Multilayer Ceramic Capacitors

■RELIABILITY DATA

	mperature Range						
	Temperature Compensating(Class1)	Standard High Frequency Type	−55 to +	-125°C			
	Compensating (Classif)	nigh Frequency Type	1			_	
				Specification	Temperature		
			BJ	В	-25 to +8		
Specified			l 	X5R	-55 to +8		
∕alue			B7	X7R	-55 to +1		
/ alue	High Permittivity (Class2))	C6	X6S	-55 to +1		
			C7	X7S	-55 to +1		
			LD(※)	X5R	-55 to +8		
			F	F	-25 to +8		
			L	Y5V	-30 to +8		
			Note: ×	LD Low distortion hi	gh value multilayer	ceramic capa	
. Storage Con	nditions						
	Temperature	Standard		105°0			
	Compensating(Class1)	High Frequency Type	−55 to +	- 125°C			
				Specification	Temperature	Range	
				В	-25 to +8		
		BJ	X5R	-55 to +8			
Specified			B7 X7R -55 to +125°C				
√alue				+ +			
	High Permittivity (Class2))	C7	X7S			
		LD(※)	X5R	−55 to +8	35°C		
		_	F	−25 to +8	35°C		
		F	Y5V	−30 to +8	35°C		
			Note: 🔆	LD Low distortion hi	gh value multilayer	ceramic capa	
Rated Voltag	ge						
	Temperature	Standard	50VDC, 25	VDC, 16VDC			
Specified	Compensating(Class1)	High Frequency Type	50VDC, 25VDC, 16VDC				
'alue	High Permittivity (Class2)		50VDC, 35VDC, 25VDC, 16VDC, 10VDC, 6.3VDC, 4VDC, 2.5VDC				
	riigir i crimicuvicy (Olassz)	,	00100, 00	7700, 20700, 10700	, 10100, 0.0100,	7700, 2.0700	
\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\		- \					
vvitnstanding	y Voltage (Between terminal	T	ı				
Specified	Temperature	Standard					
speciπeα /alue	Compensating(Class1)	High Frequency Type	No breakdown or damage				
aluc	High Permittivity (Class2))					
		Cla	ass 1	CI	ass 2		
Test	Applied voltage	Rated v	oltage × 3	Rated v	oltage × 2.5		
Methods and	Duration			1 to 5 sec.			
	Charge/discharge current			50mA max.			
Remarks	3 . 3						
Kemarks							
	esistance	Standard					
5. Insulation Re	esistance Temperature	Standard	- 10000 MΩ	min.			
5. Insulation Re	esistance	Standard High Frequency Type					
i. Insulation Re	Temperature Compensating(Class1)	High Frequency Type	C≦0.047 µ	μ F : 10000 M Ω min.			
5. Insulation Re	esistance Temperature	High Frequency Type	C≦0.047 µ				
. Insulation Respectified	Temperature Compensating(Class1) High Permittivity (Class2) Applied voltage	High Frequency Type Note 1 : Rated voltage	C≦0.047 µ	μ F : 10000 M Ω min.			
Insulation Repecified alue	Temperature Compensating(Class1) High Permittivity (Class2)	High Frequency Type Note 1 : Rated voltage : 60±5 sec.	C≦0.047 µ	μ F : 10000 M Ω min.			

This catalog contains the typical specification only due to the limitation of space. When you consider the purchase of our products, please check our specification. For details of each product (characteristics graph, reliability information, precautions for use, and so on), see our Web site (http://www.ty-top.com/).

