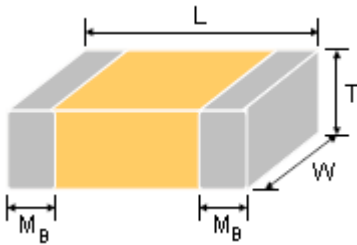


Ceramic Capacitors

Middle and High Voltage



Features:

- High voltage in a given case size
- High stability and reliability

Applications:

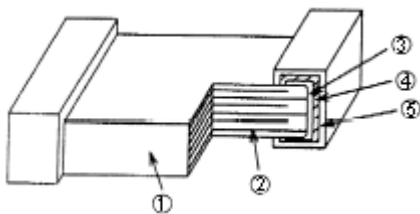
- Snubbers in high frequency power converters
- High voltage coupling / DC blocking
- DC-DC converters
- Back-lighting inverters

External Dimensions

Size Inch (mm)	L (mm)	W (mm)	T (mm) / Symbol		Remarks	M _B (mm)
0603 (1608)	1.6 ±0.1	0.8 ±0.1	0.8 ±0.07	S	-	0.4 ±0.15
0805 (2012)	2 ±0.15	1.25 ±0.1	0.6 ±0.1	A	-	0.5 ±0.2
			0.8 ±0.1	B	-	
			1.25 ±0.1	D	#	
1206 (3216)	3.2 ±0.15	1.6 ±0.15	0.8 ±0.1	B	-	0.6 ±0.2
			0.95 ±0.1	C	-	
			1.25 ±0.1	D	#	
	3.2 ±0.2	1.6 ±0.2	1.6 ±0.2	G	#	
1210 (3225)	3.2 ±0.3	2.5 ±0.2	0.95 ±0.1	C	#	0.75 ±0.25
			1.25 ±0.1	D	#	
	3.2 ±0.4	2.5 ±0.3	1.6 ±0.2	G	#	
			2.5 ±0.3	M	#	
1812 (4532)	4.5 + 0.5 / -0.3	3.2 ±0.3	1.25 ±0.1	D	#	0.5 ±0.25
			1.6 ±0.2	G	#	
			2 ±0.2	K	#	

Reflow soldering only is recommended

Constructions



No.	Name	NP0, X7R*	NP0, X7R
1	Ceramic material	BaTiO ₃ based	
2	Inner electrode	AgPd alloy	Ni
3	Termination	Inner layer	Cu
4		Middle layer	Ni
5		Outer layer	Sn

* Partial NP0;X7R items are with Ag/Ni/Sn terminations, please refer to product range of NP0;X7R dielectric for detail

Ceramic Capacitors



Middle and High Voltage

General Electrical Data

Dielectric	NPO	X7R
Size	0603, 0805, 1206, 1210, 1812	
Capacitance*	0.5 pF to 6,800 pF	100 pF to 1 μF
Capacitance tolerance***	Cap ≤5 pF : C (±0.25 pF) Cap ≥10 pF : J (±5%), K (±10%)	K (±10%)
Rated voltage (WVDC)	200 V to 3 kV	
Q*	Cap <30 pF : Q ≥400 +20 C Cap ≥30 pF : Q ≥1,000	≤2.5%
Insulation resistance at Ur**	Ur = 200 to 630 V : ≥10 GΩ or R × C ≥100 Ω-F whichever is smaller Ur = 1,000 to 3,000 V : ≥10 GΩ	
Dielectric strength	200 to 300 V : ≥2 × WVDC 500 to 999 V : ≥1.5 × WVDC 1,000 to 3,000 V : ≥1.2 × WVDC	
Operating temperature	-55 to +125°C	
Capacitance characteristic	±30 ppm	±15%
Termination	Ni/Sn (lead-free termination)	

* Measured at the condition of 30 to 70% related humidity

NPO : Apply 1 ±0.2 Vrms, 1 MHz ±10% for Cap ≤1,000 pF and 1 ±0.2 Vrms, 1 KHz ±10% for Cap >1,000 pF, 25°C at ambient temperature

X7R : Apply 1 ±0.2 Vrms, 1 KHz ±10%, at 20°C ambient temperature

** Measured at 500 V dc for 60 seconds for Ur >500 V dc

*** Preconditioning for Class II MLCC : Perform a heat treatment at 150 ±10°C for 1 hour, then leave in ambient condition for 24 ±2 hours before measurement

Capacitance Range (Middle Voltage - 200 V to 630 V)

NPO Dielectric

Capacitance	Dielectric	NPO																	
	Size	0603		0805				1206				1210				1812			
	Rated Voltage (V dc)	200	250	200	250	500	630	200	250	500	630	200	250	500	630	200	250	500	630
0.5 pF (0R5)	S	S	A	A	A	A	-	-	-	-	-	-	-	-	-	-	-	-	-
1 pF (1R0)	S	S	A	A	A	A	-	-	-	-	-	-	-	-	-	-	-	-	-
1.2 pF (1R2)	S	S	A	A	A	A	-	-	-	-	-	-	-	-	-	-	-	-	-
1.5 pF (1R5)	S	S	A	A	A	A	B	B	B	B	-	-	-	-	-	-	-	-	-
1.8 pF (1R8)	S	S	A	A	A	A	B	B	B	B	-	-	-	-	-	-	-	-	-
2.2 pF (2R2)	S	S	A	A	A	A	B	B	B	B	-	-	-	-	-	-	-	-	-
2.7 pF (2R7)	S	S	A	A	A	A	B	B	B	B	-	-	-	-	-	-	-	-	-
3.3 pF (3R3)	S	S	A	A	A	A	B	B	B	B	-	-	-	-	-	-	-	-	-

