High Reliability Application Multilayer Ceramic Capacitors

■RELIABILITY DATA

1. Operating Tempe	erature Range
	X7R(-55°C to +125°C)
Specified Value Test Methods and	X/R(-55 C to +125 C)
Remarks	Continuous use is available in this range. (reference temperature : 25°C)
2.Highest Operating	temperature Range
Specified Value	X7R(-55°C to +125°C)
Test Methods and Remarks	Maximum ambient temperature at which capacitors can be continuously used with rated voltage applied.
3. Rated Voltage	
Specified Value	Please refer to the page of the "PART NUMBERS".
Test Methods and Remarks	Continuous maximum applied voltage. If an AC voltage is loaded on a DC voltage, the sum of the two peak voltages should be lower than the rated voltage of the capacitor.
4. Shape and Dimer	sions
Specified Value	Please refer to the page of the "EXTERNAL DIMENSIONS".
5. Heat Treatment	(Class II)
Test Methods and	Initial value shall be measured after test sample is heat—treated at $150\pm0/-10^{\circ}$ C for an hour and kept at room temperature for 24 \pm
Remarks	2 hours.
6. Voltage Treatmen	nt (Class II)
Test Methods and	Initial value shall be measured after test sample is voltage—treated for an hour at temperature and voltage which are specified as test
Remarks	conditions, and kept at room temperature for 24 ± 2 hours.
7. Dielectric Withst	anding Voltage(between terminals)
Specified Value	No abnormality.
Test Methods and	Applied voltage : Rated voltage × 2.5
Remarks	Duration : 1 to 5 seconds. Charging and discharging current shall be 50mA max.
8. Insulation Resista	ance
Specified Value	Larger than whichever smaller of 500 M Ω · μ F or 10 ⁴ M Ω
Test Methods and	Applied voltage : Rated voltage
Remarks	Duration : 60±5 seconds. Charging and discharging current shall be 50mA max.
-	oranging and disorial ging out one stain be own, than.
9. Capacitance and	Tolerance
Specified Value	Please refer to the page of the "PART NUMBERS".
	Measurement frequency : 1kHz±10%(C≦10 μ F)
Test Methods and	Measurement voltage : $1\pm0.2 \text{Vrms} (C \le 10 \mu\text{ F})$
Remarks	0.5 ± 0.1 V $(6.3$ V rated voltage) Heat treatment specified in No.5 of the specification shall be conducted prior to measurement.
10. Q or Dissipation	factor (tan δ)
Specified Value	Please refer to the page of the "PART NUMBERS".
	Measurement frequency : 1kHz±10%(C≦10 μ F)
Test Methods and Remarks	Measurement voltage $: 1\pm 0.2 \text{Vrms}(\text{C} \le 10 \mu\text{F})$ $0.5\pm 0.1 \text{V}(6.3 \text{V rated voltage})$
nemarks	U.5±0.1V (6.3V rated voltage) Heat treatment specified in No.5 of the specification shall be conducted prior to measurement. NO DC bias is applied.
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11. Temperature Characteristic (without DC bias) Specified Value $X7R(-55^{\circ}C \text{ to } +125^{\circ}C): \pm 15\%$ Confirming to EIA RS-198-D (1991) Heat treatment specified in No.5 of the specification shall be conducted prior to measurement. Change of the maximum capacitance deviation in step 1 to 5. Temperature (°C) step Test Methods and +25 Remarks 2 Minimum operating temperature 3 +25 4 Maximum operating temperature 5 +25

12. Adhesive Force of Terminal Electrodes

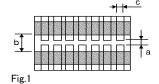
Specified Value

Appearance: Terminal electrodes shall be no exfoliation or a sign of exfoliation.

Solder lands refer to fig.1.

	1608 size	larger than 2012 size
Applying force	5N	10N
Duration	30±5 seconds.	
Board	Glass epoxy-resin substrate	
Thickness	1.6mm	

Test Methods and Remarks



	Case size			
Dimension	1608	2012	3216	3225
а	1.0	1.2	2.2	2.2
b	3.0	4.0	5.0	5.0
С	1.2	1.65	2.0	2.9

13. Vibration		
Specified Value	Capacitance change : Init Dissipation factor : Init	abnormality cial value shall be satisfied. cial value shall be satisfied. cial value shall be satisfied.
Test Methods and Remarks	heat treated as specified in No.5. Solder lands refer to figure 1. Direction of the vibration test Vibrationfrequency Total amplitude	f the specification shall be conducted prior to test. Measurement shall be conducted after test sample is : X, Y, Z each of 3 orientations for 2 hours respectively (total 6 hours) : 10 to 55 to 10Hz (1 minutes each) : 1.5 mm be made after test sample is kept at room temperature for 24 ±2 hours.

44.5		
14. Resistance to S		
	Appearance	: No abnormality
	Capacitance change	: ≦±7.5%
Specified Value	Dissipation factor	: Initial value shall be satisfied.
	Insulation resistance	: Initial value shall be satisfied.
	Dielectric withstanding volt	age (between terminals): No abnormality
	Heat treatment specified in	No.5 of the specification shall be conducted prior to test.
	Immerse test sample in an	solder solution(Sn-3Ag-0.5Cu).
	Soldering temperature	: 270°C±5°C
Test Methods and	Duration	$:3\pm0.5$ seconds
Remarks	Soaking position	: Test sample is soaked until the termnal electrode is covered in solder solution.
	Preheating condition	: 3216 size or smaller size: 120 to 150°C for 1 minute,
		3225 size: 100 to 120°C for 1 minute, 170 to 200°C for 1 minute.
	Measurement after the test	shall be made after test sample is kept at room temperature for 24 ±2 hours.