6. Capacitance (Tolerance)									
	Temperature Compensating(Class1)	Standard	C U U SL	0.2pF≦C≦5pF 0.2pF≦C≦10pF C>10pF	: ±0.25pF : ±0.5pF : ±5% or ±10%				
Specified Value	Compensating (Class)	High Frequency Type	СН	0.2pF≦C≦2pF C>2pF	: ±0.1pF : ±5%				
	High Permittivity (Class2)			BJ, B7, C6, C7, LD(※): ±10% or ±20%, F: +80/-20% Note: ※LD Low distortion high value multilayer ceramic capacitor					
			Cla	ss 1	Class 2				
Test	Standar		dard High Frequency Type		C≦10 <i>μ</i> F	C>10 μ F			
Nethods and	Preconditioning		None		Thermal treatment (at 150°C for 1hr) Note 2				
Remarks	Measuring frequency		1MHz	±10%	1kHz±10%	120±10Hz			
	Measuring voltage Note		0.5 to	5Vrms	1±0.2Vrms	0.5±0.1Vrms			
	Bias application				None				

7. Q or Dissipat	tion Factor							
Specified Value	Temperature S Compensating (Class1)		Standard	ondard C < 30pF : Q ≥ 400 + 20C C ≥ 30pF : Q ≥ 1000 (C:Nominal capacitance)				
	Compensating (Class I)	High Frequency Type		Refer	to detailed specification	1		
	High Permittivity (Class2) Note 1			BJ, B	7, C6, C7:2.5% max., F	:7% max.		
			Class 1			Class 2		
			Standard		High Frequency Type	C≦10 <i>μ</i> F	C>10 μ F	
	Preconditioning		None			Thermal treatment (at	150°C for 1hr) Note 2	
Test	Measuring frequency		1MHz±10%		1GHz	1kHz±10%	120±10Hz	
Methods and	Measuring voltage Note 1			0.5 to 5Vrms 1±0.2Vrms 0.5±0.1Vrms				
Remarks	Bias application			None				
	High Frequency Type							
	Measuring equipment	: HP	4291A					
	Measuring jig	: HP	16192A					

8. Temperature	Characteristic (Without vo	Itage application)						
			Tem	perature Charac	C] T	Tolerance [ppm/°C]		
			C□:	0	CG,CH, CJ, (CK	G: ±30	
		Standard					H: ±60	
	Temperature	Staridard	U□ :	- 750	UJ, UK		J: ±120	
	Compensating(Class1)						K: ±250	
			SL :	+350 to -100	00			
		High Frequency Type	Tem	perature Charac	cteristic [ppm/°	C] T	olerance [ppm/°C]	
		nigh Frequency Type	C□: 0		CH		H: ±60	
Specified				Specification	Capacitance	Reference	Temperature Range	
Value				opcomodium	change	temperatur	ure	
			BJ	В	±10%	20°C	−25 to +85°C	
				X5R	±15%	25°C	−55 to +85°C	
			B7	X7R	±15%	25°C	−55 to +125°C	
	High Permittivity (Class2))	C6	X6S	±22%	25°C	-55 to +105°C	
			C7	X7S	±22%	25°C	-55 to +125°C	
			LD(※)	X5R	±15%	25°C	−55 to +85°C	
			F	F	+30/-80%	20°C	−25 to +85°C	
				Y5V	+22/-82%	25°C	−30 to +85°C	
			Note: >	LD Low disto	ortion high value	multilayer cer	amic capacitor	

Class 1

Capacitance at 20° C and 85° C shall be measured in thermal equilibrium, and the temperature characteristic shall be calculated from the following equation.

$$\frac{(C_{85}-C_{20})}{C_{20}\times\Delta T} \times 10^{6} (ppm/^{\circ}C) \qquad \Delta T = 65$$

Test Methods and Remarks

Class 2

Capacitance at each step shall be measured in thermal equilibrium, and the temperature characteristic shall be calculated from the following equation.

Step	B,F	X5R, X7R, X6S, X7S, Y5V				
1	Minimum operating temperature					
2	20°C	25°C				
3	Maximum operating temperature					

This catalog contains the typical specification only due to the limitation of space. When you consider the purchase of our products, please check our specification. For details of each product (characteristics graph, reliability information, precautions for use, and so on), see our Web site (http://www.ty-top.com/).