Ceramic Capacitors



Middle and High Voltage

Capacitance	Dielectric	NP0																	
	Size	603		0805				1206				1210				1812			
	Rated Voltage (V dc)	200	250	200	250	500	630	200	250	500	630	200	250	500	630	200	250	500	630
3.9 pF (3R9)	S	S	A	A	A	A	B	B	B	B	-	-	-	-	-	-	-	-	-
4.7 pF (4R7)	S	S	A	A	A	A	B	B	B	B	-	-	-	-	-	-	-	-	-
5.6 pF (5R6)	S	S	A	A	A	A	B	B	B	B	-	-	-	-	-	-	-	-	-
6.8 pF (6R8)	S	S	A	A	A	A	B	B	B	B	-	-	-	-	-	-	-	-	-
8.2 pF (8R2)	S	S	A	A	A	A	B	B	B	B	-	-	-	-	-	-	-	-	-
10 pF (100)	S	S	A	A	A	A	B	B	B	B	C	C	C	C	D	D	D	D	D
12 pF (120)	S	S	A	A	A	A	B	B	B	B	C	C	C	C	D	D	D	D	D
15 pF (150)	S	S	A	A	A	A	B	B	B	B	C	C	C	C	D	D	D	D	D
18 pF (180)	S	S	A	A	A	A	B	B	B	B	C	C	C	C	D	D	D	D	D
22 pF (220)	S	S	A	A	A	A	B	B	B	B	C	C	C	C	D	D	D	D	D
27 pF (270)	S	S	A	A	A	A	B	B	B	B	C	C	C	C	D	D	D	D	D
33 pF (330)	S	S	A	A	A	A	B	B	B	B	C	C	C	C	D	D	D	D	D
39 pF (390)	S	S	A	A	A	A	B	B	B	B	C	C	C	C	D	D	D	D	D
47 pF (470)	S	S	A	A	A	A	B	B	B	B	C	C	C	C	D	D	D	D	D
56 pF (560)	S	S	A	A	A	A	B	B	B	B	C	C	C	C	D	D	D	D	D
68 pF (680)	S	S	A	A	A	A	B	B	B	B	C	C	C	C	D	D	D	D	D
82 pF (820)	S	S	A	A	B	B	B	B	B	B	C	C	C	C	D	D	D	D	D
100 pF (101)	S	S	A	B	B	B	B	B	B	B	C	C	C	C	D	D	D	D	D
120 pF (121)	S	S	A	B	D	D	B	B	B	B	C	C	C	C	D	D	D	D	D
150 pF (151)	S	S	B	D	D	D	B	B	B	B	C	C	C	C	D	D	D	D	D
180 pF (181)	S	S	B	D	D	D	B	B	B	B	C	C	C	C	D	D	D	D	D
220 pF (221)	S	S	D	D	D	D	B	B	B	B	C	C	C	C	D	D	D	D	D
270 pF (271)	X	X	D	D	D	D	B	C	C	C	C	C	C	C	D	D	D	D	D
330 pF (331)	X	X	D	D	D	D	B	C	C	C	C	C	C	C	D	D	D	D	D
390 pF (391)	X	X	D	D	D	D	B	C	C	C	C	C	C	C	D	D	D	D	D
470 pF (471)	X	X	D	D	-	-	C	C	C	C	C	C	C	C	D	D	D	D	D
560 pF (561)	-	-	D	D	-	-	C	D	D	D	C	C	C	C	D	D	D	D	D
680 pF (681)	-	-	D	D	-	-	C	D	D	D	C	C	C	C	D	D	D	D	D
820 pF (821)	-	-	D	D	-	-	C	G	G	G	C	C	C	C	D	D	D	D	D
1,000 pF (102)	-	-	D		-	-	C	G	G	G	D	D	D	D	D	D	D	D	D

Ceramic Capacitors

Middle and High Voltage



Capacitance Range (Middle Voltage - 200 V to 630 V)

NP0 Dielectric

Capacitance	Dielectric	NP0																			
	Size	0603				0805				1206				1210				1812			
	Rated Voltage (V dc)	200	250	200	250	500	630	200	250	500	630	200	250	500	630	200	250	500	630		
1,200 pF (122)	-	-	-	-	-	-	-	C	G	G	G	D	D	D	D	D	D	D	D		
1,500 pF (152)	-	-	-	-	-	-	-	D	G	G	G	D	D	D	D	D	D	D	D		
1,800 pF (182)	-	-	-	-	-	-	-	D	G	G	G	D	D	D	D	D	D	D	D		
2,200 pF (222)	-	-	-	-	-	-	-	D	G	G	G	D	D	-	-	D	D	D	D		
2,700 pF (272)	-	-	-	-	-	-	-	-	-	-	-	D	D	-	-	D	D	D	D		
3,300 pF (332)	-	-	-	-	-	-	-	-	-	-	-	D	D	-	-	D	D	D	D		
3,900 pF (392)	-	-	-	-	-	-	-	-	-	-	-	D	D	-	-	D	-	-	-		
4,700 pF (472)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	D	-	-	-		
5,600 pF (562)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	D	-	-	-		
6,800 pF (682)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	D	-	-	-		

