

Chip Monolithic Ceramic Capacitors



Explanation of Symbols in This Catalog

Ultra-compact

Lx W dimension: products of 0.6 x 0.3 mm or less

High Q

Low dissipation for high frequency
 By devising ceramic materials and electrode materials, low dissipation is achieved in frequency bands of VHF, UHF and microwave or beyond.

Low ESL

Low inductance
 This capacitor is designed so that the parasitic inductance component (ESL) that the capacitor has on the high frequency side becomes lower.

Anti-noise

Product suitable for acoustic noise reduction and low distortion
 This product suppresses acoustic noise, which occurs when a ceramic capacitor is used, by devising the materials and configuration.

Deflecting crack

Product resistant to deflection cracking
 This capacitor is designed to prevent failures as much as possible by short mode caused by cracking when there is board deflection.

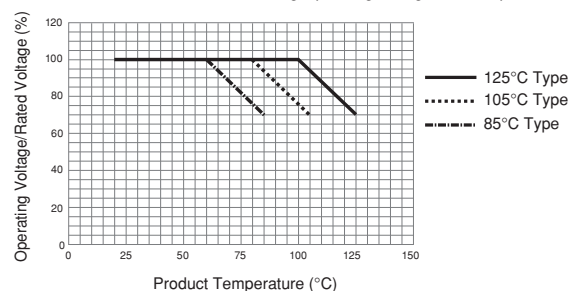
Soldering crack

Product with solder cracking suppression
 This capacitor is configured with metal terminals and leads connected to the chip.
 The metal terminals and leads relieve the stress from expansion and contraction of the solder, to suppress solder cracking.

Derating

Voltage and temperature derating recommended product
 This product is suitable when a voltage continuously applied to a capacitor in an operating circuit, is used below (derated) the rated voltage of the capacitor.
 This model guarantees the test conditions in the endurance test, at a rated voltage x 100% at the maximum operating temperature. A reliability assurance level equivalent to a common product can be secured, by using this product within the voltage and temperature derated conditions recommended in the figure below.

Recommended Conditions of the Derating Operating Voltage and Temperature



EU RoHS Compliant

- All the products in this catalog comply with EU RoHS.
- EU RoHS is "the European Directive 2011/65/EU on the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment."
- For more details, please refer to our website 'Murata's Approach for EU RoHS' (<http://www.murata.com/info/rohs.html>).

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

● Part Numbering

Chip Monolithic Ceramic Capacitors for General

(Part Number)

GR	M	18	8	B1	1H	102	K	A01	D
①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩

① Product ID ② Series

Product ID	Code	Series
GJ	M	High frequency HiQ type 1005(in mm)/0402(in inch) size max.
GM	A	Top & bottom electrode type for bonding
	D	Product for bonding/AuSn soldering
GQ	M	High frequency HiQ type 1608(in mm)/0603(in inch) size min.
GR	3	High effective capacitance & High allowable ripple current
	J	Resin external electrode type
	M	General purpose products
KR	3	Metal terminal type/High effective capacitance & High allowable ripple current
	M	Metal terminal type
LL	A	8-terminal low ESL type
	L	LW reversed low ESL type
	M	10-terminal low ESL type
	R	ESR Controlled low ESL type

③ Chip Dimensions (L×W)

Code	Dimensions (L×W)	Size Code (in inch)
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
15	1.0×0.5mm	0402
18	1.6×0.8mm	0603
1U	0.6×1.0mm	02404
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
55	5.7×5.0mm	2220

④ Height Dimension (T) (Except KR□)

Code	Dimension (T)
2	0.2mm
3	0.3mm
4	0.4mm
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
M	1.15mm
Q	1.5mm
S	2.8mm
X	Depends on individual standards.

④ Height Dimension (T) (KR□ Only)

Code	Dimension (T)
E	1.8mm
F	1.9mm
K	2.7mm
L	2.8mm
Q	3.7mm
T	4.8mm
W	6.4mm

Continued on the following page. 

(Part Number)

GR	M	18	8	B1	1H	102	K	A01	D
1	2	3	4	5	6	7	8	9	10

Continued from the preceding page.

⑤ Temperature Characteristics

Temperature Characteristic Codes		Temperature Characteristics				Operating Temperature Range	Capacitance Change Each Temperature (%)					
Code	Public STD Code	Reference Temperature	Temperature Range	Capacitance Change or Temperature Coefficient	-55°C		*3		-10°C			
					Max.		Min.	Max.	Min.	Max.	Min.	
1X	SL	JIS	20°C	20 to 85°C	+350 to -1000ppm/°C	-55 to 125°C	-	-	-	-	-	-
2C	CH	JIS	20°C	20 to 125°C	0±60ppm/°C	-55 to 125°C	0.82	-0.45	0.49	-0.27	0.33	-0.18
3C	CJ	JIS	20°C	20 to 125°C	0±120ppm/°C	-55 to 125°C	1.37	-0.9	0.82	-0.54	0.55	-0.36
3U	UJ	JIS	20°C	20 to 85°C	-750±120ppm/°C	-25 to 85°C	-	-	4.94	2.84	3.29	1.89
4C	CK	JIS	20°C	20 to 125°C	0±250ppm/°C	-55 to 125°C	2.56	-1.88	1.54	-1.13	1.02	-0.75
5C	C0G	EIA	25°C	25 to 125°C	0±30ppm/°C	-55 to 125°C	0.58	-0.24	0.4	-0.17	0.25	-0.11
7U	U2J	EIA	25°C	25 to 125°C *2	-750±120ppm/°C	-55 to 125°C	8.78	5.04	6.04	3.47	3.84	2.21
B1	B *1	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	-	-	-	-	-	-
R1	R *1	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	-	-	-	-	-	-

*1 Capacitance change is specified with 50% rated voltage applied.

*2 Rated Voltage 100Vdc max: 25 to 85°C

*3 -25°C (Reference Temperature 20°C) / -30°C (Reference Temperature 25°C)

⑥ Rated Voltage

Code	Rated Voltage
0E	DC2.5V
0G	DC4V
0J	DC6.3V
1A	DC10V
1C	DC16V
1E	DC25V
1H	DC50V
1J	DC63V
1K	DC80V
2A	DC100V
2D	DC200V
2E	DC250V
2W	DC450V
2H	DC500V
2J	DC630V
3A	DC1kV
3D	DC2kV
3F	DC3.15kV
YA	DC35V

⑦ Capacitance

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. If any alphabet, other than "R", is included, this indicates the specific part number is a non-standard part.

Ex.)

Code	Capacitance
R50	0.50pF
1R0	1.0pF
100	10pF
103	10000pF

⑧ Capacitance Tolerance

Code	Capacitance Tolerance
B	±0.1pF
C	±0.25pF
D	±0.5pF (10pF and below)
	±0.5% (10pF and over)
F	±1%
G	±2%
J	±5%
K	±10%
M	±20%
W	±0.05pF

Continued on the following page. 

(Part Number)

GR	M	18	8	B1	1H	102	K	A01	D
1	2	3	4	5	6	7	8	9	10

 Continued from the preceding page.

⑨ Individual Specification Code (Except **LLR**)

Expressed by three figures.

⑨ ESR (**LLR** Only)

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

⑩ Packaging

Code	Packaging
L	ø180mm Embossed Taping
D/E/W	ø180mm Paper Taping
K	ø330mm Embossed Taping
J/F	ø330mm Paper Taping
B	Bulk
T	Bulk Tray

Please contact us if you find any part number not provided in this table.

Selection Guide for Chip Monolithic Ceramic Capacitors

	Series	Ultra-small (smaller than 0201)	Low dissipation/HiQ	Low ESL	Fail safe	Anti-deflecting crack	Anti-soldering crack	Anti-noise, low distortion	For bonding	Specific applications	Safety standard certified type
For General Purpose	GRM page p17										
	GA2										
	GA3										
	GJM p87										
	GJ4										
	GJ8										
	GMA p109										
	GMD p111										
	GQM p114										
	GRJ p123										
	GR3 p125										
	GR4										
	GR7										
	KRM p127										
	KR3 p130										
	LLA p133										
	LLL p135										
	LLM p137										
	LLR p139										
	ZRA										
	ZRB										
For Automotive (Cat. No. C03)	GCM										
	GCD										
	GCE										
	GCG										
	GCJ										
	GC3										
	KCM										
	KC3										

Capacitance Table

How to read the Capacitance Table

LxW (mm)	0.4×0.2		0.6×0.3		1.0
T max. (mm)	0.22		0.33		0.4
Rated Voltage (Vdc)	25		25		50
Cap. / TC Code	C0G	CΔ	C0G	CΔ	C0G
0.10pF					p101
0.20pF	p88	p91	p94	p97	p101
1.0pF	p88	p91	p94	p98	p101
2.0pF	p88	p91	p95	p98	p101
3.0pF	p88	p91	p95	p98	p102

The values can be narrowed down in the order of size, rated voltage, and temperature characteristics.

Refers to the page of the part number list.
Check the part number list for the applicable product number.

Temperature Characteristics Table

The Table is colored by temperature characteristic codes.
Refer to the following Table for the meaning of each code.

EIA:	C0G	U2J	X7R	X7S	X7T	X7U	X6S	X6T	X5R
JIS:	CK	CJ	CH	SL	UJ	R	B		

Temperature Characteristic Codes		Temperature Characteristics			Operating Temperature Range	Capacitance Change Each Temperature (%)					
						-55°C		*2		-10°C	
Public STD Code		Reference Temperature	Temperature Range	Capacitance Change or Temperature Coefficient		Max.	Min.	Max.	Min.	Max.	Min.
C0G	EIA	25°C	25 to 125°C	0±30ppm/°C	-55 to 125°C	0.58	-0.24	0.4	-0.17	0.25	-0.11
CK	JIS	20°C	20 to 125°C	0±250ppm/°C	-55 to 125°C	2.56	-1.88	1.54	-1.13	1.02	-0.75
CJ	JIS	20°C	20 to 125°C	0±120ppm/°C	-55 to 125°C	1.37	-0.9	0.82	-0.54	0.55	-0.36
CH	JIS	20°C	20 to 125°C	0±60ppm/°C	-55 to 125°C	0.82	-0.45	0.49	-0.27	0.33	-0.18
SL	JIS	20°C	20 to 85°C	+350 to -1000ppm/°C	-55 to 125°C	-	-	-	-	-	-
U2J	EIA	25°C	25 to 125°C *1	-750±120ppm/°C	-55 to 125°C	8.78	5.04	6.04	3.47	3.84	2.21
UJ	JIS	20°C	20 to 85°C	-750±120ppm/°C	-25 to 85°C	-	-	4.94	2.84	3.29	1.89
X7R	EIA	25°C	-55 to 125°C	±15%	-55 to 125°C	-	-	-	-	-	-
X7S	EIA	25°C	-55 to 125°C	±22%	-55 to 125°C	-	-	-	-	-	-
X7T	EIA	25°C	-55 to 125°C	+22%, -33%	-55 to 125°C	-	-	-	-	-	-
X7U	EIA	25°C	-55 to 125°C	+22%, -56%	-55 to 125°C	-	-	-	-	-	-
R	JIS	20°C	-55 to 125°C	±15%	-55 to 125°C	-	-	-	-	-	-
X6S	EIA	25°C	-55 to 105°C	±22%	-55 to 105°C	-	-	-	-	-	-
X6T	EIA	25°C	-55 to 105°C	+22%, -33%	-55 to 105°C	-	-	-	-	-	-
X5R	EIA	25°C	-55 to 85°C	±15%	-55 to 85°C	-	-	-	-	-	-
B	JIS	20°C	-25 to 85°C	±10%	-25 to 85°C	-	-	-	-	-	-

*1 Rated Voltage 100Vdc max: 25 to 85°C

*2 -25°C (Reference Temperature 20°C) / -30°C (Reference Temperature 25°C)

p00

Each number in the Part Number List refers to the page number printed at the bottom of the page.

■ GRM Series Temperature Compensating Type

p00 ← Part Number List JIS: **CK** **CJ** **CH** **SL** **UJ** EIA: **C0G** **U2J**



p00

Each number in the Part Number List refers to the page number printed at the bottom of the page.

(→ ■ GRM Series Temperature Compensating Type)

p00

JIS:

CK

C

U

CH

SL

UJ

EIA:

COC

U

2J



Capacitance Table

p00

Each number in the Part Number List refers to the page number printed at the bottom of the page.

■ GRM Series High Dielectric Constant Type

p00	← Part Number List						JIS:	R	B	EIA:	X7R	X7S	X7T	X7U	X6S	X6T	X5R									
LxW (mm)		0.4x0.2						0.6x0.3														1.0x0.5				
T max. (mm)		0.22						0.33														0.22				
Rated Voltage (Vdc)	16	10	6.3	4	2.5		50	35	25	16	10	6.3	4	10	6.3	4										
Cap. / TC Code	X7R	X7R	X5R, B	X5R, B	X6T	X5R	X6T	X7R	B	X5R	X7R, R	X6S	X5R, B	X7Δ, R	X6S	X5R, B	X7Δ, R	X5R, B	X7R, R	X6S	X5R, B	X6S	X5R, B	X6S	X5R, B	X7T
100pF	p74	p74	p74	p74				p75	p75		p75															
150pF	p74	p74	p74	p74				p75	p75		p75															
220pF	p74	p74	p74	p74				p75	p75		p75															
330pF	p74	p74	p74	p74				p75	p75		p75															
470pF	p74	p74	p74	p74				p75	p75		p75															
680pF		p74	p74	p74				p75	p75		p75															
820pF		p74																								
1000pF	p74	p74	p74	p74	p74			p75	p75		p75	p75		p75												
1500pF			p74	p74	p74			p75	p75		p75	p75		p75												
2200pF			p74	p74	p74						p75	p75		p75	p75		p76									
3300pF			p74	p74	p74						p75	p75		p75	p75		p76									
4700pF			p74	p74	p74						p75	p75		p75	p75		p76	p76	p76	p76	p76		p76			
6800pF			p74	p74	p74						p75	p75		p75	p75		p76	p76	p76	p76	p76		p76			
10000pF			p74	p74	p74						p75	p75		p75	p75		p76	p76	p76	p76	p76					
15000pF				p74		p74								p75	p76		p76	p76		p76	p76					
22000pF				p74		p74								p75	p76		p76	p76		p76	p76					
33000pF				p74		p75								p75	p76		p76	p76		p76	p76					
47000pF				p74		p75								p76	p76		p76	p76		p76	p76					
68000pF				p74		p75								p76	p76		p76	p76		p76	p76					
0.10μF			p74	p74	p75	p75			p75		p75	p75	p75	p75	p76	p76	p76	p76		p76			p76	p77	p77	p77
0.15μF																							p76	p77	p77	p77
0.22μF																	p76		p76	p76	p76	p76	p77	p77	p77	p77
0.33μF																										
0.47μF																										
0.68μF																										
1.0μF																										
2.2μF																										
4.7μF																										
10μF																										
22μF																										
47μF																										
100μF																										
220μF																										



Capacitance Table

p00 Each number in the Part Number List refers to the page number printed at the bottom of the page.

(→ ■ GRM Series High Dielectric Constant Type)

p00 ← Part Number List

JIS:

R

B

EIA:

X7R

X7S

X7T

X7U

X6S

X6T

X5R

LxW (mm)	1.0x0.5																									
T max. (mm)	0.22			0.3						0.33				0.55												
Rated Voltage (Vdc)	4	2.5		50		25		16		10	10	6.3	4	100	50		35		25		16					
Cap. / TC Code	X6Δ	X5R	X7T	X7R, R	B	X7R	B	X7R	B	X5R	X5R, B	X6T	X5R, B	X6T	X7R	X7R, R	X6S	X5R, B	X6S	X5R	X7R, R	X6S	X5R, B	X7R, R	X6S	X5R, B
100pF																										
150pF																										
220pF				p77	p77	p77									p77	p77	p78		p78							
330pF				p77	p77	p77									p77	p77	p78		p78							
470pF				p77	p77	p77									p77	p77	p78		p78							
680pF				p77	p77	p77									p77	p77	p78		p78							
820pF																										
1000pF				p77	p77	p77									p77	p77	p78		p78							
1500pF				p77	p77	p77									p77	p77	p78		p78							
2200pF						p77	p77								p77	p77	p78		p78							
3300pF								p77	p77						p77	p77	p78		p78							
4700pF								p77	p77						p77	p77	p78		p78							
6800pF								p77	p77							p78	p78		p78			p78				
10000pF										p77					p78	p78		p78			p78	p78		p78		
15000pF										p77					p78			p78			p78	p78		p78		
22000pF										p77					p78			p78			p78	p78		p78		
33000pF										p77					p78	p78	p78			p78	p78		p78			
47000pF															p78	p78	p78			p78	p78		p78			
68000pF															p78	p78	p78			p78	p78		p78	p79	p79	
0.10μF	p77		p77												p78		p78	p78			p78	p79				
0.15μF																								p79		
0.22μF	p77		p77																p78	p78		p78	p78	p79		p79
0.33μF																										
0.47μF	p77																			p78				p78		p79
0.68μF																										
1.0μF	p77	p77									p77	p77	p77	p77								p78	p79			p79
2.2μF																										
4.7μF																										
10μF																										
22μF																										
47μF																										
100μF																										
220μF																										



Capacitance Table

p00 Each number in the Part Number List refers to the page number printed at the bottom of the page.

(→ ■ GRM Series High Dielectric Constant Type)

p00 ← Part Number List

JIS:

R

B

EIA:

X7R

X7S

X7T

X7U

X6S

X6T

X5R

L×W (mm)	1.0×0.5																				1.6×0.8					
T max. (mm)	0.55						0.6						0.65	0.7						0.5						
Rated Voltage (Vdc)	10			6.3			4	35	25	16	6.3	4	2.5	6.3	25	16	10	6.3	4	2.5	25	16	6.3	4		
Cap. / TC Code	X7R	X6S	X5R, B	X7R	X6S	X5R, B	X7R	X5R	X6S	X6S	X5R, B	X5R, B	X6T	X6S	X5R	X6S	X5R	X7S	X6S	X7S	X5R	X5R	X5R, B	X5R, B	X5R	X5R
100pF																										
150pF																										
220pF																										
330pF																										
470pF																										
680pF																										
820pF																										
1000pF																										
1500pF																										
2200pF																										
3300pF																										
4700pF																										
6800pF																										
10000pF																										
15000pF																										
22000pF																										
33000pF																										
47000pF																										
68000pF																										
0.10μF																										
0.15μF			p79			p79					p79	p79														
0.22μF	p79		p79			p79					p79	p79														
0.33μF			p79			p79					p79	p79														
0.47μF	p79		p79			p79					p79	p79														
0.68μF			p79			p79					p79	p79														
1.0μF		p79		p79			p79	p79	p79	p79													p80	p80	p80	
2.2μF			p79		p79										p79	p79	p79	p79	p79	p79						
4.7μF											p79	p79	p79	p79												
10μF																					p79	p79			p80	p80
22μF																										
47μF																										
100μF																										
220μF																										



Capacitance Table

p00

Each number in the Part Number List refers to the page number printed at the bottom of the page.

(→ ■ GRM Series High Dielectric Constant Type)

LxW (mm)	1.6×0.8																	
T max. (mm)	0.55						0.9						0.95					
Rated Voltage (Vdc)	16	10	6.3	250	200	100	50	25	16	10	6.3	25	16	10	50	35		
Cap. / TC Code	X5R	X6S	X5R	X7T	X6S	X7R	X7R	X7R	X7R, R	X5R, B	X7R, R	X5R, B	X7Δ, R	X6S	X5R, B	X7Δ	X5R, B	B
	X5R	X6S	X5R	X7T	X6S	X7R	X7R	X7R	X7R, R	X5R, B	X7R, R	X5R, B	X7Δ, R	X6S	X5R, B	X7Δ	X5R, B	B
100pF																		
150pF																		
220pF						p80	p80	p80	p80	p80	p80							
330pF						p80	p80	p80	p80	p80	p80							
470pF						p80	p80	p80	p80	p80	p80							
680pF						p80	p80	p80	p80	p80	p80							
820pF																		
1000pF						p80	p80	p80	p80	p80	p80							
1500pF						p80	p80	p80	p80	p80	p80							
2200pF						p80	p80	p80	p80	p80	p80							
3300pF								p80	p80	p80	p80							
4700pF								p80	p80	p80	p81							
6800pF								p80	p80	p80	p81							
10000pF								p80	p80	p80	p81	p81						
15000pF								p80	p80	p80	p81	p81						
22000pF								p80	p80	p80	p81	p81						
33000pF								p80	p80	p80	p81	p81	p81					
47000pF								p80	p80	p80	p81	p81	p81					
68000pF								p80	p80	p80	p81	p81	p81					
0.10μF						p80	p80	p80	p81		p81							
0.15μF								p80	p81	p81	p81	p81	p81					
0.22μF								p80	p80	p81	p81	p81	p81					
0.33μF													p81	p81	p81	p81		
0.47μF								p80	p81	p81	p81	p81						
0.68μF													p81	p81	p81			
1.0μF								p80	p81	p81	p81	p81						
2.2μF													p81	p81	p81	p81		
4.7μF	p80	p80	p80	p80	p80													
10μF																		
22μF																		
47μF																		
100μF																		
220μF																		



Capacitance Table

p00 Each number in the Part Number List refers to the page number printed at the bottom of the page.

(→ ■ GRM Series High Dielectric Constant Type)

p00

← Part Number List

JIS:

R

B

EIA:

X7R

X7S

X7T

X7U

X6S

X6T

X5R

LxW (mm)	1.6x0.8										2.0x1.25															
T max. (mm)	1.0										0.7	0.95														
Rated Voltage (Vdc)	25			16		10	6.3		4		16	100	50		35	25			16		10		6.3			
Cap. / TC Code	X7S	X6S	X5R	X7S	X6S	X7T	X7T	X5R, B	X6S	X5R, B	X6S	X7R	X7R, R	X5R, B	X6S	X5R	X7R, R	X6S	X5R, B	X7R, R	X6S	X5R, B	X7Δ	X5R, B	X6S	X5R, B
100pF																										
150pF																										
220pF																										
330pF																										
470pF																										
680pF																										
820pF																										
1000pF																										
1500pF																										
2200pF																										
3300pF																										
4700pF																										
6800pF																										
10000pF												p82	p82													
15000pF													p82													
22000pF																										
33000pF													p82	p82												
47000pF																										
68000pF																	p82									
0.10μF																	p82									
0.15μF																										
0.22μF																										
0.33μF												p82	p82							p82						
0.47μF																										
0.68μF																	p82									
1.0μF											p82						p82									
2.2μF	p82	p82		p82													p82	p82	p82	p82			p82			
4.7μF		p82																			p82	p82	p82			
10μF			p82		p82	p82																			p82	
22μF								p82	p82	p82	p82															
47μF																										
100μF																										
220μF																										



Capacitance Table

p00

Each number in the Part Number List refers to the page number printed at the bottom of the page.

