

Chip Monolithic Ceramic Capacitors

muRata

Safety Standard Certified GA3 Series UL, IEC60384-14 Class X1/Y2 Type GC

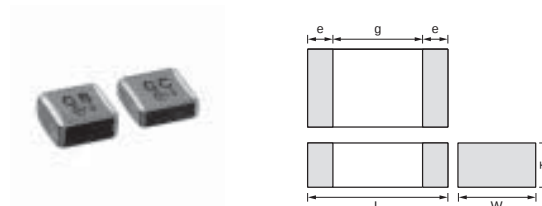
■ Features

1. Chip monolithic ceramic capacitor (certified as conforming to safety standards) for AC lines.
2. A new monolithic structure for small, high capacitance capable of operating at high voltage levels.
3. Compared to lead type capacitors, this new capacitor is greatly downsized and low-profiled to 1/10 or less in volume, and 1/4 or less in height.
4. Type GC can be used as an X1-class and Y2-class capacitor, line-by-pass capacitor of UL1414.
5. +125 degree C guaranteed
6. Only for reflow soldering

■ Applications

1. Ideal for use as Y capacitor or X capacitor for various switching power supplies
2. Ideal for modem applications

Do not use these products in any Automotive Power train or Safety equipment including Battery chargers for Electric Vehicles and Plug-in Hybrids. Only Murata products clearly stipulated as "for Automotive use" can be used for automobile applications such as Power train and Safety equipment.



Part Number	Dimensions (mm)				
	L	W	T	e min.	g min.
GA355D	5.7 ±0.4	5.0 ±0.4	2.0 ±0.3	0.3	4.0

■ Standard Certification

	Standard No.	Class	Rated Voltage
UL	UL1414	Line By-pass	AC250V (r.m.s.)
VDE	IEC 60384-14 EN 60384-14	X1, Y2	
BSI	EN 60065 (14.2) IEC 60384-14 EN 60384-14		
SEMKO	IEC 60384-14 EN 60384-14		
ESTI	EN 60065 IEC 60384-14		

Part Number	Rated Voltage (V)	TC Code (Standard)	Capacitance (pF)	Length L (mm)	Width W (mm)	Thickness T (mm)	Electrode g min. (mm)	Electrode e (mm)
GA355DR7GC101KY02L	AC250 (r.m.s.)	X7R (EIA)	100 ±10%	5.7	5.0	2.0	4.0	0.3 min.
GA355DR7GC151KY02L	AC250 (r.m.s.)	X7R (EIA)	150 ±10%	5.7	5.0	2.0	4.0	0.3 min.
GA355DR7GC221KY02L	AC250 (r.m.s.)	X7R (EIA)	220 ±10%	5.7	5.0	2.0	4.0	0.3 min.
GA355DR7GC331KY02L	AC250 (r.m.s.)	X7R (EIA)	330 ±10%	5.7	5.0	2.0	4.0	0.3 min.

For General Purpose
GRM/GRJ Series

Only for Applications

AC250V Type
GA2 Series

Safety Standard
Certified GA3 Series

Product Information

Chip Monolithic Ceramic Capacitors



Safety Standard Certified GA3 Series IEC60384-14 Class Y2, X1/Y2 Type GF

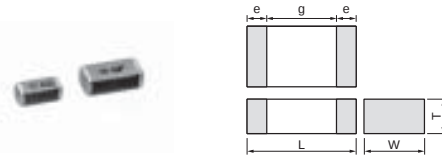
■ Features

1. Available for equipment based on IEC/EN60950 and UL1950. Besides, the GA352/355 types are available for equipment based on IEC/EN60065, UL1492, and UL6500.
2. Type GF can be used as a Y2-class capacitor.
3. A new monolithic structure for small, high capacitance capable of operating at high voltage levels.
4. +125 degree C guaranteed
5. Only for reflow soldering

■ Applications

1. Ideal for use on line filters and couplings for DAA modems without transformers
2. Ideal for use on line filters for information equipment
3. Ideal for use as Y capacitor or X capacitor for various switching power supplies (GA352/355 types only)

Do not use these products in any Automotive Power train or Safety equipment including Battery chargers for Electric Vehicles and Plug-in Hybrids. Only Murata products clearly stipulated as "for Automotive use" can be used for automobile applications such as Power train and Safety equipment.