The letter in cell is expressed the symbol of product thickness

X7R Dielectric

Capacitance	Dielectric	X7R																		
	Size	0805				1206				1210				1812						
	Rated Voltage (V dc)	200	250	500	630	200	250	500	630	200	250	500	630	200	250	500	630			
100 pF (101)	B	B	B	B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
120 pF (121)	B	B	B	B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
150 pF (151)	B	B	B	B	D	D	D	D	-	-	-	-	-	-	-	-	-	-	-	-
180 pF (181)	B	B	B	B	D	D	D	D	-	-	-	-	-	-	-	-	-	-	-	-
220 pF (221)	B	B	B	B	D	D	D	D	-	-	-	-	-	-	-	-	-	-	-	-
270 pF (271)	B	B	B	B	D	D	D	D	-	-	-	-	-	-	-	-	-	-	-	-
330 pF (331)	B	B	B	B	D	D	D	D	-	-	-	-	-	-	-	-	-	-	-	-
390 pF (391)	B	B	B	B	D	D	D	D	-	-	-	-	-	-	-	-	-	-	-	-
470 pF (471)	B	B	B	B	D	D	D	D	-	-	-	-	-	-	-	-	-	-	-	-
560 pF (561)	B	B	B	B	D	D	D	D	-	-	-	-	-	-	-	-	-	-	-	-
680 pF (681)	B	B	B	B	D	D	D	D	-	-	-	-	-	-	-	-	-	-	-	-
820 pF (821)	B	B	B	B	D	D	D	D	-	-	-	-	-	-	-	-	-	-	-	-
1,000 pF (102)	B	B	B	B	D	D	D	D	C	C	D	D	D	D	D	D	D	D	D	D
1,200 pF (122)	B	B	B	B	D	D	D	D	C	C	D	D	D	D	D	D	D	D	D	D
1,500 pF (152)	B	B	B	B	D	D	D	D	C	C	D	D	D	D	D	D	D	D	D	D

Ceramic Capacitors



Middle and High Voltage

X7R Dielectric

Capacitance	Dielectric	X7R															
	Size	0805				1206				1210				1812			
	Rated Voltage (V dc)	200	250	500	630	200	250	500	630	200	250	500	630	200	250	500	630
1,800 pF (182)	B	B	B	B	D	D	D	D	C	C	D	D	D	D	D	D	D
2,200 pF (222)	B	B	B	B	D	D	D	D	C	C	D	D	D	D	D	D	D
2,700 pF (272)	B	B	B	B	D	D	D	D	C	C	D	D	D	D	D	D	D
3,300 pF (332)	B	B	B	B	D	D	D	D	C	C	D	D	D	D	D	D	D
3,900 pF (392)	B	B	B	B	D	D	D	D	C	C	D	D	D	D	D	D	D
4,700 pF (472)	B	B	D	D	D	D	D	D	C	C	D	D	D	D	D	D	D
5,600 pF (562)	D	D	D	D	D	D	D	D	C	C	D	D	D	D	D	D	D
6,800 pF (682)	D	D	D	D	D	D	D	D	C	C	D	D	D	D	D	D	D
8,200 pF (822)	D	D	D	D	D	D	D	D	C	C	D	D	D	D	D	D	D
0.010 µF (103)	D	D	D	D	D	D	D	D	C	C	D	D	D	D	D	D	D
0.012 µF (123)	D	D	-	-	D	D	D	D	C	C	D	D	D	D	D	D	D
0.015 µF (153)	D	D	-	-	D	D	D	D	C	C	D	D	D	D	D	D	D
0.018 µF (183)	D	D	-	-	D	D	D	D	C	C	D	D	D	D	D	D	D
0.022 µF (223)	D	D	-	-	D	D	G	G	C	C	D	D	D	D	D	D	D
0.027 µF (273)	-	-	-	-	D	D	G	G	C	C	G	G	D	D	D	D	D
0.033 µF (333)	-	-	-	-	G	G	G	G	C	C	G	G	D	D	D	D	D
0.039 µF (393)	-	-	-	-	G	G	-	-	C	C	G	G	D	D	D	D	D
0.047 µF (473)	-	-	-	-	G	G	-	-	D	D	G	G	D	D	D	D	D
0.056 µF (563)	-	-	-	-	G	G	-	-	D	D	G	G	D	D	K	K	K
0.068 µF (683)	-	-	-	-	G	G	-	-	G	G	-	-	D	D	K	K	K
0.082 µF (823)	-	-	-	-	G	G	-	-	G	G	-	-	D	D	K	K	K
0.1 µF (104)	-	-	-	-	G	G	-	-	G	G	-	-	D	D	K	K	K
0.12 µF (124)	-	-	-	-	-	-	-	-	G	G	-	-	D	D	-	-	-
0.15 µF (154)	-	-	-	-	-	-	-	-	M	M	-	-	K	K	-	-	-
0.18 µF (184)	-	-	-	-	-	-	-	-	M	M	-	-	K	K	-	-	-
0.22 µF (224)	-	-	-	-	-	-	-	-	M	M	-	-	K	K	-	-	-
0.27 µF (274)	-	-	-	-	-	-	-	-	M	M	-	-	K	K	-	-	-
0.33 µF (334)	-	-	-	-	-	-	-	-	M	M	-	-	K	K	-	-	-
0.39 µF (394)	-	-	-	-	-	-	-	-	M	M	-	-	K	K	-	-	-
0.47 µF (474)	-	-	-	-	-	-	-	-	M	M	-	-	K	K	-	-	-
0.56 µF (564)	-	-	-	-	-	-	-	-	-	-	-	-	M	M	-	-	-
0.68 µF (684)	-	-	-	-	-	-	-	-	-	-	-	-	M	M	-	-	-
0.84 µF (844)	-	-	-	-	-	-	-	-	-	-	-	-	M	M	-	-	-
1 µF (105)	-	-	-	-	-	-	-	-	-	-	-	-	M	M	-	-	-