(→ ■ GRM Series High Dielectric Constant Type)

p00

← Part Number List

JIS:

R

B

EIA:

X7R

X7S

X7T

X7U

X6S

X6T

X5R

LxW (mm)	2.0x1.25																							
T max. (mm)	0.95			1.0								1.35								1.4				
Rated Voltage (Vdc)	4	2.5	250	200	100	50	35	25	16	100	50	25		16		100	50	25	16					
Cap. / TC Code	X6S	X5R	X6T	X7R	X7R	X7R	X6S	X7S	X6S	X7S	X5R	X7R	X7R, R	X5R, B	R	X6S	X5R, B	X7R	X5R, B	X7R, R	X5R, B	X7R	X6S	
100pF																								
150pF																								
220pF																								
330pF																								
470pF																								
680pF																								
820pF																								
1000pF				p82	p83																			
1500pF				p83	p83																			
2200pF				p83	p83																			
3300pF				p83	p83																			
4700pF				p83	p83																			
6800pF				p83	p83																			
10000pF											p83													
15000pF											p83													
22000pF						p83					p83													
33000pF											p83													
47000pF											p83	p83												
68000pF											p83	p83												
0.10μF											p83	p83	p83											
0.15μF											p83	p83	p83	p83										
0.22μF					p83						p83	p83												
0.33μF					p83																			
0.47μF											p83	p83							p83					
0.68μF												p83												
1.0μF												p83	p83											
2.2μF												p83	p83											
4.7μF							p83	p83	p83	p83						p83	p83	p83						
10μF	p82																							
22μF											p83													
47μF		p82	p82																					
100μF																								
220μF																								



Capacitance Table

p00 Each number in the Part Number List refers to the page number printed at the bottom of the page.

(→ ■ GRM Series High Dielectric Constant Type)

p00 ← Part Number List

JIS:

R

B

EIA:

X7R

X7S

X7T

X7U

X6S

X6T

X5R

LxW (mm)	2.0x1.25																											
T max. (mm)	1.4						1.45																					
Rated Voltage (Vdc)	10		6.3		4		250	200	50		35		25		16		10		6.3		4							
Cap. / TC Code	X7R	B	X7R	X6S	X7U	X6S	X7R	X7R	X7S	X6S	X7S	X6S	X5R	X7S	X6S	X5R	X7S	X6S	X5R	X7T	X6S	X5R	X7T	X5R, B	X6S	X5R, B		
100pF																												
150pF																												
220pF																												
330pF																												
470pF																												
680pF																												
820pF																												
1000pF																												
1500pF																												
2200pF																												
3300pF																												
4700pF																												
6800pF																												
10000pF											p83	p83																
15000pF											p83	p83																
22000pF											p83	p83																
33000pF																												
47000pF																												
68000pF																												
0.10μF																												
0.15μF																												
0.22μF																												
0.33μF																												
0.47μF																												
0.68μF																												
1.0μF																												
2.2μF																												
4.7μF	p83										p84	p84	p84			p84												
10μF	p83		p83											p84	p84	p84	p84		p84									
22μF		p83		p83	p83	p83											p84			p84	p84	p84	p84	p84	p84			
47μF																							p84		p84	p84		
100μF																												
220μF																												



Capacitance Table

p00

Each number in the Part Number List refers to the page number printed at the bottom of the page.

(→ ■ GRM Series High Dielectric Constant Type)

p00

← Part Number List

JIS:

R

B

EIA:

X7R

X7S

X7T

X7U

X6S

X6T

X5R

LxW (mm)	3.2x1.6																								
T max. (mm)	0.95						1.0	1.25						1.3	1.8										
Rated Voltage (Vdc)	35	25	16	10	6.3		630	1000	630	250	200	50	25	100	1000	630	250	200	100	50	25	16			
Cap. / TC Code	X5R	R	X5R, B	X5R, B	X6S	X5R, B	X7R	X7R	X7R	X7R	X7R	B	X5R	X7R	X7R	X7R	X7R	X7R	X7R	X7R	X5R, B	X7R	X5R, B	X7R	X6S
100pF																									
150pF																									
220pF																									
330pF																									
470pF								p84																	
680pF								p84																	
820pF																									
1000pF							p84	p84																	
1500pF							p84	p84																	
2200pF							p84	p84																	
3300pF							p84	p84																	
4700pF							p84	p84																	
6800pF							p84		p84						p84										
10000pF							p84								p84										
15000pF									p84	p84							p84								
22000pF									p84	p84							p84								
33000pF																	p84	p84							
47000pF																	p84	p84							
68000pF									p84	p84															
0.10μF																	p84	p84							
0.15μF																									
0.22μF																									
0.33μF		p84																							
0.47μF											p84			p84											
0.68μF											p84			p84											
1.0μF											p84	p84							p84						
2.2μF																			p84	p84					
4.7μF																			p84	p84	p84		p84		
10μF	p84		p84	p84									p84							p84	p84	p84	p84		
22μF			p84	p84	p84	p84	p84	p84												p84	p84	p84	p84		p85
47μF																									
100μF																									
220μF																									



Capacitance Table

p00

Each number in the Part Number List refers to the page number printed at the bottom of the page.

(→ ■ GRM Series High Dielectric Constant Type)

p00

← Part Number List

JIS:

R

B

EIA:

X7R

X7S

X7T

X7U

X6S

X6T

X5R

LxW (mm)	3.2x1.6															3.2x2.5									
T max. (mm)	1.8								1.9							1.5				1.8	2.0				2.2
Rated Voltage (Vdc)	16	10	6.3		4		100	25	16	6.3		4			1000	630	250	200	100	1000	630	250	200	25	
Cap. / TC Code	X5R, B	X7R	X5R, B	X7Δ	X6S	X5R, B	X7U	X6S	X7R	X6S	X7S	X6T	X5R	X7U	X6T	X5R	X7R	X7R	X7R	X7R	X7R	X7R	X7R	X7R	
100pF																									
150pF																									
220pF																									
330pF																									
470pF																									
680pF																									
820pF																									
1000pF																									
1500pF																									
2200pF																									
3300pF																									
4700pF																									
6800pF																p85									
10000pF																p85									
15000pF																				p85					
22000pF																	p85								
33000pF																					p85				
47000pF																					p85				
68000pF																		p85	p85						
0.10μF																						p85	p85		
0.15μF																						p85	p85		
0.22μF																						p85	p85		
0.33μF																									
0.47μF																									
0.68μF																									
1.0μF																				p85					
2.2μF									p85																
4.7μF																									
10μF																								p85	
22μF	p85	p85	p85		p85					p84	p85														
47μF			p85	p85	p85	p85	p85	p85	p85																
100μF												p85	p85	p85	p85	p85									
220μF																p85									



Capacitance Table

p00

Each number in the Part Number List refers to the page number printed at the bottom of the page.

(→ ■ GRM Series High Dielectric Constant Type)

p00

← Part Number List

JIS:

R

B

EIA:

X7R

X7S

X7T

X7U

X6S

X6T

X5R

LxW (mm)	3.2x2.5																4.5x3.2								5.7x5.0	
T max. (mm)	2.7																1.5			2.0				2.0		
Rated Voltage (Vdc)	100	80	63	50		35		25		16		10		6.3		4	630	250	200	1000	630	250	200	1000	630	
Cap. / TC Code	X7R	X7R	X7R	X7R	X5R, B	X7R	X5R, B	X7R	X5R, B	X7R	X6S	X5R, B	X7R	X5R, B	X7Δ	X5R, B	X7U	X7R	X7R	X7R	X7R	X7R	X7R	X7R	X7R	
100pF																										
150pF																										
220pF																										
330pF																										
470pF																										
680pF																										
820pF																										
1000pF																										
1500pF																										
2200pF																										
3300pF																										
4700pF																										
6800pF																										
10000pF																										
15000pF																										
22000pF																										
33000pF																					p85					
47000pF																					p85					
68000pF																		p85						p85		
0.10μF																						p85				
0.15μF																			p85	p85					p85	
0.22μF																							p85	p85		
0.33μF																							p85	p85		
0.47μF																							p85	p85		
0.68μF																										
1.0μF																										
2.2μF	p85																									
4.7μF		p85			p85																					
10μF			p85	p85	p85	p85	p85	p85	p85																	
22μF								p85	p85	p85	p85															
47μF											p85	p85	p85	p85	p85											
100μF													p85	p85	p85	p85										
220μF																										



Capacitance Table

p00

Each number in the Part Number List refers to the page number printed at the bottom of the page.

(→ ■ GRM Series High Dielectric Constant Type)

p00

← Part Number List

JIS:

R

B

EIA:

X7R

X7S

X7T

X7U

X6S

X6T

X5R

LxW (mm)	5.7x5.0	
T max. (mm)	2.0	
Rated Voltage (Vdc)	250	200
Cap. / TC Code	X7R	X7R
100pF		
150pF		
220pF		
330pF		
470pF		
680pF		
820pF		
1000pF		
1500pF		
2200pF		
3300pF		
4700pF		
6800pF		
10000pF		
15000pF		
22000pF		
33000pF		
47000pF		
68000pF		
0.10μF		
0.15μF		
0.22μF		
0.33μF	p85	p86
0.47μF	p86	p86
0.68μF	p86	p86
1.0μF	p86	p86
2.2μF		
4.7μF		
10μF		
22μF		
47μF		
100μF		
220μF		

Capacitance Table

Each number in the Part Number List refers to the page number printed at the bottom of the page.

GJM Series Temperature Compensating Type

← Part Number List JIS: CK CJ CH EIA: C0G

L×W (mm)	0.4×0.2		0.6×0.3		1.0×0.5	
T max. (mm)	0.22		0.33		0.55	
Rated Voltage (Vdc)	25		25		50	
Cap. / TC Code	C0G	CΔ	C0G	CΔ	C0G	CΔ
0.10pF					p101	p104
0.20pF	p88	p91	p94	p97	p101	p104
1.0pF	p88	p91	p94	p98	p101	p105
2.0pF	p88	p91	p95	p98	p101	p105
3.0pF	p88	p91	p95	p98	p102	p105
4.0pF	p89	p92	p95	p98	p102	p105
5.0pF	p89	p92	p95	p99	p102	p106
6.0pF	p89	p92	p96	p99	p102	p106
7.0pF	p90	p93	p96	p99	p103	p106
8.0pF	p90	p93	p96	p100	p103	p107
9.0pF	p90	p94	p97	p100	p104	p107
10pF	p91	p94	p97	p101	p104	p107
11pF	p91	p94	p97	p101	p104	p107
12pF	p91	p94	p97	p101	p104	p108
13pF	p91	p94	p97	p101	p104	p108
15pF	p91	p94	p97	p101	p104	p108
16pF	p91	p94	p97	p101	p104	p108
18pF	p91	p94	p97	p101	p104	p108
20pF	p91	p94	p97	p101	p104	p108
22pF	p91	p94	p97	p101	p104	p108
24pF			p97	p101	p104	p108
27pF			p97	p101	p104	p108
30pF			p97	p101	p104	p108
33pF			p97	p101	p104	p108
36pF					p104	p108
39pF					p104	p108
43pF					p104	p108
47pF					p104	p108

The indication for every 0.1 pF has been omitted for less than 10 pF. Refer to the Part Number List for details.

Capacitance Table

p00

Each number in the Part Number List refers to the page number printed at the bottom of the page.

■ GMA Series High Dielectric Constant Type

p00

← Part Number List

JIS:

R

B

EIA:

X7R

X5R

L×W (mm)	0.38×0.38			0.5×0.5								0.8×0.8							
T max. (mm)	0.35			0.4								0.6							
Rated Voltage (Vdc)	10			100	25		10			6.3		100	25		10			6.3	
Cap. / TC Code	X7R	R	B	X7R	X7R	B	X7R	R	B	X5R	B	X7R	X7R	B	X7R	R	B	X5R	B
100pF				p110															
150pF				p110															
220pF				p110															
330pF				p110															
470pF				p110															
680pF				p110															
1000pF	p110	p110	p110	p110															
1500pF	p110	p110	p110		p110	p110						p110							
1800pF	p110	p110	p110																
2200pF					p110	p110						p110							
3300pF					p110	p110						p110							
4700pF					p110	p110						p110							
6800pF							p110	p110	p110			p110							
10000pF	p110	p110					p110	p110	p110				p110	p110					
15000pF							p110	p110	p110				p110	p110					
22000pF							p110	p110	p110				p110	p110					
33000pF															p110	p110	p110		
47000pF															p110	p110	p110		
68000pF															p110	p110	p110		
0.10μF										p110	p110				p110	p110	p110		
0.47μF																		p110	p110

Capacitance Table

p00

Each number in the Part Number List refers to the page number printed at the bottom of the page.

■ GMD Series High Dielectric Constant Type

p00

← Part Number List

JIS:

R

B

EIA:

X7R

X5R

LxW (mm)	0.6x0.3										1.0x0.5											
T max. (mm)	0.33										0.55											
Rated Voltage (Vdc)	25			16			10			6.3		50			25			16			10	
Cap. / TC Code	X7R	R	B	X7R	R	B	X7R	R	B	X5R	B	X7R	R	B	X7R	R	B	X7R	R	B	X5R	B
100pF	p112	p112	p112																			
120pF	p112	p112	p112																			
150pF	p112	p112	p112																			
180pF	p112	p112	p112																			
220pF	p112	p112	p112									p112	p112	p113								
270pF	p112	p112	p112									p112	p113	p113								
330pF	p112	p112	p112									p112	p113	p113								
390pF	p112	p112	p112									p112	p113	p113								
470pF	p112	p112	p112									p112	p113	p113								
560pF	p112	p112	p112									p112	p113	p113								
680pF	p112	p112	p112									p112	p113	p113								
820pF	p112	p112	p112									p112	p113	p113								
1000pF	p112	p112	p112									p112	p113	p113								
1200pF	p112	p112	p112									p112	p113	p113								
1500pF	p112	p112	p112									p112	p113	p113								
1800pF				p112	p112	p112						p112	p113	p113								
2200pF				p112	p112	p112						p112	p113	p113								
2700pF				p112	p112	p112						p112	p113	p113								
3300pF				p112	p112	p112						p112	p113	p113								
3900pF							p112	p112	p112			p112	p113	p113								
4700pF							p112	p112	p112			p112	p113	p113								
5600pF							p112	p112	p112						p113	p113	p113					
6800pF							p112	p112	p112						p113	p113	p113					
8200pF							p112	p112	p112						p113	p113	p113					
10000pF							p112	p112	p112						p113	p113	p113					
12000pF															p113	p113	p113					
15000pF															p113	p113	p113					
18000pF															p113	p113	p113					
22000pF															p113	p113	p113					
27000pF															p113	p113	p113					
33000pF															p113	p113	p113					
39000pF															p113	p113	p113					
47000pF															p113	p113	p113					
56000pF										p112	p112							p113	p113	p113		
68000pF										p112	p112							p113	p113	p113		
82000pF										p112	p112							p113	p113	p113		
0.10μF										p112	p112							p113	p113	p113		
0.12μF																					p113	p113
0.15μF																					p113	p113
0.18μF																					p113	p113
0.22μF																					p113	p113
0.27μF																					p113	p113
0.33μF																					p113	p113
0.39μF																					p113	p113
0.47μF																					p113	p113

Capacitance Table

p00

Each number in the Part Number List refers to the page number printed at the bottom of the page.

■ GQM Series Temperature Compensating Type

p00

← Part Number List

JIS:

CK

CJ

CH

EIA:

C0G

LxW (mm)	1.6x0.8					2.0x1.25					2.8x2.8
T max. (mm)	0.8	0.9				0.95				1.0	1.35
Rated Voltage (Vdc)	250	100		50		100		50		250	500
Cap. / TC Code	C0G	C0G	CΔ	C0G	CH	C0G	CΔ	C0G	CH	C0G	C0G
1.0pF	p115	p115	p116			p117	p118			p120	p121
2.0pF	p115	p116	p116			p118	p118			p120	p121
3.0pF	p115	p116	p116			p118	p118			p120	p121
4.0pF	p115	p116	p116			p118	p118			p120	p121
5.0pF	p115	p116	p116			p118	p118			p120	p121
6.0pF	p115	p116	p116			p118	p119			p120	p121
7.0pF	p115			p116	p117	p118	p119			p120	p121
8.0pF	p115			p116	p117	p118	p119			p120	p121
9.0pF	p115			p116	p117	p118	p119			p120	p121
10pF	p115			p116	p117	p118	p119			p120	p121
11pF	p115			p116	p117	p118	p119			p120	p121
12pF	p115			p116	p117	p118	p119			p120	p121
13pF	p115			p116	p117	p118	p119			p120	p121
15pF	p115			p116	p117	p118	p119			p120	p121
16pF	p115			p116	p117	p118	p119			p120	p121
18pF	p115			p117	p117	p118	p119			p120	p121
20pF	p115			p117	p117			p119	p119	p120	p121
22pF	p115			p117	p117			p119	p119	p120	p121
24pF	p115			p117	p117			p119	p119	p120	p121
27pF	p115			p117	p117			p119	p119	p120	p121
30pF	p115			p117	p117			p119	p119	p120	p121
33pF	p115			p117	p117			p119	p119	p120	p121
36pF	p115			p117	p117			p119	p119	p120	p121
39pF	p115			p117	p117			p119	p119	p120	p121
43pF	p115			p117	p117			p119	p119	p120	p121
47pF	p115			p117	p117			p119	p119	p120	p121
51pF				p117	p117			p119	p119	p120	p121
56pF				p117	p117			p119	p119	p120	p121
62pF				p117	p117			p119	p119	p120	p121
68pF				p117	p117			p119	p119	p120	p122
75pF				p117	p117			p119	p119	p120	p122
82pF				p117	p117			p119	p119	p120	p122
91pF				p117	p117			p119	p119	p120	p122
100pF				p117	p117			p119	p119	p121	p122

The indication for every 0.1 pF has been omitted for less than 10 pF. Refer to the Part Number List for details.

Capacitance Table

p00

Each number in the Part Number List refers to the page number printed at the bottom of the page.

■ GRJ Series High Dielectric Constant Type

p00

← Part Number List

EIA:

X7R

X7S

LxW (mm)	2.0x1.25		3.2x1.6						3.2x2.5											
T max. (mm)	1.0	1.45	1.25			1.8			1.5			2.0			2.3	2.8				
Rated Voltage (Vdc)	250	250	1000	630	250	1000	630	250	1000	630	250	1000	630	250	100	50	25	16	10	6.3
Cap. / TC Code	X7R	X7R	X7R	X7R	X7R	X7R	X7R	X7R	X7R	X7R	X7R	X7R	X7R	X7R	X7R	X7R	X7S	X7R	X7R	X7R
470pF			p124																	
680pF			p124																	
1000pF	p124		p124	p124																
1500pF	p124		p124	p124																
2200pF	p124		p124	p124																
3300pF	p124		p124	p124																
4700pF	p124		p124	p124																
6800pF	p124			p124		p124			p124											
10000pF		p124		p124		p124			p124											
15000pF		p124			p124		p124					p124								
22000pF		p124			p124		p124			p124		p124								
33000pF								p124					p124							
47000pF								p124					p124							
68000pF				p124						p124										
0.10μF								p124							p124					
0.15μF										p124										
0.22μF															p124					
0.33μF																				
0.47μF																				
0.68μF																				
1.0μF																				
2.2μF															p124					
4.7μF																p124				
10μF																	p124	p124		
22μF																		p124	p124	
47μF																				p124



LxW (mm)	4.5x3.2					5.7x5.0		
T max. (mm)	1.5		2.0			2.0		
Rated Voltage (Vdc)	630	250	1000	630	250	1000	630	250
Cap. / TC Code	X7R	X7R	X7R	X7R	X7R	X7R	X7R	X7R
33000pF			p124					
47000pF			p124					
68000pF	p124					p124		
0.10μF				p124		p124		
0.15μF		p124					p124	
0.22μF					p124		p124	
0.33μF					p124			p124
0.47μF					p124			p124
0.68μF								p124
1.0μF								p124

Capacitance Table

Each number in the Part Number List refers to the page number printed at the bottom of the page.

GR3 Series High Dielectric Constant Type

p00 ← Part Number List EIA: X7T

L×W (mm)	2.0×1.25		3.2×1.6									3.2×2.5					4.5×3.2				5.7×5.0					
T max. (mm)	1.0	1.45	1.0		1.25			1.8			1.5		2.0			1.5	2.0		2.0			2.7				
Rated Voltage (Vdc)	250	250	450	250	630	450	250	630	450	250	630	250	630	450	250	250	630	450	250	630	450	250	630	450	250	
Cap. / TC Code	X7T	X7T	X7T	X7T	X7T	X7T	X7T	X7T	X7T	X7T	X7T	X7T	X7T	X7T	X7T	X7T	X7T	X7T	X7T	X7T	X7T	X7T	X7T	X7T	X7T	
10000pF	p126		p126		p126																					
15000pF	p126		p126				p126																			
22000pF		p126			p126					p126																
33000pF			p126		p126							p126														
47000pF						p126		p126					p126													
68000pF									p126					p126			p126									
0.10μF											p126			p126					p126							
0.15μF														p126			p126		p126							
0.22μF																p126				p126			p126			
0.27μF																						p126				
0.33μF																		p126		p126						
0.47μF																			p126	p126						
0.56μF																							p126			
0.68μF																				p126						
1.0μF																									p126	

Capacitance Table

p00

Each number in the Part Number List refers to the page number printed at the bottom of the page.

KRM Series High Dielectric Constant Type

p00

← Part Number List

EIA:

X7R

X6S

X5R

LxW (mm)	3.5x1.7					3.6x1.7	3.7x1.85	6.1x5.3														
T max. (mm)	2.0	2.9				2.9	2.9	3.0								3.9					5.0	
Rated Voltage (Vdc)	25	100	50	35	25	50	100	1000	630	250	100	63	50	35	25	100	63	50	35	25	1000	630
Cap. / TC Code	X5R	X7R	X7R	X6S	X6S	X7R	X7R	X7R	X7R	X7R	X7R	X7R	X7R	X7R	X7R	X7R	X7R	X7R	X7R	X7R	X7R	X7R
68000pF								p129														
0.10μF								p129														
0.15μF									p129													p129
0.22μF									p129													p129
0.33μF																						p129
0.47μF																						p129
0.68μF										p129												
1.0μF		p129								p129												
1.5μF																						
2.2μF						p129	p129															
4.7μF			p129								p129	p129	p129									
6.8μF																p129						
10μF	p129			p129	p129									p129	p129		p129					
15μF															p129	p129						
17μF																		p129	p129			
22μF																			p129	p129		
33μF																				p129		
47μF																						
68μF																						



LxW (mm)	6.1x5.3									
T max. (mm)	5.0					6.7				
Rated Voltage (Vdc)	250	100	50	35	25	100	63	50	35	25
Cap. / TC Code	X7R	X7R	X7R	X7R	X7R	X7R	X7R	X7R	X7R	X7R
68000pF										
0.10μF										
0.15μF										
0.22μF										
0.33μF										
0.47μF										
0.68μF										
1.0μF										
1.5μF	p129									
2.2μF	p129									
4.7μF										
6.8μF										
10μF		p129								
15μF						p129				
17μF										
22μF			p129	p129			p129			
33μF				p129	p129			p129		
47μF									p129	p129
68μF										p129

Capacitance Table

p00

Each number in the Part Number List refers to the page number printed at the bottom of the page.