Part Number	Dimensions (mm)				
	L	W	T	e min.	g min.
GA342A	4.5 ±0.3	2.0 ±0.2	1.0 +0, -0.3	0.3	2.5
GA342D			2.0 ±0.2		
GA342Q			1.5 +0, -0.3		
GA352Q	5.7 ±0.4	2.8 ±0.3	1.5 +0, -0.3		4.0
GA355D			2.0 +0, -0.3		
GA355Q			1.5 +0, -0.3		

■ Standard Certification

	Standard No.	Class	Status of Certification		Rated Voltage
			Size : 4.5×2.0mm	Size : 5.7×2.8mm and over	
UL	UL1414	X1, Y2	—	◎	AC250V (r.m.s.)
	UL 60950-1	—	◎	—	
VDE	IEC 60384-14	X1, Y2	—	◎	
SEMKO	EN 60384-14	Y2	◎	◎	

Applications

Size	Switching power supplies	Communication network devices such as a modem
4.5×2.0mm	—	◎
5.7×2.8mm and over	◎	◎

Part Number	Rated Voltage (V)	TC Code (Standard)	Capacitance (pF)	Length L (mm)	Width W (mm)	Thickness T (mm)	Electrode g min. (mm)	Electrode e (mm)
GA342D1XGF100JY02L	AC250 (r.m.s.)	SL (JIS)	10 ±5%	4.5	2.0	2.0	2.5	0.3 min.
GA342D1XGF120JY02L	AC250 (r.m.s.)	SL (JIS)	12 ±5%	4.5	2.0	2.0	2.5	0.3 min.
GA342D1XGF150JY02L	AC250 (r.m.s.)	SL (JIS)	15 ±5%	4.5	2.0	2.0	2.5	0.3 min.
GA342D1XGF180JY02L	AC250 (r.m.s.)	SL (JIS)	18 ±5%	4.5	2.0	2.0	2.5	0.3 min.
GA342D1XGF220JY02L	AC250 (r.m.s.)	SL (JIS)	22 ±5%	4.5	2.0	2.0	2.5	0.3 min.
GA342A1XGF270JW31L	AC250 (r.m.s.)	SL (JIS)	27 ±5%	4.5	2.0	1.0	2.5	0.3 min.
GA342A1XGF330JW31L	AC250 (r.m.s.)	SL (JIS)	33 ±5%	4.5	2.0	1.0	2.5	0.3 min.
GA342A1XGF390JW31L	AC250 (r.m.s.)	SL (JIS)	39 ±5%	4.5	2.0	1.0	2.5	0.3 min.
GA342A1XGF470JW31L	AC250 (r.m.s.)	SL (JIS)	47 ±5%	4.5	2.0	1.0	2.5	0.3 min.
GA342A1XGF560JW31L	AC250 (r.m.s.)	SL (JIS)	56 ±5%	4.5	2.0	1.0	2.5	0.3 min.
GA342A1XGF680JW31L	AC250 (r.m.s.)	SL (JIS)	68 ±5%	4.5	2.0	1.0	2.5	0.3 min.
GA342A1XGF820JW31L	AC250 (r.m.s.)	SL (JIS)	82 ±5%	4.5	2.0	1.0	2.5	0.3 min.
GA342QR7GF101KW01L	AC250 (r.m.s.)	X7R (EIA)	100 ±10%	4.5	2.0	1.5	2.5	0.3 min.
GA342QR7GF151KW01L	AC250 (r.m.s.)	X7R (EIA)	150 ±10%	4.5	2.0	1.5	2.5	0.3 min.
GA342DR7GF221KW02L	AC250 (r.m.s.)	X7R (EIA)	220 ±10%	4.5	2.0	2.0	2.5	0.3 min.
GA342DR7GF331KW02L	AC250 (r.m.s.)	X7R (EIA)	330 ±10%	4.5	2.0	2.0	2.5	0.3 min.
GA342QR7GF471KW01L	AC250 (r.m.s.)	X7R (EIA)	470 ±10%	4.5	2.0	1.5	2.5	0.3 min.
GA352QR7GF471KW01L	AC250 (r.m.s.)	X7R (EIA)	470 ±10%	5.7	2.8	1.5	4.0	0.3 min.
GA342QR7GF681KW01L	AC250 (r.m.s.)	X7R (EIA)	680 ±10%	4.5	2.0	1.5	2.5	0.3 min.
GA352QR7GF681KW01L	AC250 (r.m.s.)	X7R (EIA)	680 ±10%	5.7	2.8	1.5	4.0	0.3 min.
GA342DR7GF102KW02L	AC250 (r.m.s.)	X7R (EIA)	1000 ±10%	4.5	2.0	2.0	2.5	0.3 min.
GA352QR7GF102KW01L	AC250 (r.m.s.)	X7R (EIA)	1000 ±10%	5.7	2.8	1.5	4.0	0.3 min.

Continued on the following page.

