

Chip Multilayer Ceramic Capacitors for General



GA3 Series Type GB







IEC60384-14 X2 Class Certified Product

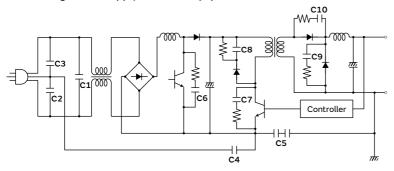
Features

1 International Standard (IEC60384-14) certified product.

Please down load Safety Standard Certification (Type GB: X2) from here. WEB

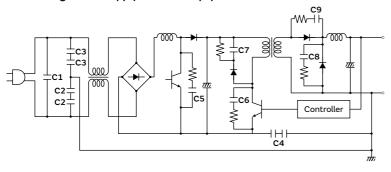
2 Can be used as a Class X2 capacitor.

Switching Power Supply - Class 1 Equipment



No.	Application	Recommend MLCC Type
C1	X Cap	Type: GB
C2		
С3	Y Cap	Type: GF
C4		
C5	Primary - Secondary Coupling	Type: GF×2

Switching Power Supply - Class 2 Equipment



No.	Application	Recommend MLCC Type	
C1	X Cap	Type: GB	
C2	Y Cap		
С3	т Сар	Type: GF×2	
C4	Primary - Secondary Coupling		

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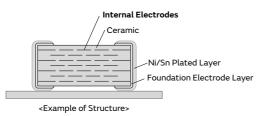
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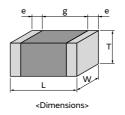
3 Realized large capacitance value and small size while maintaining high withstand voltages by the multilayer structure.



- 4 Compared with conventional lead type capacitors, this product realized great reductions in size and height, with a volume of 1/10 or less, and height of 1/4 or less.
- 5 This product is only for reflow soldering.

Specifications

Size (mm)	5.7×5.0mm
Rated Voltage	250Vac
Capacitance	10000pF to 56000pF
Main Applications	AC-DC power supply



This catalog contains only a portion of the product lineup.

Please refer to the capacitor search tool on the Murata Web site for details.

GA3 Series Type GB High Dielectric Constant Type Part Number List

5.7×5.0mm

T max.	Rated Voltage	TC Code	Cap.	Tol.	Part Number	p*
1.5mm	250Vac	X7R	10000pF	±10%	GA355QR7GB103KW01#	p192
			15000pF	±10%	GA355QR7GB153KW01#	p192
2.0mm	250Vac	X7R	22000pF	±10%	GA355DR7GB223KW01#	p192
2.5mm	250Vac	X7R	33000pF	±10%	GA355ER7GB333KW01#	p192
			47000pF	±10%	GA355ER7GB473KW01#	p192
2.9mm	250Vac	X7R	56000pF	±10%	GA355XR7GB563KW06#	p192

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GA3 Series Type GB Specifications and Test Methods (1)

No	lte	em	Specification	Test Metho	od (Ref. Standard: JIS C 5101, IEC60384)
1	Appearance		No defects or abnormalities.	Visual inspection.	
2	Dimension Withi		Within the specified dimensions.	Using calipers and micrometers.	
3	Voltage Proof		No defects or abnormalities.	Test Voltage: DC Applied Time: 60	
4	Insulation Res	sistance (I.R.)	6000 M Ω or more	Measurement Vo Charging Time: 6	oint: Between the terminations oltage: DC500±50V 50±5s emperature: Room Temperature
5	Capacitance		Shown in Rated value.		emperature: Room Temperature
6	Dissipation Fa	actor (D.F.)	0.025 max.		requency: 1.0±0.1kHz oltage: AC1.0±0.2V (r.m.s.)
7	Temperature Characteristics of Capacitance		R7: Within ±15% (-55 to +125°C)	each specified to Capacitance valo Step 1 2 3 4 5 Pretreatment Perform a heat to	change should be measured after 5 minutes at emp. stage. ue as a reference is the value in step 3. Temperature (°C) Reference Temp. ±2 Min. Operating Temp. ±3 Reference Temp. ±2 Max. Operating Temp. ±3 Reference Temp. ±2 **Treatment at 150+0/-10°C for 1h±5min and 4±2h. at room condition*.
		Appearance	No defects or abnormalities.		citor on the test substrate A shown in
		Capacitance	Within the specified initial value.	"Complement of Test Method". Kind of Vibration: A simple harmonic motion	
8	Vibration D.F.		Within the specified initial value.	10Hz to 55Hz to 10Hz (1min) Total amplitude: 1.5mm This motion should be applied for a period of 2h in each 3 mutually perpendicular directions (total of 6h).	
9	Solderability		95% of the terminations is to be soldered evenly and continuously.	Flux: Solution of Preheat: 80 to 1 Solder: Sn-3.0Ag Solder Temp.: 24 Immersion time:	
		Appearance	No defects or abnormalities.	Test Method: So	lder bath method
		Capacitance Change	Within ±10%	Solder: Sn-3.0Ag Solder Temp.: 26 Immersion time:	
	Resistance to	I.R.	1000M Ω or more	Immersing in spe	eed: 25±2.5mm/s.
10	Soldering Heat	Voltage Proof	No defects.	Preheat: GA355 • Pretreatment Perform a heat t	24±2h at room condition*. size: 100 to 120°C for 1min and 170 to 200°C for 1min creatment at 150+0/-10°C for 1h±5min and 4±2h at room condition*.
11	Adhesive Strength of Termination		No removal of the terminations or other defect should occur.	"Complement of	citor on the test substrate A shown in FTest Method". ——10N, 10±1s n: In parallel with the test substrate and vertical with the capacitor side.
12	2 Substrate Bending Test		No defects or abnormalities.	"Complement of Then apply the f Substrate Bendi Flexure: 1mm Holding Time: 5±	orce in the direction shown in "Test Method of ng Test" of "Complement of Test Method".

 $^{{\}rm ^*Room\ Condition:}\ Temperature: 15\ to\ 35^{\circ}C,\ Relative\ humidity: 45\ to\ 75\%,\ Atmosphere\ pressure: 86\ to\ 106\ kPa$

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GA3 Series Type GB Specifications and Test Methods (1)

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No	lte	em	Specification	Test Method (Ref. Standard: JIS C 5101, IEC60384)
		Appearance Capacitance Change	No defects or abnormalities. Within±15%	Fix the capacitor to the supporting test substrate A (glass epoxy board) shown in "Complement of Test Method". Perform the 5 cycles according to the four heat treatments shown in the following table.
		D.F.	0.05 max.	, and the same of
	Temperature	I.R.	3000MΩ or more	Step Temp. (°C) Time (min) 1 Min. Operating Temp. +0/-3 30±3
13	Sudden Change			2 Room Temp. 2 to 3 3 Max. Operating Temp. +3/-0 30±3 4 Room Temp. 2 to 3
		Voltage Proof	No defects.	Exposure Time: 24±2h at room condition*. • Pretreatment Perform a heat treatment at 150+0/-10°C for 1h±5min and then let sit for 24±2h at room condition*.
		Appearance	No defects or abnormalities.	Fix the capacitor to the supporting test substrate B (glass epoxy
14		Capacitance Change	Within±15%	board) shown in "Complement of Test Method". Before this test, the test shown in the following is performed. • No.11 Adhesive Strength of Termination (apply force: 5N)
	High	D.F.	0.05 max.	No.12 Substrate Bending Test
	Temperature High Humidity (Steady)	I.R.	3000M $Ω$ or more	Test Temperature: 40±2°C Test Humidity: 90 to 95%RH
		Voltage Proof	No defects.	Test Time: 500+24/-0h Applied Voltage: Rated voltage Exposure Time: 24±2h at room condition*. • Pretreatment Perform a heat treatment at 150+0/-10°C for 1h±5min and then let sit for 24±2h at room condition*.
		Appearance	No defects or abnormalities.	Fix the capacitor to the supporting test substrate B (glass epoxy
		Capacitance Change	Within ±20%	board) shown in "Complement of Test Method". Before this test, the test shown in the following is performed. • No.11 Adhesive Strength of Termination (apply force: 5N)
		D.F.	0.05 max.	No.12 Substrate Bending Test
		I.R.	$3000 M\Omega$ or more	Next, Impulse Voltage test is performed. Each individual capacitor shall be subjected to a 2.5kV Impulse
15	Durability	Voltage Proof	No defects.	(the voltage value means zero to peak) for 3 times. Then the capacitors are applied to life test. 100 (%) 90 50 Trime to half-value (T1) = 1.2μs=1.67T Time to half-value (T2) = 50μs Apply voltage as Table for 1000h at 125+2/-0°C, relative humidity 50% max. Applied Voltage AC312.5V (r.m.s.), except that once each hour the voltage is increased to AC1000V (r.m.s.) for 0.1s. Exposure Time: 24±2h at room condition*. • Pretreatment Perform a heat treatment at 150+0/-10°C for 1h±5min and then let sit for 24±2h at room condition*.

