

ALTERNATION HISTORY RECORDS 变更记录

Date 日期	Version 版本	Mark 标记	Page 页码	Description 描述	Drafter 制定者	Approver 审批者
2015-09-10	A	/	8	InitialIssue(首次发行)	Doris Chang	/
2025-02-12	A-1	△	P1	Increase reel size	Doris Chang	Emily Peng

1. FEATURES

- High Voltage in a given case size.
- High reliability and stability.
- RoHS Compliant

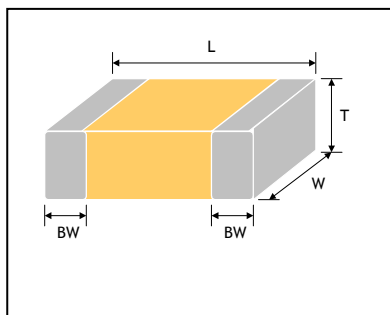
2. APPLICATIONS

- DC to DC converter.
- High voltage coupling/DC blocking.
- Back-lighting inverters.
- Sunbbers in high frequency power convertors.

3.HOW TO ORDER

<u>M</u>	<u>0805</u>	<u>B</u>	<u>102</u>	<u>K</u>	<u>101</u>	<u>B</u>	<u>D</u>
Type	Size	Dielectric	Capacitance	Tolerance	Rated voltage	Thickness	Packaging
	Inch (mm)	N:	Two significant digits followed by no. of zeros. And R is in place of decimal point.	B=±0.1pF C=±0.25pF D=±0.5pF F=±1% G=±2% J=±5% K=±10% M=±20% Z=-20/+80%	Two significant digits followed by no. of zeros. And R is in place of decimal point.	N: 0.50 ± 0.05mm A: 0.60 ± 0.10mm S: 0.80 ± 0.10mm X: 0.80 ± 0.20mm B: 0.85 ± 0.15mm C: 0.95 ± 0.10mm D: 1.25 ± 0.10mm I: 1.25 ± 0.20mm G: 1.60 ± 0.20mm K: 2.00 ± 0.20mm M: 2.50 ± 0.30mm U: 2.80 ± 0.30mm	 K=0.5kpcs/7" reel A=1kpcs/ 7"reel B=2kpcs/ 7"reel C=3kpcs/7" reel D=4kpcs/7" reel I=10kpcs/ 7"reel
	0402 (1005)	C0G(NPO)					
	0603 (1608)	B: X7R					
	0805 (2012)	Y: Y5V					
	1206 (3216)						
	1210 (3225)						
	1808 (4520)		eg.: R47=0.47pF 0R5=0.5pF 1R0=1.0pF 100=10x10 ⁰ =10pF		201= 200 VDC 251= 250 VDC 501= 500 VDC 631= 630 VDC		
	1812 (4532)						
	1825 (4563)						
	2220 (5750)						
	2225 (5763)						

4. EXTERNAL DIMENSIONS



Size	L (mm)	W (mm)	Tmax (mm)	BW min (mm)
0402 (1005)	1.00±0.05	0.50±0.05	0.55	0.15
0603 (1608)	1.60±0.15	0.80±0.15	0.95	0.20
0805 (2012)	2.00±0.20	1.25±0.20	1.45	0.30
1206 (3216)	3.20±0.20	1.60±0.20	1.80	0.30
	3.20+0.3/-0.1	1.60+0.3/0.1	1.90	
1210 (3225)	3.20±0.40	2.50±0.30	2.80	0.30
1808 (4520)	4.50±0.40	2.00±0.20	2.20	0.26
1812 (4532)	4.50±0.40	3.20±0.30	2.80	0.26
1825 (4563)	4.50±0.40	6.30±0.40	2.80	0.30
2220 (5750)	5.70±0.40	5.00±0.40	3.10	0.30
2225 (5763)	5.70±0.40	6.30±0.40	3.10	0.30

5. GENERAL ELECTRICAL DATA

Dielectric	C0G(NPO)	X7R	Y5V
Size	0402, 0603, 0805, 1206, 1210, 1808, 1812	0603, 0805, 1206, 1210, 1808, 1812, 1825, 2220, 2225	0805, 1206, 1210, 1812
Capacitance range*	0.5pF to 39.0nF	100pF to 1.0μF	10nF to 1.0μF
Capacitance tolerance	Cap≤5pF: B (±0.1pF), C (±0.25pF) 5pF<Cap<10pF: C (±0.25pF), D (±0.5pF) Cap≥10pF: F (±1%), G (±2%), J (±5%), K (±10%)	J (±5%), K (±10%), M (±20%)	Z (-20/+80%)
Rated voltage (WVDC)	100V, 200V, 250V, 500V, 630V	100V, 200V, 250V, 500V, 630V	100V, 200V, 250V
Tan δ*	Cap<30pF: Q≥400+20C Cap≥30pF: Q≥1000	≤2.5% (Apply 1.0±0.2Vrms, 1.0KHz±10%)	≤5%
Insulation resistance at Ur**	≥100GΩ or R•C≥1000 whichever is smaller	≥10GΩ or R•C≥100Ω•F whichever is smaller	
Operating temperature	-55 to +125°C		-25 to +85°C
Capacitance characteristic	±30ppm / °C	±15%	+30/-80%
Termination	Cu (or Ag)/Ni/Sn (lead-free termination)		

* Measured at the condition of 30~70% related humidity.

C0G(NPO): Apply 1.0±0.2Vrms, 1.0MHz±10% for Cap≤1000pF and 1.0±0.2Vrms, 1.0kHz±10% for Cap>1000pF, 25°C at ambient temperature

X7R: Apply 1.0±0.2Vrms, 1.0kHz±10%, at 25°C ambient temperature.

Y5V: Apply 1.0±0.2Vrms, 1.0kHz±10%, at 20°C ambient temperature.