Product Information	Safety Standard Certified GA3 Series	AC250V Type GA2 Series	Only for Applications	For General Purpose GRM/GRJ Series
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Chip Monolithic Ceramic Capacitors



Safety Standard Certified GA3 Series IEC60384-14 Class Y3 Type GD

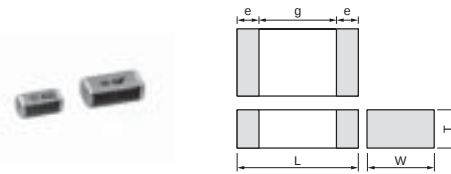
■ Features

1. Available for equipment based on IEC/EN60950 and UL1950.
2. Type GD can be used as a Y3-class capacitor.
3. A new monolithic structure for small, high capacitance capable of operating at high voltage levels.
4. +125 degree C guaranteed
5. Only for reflow soldering

■ Applications

1. Ideal for use on line filters and couplings for DAA modems without transformers
2. Ideal for use on line filters for information equipment

Do not use these products in any Automotive Power train or Safety equipment including Battery chargers for Electric Vehicles and Plug-in Hybrids. Only Murata products clearly stipulated as "for Automotive use" can be used for automobile applications such as Power train and Safety equipment.



Part Number	Dimensions (mm)				
	L	W	T	e min.	g min.
GA342A	4.5 ±0.3	2.0 ±0.2	1.0 +0, -0.3	0.3	2.5
GA342D			2.0 ±0.2		
GA342Q			1.5 +0, -0.3		
GA343D	4.5 ±0.4	3.2 ±0.3	2.0 +0, -0.3		
GA343Q			1.5 +0, -0.3		

■ Standard Certification

	Standard No.	Class	Rated Voltage
UL	UL 60950-1	Y3	AC250V(r.m.s.)
SEMKO	IEC 60384-14 EN 60384-14		

Applications

Size	Switching power supplies	Communication network devices such as a modem
4.5×3.2mm and under	—	◎

Part Number	Rated Voltage (V)	TC Code (Standard)	Capacitance (pF)	Length L (mm)	Width W (mm)	Thickness T (mm)	Electrode g min. (mm)	Electrode e (mm)
GA342D1XGD100JY02L	AC250 (r.m.s.)	SL (JIS)	10 ±5%	4.5	2.0	2.0	2.5	0.3 min.
GA342D1XGD120JY02L	AC250 (r.m.s.)	SL (JIS)	12 ±5%	4.5	2.0	2.0	2.5	0.3 min.
GA342D1XGD150JY02L	AC250 (r.m.s.)	SL (JIS)	15 ±5%	4.5	2.0	2.0	2.5	0.3 min.
GA342D1XGD180JY02L	AC250 (r.m.s.)	SL (JIS)	18 ±5%	4.5	2.0	2.0	2.5	0.3 min.
GA342D1XGD220JY02L	AC250 (r.m.s.)	SL (JIS)	22 ±5%	4.5	2.0	2.0	2.5	0.3 min.
GA342A1XGD270JW31L	AC250 (r.m.s.)	SL (JIS)	27 ±5%	4.5	2.0	1.0	2.5	0.3 min.
GA342A1XGD330JW31L	AC250 (r.m.s.)	SL (JIS)	33 ±5%	4.5	2.0	1.0	2.5	0.3 min.
GA342A1XGD390JW31L	AC250 (r.m.s.)	SL (JIS)	39 ±5%	4.5	2.0	1.0	2.5	0.3 min.
GA342A1XGD470JW31L	AC250 (r.m.s.)	SL (JIS)	47 ±5%	4.5	2.0	1.0	2.5	0.3 min.
GA342A1XGD560JW31L	AC250 (r.m.s.)	SL (JIS)	56 ±5%	4.5	2.0	1.0	2.5	0.3 min.
GA342A1XGD680JW31L	AC250 (r.m.s.)	SL (JIS)	68 ±5%	4.5	2.0	1.0	2.5	0.3 min.
GA342A1XGD820JW31L	AC250 (r.m.s.)	SL (JIS)	82 ±5%	4.5	2.0	1.0	2.5	0.3 min.
GA342QR7GD101KW01L	AC250 (r.m.s.)	X7R (EIA)	100 ±10%	4.5	2.0	1.5	2.5	0.3 min.
GA342QR7GD151KW01L	AC250 (r.m.s.)	X7R (EIA)	150 ±10%	4.5	2.0	1.5	2.5	0.3 min.
GA342QR7GD221KW01L	AC250 (r.m.s.)	X7R (EIA)	220 ±10%	4.5	2.0	1.5	2.5	0.3 min.
GA342QR7GD331KW01L	AC250 (r.m.s.)	X7R (EIA)	330 ±10%	4.5	2.0	1.5	2.5	0.3 min.
GA342QR7GD471KW01L	AC250 (r.m.s.)	X7R (EIA)	470 ±10%	4.5	2.0	1.5	2.5	0.3 min.
GA342QR7GD681KW01L	AC250 (r.m.s.)	X7R (EIA)	680 ±10%	4.5	2.0	1.5	2.5	0.3 min.
GA342QR7GD102KW01L	AC250 (r.m.s.)	X7R (EIA)	1000 ±10%	4.5	2.0	1.5	2.5	0.3 min.
GA342QR7GD152KW01L	AC250 (r.m.s.)	X7R (EIA)	1500 ±10%	4.5	2.0	1.5	2.5	0.3 min.
GA343QR7GD182KW01L	AC250 (r.m.s.)	X7R (EIA)	1800 ±10%	4.5	3.2	1.5	2.5	0.3 min.
GA343QR7GD222KW01L	AC250 (r.m.s.)	X7R (EIA)	2200 ±10%	4.5	3.2	1.5	2.5	0.3 min.
GA343DR7GD472KW01L	AC250 (r.m.s.)	X7R (EIA)	4700 ±10%	4.5	3.2	2.0	2.5	0.3 min.