^{*} Room Condition: Temperature: 15 to 35°C, Relative humidity: 45 to 75%, Atmosphere pressure: 86 to 106kPa

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GA3 Series Type GB Specifications and Test Methods (1)

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No	ltem	Specification	Test Method (Ref. Standard: JIS C 5101, IEC60384)
16	Passive Flammability	The burning time shall not be exceeded the time 30s. The tissue paper shall not ignite.	The capacitor under test shall be held in the flame in the position which best promotes burning. Each specimen shall only be exposed once to the flame. Time of exposure to flame: 30s Length of flame: 12±1mm Gas burner: Length 35mm min. Inside dia: 0.5±0.1mm Outside dia: 0.9mm max. Gas: Butane gas purity 95% min. Approximately 8mm Buner Flame 200±5mm Tissue Paper Wood Board of Approximately 10mm in Thickness
17	Active Flammability	The cheesecloth shall not be on fire.	The specimens shall be individually wrapped in at least one but more than two complete layers of cheesecloth. The specimens shall be subjected to 20 discharges. The interval between successive discharges shall be 5s. The UAC shall be maintained for 2min after the last discharge. $\begin{array}{cccccccccccccccccccccccccccccccccccc$

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GA3 Series Type GB Specifications and Test Methods (1)

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Complement of Test Method

1. Test Substrate

The test substrate should be Substrate A or Substrate B as described in "Specifications and Test Methods".

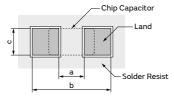
The specimen should be soldered by the conditions as described below.

Soldering Method: Reflow soldering

Solder: Sn-3.0Ag-0.5Cu

(1) Test Substrate A

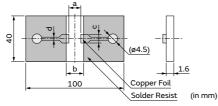
Land Dimensions



Part Number	Dimension (mm)			
Part Number	a	ь		
GA355	4.5	8.0	5.6	

- Material: Glass Epoxy Board
- Thickness: 1.6mm
- Thickness of Copper Foil: 0.035mm

(2) Test Substrate B

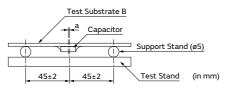


Part Number	Dimension of Pattern (mm)				
Part Number	a	b	С	d	
GA355	4.5	8.0	5.6	1.0	

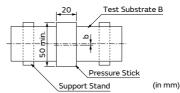
- Material: Glass Epoxy Board
- Thickness of Copper Foil: 0.035mm

2. Test Method of Substrate Bending Test

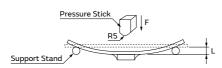
(a) Support State



(b) Test State



- a: ± 2 gap between support stand center and test stand
- b: ±5 gap between support stand center and test stand center
- Material of Test Stand and Pressure Stick
 - The material shoud be a metal where a remarkable transformation and the distortion are not caused even if it is pressurized.
- Pressurizing Speed
 - The pressurizing speed is pressurized at the speed of about 1mm/s until the flexure reaches a regulated value.



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Safety Standard Certified Chip Multilayer Ceramic Capacitors for General Purpose / Acquired certifications of UL60950-1

GA3 Series Type GD







UL60950-1 Certified Product

Features

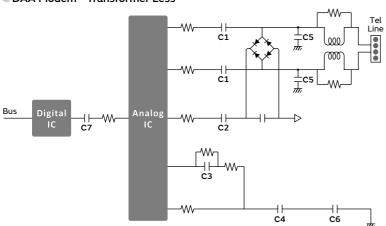
International Standard (IEC60384-14) certified product.

Please down load Safety Standard Certification (Type GD) from here.



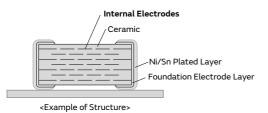
Can be uesd for UL60950-1 devices.

DAA Modem - Transformer Less



No.	Application	Recommend MLCC Type
C5	Lighting Surge Absorption	
C6	Noise Immunity	Type: GD / GF
C7	D/A Isolation Barrier	

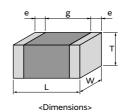
Realized large capacitance value and small size while maintaining high withstand voltages by the multilayer structure.



This product is only for reflow soldering.

Specifications

Size (mm)	4.5×2.0mm to 4.5×3.2mm
Rated Voltage	250Vac
Capacitance	10pF to 4700pF
Main Applications	Modem



GND

This catalog contains only a portion of the product lineup.

Please refer to the capacitor search tool on the Murata Web site for details.

GA3 Series Type GD Temperature Compensating Type Part Number List

4.5×2.0mm

T max.	Rated Voltage	TC Code	Cap.	Tol.	Part Number	p*
1.0mm	250Vac	SL	10pF	±5%	GA342A1XGD100JW31#	p199
			12pF	±5%	GA342A1XGD120JW31#	p199
			15pF	±5%	GA342A1XGD150JW31#	p199
			18pF	±5%	GA342A1XGD180JW31#	p199
			22pF	±5%	GA342A1XGD220JW31#	p199
			27pF	±5%	GA342A1XGD270JW31#	p199
			33pF	±5%	GA342A1XGD330JW31#	p199
			39pF	±5%	GA342A1XGD390JW31#	p199
			47pF	±5%	GA342A1XGD470JW31#	p199
			56pF	±5%	GA342A1XGD560JW31#	p199
			68pF	±5%	GA342A1XGD680JW31#	p199
			82pF	±5%	GA342A1XGD820JW31#	p199

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GA3 Series Type GD High Dielectric Constant Type Part Number List

4.5×2.0mm

T max.	Rated Voltage	TC Code	Cap.	Tol.	Part Number	p*
1.5mm	250Vac	X7R	100pF	±10%	GA342QR7GD101KW01#	p203
			150pF	±10%	GA342QR7GD151KW01#	p203
			220pF	±10%	GA342QR7GD221KW01#	p203
			330pF	±10%	GA342QR7GD331KW01#	p203
			470pF	±10%	GA342QR7GD471KW01#	p203
			680pF	±10%	GA342QR7GD681KW01#	p203
			1000pF	±10%	GA342QR7GD102KW01#	p203
			1500pF	±10%	GA342QR7GD152KW01#	p203

4.5×3.2mm

T max.	Rated Voltage	TC Code	Cap.	Tol.	Part Number	р*
1.5mm	250Vac	X7R	1800pF	±10%	GA343QR7GD182KW01#	p203
			2200pF	±10%	GA343QR7GD222KW01#	p203
2.0mm	250Vac	X7R	4700pF	±10%	GA343DR7GD472KW01#	p203

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GA3 Series Type GD Specifications and Test Methods (1)

