

Surface Mount Multilayer Chip Capacitors



FEATURES

- Ultra stable class 1 dielectric
- Four standard sizes
- High capacitance per unit volume
- Supplied in tape on reel
- For high frequency applications
- Ni-barrier with 100 % tin terminations



RoHS
COMPLIANT

APPLICATIONS

- Consumer electronics
- Telecommunications
- Data processing

GENERAL SPECIFICATIONS

NOTE: Electrical characteristics values - temperature at 20 ± 1 °C, pressure at 86 to 106 Kpa and humidity at 63 to 67 % unless otherwise stated

Rated Voltage U_R (DC): 10 V; 16 V; 25 V; 50 V; 100 V

Capacitance Range: 0.5 pF to 0.039 μ F

Tolerance on Capacitance:

$C < 10$ pF = ± 0.1 pF; ± 0.25 pF; ± 0.5 pF

$C \geq 10$ pF = ± 1 %; ± 2 %; ± 5 %; ± 10 %

Tolerance on Capacitance (cont):

$Q \geq 30$ pF = $Q \geq 1000$

$Q < 30$ pF = $Q \geq 400 + 20C$

Temperature Coefficient: ± 30 ppm/ °C

Insulation Resistance after 120 seconds at U_R (DC):

10 G Ω minimum or 500 Ω F minimum, whichever is less

Climatic Category (IEC 68): 55/125/56

DIMENSIONS in inches [millimeters]					
	SIZE CODE	L	W	T MAX.	MB
	0402	0.040 ± 0.002 [1.0 $\pm$ 0.05]	0.020 ± 0.002 [0.5 $\pm$ 0.05]	0.022 [0.55]	$0.010 + 0.002/- 0.004$ [0.25 + 0.05/- 0.10]
	0603	0.063 ± 0.004 [1.6 $\pm$ 0.10]	0.030 ± 0.004 [0.8 $\pm$ 0.10]	0.035 [0.87]	0.015 ± 0.006 [0.40 $\pm$ 0.15]
	0805	0.080 ± 0.006 [2.0 $\pm$ 0.15]	0.050 ± 0.004 [1.25 $\pm$ 0.10]	0.053 [1.35]	0.020 ± 0.008 [0.50 $\pm$ 0.20]
	1206	$0.125 + 0.012/- 0.004$ [3.2 + 0.30/- 0.10]	$0.063 + 0.012/- 0.004$ [1.6 + 0.30/- 0.10]	0.075 [1.90]	0.025 ± 0.008 [0.60 $\pm$ 0.20]

ORDERING INFORMATION							
VJ0402	A	101	J	X	Q	C	W1BC
SIZE CODE	DIELECTRIC	CAPACITANCE	TOLERANCE	TERMINATION	VOLTAGE	PACKAGING	PROCESS CODE FOR VISHAY BCC MLCC
0402 0603 0805 1206	A = COG (NP0)	two significant digits followed by the number of zeros: 101 = 100 pF 102 = 1000 pF 152 = 1500 pF 103 = 10000 pF	Cap. < 10pF B = ± 0.10 pF C = ± 0.25 pF D = ± 0.50 pF Cap. ≥ 10 pF F = ± 1 % G = ± 2 % J = ± 5 % K = ± 10 %	X = Ni Barrier	Q = 10 V J = 16 V X = 25 V A = 50 V B = 100 V	C = 7" reel/ paper tape P = 13" reel/ paper tape T = 7" reel/ plastic tape R = 13" reel/ plastic tape	