**Measured at 500VDC for 60 sec, for UR>500VDC

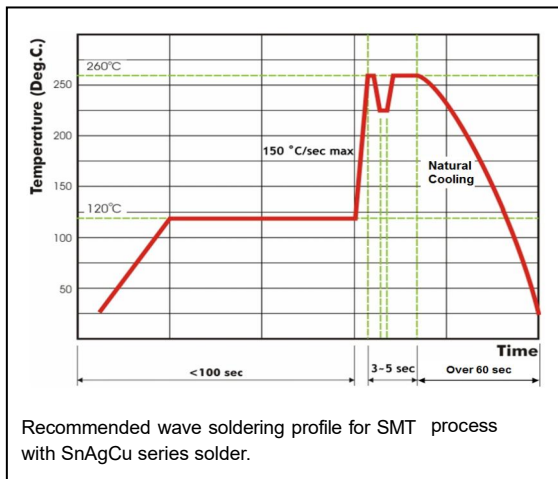
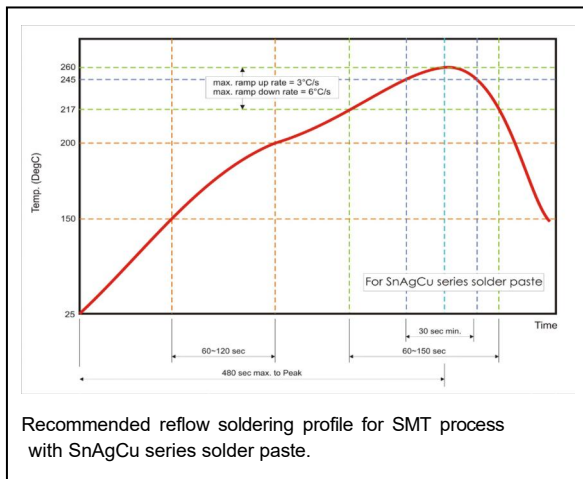
6.CAPACITANCERANGE

DIELECTRIC		NPO																					
SIZE		0402		0603		0805				1206				1210				1808		1812			
RATED VOLTAGE (VCD)		200	250	200	250	200	250	500	630	200	250	500	630	200	250	500	630	500	630	200	250	500	630
Capacitance	0.5pF(0R5)	N	N	S	S	A	A	A	A														
	1.0pF(1R0)	N	N	S	S	A	A	A	A														
	1.2pF (1R2)	N	N	S	S	A	A	A	A														
	1.5pF (1R5)	N	N	S	S	A	A	A	A	B	B	B	B										
	1.8pF (1R8)	N	N	S	S	A	A	A	A	B	B	B	B					D	D				
	2.2pF (2R2)	N	N	S	S	A	A	A	A	B	B	B	B					D	D				
	2.7pF (2R7)	N	N	S	S	A	A	A	A	B	B	B	B					D	D				
	3.3pF (3R3)	N	N	S	S	A	A	A	A	B	B	B	B					D	D				
	3.9pF (3R9)	N	N	S	S	A	A	A	A	B	B	B	B					D	D				
	4.7pF (4R7)	N	N	S	S	A	A	A	A	B	B	B	B					D	D				
	5.6pF (5R6)	N	N	S	S	A	A	A	A	B	B	B	B					D	D				
	6.8pF (6R8)	N	N	S	S	A	A	A	A	B	B	B	B					D	D				
	8.2pF (8R2)	N	N	S	S	A	A	A	A	B	B	B	B					D	D				
	10pF (100)	N	N	S	S	A	A	A	A	B	B	B	B	C	C	C	C	D	D	D	D	D	D
	12pF (120)	N	N	S	S	A	A	A	A	B	B	B	B	C	C	C	C	D	D	D	D	D	D
	15pF (150)	N	N	S	S	A	A	A	A	B	B	B	B	C	C	C	C	D	D	D	D	D	D
	18pF (180)	N	N	S	S	A	A	A	A	B	B	B	B	C	C	C	C	D	D	D	D	D	D
	20pF (200)	N	N	S	S	A	A	A	A	B	B	B	B	C	C	C	C	D	D	D	D	D	D
	22pF (220)	N	N	S	S	A	A	A	A	B	B	B	B	C	C	C	C	D	D	D	D	D	D
	27pF (270)	N	N	S	S	A	A	A	A	B	B	B	B	C	C	C	C	D	D	D	D	D	D
	33pF (330)	N	N	S	S	A	A	A	A	B	B	B	B	C	C	C	C	D	D	D	D	D	D
	39pF (390)	N	N	S	S	A	A	A	A	B	B	B	B	C	C	C	C	D	D	D	D	D	D
	47pF (470)	N	N	S	S	A	A	A	A	B	B	B	B	C	C	C	C	D	D	D	D	D	D
	56pF (560)	N	N	S	S	A	A	A	A	B	B	B	B	C	C	C	C	D	D	D	D	D	D
	68pF (680)	N		S	S	A	A	A	A	B	B	B	B	C	C	C	C	D	D	D	D	D	D
	82pF (820)	N		S	S	A	A	A	A	B	B	B	B	C	C	C	C	D	D	D	D	D	D
	100pF (101)	N		S	S	A	A	A	A	B	B	B	B	C	C	C	C	D	D	D	D	D	D
	120pF (121)			S	S	A	B	D	D	B	B	B	B	C	C	C	C	D	D	D	D	D	D
	150pF (151)			S	S	B	D	D	D	B	B	B	B	C	C	C	C	D	D	D	D	D	D
	180pF (181)			S	S	B	D	D	D	B	B	B	B	C	C	C	C	D	D	D	D	D	D
	220pF (221)			S	S	D	D	D	D	B	B	B	B	C	C	C	C	D	D	D	D	D	D
	270pF (271)			X	X	D	D	D	D	B	C	C	C	C	C	C	C	K	K	D	D	D	D
	330pF (331)			X	X	D	D	D	D	B	C	C	C	C	C	C	C	K	K	D	D	D	D
	390pF (391)			X	X	D	D	D	D	B	C	C	C	C	C	C	C	K	K	D	D	D	D
	470pF (471)			X	X	D	D	I	I	C	C	C	C	C	C	C	C	K	K	D	D	D	D
	560pF (561)			X	X	D	D	I	I	C	C	C	C	C	C	C	C	K	K	D	D	D	D
	680pF (681)					D	D	I	I	C	D	D	D	C	C	C	C	K	K	D	D	D	D
	820pF (821)					D	D	I	I	C	D	D	D	C	C	C	C	K	K	D	D	D	D
	1,000pF(102)					D	D	I	I	C	G	G	G	D	D	D	D	K	K	D	D	D	D
	1,200pF (122)					D	D			C	G	G	G	D	D	D	D	K	K	D	D	D	D
	1,500pF (152)					D	D			D	G	G	G	D	D	D	D	K	K	D	D	D	D
	1,800pF (182)					D	D			D	G	G	G	D	D	D	D	K	K	D	D	D	D
	2,200pF (222)					D	D			D	G	G	G	D	D	D	D	K	K	D	D	D	D
	2,700pF (272)									D	G			D	D	D	D			D	D	D	D
	3,300pF (332)									D	G			D	D	D	D			D	D	D	D
	3,900pF (392)									D	G			D	D	D	D			D	D	D	D
	4,700pF (472)									D	G			G	G					D	D	D	D
	5,600pF (562)													G	G					D	D	D	D
	6,800pF (682)													G	G					D	D	D	D
	8,200pF (822)													G	G							D	D
	0.010μF (103)													G	G							D	D
	0.022μF (223)													M	M							K	K
	0.033μF (333)													M	M							M	M