No	lte	em	Specification	Test Method (Ref. Standard: JIS C 5101, IEC60384)		
1	Appearance		No defects or abnormalities.	Visual inspection.		
2	Dimension		Within the specified dimensions.	Using calipers and micrometers.		
3	Voltage Proof		No defects or abnormalities.	Measurement Point: Between the terminations Test Voltage: AC1500V (r.m.s.) Applied Time: 60±1s Charge/discharge current: 50mA max.		
4	Impulse Volta	ge	No self healing break downs or flash-overs have taken place in the capacitor.	10 impulse of alternating polarity is subjected. (5 impulse for each polarity) The interval between impulse is 60s. Applied Voltage: 2.5kVo-p		
5	Insulation Res	sistance (I.R.)	6000MΩ or more	Measurement Point: Between the terminations Measurement Voltage: DC500±50V Charging Time: 60±5s Measurement Temperature: Room Temperature		
6	Capacitance		Shown in Rated value.			
7	Q		C ≧ 30pF: 1000 or more C < 30pF: 400+20C or more C: Nominal Capacitance (pF)	Measurement Temperature: Room Temperature Measurement Frequency: 1.0±0.1MHz Measurement Voltage: AC1.0±0.2V (r.m.s.)		
8	Temperature Characteristics of Capacitance		1X: +350 to -1000 ppm/°C (Temp.Range:+20 to +85°C)	The capacitance change should be measured after 5 minutes at each specified temp. stage. Capacitance value as a reference is the value in step 3. Step		
		Appearance	No defects or abnormalities.	Solder the capacitor on the test substrate A shown in		
		Capacitance	Within the specified initial value.	"Complement of Test Method".		
9	Vibration	Q	Within the specified initial value.	Kind of Vibration: A simple harmonic motion 10Hz to 55Hz to 10Hz (1min) Total amplitude: 1.5mm This motion should be applied for a period of 2h in each 3 mutually perpendicular directions (total of 6h).		
10	O Solderability		95% of the terminations is to be soldered evenly and continuously.	Test Method: Solder bath method Flux: Solution of rosin ethanol 25 (wt)% Preheat: 80 to 120°C for 10 to 30s Solder: Sn-3.0Ag-0.5Cu (Lead Free Solder) Solder Temp.: 245±5°C Immersion time: 2±0.5s Immersing in speed: 25±2.5mm/s.		
		Appearance	No defects or abnormalities.	Test Method: Solder bath method		
	Resistance to	Capacitance Change	Within±2.5% or ±0.25pF (Whichever is larger)	Solder: Sn-3.0Ag-0.5Cu (Lead Free Solder) Solder Temp.: 260±5°C Immersion time: 10±1s		
11	Soldering	I.R.	1000MΩ or more	Immersing in speed: 25±2.5mm/s.		
	Heat	Voltage Proof	No defects.	Exposure Time: 24±2h at room condition*. Preheat: GA342 size: 100 to 120°C for 1min and 170 to 200°C for 1min		
12	Adhesive Strength of Termination		No removal of the terminations or other defect should occur.	Solder the capacitor on the test substrate A shown in "Complement of Test Method". 10N, 10±1s Applied Direction: In parallel with the test substrate and vertical with the capacitor side.		
13	Substrate Bending Test		No defects or abnormalities.	Solder the capacitor on the test substrate B shown in "Complement of Test Method". Then apply the force in the direction shown in "Test Method of Substrate Bending Test" of "Complement of Test Method". Flexure: 1mm Holding Time: 5±1s Soldering Method: Reflow soldering		

 $^{^{\}star}$ Room Condition: Temperature: 15 to 35°C, Relative humidity: 45 to 75%, Atmosphere pressure: 86 to 106kPa

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GA3 Series Type GD Specifications and Test Methods (1)

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No	lte	em	Specification	Test Method (Ref. Standard: JIS C 5101, IEC60384)		
		Appearance Capacitance	No defects or abnormalities. Within ±2.5% or ±0.25pF (Whichever is larger)	Fix the capacitor to the supporting test substrate A (glass epoxy board) shown in "Complement of Test Method" Perform the 5 cycles according to the four heat treatments		
	Temperature	Change	Within the specified initial value.	shown in the following table.		
14	Sudden Change	I.R.	3000MΩ or more	Step Temp. (°C) Time (min) 1 Min. Operating Temp. +0/-3 30±3		
	Change	Voltage Proof	No defects.	2 Room Temp. 2 to 3 3 Max. Operating Temp. +3/-0 30±3 4 Room Temp. 2 to 3 Exposure Time: 24±2h at room condition*.		
		Appearance	No defects or abnormalities.	Fix the capacitor to the supporting test substrate B (glass epoxy		
		Capacitance Change	Within ±5.0% or ±0.5pF (Whichever is larger)	board) shown in "Complement of Test Method". Before this test, the test shown in the following is performed.		
15	High Temperature High Humidity	Q	C ≥ 30pF: 350 or more C < 30pF: 275+5/2C or more C: Nominal Capacitance (pF)	No.12 Adhesive Strength of Termination (apply force: 5N) No.13 Substrate Bending Test Test Temperature: 40±2°C Test Humidity: 90 to 95%RH		
	(Steady)	I.R.	3000MΩ or more	Test Time: 500+24/-0h.		
		Voltage Proof	No defects.	Applied Voltage: Rated voltage Exposure Time:24±2h at room condition*.		
		Appearance	No defects or abnormalities.	Fix the capacitor to the supporting test substrate B (glass epoxy		
		Capacitance Change	Within ±3.0% or ±0.3pF (Whichever is larger)	board) shown in "Complement of Test Method". Before this test, the test shown in the following is performed. • No.12 Adhesive Strength of Termination (apply force: 5N)		
	Durability	Q	C ≧ 30pF: 350 or more C < 30pF: 275+5/2C or more C: Nominal Capacitance (pF)	No.13 Substrate Bending Test Next, Impulse Voltage test is performed. Each individual capacitor shall be subjected to a 2.5kV Impulse		
		I.R.	3000MΩ or more	(the voltage value means zero to peak) for 3 times. Then the capacitors are applied to life test.		
16		Voltage Proof	No defects.	Front time (T1) = $1.2\mu s=1.67T$ Time to half-value (T2) = $50\mu s$ Apply voltage as Table for $1000h$ at $125+2/-0^{\circ}C$, relative humidity 50% max.		
				Applied voltage AC425V (r.m.s.), except that once each hour the voltage is increased to AC1000V (r.m.s.) for 0.1s.		
				Exposure Time: 24±2h at room condition*.		
17	17 Passive Flammability		The burning time shall not be exceeded the time 30s. The tissue paper shall not ignite.	The capacitor under test shall be held in the flame in the position which best promotes burning. Each specimen shall only be exposed once to the flame. Time of exposure to flame: 30s Length of flame: 12±1mm Gas burner: Length 35mm min. Inside dia: 0.5±0.1mm Outside dia: 0.9mm max. Gas: Butane gas purity 95% min. Approximately 8mm Buner Flame 200±5mm		
				Wood Board of Approximately 10mm in Thickness		

 $^{{}^*\,}Room\,Condition:\,Temperature:\,15\,to\,35^\circ C,\,Relative\,humidity:\,45\,to\,75\%,\,Atmosphere\,pressure:\,86\,to\,106 kPa$

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GA3 Series Type GD Specifications and Test Methods (1)

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No	ltem	Specification	Test Method (Ref. Standard: JIS C 5101, IEC60384)
			The specimens shall be individually wrapped in at least one but more than two complete layers of cheesecloth. The specimens shall be subjected to 20 discharges. The interval between successive discharges shall be 5s. The UAC shall be maintained for 2min after the last discharge.
18	Active Flammability	The cheesecloth shall not be on fire.	C1, C2: Filter capacitor 1µF±10% C3: Capacitor 0.033µF±5% L1 to L4: Rod coa choke 1.5mH±20%, 16A
			R: Resistor 100Ω±2% Cx < 0.068μF Ct: Tank capacitor 3μF±5% 10kV Cx ≦ 1μF U-: UR±5% UR: Rated voltage Cx: Capacitor under test F: Slow-blow fuse, rated 16A Ut: Voltage to which the tank capacitor Ct is charged
			2.5kV time

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GA3 Series Type GD Specifications and Test Methods (1)

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Complement of Test Method

1. Test Substrate

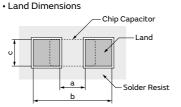
The test substrate should be Substrate A or Substrate B as described in "Specifications and Test Methods".