■ KR3 Series High Dielectric Constant Type

p00

← Part Number List

EIA:

X7T

LxW (mm)	6.1x5.3										
T max. (mm)	3.0			3.9			5.0		6.7		
Rated Voltage (Vdc)	630	450	250	630	450	250	450	250	630	450	250
Cap. / TC Code	X7T	X7T	X7T	X7T	X7T	X7T	X7T	X7T	X7T	X7T	X7T
0.10μF	p132										
0.15μF	p132										
0.22μF		p132		p132							
0.27μF				p132							
0.33μF		p132									
0.47μF		p132	p132						p132		
0.56μF					p132				p132		
0.68μF			p132				p132				
1.0μF						p132	p132				
1.2μF										p132	
1.5μF								p132			
2.2μF											p132

■ LLA Series High Dielectric Constant Type

p00

← Part Number List

EIA:

X7R

X7S

LxW (mm)	1.6×0.8	2.0×1.25										3.2×1.6							
T max. (mm)	0.55	0.55					0.95					0.55			0.95		1.25		
Rated Voltage (Vdc)	4	25	16	10	6.3	4	25	16	10	6.3	4	16	10	6.3	16	10	16	10	
Cap. / TC Code	X7S	X7R	X7R	X7R	X7R	X7S	X7R	X7R	X7R	X7R	X7S	X7R	X7R	X7R	X7R	X7R	X7R	X7R	
10000pF		p134					p134												
22000pF		p134					p134												
47000pF			p134				p134												
0.10μF	p134		p134					p134											
0.22μF	p134			p134				p134				p134							
0.47μF	p134				p134				p134				p134		p134				
1.0μF						p134				p134				p134		p134	p134		
2.2μF	p134										p134			p134				p134	
4.7μF						p134													

Capacitance Table

p00

Each number in the Part Number List refers to the page number printed at the bottom of the page.

■ LLL Series High Dielectric Constant Type

p00

← Part Number List

EIA:

X7R

X7S

X6S

X5R

LxW (mm)	0.5x1.0			0.6x1.0	0.8x1.6										1.25x2.0									
T max. (mm)	0.35			0.45	0.5				0.55	0.6					0.5								0.7	
Rated Voltage (Vdc)	6.3	4		4	25	16	10	4	4	50	25	16	10	4	50	25	16	10	6.3	4	50	25		
Cap. / TC Code	X6S	X7S	X6S	X5R	X7R	X7R	X7R	X7S	X7S	X7R	X7R	X7R	X7R	X7S	X7R	X7R	X7R	X7R	X7R	X7S	X7R	X7R		
2200pF										p136														
4700pF										p136														
10000pF					p136						p136				p136						p136			
22000pF						p136					p136					p136					p136			
47000pF						p136						p136					p136					p136		
0.10µF	p136						p136						p136				p136					p136		
0.22µF	p136							p136					p136					p136				p136		
0.47µF		p136												p136					p136					
1.0µF			p136																	p136				
2.2µF									p136															
4.3µF				p136																				
4.7µF																								
10µF																								



LxW (mm)	1.25x2.0				1.6x3.2														
T max. (mm)	0.7	0.95			0.5				0.8					1.25					
Rated Voltage (Vdc)	10	16	10	4	50	25	16	10	50	25	16	10	6.3	50	25	16	10	6.3	
Cap. / TC Code	X7R	X7R	X7R	X7S	X7R	X7R	X7R	X7R	X7R	X7R	X7R	X7R	X7R	X7R	X7R	X7R	X7R	X7R	
2200pF																			
4700pF																			
10000pF					p136				p136										
22000pF					p136				p136										
47000pF						p136			p136										
0.10μF						p136				p136				p136					
0.22μF	p136	p136					p136				p136				p136				
0.47μF			p136					p136			p136				p136				
1.0μF			p136									p136				p136			
2.2μF				p136									p136				p136		
4.3μF																			
4.7μF																	p136		
10μF																		p136	

■ LLM Series High Dielectric Constant Type

p00

← Part Number List

EIA:

X7R

X7S

LxW (mm)	2.0×1.25		3.2×1.6		
T max. (mm)	0.55		0.55		
Rated Voltage (Vdc)	6.3	4	16	10	6.3
Cap. / TC Code	X7R	X7S	X7R	X7R	X7R
0.10μF			p138		
0.22μF	p138		p138		
0.47μF	p138			p138	
1.0μF		p138			
2.2μF					p138

■ LLR Series High Dielectric Constant Type

p00

← Part Number List

EIA:

X7S

LxW (mm)	0.8×1.6	
T max. (mm)	0.55	
Rated Voltage (Vdc)	4	
TC Code	X7S	
Cap. / ESR (mΩ)	100	220
1.0μF	p140	p140
	p140	p140

Search Capacitors

Specifications and Test Methods, Package, Chart of Characteristic Data, please refer to the search web page.

<http://www.murata.com/products/capacitor/>

Data Sheet

The product details page can be output in PDF.

Status and Features Icons

The status and features of products can be checked at once. When ? is clicked, a description of each icon will be displayed.

Characteristics & Applications

This links to the introduction page of each series.

Detailed Specifications Sheet

- Rated value
- Specifications and Test Methods
- Package
- Caution, Notice (Storage, Soldering and Mounting,etc.)

Characteristics Data

The following characteristics data of the main products can be acquired.

- SPICE Netlist (mod type)
- S parameter (S2P type)
- Reliability Test Data *Typical data

- Shape (Dimensions)
- Rated Values

- Specification by Packaging Code/ Minimum Order Quantity
- Weight (1 pc/ø180mm reel)

Chart of Characteristic Data

The main products published characteristic data.

- Frequency characteristics (ESR, Impedance)
- S parameter (Smith chart S11)
- DC bias characteristics
- AC voltage characteristics
- Capacitance - temperature characteristics
- Calorific property by ripple current

Design Tools SimSurfing

The SimSurfing design tools are useful for displaying the graph, downloading CSV data and overwriting the product number graph.



For General Purpose

GRM Series



This is Murata primary products renowned for both small size and large capacitance value with latest advanced technology.

Features

① Achieves large-capacity and small size in a multilayer structure.



② Sn plating is applied to the external electrodes; excellent solderability.

③ High reliability with no polarity.

	Ceramic Capacitor	Tantalum Capacitor	Aluminum Electrolytic Capacitor	Conductive Polymer Capacitor
Price	○	○	◎	○
Comparison between Impedance Frequency Characteristics	◎	△	△	○
Capacitance temperature characteristics	○	◎	○	○
DC breakdown voltage	◎	△	△	△
Polarity	No	Yes	Yes	Yes
Pulse response	◎	△	△	○
Allowable ripple current	◎	△	△	△
Reliability	◎	○	○	○
DC bias characteristics	△	◎	◎	◎

◎: Particularly excellent ○: Excellent △: Inferior

Specifications

Size	0.4×0.2mm to 5.7×5.0mm
Rated Voltage	DC2.5V to 3.15kV
Capacitance	0.1pF to 220μF
Main Applications	1. Rated voltage 100V Max. High Dielectric Constant Type . . . For decoupling and smoothing circuits Temperature Compensating Type . . . For tuning circuits, oscillating circuits, and high frequency filter circuits 2. Rated voltage 200V min. High Dielectric Constant Type . . . For clamp snubber circuits and smoothing circuits Temperature Compensating Type . . . Power supply damper snubber



This catalog contains only a portion of the product lineup.
 Please refer to the capacitor search tool on the Murata Web site for details.

GRM Series

GJM Series

GMA Series

GMD Series

GQM Series

GRJ Series

GR3 Series

KRM Series

KR3 Series

LLA Series

LLL Series

LLM Series

LLR Series

⚠Caution/
Notice

GRM Series Temperature Compensating Type Part Number List

(→ ■ 1.6×0.8mm)

T max.	Rated Voltage	TC Code	Cap.	Tol.	Part Number	
0.9mm	100Vdc	CJ	2.9pF	±0.25pF	GRM1883C2A2R9CA01#	
				±0.05pF	GRM1883C2A3R0WA01#	
				±0.1pF	GRM1883C2A3R0BA01#	
				±0.25pF	GRM1883C2A3R0CA01#	
			3.1pF	±0.05pF	GRM1883C2A3R1WA01#	
				±0.1pF	GRM1883C2A3R1BA01#	
				±0.25pF	GRM1883C2A3R1CA01#	
			3.2pF	±0.05pF	GRM1883C2A3R2WA01#	
				±0.1pF	GRM1883C2A3R2BA01#	
				±0.25pF	GRM1883C2A3R2CA01#	
			3.3pF	±0.05pF	GRM1883C2A3R3WA01#	
				±0.1pF	GRM1883C2A3R3BA01#	
				±0.25pF	GRM1883C2A3R3CA01#	
			3.4pF	±0.05pF	GRM1883C2A3R4WA01#	
				±0.1pF	GRM1883C2A3R4BA01#	
				±0.25pF	GRM1883C2A3R4CA01#	
			3.5pF	±0.05pF	GRM1883C2A3R5WA01#	
				±0.1pF	GRM1883C2A3R5BA01#	
				±0.25pF	GRM1883C2A3R5CA01#	
			3.6pF	±0.05pF	GRM1883C2A3R6WA01#	
				±0.1pF	GRM1883C2A3R6BA01#	
				±0.25pF	GRM1883C2A3R6CA01#	
			3.7pF	±0.05pF	GRM1883C2A3R7WA01#	
				±0.1pF	GRM1883C2A3R7BA01#	
				±0.25pF	GRM1883C2A3R7CA01#	
			3.8pF	±0.05pF	GRM1883C2A3R8WA01#	
				±0.1pF	GRM1883C2A3R8BA01#	
				±0.25pF	GRM1883C2A3R8CA01#	
			3.9pF	±0.05pF	GRM1883C2A3R9WA01#	
				±0.1pF	GRM1883C2A3R9BA01#	
				±0.25pF	GRM1883C2A3R9CA01#	
		CH	4.0pF	±0.05pF	GRM1882C2A4R0WA01#	
				±0.1pF	GRM1882C2A4R0BA01#	
				±0.25pF	GRM1882C2A4R0CA01#	
			4.1pF	±0.05pF	GRM1882C2A4R1WA01#	
				±0.1pF	GRM1882C2A4R1BA01#	
				±0.25pF	GRM1882C2A4R1CA01#	
			4.2pF	±0.05pF	GRM1882C2A4R2WA01#	
				±0.1pF	GRM1882C2A4R2BA01#	
				±0.25pF	GRM1882C2A4R2CA01#	
			4.3pF	±0.05pF	GRM1882C2A4R3WA01#	
				±0.1pF	GRM1882C2A4R3BA01#	
				±0.25pF	GRM1882C2A4R3CA01#	
			4.4pF	±0.05pF	GRM1882C2A4R4WA01#	
				±0.1pF	GRM1882C2A4R4BA01#	
				±0.25pF	GRM1882C2A4R4CA01#	
			4.5pF	±0.05pF	GRM1882C2A4R5WA01#	
				±0.1pF	GRM1882C2A4R5BA01#	
				±0.25pF	GRM1882C2A4R5CA01#	
			4.6pF	±0.05pF	GRM1882C2A4R6WA01#	
				±0.1pF	GRM1882C2A4R6BA01#	
				±0.25pF	GRM1882C2A4R6CA01#	
			4.7pF	±0.05pF	GRM1882C2A4R7WA01#	
				±0.1pF	GRM1882C2A4R7BA01#	

T max.	Rated Voltage	TC Code	Cap.	Tol.	Part Number	
0.9mm	100Vdc	CH	4.7pF	±0.25pF	GRM1882C2A4R7CA01#	
				±0.05pF	GRM1882C2A4R8WA01#	
				±0.1pF	GRM1882C2A4R8BA01#	
				±0.25pF	GRM1882C2A4R8CA01#	
			4.9pF	±0.05pF	GRM1882C2A4R9WA01#	
				±0.1pF	GRM1882C2A4R9BA01#	
				±0.25pF	GRM1882C2A4R9CA01#	
			5.0pF	±0.05pF	GRM1882C2A5R0WA01#	
				±0.1pF	GRM1882C2A5R0BA01#	
				±0.25pF	GRM1882C2A5R0CA01#	
			5.1pF	±0.05pF	GRM1882C2A5R1WA01#	
				±0.1pF	GRM1882C2A5R1BA01#	
				±0.25pF	GRM1882C2A5R1CA01#	
			5.2pF	±0.05pF	GRM1882C2A5R2WA01#	
				±0.1pF	GRM1882C2A5R2BA01#	
				±0.25pF	GRM1882C2A5R2CA01#	
			5.3pF	±0.05pF	GRM1882C2A5R3WA01#	
				±0.1pF	GRM1882C2A5R3BA01#	
				±0.25pF	GRM1882C2A5R3CA01#	
			5.4pF	±0.05pF	GRM1882C2A5R4WA01#	
				±0.1pF	GRM1882C2A5R4BA01#	
				±0.25pF	GRM1882C2A5R4CA01#	
			5.5pF	±0.05pF	GRM1882C2A5R5WA01#	
				±0.1pF	GRM1882C2A5R5BA01#	
				±0.25pF	GRM1882C2A5R5CA01#	
			5.6pF	±0.05pF	GRM1882C2A5R6WA01#	
				±0.1pF	GRM1882C2A5R6BA01#	
				±0.25pF	GRM1882C2A5R6CA01#	
			5.7pF	±0.05pF	GRM1882C2A5R7WA01#	
				±0.1pF	GRM1882C2A5R7BA01#	
				±0.25pF	GRM1882C2A5R7CA01#	
			5.8pF	±0.05pF	GRM1882C2A5R8WA01#	
				±0.1pF	GRM1882C2A5R8BA01#	
				±0.25pF	GRM1882C2A5R8CA01#	
			5.9pF	±0.05pF	GRM1882C2A5R9WA01#	
				±0.1pF	GRM1882C2A5R9BA01#	
				±0.25pF	GRM1882C2A5R9CA01#	
			6.0pF	±0.05pF	GRM1882C2A6R0WA01#	
				±0.1pF	GRM1882C2A6R0BA01#	
				±0.25pF	GRM1882C2A6R0CA01#	
			6.1pF	±0.05pF	GRM1882C2A6R1WA01#	
				±0.1pF	GRM1882C2A6R1BA01#	
				±0.25pF	GRM1882C2A6R1CA01#	
			6.2pF	±0.05pF	GRM1882C2A6R2WA01#	
				±0.1pF	GRM1882C2A6R2BA01#	

Part number # indicates the package specification code.

GRM Series Temperature Compensating Type Part Number List

(→ ■ 1.6×0.8mm)

T max.	Rated Voltage	TC Code	Cap.	Tol.	Part Number	
0.9mm	100Vdc	CH	6.2pF	±0.05pF	GRM1882C2A6R2WA01#	
				±0.1pF	GRM1882C2A6R2BA01#	
				±0.25pF	GRM1882C2A6R2CA01#	
				±0.5pF	GRM1882C2A6R2DA01#	
			6.3pF	±0.05pF	GRM1882C2A6R3WA01#	
				±0.1pF	GRM1882C2A6R3BA01#	
				±0.25pF	GRM1882C2A6R3CA01#	
				±0.5pF	GRM1882C2A6R3DA01#	
			6.4pF	±0.05pF	GRM1882C2A6R4WA01#	
				±0.1pF	GRM1882C2A6R4BA01#	
				±0.25pF	GRM1882C2A6R4CA01#	
				±0.5pF	GRM1882C2A6R4DA01#	
			6.5pF	±0.05pF	GRM1882C2A6R5WA01#	
				±0.1pF	GRM1882C2A6R5BA01#	
				±0.25pF	GRM1882C2A6R5CA01#	
				±0.5pF	GRM1882C2A6R5DA01#	
			6.6pF	±0.05pF	GRM1882C2A6R6WA01#	
				±0.1pF	GRM1882C2A6R6BA01#	
				±0.25pF	GRM1882C2A6R6CA01#	
				±0.5pF	GRM1882C2A6R6DA01#	
			6.7pF	±0.05pF	GRM1882C2A6R7WA01#	
				±0.1pF	GRM1882C2A6R7BA01#	
				±0.25pF	GRM1882C2A6R7CA01#	
				±0.5pF	GRM1882C2A6R7DA01#	
			6.8pF	±0.05pF	GRM1882C2A6R8WA01#	
				±0.1pF	GRM1882C2A6R8BA01#	
				±0.25pF	GRM1882C2A6R8CA01#	
				±0.5pF	GRM1882C2A6R8DA01#	
			6.9pF	±0.05pF	GRM1882C2A6R9WA01#	
				±0.1pF	GRM1882C2A6R9BA01#	
				±0.25pF	GRM1882C2A6R9CA01#	
				±0.5pF	GRM1882C2A6R9DA01#	
			7.0pF	±0.05pF	GRM1882C2A7R0WA01#	
				±0.1pF	GRM1882C2A7R0BA01#	
				±0.25pF	GRM1882C2A7R0CA01#	
				±0.5pF	GRM1882C2A7R0DA01#	
			7.1pF	±0.05pF	GRM1882C2A7R1WA01#	
				±0.1pF	GRM1882C2A7R1BA01#	
				±0.25pF	GRM1882C2A7R1CA01#	
				±0.5pF	GRM1882C2A7R1DA01#	
			7.2pF	±0.05pF	GRM1882C2A7R2WA01#	
				±0.1pF	GRM1882C2A7R2BA01#	
				±0.25pF	GRM1882C2A7R2CA01#	
				±0.5pF	GRM1882C2A7R2DA01#	
			7.3pF	±0.05pF	GRM1882C2A7R3WA01#	
				±0.1pF	GRM1882C2A7R3BA01#	
				±0.25pF	GRM1882C2A7R3CA01#	
				±0.5pF	GRM1882C2A7R3DA01#	
			7.4pF	±0.05pF	GRM1882C2A7R4WA01#	
				±0.1pF	GRM1882C2A7R4BA01#	
				±0.25pF	GRM1882C2A7R4CA01#	
				±0.5pF	GRM1882C2A7R4DA01#	
			7.5pF	±0.05pF	GRM1882C2A7R5WA01#	
				±0.1pF	GRM1882C2A7R5BA01#	

T max.	Rated Voltage	TC Code	Cap.	Tol.	Part Number	
0.9mm	100Vdc	CH	7.5pF	±0.25pF	GRM1882C2A7R5CA01#	
				±0.5pF	GRM1882C2A7R5DA01#	
			7.6pF	±0.05pF	GRM1882C2A7R6WA01#	
				±0.1pF	GRM1882C2A7R6BA01#	
				±0.25pF	GRM1882C2A7R6CA01#	
				±0.5pF	GRM1882C2A7R6DA01#	
			7.7pF	±0.05pF	GRM1882C2A7R7WA01#	
				±0.1pF	GRM1882C2A7R7BA01#	
				±0.25pF	GRM1882C2A7R7CA01#	
				±0.5pF	GRM1882C2A7R7DA01#	
			7.8pF	±0.05pF	GRM1882C2A7R8WA01#	
				±0.1pF	GRM1882C2A7R8BA01#	
				±0.25pF	GRM1882C2A7R8CA01#	
				±0.5pF	GRM1882C2A7R8DA01#	
			7.9pF	±0.05pF	GRM1882C2A7R9WA01#	
				±0.1pF	GRM1882C2A7R9BA01#	
				±0.25pF	GRM1882C2A7R9CA01#	
				±0.5pF	GRM1882C2A7R9DA01#	
			8.0pF	±0.05pF	GRM1882C2A8R0WA01#	
				±0.1pF	GRM1882C2A8R0BA01#	
				±0.25pF	GRM1882C2A8R0CA01#	
				±0.5pF	GRM1882C2A8R0DA01#	
			8.1pF	±0.05pF	GRM1882C2A8R1WA01#	
				±0.1pF	GRM1882C2A8R1BA01#	
				±0.25pF	GRM1882C2A8R1CA01#	
				±0.5pF	GRM1882C2A8R1DA01#	
			8.2pF	±0.05pF	GRM1882C2A8R2WA01#	
				±0.1pF	GRM1882C2A8R2BA01#	
				±0.25pF	GRM1882C2A8R2CA01#	
				±0.5pF	GRM1882C2A8R2DA01#	
			8.3pF	±0.05pF	GRM1882C2A8R3WA01#	
				±0.1pF	GRM1882C2A8R3BA01#	
				±0.25pF	GRM1882C2A8R3CA01#	
				±0.5pF	GRM1882C2A8R3DA01#	
			8.4pF	±0.05pF	GRM1882C2A8R4WA01#	
				±0.1pF	GRM1882C2A8R4BA01#	
				±0.25pF	GRM1882C2A8R4CA01#	
				±0.5pF	GRM1882C2A8R4DA01#	
			8.5pF	±0.05pF	GRM1882C2A8R5WA01#	
				±0.1pF	GRM1882C2A8R5BA01#	
				±0.25pF	GRM1882C2A8R5CA01#	
				±0.5pF	GRM1882C2A8R5DA01#	
			8.6pF	±0.05pF	GRM1882C2A8R6WA01#	
				±0.1pF	GRM1882C2A8R6BA01#	
				±0.25pF	GRM1882C2A8R6CA01#	
				±0.5pF	GRM1882C2A8R6DA01#	
			8.7pF	±0.05pF	GRM1882C2A8R7WA01#	
				±0.1pF	GRM1882C2A8R7BA01#	
				±0.25pF	GRM1882C2A8R7CA01#	
				±0.5pF	GRM1882C2A8R7DA01#	
			8.8pF	±0.05pF	GRM1882C2A8R8WA01#	
				±0.1pF	GRM1882C2A8R8BA01#	
				±0.25pF	GRM1882C2A8R8CA01#	
				±0.5pF	GRM1882C2A8R8DA01#	

Part number # indicates the package specification code.