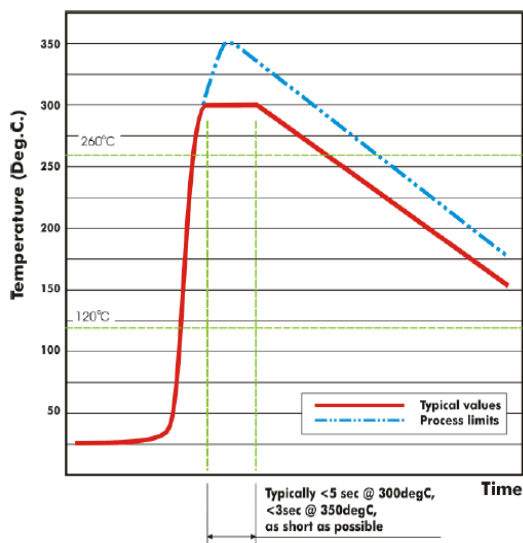
DIELECTRIC		X7R																							
SIZE		0603		0805				1206						1210						1808		1812			
RATED VOLTAGE		200	250	200	250	500	630	200	250	400	450	500	630	200	250	400	450	500	630	500	630	200	250	500	630
Capacitance	100pF (101)	X	X	B	B	B	B	D	D			D	D	D	D			D	D						
	120pF (121)	X	X	B	B	B	B	D	D			D	D	D	D			D	D						
	150pF (151)	X	X	B	B	B	B	D	D			D	D	D	D			D	D	D	D				
	180pF (181)	X	X	B	B	B	B	D	D			D	D	D	D			D	D	D	D				
	220pF (221)	X	X	B	B	B	B	D	D			D	D	D	D			D	D	D	D				
	270pF (271)	X	X	B	B	B	B	D	D			D	D	D	D			D	D	D	D				
	330pF (331)	X	X	B	B	B	B	D	D			D	D	D	D			D	D	D	D				
	390pF (391)	X	X	B	B	B	B	D	D			D	D	D	D			D	D	D	D				
	470pF (471)	X	X	B	B	B	B	D	D			D	D	D	D			D	D	D	D				
	560pF (561)	X	X	B	B	B	B	D	D			D	D	D	D			D	D	D	D				
	680pF (681)	X	X	B	B	B	B	D	D			D	D	C	C			D	D	D	D				
	820pF (821)	X	X	B	B	B	B	D	D			D	D	C	C			D	D	D	D				
	1,000pF (102)	X	X	B	B	B	B	D	D			D	D	C	C			D	D	D	D	D	D	D	D
	1,200pF (122)	X	X	B	B	B	B	D	D			D	D	C	C			D	D	D	D	D	D	D	D
	1,500pF (152)	X	X	B	B	B	B	D	D			D	D	C	C			D	D	D	D	D	D	D	D
	1,800pF (182)	X	X	B	B	B	B	D	D			D	D	C	C			D	D	D	D	D	D	D	D
	2,200pF (222)	X	X	B	B	B	B	D	D			D	D	C	C			D	D	D	D	D	D	D	D
	2,700pF (272)	X	X	B	B	B	B	D	D			D	D	C	C			D	D	D	D	D	D	D	D
	3,300pF (332)	X	X	B	B	B	B	D	D			D	D	C	C			D	D	D	D	D	D	D	D
	3,900pF (392)	X	X	B	B	B	B	D	D			D	D	C	C			D	D	D	D	D	D	D	D
	4,700pF (472)	X	X	B	B	D	D	D	D			D/B	D	C	C			D	D	D	D	D	D	D	D
	5,600pF (562)	X	X	D	D	D	D	D	D			D	D	C	C			D	D	K	K	D	D	D	D
	6,800pF (682)	X	X	D	D	D	D	D	D			D	D	C	C			D	D	K	K	D	D	D	D
	8,200pF (822)	X	X	D	D	D	D	D	D			D	D	C	C			D	D	K	K	D	D	D	D
	0.010μF (103)	X	X	D	D	D	D	D	B/D			D	D	C	C			D	D	K	K	D	D	D	D
	0.012μF (123)			D	D	D	D	D	D			D	D	C	C			D	D	K	K	D	D	D	D
	0.015μF (153)			D	D	D	D	D	D			D	D	C	C			D	D	K	K	D	D	D	D
	0.018μF (183)			D	D	D	D	D	D			D	D	C	C			D	D	K	K	D	D	D	D
	0.022μF (223)			D	D	D	D	D	D			G	G	C	C			D	D	K	K	D	D	D	D
	0.027μF (273)			D	D			D	D			G	G	C	C			G	G	K	K	D	D	D	D
	0.033μF (333)			D	D			G	G			G	G	C	C			G	G	K	K	D	D	D	D
	0.039μF (393)			D	D			G	G			G	G	C	C			G	G	K	K	D	D	D	D
	0.047μF (473)			D	D			G	G			G	G	D	D			G	G	K	K	D	D	D	D
	0.056μF (563)			D	D			G	G			G	G	D	D			G	G	K	K	D	D	K	K
	0.068μF (683)			D	D			G	G	G	G			G	G			K	K	K	K	D	D	K	K
	0.082μF (823)			D				G	G	G	G			G	G			K	K	K	K	D	D	K	K
	0.10μF (104)			D				G	G	G	G			G	G			K	K			D	D	K	K
	0.12μF (124)							G	G					G	G	M	M	M	M			D	D	M	M
	0.15μF (154)							G	G					M	M	M	M	M	M			K	K	M	M
	0.18μF (184)							G	G					M	M	M	M					K	K	M	M
0.22μF (224)							G	G					M	M	M	M					K	K	M	M	
0.27μF (274)													M	M	M	M					K	K	M		
0.33μF (334)													M	M	M	M					K	K	M		
0.39μF (394)													M	M							K	K	M		
0.47μF (474)													M	M							K	K	M		
0.56μF (564)													M	M							M	M			
0.68μF (684)													M	M							M	M			
0.84μF (844)																					M	M			
1.0μF (105)																					M	M			