Chip Monolithic Ceramic Capacitors



Safety Standard Certified GA3 Series IEC60384-14 Class X2 Type GB

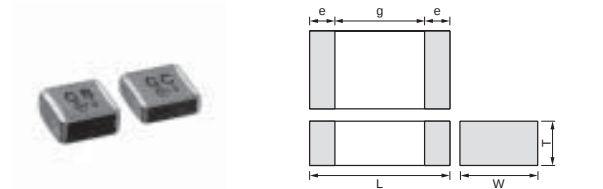
■ Features

1. Type GB can be used as an X2-class capacitor.
2. Chip monolithic ceramic capacitor (certified as conforming to safety standards) for AC lines.
3. A new monolithic structure for small, high capacitance capable of operating at high voltage levels.
4. Compared to lead type capacitors, this new capacitor is greatly downsized and low-profiled to 1/10 or less in volume, and 1/4 or less in height.
5. +125 degree C guaranteed
6. Only for reflow soldering

■ Applications

Ideal for use as X capacitor for various switching power supplies

Do not use these products in any Automotive Power train or Safety equipment including Battery chargers for Electric Vehicles and Plug-in Hybrids. Only Murata products clearly stipulated as "for Automotive use" can be used for automobile applications such as Power train and Safety equipment.



Part Number	Dimensions (mm)				
	L	W	T	e min.	g min.
GA355Q	5.7 ±0.4	5.0 ±0.4	1.5 +0,-0.3	0.3	3.0
GA355D			2.0 +0,-0.3		
GA355E			2.5 +0,-0.3		
GA355X			2.9 +0,-0.4		

■ Standard Certification

	Standard No.	Class	Rated Voltage
VDE	IEC 60384-14 EN 60384-14	X2	AC250V (r.m.s.)
SEMCO			
ESTI			

Part Number	Rated Voltage (V)	TC Code (Standard)	Capacitance (pF)	Length L (mm)	Width W (mm)	Thickness T (mm)	Electrode g min. (mm)	Electrode e (mm)
GA355QR7GB103KW01L	AC250 (r.m.s.)	X7R (EIA)	10000 ±10%	5.7	5.0	1.5	3.0	0.3 min.
GA355QR7GB153KW01L	AC250 (r.m.s.)	X7R (EIA)	15000 ±10%	5.7	5.0	1.5	3.0	0.3 min.
GA355DR7GB223KW01L	AC250 (r.m.s.)	X7R (EIA)	22000 ±10%	5.7	5.0	2.0	3.0	0.3 min.
GA355ER7GB333KW01L	AC250 (r.m.s.)	X7R (EIA)	33000 ±10%	5.7	5.0	2.5	3.0	0.3 min.
GA355ER7GB473KW01L	AC250 (r.m.s.)	X7R (EIA)	47000 ±10%	5.7	5.0	2.5	3.0	0.3 min.
GA355XR7GB563KW06L	AC250 (r.m.s.)	X7R (EIA)	56000 ±10%	5.7	5.0	2.9	3.0	0.3 min.

For General Purpose
GRM/GRJ Series

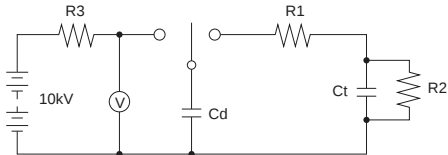
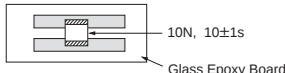
Only for Applications