 $\frac{(C-C_2)}{C_2}$ × 100 (%)

C : Capacitance in Step 1 or Step 3

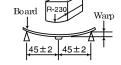
C2 : Capacitance in Step 2

9. Deflection				
	Temperature	Standard	Appearance Capacitance change	: No abnormality : Within $\pm 5\%$ or ± 0.5 pF, whichever is larger.
Specified	Compensating(Class1)	High Frequency Type	Annearance : No abnormality	,
Value	High Permittivity (Class2)	Appearance Capacitance change	: No abnormality : Within $\pm 12.5\%$ (BJ, B7, C6, C7,LD($\frac{1}{3}$)) Within $\pm 30\%$ (F)

Note: XLD Low distortion high value multilayer ceramic capacitor

Test Methods and Remarks

	Multilayer Ceramic Capacitors						
	042, 063, *105 Type	The other types					
Board	Glass epoxy-r	Glass epoxy-resin substrate					
Thickness	0.8mm	1.6mm					
Warp	1n	nm					
Duration	10 :	sec.					
*105 Type thickness, C: 0.2mm ,P: 0.3mm.							



(Unit: mm

Capacitance measurement shall be conducted with the board bent

10. Body Stren	gth		
	Temperature	Standard	
Specified Value	Compensating(Class1)	High Frequency Type	No mechanical damage.
Value	High Permittivity (Class2))	_
Test Methods and Remarks	High Frequency Type Applied force : 5N Duration : 10 sec.	Pres ← A →	R0.5 Pressing jig Chip A

11. Adhesive S	trength of Terminal Electro	des				
0	Temperature	Standard				
Specified Value	Specified Compensating (Class1) High Frequency Type		No terminal separati	No terminal separation or its indication.		
	High Permittivity (Class	2)				
		Multilayer Cerami	c Capacitors	Hooked jig		
Test		042, 063 Type 105 Type				
Methods and	Applied force	2N	5N	R=05 나를 Board		
Remarks	Duration	30±5 s	ec.			
				Chip Chip		

12. Solderability	1						
	Temperature	Standard					
Specified Compensating(Class1)	Compensating(Class1)	High Frequency Type	At least 95%	At least 95% of terminal electrode is covered by new solder.			
- Value	High Permittivity (Class2)						
T4	Eutectic s		Eutectic solder Lead-fre				
Test Methods and	Solder type	H60A or H	63A	Sn-3.0Ag-0.5Cu			
Remarks	Solder temperature	230±5°	С	245±3℃			
Remarks	Duration		4±1	sec.			

This catalog contains the typical specification only due to the limitation of space. When you consider the purchase of our products, please check our specification. For details of each product (characteristics graph, reliability information, precautions for use, and so on), see our Web site (http://www.ty-top.com/).

. Resistance	to Soldering				
Specified Value	Temperature	Standard	Capacitance change : Wit Q : Init Insulation resistance : Init	o abnormality thin ±2.5% or ±0 tial value tial value tween terminals)	2.25pF, whichever is larger. : No abnormality
	Compensating(Class1)	High Frequency Type	Capacitance change : Wit Q : Init Insulation resistance : Init	abnormality thin ±2.5% tial value tial value tween terminals)	: No abnormality
	High Permittivity(Class	2) Note 1	Capacitance change : Wit Wit Dissipation factor : Init Insulation resistance : Init	thin ±20%(F) tial value tial value tween terminals):	•
			Class 1		
		042, 063 Type	105 Ty	/pe	
	Preconditioning		None		
	Preheating	150°C, 1 to 2 min.	80 to 100°C, 2 150 to 200°C, 2		
	Solder temp.		270±5°C		
	Duration		3±0.5 sec.		
Γest ∕lethods and	Recovery	6 to 24 hrs	(Standard condition) Note 5		
Remarks			Class	2	
		042,063 Type	105, 107, 21	12 Type	316, 325 Type
	Preconditioning		Thermal treatment (at 15	50°C for 1 hr)No	te 2
	Preheating	150°C, 1 to 2 min.	80 to 100°C, 2 150 to 200°C, 2		80 to 100°C, 5 to 10 min. 150 to 200°C, 5 to 10 min.
	Solder temp.		270±5		
	Duration		3±0.5 s	sec.	
	Recovery		condition) Note 5	j	