7. Recommended soldering conditions

The lead-free termination MLCCs are not only to be used on SMT against lead-free solder paste, but also suitable against lead-containing solder paste. If the optimized solder joint is requested, increasing soldering time, temperature and concentration of N₂ within oven are recommended.



Manual soldering (solder iron)

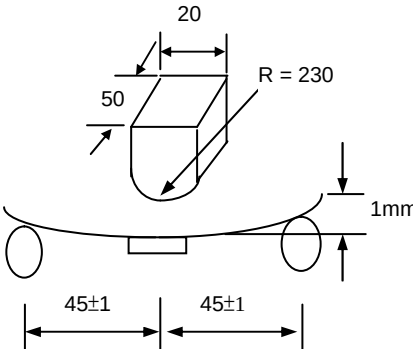
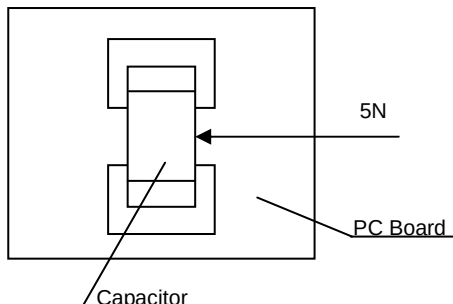


8.RELIABILITY TEST CONDITIONS AND REQUIREMENTS

No.	Item	Test Condition	Requirements																
1.	Visual and Dimensions	---	* No remarkable defect. * Dimensions to confirm to individual specification sheet.																
2.	Capacitance	Class I: C0G(NP0)	* Shall not exceed the limits given in the detailed spec.																
3.	Q/ D.F. (Dissipation Factor)	Cap≤1000pF, 1.0±0.2Vrms, 1MHz±10% Cap>1000pF, 1.0±0.2Vrms, 1KHz±10% Class II: (X7R, Y5V) 1.0±0.2Vrms, 1kHz±10%	C0G(NPO): Cap≥30pF, Q≥1000; Cap<30pF, Q≥400+20C X7R: ≤2.5% Y5V: ≤5.0%																
4.	Temperature Coefficient	With no electrical load. <table><tr><th>T.C.</th><th>Operating Temp</th></tr><tr><td>C0G(NPO)</td><td>-55~125°C at 25°C</td></tr><tr><td>X7R</td><td>-55~125°C at 25°C</td></tr><tr><td>Y5V</td><td>-25~85°C at 20°C</td></tr></table>	T.C.	Operating Temp	C0G(NPO)	-55~125°C at 25°C	X7R	-55~125°C at 25°C	Y5V	-25~85°C at 20°C	<table><tr><th>T.C.</th><th>Capacitance Change</th></tr><tr><td>C0G(NPO)</td><td>Within ±30ppm/°C</td></tr><tr><td>X7R</td><td>Within ±15%</td></tr><tr><td>Y5V</td><td>Within +30%/-80%</td></tr></table>	T.C.	Capacitance Change	C0G(NPO)	Within ±30ppm/°C	X7R	Within ±15%	Y5V	Within +30%/-80%
T.C.	Operating Temp																		
C0G(NPO)	-55~125°C at 25°C																		
X7R	-55~125°C at 25°C																		
Y5V	-25~85°C at 20°C																		
T.C.	Capacitance Change																		
C0G(NPO)	Within ±30ppm/°C																		
X7R	Within ±15%																		
Y5V	Within +30%/-80%																		
5.	Insulation Resistance	UR=100V: To apply voltage at UR for max. 120 sec. UR>100V: To apply voltage at UR (500V max.) for 60 sec.	≥10GΩ or RxC≥100Ω-F whichever is smaller.																
6.	Dielectric Strength	* To apply voltage: 100V =2.5 times of UR 200V/250V =2 times of UR 500V/630V =1.5 times of UR * Duration: 1 to 5 sec.	* No evidence of damage or flashover during test.																
7.	Solderability	* Solder temperature: 235±5°C * Dipping time: 2±0.5 sec.	95% min. coverage of all metalized area.																
8.	Resistance to Soldering Heat	* Solder temperature: 260±5°C * Dipping time: 10±1 sec * Preheating: 120 to 150°C for 1 minute before immerse the capacitor in a eutectic solder. * Before initial measurement (Class II only): Perform 150+0/-10°C for 1 hr and then set for 48±4 hrs at room temp. * Measurement to be made after keeping at room temp. for 24±2 hrs (Class I) or 48±4 hrs (Class II).	* No remarkable damage. * Cap change: C0G(NPO): within ±2.5% or ±0.25pF whichever is larger. X7R: within ±7.5% Y5V: within ±20% * Q/D.F.: C0G(NPO) / X7R / Y5V : ≤ 1.0 × Initial requirement * 25% max. leaching on each edge.																
9.	Temperature Cycle	* Conduct the five cycles according to the temperatures and time. <table><tr><th>Step</th><th>Temp. (°C)</th><th>Time (min.)</th></tr><tr><td>1</td><td>Min. operating temp. +0/-3</td><td>30±3</td></tr><tr><td>2</td><td>Room temp.</td><td>2~3</td></tr><tr><td>3</td><td>Max. operating temp. +3/-0</td><td>30±3</td></tr><tr><td>4</td><td>Room temp.</td><td>2~3</td></tr></table> * Before initial measurement (Class II only): Perform 150+0/-10°C for 1 hr and then set for 48±4 hrs at room temp. * Measurement to be made after keeping at room temp. for 24±2 hrs (Class I) or 48±4 hrs (Class II).	Step	Temp. (°C)	Time (min.)	1	Min. operating temp. +0/-3	30±3	2	Room temp.	2~3	3	Max. operating temp. +3/-0	30±3	4	Room temp.	2~3	* No remarkable damage. * Cap change : C0G(NPO): within ±2.5% or ±0.25pF whichever is larger. X7R: within ±7.5% Y5V: within ±20% * Q/D.F.: C0G(NPO) / X7R / Y5V : ≤ 1.0 × Initial requirement * I.R. ≥ 0.25 × initial requirements.	
Step	Temp. (°C)	Time (min.)																	
1	Min. operating temp. +0/-3	30±3																	
2	Room temp.	2~3																	
3	Max. operating temp. +3/-0	30±3																	
4	Room temp.	2~3																	
10.	Humidity (Damp Heat) Load	* Test temp.: 40±2°C * Humidity: 90~95%RH * Test time: 500+24/-0 hrs. * To apply voltage : rated voltage (Max. 500V) * Measurement to be made after keeping at room temp. for 24±2 hrs. (Class I) or 48±4 hrs. (Class II).	* No remarkable damage. * Cap change: NP0: within ±7.5% or ±0.75pF whichever is larger. X7R: within ±12.5% Y5V: within ±30% * Q/D.F. value: NP0: Cap≥30pF, Q≥200; Cap<30pF, Q≥100+10/3C X7R: ≤3.0% Y5V: ≤7.5% * I.R.: ≥500MΩ or RxC≥25Ω-F whichever is smaller.																