The letter in cell is expressed the symbol of product thickness

Ceramic Capacitors

Middle and High Voltage



Capacitance Range (High Voltage - 1 kV to 3 kV)

NP0 Dielectric

Capacitance	Dielectric	NP0						
	Size	1206		1210		1812		
	Rated Voltage (V dc)	1,000	2,000	1,000	2,000	1,000	2,000	3,000
1.5 pF (1R5)	B	B	-	-	-	-	-	
1.8 pF (1R8)	B	B	-	-	-	-	-	
2 pF (2R0)	B	B	-	-	-	-	-	
2.2 pF (2R2)	B	B	-	-	-	-	-	
2.7 pF (2R7)	B	B	-	-	-	-	-	
3.3 pF (3R3)	B	B	-	-	-	-	-	
3.9 pF (3R9)	B	B	-	-	-	-	-	
4.7 pF (4R7)	B	B	-	-	-	-	-	
5.6 pF (5R6)	B	B	-	-	-	-	-	
6.8 pF (6R8)	B	B	-	-	-	-	-	
8.2 pF (8R2)	B	B	-	-	-	-	-	
10 pF (100)	B	B	C	C	D	D	D	
12 pF (120)	B	B	C	C	D	D	D	
15 pF (150)	B	B	C	C	D	D	D	
18 pF (180)	B	B	C	C	D	D	D	
22 pF (220)	B	B	C	C	D	D	D	
27 pF (270)	B	B	C	C	D	D	D	
33 pF (330)	B	C	C	C	D	D	D	
39 pF (390)	B	C	C	C	D	D	D	
47 pF (470)	C	C	C	C	D	D	D	
56 pF (560)	C	D	C	D	D	D	D	
68 pF (680)	C	D	C	D	D	D	D	
82 pF (820)	D	D	C	D	D	D	D	
100 pF (101)	D	D	D	D	D	D	D	
120 pF (121)	D	G	D	D	D	D	D	
150 pF (151)	D	G	D	G	D	D	D	
180 pF (181)	G	G	D	G	D	D	K	
220 pF (221)	G	G	G	G	D	D	K	
270 pF (271)	G	-	G	-	D	K	K	
330 pF (331)	G	-	G	-	D	K	K	
390 pF (391)	G	-	G	-	D	K	K	
470 pF (471)	G	-	G	-	K	K	K	
560 pF (561)	-	-	-	-	K	K	-	

Ceramic Capacitors



Middle and High Voltage

Capacitance Range (High Voltage - 1 kV to 3 kV)

NP0 Dielectric

Capacitance	Dielectric	NP0						
	Size	1206		1210		1812		
	Rated Voltage (V dc)	1,000	2,000	1,000	2,000	1,000	2,000	3,000
680 pF (681)		-	-	-	-	K	K	-
820 pF (821)		-	-	-	-	K	K	-
1,000 pF (102)		-	-	-	-	K	K	-
1,200 pF (122)		-	-	-	-	K	-	-
1,500 pF (152)		-	-	-	-	K	-	-

The letter in cell is expressed the symbol of product thickness

X7R Dielectric

Capacitance	Dielectric	X7R					
	Size	1206		1210	1812		
	Rated Voltage (V dc)	1,000	2,000	1,000	1,000	2,000	3,000
150 pF (151)		D	D	-	-	-	-
180 pF (181)		D	D	-	-	-	-
220 pF (221)		D	D	-	-	-	-
270 pF (271)		D	D	-	D	D	-
330 pF (331)		D	D	-	D	D	-
390 pF (391)		D	D	-	D	D	-
470 pF (471)		D	D	-	D	D	-
560 pF (561)		D	D	-	D	D	-
680 pF (681)		D	D	-	D	D	K
820 pF (821)		D	G	-	D	D	K
1,000 pF (102)		D	G	D	D	D	K
1,200 pF (122)		D	G	D	D	D	-
1,500 pF (152)		D	G	D	D	D	-
1,800 pF (182)		D	G	D	D	G	-
2,200 pF (222)		D	-	D	D	G	-
2,700 pF (272)		D	-	D	D	G	-
3,300 pF (332)		D	-	D	D	K	-
3,900 pF (392)		D	-	G	D	K	-
4,700 pF (472)		D	-	G	D	K	-
5,600 pF (562)		D	-	G	D	-	-
6,800 pF (682)		D	-	G	D	-	-
8,200 pF (822)		D	-	G	D	-	-