AC250V Type
GA2 Series

Safety Standard
Certified GA3 Series

Product Information

GA3 Series Specifications and Test Methods

No.	Item	Specifications	Test Method																				
1	Operating Temperature Range	−55 to +125℃	—																				
2	Appearance	No defects or abnormalities	Visual inspection																				
3	Dimensions	Within the specified dimensions	Using calipers and micrometers																				
4	Dielectric Strength	No defects or abnormalities	No failure should be observed when voltage in the table is applied between the terminations for 60±1 sec., provided the charge/discharge current is less than 50mA. <table><tr><th></th><th>Test Voltage</th></tr><tr><td>Type GB</td><td>DC1075V</td></tr><tr><td>Type GC/GD</td><td>AC1500V (r.m.s.)</td></tr><tr><td>Type GF</td><td>AC2000V (r.m.s.)</td></tr></table>		Test Voltage	Type GB	DC1075V	Type GC/GD	AC1500V (r.m.s.)	Type GF	AC2000V (r.m.s.)												
	Test Voltage																						
Type GB	DC1075V																						
Type GC/GD	AC1500V (r.m.s.)																						
Type GF	AC2000V (r.m.s.)																						
5	Pulse Voltage (Application: Type GD/GF)	No self healing breakdowns or flash-overs have taken place in the capacitor.	10 impulses of alternating polarity are subjected. (5 impulses for each polarity) The interval between impulses is 60 sec. Applied Pulse: 1.2/50μs Applied Voltage: 2.5kVo-p																				
6	Insulation Resistance (I.R.)	More than 6,000MΩ	The insulation resistance should be measured with DC500±50V and within 60±5 sec. of charging.																				
7	Capacitance	Within the specified tolerance																					
8	Dissipation Factor (D.F.) Q	<table><tr><th>Char.</th><th>Specification</th></tr><tr><td>X7R</td><td>D.F. ≤0.025</td></tr><tr><td>SL</td><td>Q ≥ 400+20C*2 (C < 30pF) Q ≥ 1000 (C ≥ 30pF)</td></tr></table>	Char.	Specification	X7R	D.F. ≤0.025	SL	Q ≥ 400+20C*2 (C < 30pF) Q ≥ 1000 (C ≥ 30pF)	The capacitance/Q/D.F. should be measured at a frequency of 1±0.2kHz (SL char.: 1±0.2MHz) and a voltage of AC1±0.2V (r.m.s.)														
Char.	Specification																						
X7R	D.F. ≤0.025																						
SL	Q ≥ 400+20C*2 (C < 30pF) Q ≥ 1000 (C ≥ 30pF)																						
9	Capacitance Temperature Characteristics	<table><tr><th>Char.</th><th>Capacitance Change</th></tr><tr><td>X7R</td><td>Within ±15%</td></tr></table> Temperature characteristic guarantee is −55 to +125℃ <table><tr><th>Char.</th><th>Temperature Coefficient</th></tr><tr><td>SL</td><td>+350 to −1000ppm/℃</td></tr></table> Temperature characteristic guarantee is +20 to +85℃	Char.	Capacitance Change	X7R	Within ±15%	Char.	Temperature Coefficient	SL	+350 to −1000ppm/℃	The capacitance measurement should be made at each step specified in the Table. <table><tr><th>Step</th><th>Temperature (℃)</th></tr><tr><td>1</td><td>25±2 (20±2 for SL char.)</td></tr><tr><td>2</td><td>Min. Operating Temp.±3</td></tr><tr><td>3</td><td>25±2 (20±2 for SL char.)</td></tr><tr><td>4</td><td>Max. Operating Temp.±2</td></tr><tr><td>5</td><td>25±2 (20±2 for SL char.)</td></tr></table> SL char. : The capacitance should be measured at even 85℃ between step 3 and step 4. •Pretreatment for X7R char. Perform a heat treatment at 150±18℃ for 60±5 min. and then let sit for 24±2 hrs. at room condition.*1	Step	Temperature (℃)	1	25±2 (20±2 for SL char.)	2	Min. Operating Temp.±3	3	25±2 (20±2 for SL char.)	4	Max. Operating Temp.±2	5	25±2 (20±2 for SL char.)
Char.	Capacitance Change																						
X7R	Within ±15%																						
Char.	Temperature Coefficient																						
SL	+350 to −1000ppm/℃																						
Step	Temperature (℃)																						
1	25±2 (20±2 for SL char.)																						
2	Min. Operating Temp.±3																						
3	25±2 (20±2 for SL char.)																						
4	Max. Operating Temp.±2																						
5	25±2 (20±2 for SL char.)																						
10	Discharge Test (Application: Type GC)	Appearance I.R. Dielectric Strength	No defects or abnormalities More than 1,000MΩ In accordance with item No.4																				
			As in Fig., discharge is made 50 times at 5 sec. intervals from the capacitor (Cd) charged at DC voltage of specified.  Ct: Capacitor under test Cd: 0.001μF R1: 1,000Ω R2: 100MΩ R3: Surge resistance																				
11	Adhesive Strength of Termination	No removal of the terminations or other defect should occur.	Solder the capacitor to the testing jig (glass epoxy board) shown in Fig. 1. Then apply 10N force in the direction of the arrow. The soldering should be done using the reflow method and should be conducted with care so that the soldering is uniform and free of defects such as heat shock.  10N, 10±1s Glass Epoxy Board																				
			Fig. 1																				