8. RELIABILITY TEST CONDITIONS AND REQUIREMENTS

No.	Item	Test Condition	Requirements																
1.	Visual and Dimensions	---	* No remarkable defect. * Dimensions to confirm to individual specification sheet.																
2.	Capacitance	Class I: C0G(NP0)	* Shall not exceed the limits given in the detailed spec.																
3.	Q/ D.F. (Dissipation Factor)	Cap≤1000pF, 1.0±0.2Vrms, 1MHz±10% Cap>1000pF, 1.0±0.2Vrms, 1KHz±10% Class II: (X7R, Y5V) 1.0±0.2Vrms, 1kHz±10%	C0G(NP0): Cap≥30pF, Q≥1000; Cap<30pF, Q≥400+20C X7R: ≤2.5% Y5V: ≤5.0%																
4.	Temperature Coefficient	With no electrical load. <table><tr><th>T.C.</th><th>Operating Temp</th></tr><tr><td>C0G(NPO)</td><td>-55~125°C at 25°C</td></tr><tr><td>X7R</td><td>-55~125°C at 25°C</td></tr><tr><td>Y5V</td><td>-25~85°C at 20°C</td></tr></table>	T.C.	Operating Temp	C0G(NPO)	-55~125°C at 25°C	X7R	-55~125°C at 25°C	Y5V	-25~85°C at 20°C	<table><tr><th>T.C.</th><th>Capacitance Change</th></tr><tr><td>C0G(NPO)</td><td>Within ±30ppm/°C</td></tr><tr><td>X7R</td><td>Within ±15%</td></tr><tr><td>Y5V</td><td>Within +30%/-80%</td></tr></table>	T.C.	Capacitance Change	C0G(NPO)	Within ±30ppm/°C	X7R	Within ±15%	Y5V	Within +30%/-80%
T.C.	Operating Temp																		
C0G(NPO)	-55~125°C at 25°C																		
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T.C.	Capacitance Change																		
C0G(NPO)	Within ±30ppm/°C																		
X7R	Within ±15%																		
Y5V	Within +30%/-80%																		
5.	Insulation Resistance	U _R =100V: To apply voltage at U _R for max. 120 sec. U _R >100V: To apply voltage at U _R (500V max.) for 60 sec.	≥10GΩ or RxC≥100Ω-F whichever is smaller.																
6.	Dielectric Strength	* To apply voltage: 100V =2.5 times of U _R 200V/250V =2 times of U _R 500V/630V =1.5 times of U _R * Duration: 1 to 5 sec.	* No evidence of damage or flashover during test.																
7.	Solderability	* Solder temperature: 235±5°C * Dipping time: 2±0.5 sec.	95% min. coverage of all metalized area.																
8.	Resistance to Soldering Heat	* Solder temperature: 260±5°C * Dipping time: 10±1 sec * Preheating: 120 to 150°C for 1 minute before immerse the capacitor in a eutectic solder. * Before initial measurement (Class II only): Perform 150+0/-10°C for 1 hr and then set for 48±4 hrs at room temp. * Measurement to be made after keeping at room temp. for 24±2 hrs (Class I) or 48±4 hrs (Class II).	* No remarkable damage. * Cap change: C0G(NP0): within ±2.5% or ±0.25pF whichever is larger. X7R: within ±7.5% Y5V: within ±20% * Q/D.F.: C0G(NP0) / X7R / Y5V : ≤ 1.0 × Initial requirement * 25% max. leaching on each edge.																
9.	Temperature Cycle	* Conduct the five cycles according to the temperatures and time. <table><tr><th>Step</th><th>Temp. (°C)</th><th>Time (min.)</th></tr><tr><td>1</td><td>Min. operating temp. +0/-3</td><td>30±3</td></tr><tr><td>2</td><td>Room temp.</td><td>2~3</td></tr><tr><td>3</td><td>Max. operating temp. +3/-0</td><td>30±3</td></tr><tr><td>4</td><td>Room temp.</td><td>2~3</td></tr></table> * Before initial measurement (Class II only): Perform 150+0/-10°C for 1 hr and then set for 48±4 hrs at room temp. * Measurement to be made after keeping at room temp. for 24±2 hrs (Class I) or 48±4 hrs (Class II).	Step	Temp. (°C)	Time (min.)	1	Min. operating temp. +0/-3	30±3	2	Room temp.	2~3	3	Max. operating temp. +3/-0	30±3	4	Room temp.	2~3	* No remarkable damage. * Cap change : C0G(NP0): within ±2.5% or ±0.25pF whichever is larger. X7R: within ±7.5% Y5V: within ±20% * Q/D.F.: C0G(NP0) / X7R / Y5V : ≤ 1.0 × Initial requirement * I.R. ≥ 0.25 × initial requirements.	
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10.	Humidity (Damp Heat) Load	* Test temp.: 40±2°C * Humidity: 90~95%RH * Test time: 500+24/-0 hrs. * To apply voltage : rated voltage (Max. 500V) * Measurement to be made after keeping at room temp. for 24±2 hrs. (Class I) or 48±4 hrs. (Class II).	* No remarkable damage. * Cap change: NP0: within ±7.5% or ±0.75pF whichever is larger. X7R: within ±12.5% Y5V: within ±30% * Q/D.F. value: NP0: Cap≥30pF, Q≥200; Cap<30pF, Q≥100+10/3C X7R: ≤3.0% Y5V: ≤7.5% * I.R.: ≥500MΩ or RxC≥25Ω-F whichever is smaller.																

No.	Item	Test Condition	Requirements																				
11.	High Temperature Load (Endurance)	* Test temp.: C0G(NPO), X7R: 125±3°C Y5V: 85±3°C * To apply voltage: (1) $U_R \leq 250V$: 200% of rated voltage. Exception item: <table><thead><tr><th>U_R</th><th>Size</th><th>Cap</th><th>Voltage</th></tr></thead><tbody><tr><td rowspan="3">100V</td><td>0805</td><td>≥ 124</td><td rowspan="6">1.5 times of U_R</td></tr><tr><td>1206</td><td rowspan="2">≥ 105</td></tr><tr><td>1210</td></tr><tr><td rowspan="5">200V and 250V</td><td>1210</td><td>> 224</td></tr><tr><td>1812</td><td>> 474</td></tr><tr><td>1825</td><td rowspan="3">≥ 105</td></tr><tr><td>2220</td></tr><tr><td>2225</td></tr></tbody></table> (2) $250 < U_R \leq 500V$: 150% of rated voltage. (3) $U_R > 500V$: 120% of rated voltage. (4) 1206, NPO $\geq 1.5pF$: 100% of rated voltage. * Test time: 1000+24/-0 hrs. * Measurement to be made after keeping at room temp. for 24±2 hrs (Class I) or 48±4 hrs (Class II).	U_R	Size	Cap	Voltage	100V	0805	≥ 124	1.5 times of U_R	1206	≥ 105	1210	200V and 250V	1210	> 224	1812	> 474	1825	≥ 105	2220	2225	* No remarkable damage. * Cap change: C0G(NPO) : within $\pm 3\%$ or $\pm 0.3pF$ whichever is larger X7R : within $\pm 12.5\%$ Y5V : within $\pm 30\%$ * Q/D.F Value: C0G(NPO): Cap$\geq 30pF$: Q≥ 350; 10pF$\leq$Cap$< 30pF$: Q$\geq 275+2.5C$; Cap$< 10pF$: Q$\geq 200+10C$ X7R: $\leq 3.0\%$ Y5V: $\leq 7.5\%$ * I.R.: $\geq 1G\Omega$ or Rx$\geq 50\Omega \cdot F$ whichever is smaller.
U_R	Size	Cap	Voltage																				
100V	0805	≥ 124	1.5 times of U_R																				
	1206	≥ 105																					
	1210																						
200V and 250V	1210	> 224																					
	1812	> 474																					
	1825	≥ 105																					
	2220																						
	2225																						
12.	Resistance to Flexure of Substrate	* The middle part of substrate shall be pressurized by means of the pressurizing rod at a rate of about 1mm per second until the deflection becomes 1mm. 	* No remarkable damage. * Cap change: C0G(NPO): within $\pm 5.0\%$ or $\pm 0.5pF$ whichever is larger. X7R: within $\pm 12.5\%$ Y5V: within $\pm 30\%$ (This capacitance change means the change of capacitance under specified flexure of substrate from the capacitance measured before the test.)																				
13.	Adhesive Strength of Termination	* Capacitors mounted on a substrate. A force of 5N(≤ 0603) or 10N(> 0603) applied perpendicular to the place of substrate and parallel the line joining the center of terminations for 10±1 second. 	* No remarkable damage or removal of the terminations.																				
14.	Vibration Resistance	* Vibration frequency: 10~55 Hz/min. * Total amplitude: 1.5mm * Test time: 6 hrs. (Two hrs each in three mutually perpendicular directions.)	* No remarkable damage. * Cap change and Q/D.F.: To meet initial spec.																				