14. Temperatur	re Cycle (Thermal Shock)							
Specified Value	Standard Temperature			Appearance Capacitance change Q Insulation resistance Withstanding voltage	: Within ± : Initial val : Initial val	: No abnormality : Within ±2.5% or ±0.25pF, whichever is larger. : Initial value : Initial value (between terminals) : No abnormality		
	Compensating (Class1)	High Frequency Type		Appearance Capacitance change Q Insulation resistance Withstanding voltage	: No abnormality : Within ±0.25pF : Initial value : Initial value (between terminals) : No abnormality			
	High Permittivity(Class2) Note 1		Appearance : No abnormality Capacitance change : Within ±7.5% (BJ, B7, C6, C7, LD(※)) Within ±20% (F) Dissipation factor : Initial value Insulation resistance : Initial value Withstanding voltage (between terminals) : No abnormality Note: ※LD Low distortion high value multilayer ceramic capacitor				
			C	Class 1	Class 2			
	Preconditioning			None		Thermal treatment (at 150°C for 1 hr) Note 2		
Test Methods and Remarks	1 cycle		Step 1 2 3 4	Minimum opera Normal te Maximum opera	rature (°C) Time (min.) rating temperature 30 ± 3 temperature 2 to 3 rating temperature 30 ± 3 temperature 2 to 3			
	Number of cycles				5 times	times		
	Recovery	6 to 24 hrs	(Stan	dard condition) Note 5		24±2 hrs (S	Standard condition)	Note 5

This catalog contains the typical specification only due to the limitation of space. When you consider the purchase of our products, please check our specification. For details of each product (characteristics graph, reliability information, precautions for use, and so on), see our Web site (http://www.ty-top.com/).

15. Humidity (Steady State)						
Specified Value	Temperature Compensating(Class1)		Appearance	: No abnormality		
			Capacitance change	: Within ±5% or ±0.5pF, whichever is larger.		
		Standard	Q	: C<10pF : Q≧200+10C		
				10≦C<30pF: Q≧275+2.5C		
				C≧30pF:Q≧350 (C:Nominal capacitance)		
			Insulation resistance	: 1000 MΩ min.		
		High Frequency Type	Appearance	: No abnormality		
			Capacitance change	: Within $\pm 0.5 pF$,		
			Insulation resistance	: 1000 M Ω min.		
	High Permittivity (Class2) Note 1		Appearance	: No abnormality		
			Capacitance change	: Within ±12.5% (BJ, B7, C6, C7, LD(**))		
				Within $\pm 30\%$ (F)		
			Dissipation factor	: 5.0% max.(BJ, B7, C6, C7, LD(※))		
				11.0% max.(F)		
			Insulation resistance	: 50 M Ω μ F or 1000 M Ω whichever is smaller.		
			Note: XLD Low distortion high value multilayer ceramic capacitor			
		Cla	ass 1	Class 2		
Test Methods and Remarks		Standard	High Frequency Typ	e All items		
	Preconditioning	None		Thermal treatment(at 150°C for 1 hr) Note 2		
	Temperature	40±2°C	60±2°C	40±2°C		
	Humidity	90 to	95%RH	90 to 95%RH		
	Duration	500+2	4/−0 hrs	500+24/-0 hrs		
	Recovery	6 to 24 hrs (Stand	ard condition)Note 5	24±2 hrs(Standard condition)Note 5		