GRM Series Temperature Compensating Type Part Number List

(→ ■ 5.7×5.0mm)

T max.	Rated Voltage	TC Code	Cap.	Tol.	Part Number	
2.0mm	500Vdc	U2J	47000pF	±5%	GRM55D7U2H473JW31#	

GRM Series

GJM Series

GMA Series

GMD Series

GQM Series

GRJ Series

GR3 Series

KRM Series

KR3 Series

LLA Series

LLL Series

LLM Series

LLR Series

⚠Caution/
Notice

GRM Series High Dielectric Constant Type Part Number List

(→ ■ 5.7×5.0mm)

T max.	Rated Voltage	TC Code	Cap.	Tol.	Part Number	
2.0mm	250Vdc	X7R	0.47μF	±10%	GRM55DR72E474KW01#	
			0.68μF	±10%	GRM55DR72E684KW01#	
			1.0μF	±10%	GRM55DR72E105KW01#	
	200Vdc	X7R	0.33μF	±10%	GRM55DR72D334KW01#	
			0.47μF	±10%	GRM55DR72D474KW01#	
			0.68μF	±10%	GRM55DR72D684KW01#	
			1.0μF	±10%	GRM55DR72D105KW01#	

GRM Series

GJM Series

GMA Series

GMD Series

GQM Series

GRJ Series

GR3 Series

KRM Series

KR3 Series

LLA Series

LLL Series

LLM Series

LLR Series

⚠Caution/
Notice

Part number # indicates the package specification code.

High Frequency High Q Type 1005(in mm)/0402(in inch) Size Max.

GJM Series

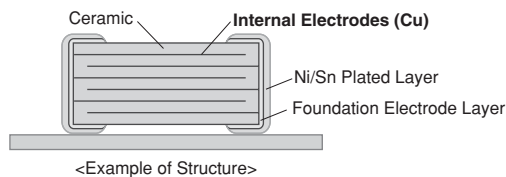


This product improves the high frequency characteristics and contributes to a reduction of power consumption by the High Q and low ESR.

Features

① Mainly ideal for mobile communication devices and temperature compensation of related modules.

This product is ideal for temperature compensation of high frequency circuits, such as resonant circuits, tuning circuits, and impedance matching circuits where the operating characteristics of the device are greatly affected by the capacitance fluctuation.



② High Q and low ESR in VHF, UHF and microwave frequency bands.

High Q and low ESR were achieved at a high frequency by adopting ceramic material as the dielectric material which enables an extremely low loss at high frequency, and base metal electrodes as the internal electrodes.



③ Can be used for tight tolerance.

In addition to standard tolerance, the allowable range of this product is also suitable for the following tight tolerance.

Capacitance Range	Standard Capacitance Tolerance (Capacitance Tolerance Symbol)	Narrow Capacitance Tolerance (Capacitance Tolerance Symbol)
$\leq 0.9\text{pF}$	$\pm 0.1\text{pF}$ (B)	$\pm 0.05\text{pF}$ (W)
1.0 to 5.0pF	$\pm 0.25\text{pF}$ (C)	$\pm 0.05\text{pF}$ (W), $\pm 0.1\text{pF}$ (B)
5.1 to 9.9pF	$\pm 0.5\text{pF}$ (D)	$\pm 0.05\text{pF}$ (W), $\pm 0.1\text{pF}$ (B), $\pm 0.25\text{pF}$ (C)
$\geq 10\text{pF}$	$\pm 5\%$ (J)	$\pm 2\%$ (G)

Specifications

Size	0.4×0.2mm to 1.0×0.5mm
Rated Voltage	DC6.3V to 50V
Capacitance	0.1pF to 47pF
Main Applications	Small communication devices, such as mobile phones and high frequency communication modules



This catalog contains only a portion of the product lineup.
Please refer to the capacitor search tool on the Murata Web site for details.

GJM Series

GJM Series

GMA Series

GMD Series

GQM Series

GRJ Series

GR3 Series

KRM Series

KR3 Series

LLA Series

LLL Series

LLM Series

LLR Series

⚠Caution/
Notice

GJM Series Temperature Compensating Type High Q Part Number List

(→ ■ 1.0×0.5mm)

T max.	Rated Voltage	TC Code	Cap.	Tol.	Part Number	
0.55mm	50Vdc	CH	11pF	±5%	GJM1552C1H110JB01#	
				±2%	GJM1552C1H120GB01#	
				±5%	GJM1552C1H120JB01#	
			13pF	±2%	GJM1552C1H130GB01#	
				±5%	GJM1552C1H130JB01#	
			15pF	±2%	GJM1552C1H150GB01#	
				±5%	GJM1552C1H150JB01#	
			16pF	±2%	GJM1552C1H160GB01#	
				±5%	GJM1552C1H160JB01#	
			18pF	±2%	GJM1552C1H180GB01#	
				±5%	GJM1552C1H180JB01#	
			20pF	±2%	GJM1552C1H200GB01#	
				±5%	GJM1552C1H200JB01#	
			22pF	±1%	GJM1552C1H220FB01#	
				±2%	GJM1552C1H220GB01#	
				±5%	GJM1552C1H220JB01#	
			24pF	±1%	GJM1552C1H240FB01#	
				±2%	GJM1552C1H240GB01#	
				±5%	GJM1552C1H240JB01#	
			27pF	±1%	GJM1552C1H270FB01#	
				±2%	GJM1552C1H270GB01#	
				±5%	GJM1552C1H270JB01#	
			30pF	±1%	GJM1552C1H300FB01#	
				±2%	GJM1552C1H300GB01#	
				±5%	GJM1552C1H300JB01#	
			33pF	±1%	GJM1552C1H330FB01#	
				±2%	GJM1552C1H330GB01#	
				±5%	GJM1552C1H330JB01#	
			36pF	±1%	GJM1552C1H360FB01#	
				±2%	GJM1552C1H360GB01#	
				±5%	GJM1552C1H360JB01#	
			39pF	±1%	GJM1552C1H390FB01#	
				±2%	GJM1552C1H390GB01#	
				±5%	GJM1552C1H390JB01#	
			43pF	±1%	GJM1552C1H430FB01#	
				±2%	GJM1552C1H430GB01#	
				±5%	GJM1552C1H430JB01#	
			47pF	±1%	GJM1552C1H470FB01#	
				±2%	GJM1552C1H470GB01#	
				±5%	GJM1552C1H470JB01#	

Part number # indicates the package specification code.

Top & Bottom Electrode Type for Bonding

GMA Series

This capacitor is suitable for wire bonding mounting by the external electrodes of Au plating.
 Mounting in IC packages is also possible with the upper/lower electrode structure!

Features

① Allows for high density mounting.

Noise can be reduced by eliminating the routing of the wire, and high efficiency can be achieved with a built-in capacitor in a package, such as IC. Miniaturization of the set is also possible.



② Ideal for bypass applications.

Achieved small size and large capacity with a multilayer structure.

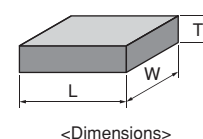
③ Excellent in high frequency characteristics.

Since the capacitor consists of an upper/lower electrode structure, the current path becomes shorter and lowers the ESL. Compared with the general purpose GRM series of the same capacity, the impedance of this product becomes lower at high frequencies.



Specifications

Size	0.38×0.38mm to 0.8×0.8mm
Rated Voltage	DC6.3V to 100V
Capacitance	100pF to 0.47μF
Main Applications	1. Optical communication related equipment 2. Various device related, such as GaAsIC (mounted in IC packages) 3. Measuring instruments, other ultra compact/thin devices



This catalog contains only a portion of the product lineup.
 Please refer to the capacitor search tool on the Murata Web site for details.

GRM Series

GJM Series

GMA Series

GMD Series

GQM Series

GRJ Series

GR3 Series

KRM Series

KR3 Series

LLA Series

LLL Series

LLM Series

LLR Series

⚠Caution/
Notice

GMA Series High Dielectric Constant Type Part Number List

■ 0.38×0.38mm Ultra-compact

T max.	Rated Voltage	TC Code	Cap.	Tol.	Part Number	
0.35mm	10Vdc	X7R	1000pF	±20%	GMA0D3R71A102MA01#	
			1500pF	±20%	GMA0D3R71A152MA01#	
			1800pF	±20%	GMA0D3R71A182MA01#	
			10000pF	±20%	GMA0D3R71A103MA01#	
		R	1000pF	±20%	GMA0D3R11A102MA01#	
			1500pF	±20%	GMA0D3R11A152MA01#	
			1800pF	±20%	GMA0D3R11A182MA01#	
			10000pF	±20%	GMA0D3R11A103MA01#	
		B	1000pF	±20%	GMA0D3B11A102MA01#	
			1500pF	±20%	GMA0D3B11A152MA01#	
			1800pF	±20%	GMA0D3B11A182MA01#	
			1800pF	±20%	GMA0D3B11A182MA01#	

■ 0.5×0.5mm

T max.	Rated Voltage	TC Code	Cap.	Tol.	Part Number	
0.4mm	100Vdc	X7R	100pF	±20%	GMA05XR72A101MA01#	
			150pF	±20%	GMA05XR72A151MA01#	
			220pF	±20%	GMA05XR72A221MA01#	
			330pF	±20%	GMA05XR72A331MA01#	
			470pF	±20%	GMA05XR72A471MA01#	
			680pF	±20%	GMA05XR72A681MA01#	
			1000pF	±20%	GMA05XR72A102MA01#	
		X7R	1500pF	±20%	GMA05XR71E152MA11#	
			2200pF	±20%	GMA05XR71E222MA11#	
			3300pF	±20%	GMA05XR71E332MA11#	
			4700pF	±20%	GMA05XR71E472MA11#	
		B	1500pF	±20%	GMA05XB31E152MA11#	
			2200pF	±20%	GMA05XB31E222MA11#	
			3300pF	±20%	GMA05XB31E332MA11#	
			4700pF	±20%	GMA05XB31E472MA11#	
	25Vdc	X7R	6800pF	±20%	GMA05XR71A682MA01#	
			10000pF	±20%	GMA05XR71A103MA01#	
			15000pF	±20%	GMA05XR71A153MA01#	
			22000pF	±20%	GMA05XR71A223MA01#	
		R	6800pF	±20%	GMA05XR11A682MA01#	
			10000pF	±20%	GMA05XR11A103MA01#	
			15000pF	±20%	GMA05XR11A153MA01#	
			22000pF	±20%	GMA05XR11A223MA01#	
		B	6800pF	±20%	GMA05XB11A682MA01#	
			10000pF	±20%	GMA05XB11A103MA01#	
			15000pF	±20%	GMA05XB11A153MA01#	
			22000pF	±20%	GMA05XB11A223MA01#	
	10Vdc	X7R	6800pF	±20%	GMA05XR71A682MA01#	
			10000pF	±20%	GMA05XR71A103MA01#	
			15000pF	±20%	GMA05XR71A153MA01#	
			22000pF	±20%	GMA05XR71A223MA01#	
	6.3Vdc	X5R	0.10μF	±20%	GMA05XR60J104ME12#	
			0.10μF	±20%	GMA05XB30J104ME12#	
		B	0.10μF	±20%	GMA05XB30J104ME12#	
			0.10μF	±20%	GMA05XB30J104ME12#	

■ 0.8×0.8mm

T max.	Rated Voltage	TC Code	Cap.	Tol.	Part Number	
0.6mm	100Vdc	X7R	1500pF	±20%	GMA085R72A152MA01#	
			2200pF	±20%	GMA085R72A222MA01#	

T max.	Rated Voltage	TC Code	Cap.	Tol.	Part Number	
0.6mm	100Vdc	X7R	3300pF	±20%	GMA085R72A332MA01#	
			4700pF	±20%	GMA085R72A472MA01#	
			6800pF	±20%	GMA085R72A682MA01#	
	25Vdc	X7R	10000pF	±20%	GMA085R71E103MA11#	
			15000pF	±20%	GMA085R71E153MA11#	
			22000pF	±20%	GMA085R71E223MA11#	
		B	10000pF	±20%	GMA085B31E103MA11#	
			15000pF	±20%	GMA085B31E153MA11#	
			22000pF	±20%	GMA085B31E223MA11#	
	10Vdc	X7R	33000pF	±20%	GMA085R71A333MA01#	
			47000pF	±20%	GMA085R71A473MA01#	
			68000pF	±20%	GMA085R71A683MA01#	
			0.10μF	±20%	GMA085R71A104MA01#	
		R	33000pF	±20%	GMA085R11A333MA01#	
			47000pF	±20%	GMA085R11A473MA01#	
			68000pF	±20%	GMA085R11A683MA01#	
			0.10μF	±20%	GMA085R11A104MA01#	
		B	33000pF	±20%	GMA085B11A333MA01#	
			47000pF	±20%	GMA085B11A473MA01#	
			68000pF	±20%	GMA085B11A683MA01#	
	6.3Vdc	X5R	0.47μF	±20%	GMA085R60J474ME12#	
			0.47μF	±20%	GMA085B30J474ME12#	

Part number # indicates the package specification code.

Product for Bonding/AuSn Soldering

GMD Series

This capacitor is compatible to wire bonding mounting by the external electrodes of Au plating.

Features

① Can be mounted by wire bonding and AuSn soldering.

Since the external electrodes are based on the Au plating specification, mounting by wire/die bonding is possible.



② Ideal for mounting in packages, such as optical communication related devices , IC and etc.

Noise can be reduced by eliminating the routing of the wire, and high efficiency can be achieved with a built-in capacitor in the package, such as TO-CAN, IC and etc. by wire bonding mounting.

③ Contributes to the miniaturization of the set.

Murata offers a lineup of small size products, such as the 0603 (0201) and 1005 (0402) in mm (inch).

Specifications

Size	0.6×0.3mm to 1.0×0.5mm
Rated Voltage	DC6.3V to 50V
Capacitance	100pF to 1.0μF
Main Applications	1. Optical communication related equipment 2. Mounting in IC packages



This catalog contains only a portion of the product lineup.
 Please refer to the capacitor search tool on the Murata Web site for details.

High Frequency High Q Type 1608(in mm)/0603(in inch) Size Min.

GQM Series **High Q**

High Frequency Capacitor Ideal for PA Design of Base Stations

Features

- 1 **Mainly ideal for base stations of mobile communication devices and temperature compensation of related modules.**

This product is ideal for temperature compensation of high frequency circuits, such as resonant circuits, tuning circuits, and impedance matching circuits where the operating characteristics of the device are greatly affected by the capacitance fluctuation.



- 2 **High Q and low ESR in VHF, UHF and microwave frequency bands.**

High Q and low ESR were achieved at a high frequency by adopting ceramic material as the dielectric material which enables an extremely low loss at high frequency, and base metal electrodes as the internal electrodes.



- 3 **Can be used for tight tolerance.**

In addition to standard tolerance, the allowable range of this product is also suitable for the following narrow tolerance.

Capacitance Range	Standard Capacitance Tolerance (Capacitance Tolerance Symbol)	Narrow Capacitance Tolerance (Capacitance Tolerance Symbol)
≤0.9pF	±0.1pF (B)	±0.05pF (W)
1.0 to 5.0pF	±0.25pF (C)	±0.05pF (W), ±0.1pF (B)
5.1 to 9.9pF	±0.5pF (D)	±0.05pF (W), ±0.1pF (B), ±0.25pF (C)
≥10pF	±5% (J)	±2% (G)

Specifications

Size	1.0×0.5mm to 2.8×2.8mm
Rated Voltage	DC50V to 500V
Capacitance	0.1pF to 200pF
Main Applications	Mobile phone base stations



This catalog contains only a portion of the product lineup.
Please refer to the capacitor search tool on the Murata Web site for details.

GRRM Series

GJM Series

GMA Series

GMD Series

GQM Series

GRJ Series

GR3 Series

KRM Series

KR3 Series

LLA Series

LLL Series

LLM Series

LLR Series

⚠Caution/
Notice

GQM Series Temperature Compensating Type **High Q** Part Number List

(→ ■ 2.8×2.8mm)

T max.	Rated Voltage	TC Code	Cap.	Tol.	Part Number	
1.35mm	500Vdc	C0G	68pF	±2%	GQM22M5C2H680GB01#	
				±5%	GQM22M5C2H680JB01#	
			75pF	±2%	GQM22M5C2H750GB01#	
				±5%	GQM22M5C2H750JB01#	
			82pF	±2%	GQM22M5C2H820GB01#	
				±5%	GQM22M5C2H820JB01#	
			91pF	±2%	GQM22M5C2H910GB01#	
				±5%	GQM22M5C2H910JB01#	
			100pF	±2%	GQM22M5C2H101GB01#	
				±5%	GQM22M5C2H101JB01#	

Part number # indicates the package specification code.

Resin External Electrode Type

GRJ Series



Deflecting crack

The resin external electrodes prevent the occurrence of cracking caused by deflection stress after board mounting!

Features

1 The resin external electrodes suppress cracks by board deflection.

Cracking of the ceramic element is suppressed by the resin of the external electrodes, which releases the stress.



2 Suppresses the occurrence of cracking caused by deflection stress at the time of board mounting, etc.

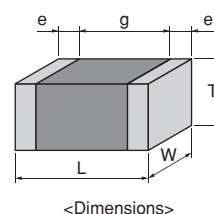


Due to the specification of the measuring instrument, measurements can be performed up to 8mm.

3 Ideal for consumer and industrial electronic equipment, etc. where there heat stress, vibration and impact are applied.

Specifications

Size	2.0×1.25mm to 5.7×5.0mm
Rated Voltage	DC6.3V to 1kV
Capacitance	470pF to 47μF
Main Applications	Consumer & Industrial Electronic Equipment



This catalog contains only a portion of the product lineup.
Please refer to the capacitor search tool on the Murata Web site for details.

GRM Series

GJM Series

GMA Series

GMD Series

GQM Series

GRJ Series

GR3 Series

KRM Series

KR3 Series

LLA Series

LLL Series

LLM Series

LLR Series

⚠Caution/
Notice

GRJ Series High Dielectric Constant Type Part Number List

■ 2.0×1.25mm

T max.	Rated Voltage	TC Code	Cap.	Tol.	Part Number	
1.0mm	250Vdc	X7R	1000pF	±10%	GRJ21AR72E102KWJ1#	
			1500pF	±10%	GRJ21AR72E152KWJ1#	
			2200pF	±10%	GRJ21AR72E222KWJ1#	
			3300pF	±10%	GRJ21AR72E332KWJ1#	
			4700pF	±10%	GRJ21AR72E472KWJ1#	
			6800pF	±10%	GRJ21AR72E682KWJ1#	
1.45mm	250Vdc	X7R	10000pF	±10%	GRJ21BR72E103KWJ3#	
			15000pF	±10%	GRJ21BR72E153KWJ3#	
			22000pF	±10%	GRJ21BR72E223KWJ3#	

■ 3.2×1.6mm

T max.	Rated Voltage	TC Code	Cap.	Tol.	Part Number		
1.25mm	1000Vdc	X7R	470pF	±10%	GRJ31BR73A471KWJ1#		
			680pF	±10%	GRJ31BR73A681KWJ1#		
			1000pF	±10%	GRJ31BR73A102KWJ1#		
			1500pF	±10%	GRJ31BR73A152KWJ1#		
			2200pF	±10%	GRJ31BR73A222KWJ1#		
			3300pF	±10%	GRJ31BR73A332KWJ1#		
			4700pF	±10%	GRJ31BR73A472KWJ1#		
	630Vdc	X7R	1000pF	±10%	GRJ31BR72J102KWJ1#		
			1500pF	±10%	GRJ31BR72J152KWJ1#		
			2200pF	±10%	GRJ31BR72J222KWJ1#		
			3300pF	±10%	GRJ31BR72J332KWJ1#		
			4700pF	±10%	GRJ31BR72J472KWJ1#		
			6800pF	±10%	GRJ31BR72J682KWJ1#		
			10000pF	±10%	GRJ31BR72J103KWJ1#		
	250Vdc	X7R	15000pF	±10%	GRJ31BR72E153KWJ1#		
			22000pF	±10%	GRJ31BR72E223KWJ1#		
			68000pF	±10%	GRJ31BR72E683KWJ1#		
	1.8mm	1000Vdc	X7R	6800pF	±10%	GRJ31CR73A682KWJ3#	
				10000pF	±10%	GRJ31CR73A103KWJ3#	
		630Vdc	X7R	15000pF	±10%	GRJ31CR72J153KWJ3#	
				22000pF	±10%	GRJ31CR72J223KWJ3#	
		250Vdc	X7R	33000pF	±10%	GRJ31CR72E333KWJ3#	
				47000pF	±10%	GRJ31CR72E473KWJ3#	
				0.10μF	±10%	GRJ31CR72E104KWJ3#	

■ 3.2×2.5mm

T max.	Rated Voltage	TC Code	Cap.	Tol.	Part Number	
1.5mm	1000Vdc	X7R	6800pF	±10%	GRJ32QR73A682KWJ1#	
			10000pF	±10%	GRJ32QR73A103KWJ1#	
	630Vdc	X7R	22000pF	±10%	GRJ32QR72J223KWJ1#	
	250Vdc	X7R	68000pF	±10%	GRJ32QR72E683KWJ1#	
			0.15μF	±10%	GRJ32QR72E154KWJ1#	
2.0mm	1000Vdc	X7R	15000pF	±10%	GRJ32DR73A153KWJ1#	
			22000pF	±10%	GRJ32DR73A223KWJ1#	
	630Vdc	X7R	33000pF	±10%	GRJ32DR72J333KWJ1#	
			47000pF	±10%	GRJ32DR72J473KWJ1#	

T max.	Rated Voltage	TC Code	Cap.	Tol.	Part Number	
2.0mm	250Vdc	X7R	0.10μF	±10%	GRJ32DR72E104KWJ1#	
			0.22μF	±10%	GRJ32DR72E224KWJ1#	
2.3mm	100Vdc	X7R	2.2μF	±10%	GRJ32DR72A225KE11#	
				±20%	GRJ32DR72A225ME11#	
2.8mm	50Vdc	X7R	4.7μF	±10%	GRJ32ER71H475KE11#	
				±20%	GRJ32ER71H475ME11#	
		X7S	10μF	±10%	GRJ32EC71H106KE11#	
				±20%	GRJ32EC71H106ME11#	
	25Vdc	X7R	10μF	±10%	GRJ32ER71E106KE11#	
				±20%	GRJ32ER71E106ME11#	
				±20%	GRJ32ER71C226KE11#	
	16Vdc	X7R	22μF	±10%	GRJ32ER71C226KE11#	
				±20%	GRJ32ER71C226ME11#	
				±20%	GRJ32ER71A226KE11#	
	10Vdc	X7R	22μF	±10%	GRJ32ER71A226KE11#	
				±20%	GRJ32ER71A226ME11#	
	6.3Vdc	X7R	47μF	±10%	GRJ32ER70J476KE11#	
				±20%	GRJ32ER70J476ME11#	

■ 4.5×3.2mm

T max.	Rated Voltage	TC Code	Cap.	Tol.	Part Number	
1.5mm	630Vdc	X7R	68000pF	±10%	GRJ43QR72J683KWJ1#	
	250Vdc	X7R	0.15μF	±10%	GRJ43QR72E154KWJ1#	
2.0mm	1000Vdc	X7R	33000pF	±10%	GRJ43DR73A333KWJ1#	
			47000pF	±10%	GRJ43DR73A473KWJ1#	
	630Vdc	X7R	0.10μF	±10%	GRJ43DR72J104KWJ1#	
	250Vdc	X7R	0.22μF	±10%	GRJ43DR72E224KWJ1#	
			0.33μF	±10%	GRJ43DR72E334KWJ1#	
			0.47μF	±10%	GRJ43DR72E474KWJ1#	

■ 5.7×5.0mm

T max.	Rated Voltage	TC Code	Cap.	Tol.	Part Number	
2.0mm	1000Vdc	X7R	68000pF	±10%	GRJ55DR73A683KWJ1#	
			0.10μF	±10%	GRJ55DR73A104KWJ1#	
	630Vdc	X7R	0.15μF	±10%	GRJ55DR72J154KWJ1#	
			0.22μF	±10%	GRJ55DR72J224KWJ1#	
	250Vdc	X7R	0.33μF	±10%	GRJ55DR72E334KWJ1#	
			0.47μF	±10%	GRJ55DR72E474KWJ1#	
			0.68μF	±10%	GRJ55DR72E684KWJ1#	
			1.0μF	±10%	GRJ55DR72E105KWJ1#	

Part number # indicates the package specification code.