9. PACKAGING DIMENSION AND QUANTITY

Size	Thickness/Symbol (mm)		Paper tape		Plastic tape	
			7" reel	13" reel	7" reel	13" reel
0402	0.50±0.05	N	10k	50k	-	-
0603	0.80±0.10	S	4k	15k	-	-
	0.80±0.20	X	4k	15k	-	-
0805	0.60±0.10	A	4k	15k	-	-
	0.85±0.15	B	4k	15k	-	-
	1.25±0.10	D	-	-	3k	10k
	1.25±0.20	I	-	-	3k	10k
	0.85±0.15	B	4k	15k	-	-
1206	0.95±0.10	C	-	-	3k	10k
	1.25±0.10	D	-	-	3k	10k
	1.60±0.20	G	-	-	2k	10k
	1.60±0.30/-0.10	P	-	-	2k	9k
	0.95±0.10	C	-	-	3k	10k
1210	1.25±0.10	D	-	-	3k	10k
	1.60±0.20	G	-	-	2k	-
	2.00±0.20	K	-	-	1k	6k
	2.50±0.30	M	-	-	1k	6k
	1.25±0.10	D	-	-	2k	10k
1808	1.60±0.20	G	-	-	2k	8k
	2.00±0.20	K	-	-	1k	6k
	1.25±0.10	D	-	-	1k	5k
1812	1.60±0.20	G	-	-	1k	-
	2.00±0.20	K	-	-	1k	-
	2.50±0.30	M	-	-	0.5k	3k
	1.25±0.10	D	-	-	1k	5k