Class 1 NP0 10/16/25/50/100 V

Surface Mount Multilayer Chip Capacitors Vishay BCcomponents

SELECTION CHART FOR 10/16/25/50 AND 100 V

DIELECTRIC		NP0																			
EIA CAP CODE	EIA SIZE	0402					0603					0805					1206				
	CAP	10 V	16 V	25 V	50 V	100	10 V	16 V	25 V	50 V	100 V	10 V	16 V	25 V	50 V	100 V	10 V	16 V	25 V	50 V	100 V
0R5	0.5 pF	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A					
1R0	1.0	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A					
1R2	1.2	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A					
1R5	1.5	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
1R8	1.8	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
2R2	2.2	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
2R7	2.7	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
3R3	3.3	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
3R9	3.9	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
4R7	4.7	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
5R6	5.6	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
6R8	6.8	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
8R2	8.2	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
100	10 pF	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
120	12	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
150	15	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
180	18	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
220	22	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
270	27	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
330	33	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
390	39	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
470	47	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
560	56	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
680	68	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
820	82	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
101	100 pF	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
121	120	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
151	150	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
181	180	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
221	220	N	N	N	N		S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
271	270	N	N				S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
331	330	N	N				S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
391	390	N	N				S	S	S	S	S	B	B	B	B	B	B	B	B	B	B
471	470	N	N				S	S	S	S	S	B	B	B	B	B	B	B	B	B	B
561	560						S	S	S	S	S	B	B	B	B	B	B	B	B	B	B
681	680						S	S	S	S		B	B	B	B	B	B	B	B	B	B
821	820						S	S	S	S		B	B	B	B	B	B	B	B	B	B
102	1000 pF						S	S	S	S		B	B	B	B	B	B	B	B	B	B
122	1200						S	S				B	B	B	B	B	B	B	B	B	B
152	1500						S	S				B	B	B	B	B	B	B	B	B	B
182	1800						S	S				B	B	B	B	B	B	B	B	B	B
222	2200						S	S				B	B	B	B	B	B	B	B	B	B
272	2700						S	S				D	D	D	D	D	B	B	B	B	B
332	3300						S	S				D	D	D	D	D	B	B	B	B	B
392	3900											D	D	D	D	D	B	B	B	B	B
472	4700											D	D	D	D		B	B	B	B	B
562	5600											D	D				B	B	B	B	B
682	6800											D	D				C	C	C	C	C
822	8200											D	D				C	C	C	C	C
103	0.01 µF											D	D				D	D	D	D	
123	0.012											D	D				D	D	P	P	
153	0.015																D	D	P	P	
183	0.018																D	D			
223	0.022																D	D			
273	0.027																D	D			
333	0.033																D	D			
393	0.039																G	G			
473	0.047																				
563	0.056																				
683	0.068																				
823	0.082																				
104	0.1 µF																				

Letters indicate product thickness, see Packaging Quantities

PACKAGING QUANTITIES

THICKNESS CLASSIFICATION (mm)	AMOUNT PER REEL			
	$\Delta 180 \text{ mm; } 7 \text{ inch}$			
	0402	0603	0805	1206
N = 0.50 ± 0.05	Paper 10 Kp/Reel	-	-	-
S = 0.8 ± 0.07	-	Paper 4 Kp/Reel	-	-
X = $0.8 + 0.15/-0.10$	-	Paper 4 Kp/Reel	-	-
A = 0.6 ± 0.1	-	-	Paper 4 Kp/Reel	-
B = 0.8 ± 0.1	-	-	Paper 4 Kp/Reel	Paper 4 Kp/Reel
C = 0.95 ± 0.1	-	-	-	Plastic 3 Kp/Reel
D = 1.25 ± 0.1	-	-	Plastic 3 Kp/Reel	Plastic 3 Kp/Reel
J = 1.15 ± 0.15	-	-	-	Plastic 3 Kp/Reel
I = 1.25 ± 0.2	-	-	Plastic 3 Kp/Reel	-
P = $1.60 + 0.30/-0.10$	-	-	-	Plastic 2 Kp/Reel
G = 1.60 ± 0.2	-	-	-	Plastic 2 Kp/Reel

PACKAGING QUANTITIES

THICKNESS CLASSIFICATION (mm)	AMOUNT PER REEL			
	$\Delta 330 \text{ mm; } 13 \text{ inch}$			
	0402	0603	0805	1206
N = 0.50 ± 0.05	Paper 50 Kp/Reel	-	-	-
S = 0.8 ± 0.07	-	Paper 15 Kp/Reel	-	-
X = $0.8 + 0.15/-0.10$	-	Paper 15 Kp/Reel	-	-
A = 0.6 ± 0.1	-	-	Paper 15 Kp/Reel	-
B = 0.8 ± 0.1	-	-	Paper 15 Kp/Reel	Paper 15 Kp/Reel
C = 0.95 ± 0.1	-	-	-	Plastic 10 Kp/Reel
D = 1.25 ± 0.1	-	-	Plastic 10 Kp/Reel	Plastic 10 Kp/Reel
J = 1.15 ± 0.15	-	-	-	Plastic 10 Kp/Reel
I = 1.25 ± 0.2	-	-	Plastic 10 Kp/Reel	-
P = $1.60 + 0.30/-0.10$	-	-	-	-
G = 1.60 ± 0.2	-	-	-	-