Ceramic Capacitors

Middle and High Voltage



X7R Dielectric

Capacitance	Dielectric	X7R					
	Size	1206		1210	1812		
	Rated Voltage (V dc)	1,000	2,000	1,000	1,000	2,000	3,000
0.01 μ F (103)	D	-	-	G	D	-	-
0.012 μ F (123)	-	-	-	-	K	-	-
0.015 μ F (153)	-	-	-	-	K	-	-

The letter in cell is expressed the symbol of product thickness

The letter in cell with "A" mark is expressed product with Ag/Ni/Sn terminations

Packaging Dimension and Quantity

Size	Thickness/Symbol		Paper Tape		Plastic Tape	
			7" Reel	13" Reel	7" Reel	13" Reel
0603	0.8 \pm 0.07	S	4 k	15 k	-	-
0805	0.6 \pm 0.1	A	4 k	15 k	-	-
	0.8 \pm 0.1	B	4 k	15 k	-	-
	1.25 \pm 0.1	D	-	-	3 k	10 k
1206	0.8 \pm 0.1	B	4 k	15 k	-	-
	0.95 \pm 0.1	C	-	-	3 k	10 k
	1.25 \pm 0.1	D	-	-	3 k	10 k
	1.6 \pm 0.2	G	-	-	2 k	10 k
1210	0.95 \pm 0.1	C	-	-	3 k	10 k
	1.25 \pm 0.1	D	-	-	3 k	10 k
	1.6 \pm 0.2	G	-	-	2 k	-
	2.5 \pm 0.3	M	-	-	1 k	6 k
1812	1.25 \pm 0.1	D	-	-	1 k	-
	1.6 \pm 0.2	G	-	-	1 k	-
	2 \pm 0.2	K	-	-	1 k	-

Unit : Pieces

Ceramic Capacitors



Middle and High Voltage

Reliability Test Conditions and Requirements

Item	Test Condition	Requirements												
Visual and Mechanical	---	No remarkable defect Dimensions to conform to individual specification sheet												
Capacitance	Class I : (NP0) Cap ≤1,000 pF, 1 ±0.2 Vrms, 1 MHz ±10% Cap >1,000 pF, 1 ±0.2 Vrms, 1 KHz ±10%	Shall not exceed the limits given in the detailed specifications												
Q / D.F. (Dissipation Factor)	Class II : (X7R) 1 ±0.2 Vrms, 1 KHz ±10%	NP0 : Cap ≥30 pF, Q ≥1,000; Cap <30 pF, Q ≥400 +20 C X7R : ≤2.5%												
Dielectric Strength	To apply voltage : 200 V to 300 V ≥2 times V dc 500 V to 999 V ≥1.5 times V dc 1,000 V to 3,000 V ≥1.2 times V dc Cut-off, set at 10 mA TEST = 15 s RAMP = 0	No evidence of damage or flash over during test												
Insulation Resistance	Rated voltage : 200 to 630 V	To apply rated voltage (500 V max.) for 60 s ≥10 GΩ or R × C ≥100 Ω-F whichever is smaller												
	Rated voltage : ≥630 V	To apply 500 V for 60 s ≥10 GΩ												
Temperature Coefficient	With no electrical load <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>T.C.</th> <th>Operating Temperature</th> </tr> </thead> <tbody> <tr> <td>NP0</td> <td>-55 to 125°C at 25°C</td> </tr> <tr> <td>X7R</td> <td>-55 to 125°C at 25°C</td> </tr> </tbody> </table>	T.C.	Operating Temperature	NP0	-55 to 125°C at 25°C	X7R	-55 to 125°C at 25°C	<table border="1" style="margin-left: 20px;"> <thead> <tr> <th>T.C.</th> <th>Capacitance Change</th> </tr> </thead> <tbody> <tr> <td>NP0</td> <td>Within ±30 ppm / °C</td> </tr> <tr> <td>X7R</td> <td>Within ±15%</td> </tr> </tbody> </table>	T.C.	Capacitance Change	NP0	Within ±30 ppm / °C	X7R	Within ±15%
T.C.	Operating Temperature													
NP0	-55 to 125°C at 25°C													
X7R	-55 to 125°C at 25°C													
T.C.	Capacitance Change													
NP0	Within ±30 ppm / °C													
X7R	Within ±15%													
Adhesive Strength of Termination	Pressurizing force : 5 N (≤0603) and 10 N (>0603) Test time : 10 ±1 s	No remarkable damage or removal of the terminations												
Vibration Resistance	Vibration frequency : 10 to 55 Hz / min. Total amplitude : 1.5 mm Test time : 6 hrs (Two hours each in three mutually perpendicular directions)	No remarkable damage Cap change and Q / D.F.: To meet initial specification												
Solderability	Solder temperature : 235 ±5°C Dipping time : 2 ±0.5 s	95% minimum coverage of all metalized area												
Bending Test	The middle part of substrate shall be pressurized by means of the pressurizing rod at a rate of about 1 mm per second until the deflection becomes 1 mm and then the pressure shall be maintained for 5 ±1 s Measurement to be made after keeping at room temperature for 24 ±2 hrs	No remarkable damage Cap change : NP0 : Within ±5% or ±0.5 pF whichever is larger X7R : Within ±12.5% (This capacitance change means the change of capacitance under specified flexure of substrate from the capacitance measured before the test)												