The specimen should be soldered by the conditions as described below.

Soldering Method: Reflow soldering

Solder: Sn-3.0Ag-0.5Cu

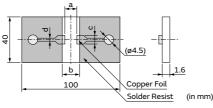
(1) Test Substrate A



Part Number	C	imension (mm	1)
Part Number	a	ь	С
GA342	3.5	7.0	2.4

- Material: Glass Epoxy Board
- Thickness: 1.6mm
- Thickness of Copper Foil: 0.035mm

(2) Test Substrate B

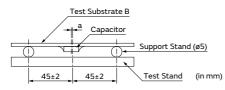


Part Number	Dir	nension of	Pattern (m	nm)
Part Number	a	b	С	d
GA342	3.5	7.0	2.4	1.0

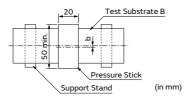
- Material: Glass Epoxy Board
- Thickness of Copper Foil: 0.035mm

2. Test Method of Substrate Bending Test

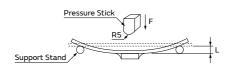
(a) Support State



(b) Test State



- a: ± 2 gap between support stand center and test stand
- b: ±5 gap between support stand center and test stand center
- Material of Test Stand and Pressure Stick
- The material shoud be a metal where a remarkable transformation and the distortion are not caused even if it is pressurized.
- Pressurizing Speed
 - The pressurizing speed is pressurized at the speed of about 1mm/s until the flexure reaches a regulated value.



GA3 Series Type GD Specifications and Test Methods (2)

No	Ite	em	Specification	Test Method (Ref. Standard: JIS C 5101, IEC60384)		
1	Appearance		No defects or abnormalities.	Visual inspection.		
2	Dimension		Within the specified dimensions.	Using calipers and micrometers.		
3	Voltage Proof		No defects or abnormalities.	Measurement Point: Between the terminations Test Voltage: AC1500V (r.m.s.) Applied Time: 60±1s Charge/discharge current: 50mA max.		
4	Impulse Volta	ge	No self healing break downs or flash-overs have taken place in the capacitor.	10 impulse of alternating polarity is subjected. (5 impulse for each polarity) The interval between impulse is 60s. Applied Voltage: 2.5kVo-p		
5	Insulation Res	sistance (I.R.)	6000 M Ω or more	Measurement Point: Between the terminations Measurement Voltage: DC500±50V Charging Time: 60±5s Measurement Temperature: Room Temperature		
6	Capacitance		Shown in Rated value.	Measurement Temperature: Room Temperature		
7	Dissipation Fa	actor (D.F.)	0.025 max.	Measurement Frequency: 1.0±0.1kHz Measurement Voltage: AC1.0±0.2V (r.m.s.)		
8	Temperature		R7: Within ±15% (-55 to +125°C)	The capacitance change should be measured after 5 minutes at each specified temp. stage. Capacitance value as a reference is the value in step 3. Step Temperature (°C) 1 Reference Temp. ±2 2 Min. Operating Temp. ±3 3 Reference Temp. ±2 4 Max. Operating Temp. ±3 5 Reference Temp. ±2 • Pretreatment Perform a heat treatment at 150+0/-10°C for 1h±5min and then let sit for 24±2h at room condition*.		
		Appearance	No defects or abnormalities.	Solder the capacitor on the test substrate A shown in		
		Capacitance	Within the specified initial value.	"Complement of Test Method". Kind of Vibration: A simple harmonic motion		
9	Vibration	D.F.	Within the specified initial value.	10Hz to 55Hz to 10Hz (1min) Total amplitude: 1.5mm This motion should be applied for a period of 2h in each 3 mutually perpendicular directions (total of 6h).		
10	O Solderability		95% of the terminations is to be soldered evenly and continuously.	Test Method: Solder bath method Flux: Solution of rosin ethanol 25 (wt)% Preheat: 80 to 120°C for 10 to 30s Solder: Sn-3.0Ag-0.5Cu (Lead Free Solder) Solder Temp.: 245±5°C Immersion time: 2±0.5s Immersing in speed: 25±2.5mm/s.		
		Appearance	No defects or abnormalities.	Test Method: Solder bath method		
		Capacitance Change	Within ±10%	Solder: Sn-3.0Ag-0.5Cu (Lead Free Solder) Solder Temp.: 260±5°C Immersion time: 10±1s		
	Resistance to	I.R.	1000MΩ or more	Immersing in speed: 25±2.5mm/s.		
11	Soldering Heat	Voltage Proof	No defects.	Exposure Time: 24±2h at room condition*. Preheat: GA342/43 size: 100 to 120°C for 1min and 170 to 200°C for 1min • Pretreatment Perform a heat treatment at 150+0/-10°C for 1h±5min and then let sit for 24±2h at room condition*.		
12	Adhesive Strength of Termination		No removal of the terminations or other defect should occur.	Solder the capacitor on the test substrate A shown in "Complement of Test Method". 10N, 10±1s Applied Direction: In parallel with the test substrate and vertical with the capacitor side.		

 $^{{\}rm * Room\ Condition:}\ Temperature: 15\ to\ 35^{\circ}C,\ Relative\ humidity: 45\ to\ 75\%,\ Atmosphere\ pressure: 86\ to\ 106\ kPa$

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GA3 Series Type GD Specifications and Test Methods (2)

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No	lte	em .	Specification	Test Method (Ref. Standard: JIS C 5101, IEC60384)		
13	Substrate Bending Test		No defects or abnormalities.	Solder the capacitor on the test substrate B shown i "Complement of Test Method". Then apply the force in the direction shown in "Test Substrate Bending Test" of "Complement of Test Me Flexure: 1mm Holding Time: 5±1s Soldering Method: Reflow soldering		own in "Test Method of
		Appearance	No defects or abnormalities.	1	apacitor to the supporting test	
		Capacitance Change	Within±15%	Perform	nown in "Complement of Test N the 5 cycles according to the f the following table.	
		D.F.	0.05 max.	Step	Temp. (°C)	Time (min)
14	Temperature Sudden	I.R.	3000MΩ or more	1 2	Min. Operating Temp. +0/-3 Room Temp.	30±3 2 to 3
14	Change	Voltage Proof	No defects.	3 4 Exposure • Pretrea Perform	Max. Operating Temp. +3/-0 Room Temp. Time: 24±2h at room condition	30±3 2 to 3 on*. O°C for 1h±5min and
		Appearance	No defects or abnormalities.	Fix the ca	apacitor to the supporting test	substrate B (glass epoxy
		Capacitance Change	Within±15%	Before th	nown in "Complement of Test N his test, the test shown in the f Adhesive Strength of Terminati	ollowing is performed.
	High	D.F.	0.05 max.	• No.13 S	No.13 Substrate Bending Test	
15	Temperature High	I.R.	3000M $Ω$ or more	Test Temperature: 40±2°C Test Humidity: 90 to 95%RH		
	Humidity (Steady)	Voltage Proof	No defects.	Test Tim Applied \ Exposure • Pretrea Perform	Test Time: 500+24/-0h Applied Voltage: Rated voltage Exposure Time: 24±2h at room condition*. • Pretreatment Perform a heat treatment at 150+0/-10°C for 1h±5min ar then let sit for 24±2h at room condition*.	
		Appearance	No defects or abnormalities.	Fix the ca	apacitor to the supporting test	substrate B (glass epoxy
		Capacitance Change	Within ±20%	board) shown in "Complement of Test Method". Before this test, the test shown in the following is per No.12 Adhesive Strength of Termination (apply force		ollowing is performed.
		D.F.	0.05 max.	No.13 Substrate Bending Test		
		I.R.	3000M $Ω$ or more	Next, Impulse Voltage test is performed. Each individual capacitor shall be subjected to a 2.5k\		
16	Durability	Voltage Proof	No defects. S to 35% Polative hymidity: 45 to 75% Atmosphere pro	(the voltage value means zero to peak) for 3 times. Then the capacitors are applied to life test. 100 (%) 90 Front time (T1) = 1.2 \muss = 1.6 Time to half-value (T2) = 50 Apply voltage as Table for 1000h at 125+2/-0°C, relative humidity 50% max. Applied Voltage AC425V (r.m.s.), except that once each hour the voltage is increased to AC1000V (r.m.s.) for 0.1s. Exposure Time: 24±2h at room condition*. Pretreatment Perform a heat treatment at 150+0/-10°C for 1h±5min and then let sit for 24±2h at room condition*.		time (T1) = 1.2µs=1.67T to half-value (T2) = 50µs 5+2/-0°C, relative ach hour the voltage 0.1s. on*. 0°C for 1h±5min and