16. Humidity Lo	pading			
Specified Value	Temperature Compensating(Class1)	Standard	Appearance Capacitance change Q Insulation resistance	: No abnormality : Within $\pm 7.5\%$ or ± 0.75 pF, whichever is larger. : C <30 pF:Q $\ge 100+10$ C/3 C ≥ 30 pF:Q ≥ 200 (C:Nominal capacitance) : 500 M Ω min.
		High Frequency Type	Appearance Capacitance change Insulation resistance	: No abnormality : C≦2pF:Within ±0.4 pF C>2pF:Within ±0.75 pF (C:Nominal capacitance) : 500 MΩ min.
	High Permittivity (Class2) Note 1		Appearance Capacitance change Dissipation factor Insulation resistance Note: ※LD Low distor	: No abnormality : Within ±12.5% (BJ, B7, C6, C7, LD(※)) Within ±30% (F) : 5.0% max. (BJ, B7, C6, C7, LD(※)) 11.0% max. (F) : 25 M Ω μ F or 500 M Ω, whichever is smaller. tion high value multilayer ceramic capacitor
		C	Capacitance change Q Insulation resistance Appearance Capacitance change Insulation resistance Appearance Capacitance change Dissipation factor Insulation resistance Note: ※LD Low distort Class 1 d High Frequency Typ None C 90 to 95%RH 500+24/-0 hrs Rated voltage 50mA max.	Class 2
	Preconditioning	Standard		Voltage treatment (Rated voltage are applied for 1 hour at 40°C) Note 3
Test	Temperature	40±2°C	60±2°C	40±2°C
Methods and	Humidity	11		90 to 95%RH
Remarks	Duration	500+24/-0 hrs		500+24/-0 hrs
	Applied voltage	Rated voltage		Rated voltage
	Charge/discharge current	50mA max.		50mA max.
	Recovery	6 to 24 hrs (Standard condition) Note 5		24±2 hrs(Standard condition) Note 5

This catalog contains the typical specification only due to the limitation of space. When you consider the purchase of our products, please check our specification. For details of each product (characteristics graph, reliability information, precautions for use, and so on), see our Web site (http://www.ty-top.com/).

17. High Tempe	erature Loading				
Specified Value	Temperature Compensating(Class1)	Standard	Appearance Capacitance change Q Insulation resistance	: $C < 10pF$: $Q \ge 200 + 10C$ $10 \le C < 30pF$: $Q \ge 275 + 2.5C$ $C \ge 30pF$: $Q \ge 350(C$: Nominal capacitance)	
		High Frequency Type	Appearance Capacitance change Insulation resistance		
	High Permittivity (Class2) Note 1		Appearance Capacitance change Dissipation factor Insulation resistance Note: %LD Low dis	Within ±30% (F): 5.0% max.(BJ, B7, C6, C7, LD(※)) 11.0% max.(F)	
		Class 1		Class 2	
		Standard H	High Frequency Type	BJ, LD(<u>*</u>), F C6 B7, C7	
	Preconditioning	None		Voltage treatment (Twice the rated voltage shall be applied for 1 hour at 85°C, 105°C or 125°C) Note 3, 4	
Test Methods and	Temperature	Maximum operating temperature		Maximum operating temperature	
	Duration	1000+48/-0 hrs		1000+48/-0 hrs	
Remarks	Applied voltage	Rated voltage × 2 Note 4		Rated voltage × 2 Note 4	
IVEIIIAIKS	Charge/discharge current	50mA max.		50mA max.	
	Recovery	6 to 24hr (Standard condition) Note 5		24±2 hrs (Standard condition) Note 5	
			Note:	: ※LD Low distortion high value multilayer ceramic capacitor	

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

- Note 2 Thermal treatment : Initial value shall be measured after test sample is heat-treated at $150 \pm 0/-10^{\circ}$ C for an hour and kept at room temperature for 24 ± 2 hours.
- Note 3 Voltage treatment: Initial value shall be measured after test sample is voltage—treated for an hour at both the temperature and voltage specified in the test conditions, and kept at room temperature for 24±2hours.
- Note 4 150% of rated voltage is applicable to some items. Please refer to their specifications for further information.
- Note 5 Standard condition: Temperature: 5 to 35°C, Relative humidity: 45 to 85 % RH, Air pressure: 86 to 106kPa When there are questions concerning measurement results, in order to provide correlation data, the test shall be conducted under the following condition.

Temperature: $20\pm2^{\circ}$ C, Relative humidity: 60 to 70 % RH, Air pressure: 86 to 106kPa Unless otherwise specified, all the tests are conducted under the "standard condition".

This catalog contains the typical specification only due to the limitation of space. When you consider the purchase of our products, please check our specification. For details of each product (characteristics graph, reliability information, precautions for use, and so on), see our Web site (http://www.ty-top.com/).