High Effective Capacitance & High Allowable Ripple Current

GR3 Series **Anti-noise**

This is a general purpose high ripple resistance product excellent in DC bias characteristics.

Features

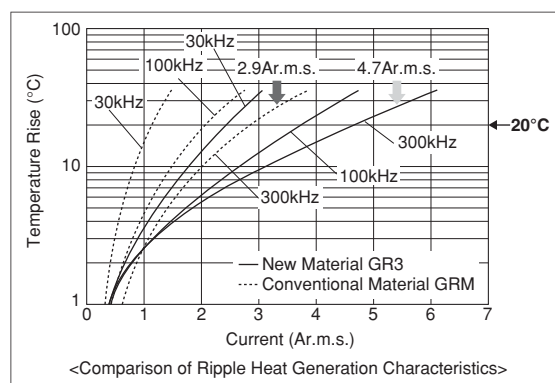
- ① When a DC bias is applied, a capacitance higher than conventional products (X7R characteristics) can be acquired.

About twice the capacitance can be secured when DC200V is applied.



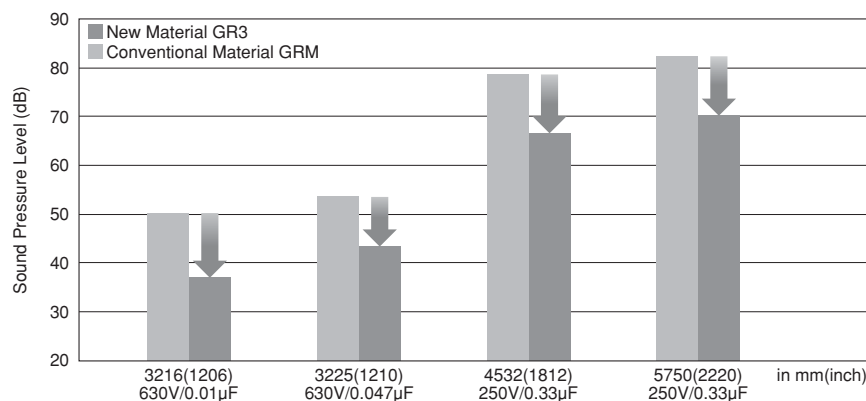
- ② Improved ripple resistance performance compared to conventional products (X7R characteristics).

In the case of a product with a capacitance of 1µF, when the exothermic temperature reaches 20°C at frequency f=300kHz, the amount of resistance of a product with conventional material is 2.9Ar.m.s.; however, the new material is 4.7Ar.m.s..



- ③ This product has a noise reduction effect.

Since dielectric materials which enable a reduction of noise are used, this product is more effective for reducing noise compared to the general purpose GRM series.



Specifications

Size	2.0×1.25mm to 5.7×5.0mm
Rated Voltage	DC250V to 630V
Capacitance	0.01µF to 1.0µF
Main Applications	For PFC (Power Factor Correction) Circuits of Power Supplies, EMI Suppression and Smoothing Circuits



This catalog contains only a portion of the product lineup.
 Please refer to the capacitor search tool on the Murata Web site for details.

GRM Series

GJM Series

GMA Series

GMD Series

GQM Series

GRJ Series

GR3 Series

KRM Series

KR3 Series

LLA Series

LLL Series

LLM Series

LLR Series

⚠Caution/
Notice

GR3 Series High Dielectric Constant Type Anti-noise Part Number List

■ 2.0×1.25mm

T max.	Rated Voltage	TC Code	Cap.	Tol.	Part Number	
1.0mm	250Vdc	X7T	10000pF	±10%	GR321AD72E103KW01#	
			15000pF	±10%	GR321AD72E153KW01#	
1.45mm	250Vdc	X7T	22000pF	±10%	GR321BD72E223KW03#	

■ 3.2×1.6mm

T max.	Rated Voltage	TC Code	Cap.	Tol.	Part Number	
1.0mm	450Vdc	X7T	10000pF	±10%	GR331AD72W103KW01#	
			15000pF	±10%	GR331AD72W153KW01#	
	250Vdc	X7T	33000pF	±10%	GR331AD72E333KW01#	
1.25mm	630Vdc	X7T	10000pF	±10%	GR331BD72J103KW01#	
	450Vdc	X7T	22000pF	±10%	GR331BD72W223KW01#	
			33000pF	±10%	GR331BD72W333KW01#	
	250Vdc	X7T	47000pF	±10%	GR331BD72E473KW01#	
1.8mm	630Vdc	X7T	15000pF	±10%	GR331CD72J153KW03#	
	450Vdc	X7T	47000pF	±10%	GR331CD72W473KW03#	
	250Vdc	X7T	68000pF	±10%	GR331CD72E683KW03#	

■ 3.2×2.5mm

T max.	Rated Voltage	TC Code	Cap.	Tol.	Part Number	
1.5mm	630Vdc	X7T	22000pF	±10%	GR332QD72J223KW01#	
	250Vdc	X7T	0.10μF	±10%	GR332QD72E104KW01#	
2.0mm	630Vdc	X7T	33000pF	±10%	GR332DD72J333KW01#	
			47000pF	±10%	GR332DD72J473KW01#	
	450Vdc	X7T	68000pF	±10%	GR332DD72W683KW01#	
			0.10μF	±10%	GR332DD72W104KW01#	
	250Vdc	X7T	0.15μF	±10%	GR332DD72E154KW01#	

■ 4.5×3.2mm

T max.	Rated Voltage	TC Code	Cap.	Tol.	Part Number	
1.5mm	250Vdc	X7T	0.22μF	±10%	GR343QD72E224KW01#	
2.0mm	630Vdc	X7T	68000pF	±10%	GR343DD72J683KW01#	
	450Vdc	X7T	0.15μF	±10%	GR343DD72W154KW01#	
	250Vdc	X7T	0.33μF	±10%	GR343DD72E334KW01#	

■ 5.7×5.0mm

T max.	Rated Voltage	TC Code	Cap.	Tol.	Part Number	
2.0mm	630Vdc	X7T	0.10μF	±10%	GR355DD72J104KW01#	
			0.15μF	±10%	GR355DD72J154KW01#	
	450Vdc	X7T	0.22μF	±10%	GR355DD72W224KW01#	
			0.33μF	±10%	GR355DD72W334KW01#	
			0.47μF	±10%	GR355DD72W474KW01#	
	250Vdc	X7T	0.47μF	±10%	GR355DD72E474KW01#	
			0.68μF	±10%	GR355DD72E684KW01#	
2.7mm	630Vdc	X7T	0.22μF	±10%	GR355XD72J224KW05#	

T max.	Rated Voltage	TC Code	Cap.	Tol.	Part Number	
2.7mm	630Vdc	X7T	0.27μF	±10%	GR355XD72J274KW05#	
	450Vdc	X7T	0.56μF	±10%	GR355XD72W564KW05#	
	250Vdc	X7T	1.0μF	±10%	GR355XD72E105KW05#	

Part number # indicates the package specification code.

Metal Terminal Type For General Purpose

KRM Series



Anti-noise

Deflecting crack

Soldering crack

Bonding the metal terminals to external electrodes solves design issues by mounting large size MLCC!

Features

① Bond metal terminals to the external electrodes of chips.

The stress applied to the chip is relieved by the elastic action of the metal terminal.



② Substantially reduces noise, board deflection cracks and soldering cracks.

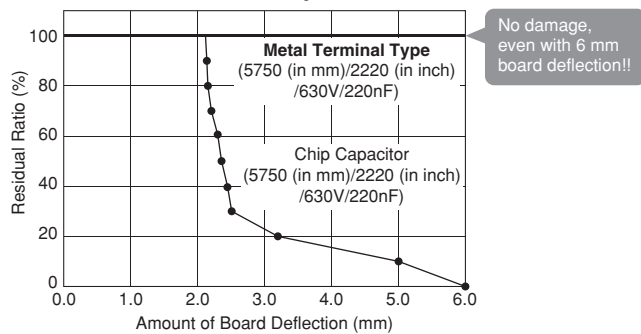
This product is not damaged even with a board deflection of 6 mm.

Solder cracks do not occur even with 2,000 cycles of heat stress.

● Acoustic Noise is Reduced with Metal Terminals



● Reduces Stress Caused by Board Deflection



● Suppresses Solder Cracks Caused by Heat Stress

Chip Size	Chip Only (5750 (in mm)/2220 (in inch) size)	Metal Terminal Type (5750 (in mm)/2220 (in inch) size)
1000 Cycle		
2000 Cycle		

Test Condition: -55 to +125°C, 5min., (Tank)
 Board Used: Glass Epoxy Board (FR-4)

Compared with chips only, this product is excellent in solder cracking resistance.

Demonstrates replacement value of low noise capacitors Experience the effectiveness of the KRM Series.

▶ Examples of Noise Countermeasures

GRM Series

GJM Series

GMA Series

GMD Series

GQM Series

GRJ Series

GR3 Series

KRM Series

KR3 Series

LLA Series

LLL Series

LLM Series

LLR Series

⚠Caution/
Notice

③ 2 chips can be stacked.

Realize large capacity by stacking 2 capacitors.

Specifications

Size	2.2×1.25mm to 6.1×5.3mm
Rated Voltage	DC16V to 1kV
Capacitance	0.068μF to 68μF
Main Applications	For smoothing and noise suppression of DC-DC converters

This catalog contains only a portion of the product lineup.
 Please refer to the capacitor search tool on the Murata Web site for details.



<Dimensions>

KRM Series High Dielectric Constant Type Anti-noise Deflecting crack Soldering crack Part Number List

■ 3.5×1.7mm

T max.	Rated Voltage	TC Code	Cap.	Tol.	Part Number	
2.0mm	25Vdc	X5R	10μF	±10%	KRM31FR61E106KH01#	
2.9mm	100Vdc	X7R	1.0μF	±10%	KRM31KR72A105KH01#	
	50Vdc	X7R	4.7μF	±10%	KRM31KR71H475KH01#	
	35Vdc	X6S	10μF	±10%	KRM31KC8YA106KH01#	
	25Vdc	X6S	10μF	±10%	KRM31KC81E106KH01#	

T max.	Rated Voltage	TC Code	Cap.	Tol.	Part Number	
5.0mm	25Vdc	X7R	33μF	±20%	KRM55TR71E336MH01#	
6.7mm	100Vdc	X7R	15μF	±20%	KRM55WR72A156MH01#	
	63Vdc	X7R	22μF	±20%	KRM55WR71J226MH01#	
	50Vdc	X7R	33μF	±20%	KRM55WR71H336MH01#	
	35Vdc	X7R	47μF	±20%	KRM55WR7YA476MH01#	
	25Vdc	X7R	47μF	±20%	KRM55WR71E476MH01#	
			68μF	±20%	KRM55WR71E686MH01#	

■ 3.6×1.7mm

T max.	Rated Voltage	TC Code	Cap.	Tol.	Part Number	
2.9mm	50Vdc	X7R	2.2μF	±10%	KRM31KR71H225KH01#	

■ 3.7×1.85mm

T max.	Rated Voltage	TC Code	Cap.	Tol.	Part Number	
2.9mm	100Vdc	X7R	2.2μF	±10%	KRM31KR72A225KH01#	

■ 6.1×5.3mm

T max.	Rated Voltage	TC Code	Cap.	Tol.	Part Number	
3.0mm	1000Vdc	X7R	68000pF	±10%	KRM55LR73A683KH01#	
			0.10μF	±10%	KRM55LR73A104KH01#	
	630Vdc	X7R	0.15μF	±10%	KRM55LR72J154KH01#	
			0.22μF	±10%	KRM55LR72J224KH01#	
	250Vdc	X7R	0.68μF	±10%	KRM55LR72E684KH01#	
			1.0μF	±10%	KRM55LR72E105KH01#	
	100Vdc	X7R	4.7μF	±10%	KRM55LR72A475KH01#	
	63Vdc	X7R	4.7μF	±10%	KRM55LR71J475KH01#	
	50Vdc	X7R	4.7μF	±10%	KRM55LR71H475KH01#	
			10μF	±10%	KRM55LR71H106KH01#	
	35Vdc	X7R	10μF	±10%	KRM55LR7YA106KH01#	
			15μF	±10%	KRM55LR7YA156KH01#	
	25Vdc	X7R	15μF	±10%	KRM55LR71E156KH01#	
3.9mm	100Vdc	X7R	6.8μF	±10%	KRM55QR72A685KH01#	
	63Vdc	X7R	10μF	±10%	KRM55QR71J106KH01#	
	50Vdc	X7R	17μF	±10%	KRM55QR71H176KH01#	
	35Vdc	X7R	17μF	±10%	KRM55QR7YA176KH01#	
			22μF	±10%	KRM55QR7YA226KH01#	
	25Vdc	X7R	22μF	±10%	KRM55QR71E226KH01#	
			33μF	±10%	KRM55QR71E336KH01#	
5.0mm	1000Vdc	X7R	0.15μF	±20%	KRM55TR73A154MH01#	
			0.22μF	±20%	KRM55TR73A224MH01#	
	630Vdc	X7R	0.33μF	±20%	KRM55TR72J334MH01#	
			0.47μF	±20%	KRM55TR72J474MH01#	
	250Vdc	X7R	1.5μF	±20%	KRM55TR72E155MH01#	
			2.2μF	±20%	KRM55TR72E225MH01#	
	100Vdc	X7R	10μF	±20%	KRM55TR72A106MH01#	
	50Vdc	X7R	22μF	±20%	KRM55TR71H226MH01#	
	35Vdc	X7R	22μF	±20%	KRM55TR7YA226MH01#	
			33μF	±20%	KRM55TR7YA336MH01#	

Part number # indicates the package specification code.

Metal Terminal Type High Effective Capacitance & High Allowable Ripple Current

KR3 Series



Anti-noise

Deflecting crack

Soldering crack

Bonding the metal terminals to external electrodes solves design issues by mounting large size MLCC!

Features

① Bond metal terminals to the external electrodes of chips.

The stress applied to the chip is relieved by the elastic action of the metal terminal.

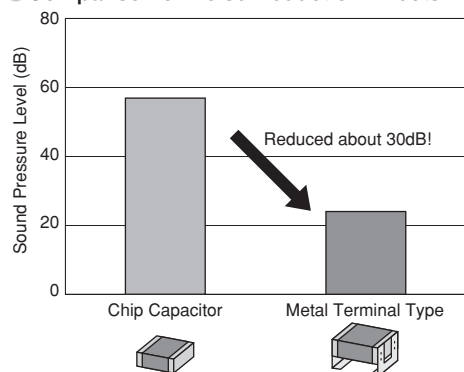


② Substantially reduces noise, board deflection cracks and soldering cracks.

This product is not damaged even with a board deflection of 6 mm.

Solder cracks do not occur even with 2,000 cycles of heat stress.

● Comparison of Noise Reduction Effects



Evaluation Items: 5750 (in mm)/2220 (in inch) size/DC630V/220nF
 Test Method: DC50V, AC10Vp-p/3kHz
 Test Board: Glass Epoxy Board (T: 1.6mm)
 Test Quantity: 3pc
 Distance Between Microphone and Board: 3mm

Note: Results Using Murata's Evaluation Board

● Reduces Stress Caused by Board Deflection



No damage, even with 6 mm board deflection!!

● Suppresses Solder Cracks Caused by Heat Stress

Chip Size	Chip Only (5750 (in mm)/2220 (in inch) size)		Metal Terminal Type (5750 (in mm)/2220 (in inch) size)	
1000 Cycle				
2000 Cycle				

Compared with chips only, this product is excellent in solder cracking resistance.

Test Condition: -55 to +125°C, 5min., (Tank)
 Board Used: Glass Epoxy Board (FR-4)

③ Adopted Low Dielectric Constant Materials

Improved effective capacity and ripple resistant performance, compared to conventional products (X7R characteristics).



Specifications

Size	6.1×5.3mm
Rated Voltage	DC250V to 630V
Capacitance	0.1μF to 2.2μF
Main Applications	For DC-DC converters of general electronic equipment

This catalog contains only a portion of the product lineup.
 Please refer to the capacitor search tool on the Murata Web site for details.



GRM Series

GJM Series

GMA Series

GMD Series

GQM Series

GRJ Series

GR3 Series

KRM Series

KR3 Series

LLA Series

LLL Series

LLM Series

LLR Series

⚠Caution/
Notice

KR3 Series High Dielectric Constant Type **Anti-noise** **Deflecting crack** **Soldering crack** **Part Number List**

■ 6.1×5.3mm

T max.	Rated Voltage	TC Code	Cap.	Tol.	Part Number	
3.0mm	630Vdc	X7T	0.10μF	±10%	KR355LD72J104KH01#	
			0.15μF	±10%	KR355LD72J154KH01#	
	450Vdc	X7T	0.22μF	±10%	KR355LD72W224KH01#	
			0.33μF	±10%	KR355LD72W334KH01#	
			0.47μF	±10%	KR355LD72W474KH01#	
	250Vdc	X7T	0.47μF	±10%	KR355LD72E474KH01#	
			0.68μF	±10%	KR355LD72E684KH01#	
3.9mm	630Vdc	X7T	0.22μF	±10%	KR355QD72J224KH01#	
			0.27μF	±10%	KR355QD72J274KH01#	
	450Vdc	X7T	0.56μF	±10%	KR355QD72W564KH01#	
	250Vdc	X7T	1.0μF	±10%	KR355QD72E105KH01#	
5.0mm	450Vdc	X7T	0.68μF	±20%	KR355TD72W684MH01#	
			1.0μF	±20%	KR355TD72W105MH01#	
	250Vdc	X7T	1.5μF	±20%	KR355TD72E155MH01#	
6.7mm	630Vdc	X7T	0.47μF	±20%	KR355WD72J474MH01#	
			0.56μF	±20%	KR355WD72J564MH01#	
	450Vdc	X7T	1.2μF	±20%	KR355WD72W125MH01#	
	250Vdc	X7T	2.2μF	±20%	KR355WD72E225MH01#	

8-Terminal Low ESL Type

LLA Series



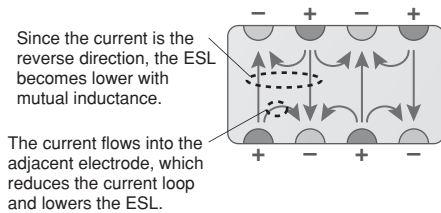
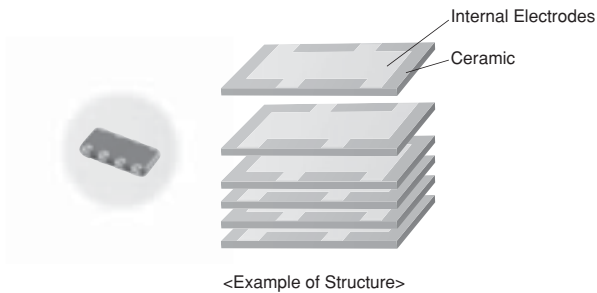
Low
ESL

8-Terminal Type Low ESL Capacitor Ideal for Power Supply Decoupling of High-speed Operation IC

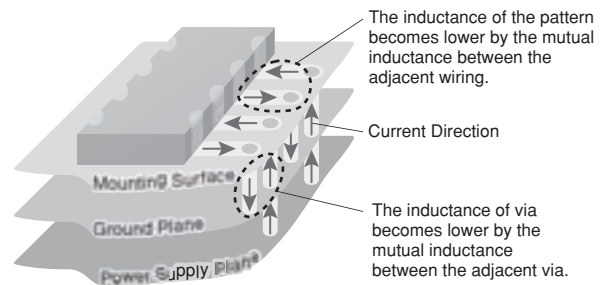
Features

① Ultra-low ESL

Since the equivalent series inductance (ESL) is very low with excellent high frequency characteristics due to the design structure, this capacitor is ideal for power supply decoupling of high-speed operation IC.



<Effectiveness of Cancelling Out Inductance by Mutual Inductance>



<Effectiveness of Suppressing Inductance when Mounting a Multi-terminal Capacitor>

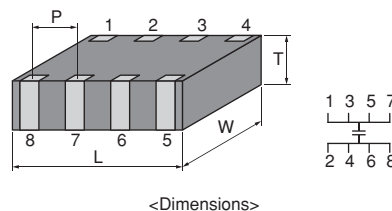
The inductance for the boards also becomes lower, not only the capacitor.

② A maximum operating temperature up to 125°C.

This product is applicable to high temperatures (X7* characteristics); however, Murata also offers numerous thin type products, which are ideal as decoupling capacitors on IC package.

Specifications

Size	1.6×0.8mm to 3.2×1.6mm
Rated Voltage	DC4V to 25V
Capacitance	0.01μF to 4.7μF
Main Applications	Application processor/CPU/GPU



This catalog contains only a portion of the product lineup.
Please refer to the capacitor search tool on the Murata Web site for details.