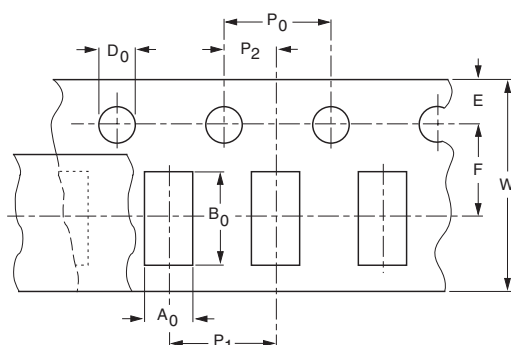
COVER TAPE (POLYESTER - ANTISTATIC)

PROPERTIES OF COVER TAPE	
PARAMETER	WIDTH
	$5.5 \pm 0.1 \text{ mm}$
Breaking force	$\geq 10.7 \text{ N}$
Elongation at break	$\geq 63 \%$
Surface resistance	$< 10^{10} \Omega/\text{sq.}$
Softening point	$71 \pm 5^\circ \text{C}$
Thickness	$62 \mu\text{m}$

CARRIER TAPE (POLYCARBONATE)

PROPERTIES OF CARRIER TAPE	
PARAMETER	WIDTH
	$8.1 \pm 0.2 \text{ mm}$
Thickness	190 to 280 μm
Tensile strength at break	$> 60 \text{ N/mm}^2$
Elongation at break	100 to 150 %
Surface resistance	$> 10^{12} \Omega/\text{sq.}$

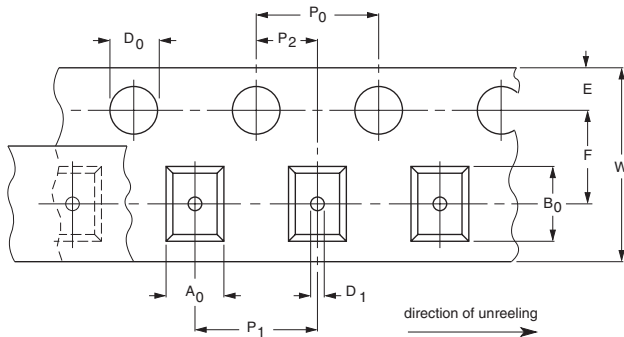
PAPER TAPE SPECIFICATIONS



DIMENSIONS OF PAPER TAPE in millimeters

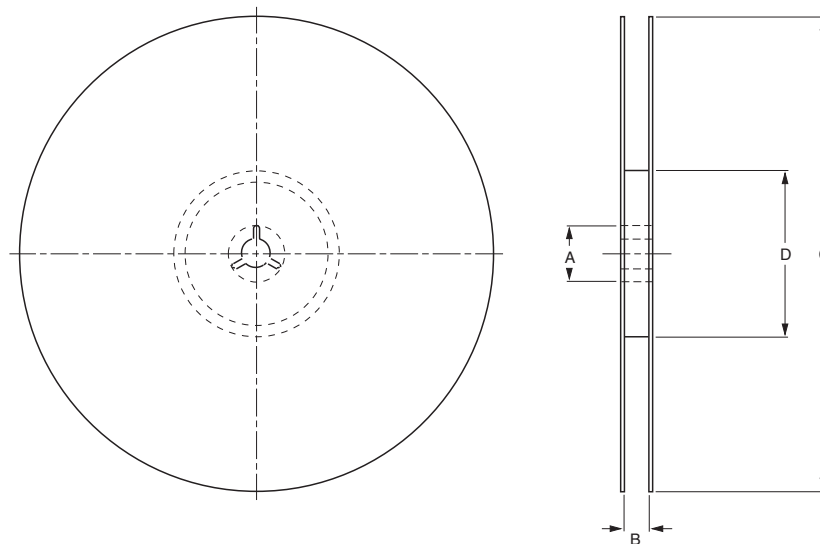
SYMBOL	PRODUCT SIZE CODE							
	0402		0603		0805		1206	
	SIZE	TOL.	SIZE	TOL.	SIZE	TOL.	SIZE	TOL.
A ₀	0.62	± 0.05	1.02	± 0.05	1.50	± 0.10	2.00	± 0.10
B ₀	1.12	± 0.05	1.82	± 0.05	2.30	± 0.10	3.50	± 0.10
W	8.00	± 0.10	8.00	± 0.10	8.00	± 0.10	8.00	± 0.10
E	1.75	± 0.05	1.75	± 0.05	1.75	± 0.05	1.75	± 0.10
F	3.50	± 0.05	3.50	± 0.05	3.50	± 0.05	3.50	± 0.05
D ₀	1.55	± 0.05	1.55	± 0.05	1.55	± 0.05	1.50	± 0.05
P ₀	4.00	± 0.10	4.00	± 0.10	4.00	± 0.10	4.00	± 0.10
P ₁	2.00	± 0.05	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