15. Solderability	15. Solderability					
Specified Value	More than 95% of terminal electrode shall be covered with fresh solder.					
Test Methods and Remarks	· •	n No.5 of the specification shall be conducted prior to test. solder solution(Sn-3Ag-0.5Cu). : 245°C±5°C : 4±1 seconds : Test sample is immersed until the terminal electrode is covered in solder solution.				

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16. Thermal shock

: No abnormality Appearance Capacitance change : **≦**±7.5%

Insulation resistance Dielectric withstanding voltage

Dissipation factor

: Initial value shall be satisfied. : Initial value shall be satisfied. (between terminals): No abnormality

Heat treatment specified in No.5 of the specification shall be conducted prior to test.

Measurement shall be conducted after test sample is heat treated as specifie	d in No.5.
condition of the one cycle (Air-Air)	

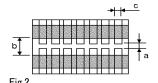
Ste	ер	Temperature (°C)	Time (min.)	Transfer time
1	1	Minimum usage temperature	15	within 20 seconds
2	2	Maximum usage temperature	15	within 20 seconds

Test Methods and Remarks

Specified Value

Test cycles: 100 times.

Measurement after the test shall be made after test sample is kept at room temperature for 24 ± 2 hours.



	Case size			
Dimension	Dimension 1608 2012 3		3216	3225
а	0.6	0.8	2.0	2.0
b	2.2	3.0	4.4	4.4
С	0.9	1.3	1.7	2.6

17. Humidity Loading

Test Methods and

Remarks

Appearance : No abnormality Specified Value Capacitance change : ±12.5% Note1 Dissipation factor : 5.0%max. Insulation resistance : Larger than whichever smaller of 25M Ω • μ F or 500M Ω

> Test condition : 85°C/85%RH. Duration : 1000 + 48/-0 hours.DC bias : Applied rated voltage.

Voltage treatment specified in No.6 of the specification shall be conducted prior to test.

Measurement after the test shall be made after test sample is kept at room temperature for 24 \pm 2 hours.

18. High Temperature Loading

Appearance : No abnormality Specified Value : ≦±12.5% Capacitance change Note1 Dissipation factor : 5.0%max.

Insulation resistance : Larger than whichever smaller of 25M $\Omega \cdot \mu$ F or 500M Ω

Voltage treatment specified in No.6 of the specification shall be conducted prior to test.

Test sample shall be put in thermostatic oven with maximum temperature.

Test Methods and Remarks

Applied voltage : Rated voltage x 2 Duration : 1000 + 48/-0 hours.Charging and discharging current shall be 50mA or less.

Measurement after the test shall be made after test sample is kept at room temperature for 24 ± 2 hours.

19. Resistance to Flexure of substrate

Appearance : No abnormality : ≤±12.5% Capacitance change Specified Value Dissipation factor : 5.0%max.

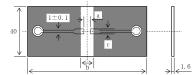
> Insulation resistance : Initial value shall be satisfied.

Warp : 1mm

Testing board : Grass epoxy - resin substrate

Thickness : 1.6mm Test board and solder lands : Refer to fig. 3.

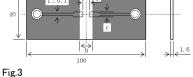
Test Methods and Remarks



	Case size			
Dimension	1608	2012	3216	3225
а	0.6	8.0	2.0	2.0
b	2.2	3.0	4.4	4.4
С	0.9	1.3	1.7	2.6



Measurement shall be made with board in the bent position. (fig.4)



20. High Temperatu	20. High Temperature Exposure			
Specified Value Note1	Appearance Capacitance change Dissipation factor Insulation resistance	: No abnormality : \leq \pm 12.5% : 5.0%max. : Larger than whichever smaller of 500M Ω • μ F or 10000M Ω		
Test Methods and Remarks	Test sample shall be put in Duration : 1000 +48/-0 Initial value shall be measur	No.5 of the specification shall be conducted prior to test. thermostatic oven with maximum temperature. nours. red after test sample is heat—treated specified No.5. t shall be made after test sample is kept at room temperature for 24 ±2 hours.		

21. Temperature Cy	cling			
Specified Value	Appearance Capacitance of Dissipation fac	9	d	
	Insulation resi	stance : Initial value shall be satisfic	d	
		nt specified in No.5 of the specification shall be shall be conducted after test sample is heat tre ne one cycle Temperature(°C)	•	
	1	Minimum usage temperature	30±3	
Test Methods and	2	+25	2 to 3	
Remarks	3	Maximum usage temperature	30±3	
	4	+25	2 to 3	
	Test cycles:2 Solder lands re Measurement		kept at room temperature for 24 ± 2 hours.	

22. Body strength	
Specified Value	No mechanical damage
Test Methods and Remarks	Applying force : 10N Applying time : 10 seconds $R=0.5$ $R=0.5$ $R=0.5$ $Chip$ L $L \ge W$

Note 1 The figures indicate typical specifications. Please refer to individual specifications in detail.

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