Unit: pieces

APPENDIXES

Tape & reel dimensions

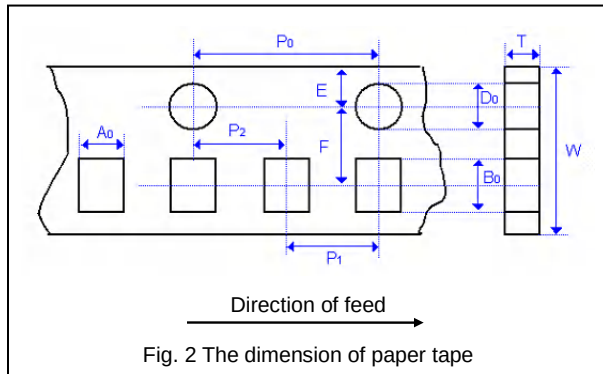


Fig. 2 The dimension of paper tape

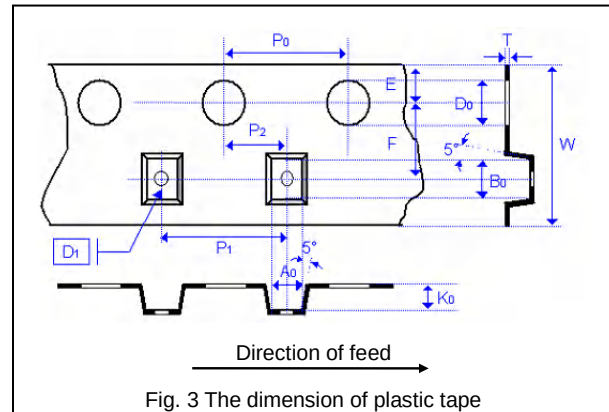


Fig. 3 The dimension of plastic tape

Size	0201	0402	0603	0805			1206			1210				1808		1812		
Thickness	L	N,E	S,H,X	A,H	B,T	D,I	B,T	C,J,D	G,P	T	C,D	G,K	M	D,F	G,K	D,F	G,K	M,U
A ₀	0.40 +/-0.10	0.70 +/-0.20	1.05 +/-0.30	1.50 +/-0.20	1.50 +/-0.20	< 1.80	1.90 +/-0.50	< 2.00	<2.30	< 3.05	< 3.05	< 3.05	< 3.20	< 2.50	< 2.50	< 3.90	< 3.90	< 3.90
B ₀	0.70 +/-0.10	1.20 +/-0.20	1.80 +/-0.30	2.30 +/-0.20	2.30 +/-0.20	< 2.70	3.50 +/-0.50	< 3.70	< 4.00	< 3.80	< 3.80	< 3.80	<4.00	< 5.30	< 5.30	< 5.30	< 5.30	< 5.30
T	≤0.55	≤0.80	≤1.20	≤1.15	≤1.20	0.23 +/-0.1	≤1.20	0.23 +/-0.1	0.23 +/-0.1	0.23 +/-0.1	0.23 +/-0.1	0.23 +/-0.1	0.23 +/-0.1	0.25 +/-0.1	0.25 +/-0.1	0.25 +/-0.1	0.25 +/-0.1	0.25 +/-0.1
K ₀	0.44 +/-0.05	-	-	-	-	< 2.50	-	< 2.50	< 2.50	< 1.50	< 2.00	< 2.50	< 3.20	< 2.50	< 2.50	< 2.50	< 2.50	< 3.50
W	8.00 +/-0.30	8.00 +/-0.30	8.00 +/-0.30	8.00 +/-0.30	8.00 +/-0.30	8.00 +/-0.30	8.00 +/-0.30	8.00 +/-0.30	8.00 +/-0.30	8.00 +/-0.30	8.00 +/-0.30	8.00 +/-0.30	8.00 +/-0.30	12.00 +/-0.30	12.00 +/-0.30	12.00 +/-0.30	12.00 +/-0.30	12.00 +/-0.30
P ₀	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10
10xP ₀	40.00 +/-0.10	40.00 +/-0.10	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20
P ₁	2.00 +/-0.05	2.00 +/-0.05	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10
P ₂	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.10	2.00 +/-0.10	2.00 +/-0.10	2.00 +/-0.10	2.00 +/-0.10
D ₀	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0
D ₁	-	-	-	-	-	1.00 +/-0.10	-	1.00 +/-0.10	1.00 +/-0.10	1.00 +/-0.10	1.00 +/-0.10	1.00 +/-0.10	1.00 +/-0.10	1.50 +/-0.10	1.50 +/-0.10	1.50 +/-0.10	1.50 +/-0.10	1.50 +/-0.10
E	1.75 +/-0.10	1.75 +/-0.10	1.75 +/-0.10	1.75 +/-0.10	1.75 +/-0.10	1.75 +/-0.10	1.75 +/-0.10	1.75 +/-0.10	1.75 +/-0.10	1.75 +/-0.10	1.75 +/-0.10	1.75 +/-0.10	1.75 +/-0.10	1.75 +/-0.10	1.75 +/-0.10	1.75 +/-0.10	1.75 +/-0.10	1.75 +/-0.10