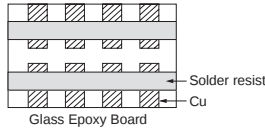
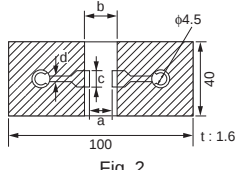
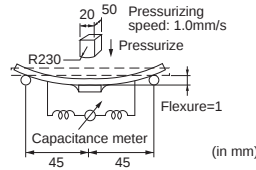
*1 "Room condition" Temperature: 15 to 35°C, Relative humidity: 45 to 75%, Atmospheric pressure: 86 to 106kPa

*2 "C" expresses nominal capacitance value (pF).

Continued on the following page. 

GA3 Series Specifications and Test Methods

Continued from the preceding page.

No.	Item		Specifications	Test Method																										
12	Vibration Resistance	Appearance	No defects or abnormalities	Solder the capacitor to the test jig (glass epoxy board). The capacitor should be subjected to a simple harmonic motion having a total amplitude of 1.5mm, the frequency being varied uniformly between the approximate limits of 10 and 55Hz. The frequency range, from 10 to 55Hz and return to 10Hz, should be traversed in approximately 1 min. This motion should be applied for a period of 2 hrs. in each of 3 mutually perpendicular directions (total of 6 hrs.). 																										
		Capacitance	Within the specified tolerance																											
		D.F. Q	<table><tr><th>Char.</th><th>Specification</th></tr><tr><td>X7R</td><td>D.F. ≤0.025</td></tr><tr><td>SL</td><td>Q ≥ 400 + 20C*2 (C < 30pF) Q ≥ 1000 (C ≥ 30pF)</td></tr></table>		Char.	Specification	X7R	D.F. ≤0.025	SL	Q ≥ 400 + 20C*2 (C < 30pF) Q ≥ 1000 (C ≥ 30pF)																				
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13	Deflection	No marking defects	 Fig. 2 <table><tr><th rowspan="2">L×W (mm)</th><th colspan="4">Dimension (mm)</th></tr><tr><th>a</th><th>b</th><th>c</th><th>d</th></tr><tr><td>4.5×2.0</td><td>3.5</td><td>7.0</td><td>2.4</td><td rowspan="4">1.0</td></tr><tr><td>4.5×3.2</td><td>3.5</td><td>7.0</td><td>3.7</td></tr><tr><td>5.7×2.8</td><td>4.5</td><td>8.0</td><td>3.2</td></tr><tr><td>5.7×5.0</td><td>4.5</td><td>8.0</td><td>5.6</td></tr></table>	L×W (mm)	Dimension (mm)				a	b	c	d	4.5×2.0	3.5	7.0	2.4	1.0	4.5×3.2	3.5	7.0	3.7	5.7×2.8	4.5	8.0	3.2	5.7×5.0	4.5	8.0	5.6	Solder the capacitor to the testing jig (glass epoxy board) shown in Fig. 2. Then apply a force in the direction shown in Fig. 3. The soldering should be done using the reflow method and should be conducted with care so that the soldering is uniform and free of defects such as heat shock.  Fig. 3
		L×W (mm)	Dimension (mm)																											
			a	b	c	d																								
4.5×2.0	3.5	7.0	2.4	1.0																										
4.5×3.2	3.5	7.0	3.7																											
5.7×2.8	4.5	8.0	3.2																											
5.7×5.0	4.5	8.0	5.6																											
14	Solderability of Termination	75% of the terminations are to be soldered evenly and continuously.	Immerse the capacitor in a solution of ethanol (JIS-K-8101) and rosin (JIS-K-5902) (25% rosin in weight proportion). Immerse in solder solution for 2±0.5 sec. Immersing speed: 25±2.5mm/s Temp. of solder: 245±5°C Lead Free Solder (Sn-3.0Ag-0.5Cu) 235±5°C H60A or H63A Eutectic Solder																											
15	Resistance to Soldering Heat	Appearance	No marking defects	Preheat the capacitor as in table. Immerse the capacitor in solder solution at 260±5°C for 10±1 sec. Let sit at room condition*1 for 24±2 hrs., then measure. •Immersing speed: 25±2.5mm/s •Pretreatment for X7R char. Perform a heat treatment at 150⁺¹₋₁₈°C for 60±5 min. and then let sit for 24±2 hrs. at room condition.*1 *Preheating <table><tr><th>Step</th><th>Temperature</th><th>Time</th></tr><tr><td>1</td><td>100 to 120°C</td><td>1 min.</td></tr><tr><td>2</td><td>170 to 200°C</td><td>1 min.</td></tr></table>	Step	Temperature	Time	1	100 to 120°C	1 min.	2	170 to 200°C	1 min.																	
		Step	Temperature		Time																									
		1	100 to 120°C		1 min.																									
		2	170 to 200°C		1 min.																									
Capacitance Change	<table><tr><th>Char.</th><th>Capacitance Change</th></tr><tr><td>X7R</td><td>Within ±10%</td></tr><tr><td>SL</td><td>Within ±2.5% or ±0.25pF (Whichever is larger)</td></tr></table>	Char.	Capacitance Change	X7R	Within ±10%	SL	Within ±2.5% or ±0.25pF (Whichever is larger)																							
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I.R.	More than 1,000MΩ																													
Dielectric Strength	In accordance with item No.4																													