 $^{{\}rm ^*Room\ Condition:\ Temperature:\ 15\ to\ 35^\circ C,\ Relative\ humidity:\ 45\ to\ 75\%,\ Atmosphere\ pressure:\ 86\ to\ 106kPa}$

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GA3 Series Type GD Specifications and Test Methods (2)

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The capacitor under test shall be held in the flame in the position which best promotes burning. Each specimen shall only be exposed once to the flame in the position which best promotes burning. Each specimen shall only be exposed once to the flame in the position which best promotes burning. Each specimen shall only be exposed once to the flame in the position which best promotes burning. Each specimen shall only be exposed once to the flame in the position which best promotes burning. Each specimen shall only be exposed once to the flame in the position which best promotes burning. Each specimen shall only be exposed once to the flame in the position which best promotes burning. Each specimen shall only be exposed once to the flame in the position which best promotes burning. Each specimen shall only be exposed once to the flame in the position which best promotes burning. Each specimen shall only be exposed once to the flame in the position which best promotes burning. Each specimen shall only be exposed once to the flame in the position which best promotes burning. Each specimen shall only be exposed once to the flame in the position which best promotes about any to be exposed once to the flame in the position which best promotes about any to be exposed once to the flame in the position which best promotes along the position which best promotes and specimen shall only be exposed once to the flame in the position which best promotes and layer to expose any to the position which best promotes along the position which best promotes along the position which best promotes and layer to expose once to the flame in the position which best promotes along the position which best promotes and the position which best promotes and the position of the position of the position and the position	Continued from the preceding page.						
position which best promotes burning. Each specimen shall only be exposed once to the flame Time of exposure to flame: 30s. Length of flame: 12±1mm as burner. Length 35mm min. Inside dia: 0.5±0.1mm Outside dia: 0.5±0.1mm Outside dia: 0.5±0.1mm Outside dia: 0.5±0.1mm Approximately 95% min. The burning time shall not be exceeded the time 30s. The tissue paper shall not ignite. The specimens shall be individually wrapped in at least more than two complete layers of cheesecloth. The specimens shall be subjected to 20 discharges. The interval between successive discharges shall be 5s. The UAC shall be maintained for 20m after the last dis The UAC shall be maintained for 20m after the last dis C1, C2: Filter capacitor 1µF±10% C3: Capacitor 0.033µF±5% C1 talk capacitor 3y±5% cloky Cx \$1µF U: Uiz 5% U: Uiz 5% U: Uiz 5% U: Uiz 5% U: Viz 18x5%	No Item	Specification	Test Method (Ref. Standard: JIS C 5101, IEC60384)				
more than two complete layers of cheesecloth. The specimens shall be subjected to 20 discharges. The interval between successive discharges shall be 55. The UAC shall be maintained for 2min after the last discharges. The UAC shall be maintained for 2min after the last discharges. The UAC shall be maintained for 2min after the last discharged to 20 ct. The UAC shall be maintained for 2min after the last discharged to 30 ct. The UAC shall be maintained for 2min after the last discharged to 30 ct. The UAC shall be maintained for 2min after the last discharge to 30 ct. The UAC shall be maintained for 2min after the last discharges the UAC shall be maintai	17 Passive Flammability		Each specimen shall only be exposed once to the flame. Time of exposure to flame: 30s Length of flame: 12±1mm Gas burner: Length 35mm min. Inside dia: 0.5±0.1mm Outside dia: 0.9mm max. Gas: Butane gas purity 95% min. Approximately 8mm Buner Flame 200±5mm Tissue Paper				
	18 Active Flammability	The cheesecloth shall not be on fire.	The specimens shall be subjected to 20 discharges. The interval between successive discharges shall be 5s. The UAC shall be maintained for 2min after the last discharge. $\begin{array}{cccccccccccccccccccccccccccccccccccc$				

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GA3 Series Type GD Specifications and Test Methods (2)

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Complement of Test Method

1. Test Substrate

The test substrate should be Substrate A or Substrate B as described in "Specifications and Test Methods".

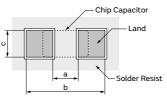
The specimen should be soldered by the conditions as described below.

Soldering Method: Reflow soldering

Solder: Sn-3.0Ag-0.5Cu

(1) Test Substrate A

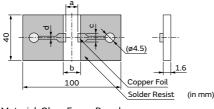
Land Dimensions



Part Number	Е	Dimension (mm	1)
Part Number	a	b	С
GA342	3.5	7.0	2.4
GA343	3.5	7.0	3.7

- Material: Glass Epoxy Board
- Thickness: 1.6mm
- Thickness of Copper Foil: 0.035mm

(2) Test Substrate B

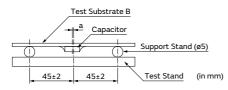


Part Number	Dir	nension of	Pattern (m	ım)
Part Number	a	b	С	d
GA342	3.5	7.0	2.4	1.0
GA343	3.5	7.0	3.7	1.0

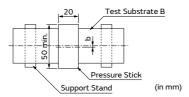
- Material: Glass Epoxy Board
- Thickness of Copper Foil: 0.035mm

2. Test Method of Substrate Bending Test

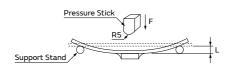
(a) Support State



(b) Test State



- a: ± 2 gap between support stand center and test stand
- b: ±5 gap between support stand center and test stand center
- Material of Test Stand and Pressure Stick
- The material shoud be a metal where a remarkable transformation and the distortion are not caused even if it is pressurized.
- Pressurizing Speed
 - The pressurizing speed is pressurized at the speed of about 1mm/s until the flexure reaches a regulated value.









Size 4.5x2.0mm: This product is applicable only for the instruments certified by EN/IEC60950-1

Size 5.7x2.8mm or 5.7x5.0mm: This product is applicable as X or Y capacitor

Features

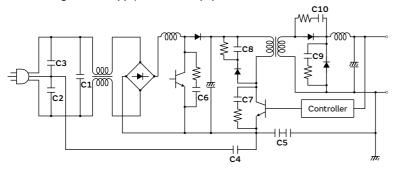
1 International Standard (IEC60384-14) certified product.

Please down load Safety Standard Certification (Type GF: X1/Y2) from here.



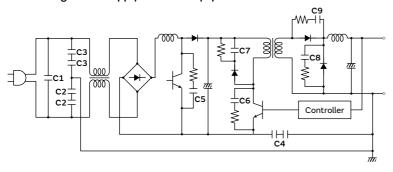
2 Can be used as a Class Y2 capacitor.

Switching Power Supply - Class 1 Equipment



No.	Application	Recommend MLCC Type
C1	X Cap	Type: GB
C2		
С3	Y Cap	Type: GF
C4		
C5	Primary - Secondary Coupling	Type: GF×2

Switching Power Supply - Class 2 Equipment



No.	Application	Recommend MLCC Type
C1	X Cap	Type: GB
C2	V Can	
С3	Y Cap	Type: GF×2
C4	Primary - Secondary Coupling	

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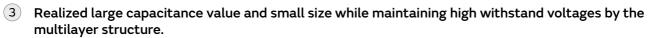
III GMD

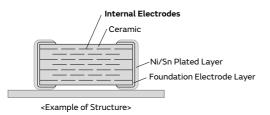
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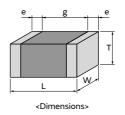




4 This product is only for reflow soldering.

Specifications

Size (mm)	4.5×2.0mm to 5.7×5.0mm
Rated Voltage	250Vac
Capacitance	10pF to 4700pF
Main Applications	AC-DC power supply



This catalog contains only a portion of the product lineup.

