using a eutectic solder. Then apply 10N* force in parallel with the test jig for 10±1 sec. The soldering should be done either with an iron or using the reflow method and should be conducted with care so that the soldering is uniform and free of defects such as heat shock. *5N (LLL15, LLL18, LLR18, LLA, LLM Series)
11	Vibration	Appearance	No defects or abnormalities	Solder the capacitor to the test jig (glass epoxy board) in the same manner and under the same conditions as (10). The capacitor should be subjected to a simple harmonic motion having a total amplitude of 1.5mm, the frequency being varied uniformly between the approximate limits of 10 and 55Hz. The frequency range, from 10 to 55Hz and return to 10Hz, should be traversed in approximately 1 minute. This motion should be applied for a period of 2 hours in each of 3 mutually perpendicular directions (total of 6 hours).
		Capacitance	Within the specified tolerance	
		D.F.	R6, R7, C7, C8: 0.120 max.	
12	Solderability of Termination		75% of the terminations are to be soldered evenly and continuously.	Immerse the capacitor in a solution of ethanol (JIS-K-8101) and rosin (JIS-K-5902) (25% rosin in weight proportion). Preheat at 80 to 120°C for 10 to 30 seconds. After preheating, immerse in eutectic solder solution for 2±0.5 seconds at 230±5°C, or Sn-3.0Ag-0.5Cu solder solution for 2±0.5 seconds at 245±5°C.
13	Resistance to Soldering Heat	Appearance	No marking defects	Preheat the capacitor at 120 to 150°C for 1 minute. Immerse the capacitor in a eutectic solder or Sn-3.0Ag-0.5Cu solder solution at 270±5°C for 10±0.5 seconds. Let sit at room temperature for 24±2 hours, then measure. • Initial measurement. Perform a heat treatment at 150+0/–10°C for one hour and then let sit for 24±2 hours at room temperature. Perform the initial measurement.
		Capacitance Change	R6, R7, C7, C8: Within ±7.5%	
		D.F.	R6, R7, C7, C8: 0.120 max.	
		I.R.	50Ω · F min.	
		Dielectric Strength	No failure	

Continued on the following page.

LLL/LLR/LLA/LLM Series Specifications and Test Methods (2)

Continued from the preceding page.

When no "*" is added in PNs table, please refer to LLL/LLR/LLA/LLM Series Specifications and Test Methods (1).
When "*" is added in PNs table, please refer to LLL/LLR/LLA/LLM Series Specifications and Test Methods (2).

No.	Item		Specifications	Test Method
14	Temperature Sudden Change	Appearance	No marking defects	Fix the capacitor to the supporting jig in the same manner and under the same conditions as (10).Perform the five cycles according to the four heat treatments listed in the following table. Let sit for 24±2 hours at room temperature, then measure. Step 1: Temp. (°C) Min. Operating Temp. +0/–3, Time (min.) 30±3 Step 2: Temp. (°C) Room Temp., Time (min.) 2 to 3 Step 3: Temp. (°C) Min. Operating Temp. +0/–3, Time (min.) 30±3 Step 4: Temp. (°C) Room Temp., Time (min.) 2 to 3 • Initial measurement Perform a heat treatment at 150+0/–10°C for one hour and then let sit for 24±2 hours at room temperature. Perform the initial measurement.
		Capacitance Change	R6, R7, C7, C8: Within ±12.5%	
		D.F.	R6, R7, C7, C8: 0.120 max.	
		I.R.	50Ω · F min.	
		Dielectric Strength	No failure	
15	High Temperature High Humidity (Steady State)	Appearance	No marking defects	Apply the rated voltage at 40±2°C and 90 to 95% humidity for 500±12 hours. The charge/discharge current is less than 50mA. Apply the rated DC voltage. •Initial measurement Perform a heat treatment at 150+0/–10°C for one hour and then let sit for 24±2 hours at room temperature. Perform the initial measurement. •Measurement after test Perform a heat treatment at 150+0/–10°C for one hour and then let sit for 24±2 hours at room temperature, then measure.
		Capacitance Change	R6, R7, C7, C8: Within ±12.5%	
		D.F.	R6, R7, C7, C8: 0.2 max.	
		I.R.	12.5Ω · F min.	
16	Durability	Appearance	No marking defects	Apply 150% of the rated voltage for 1000±12 hours at the maximum operating temperature ±3°C. The charge/discharge current is less than 50mA. •Initial measurement Perform a heat treatment at 150+0/–10°C for one hour and then let sit for 24±2 hours at room temperature. Perform the initial measurement. •Measurement after test Perform a heat treatment at 150+0/–10°C for one hour and then let sit for 24±2 hours at room temperature, then measure.
		Capacitance Change	R6, R7, C7, C8: Within ±12.5% * LLL153C70G474: Within ±20%	
		D.F.	R6, R7, C7, C8: 0.2 max.	
		I.R.	25Ω · F min.	
*17	ESR		Within below ESR value at Frequency: 10±0.1MHz 100mΩ: Within 70 to 130mΩ 220mΩ: Within 154 to 286mΩ 470mΩ: Within 329 to 611mΩ 1000mΩ: Within 700 to 1300mΩ	The ESR should be measured at room temperature with the Equivalent of HP4294A.

* LLR: This specification is only for LLR Type