*1 "Room condition" Temperature: 15 to 35°C, Relative humidity: 45 to 75%, Atmospheric pressure: 86 to 106kPa

*2 "C" expresses nominal capacitance value (pF).

Continued on the following page. ↗

For General Purpose
GRM/GRJ Series

Only for Applications

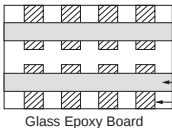
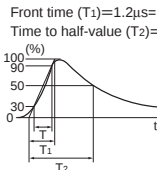
AC250V Type
GA2 Series

Safety Standard
Certified GA3 Series

Product Information

GA3 Series Specifications and Test Methods

Continued from the preceding page.

No.	Item	Specifications	Test Method															
16	Temperature Cycle	Appearance	No marking defects															
		Capacitance Change	<table><tr><th>Char.</th><th>Capacitance Change</th></tr><tr><td>X7R</td><td>Within ±15%</td></tr><tr><td>SL</td><td>Within ±2.5% or ±0.25pF (Whichever is larger)</td></tr></table>	Char.	Capacitance Change	X7R	Within ±15%	SL	Within ±2.5% or ±0.25pF (Whichever is larger)									
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D.F. Q	<table><tr><th>Char.</th><th>Specification</th></tr><tr><td>X7R</td><td>D.F.≤0.05</td></tr><tr><td>SL</td><td>Q≥400+20C*2 (C<30pF) Q≥1000 (C≥30pF)</td></tr></table>	Char.	Specification	X7R	D.F.≤0.05	SL	Q≥400+20C*2 (C<30pF) Q≥1000 (C≥30pF)											
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SL	Q≥400+20C*2 (C<30pF) Q≥1000 (C≥30pF)																	
I.R.	More than 3,000MΩ																	
	Dielectric Strength	In accordance with item No.4	Fix the capacitor to the supporting jig (glass epoxy board) shown in Fig. 4. Perform the 5 cycles according to the 4 heat treatments listed in the following table. Let sit for 24±2 hrs. at room condition,*1 then measure. <table><tr><th>Step</th><th>Temperature (°C)</th><th>Time (min.)</th></tr><tr><td>1</td><td>Min. Operating Temp.±3</td><td>30±3</td></tr><tr><td>2</td><td>Room Temp.</td><td>2 to 3</td></tr><tr><td>3</td><td>Max. Operating Temp.±2</td><td>30±3</td></tr><tr><td>4</td><td>Room Temp.</td><td>2 to 3</td></tr></table> •Pretreatment for X7R char. Perform a heat treatment at 150[±]18℃ for 60±5 min. and then let sit for 24±2 hrs. at room condition.*1  Solder resist Cu Glass Epoxy Board Fig. 4	Step	Temperature (°C)	Time (min.)	1	Min. Operating Temp.±3	30±3	2	Room Temp.	2 to 3	3	Max. Operating Temp.±2	30±3	4	Room Temp.	2 to 3
Step	Temperature (°C)	Time (min.)																
1	Min. Operating Temp.±3	30±3																
2	Room Temp.	2 to 3																
3	Max. Operating Temp.±2	30±3																
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17	Humidity (Steady State)	Appearance	No marking defects															
		Capacitance Change	<table><tr><th>Char.</th><th>Capacitance Change</th></tr><tr><td>X7R</td><td>Within ±15%</td></tr><tr><td>SL</td><td>Within ±5.0% or ±0.5pF (Whichever is larger)</td></tr></table>	Char.	Capacitance Change	X7R	Within ±15%	SL	Within ±5.0% or ±0.5pF (Whichever is larger)									
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I.R.	More than 3,000MΩ																	
	Dielectric Strength	In accordance with item No.4	Before this test, the test shown in the following is performed. ·Item 11 Adhesive Strength of Termination (applied force is 5N) ·Item 13 Deflection Let the capacitor sit at 40±2℃ and relative humidity of 90 to 95% for 500[±]24 hrs. Remove and let sit for 24±2 hrs. at room condition,*1 then measure. •Pretreatment for X7R char. Perform a heat treatment at 150[±]18℃ for 60±5 min. and then let sit for 24±2 hrs. at room condition.*1															
18	Life	Appearance	No marking defects															
		Capacitance Change	<table><tr><th>Char.</th><th>Capacitance Change</th></tr><tr><td>X7R</td><td>Within ±20%</td></tr><tr><td>SL</td><td>Within ±3.0% or ±0.3pF (Whichever is larger)</td></tr></table>	Char.	Capacitance Change	X7R	Within ±20%	SL	Within ±3.0% or ±0.3pF (Whichever is larger)									
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I.R.	More than 3,000MΩ																	
	Dielectric Strength	In accordance with item No.4	Before this test, the test shown in the following is performed. ·Item 11 Adhesive Strength of Termination (apply force is 5N) ·Item 13 Deflection Impulse Voltage Each individual capacitor should be subjected to a 2.5kV (Type GC/GF: 5kV) Impulse (the voltage value means zero to peak) for three times. Then the capacitors are applied to life test.  Front time (T₁)=1.2μs=1.67T Time to half-value (T₂)=50μs Apply voltage as in Table for 1,000 hrs. at 125[±]2℃, relative humidity 50% max. <table><tr><th>Type</th><th>Applied Voltage</th></tr><tr><td>GB</td><td>AC312.5V (r.m.s.), except that once each hour the voltage is increased to AC1,000V (r.m.s.) for 0.1 sec.</td></tr><tr><td>GC GF GD</td><td>AC425V (r.m.s.), except that once each hour the voltage is increased to AC1,000V (r.m.s.) for 0.1 sec.</td></tr></table> Let sit for 24±2 hrs. at room condition,*1 then measure. •Pretreatment for X7R char. Perform a heat treatment at 150[±]18℃ for 60±5 min. and then let sit for 24±2 hrs. at room condition.*1	Type	Applied Voltage	GB	AC312.5V (r.m.s.), except that once each hour the voltage is increased to AC1,000V (r.m.s.) for 0.1 sec.	GC GF GD	AC425V (r.m.s.), except that once each hour the voltage is increased to AC1,000V (r.m.s.) for 0.1 sec.									
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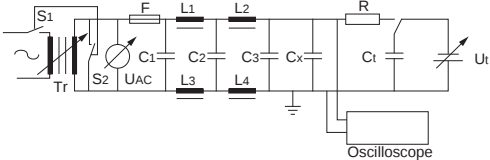
*1 "Room condition" Temperature: 15 to 35°C, Relative humidity: 45 to 75%, Atmospheric pressure: 86 to 106kPa