Ceramic Capacitors



Middle and High Voltage

Item	Test Condition	Requirements															
Resistance to Soldering Heat	Solder temperature : 260 ±5°C Dipping time : 10 ±1 s 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 hour and then set for 48 ±4 hours at room temperature Measurement to be made after keeping at room temperature for 24 ±2 hours (Class I) or 48 ±4 hours (Class II)	No remarkable damage Cap change : NP0 : Within ±2.5% or ±0.25 pF whichever is larger X7R : Within ±7.5% Q / D.F., I.R. and dielectric strength : To meet initial requirements 25% maximum leaching on each edge															
Temperature Cycle	Conduct the five cycles according to the temperatures and time <table border="1"> <thead> <tr> <th>Step</th> <th>Temperature (°C)</th> <th>Time (Min.)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Minimum operating temperature +0 / -3</td> <td>30 ±3</td> </tr> <tr> <td>2</td> <td>Room temperature</td> <td>2 to 3</td> </tr> <tr> <td>3</td> <td>Maximum operating temperature +3 / -0</td> <td>30 ±3</td> </tr> <tr> <td>4</td> <td>Room temperature</td> <td>2 to 3</td> </tr> </tbody> </table> Before initial measurement (Class II only) : Perform 150+0 / -10°C for 1 hour and then set for 48 ±4 hours at room temperature Measurement to be made after keeping at room temperature for 24 ±2 hours (Class I) or 48 ±4 hours (Class II)	Step	Temperature (°C)	Time (Min.)	1	Minimum operating temperature +0 / -3	30 ±3	2	Room temperature	2 to 3	3	Maximum operating temperature +3 / -0	30 ±3	4	Room temperature	2 to 3	No remarkable damage Cap change : NP0 : Within ±2.5% or ±0.25 pF whichever is larger X7R : Within ±7.5% Q / D.F., I.R. and dielectric strength : To meet initial requirements
Step	Temperature (°C)	Time (Min.)															
1	Minimum operating temperature +0 / -3	30 ±3															
2	Room temperature	2 to 3															
3	Maximum operating temperature +3 / -0	30 ±3															
4	Room temperature	2 to 3															
Humidity (Damp Heat) Steady State	Test temperature : 40 ±2°C Humidity : 90 to 95% RH Test time : 500 +24 / -0 hrs Measurement to be made after keeping at room temperature for 24 ±2 hours (Class I) or 48 ±4 hours (Class II)	No remarkable damage Cap change : NP0 : within ±5% or ±0.5 pF whichever is larger X7R : within ±12.5% Q / D.F. value : NP0 : Cap ≥30 pF, Q ≥350; 10 pF ≤Cap <30 pF, Q ≥275 + 2.5 C Cap <10 pF; Q ≥200 + 10 C X7R : ≤3% I.R. : ≥1 GΩ or R × C ≥50 Ω-F whichever is smaller															
Humidity (Damp Heat) Load	Test temperature : 40 ±2°C Humidity : 90 to 95% RH Test time : 500 +24 / -0 hrs To apply voltage : Frated voltage (Maximum 500 V) Measurement to be made after keeping at room temperature for 24 ±2 hours (Class I) or 48 ±4 hours (Class II)	No remarkable damage Cap change : NP0 : within ±7.5% or ±0.75 pF whichever is larger X7R : within ±12.5% Q / D.F. value : NP0 : Cap ≥30 pF, Q ≥200; Cap <30 pF, Q ≥100 + 10 / 3 C X7R : ≥3% I.R. : ≥500 MΩ or R × C ≥25 Ω-F whichever is smaller															