BLISTER TAPE SPECIFICATIONS



DIMENSIONS OF BLISTER TAPE in millimeters			
DIMENSION	PRODUCT		TOLERANCE
	0805	1206	
A ₀	< 1.57	< 2.00	-
B ₀	< 2.45	< 3.60	-
W	8.00	8.00	± 0.10
E	1.75	1.75	± 0.10
F	3.50	3.50	± 0.05
D ₀	1.50	1.50	± 0.05
D ₁	1.00	1.00	± 0.10
P ₀	4.00	4.00	± 0.10
P ₁	4.00	4.00	± 0.10
P ₂	2.00	2.00	± 0.05

REEL SPECIFICATIONS



REEL DIMENSIONS AND TAPE WIDTH in millimeters		
	Ø 180 mm; 7 inch	Ø 330 mm; 13 inch
A	13.0 ± 1.0	13.0 ± 0.5
B	9.0 ± 1.0	9.0 ± 1.0
C	178.0 ± 1.0	330.0 ± 1.0
D	60.5 ± 1.0	100.0 ± 1.0

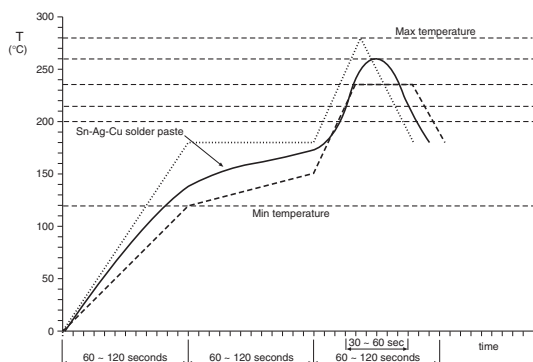
METHOD OF MOUNTING AND DIMENSIONS OF SOLDER LANDS

For normal use the capacitors may be mounted on printed-circuit boards or ceramic substrates by applying wave soldering and reflow soldering.

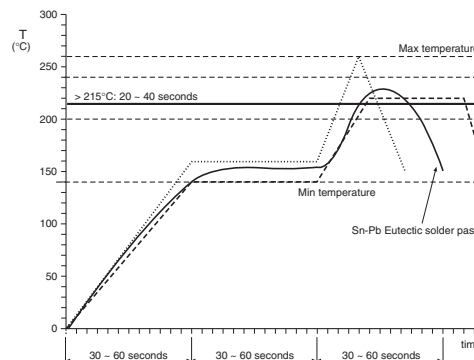
An improper combination of soldering, substrate and chip size can lead to a damaging of the component. The risk increases with the chip size and with temperature fluctuations (> 100 °C) Therefore, it is advised to use the smallest possible size and follow the dimensional recommendations given.