Please refer to the capacitor search tool on the Murata Web site for details.

GA3 Series Type GF Temperature Compensating Type Part Number List

4.5×2.0mm

T max.	Rated Voltage	TC Code	Сар.	Tol.	Part Number	p*
1.0mm	250Vac	SL	10pF	±5%	GA342A1XGF100JW31#	p211
			12pF	±5%	GA342A1XGF120JW31#	p211
			15pF	±5%	GA342A1XGF150JW31#	p211
			18pF	±5%	GA342A1XGF180JW31#	p211
			22pF	±5%	GA342A1XGF220JW31#	p211
			27pF	±5%	GA342A1XGF270JW31#	p211
			33pF	±5%	GA342A1XGF330JW31#	p211
			39pF	±5%	GA342A1XGF390JW31#	p211
			47pF	±5%	GA342A1XGF470JW31#	p211
			56pF	±5%	GA342A1XGF560JW31#	p211
			68pF	±5%	GA342A1XGF680JW31#	p211
			82pF	±5%	GA342A1XGF820JW31#	p211

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GA3 Series Type GF High Dielectric Constant Type Part Number List

4.5×2.0mm

T max.	Rated Voltage	TC Code	Сар.	Tol.	Part Number	p*
1.5mm	250Vac	X7R	100pF	±10%	GA342QR7GF101KW01#	p215
			150pF	±10%	GA342QR7GF151KW01#	p215
			470pF	±10%	GA342QR7GF471KW01#	p215
			680pF	±10%	GA342QR7GF681KW01#	p215
2.2mm	250Vac	X7R	220pF	±10%	GA342DR7GF221KW02#	p215
			330pF	±10%	GA342DR7GF331KW02#	p215
			1000pF	±10%	GA342DR7GF102KW02#	p215

5.7×2.8mm

T max.	Rated Voltage	TC Code	Сар.	Tol.	Part Number	p*
1.5mm	250Vac	X7R	100pF	±10%	GA352QR7GF101KW31#	p215
			150pF	±10%	GA352QR7GF151KW31#	p215
			220pF	±10%	GA352QR7GF221KW31#	p215
			330pF	±10%	GA352QR7GF331KW31#	p215
			470pF	±10%	GA352QR7GF471KW01#	p215
			680pF	±10%	GA352QR7GF681KW01#	p215
			1000pF	±10%	GA352QR7GF102KW01#	p215
			1500pF	±10%	GA352QR7GF152KW01#	p215

5.7×5.0mm

T max.	Rated Voltage	TC Code	Сар.	Tol.	Part Number	P*
1.5mm	250Vac	X7R	1800pF	±10%	GA355QR7GF182KW01#	p215
			2200pF	±10%	GA355QR7GF222KW01#	p215
			3300pF	±10%	GA355QR7GF332KW01#	p215
2.0mm	250Vac	X7R	4700pF	±10%	GA355DR7GF472KW01#	p215

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GA3 Series Type GF Specifications and Test Methods (1)

No	Ite	em	Specification	Test Method (Ref. Standard: JIS C 5101, IEC60384)
1	Appearance		No defects or abnormalities.	Visual inspection.
2	Dimension		Within the specified dimensions.	Using calipers and micrometers.
3	Voltage Proof		No defects or abnormalities.	Measurement Point: Between the terminations Test Voltage: AC2000V (r.m.s.) Applied Time: 60±1s Charge/discharge current: 50mA max.
4			No self healing break downs or flash-overs have taken place in the capacitor.	10 impulse of alternating polarity is subjected. (5 impulse for each polarity) The interval between impulse is 60s. Applied Voltage: 2.5kVo-p
5	Insulation Res	sistance (I.R.)	6000MΩ or more	Measurement Point: Between the terminations Measurement Voltage: DC500±50V Charging Time: 60±5s Measurement Temperature: Room Temperature
6	Capacitance		Shown in Rated value.	
7	Q		C ≧ 30pF: 1000 or more C < 30pF: 400+20C or more C: Nominal Capacitance (pF)	Measurement Temperature: Room Temperature Measurement Frequency: 1.0±0.1MHz Measurement Voltage: AC1.0±0.2V (r.m.s.)
8	Temperature Characteristics of Capacitance		1X: +350 to -1000 ppm/°C (Temp.Range:+20 to +85°C)	The capacitance change should be measured after 5 minutes at each specified temp. stage. Capacitance value as a reference is the value in step 3. Step Temperature (°C)
		Appearance	No defects or abnormalities.	Solder the capacitor on the test substrate A shown in
		Capacitance	Within the specified initial value.	"Complement of Test Method".
9	Vibration	Q	Within the specified initial value.	Kind of Vibration: A simple harmonic motion 10Hz to 55Hz to 10Hz (1min) Total amplitude: 1.5mm This motion should be applied for a period of 2h in each 3 mutually perpendicular directions (total of 6h).
10	0 Solderability		95% of the terminations is to be soldered evenly and continuously.	Test Method: Solder bath method Flux: Solution of rosin ethanol 25 (wt)% Preheat: 80 to 120°C for 10 to 30s Solder: Sn-3.0Ag-0.5Cu (Lead Free Solder) Solder Temp.: 245±5°C Immersion time: 2±0.5s Immersing in speed: 25±2.5mm/s.
		Appearance	No defects or abnormalities.	Test Method: Solder bath method
	Resistance to	Capacitance Change	Within±2.5% or ±0.25pF (Whichever is larger)	Solder: Sn-3.0Ag-0.5Cu (Lead Free Solder) Solder Temp.: 260±5°C Immersion time: 10±1s
11	Soldering	I.R.	1000M Ω or more	Immersing in speed: 25±2.5mm/s.
	Heat	Voltage Proof	No defects.	Exposure Time: 24±2h at room condition*. Preheat: GA342 size: 100 to 120°C for 1min and 170 to 200°C for 1min
12	Adhesive Strength of Termination		No removal of the terminations or other defect should occur.	Solder the capacitor on the test substrate A shown in "Complement of Test Method". 10N, 10±1s Applied Direction: In parallel with the test substrate and vertical with the capacitor side.
13	Substrate Bending Test		No defects or abnormalities.	Solder the capacitor on the test substrate B shown in "Complement of Test Method". Then apply the force in the direction shown in "Test Method of Substrate Bending Test" of "Complement of Test Method". Flexure: 1mm Holding Time: 5±1s Soldering Method: Reflow soldering

 $^{^{\}star}$ Room Condition: Temperature: 15 to 35°C, Relative humidity: 45 to 75%, Atmosphere pressure: 86 to 106kPa

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GA3 Series Type GF Specifications and Test Methods (1)