LLA Series High Dielectric Constant Type Low ESL Part Number List

■ 1.6×0.8mm

T max.	Rated Voltage	TC Code	Cap.	Tol.	Part Number	
0.55mm	4Vdc	X7S	0.10μF	±20%	LLA185C70G104MA01#	
			0.22μF	±20%	LLA185C70G224MA01#	
			0.47μF	±20%	LLA185C70G474MA01#	
			2.2μF	±20%	LLA185C70G225ME16#	

■ 2.0×1.25mm

T max.	Rated Voltage	TC Code	Cap.	Tol.	Part Number	
0.55mm	25Vdc	X7R	10000pF	±20%	LLA215R71E103MA14#	
			22000pF	±20%	LLA215R71E223MA14#	
	16Vdc	X7R	47000pF	±20%	LLA215R71C473MA14#	
			0.10μF	±20%	LLA215R71C104MA14#	
	10Vdc	X7R	0.22μF	±20%	LLA215R71A224MA14#	
	6.3Vdc	X7R	0.47μF	±20%	LLA215R70J474MA14#	
	4Vdc	X7S	1.0μF	±20%	LLA215C70G105MA14#	
			4.7μF	±20%	LLA215C70G475ME19#	
0.95mm	25Vdc	X7R	10000pF	±20%	LLA219R71E103MA01#	
			22000pF	±20%	LLA219R71E223MA01#	
			47000pF	±20%	LLA219R71E473MA01#	
	16Vdc	X7R	0.10μF	±20%	LLA219R71C104MA01#	
			0.22μF	±20%	LLA219R71C224MA01#	
	10Vdc	X7R	0.47μF	±20%	LLA219R71A474MA01#	
	6.3Vdc	X7R	1.0μF	±20%	LLA219R70J105MA01#	
	4Vdc	X7S	2.2μF	±20%	LLA219C70G225MA01#	

■ 3.2×1.6mm

T max.	Rated Voltage	TC Code	Cap.	Tol.	Part Number	
0.55mm	16Vdc	X7R	0.22μF	±20%	LLA315R71C224MA14#	
	10Vdc	X7R	0.47μF	±20%	LLA315R71A474MA14#	
	6.3Vdc	X7R	1.0μF	±20%	LLA315R70J105MA14#	
			2.2μF	±20%	LLA315R70J225MA14#	
0.95mm	16Vdc	X7R	0.47μF	±20%	LLA319R71C474MA01#	
	10Vdc	X7R	1.0μF	±20%	LLA319R71A105MA01#	
1.25mm	16Vdc	X7R	1.0μF	±20%	LLA31MR71C105MA01#	
	10Vdc	X7R	2.2μF	±20%	LLA31MR71A225MA01#	

LW Reversed Low ESL Type

LLL Series



Low
ESL

This low ESL capacitor is ideal for power supply decoupling of high-speed operation electronic equipment.

Features

1 Low ESL

Since the equivalent series inductance (ESL) is low and excellent in high frequency characteristics, this capacitor is suitable for power supply decoupling of high-speed operation electronic equipment.



2 Contributes to a reduction in the number of components.

The number of components can be reduced by using low ESL capacitors, while maintaining functions equivalent to general purpose capacitors (GRM Series).

Murata proposes the use of the LLL series to reduce the number of components and high costs. Simulation is also possible.

Proposal for Cost Reductions



3 A maximum operating temperature up to 125°C.

We also offer an abundant lineup of X7* characteristics that can be used in high temperature locations, such as IC packages.

Specifications

Size	0.5×1.0mm to 1.6×3.2mm
Rated Voltage	DC2.5V to 50V
Capacitance	2,200pF to 10μF
Main Applications	Application processor/CPU/GPU



<Dimensions>

This catalog contains only a portion of the product lineup.
Please refer to the capacitor search tool on the Murata Web site for details.

LLL Series High Dielectric Constant Type Low ESL Part Number List

0.5×1.0mm

T max.	Rated Voltage	TC Code	Cap.	Tol.	Part Number	
0.35mm	6.3Vdc	X6S	0.10μF	±20%	LLL153C80J104ME01#	
			0.22μF	±20%	LLL153C80J224ME14#	
	4Vdc	X7S	0.47μF	±20%	LLL153C70G474ME17#	
		X6S	1.0μF	±20%	LLL153C80G105ME21#	

0.6×1.0mm

T max.	Rated Voltage	TC Code	Cap.	Tol.	Part Number	
0.45mm	4Vdc	X5R	4.3μF	±20%	LLL1U4R60G435ME22#	

0.8×1.6mm

T max.	Rated Voltage	TC Code	Cap.	Tol.	Part Number	
0.5mm	25Vdc	X7R	10000pF	±20%	LLL185R71E103MA11#	
	16Vdc	X7R	22000pF	±20%	LLL185R71C223MA11#	
			47000pF	±20%	LLL185R71C473MA11#	
	10Vdc	X7R	0.10μF	±20%	LLL185R71A104MA11#	
	4Vdc	X7S	0.22μF	±20%	LLL185C70G224MA11#	
0.55mm	4Vdc	X7S	2.2μF	±20%	LLL185C70G225ME01#	
0.6mm	50Vdc	X7R	2200pF	±20%	LLL185R71H222MA01#	
			4700pF	±20%	LLL185R71H472MA01#	
	25Vdc	X7R	10000pF	±20%	LLL185R71E103MA01#	
			22000pF	±20%	LLL185R71E223MA01#	
	16Vdc	X7R	47000pF	±20%	LLL185R71C473MA01#	
	10Vdc	X7R	0.10μF	±20%	LLL185R71A104MA01#	
			0.22μF	±20%	LLL185R71A224MA01#	
	4Vdc	X7S	0.47μF	±20%	LLL185C70G474MA01#	

1.25×2.0mm

T max.	Rated Voltage	TC Code	Cap.	Tol.	Part Number	
0.5mm	50Vdc	X7R	10000pF	±20%	LLL215R71H103MA11#	
	25Vdc	X7R	22000pF	±20%	LLL215R71E223MA11#	
	16Vdc	X7R	47000pF	±20%	LLL215R71C473MA11#	
			0.10μF	±20%	LLL215R71C104MA11#	
	10Vdc	X7R	0.22μF	±20%	LLL215R71A224MA11#	
	6.3Vdc	X7R	0.47μF	±20%	LLL215R70J474MA11#	
	4Vdc	X7S	1.0μF	±20%	LLL215C70G105MA11#	
0.7mm	50Vdc	X7R	10000pF	±20%	LLL216R71H103MA01#	
			22000pF	±20%	LLL216R71H223MA01#	
	25Vdc	X7R	47000pF	±20%	LLL216R71E473MA01#	
			0.10μF	±20%	LLL216R71E104MA01#	
	10Vdc	X7R	0.22μF	±20%	LLL216R71A224MA01#	
0.95mm	16Vdc	X7R	0.22μF	±20%	LLL219R71C224MA01#	
	10Vdc	X7R	0.47μF	±20%	LLL219R71A474MA01#	
			1.0μF	±20%	LLL219R71A105MA01#	
	4Vdc	X7S	2.2μF	±20%	LLL219C70G225MA01#	

1.6×3.2mm

T max.	Rated Voltage	TC Code	Cap.	Tol.	Part Number	
0.5mm	50Vdc	X7R	10000pF	±20%	LLL315R71H103MA11#	
			22000pF	±20%	LLL315R71H223MA11#	
	25Vdc	X7R	47000pF	±20%	LLL315R71E473MA11#	
			0.10μF	±20%	LLL315R71E104MA11#	
	16Vdc	X7R	0.22μF	±20%	LLL315R71C224MA11#	
	10Vdc	X7R	0.47μF	±20%	LLL315R71A474MA11#	
0.8mm	50Vdc	X7R	10000pF	±20%	LLL317R71H103MA01#	
			22000pF	±20%	LLL317R71H223MA01#	
			47000pF	±20%	LLL317R71H473MA01#	
	25Vdc	X7R	0.10μF	±20%	LLL317R71E104MA01#	
	16Vdc	X7R	0.22μF	±20%	LLL317R71C224MA01#	
			0.47μF	±20%	LLL317R71C474MA01#	
	10Vdc	X7R	1.0μF	±20%	LLL317R71A105MA01#	
	6.3Vdc	X7R	2.2μF	±20%	LLL317R70J225MA01#	
	1.25mm	50Vdc	X7R	0.10μF	±20%	LLL31MR71H104MA01#
0.22μF				±20%	LLL31MR71E224MA01#	
0.47μF				±20%	LLL31MR71E474MA01#	
16Vdc		X7R	1.0μF	±20%	LLL31MR71C105MA01#	
10Vdc		X7R	2.2μF	±20%	LLL31MR71A225MA01#	
6.3Vdc		X7R	4.7μF	±20%	LLL31MR70J475MA01#	
	X5R		10μF	±20%	LLL31MR60J106ME01#	

10-Terminal Low ESL Type

LLM Series



Low
ESL

10-Terminal Type Low ESL Capacitor Ideal for Power Supply Decoupling of High-speed Operation IC

Features

① This is the lowest ESL LW reversed type capacitor.

Since the equivalent series inductance (ESL) of this product is even lower than the LLA series (8-terminal product) with excellent high frequency characteristics, this capacitor is ideal for power supply decoupling of high-speed operation IC.



<Effectiveness of Cancelling Out Inductance by Mutual Inductance>



<Effectiveness of Suppressing Inductance when Mounting a Multi-terminal Capacitor>

The inductance for the boards also becomes lower, not only the capacitor.

② A maximum operating temperature up to 125°C.

This product is applicable to high temperatures (X7* characteristics); however, Murata also offers numerous thin type products, which are ideal as decoupling capacitors on IC package.

Specifications

Size	2.0×1.25mm to 3.2×1.6mm
Rated Voltage	DC4V to 16V
Capacitance	0.1μF to 2.2μF
Main Applications	Application processor/CPU/GPU



This catalog contains only a portion of the product lineup.
Please refer to the capacitor search tool on the Murata Web site for details.

LLM Series High Dielectric Constant Type Part Number List

■ 2.0×1.25mm

T max.	Rated Voltage	TC Code	Cap.	Tol.	Part Number	
0.55mm	6.3Vdc	X7R	0.22μF	±20%	LLM215R70J224MA11#	
			0.47μF	±20%	LLM215R70J474MA11#	
	4Vdc	X7S	1.0μF	±20%	LLM215C70G105MA11#	

■ 3.2×1.6mm

T max.	Rated Voltage	TC Code	Cap.	Tol.	Part Number	
0.55mm	16Vdc	X7R	0.10μF	±20%	LLM315R71C104MA11#	
			0.22μF	±20%	LLM315R71C224MA11#	
	10Vdc	X7R	0.47μF	±20%	LLM315R71A474MA11#	
	6.3Vdc	X7R	2.2μF	±20%	LLM315R70J225MA11#	

ESR Controlled Low ESL Type

LLR Series



Low
ESL

ESR Controlled Type Low ESL Capacitors Equipped with Anti-resonance Control Function

Features

① Reduces Anti-resonance

This capacitor is controlled so that the equivalent series resistance (ESR) becomes slightly higher, and is effective in reducing the anti-resonance that occurs when capacitor arrays are used.



② Lineup of capacitors with ESR values from 100 to 1,000mΩ.

According to the conditions of the anti-resonance, the most suitable ESR value can be selected from 4 types.

③ Low ESL

This ESR controlled type capacitor has excellent high frequency characteristics, with low equivalent series inductance (ESL). This is also ideal as a decoupling component.

Specifications

Size	0.8×1.6mm
Rated Voltage	DC4V
Capacitance	1.0μF
Main Applications	Network processor/ASIC/PMIC



This catalog contains only a portion of the product lineup.
Please refer to the capacitor search tool on the Murata Web site for details.

GRM Series

GJM Series

GMA Series

GMD Series

GQM Series

GRJ Series

GR3 Series

KRM Series

KR3 Series

LLA Series

LLL Series

LLM Series

LLR Series

⚠Caution/
Notice

LLR Series High Dielectric Constant Type Part Number List

■ 0.8×1.6mm

T max.	Rated Voltage	TC Code	Cap.	Tol.	Part Number	
0.55mm	4Vdc	X7S	1.0μF	±20%	LLR185C70G105ME01#	
				±20%	LLR185C70G105ME03#	
				±20%	LLR185C70G105ME05#	
				±20%	LLR185C70G105ME07#	

Part number # indicates the package specification code.

⚠Caution/Notice

⚠Caution

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GRM Series

GJM Series

GMA Series

GMD Series

GQM Series

GRJ Series

GR3 Series

KRM Series

KR3 Series

LLA Series

LLL Series

LLM Series

LLR Series

⚠Caution/
Notice

⚠Caution

■ Storage and Operation Conditions

1. The performance of chip monolithic ceramic capacitors may be affected by the storage conditions.

1-1. Store the capacitors in the following conditions:

Room Temperature of +5°C to +40°C and a Relative Humidity of 20% to 70%.

(1) Sunlight, dust, rapid temperature changes, corrosive gas atmosphere, or high temperature and humidity conditions during storage may affect solderability and packaging performance.

Therefore, please maintain the storage temperature and humidity. Use the product within six months, as prolonged storage may cause oxidation of the electrodes.

(2) Please confirm solderability before using after six months. Store the capacitors without opening the original bag. Even if the storage period is short, do not exceed the specified atmospheric conditions.

1-2. Corrosive gas can react with the termination (external) electrodes or lead wires of capacitors, and result in poor solderability. Do not store the capacitors in an atmosphere consisting of corrosive gas (e.g., hydrogen sulfide, sulfur dioxide, chlorine, ammonia gas, etc.).

1-3. Due to moisture condensation caused by rapid humidity changes, or the photochemical change caused by direct sunlight on the terminal electrodes and/or the resin/epoxy coatings, the solderability and electrical performance may deteriorate. Do not store capacitors under direct sunlight or in high humidity conditions.

■ Rating

1. Temperature Dependent Characteristics

1. The electrical characteristics of a capacitor can change with temperature.

1-1. For capacitors having larger temperature dependency, the capacitance may change with temperature changes.

The following actions are recommended in order to ensure suitable capacitance values.

(1) Select a suitable capacitance for the operating temperature range.

(2) The capacitance may change within the rated temperature.

When you use a high dielectric constant type capacitor in a circuit that needs a tight (narrow) capacitance tolerance (e.g., a time-constant circuit), please carefully consider the temperature characteristics, and carefully confirm the various characteristics in actual use conditions and the actual system.

[Typical Temperature Characteristics X7R (R7)]

Sample: 0.1μF, Rated Voltage 50VDC



[Typical Temperature Characteristics X5R (R6)]

Sample: 22μF, Rated Voltage 4VDC



2. Measurement of Capacitance

1. Measure capacitance with the voltage and frequency specified in the product specifications.

1-1. The output voltage of the measuring equipment may decrease occasionally when capacitance is high. Please confirm whether a prescribed measured voltage is impressed to the capacitor.

1-2. The capacitance values of high dielectric constant type capacitors change depending on the AC voltage applied. Please consider the AC voltage characteristics when selecting a capacitor to be used in an AC circuit.

Continued from the preceding page.

3. Applied Voltage

1. Do not apply a voltage to the capacitor that exceeds the rated voltage as called out in the specifications.
 - 1-1. Applied voltage between the terminals of a capacitor shall be less than or equal to the rated voltage.
 - (1) When AC voltage is superimposed on DC voltage, the zero-to-peak voltage shall not exceed the rated DC voltage.
When AC voltage or pulse voltage is applied, the peak-to-peak voltage shall not exceed the rated DC voltage.
 - (2) Abnormal voltages (surge voltage, static electricity, pulse voltage, etc.) shall not exceed the rated DC voltage.

Typical Voltage Applied to the DC Capacitor

DC Voltage	DC Voltage+AC	AC Voltage	Pulse Voltage
			

(E: Maximum possible applied voltage.)

- 1-2. Influence of over voltage
Over voltage that is applied to the capacitor may result in an electrical short circuit caused by the breakdown of the internal dielectric layers.
The time duration until breakdown depends on the applied voltage and the ambient temperature.
2. Use a safety standard certified capacitor in a power supply input circuit (AC filter), as it is also necessary to consider the withstand voltage and impulse withstand voltage defined for each device.

4. Type of Applied Voltage and Self-heating Temperature

1. Confirm the operating conditions to make sure that no large current is flowing into the capacitor due to the continuous application of an AC voltage or pulse voltage.
When a DC rated voltage product is used in an AC voltage circuit or a pulse voltage circuit, the AC current or pulse current will flow into the capacitor; therefore check the self-heating condition.
Please confirm the surface temperature of the capacitor so that the temperature remains within the upper limits of the operating temperature, including the rise in temperature due to self-heating. When the capacitor is used with a high-frequency voltage or pulse voltage, heat may be generated by dielectric loss.
<Applicable to Rated Voltage of less than 100VDC>
 - 1-1. The load should be contained to the level such that when measuring at atmospheric temperature of 25°C, the product's self-heating remains below 20°C and the surface temperature of the capacitor in the actual circuit remains within the maximum operating temperature.

[Example of Temperature Rise (Heat Generation) in Chip Monolithic Ceramic Capacitors in Contrast to Ripple Current]

Sample: R (R1) characteristics 10μF,
Rated voltage: DC10V



⚠Caution

Continued from the preceding page.

<Applicable to Temperature Characteristics X7R (R7), X7T (D7) beyond Rated Voltage of 200VDC>

1-2. The load should be contained so that the self-heating of the capacitor body remains below 20°C, when measuring at an ambient temperature of 25°C. In addition, use a K thermocouple of $\phi 0.1\text{mm}$ with less heat capacity when measuring, and measure in a condition where there is no effect from the radiant heat of other components or air flow caused by convection. Excessive generation of heat may cause deterioration of the characteristics and reliability of the capacitor. (Absolutely do not perform measurements while the cooling fan is operating, as an accurate measurement may not be performed.)

<Applicable to Temperature Characteristics U2J (7U), C0G (5C) beyond Rated Voltage of 200VDC>

1-3. Since the self-heating is low in the low loss series, the allowable power becomes extremely high compared to the common X7R (R7) characteristics. However, when a load with self-heating of 20°C is applied at the rated voltage, the allowable power may be exceeded. When the capacitor is used in a high-frequency voltage circuit of 1kHz or more, the frequency of the applied voltage should be less than 500kHz sine wave (less than 100kHz for a product with rated voltage of DC3.15kV), to limit the voltage load so that the load remains within the derating shown in the following figure. In the case of non-sine wave, high-frequency components exceeding the fundamental frequency may be included. In such a case, please contact Murata. The excessive generation of heat may cause deterioration of the characteristics and reliability of the capacitor. (Absolutely do not perform measurements while the cooling fan is operating, as an accurate measurement may not be performed.)

The temperature of the surface of capacitor: 125°C or less (including self-heating)

C0G (5C) char., Rated Voltage: DC200V



C0G (5C) char., Rated Voltage: DC250V



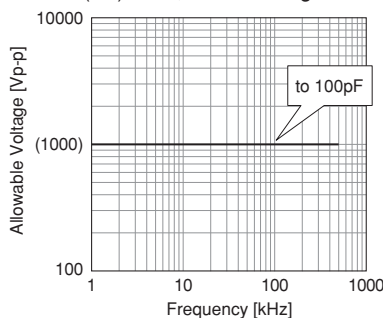
C0G (5C) char., Rated Voltage: DC500V



C0G (5C) char., Rated Voltage: DC630V



C0G (5C) char., Rated Voltage: DC1kV



The sine-wave frequency VS allowable voltage

Continued on the following page. ➤

Continued from the preceding page.

The temperature of the surface
of capacitor: 125°C or less (including self-heating)



The sine-wave frequency VS allowable voltage

<Design Tool>

• Simsurfing

Simsurfing is a web application to display the characteristics charts and download the characteristics data of our products. The frequency characteristics, temperature characteristics, bias characteristics etc. can be checked.

(Address: <http://www.murata.com/simsurfing/>)

• Medium Voltage Ceramic Capacitor Selection Tool

The selection tool "Murata Medium Voltage Capacitors Selection Tool by Voltage Form" is installed in the above SimSurfing, where the usability of the preferred medium voltage ceramic capacitors can be determined according to the application including automobiles.

By using this tool, the preferred products* can be checked by specifications, such as the power, voltage, and fundamental frequency of the voltage waveform to be input into the capacitor.

*Supported Series

Temperature characteristics U2J (7U), C0G (5C) of GRM/DC200V or more

⚠Caution

Continued from the preceding page.

5. DC Voltage and AC Voltage Characteristics

1. The capacitance value of a high dielectric constant type capacitor changes depending on the DC voltage applied. Please consider the DC voltage characteristics when a capacitor is selected for use in a DC circuit.

1-1. The capacitance of ceramic capacitors may change sharply depending on the applied voltage (see figure).

Please confirm the following in order to secure the capacitance.

- (1) Determine whether the capacitance change caused by the applied voltage is within the allowed range.
- (2) In the DC voltage characteristics, the rate of capacitance change becomes larger as voltage increases, even if the applied voltage is below the rated voltage. When a high dielectric constant type capacitor is used in a circuit that requires a tight (narrow) capacitance tolerance (e.g., a time constant circuit), please carefully consider the voltage characteristics, and confirm the various characteristics in actual operating conditions in an actual system.

2. The capacitance values of high dielectric constant type capacitors changes depending on the AC voltage applied. Please consider the AC voltage characteristics when selecting a capacitor to be used in an AC circuit.

[DC Voltage Characteristics]

Sample: X7R (R7) Characteristics 0.1μF,
Rated Voltage 50VDC



[AC Voltage Characteristics]

Sample: X7R (R7) Characteristics 10μF,
Rated Voltage 6.3VDC



6. Capacitance Aging

1. The high dielectric constant type capacitors have the characteristic in which the capacitance value decreases with the passage of time.

When you use high dielectric constant type capacitors in a circuit that needs a tight (narrow) capacitance tolerance (e.g., a time-constant circuit), please carefully consider the characteristics of these capacitors, such as their aging, voltage, and temperature characteristics. In addition, check capacitors using your actual appliances at the intended environment and operating conditions.

[Example of Change Over Time (Aging Characteristics)]



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7. Vibration and Shock

- Please confirm the kind of vibration and/or shock, its condition, and any generation of resonance.
Please mount the capacitor so as not to generate resonance, and do not allow any impact on the terminals.
- Mechanical shock due to being dropped may cause damage or a crack in the dielectric material of the capacitor.
Do not use a dropped capacitor because the quality and reliability may be deteriorated.
- When printed circuit boards are piled up or handled, the corner of another printed circuit board should not be allowed to hit the capacitor, in order to avoid a crack or other damage to the capacitor.



■ Soldering and Mounting

1. Mounting Position

- Confirm the best mounting position and direction that minimizes the stress imposed on the capacitor during flexing or bending the printed circuit board.
 - Choose a mounting position that minimizes the stress imposed on the chip during flexing or bending of the board.

[Component Direction]



[Chip Mounting Close to Board Separation Point]

It is effective to implement the following measures, to reduce stress in separating the board.

It is best to implement all of the following three measures; however, implement as many measures as possible to reduce stress.

Contents of Measures	Stress Level
(1) Turn the mounting direction of the component parallel to the board separation surface.	$A > D$
(2) Add slits in the board separation part.	$A > B$
(3) Keep the mounting position of the component away from the board separation surface.	$A > C$



[Mounting Capacitors Near Screw Holes]

When a capacitor is mounted near a screw hole, it may be affected by the board deflection that occurs during the tightening of the screw. Mount the capacitor in a position as far away from the screw holes as possible.



⚠Caution

☐ Continued from the preceding page.