SOLDERING GRAPHS

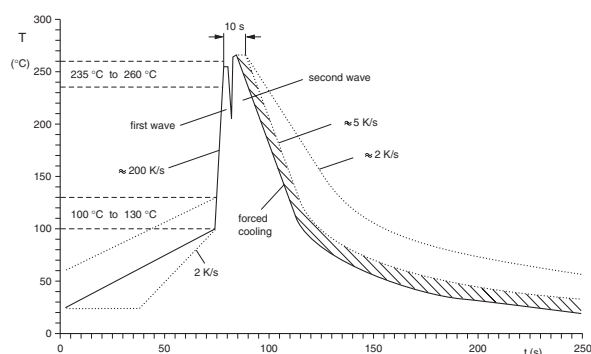
IR REFLOW WITH SnAgCu SOLDERING



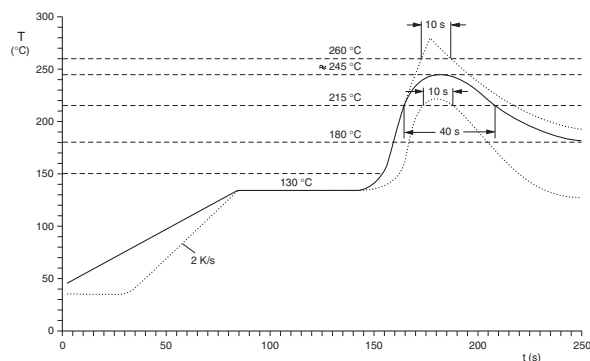
IR REFLOW WITH SnPb SOLDER



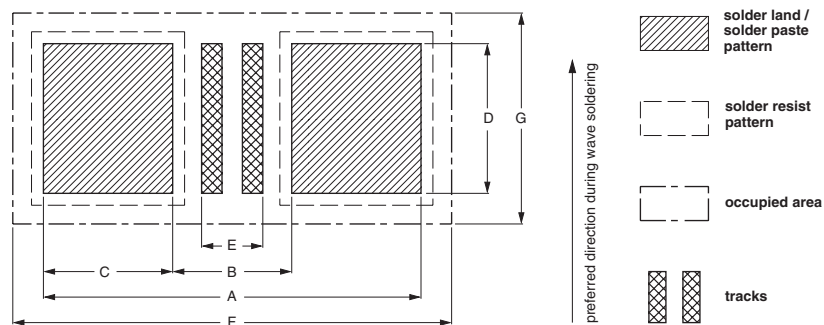
WAVE SOLDERING



REFLOW SOLDERING



RECOMMENDED DIMENSIONS OF SOLDER LANDS in millimeters



**REFLOW SOLDERING**

SIZE CODE	FOOTPRINT DIMENSIONS in mm							PROCESSING REMARKS	PLACEMENT ACCURACY
	A	B	C	D	E	F	G		
0402	1.50	0.50	0.50	0.50	0.10	1.75	0.95	IR or hot plate soldering	± 0.15
0603	2.30	0.70	0.80	0.80	0.20	2.55	1.40		± 0.25
0805	2.80	1.00	0.90	1.30	0.40	3.08	1.85		± 0.25
1206	4.00	2.20	0.90	1.60	1.60	4.25	2.25		± 0.25

WAVE SOLDERING

SIZE CODE	FOOTPRINT DIMENSIONS in mm							PROPOSED NUMBER AND DIMENSIONS OF DUMMY TRACKS (mm)	PLACEMENT ACCURACY (mm)
	A	B	C	D	E	F	G		
0603	2.40	1.00	0.70	0.80	0.20	3.10	1.90	1 x (0.2 x 0.8)	± 0.10
0805	3.20	1.40	0.90	1.30	0.36	4.10	2.50	1 x (0.3 x 1.3)	± 0.15
1206	4.80	2.30	1.25	1.70	1.25	5.90	3.20	3 x (0.25 x 1.7)	± 0.25

TEST CONDITIONS IN STATIC SOLDER BATH

PARAMETER	DESCRIPTION
SOLDERABILITY	
95 % covered with smooth and bright solder coating	CECC requirement: 235 ± 5 °C for 2 ± 0.5 seconds IEC requirement: 215 ± 3 °C for 3 ± 0.3 seconds
RESISTANCE TO LEACHING	
10 % of the metallization of the edges of the head face may be missing (inner electrodes are not visible)	260 ± 5 °C for 30 ± 1 second

TEST PROCEDURES AND REQUIREMENTS

TEST	PROCEDURE	REQUIREMENTS			
1) Visual and mechanical		• No remarkable defect. • Dimensions should confirm to individual specification sheet.			
2) Capacitance	Class I: NP0 Cap ≤ 1000 pF; 1.0 ± 0.2 V _{rms} ; 1 MHz ± 10 % Cap > 1000 pF; 1.0 ± 0.2 V _{rms} ; 1 kHz ± 10 % Class II: X7R, X5R, Y5V Cap ≤ 10 μF; 1.0 ± 0.2 V _{rms} ; 1 kHz ± 10 % Cap > 10 μF; 0.5 ± 0.2 V _{rms} ; 120 Hz ± 20 %	• Shall not exceed the limits given in the detailed specification.			
3) Q/D.F. (Dissipation Factor)		NP0: Cap ≥ 30 pF: Q ≥ 1000 Cap < 30 pF: Q ≥ 400 + 20C. X7R, X5R:			
		Rated Vol.	D.F.	Exception of D.F.	
		≥ 50 V	≤ 2.5 %	≤ 3 %	0603 ≥ 0.047μF, 0805 ≥ 0.18μF, 1206 ≥ 0.47μF
		25 V	≤ 3.5 %	≤ 5 %	0805 ≥ 1μF, 1210 ≥ 10μF
				≤ 7%	0603 ≥ 0.33μF
		16 V	≤ 3.5 %	≤ 5 %	0201 ≥ 0.0047μF, 0402 ≥ 0.033μF, 0603 ≥ 0.15μF, 0805 ≥ 0.68μF, 1206 ≥ 2.2μF
		10 V	≤ 5.0 %	—	—
		6.3 V	≤ 10 %	≤ 15 %	0805 ≥ 10μF
		Y5V:			
		Rated Vol.	D.F.	Exception of D.F.	
		≥ 50 V	≤ 5.0 %	—	—
		25 V	≤ 5.0 %	≤ 7 %	0603 ≥ 0.1μF, 0805 ≥ 0.33μF, 1206 ≥ 1μF
				≤ 9 %	0402 ≥ 0.068μF
		16 V (C < 1μF)	≤ 7.0 %	≤ 9 %	0402 ≥ 0.068μF
		16 V (C ≥ 1μF)	≤ 9.0 %	—	—
≤ 10 V	≤ 12.5 %	—	—		
≤ 6.3 V	≤ 20 %	—	—		