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No	lte	em	Specification	Test Method (Ref. Standard: JIS C 5101, IEC60384)				
		Appearance	No defects or abnormalities.	Fix the capacitor to the supporting test substrate A (glass epoxy board) shown in "Complement of Test Method".				
		Capacitance Change	Within ±2.5% or ±0.25pF (Whichever is larger)	Perform the 5 cycles according to the four heat treatments shown in the following table.				
14	Temperature Sudden	Q	Within the specified initial value.	Step Temp. (°C) Time (min)				
14	Change	I.R.	3000MΩ or more	1 Min. Operating Temp. +0/-3 30±3 2 Room Temp. 2 to 3				
		Voltage	No defects.	3 Max. Operating Temp. +3/-0 30±3 4 Room Temp. 2 to 3				
		Proof		Exposure Time: 24±2h at room condition*.				
		Appearance	No defects or abnormalities.	Fix the capacitor to the supporting test substrate B (glass epoxy				
	High	Capacitance Change	Within ±5.0% or ±0.5pF (Whichever is larger)	board) shown in "Complement of Test Method". Before this test, the test shown in the following is performed.				
	Temperature		C ≧ 30pF: 350 or more	No.12 Adhesive Strength of Termination (apply force: 5N) No.13 Substrate Bending test				
15	High Humidity	Q	C < 30pF: 275+5/2C or more C: Nominal Capacitance (pF)	Test Temperature: 40±2°C				
	(Steady)	I D	3000MQ or more	Test Humidity: 90 to 95%RH Test Time: 500+24/-0h				
		I.R.	300011X 01 HI0le	Applied Voltage: Rated voltage				
		Voltage Proof	No defects.	Exposure Time: 24±2h at room condition*.				
		Appearance	No defects or abnormalities.	Fix the capacitor to the supporting test substrate B (glass epoxy board) shown in "Complement of Test Method".				
		Capacitance Change	Within ±3.0% or ±0.3pF (Whichever is larger)	Before this test, the test shown in the following is performed. • No.12 Adhesive Strength of Termination (apply force: 5N)				
	Durability		C ≧ 30pF: 350 or more	No.13 Substrate Bending test				
		Q	C < 30pF: 275+5/2C or more C: Nominal Capacitance (pF)	Next, Impulse Voltage test is performed. Each individual capacitor shall be subjected to a 5kV Impulse				
		I.R.	3000MΩ or more	(the voltage value means zero to peak) for 3 times. Then the capacitors are applied to life test.				
16		Voltage Proof No defects.	Front time (T1) = 1.2μs=1.67T Time to half-value (T2) = 50μs Apply voltage as Table for 1000h at 125+2/-0°C, relative humidity 50% max. Applied voltage AC425V (r.m.s.), except that once each hour the voltage					
				is increased to AC1000V (r.m.s.) for 0.1s. Exposure Time: 24±2h at room condition*.				
17	7 Passive Flammability		The burning time shall not be exceeded the time 30s. The tissue paper shall not ignite.	The capacitor under test shall be held in the flame in the position which best promotes burning. Each specimen shall only be exposed once to the flame. Time of exposure to flame: 30s Length of flame: 12±1mm Gas burner: Length 35mm min. Inside dia: 0.5±0.1mm Outside dia: 0.9mm max. Gas: Butane gas purity 95% min. Approximately 8mm Buner Flame 200±5mm				
				Tissue Paper				
				Wood Board of Approximately 10mm in Thickness				

 $^{^{\}star}$ Room Condition: Temperature: 15 to 35°C, Relative humidity: 45 to 75%, Atmosphere pressure: 86 to 106kPa

Continued on the following page. 🖊

GA3 Series Type GF Specifications and Test Methods (1)

Continued from the preceding page. \searrow

No	ltem	Specification	Test Method (Ref. Standard: JIS C 5101, IEC60384)
			The specimens shall be individually wrapped in at least one but more than two complete layers of cheesecloth. The specimens shall be subjected to 20 discharges. The interval between successive discharges shall be 5s. The UAC shall be maintained for 2min after the last discharge.
18	Active Flammability	The cheesecloth shall not be on fire.	C1, C2: Filter capacitor 1µF±10% C3: Capacitor 0.033µF±5% L1 to L4: Rod coa choke 1.5mH±20%, 16A
			R: Resistor 100Ω±2% Cx < 0.068μF Ct: Tank capacitor 3μF±5% 10kV Cx ≦ 1μF U-: UR±5% UR: Rated voltage Cx: Capacitor under test F: Slow-blow fuse, rated 16A Ut: Voltage to which the tank capacitor Ct is charged
			2.5kV time

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GA3 Series Type GF Specifications and Test Methods (1)

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Complement of Test Method

1. Test Substrate

 $The \ test \ substrate \ Should \ be \ Substrate \ A \ or \ Substrate \ B \ as \ described \ in \ "Specifications \ and \ Test \ Methods".$

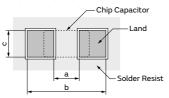
The specimen should be soldered by the conditions as described below.

Soldering Method: Reflow soldering

Solder: Sn-3.0Ag-0.5Cu

(1) Test Substrate A

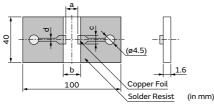
Land Dimensions



Part Number	Dimension (mm)				
Part Number	a	ь	С		
GA342	3.5	7.0	2.4		

- Material: Glass Epoxy Board
- Thickness: 1.6mm
- Thickness of Copper Foil: 0.035mm

(2) Test Substrate B

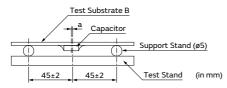


Part Number	Dimension of Pattern (mm)				
Part Number	a	b	С	d	
GA342	3.5	7.0	2.4	1.0	

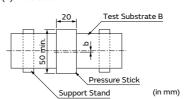
- Material: Glass Epoxy Board
- Thickness of Copper Foil: 0.035mm

2. Test Method of Substrate Bending Test

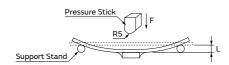
(a) Support State



(b) Test State



- a: ±2 gap between support stand center and test stand
- b: ±5 gap between support stand center and test stand center
- Material of Test Stand and Pressure Stick
- The material should be a metal where a remarkable transformation and the distortion are not caused even if it is pressurized.
- Pressurizing Speed
 - The pressurizing speed is pressurized at the speed of about 1mm/s until the flexure reaches a regulated value.



GA3 Series Type GF Specifications and Test Methods (2)

No	Item		Specification	Test Method (Ref. Standard: JIS C 5101, IEC60384)	
1	Appearance		No defects or abnormalities.	Visual inspection.	
2	Dimension		Within the specified dimensions.	Using calipers and micrometers.	
3	Voltage Proof		No defects or abnormalities.	Measurement Point: Between the terminations Test Voltage: AC2000V (r.m.s.) Applied Time: 60±1s Charge/discharge current: 50mA max.	
4	Impulse Voltage		No self healing break downs or flash-overs have taken place in the capacitor.	10 impulse of alternating polarity is subjected. (5 impulse for each polarity) The interval between impulse is 60s. Applied Voltage: 2.5kVo-p	
5	Insulation Resistance (I.R.)		6000 M Ω or more	Measurement Point: Between the terminations Measurement Voltage: DC500±50V Charging Time: 60±5s Charge/discharge current: 50mA max. Measurement Temperature: Room Temperature	
6	Capacitance		Shown in Rated value.	Measurement Temperature: Room Temperature	
7	Dissipation Fa	ctor (D.F.)	0.025 max.	Measurement Frequency: 1.0±0.1kHz Measurement Voltage: AC1.0±0.2V (r.m.s.)	
8	Temperature Characteristics of Capacitance		R7: Within ±15% (-55 to +125°C)	The capacitance change should be measured after 5 minutes at each specified temp. stage. Capacitance value as a reference is the value in step 3. Step	
	Appearance		No defects or abnormalities.	Solder the capacitor on the test substrate A shown in	
9	Vibration	D.F.	Within the specified initial value. Within the specified initial value.	"Complement of Test Method". Kind of Vibration: A simple harmonic motion 10Hz to 55Hz to 10Hz (1min) Total amplitude: 1.5mm This motion should be applied for a period of 2h in each 3 mutually perpendicular directions (total of 6h).	
10	Solderability		95% of the terminations is to be soldered evenly and continuously.	Test Method: Solder bath method Flux: Solution of rosin ethanol 25 (wt)% Preheat: 80 to 120°C for 10 to 30s Solder: Sn-3.0Ag-0.5Cu (Lead Free Solder) Solder Temp.: 245±5°C Immersion time: 2±0.5s Immersing in speed: 25±2.5mm/s.	
		Appearance	No defects or abnormalities.	Test Method: Solder bath method	
	Resistance to Soldering Heat	Capacitance Change	Within ±10%	Solder: Sn-3.0Ag-0.5Cu (Lead Free Solder) Solder Temp.: 260±5°C Immersion time: 10±1s	
		I.R.	1000MΩ or more	Immersing in speed: 25±2.5mm/s.	
11		Voltage Proof	No defects.	Exposure Time: 24±2h at room condition*. Preheat: GA342/52/55 size: 100 to 120°C for 1min and 170 to 200°C for 1min • Pretreatment Perform a heat treatment at 150+0/-10°C for 1h±5min and then let sit for 24±2h at room condition*.	
12	Adhesive Strength of Termination		No removal of the terminations or other defect should occur.	Solder the capacitor on the test substrate A shown in "Complement of Test Method". 10N, 10±1s Applied Direction: In parallel with the test substrate and vertical with the capacitor side.	