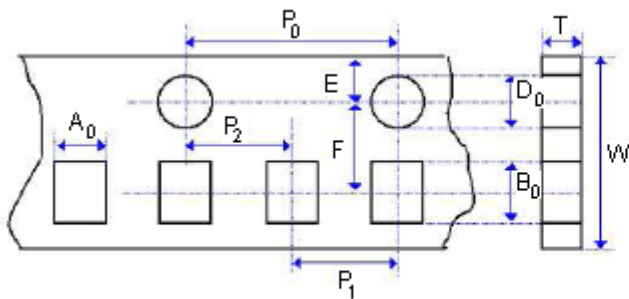
Ceramic Capacitors

Middle and High Voltage

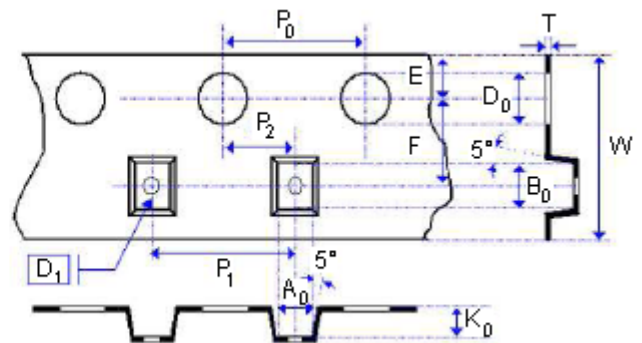
Item	Test Condition	Requirements
High Temperature Load (Endurance)	Test temperature : NP0, X7R : 125 ±3°C To apply voltage : (1) <500 V : 200% of rated voltage (2) 500 V : 150% of rated voltage (3) ≥630 V : 120% of rated voltage Test time : 1,000 +24 / -0 hrs Measurement to be made after keeping at room temperature for 24 ±2 hours (Class I) or 48 ±4 hours (Class II)	No remarkable damage Cap change : NP0 : within ±3% or ±0.3 pF whichever is larger X7R : within ±12.5% Q / D.F. value : NP0 : Cap ≥30 pF, Q ≥350 10 pF ≤Cap <30 pF, Q ≥275 + 2.5 C Cap <10 pF, Q ≥200 + 10 C X7R : ±3% I.R. : ≥1 GΩ or R × C ≥50 Ω-F whichever is smaller

Appendixes

Tape and Reel Dimensions



The Dimension of Paper Tape

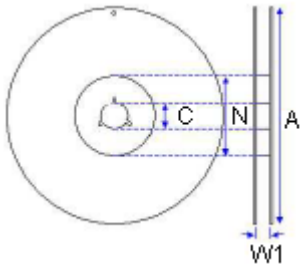


The Dimension of Plastic Tape

Size	0603	0805		1206			1210		1812
Thickness	S, X	B	C, D, I	B	C, D	G	C, D, G	M	D, K
A ₀	1.02 ±0.05	1.5 ±0.1	<1.57	2 ±0.1	<1.85	<1.95	<2.97	<2.97	<3.81
B ₀	1.8 ±0.05	2.3 ±0.1	<2.40	3.5 ±0.1	<3.46	<3.67	<3.73	<3.73	<5.30
T	0.95 ±0.05	0.95 ±0.05	0.23 ±0.05	0.95 ±0.05	0.23 ±0.05	0.23 ±0.05	0.23 ±0.05	0.23±0.05	0.25±0.05
K ₀	-	-	<2.5	-	<2.5	<2.5	<2.5	<3	<2.5
W	8 ±0.1	8 ±0.1	8 ±0.1	8 ±0.1	8 ±0.1	8 ±0.1	8 ±0.1	8 ±0.1	12 ±0.2
P ₀	4 ±0.1	4 ±0.1	4 ±0.1	4 ±0.1	4 ±0.1	4 ±0.1	4 ±0.1	4 ±0.1	4 ±0.1
10 × P ₀	40 ±0.1	40 ±0.1	40 ±0.1	40 ±0.1	40 ±0.1	40 ±0.1	40 ±0.1	40 ±0.1	40 ±0.1
P ₁	4 ±0.1	4 ±0.1	4 ±0.1	4 ±0.1	4 ±0.1	4 ±0.1	4 ±0.1	4 ±0.1	8 ±0.1
P ₂	2 ±0.05	2 ±0.05	2 ±0.05	2 ±0.05	2 ±0.05	2 ±0.05	2 ±0.05	2 ±0.05	2 ±0.05
D ₀	1.55 ±0.05	1.55 ±0.05	1.5 ±0.05	1.5 ±0.05	1.5 ±0.05	1.5 ±0.05	1.5 ±0.05	1.5 ±0.05	1.5 ±0.05
D ₁	-	-	1 ±0.1	-	1 ±0.1	1 ±0.1	1 ±0.1	1 ±0.1	1.5 ±0.1
E	1.75 ±0.05	1.75 ±0.05	1.75 ±0.1	1.75±0.1	1.75 ±0.1	1.75 ±0.1	1.75 ±0.1	1.75 ±0.1	1.75 ±0.1
F	3.5 ±0.05	3.5 ±0.05	3.5 ±0.05	3.5 ±0.05	3.5 ±0.05	3.5 ±0.05	3.5 ±0.05	3.5 ±0.05	5.5 ±0.05

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The Dimension of Reel

Size	0603, 0805, 1206, 1210			1812
Reel Size	7 Inches	10 Inches	13 Inches	7 Inches
C	13 + 0.5 / -0.2	13 + 0.5 / -0.2	13 + 0.5 / -0.2	13 + 0.5 / -0.2
W1	8.4 + 1.5 / -0	8.4 + 1.5 / -0	8.4 + 1.5 / -0	12.4 + 2.0 / -0
A	178 ±0.1	250 ±1	330 ±1	178 ±0.1
N	60 + 1 / -0	100 ±1	100 ±1	60.5 ±1