TEST PROCEDURES AND REQUIREMENTS				
TEST	PROCEDURE		REQUIREMENTS	
4) Dielectric strength	• To apply voltage ($\leq 50V$) 250%. • Duration: 1 to 5 seconds. • Charge and discharge current less than 50 mA.		• No evidence of damage or flash-over during test.	
	• To apply voltage: 100V ≥ 3 times V DC 200V ~ 300V ≥ 2 times V DC 500V ~ 999V ≥ 1.5 times V DC 1000V ~ 3000V ≥ 1.2 times V DC • Cut-off, set at 10mA • TEST = 15 seconds • RAMP = 0			
5) Insulation resistance	To apply rated voltage for max. 120 seconds		$\geq 10\text{ G}\Omega$ or $R \times C \geq 500\Omega\text{ F}$ whichever is smaller.	
	Rated voltage: 100 ~ 500V	To apply rated voltage for 60 seconds	$\geq 10\text{ G}\Omega$.	
	Rated voltage: > 500V	To apply 500V for 60 seconds	$\geq 10\text{ G}\Omega$.	
6) Temperature coefficient	With no electrical load:			
	T.C.	Operating Temp	T.C.	Capacitance Change
	NP0 (C0G)	- 55 ~ 125 °C at 25 °C	NP0 (C0G)	Within $\pm 30\text{ ppm}/^\circ\text{C}$
	NP0 (C0J)	- 55 ~ 125 °C at 25 °C	NP0 (C0J)	Within $\pm 120\text{ ppm}/^\circ\text{C}$
	X7R	- 55 ~ 125 °C at 25 °C	X7R	Within $\pm 15\%$
	X5R	- 55 ~ 85 °C at 25 °C	X5R	Within $\pm 15\%$
	Y5V	- 25 ~ 85 °C at 20 °C	Y5V	Within + 30 %/- 80 %
7) Adhesive strength of termination	• Pressurizing force: 0201: 2N 0402 and 0603: 5 N > 0603: 10 N • Test time 10 ± 1 second.		• No remarkable damage or removal of the terminations.	
8) Vibration resistance	• Vibration frequency: 10 to 55 Hz/minute. • Total amplitude: 1.5 mm. • Test time: 6 hours (2 hours each in 3 mutually perpendicular directions).		• No remarkable damage. • Capacitance change and Q/D.F.: To meet initial specification.	
9) Solderability	• Solder temperature: $235 \pm 5\text{ }^\circ\text{C}$. • Dipping time: 2 ± 0.5 seconds.		95 % minimum coverage of all metallized area.	
10) Bending test	• The middle part of the 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 seconds. • Measurement to be made after keeping at room temperature for 24 ± 2 hours.		• No remarkable damage • Capacitance change: NP0: within $\pm 5.0\%$ or $\pm 0.5\text{ pF}$ whichever is larger. X7R, X5R: 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)	
11) Resistance to soldering heat	• Solder temperature: $270 \pm 5\text{ }^\circ\text{C}$. • Dipping time: 10 ± 1 second. • Preheating: 120 to 150 °C for 1 minute before immerse the capacitor in a eutectic solder. • Before initial measurement (Class II only): Perform $150 \pm 0/-10\text{ }^\circ\text{C}$ for 1 hour and then set for 48 ± 4 hrs 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 • Capacitance change: NP0: within $\pm 2.5\%$ or $\pm 0.25\text{ pF}$ whichever is larger. X7R, X5R: within $\pm 7.5\%$ Y5V: within $\pm 20\%$ • Q/D.F., I.R. and dielectric strength: To meet initial requirements. • 25 % maximum leaching on each edge.	