2. Information before Mounting

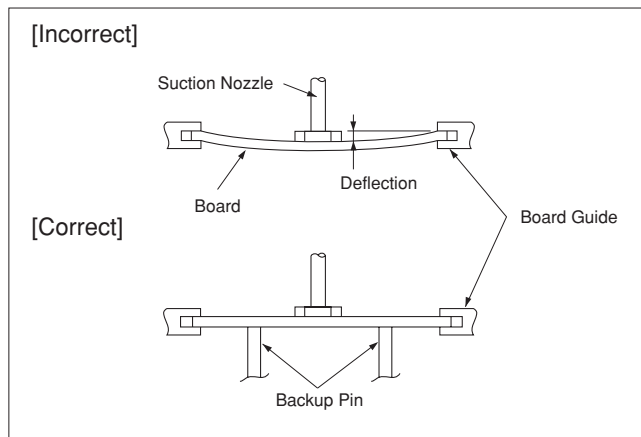
1. Do not re-use capacitors that were removed from the equipment.
2. Confirm capacitance characteristics under actual applied voltage.
3. Confirm the mechanical stress under actual process and equipment use.
4. Confirm the rated capacitance, rated voltage and other electrical characteristics before assembly.
5. Prior to use, confirm the solderability of capacitors that were in long-term storage.
6. Prior to measuring capacitance, carry out a heat treatment for capacitors that were in long-term storage.
7. The use of Sn-Zn based solder will deteriorate the reliability of the MLCC.

Please contact our sales representative or product engineers on the use of Sn-Zn based solder in advance.

8. We have also produced a DVD which shows a summary of our opinions, regarding the precautions for mounting. Please contact our sales representative to request the DVD.

3. Maintenance of the Mounting (pick and place) Machine

1. Make sure that the following excessive forces are not applied to the capacitors.
 - 1-1. In mounting the capacitors on the printed circuit board, any bending force against them shall be kept to a minimum to prevent them from any bending damage or cracking. Please take into account the following precautions and recommendations for use in your process.
 - (1) Adjust the lowest position of the pickup nozzle so as not to bend the printed circuit board.
 - (2) Adjust the nozzle pressure within a static load of 1N to 3N during mounting.
2. Dirt particles and dust accumulated between the suction nozzle and the cylinder inner wall prevent the nozzle from moving smoothly. This imposes greater force upon the chip during mounting, causing cracked chips. Also, the locating claw, when worn out, imposes uneven forces on the chip when positioning, causing cracked chips. The suction nozzle and the locating claw must be maintained, checked, and replaced periodically.



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4-1. Reflow Soldering

- When sudden heat is applied to the components, the mechanical strength of the components will decrease because a sudden temperature change causes deformation inside the components. In order to prevent mechanical damage to the components, preheating is required for both the components and the PCB. Preheating conditions are shown in table 1. It is required to keep the temperature differential between the solder and the components surface (ΔT) as small as possible.
- Solderability of tin plating termination chips might be deteriorated when a low temperature soldering profile where the peak solder temperature is below the melting point of tin is used. Please confirm the solderability of tin plated termination chips before use.
- When components are immersed in solvent after mounting, be sure to maintain the temperature difference (ΔT) between the component and the solvent within the range shown in table 1.

Table 1

Part Number	Temperature Differential
GJM/GQM/GR3/GRJ/GRM/KRM/LLL/LLR Series 02/03/15/18/21/31 sizes LLL Series 1U size	$\Delta T \leq 190^\circ\text{C}$
GR3/GRJ/GRM/KR3/KRM Series 32/43/55 sizes LLA/LLM Series 18/21/31 sizes GQM Series 22 size	$\Delta T \leq 130^\circ\text{C}$

Recommended Conditions

	Pb-Sn Solder		Lead Free Solder
	Reflow	Vapor Reflow	
Peak Temperature	230 to 250°C	230 to 240°C	240 to 260°C
Atmosphere	Air	Saturated vapor of inactive solvent	Air or N ₂

Pb-Sn Solder: Sn-37Pb

Lead Free Solder: Sn-3.0Ag-0.5Cu

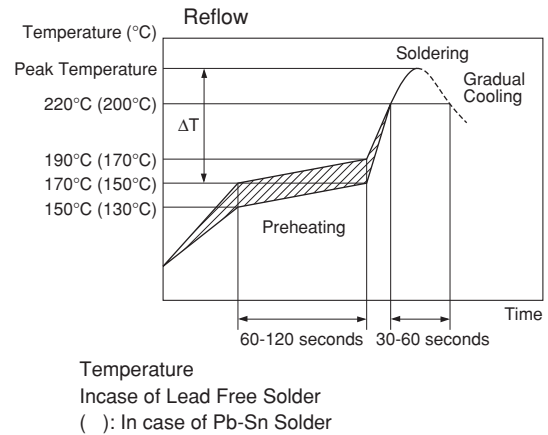
4. Optimum Solder Amount for Reflow Soldering

- Overly thick application of solder paste results in a excessive solder fillet height. This makes the chip more susceptible to mechanical and thermal stress on the board and may cause the chips to crack.
- Too little solder paste results in a lack of adhesive strength on the outer electrode, which may result in chips breaking loose from the PCB.
- Make sure the solder has been applied smoothly to the end surface to a height of 0.2mm* min.

Inverting the PCB

Make sure not to impose any abnormal mechanical shocks to the PCB.

[Standard Conditions for Reflow Soldering]



[Allowable Reflow Soldering Temperature and Time]



In the case of repeated soldering, the accumulated soldering time must be within the range shown above.



⚠Caution

Continued from the preceding page.

4-2. Flow Soldering

- Do not apply flow soldering to chips not listed in table 2.

Table 2

Part Number	Temperature Differential
GR3/GRM Series 18/21/31 sizes GQM Series 18/21 sizes LLL Series 21/31 sizes GRJ Series Rated Voltage 250VDC or more 18/21/31 sizes	$\Delta T \leq 150^{\circ}\text{C}$

- When sudden heat is applied to the components, the mechanical strength of the components will decrease because a sudden temperature change causes deformation inside the components. In order to prevent mechanical damage to the components, preheating is required for both of the components and the PCB. Preheating conditions are shown in table 2. It is required to keep the temperature differential between the solder and the components surface (ΔT) as low as possible.
- Excessively long soldering time or high soldering temperature can result in leaching of the outer electrodes, causing poor adhesion or a reduction in capacitance value due to loss of contact between the electrodes and end termination.
- When components are immersed in solvent after mounting, be sure to maintain the temperature differential (ΔT) between the component and solvent within the range shown in the table 2.

Recommended Conditions

	Pb-Sn Solder	Lead Free Solder
Preheating Peak Temperature	90 to 110°C	100 to 120°C
Soldering Peak Temperature	240 to 250°C	250 to 260°C
Atmosphere	Air	Air

Pb-Sn Solder: Sn-37Pb

Lead Free Solder: Sn-3.0Ag-0.5Cu

5. Optimum Solder Amount for Flow Soldering

- The top of the solder fillet should be lower than the thickness of the components. If the solder amount is excessive, the risk of cracking is higher during board bending or any other stressful condition.

[Standard Conditions for Flow Soldering]



[Allowable Flow Soldering Temperature and Time]



In the case of repeated soldering, the accumulated soldering time must be within the range shown above.



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4-3. Correction of Soldered Portion

When sudden heat is applied to the capacitor, distortion caused by the large temperature difference occurs internally, and can be the cause of cracks. Capacitors also tend to be affected by mechanical and thermal stress depending on the board preheating temperature or the soldering fillet shape, and can be the cause of cracks. Please refer to "1. PCB Design" or "3. Optimum solder amount" for the solder amount and the fillet shapes.

1. Correction with a Soldering Iron

- 1-1. In order to reduce damage to the capacitor, be sure to preheat the capacitor and the mounting board. Preheat to the temperature range shown in Table 3. A hot plate, hot air type preheater, etc. can be used for preheating.
- 1-2. After soldering, do not allow the component/PCB to cool down rapidly.
- 1-3. Perform the corrections with a soldering iron as quickly as possible. If the soldering iron is applied too long, there is a possibility of causing solder leaching on the terminal electrodes, which will cause deterioration of the adhesive strength and other problems.

2. Correction with Spot Heater

Compared to local heating with a soldering iron, hot air heating by a spot heater heats the overall component and board, therefore, it tends to lessen the thermal shock. In the case of a high density mounted board, a spot heater can also prevent concerns of the soldering iron making direct contact with the component.

- 2-1. If the distance from the hot air outlet of the spot heater to the component is too close, cracks may occur due to thermal shock. To prevent this problem, follow the conditions shown in Table 4.

- 2-2. In order to create an appropriate solder fillet shape, it is recommended that hot air be applied at the angle shown in Figure 1.

3. Optimum solder amount when re-working with a soldering iron

- 3-1. In the case of sizes smaller than 0603, (GJM/GQM/GR3/GRJ/GRM Series, 03/15/18 sizes), the top of the solder fillet should be lower than $\frac{2}{3}$ of the thickness of the component or 0.5mm, whichever is smaller. In the case of 0805 and larger sizes, (GJM/GQM/GR3/GRJ/GRM Series, 21/22/31/32/43/55 sizes), the top of the solder fillet should be lower than $\frac{2}{3}$ of the thickness of the component. If the solder amount is excessive, the risk of cracking is higher during board bending or under any other stressful condition.

Table 3

Part Number	Temperature of Soldering Iron Tip	Preheating Temperature	Temperature Differential (ΔT)	Atmosphere
GJM/GQM/GR3/GRJ/GRM Series 03/15/18/21/31 sizes	350°C max.	150°C min.	$\Delta T \leq 190^\circ\text{C}$	Air
GRJ/GRM Series 32/43/55 sizes GQM Series 22 size	280°C max.	150°C min.	$\Delta T \leq 130^\circ\text{C}$	Air

*Applicable for both Pb-Sn and Lead Free Solder.

Pb-Sn Solder: Sn-37Pb

Lead Free Solder: Sn-3.0Ag-0.5Cu

Table 4

Distance	5mm or more
Hot Air Application Angle	45° *Figure 1
Hot Air Temperature Nozzle Outlet	400°C max.
Application Time	Less than 10 seconds (1206 (3216 in mm) size or smaller)
	Less than 30 seconds (1210 (3225 in mm) size or larger)

[Figure 1]



⚠Caution

Continued from the preceding page.

- 3-2. A soldering iron with a tip of $\phi 3\text{mm}$ or smaller should be used. It is also necessary to keep the soldering iron from touching the components during the re-work.

- 3-3. Solder wire with $\phi 0.5\text{mm}$ or smaller is required for soldering.

<Applicable to KR3/KRM Series>

4. For the shape of the soldering iron tip, refer to the figure on the right.

Regarding the type of solder, use a wire diameter of $\phi 0.5\text{mm}$ or less (rosin core wire solder).

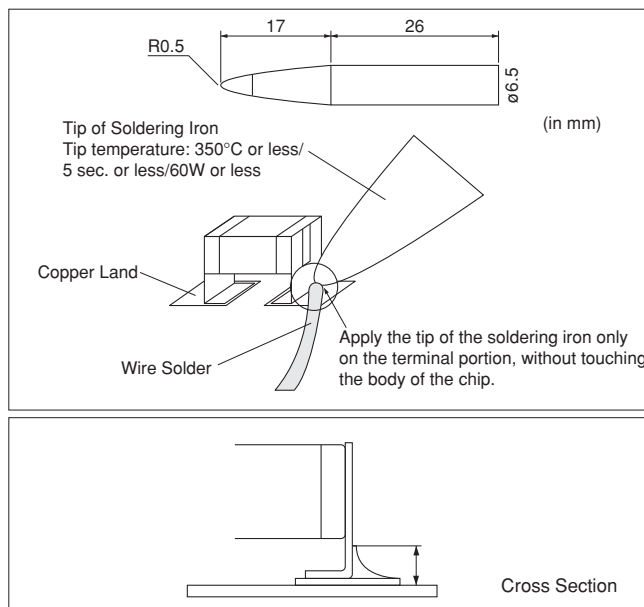
4-1. How to Apply the Soldering Iron

Apply the tip of the soldering iron against the lower end of the metal terminal.

- 1) In order to prevent cracking caused by sudden heating of the ceramic device, do not touch the ceramic base directly.
- 2) In order to prevent deviations and dislocating of the chip, do not touch the junction of the chip and the metal terminal, and the metal portion on the outside directly.

4-2. Appropriate Amount of Solder

The amount of solder for corrections by soldering iron, should be lower than the height of the lower side of the chip.



5. Washing

Excessive ultrasonic oscillation during cleaning can cause the PCBs to resonate, resulting in cracked chips or broken solder joints. Take note not to vibrate PCBs.

6. Electrical Test on Printed Circuit Board

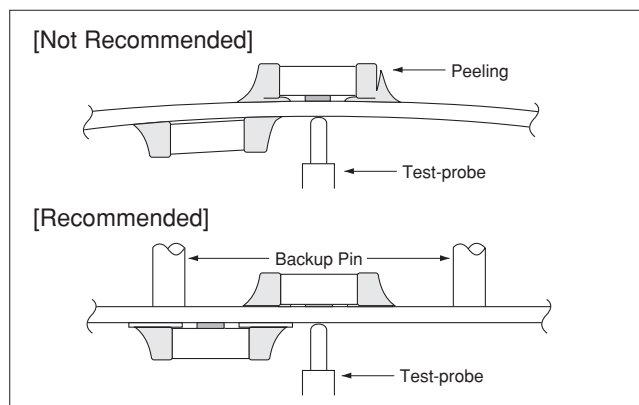
1. Confirm position of the backup pin or specific jig, when inspecting the electrical performance of a capacitor after mounting on the printed circuit board.

- 1-1. Avoid bending the printed circuit board by the pressure of a test-probe, etc.

The thrusting force of the test probe can flex the PCB, resulting in cracked chips or open solder joints.

Provide backup pins on the back side of the PCB to prevent warping or flexing. Install backup pins as close to the test-probe as possible.

- 1-2. Avoid vibration of the board by shock when a test-probe contacts a printed circuit board.



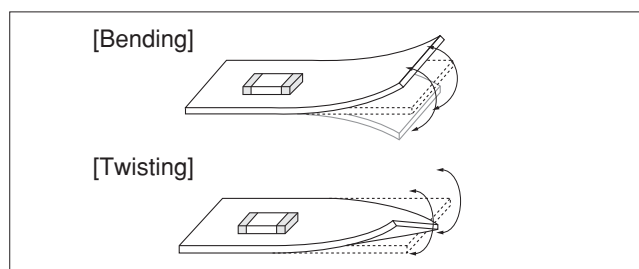
7. Printed Circuit Board Cropping

1. After mounting a capacitor on a printed circuit board, do not apply any stress to the capacitor that causes bending or twisting the board.

- 1-1. In cropping the board, the stress as shown at right may cause the capacitor to crack.

Cracked capacitors may cause deterioration of the insulation resistance, and result in a short.

Avoid this type of stress to a capacitor.



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2. Check the cropping method for the printed circuit board in advance.

2-1. Printed circuit board cropping shall be carried out by using a jig or an apparatus (Disk separator, router type separator, etc.) to prevent the mechanical stress that can occur to the board.

Board Separation Method	Hand Separation Nipper Separation	(1) Board Separation Jig	Board Separation Apparatus	
			(2) Disk Separator	(3) Router Type Separator
Level of stress on board	High	Medium	Medium	Low
Recommended	×	△*	△*	○
Notes	Hand and nipper separation apply a high level of stress. Use another method.	- Board handling - Board bending direction - Layout of capacitors	- Board handling - Layout of slits - Design of V groove - Arrangement of blades - Controlling blade life	Board handling

* When a board separation jig or disk separator is used, if the following precautions are not observed, a large board deflection stress will occur and the capacitors may crack. Use router type separator if at all possible.

(1) Example of a suitable jig

[In the case of Single-side Mounting]

An outline of the board separation jig is shown as follows. Recommended example: Stress on the component mounting position can be minimized by holding the portion close to the jig, and bend in the direction towards the side where the capacitors are mounted. Not recommended example: The risk of cracks occurring in the capacitors increases due to large stress being applied to the component mounting position, if the portion away from the jig is held and bent in the direction opposite the side where the capacitors are mounted.

[Outline of Jig]



Recommended	Not Recommended

[In the case of Double-sided Mounting]

Since components are mounted on both sides of the board, the risk of cracks occurring can not be avoided with the above method.

Therefore, implement the following measures to prevent stress from being applied to the components.
(Measures)

- (1) Consider introducing a router type separator.
If it is difficult to introduce a router type separator, implement the following measures. (Refer to item 1. Mounting Position)
- (2) Mount the components parallel to the board separation surface.
- (3) When mounting components near the board separation point, add slits in the separation position near the component.
- (4) Keep the mounting position of the components away from the board separation point.

⚠Caution

Continued from the preceding page.

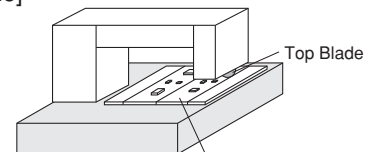
(2) Example of a Disk Separator

An outline of a disk separator is shown as follows. As shown in the Principle of Operation, the top blade and bottom blade are aligned with the V-grooves on the printed circuit board to separate the board.

In the following case, board deflection stress will be applied and cause cracks in the capacitors.

- (1) When the adjustment of the top and bottom blades are misaligned, such as deviating in the top-bottom, left-right or front-rear directions
 - (2) The angle of the V groove is too low, depth of the V groove is too shallow, or the V groove is misaligned top-bottom
- IF V groove is too deep, it is possible to brake when you handle and carry it. Carefully design depth of the V groove with consideration about strength of material of the printed circuit board.

[Outline of Machine]



[Principle of Operation]



[Cross-section Diagram]



Recommended	Not Recommended		
	Top-bottom Misalignment	Left-right Misalignment	Front-rear Misalignment
Top Blade Bottom Blade	Top Blade Bottom Blade	Top Blade Bottom Blade	Top Blade Bottom Blade

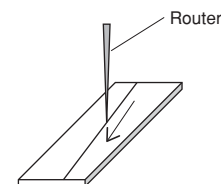
Example of Recommended V-groove Design	Not Recommended			
	Left-right Misalignment	Low-Angle	Depth too Shallow	Depth too Deep

(3) Example of Router Type Separator

The router type separator performs cutting by a router rotating at a high speed. Since the board does not bend in the cutting process, stress on the board can be suppressed during board separation.

When attaching or removing boards to/from the router type separator, carefully handle the boards to prevent bending.

[Outline Drawing]



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8. Assembly

1. Handling

If a board mounted with capacitors is held with one hand, the board may bend. Firmly hold the edges of the board with both hands when handling.

If a board mounted with capacitors is dropped, cracks may occur in the capacitors.

Do not use dropped boards, as there is a possibility that the quality of the capacitors may be impaired.

2. Attachment of Other Components

2-1. Mounting of Other Components

Pay attention to the following items, when mounting other components on the back side of the board after capacitors have been mounted on the opposite side. When the bottom dead point of the suction nozzle is set too low, board deflection stress may be applied to the capacitors on the back side (bottom side), and cracks may occur in the capacitors.

- After the board is straightened, set the bottom dead point of the nozzle on the upper surface of the board.
- Periodically check and adjust the bottom dead point.



2-2. Inserting Components with Leads into Boards

When inserting components (transformers, IC, etc.) into boards, bending the board may cause cracks in the capacitors or cracks in the solder.

Pay attention to the following.

- Increase the size of the holes to insert the leads, to reduce the stress on the board during insertion.
- Fix the board with backup pins or a dedicated jig before insertion.
- Support below the board so that the board does not bend. When using multiple backup pins on the board, periodically confirm that there is no difference in the height of each backup pin.



2-3. Attaching/Removing Sockets

When the board itself is a connector, the board may bend when a socket is attached or removed. Plan the work so that the board does not bend when a socket is attached or removed.



2-4. Tightening Screws

The board may be bent, when tightening screws, etc. during the attachment of the board to a shield or chassis.

Pay attention to the following items before performing the work.

- Plan the work to prevent the board from bending.
- Use a torque screwdriver, to prevent over-tightening of the screws.
- The board may bend after mounting by reflow soldering, etc. Please note, as stress may be applied to the chips by forcibly flattening the board when tightening the screws.



Continued on the following page. ➤

⚠Caution

☐ Continued from the preceding page.

<Applicable to GMA or GMD Series>

9. Die Bonding/Wire Bonding

1. Die Bonding of Capacitors

1-1. Use the following materials for the Brazing alloys:

Au-Sn (80/20) 300 to 320 °C in N₂ atmosphere

1-2. Mounting

- (1) Control the temperature of the substrate so it matches the temperature of the brazing alloy.
- (2) Place the brazing alloy on the substrate and place the capacitor on the alloy. Hold the capacitor and gently apply the load. Be sure to complete the operation within 1 minute.

2. Wire Bonding

2-1. Wire

Gold wire: 25 micro m (0.001 inch) diameter

2-2. Bonding

- (1) Thermo compression, ultrasonic ball bonding.
- (2) Required stage temperature: 150 to 200 °C
- (3) Required wedge or capillary weight: 0.2N to 0.5N
- (4) Bond the capacitor and base substrate or other devices with gold wire.

■ Other

1. Under Operation of Equipment

- 1-1. Do not touch a capacitor directly with bare hands during operation in order to avoid the danger of an electric shock.
- 1-2. Do not allow the terminals of a capacitor to come in contact with any conductive objects (short-circuit). Do not expose a capacitor to a conductive liquid, including any acid or alkali solutions.
- 1-3. Confirm the environment in which the equipment will operate is under the specified conditions. Do not use the equipment under the following environments.
 - (1) Being spattered with water or oil.
 - (2) Being exposed to direct sunlight.
 - (3) Being exposed to ozone, ultraviolet rays, or radiation.
 - (4) Being exposed to toxic gas (e.g., hydrogen sulfide, sulfur dioxide, chlorine, ammonia gas, etc.)
 - (5) Any vibrations or mechanical shocks exceeding the specified limits.
 - (6) Moisture condensing environments.
- 1-4. Use damp proof countermeasures if using under any conditions that can cause condensation.

2. Other

2-1. In an Emergency

- (1) If the equipment should generate smoke, fire, or smell, immediately turn off or unplug the equipment. If the equipment is not turned off or unplugged, the hazards may be worsened by supplying continuous power.
- (2) In this type of situation, do not allow face and hands to come in contact with the capacitor or burns may be caused by the capacitor's high temperature.

2-2. Disposal of Waste

When capacitors are disposed of, they must be burned or buried by an industrial waste vendor with the appropriate licenses.

2-3. Circuit Design

(1) Addition of Fail Safe Function

Capacitors that are cracked by dropping or bending of the board may cause deterioration of the insulation resistance, and result in a short. If the circuit being used may cause an electrical shock, smoke or fire when a capacitor is shorted, be sure to install fail-safe functions, such as a fuse, to prevent secondary accidents.