*2 "C" expresses nominal capacitance value (pF).

Continued on the following page. 

GA3 Series Specifications and Test Methods

Continued from the preceding page.

No.	Item	Specifications	Test Method						
19	Humidity Loading	Appearance	No marking defects						
		Capacitance Change	<table><tr><th>Char.</th><th>Capacitance Change</th></tr><tr><td>X7R</td><td>Within ±15%</td></tr><tr><td>SL</td><td>Within ±5.0% or ±0.5pF (Whichever is larger)</td></tr></table>	Char.	Capacitance Change	X7R	Within ±15%	SL	Within ±5.0% or ±0.5pF (Whichever is larger)
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I.R.	More than 3,000MΩ								
Dielectric Strength	In accordance with item No.4								
			Before this test, the test shown in the following is performed. ·Item 11 Adhesive Strength of Termination (apply force is 5N) ·Item 13 Deflection Apply the rated voltage at 40±2℃ and relative humidity of 90 to 95% for 500^{±2}/₄hrs. Remove and let sit for 24±2 hrs. at room condition,*1 then measure. •Pretreatment for X7R char. Perform a heat treatment at 150^{±1}/₈℃ for 60±5 min. and then let sit for 24±2 hrs. at room condition.*1						
20	Active Flammability	The cheesecloth should not be on fire.	The capacitor should be individually wrapped in at least one but not more than two complete layers of cheesecloth. The capacitor should be subjected to 20 discharges. The interval between successive discharges should be 5 sec. The U_{AC} should be maintained for 2 min. after the last discharge.  C_{1,2} : 1μF±10% C₃ : 0.033μF±5% 10kV L_{1 to 4} : 1.5mH±20% 16A Rod core choke C_t : 3μF±5% 10kV R : 100Ω±2% C_x : Capacitor under test U_{AC} : U_R±5% F : Fuse, Rated 16A U_R : Rated Voltage 						

*1 "Room condition" Temperature: 15 to 35°C, Relative humidity: 45 to 75%, Atmospheric pressure: 86 to 106kPa

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For General Purpose
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Only for Applications

AC250V Type
GA2 Series

Safety Standard
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Product Information