TEST PROCEDURES AND REQUIREMENTS																																																																
TEST	PROCEDURE			REQUIREMENTS																																																												
12) Temperature cycle	• Conduct the 5 cycles according to the temperatures and time.			• No remarkable damage • Capacitance change: NP0: within ± 2.5 % or ± 0.25 pF whichever is larger. X7R, X5R: within ± 7.5 % Y5V: within ± 20 % • Q/D.F., I.R. and dielectric strength: To meet initial requirements.																																																												
	Step	Temperature (°C)	Time (min.)																																																													
	1	Min. operating temp. + 0/- 3	30 ± 3																																																													
	2	Room temperature	2 ~ 3																																																													
	3	Min. operating temp. + 3/- 0	30 ± 3																																																													
	4	Room temperature	2 ~ 3																																																													
	• Before initial measurement (Class II only): Perform 150 + 0/- 10 °C for 1 hour and then set for 48 ± 4 hrs at room temperature. • Measurement to be made after keeping at room temperature for 24 ± 2 hours (Class I) or 48 ± 4 hours (Class II).																																																															
13) Humidity (steady state)	• Test temperature: 40 ± 2 °C. • Humidity: 90 ~ 95 % RH. • Test time: 500 + 24/- 0 hours. • Measurement to be made after keeping at room temperature for 24 ± 2 hours (Class I) or 48 ± 4 hours (Class II).			• No remarkable damage • Capacitance change: NP0: within ± 5.0 % or ± 0.5 pF whichever is larger. X7R, X5R: ≥ 10V, within ± 12.5 % 6.3V, within ± 25 % Y5V: within ± 30 % • Q/D.F. value: NP0: Cap ≥ 30 pF: Q ≥ 350 10pF ≤ Cap < 30 pF: Q ≥ 275 + 2.5C Cap < 10pF: Q ≥ 200 + 10C X7R, X5R: <table><tr><th>Rated Vol.</th><th>D.F.</th><th colspan="2">Exception of D.F.</th></tr><tr><td>≥ 50 V</td><td>≤ 3.0 %</td><td>≤ 6 %</td><td>0603 ≥ 0.047μF, 0805 ≥ 0.18μF, 1206 ≥ 0.47μF</td></tr><tr><td rowspan="2">25 V</td><td rowspan="2">≤ 5.0 %</td><td>≤ 10 %</td><td>0805 ≥ 1μF, 1210 ≥ 10μF</td></tr><tr><td>≤ 14 %</td><td>0603 ≥ 0.33μF</td></tr><tr><td>16 V</td><td>≤ 5.0 %</td><td>≤ 10 %</td><td>0402 ≥ 0.033μF, 0603 ≥ 0.15μF, 0805 ≥ 0.68μF, 1206 ≥ 2.2μF</td></tr><tr><td>10 V</td><td>≤ 7.5 %</td><td>≤ 15 %</td><td>0402 ≥ 0.056μF, 0603 ≥ 0.33μF, 0805 ≥ 2.2μF, 1206 ≥ 2.2μF</td></tr><tr><td>6.3 V</td><td>≤ 15 %</td><td>≤ 30 %</td><td>0805 ≥ 10μF</td></tr><tr><td colspan="4">Y5V:</td></tr><tr><th>Rated Vol.</th><th>D.F.</th><th colspan="2">Exception of D.F.</th></tr><tr><td>≥ 50 V</td><td>≤ 7.5 %</td><td>–</td><td>–</td></tr><tr><td rowspan="2">25 V</td><td rowspan="2">≤ 7.5 %</td><td>≤ 10 %</td><td>0603 ≥ 0.1μF, 0805 ≥ 0.33μF, 1206 ≥ 1μF</td></tr><tr><td>≤ 12.5 %</td><td>0402 ≥ 0.068μF</td></tr><tr><td>16 V (C < 1μF)</td><td>≤ 10 %</td><td>≤ 12.5 %</td><td>0402 ≥ 0.068μF</td></tr><tr><td>16 V (C ≥ 1μF)</td><td>≤ 12.5 %</td><td>–</td><td>–</td></tr><tr><td>10 V</td><td>≤ 15 %</td><td>–</td><td>–</td></tr><tr><td>≤ 6.3 V</td><td>≤ 30 %</td><td>–</td><td>–</td></tr></table> • I.R.: ≥ 1GΩ or R x C ≥ 50ΩF whichever is smaller	Rated Vol.	D.F.	Exception of D.F.		≥ 50 V	≤ 3.0 %	≤ 6 %	0603 ≥ 0.047μF, 0805 ≥ 0.18μF, 1206 ≥ 0.47μF	25 V	≤ 5.0 %	≤ 10 %	0805 ≥ 1μF, 1210 ≥ 10μF	≤ 14 %	0603 ≥ 0.33μF	16 V	≤ 5.0 %	≤ 10 %	0402 ≥ 0.033μF, 0603 ≥ 0.15μF, 0805 ≥ 0.68μF, 1206 ≥ 2.2μF	10 V	≤ 7.5 %	≤ 15 %	0402 ≥ 0.056μF, 0603 ≥ 0.33μF, 0805 ≥ 2.2μF, 1206 ≥ 2.2μF	6.3 V	≤ 15 %	≤ 30 %	0805 ≥ 10μF	Y5V:				Rated Vol.	D.F.	Exception of D.F.		≥ 50 V	≤ 7.5 %	–	–	25 V	≤ 7.5 %	≤ 10 %	0603 ≥ 0.1μF, 0805 ≥ 0.33μF, 1206 ≥ 1μF	≤ 12.5 %	0402 ≥ 0.068μF	16 V (C < 1μF)	≤ 10 %	≤ 12.5 %	0402 ≥ 0.068μF	16 V (C ≥ 1μF)	≤ 12.5 %	–	–	10 V	≤ 15 %	–	–	≤ 6.3 V	≤ 30 %	–	–
	Rated Vol.	D.F.	Exception of D.F.																																																													
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	≤ 6.3 V	≤ 30 %	–		–																																																											