- (2) Capacitors used to prevent electromagnetic interference in the primary AC side circuit, or as a connection/insulation, must be a safety standard certified product, or satisfy the contents stipulated in the Electrical Appliance and Material Safety Law. Install a fuse for each line in case of a short.
- (3) The GJM, GMA, GMD, GQM, GR3, GRJ, GRM, KR3, KRM, LLA, LLL, LLM and LLR series are not safety standard certified products.

2-4. Remarks

Failure to follow the cautions may result, worst case, in a short circuit and smoking when the product is used.

The above notices are for standard applications and conditions. Contact us when the products are used in special mounting conditions.

Select optimum conditions for operation as they determine the reliability of the product after assembly. The data herein are given in typical values, not guaranteed ratings.

■ Rating

1. Operating Temperature

1. The operating temperature limit depends on the capacitor.

- 1-1. Do not apply temperatures exceeding the upper operating temperature.

It is necessary to select a capacitor with a suitable rated temperature that will cover the operating temperature range.

It is also necessary to consider the temperature distribution in equipment and the seasonal temperature variable factor.

- 1-2. Consider the self-heating factor of the capacitor.

The surface temperature of the capacitor shall be the upper operating temperature or less when including the self-heating factors.

2. Atmosphere Surroundings (gaseous and liquid)

1. Restriction on the operating environment of capacitors.

- 1-1. Capacitors, when used in the above, unsuitable,

operating environments may deteriorate due to the corrosion of the terminations and the penetration of moisture into the capacitor.

- 1-2. The same phenomenon as the above may occur when the electrodes or terminals of the capacitor are subject to moisture condensation.

- 1-3. The deterioration of characteristics and insulation resistance due to the oxidization or corrosion of terminal electrodes may result in breakdown when the capacitor is exposed to corrosive or volatile gases or solvents for long periods of time.

3. Piezo-electric Phenomenon

1. When using high dielectric constant type capacitors in AC or pulse circuits, the capacitor itself vibrates at specific frequencies and noise may be generated. Moreover, when the mechanical vibration or shock is added to the capacitor, noise may occur.

■ Soldering and Mounting

1. PCB Design

1. Notice for Pattern Forms

- 1-1. Unlike leaded components, chip components are susceptible to flexing stresses since they are mounted directly on the substrate. They are also more sensitive to mechanical and thermal stresses than leaded components. Excess solder fillet height can multiply these stresses and cause chip cracking. When designing substrates, take land patterns and dimensions into consideration to eliminate the possibility of excess solder fillet height.

- 1-2. There is a possibility of chip cracking caused by PCB expansion/contraction with heat, because stress on a chip is different depending on PCB material and structure. When the thermal expansion coefficient greatly differs between the board used for mounting and the chip, it will cause cracking of the chip due to the thermal expansion and contraction. When capacitors are mounted on a fluorine resin printed circuit board or on a single-layered glass epoxy board, it may also cause cracking of the chip for the same reason.

Pattern Forms

	Prohibited	Correct
Placing Close to Chassis		
Placing of Chip Components and Leaded Components		
Placing of Leaded Components after Chip Component		
Lateral Mounting		

Continued on the following page. ➤

Notice

Continued from the preceding page.

2. Land Dimensions

- 2-1. Chip capacitors can be cracked due to the stress of PCB bending, etc. if the land area is larger than needed and has an excess amount of solder. Please refer to the land dimensions in table 1 for flow soldering, table 2 for reflow soldering, table 3 for reflow soldering for LLA Series, table 4 for reflow soldering for LLM Series. Please confirm the suitable land dimension by evaluating of the actual SET / PCB.

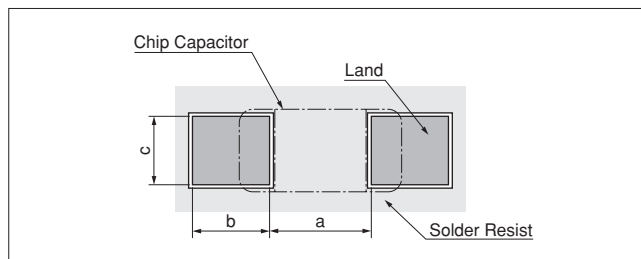


Table 1 Flow Soldering Method

Part Number	Dimensions	Chip (L×W)	a	b	c
GQM/GR3/GRJ/GRM Series 18 size		1.6×0.8	0.6 to 1.0	0.8 to 0.9	0.6 to 0.8
GQM/GR3/GRJ/GRM Series 21 size		2.0×1.25	1.0 to 1.2	0.9 to 1.0	0.8 to 1.1
GR3/GRJ/GRM Series 31 size		3.2×1.6	2.2 to 2.6	1.0 to 1.1	1.0 to 1.4
LLL Series 21 size		1.25×2.0	0.4 to 0.7	0.5 to 0.7	1.4 to 1.8
LLL Series 31 size		1.6×3.2	0.6 to 1.0	0.8 to 0.9	2.6 to 2.8

Flow soldering can only be used for products with a chip size from 1.6x0.8mm to 3.2x1.6mm.

(in mm)

Table 2 Reflow Soldering Method

Part Number	Dimensions	Chip (L×W)	a	b	c
GJM/GRM Series 02 size		0.4×0.2	0.16 to 0.2	0.12 to 0.18	0.2 to 0.23
GJM/GRM Series 03 size		0.6×0.3	0.2 to 0.3	0.2 to 0.35	0.2 to 0.4
GJM/GRM Series 15 size		1.0×0.5 (within ±0.10)	0.3 to 0.5	0.35 to 0.45	0.4 to 0.6
		1.0×0.5 (±0.15/±0.20)	0.4 to 0.6	0.4 to 0.5	0.5 to 0.7
GQM/GR3/GRJ/GRM Series 18 size		1.6×0.8 (within ±0.10)	0.6 to 0.8	0.6 to 0.7	0.6 to 0.8
		1.6×0.8 (±0.15/±0.20)	0.7 to 0.9	0.7 to 0.8	0.8 to 1.0
GQM Series 21 size		2.0×1.25	1.0 to 1.2	0.6 to 0.7	0.8 to 1.1
GR3/GRJ/GRM Series 21 size		2.0×1.25 (within ±0.10)	1.2	0.6	1.25
		2.0×1.25 (±0.15)	1.2	0.6 to 0.8	1.2 to 1.4
		2.0×1.25 (±0.20)	1.0 to 1.4	0.6 to 0.8	1.2 to 1.4
GR3/GRJ/GRM Series 31 size		3.2×1.6 (within ±0.20)	1.8 to 2.0	0.9 to 1.2	1.5 to 1.7
		3.2×1.6 (±0.30)	1.9 to 2.1	1.0 to 1.3	1.7 to 1.9
GR3/GRJ/GRM Series 32 size		3.2×2.5	2.0 to 2.4	1.0 to 1.2	1.8 to 2.3
GR3/GRJ/GRM Series 43 size		4.5×3.2	3.0 to 3.5	1.2 to 1.4	2.3 to 3.0
GR3/GRJ/GRM Series 55 size		5.7×5.0	4.0 to 4.6	1.4 to 1.6	3.5 to 4.8
LLL Series 15 size		0.5×1.0	0.15 to 0.2	0.2 to 0.25	0.7 to 1.0
LLL Series 1U size		0.6×1.0	0.20 to 0.25	0.25 to 0.35	0.7 to 1.0
LLL/LLR Series 18 size		0.8×1.6	0.2 to 0.3	0.3 to 0.4	1.4 to 1.6
LLL Series 21 size		1.25×2.0	0.4 to 0.5	0.4 to 0.5	1.4 to 1.8
LLL Series 31 size		1.6×3.2	0.6 to 0.8	0.6 to 0.7	2.6 to 2.8
GQM Series 22 size		2.8×2.8	2.2 to 2.5	0.8 to 1.0	1.9 to 2.3

(in mm)

<Applicable to Part Number KR3/KRM>

Part Number	Dimensions	Chip (L×W)	a	b	c
KRM Series 21 size		2.0×1.25	1.0 to 1.2	0.6 to 0.7	0.8 to 1.1
KRM Series 31 size		3.2×1.6	2.2 to 2.4	0.8 to 0.9	1.0 to 1.4
KR3/KRM Series 55 size		5.7×5.0	2.6	2.7	5.6

(in mm)

Continued on the following page. ➤

Continued from the preceding page.

[Land for LLA Series]



[Land for LLM Series]



Table 3 LLA Series Reflow Soldering Method

Part Number	Dimensions	Chip (L×W)	a	b	c	p
LLA Series 18 size		1.6×0.8	0.3 to 0.4	0.25 to 0.35	0.15 to 0.25	0.4
LLA Series 21 size		2.0×1.25	0.5 to 0.7	0.35 to 0.6	0.2 to 0.3	0.5
LLA Series 31 size		3.2×1.6	0.7 to 0.9	0.4 to 0.7	0.3 to 0.4	0.8

(in mm)

Table 4 LLM Series Reflow Soldering Method

Part Number	Dimensions	Chip (L×W)	a	b, b'	c, c'	d	e	f	p
LLM Series 21 size		2.0×1.25	0.6 to 0.8	(0.3 to 0.5)	0.3	2.0 to 2.6	1.3 to 1.8	1.4 to 1.6	0.5
LLM Series 31 size		3.2×1.6	1.0	(0.3 to 0.5)	0.4	3.2 to 3.6	1.6 to 2.0	2.6	0.8

$$b=(c-e)/2, b'=(d-f)/2$$

(in mm)

<Applicable to beyond Rated Voltage of 250VDC>

2-2. Dimensions of Slit (Example)

Preparing the slit helps flux cleaning and resin coating on the back of the capacitor.

However, the length of the slit design should be as short as possible to prevent mechanical damage in the capacitor.

A longer slit design might receive more severe mechanical stress from the PCB.

Recommended slit design is shown in the Table.



L×W	d	e
1.6×0.8	—	—
2.0×1.25	—	—
3.2×1.6	1.0 to 2.0	3.2 to 3.7
3.2×2.5	1.0 to 2.0	4.1 to 4.6
4.5×2.0	1.0 to 2.8	3.6 to 4.1
4.5×3.2	1.0 to 2.8	4.8 to 5.3
5.7×2.8	1.0 to 4.0	4.4 to 4.9
5.7×5.0	1.0 to 4.0	6.6 to 7.1

(in mm)

Continued on the following page. ➤

Notice

Continued from the preceding page.

3. Board Design

When designing the board, keep in mind that the amount of strain which occurs will increase depending on the size and material of the board.

[Relationship with amount of strain to the board thickness, length, width, etc.]

$$\epsilon = \frac{3PL}{2Ewh^2}$$
 Relationship between load and strain

ϵ : Strain on center of board (μst)
 L : Distance between supporting points (mm)
 w : Board width (mm)
 h : Board thickness (mm)
 E : Elastic modulus of board ($\text{N}/\text{m}^2=\text{Pa}$)
 Y : Deflection (mm)
 P : Load (N)



When the load is constant, the following relationship can be established.

- As the distance between the supporting points (L) increases, the amount of strain also increases.
→Reduce the distance between the supporting points.
 - As the elastic modulus (E) decreases, the amount of strain increases.
→Increase the elastic modulus.
 - As the board width (w) decreases, the amount of strain increases.
→Increase the width of the board.
 - As the board thickness (h) decreases, the amount of strain increases.
→Increase the thickness of the board.
- Since the board thickness is squared, the effect on the amount of strain becomes even greater.

2. Adhesive Application

- Thin or insufficient adhesive can cause the chips to loosen or become disconnected during flow soldering. The amount of adhesive must be more than dimension c , shown in the drawing at right, to obtain the correct bonding strength.

The chip's electrode thickness and land thickness must also be taken into consideration.

- Low viscosity adhesive can cause chips to slip after mounting. The adhesive must have a viscosity of $5000\text{Pa} \cdot \text{s}$ (500ps) min. (at 25°C).

3. Adhesive Coverage

Size (L×W) (in mm)	Adhesive Coverage*
1.6×0.8	0.05mg min.
2.0×1.25	0.1mg min.
3.2×1.6	0.15mg min.

*Nominal Value



3. Adhesive Curing

- Insufficient curing of the adhesive can cause chips to disconnect during flow soldering and causes deterioration in the insulation resistance between the outer electrodes due to moisture absorption. Control curing temperature and time in order to prevent insufficient hardening.

Continued on the following page. ➤

☐ Continued from the preceding page.

4. Flux for Reflow and Flow Soldering

1. An excessive amount of flux generates a large quantity of flux gas, which can cause a deterioration of solder ability, so apply flux thinly and evenly throughout. (A foaming system is generally used for flow soldering.)
2. Flux containing too high a percentage of halide may cause corrosion of the outer electrodes unless there is sufficient cleaning. Use flux with a halide content of 0.1% max.

3. Do not use strong acidic flux.

4. Do not use water-soluble flux.*

(*Water-soluble flux can be defined as non-rosin type flux including wash-type flux and non-wash-type flux.)

5. Flow Soldering

- Set temperature and time to ensure that leaching of the outer electrode does not exceed 25% of the chip end area as a single chip (full length of the edge A-B-C-D shown at right) and 25% of the length A-B shown as mounted on substrate.

[As a Single Chip]



[As Mounted on Substrate]



6. Washing

1. Please evaluate the capacitor using actual cleaning equipment and conditions to confirm the quality, and select the solvent for cleaning.
2. Unsuitable cleaning solvent may leave residual flux or other foreign substances, causing deterioration of electrical characteristics and the reliability of the capacitors.

3. Select the proper cleaning conditions.

3-1. Improper cleaning conditions (excessive or insufficient) may result in deterioration of the performance of the capacitors.

7. Coating

1. A crack may be caused in the capacitor due to the stress of the thermal contraction of the resin during curing process.
The stress is affected by the amount of resin and curing contraction.
Select a resin with low curing contraction.
The difference in the thermal expansion coefficient between a coating resin or a molding resin and the capacitor may cause the destruction and deterioration of the capacitor such as a crack or peeling, and lead to the deterioration of insulation resistance or dielectric breakdown.
Select a resin for which the thermal expansion coefficient is as close to that of the capacitor as possible.
A silicone resin can be used as an under-coating to buffer against the stress.

2. Select a resin that is less hygroscopic.

Using hygroscopic resins under high humidity conditions may cause the deterioration of the insulation resistance of a capacitor.

An epoxy resin can be used as a less hygroscopic resin.

Continued on the following page. ☐

Notice

Continued from the preceding page.

■ Other

1. Transportation

1. The performance of a capacitor may be affected by the conditions during transportation.
 - 1-1. The capacitors shall be protected against excessive temperature, humidity, and mechanical force during transportation.
 - (1) Climatic condition
 - low air temperature: -40°C
 - change of temperature air/air: -25°C/+25°C
 - low air pressure: 30 kPa
 - change of air pressure: 6 kPa/min.
 - (2) Mechanical condition

Transportation shall be done in such a way that the boxes are not deformed and forces are not directly passed on to the inner packaging.
 - 1-2. Do not apply excessive vibration, shock, or pressure to the capacitor.
 - (1) When excessive mechanical shock or pressure is applied to a capacitor, chipping or cracking may occur in the ceramic body of the capacitor.
 - (2) When the sharp edge of an air driver, a soldering iron, tweezers, a chassis, etc. impacts strongly on the surface of the capacitor, the capacitor may crack and short-circuit.
 - 1-3. Do not use a capacitor to which excessive shock was applied by dropping, etc.
A capacitor dropped accidentally during processing may be damaged.

2. Characteristics Evaluation in the Actual System

1. Evaluate the capacitor in the actual system, to confirm that there is no problem with the performance and specification values in a finished product before using.
2. Since a voltage dependency and temperature dependency exists in the capacitance of high dielectric type ceramic capacitors, the capacitance may change depending on the operating conditions in the actual system. Therefore, be sure to evaluate the various characteristics, such as the leakage current and noise absorptivity, which will affect the capacitance value of the capacitor.
3. In addition, voltages exceeding the predetermined surge may be applied to the capacitor by the inductance in the actual system. Evaluate the surge resistance in the actual system as required.

Qualified Standards

The products listed here have been produced by ISO 9001 certified factory.

Plant
Fukui Murata Mfg. Co., Ltd.
Izumo Murata Mfg. Co., Ltd.
Okayama Murata Mfg. Co., Ltd.
Murata Electronics Singapore (Pte.) Ltd.
Beijing Murata Electronics Co., Ltd.
Wuxi Murata Electronics Co., Ltd.

MEMO

[illegible]

Design assistant tool: SimSurfing

SimSurfing

MLCC is now available !

Design assistant tool "SimSurfing" has been updated and you can now find and view any kind of characteristics of MLCCs.

Available function for MLCCs:

- ① Products search
- ② View frequency characteristics (S parameters, Z, R, X, Q, DF, L, C)
DC bias can be applied to available part number.
- ③ DC voltage bias characteristics (absolute capacitance/change rate)
- ④ Temperature characteristics (absolute capacitance/change rate)
- ⑤ AC voltage bias characteristics (absolute capacitance/change rate)
- ⑥ Download SPICE netlist/S parameter



If you register members only engineers portal site "my Murata", you can use the Enhanced SimSurfing.

Member Registration
<https://my.murata.com/>

1 Select the Products

- (1) By part number
- (2) By specification

2 View characteristics

By clicking buttons in this area with part number selected, you can view any electrical characteristics chart.

3 Data download

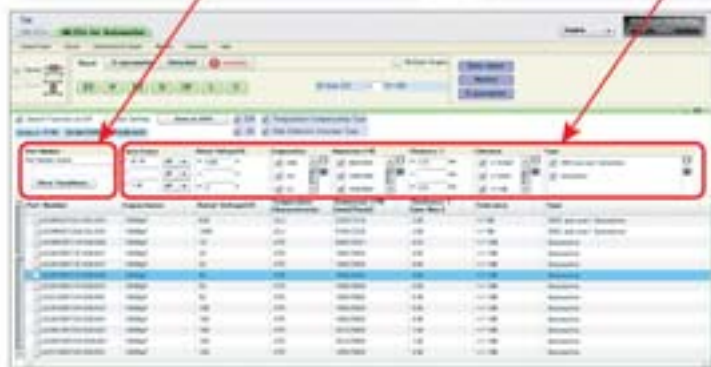
You can download SPICE netlist and S parameter files (S2P)

1

(1) Search by part number

1

(2) Search by specification



Added the capacitor finder tool for middle and high voltage capacitor which are capable for specified voltage waveform.

These images are captured at August/2014. Be sure that this software will be updated frequently.

<http://ds.murata.com/software/simsurfing/en-us/mlcc/>

Capacitor Website Introduction

muRata

Search for Capacitors

Global

Murata capacitors can be searched.

1 Search by part number

2 Search by specifications

3 Search by features

4 Search in the lineups

5 Cross reference

1 Search by part number <http://psearch.murata.com/capacitor/partnumber/>

The applicable capacitors can be searched by alphanumeric characters. Although the alternative symbol "#" is used for the package specification code, you can also enter the full package specification code to search the part number including the package specification code.

2 Search by specifications <http://psearch.murata.com/capacitor/spec/>

Capacitors can be searched by various specifications, such as the capacitance, rated voltage, and temperature characteristics.

Basic specifications

Applicable products can be searched by any value and specified range. To support the entry, the minimum and maximum values of the product applicable to the conditions selected in the other items will be displayed.

Add detailed specifications

Setting the conditions particular to the SMD, mold and lead, enables you to search the product with a more detailed specification.

3 Search by features <http://psearch.murata.com/capacitor/feature/>

The applicable capacitors can be searched by the Shape, Maximum operating temperature, Applications, Benefits, and Mounting.

Select the conditions of the following items to search for a product.

- "Shape"
- "Maximum operating temperature"
- "Applications"
- "Benefits"
- "Mounting"

4 Search in the lineups <http://psearch.murata.com/capacitor/lineup/>

Capacitors applicable to the conditions can be searched from the lineup of each series.

The features and applications of the series can also be checked in the Series page.

Capacitance chart in Series page



5 Cross reference <http://cross-reference.murata.com/capacitor/crossreference/index.cfm>

The figure shows a cross-reference search form. It includes a search bar, a search button, and a placeholder for the competitor's part number.

The Murata part number applicable to the assumed specification can be searched by the competitor's part number of the chip monolithic ceramic capacitors.

[Search result]



The number of cases applicable to the current search conditions is always displayed in real time.

Click each search condition button to display the menu. The search results will change in real time with the selected conditions.

Clicking the "Current search conditions" opens a menu, and the current narrowed down conditions can be checked.

The results can be sorted by clicking the ▲ button of the search results items.

Clicking the product name opens the details page, and more detailed information can be acquired.

A simple specification sheet can be downloaded without opening the details page.

The icons clearly indicate the status and the features of the product.

Global Locations

For details please visit www.murata.com



⚠ Note

1 Export Control

For customers outside Japan:

No Murata products should be used or sold, through any channels, for use in the design, development, production, utilization, maintenance or operation of, or otherwise contribution to (1) any weapons (Weapons of Mass Destruction [nuclear, chemical or biological weapons or missiles] or conventional weapons) or (2) goods or systems specially designed or intended for military end-use or utilization by military end-users.

For customers in Japan:

For products which are controlled items subject to the "Foreign Exchange and Foreign Trade Law" of Japan, the export license specified by the law is required for export.

2 Please contact our sales representatives or product engineers before using the products in this catalog for the applications listed below, which require especially high reliability for the prevention of defects which might directly damage a third party's life, body or property, or when one of our products is intended for use in applications other than those specified in this catalog.

- ① Aircraft equipment
- ② Aerospace equipment
- ③ Undersea equipment
- ④ Power plant equipment
- ⑤ Medical equipment
- ⑥ Transportation equipment (vehicles, trains, ships, etc.)
- ⑦ Traffic signal equipment
- ⑧ Disaster prevention / crime prevention equipment
- ⑨ Data-processing equipment
- ⑩ Application of similar complexity and/or reliability requirements to the applications listed above

3 Product specifications in this catalog are as of August 2014. They are subject to change or our products in it may be discontinued without advance notice. Please check with our sales representatives or product engineers before ordering. If there are any questions, please contact our sales representatives or product engineers.

4 Please read rating and ⚠CAUTION (for storage, operating, rating, soldering, mounting and handling) in this catalog to prevent smoking and/or burning, etc.

5 This catalog has only typical specifications. Therefore, please approve our product specifications or transact the approval sheet for product specifications before ordering.

6 Please note that unless otherwise specified, we shall assume no responsibility whatsoever for any conflict or dispute that may occur in connection with the effect of our and/or a third party's intellectual property rights and other related rights in consideration of your use of our products and/or information described or contained in our catalogs. In this connection, no representation shall be made to the effect that any third parties are authorized to use the rights mentioned above under licenses without our consent.

7 No ozone depleting substances (ODS) under the Montreal Protocol are used in our manufacturing process.

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