 $^{{\}rm ^*\,Room\,Condition:\,Temperature:\,15\,to\,35^{\circ}C,\,Relative\,humidity:\,45\,to\,75\%,\,Atmosphere\,pressure:\,86\,to\,106kPa}$

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GA3 Series Type GF Specifications and Test Methods (2)

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No	lo Item		Specification	Test Method (Ref. Standard: JIS C 5101, IEC60384)			
13	Substrate		No defects or abnormalities.	Solder the capacitor on the test substrate B shown in "Complement of Test Method". Then apply the force in the direction shown in "Test Method of Substrate Bending Test" of "Complement of Test Method". Flexure: 1mm Holding Time: 5±1s Soldering Method: Reflow soldering			
		Appearance	No defects or abnormalities.	Fix the capacitor to the supporting test substrate A (glass epox board) shown in "Complement of Test Method". Perform the 5 cycles according to the four heat treatments shown in the following table.			
	Temperature Sudden Change	Capacitance Change	Within±15%				
		D.F.	0.05 max.	Step	1 Min. Operating Temp. +0/-3 30±3 2 Room Temp. 2 to 3 3 Max. Operating Temp. +3/-0 30±3 4 Room Temp. 2 to 3 Exposure Time: 24±2h at room condition*. • Pretreatment Perform a heat treatment at 150+0/-10°C for 1h±5min and		
1.4		I.R.	3000MΩ or more				
14		Voltage Proof	No defects.	3 4 Exposure • Pretrea Perform			
		Appearance	No defects or abnormalities.		then let sit for 24±2h at room condition*. Fix the capacitor to the supporting test substrate B (glass epox board) shown in "Complement of Test Method". Before this test, the test shown in the following is performed. No.12 Adhesive Strength of Termination (apply force: 5N)		
		Capacitance Change	Within±15%	board) sh Before th			
	High	D.F.	0.05 max.	• No.13 9	Substrate Bending Test	on (apply force, 514)	
15	Temperature High	I.R.	3000 M Ω or more		Test Temperature: 40±2°C Test Humidity: 90 to 95%RH Test Time: 500+24/-0h Applied Voltage: Rated voltage Exposure Time: 24±2h at room condition*. Pretreatment Perform a heat treatment at 150+0/-10°C for 1h±5min and then let sit for 24±2h at room condition*.		
15	Humidity (Steady)	Voltage Proof	No defects.	Test Tim Applied \ Exposure • Pretrea Perform			
		Appearance	No defects or abnormalities.	Fix the capacitor to the supporting test substrate B (glass epoxy board) shown in "Complement of Test Method". Before this test, the test shown in the following is performed. • No.12 Adhesive Strength of Termination (apply force: 5N) • No.13 Substrate Bending Test Next, Impulse Voltage test is performed. Each individual capacitor shall be subjected to a 5kV Impulse			
		Capacitance Change	Within ±20%				
		D.F.	0.05 max.				
		I.R.	3000 M Ω or more				
16	Durability	Voltage Proof	No defects.	(the voltage value means zero to peak) for 3 times. Then the capacitors are applied to life test. 100 (%) 90 Front time (T1) = 1.2 µs		ime (T1) = 1.2µs=1.67T to half-value (T2) = 50µs 5+2/-0°C, relative ch hour the voltage 0.1s. n*. 0°C for 1h±5min and	

 $^{{\}rm * Room\ Condition:}\ Temperature: 15\ to\ 35^{\circ}C,\ Relative\ humidity: 45\ to\ 75\%,\ Atmosphere\ pressure: 86\ to\ 106\ kPa$

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GA3 Series Type GF Specifications and Test Methods (2)

Continued from the preceding page.						
No	ltem	Specification	Test Method (Ref. Standard: JIS C 5101, IEC60384)			
17	Passive Flammability	The burning time shall not be exceeded the time 30s. The tissue paper shall not ignite.	The capacitor under test shall be held in the flame in the position which best promotes burning. Each specimen shall only be exposed once to the flame. Time of exposure to flame: 30s Length of flame: 12±1mm Gas burner: Length 35mm min. Inside dia: 0.5±0.1mm Outside dia: 0.9mm max. Gas: Butane gas purity 95% min. Approximately 8mm Buner Flame 200±5mm Wood Board of Approximately 10mm in Thickness			
18	Active Flammability	The cheesecloth shall not be on fire.	Wood Board of Approximately 10mm in Thickness The specimens shall be individually wrapped in at least one but more than two complete layers of cheesecloth. The specimens shall be subjected to 20 discharges. The interval between successive discharges shall be 5s. The UAC shall be maintained for 2min after the last discharge. S1 C1, C2: Filter capacitor 1μF±10% C3: Capacitor 0.033μF±5% L1 to L4: Rod coa choke 1.5mH±20%, 16A R: Resistor 100Ω±2% Cx < 0.068μF Ct: Tank capacitor 3μF±5% 10kV Cx ≤ 1μF U-: UR±5% UR: Rated voltage Cx: Capacitor under test F: Slow-blow fuse, rated 16A Ut: Voltage to which the tank capacitor Ct is charged			

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Complement of Test Method

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1. Test Substrate

The test substrate should be Substrate A or Substrate B as described in "Specifications and Test Methods".

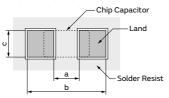
The specimen should be soldered by the conditions as described below.

Soldering Method: Reflow soldering

Solder: Sn-3.0Ag-0.5Cu

(1) Test Substrate A

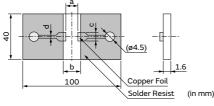
Land Dimensions



Part Number	Dimension (mm)			
Part Number	a	b	С	
GA342	3.5	7.0	2.4	
GA352	4.5	8.0	3.2	
GA355	4.5	8.0	5.6	

- Material: Glass Epoxy Board
- Thickness: 1.6mm
- Thickness of Copper Foil: 0.035mm

(2) Test Substrate B

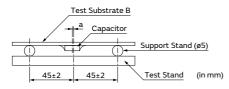


Part Number	Dimension of Pattern (mm)				
Part Number	a	b	С	d	
GA342	3.5	7.0	2.4	1.0	
GA352	4.5	8.0	3.2	1.0	
GA355	4.5	8.0	5.6	1.0	

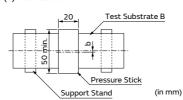
- Material: Glass Epoxy Board
- Thickness of Copper Foil: 0.035mm

2. Test Method of Substrate Bending Test

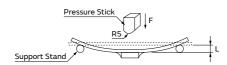
(a) Support State



(b) Test State



- a: ±2 gap between support stand center and test stand
- b: ±5 gap between support stand center and test stand center
- Material of Test Stand and Pressure Stick
- The material should be a metal where a remarkable transformation and the distortion are not caused even if it is pressurized.
- Pressurizing Speed
 - The pressurizing speed is pressurized at the speed of about 1mm/s until the flexure reaches a regulated value.



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46KI315000M2M 46KI3150CKM2K 46KI3150CKM2M 46KI3150NDM2M 46KI3220CKP0M 46KI3220JLM1M 46KN3150JH01K

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