F	3.50 +/-0.05	3.50 +/-0.05	3.50 +/-0.05	3.50 +/-0.05	3.50 +/-0.05	3.50 +/-0.05	3.50 +/-0.05	3.50 +/-0.05	3.50 +/-0.05	3.50 +/-0.05	3.50 +/-0.05	3.50 +/-0.05	3.50 +/-0.05	5.50 +/-0.10	5.50 +/-0.10	5.50 +/-0.10	5.50 +/-0.10	5.50 +/-0.10

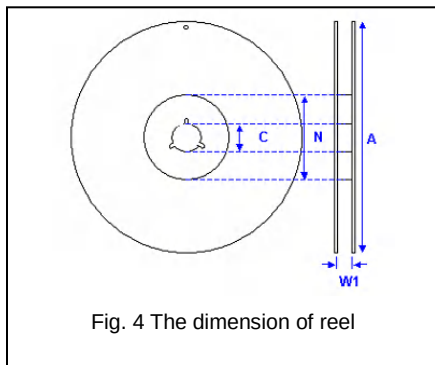
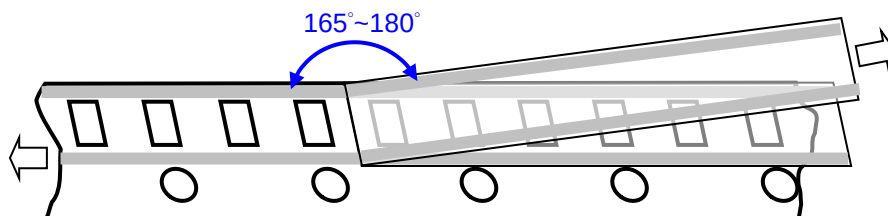


Fig. 4 The dimension of reel

Size	0402, 0603, 0805, 1206, 1210			1808, 1812
Reel size	7"	10"	13"	7"
C	13.0±0.5	13.0±0.5	13.0±0.5	13.0±0.5
W ₁	10.0±1.5	10.0±1.5	10.0±1.5	12.4±2.0/-0
A	178.0±2.0	250.0±2.0	330.0±2.0	178.0±2.0
N	60.0±1.0/-0	50 min	50 min	60.0±1.0/-0

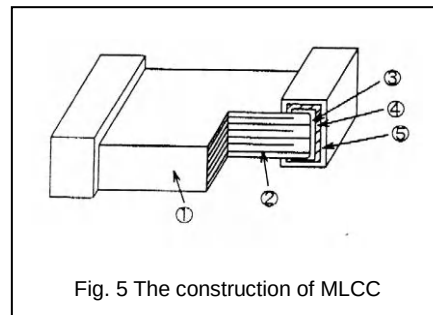
Peeling force (EIA-481)

Peel-off force should be in the range of 10 grams to 100 grams at a peel-off speed of 300±10 mm/min.



Constructions

No.	Name	NPO	X7R
①	Ceramic material	CaZrO ₃ based	BaTiO ₃ based
②	Inner electrode	Ni	
③	Termination	Inner layer	Cu
④		Middle layer	Ni
⑤		Outer layer	Sn



Storage and handling conditions

- (1) To store products at 5 to 40°C ambient temperature and 20 to 70% related humidity conditions; MSL Level 1.
- (2) The product is recommended to be used within one year after shipment. Check solderability in case of shelf life extension is needed.

Cautions:

- a. The corrosive gas reacts on the terminal electrodes of capacitors, and results in the poor solderability. Do not store the capacitors in the ambience of corrosive gas (e.g., hydrogen sulfide, sulfur dioxide, chlorine, ammonia gas etc.)
- b. In corrosive atmosphere, solderability might be degraded, and silver migration might occur to cause low reliability.
- c. Due to the dewing by rapid humidity change, or the photochemical change of the terminal electrode by direct sunlight, the solderability and electrical performance may deteriorate. Do not store capacitors under direct sunlight or dewing condition. To store products on the shelf and avoid exposure to moisture.