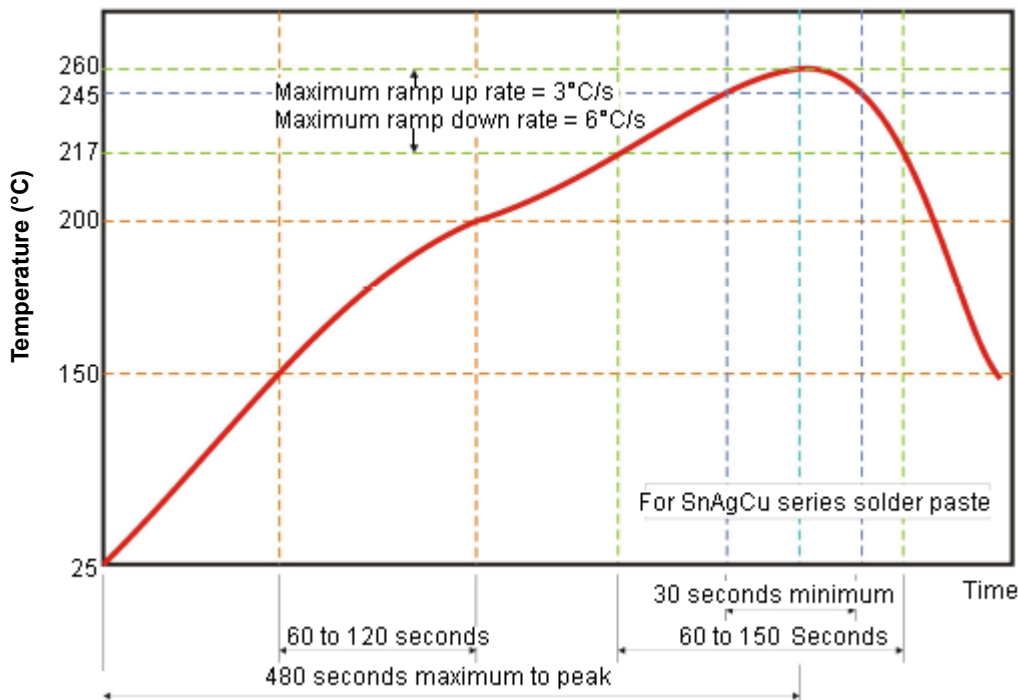
Storage and handling conditions

1. To store products at 5 to 40°C ambient temperature and 20 to 70% related humidity conditions
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. Don't store products in a corrosive environment such as sulfide, chloride gas, or acid. It may cause oxidization of electrode, which easily be resulted in poor soldering
- b. To store products on the shelf and avoid exposure to moisture
- c. Don't expose products to excessive shock, vibration, direct sunlight and so on

Recommended Soldering Conditions

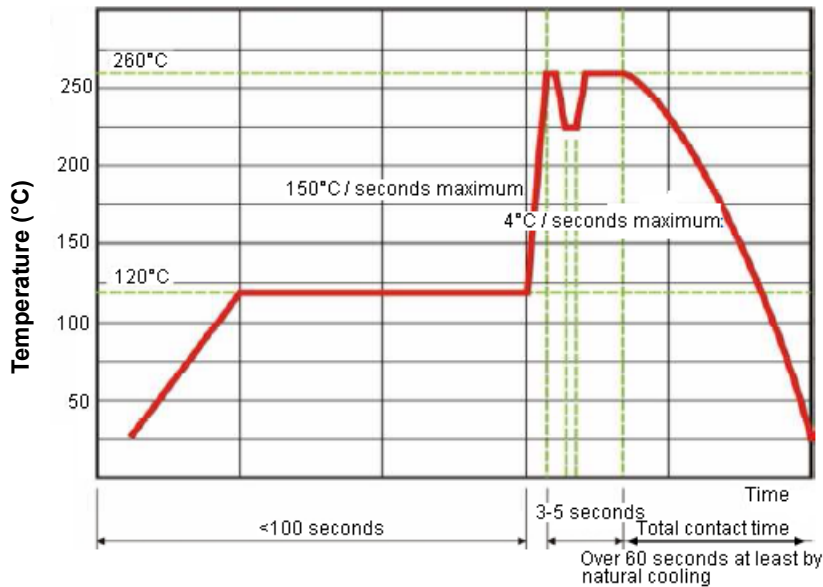


Recommended reflow soldering profile for SMT process with SnAgCu series solder paste

Ceramic Capacitors

Middle and High Voltage

Recommended wave soldering profile for SMT process with SnAgCu series solder



Part Number Table

Description	Part Number
Middle and High Voltage Ceramic Capacitor	MC0603N1R0C201CT
Middle and High Voltage Ceramic Capacitor	MC0805B101K201CT
Middle and High Voltage Ceramic Capacitor	MC1206B102K102CT
Middle and High Voltage Ceramic Capacitor	MC1210B102K102CT
Middle and High Voltage Ceramic Capacitor	MC1812B102K102CT

Part Number Explanation:

MC	0603	N	1R0	C	201	C	T
	Size	Dielectric	Capacitance	Tolerance	Rated Voltage	Termination	Packaging

Size-Inch (mm) : 0603 (1608), 0805 (2012), 1206 (3216), 1210 (3225) and 1812 (4532)

Dielectric : N = NP0, B = X7R

Capacitance : Two significant digits followed by no. of zeros. And R is in place of decimal point
0R5 = 0.5 pF 1R0 = 1 pF, 100 = 10 × 10⁰, 100 = 10 pF

Tolerance : C = ±0.25 pF, J = ±5%, K = ±10%

Rated Voltage : Two significant digits followed by no. of zeros. and R is in place of decimal point

: 201 = 200 V dc, 251 = 250 V dc, 501 = 500 V dc, 631 = 630 V dc, 102 = 1,000 V dc, 202 = 2,000 V dc, and 302 = 3,000 V dc

Termination : C = Cu/Ni/Sn (for NP0, X7R dielectric)

: L = Ag/Ni/Sn (for partial NP0 items)

Packaging : T = 7 inches reeled

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