TEST PROCEDURES AND REQUIREMENTS			
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14) Humidity load (damp heat)	- Test temperature: $40 \pm 2^\circ\text{C}$. - Humidity: 90 ~ 95 % RH. - Test time: 500 + 24/- 0 hours. - To apply voltage: rated voltage (Max 500V). - Measurement to be made after keeping at room temperature for 24 ± 2 hours (Class I) or 48 ± 4 hours (Class II).	- No remarkable damage - Capacitance change: NP0: within $\pm 7.5\%$ or $\pm 0.75\text{ pF}$ whichever is larger. X7R, X5R: $\geq 10\text{V}$, within $\pm 12.5\%$ 6.3V, with $\pm 25\%$ Y5V: $\geq 10\text{V}$, within $\pm 30\%$ 6.3V, within $+30$ to -40% - Q/D.F. value: NP0: $\text{Cap} \geq 30\text{ pF}$: $Q \geq 200$ Cap < 30 pF: $Q \geq 100 + 10/3C$ X7R, X5R:	
		Rated Vol.	D.F.
		$\geq 50\text{ V}$	$\leq 3.0\%$
		25 V	$\leq 5.0\%$
		16 V	$\leq 5.0\%$
		10 V	$\leq 7.5\%$
		6.3 V	$\leq 15\%$
		Y5V:	
		Rated Vol.	D.F.
		$\geq 50\text{ V}$	$\leq 7.5\%$
		25 V	$\leq 7.5\%$
		16 V (C < 1 μF)	$\leq 10\%$
		16 V (C $\geq 1\mu\text{F}$)	$\leq 12.5\%$
		10 V	$\leq 15\%$
		6.3 V	$\leq 30\%$
		I.R.: $\geq 500\text{M}\Omega$ or $R \times C \geq 25\Omega\text{F}$ whichever is smaller	
15) High temperature load (endurance)	- Test temperature: NP0, X7R: $125 \pm 3^\circ\text{C}$ X5R, Y5V: $85 \pm 3^\circ\text{C}$. - To apply voltage: (1) 6.3V or C $\geq 10\mu\text{F}$ (for X7R, X5R): 150% of rated voltage. (2) 6.3V < V < 500V and C < 10μF (for X7R, X5R): 200% of rated voltage. (3) 500V: 150% of rated voltage. (4) V $\geq 630\text{V}$: 120% of rated voltage. (Max. 3600V) - Test time: 1000 + 24/- 0 hours. - Measurement to be made after keeping at room temperature for 24 ± 2 hours (Class I) or 48 ± 4 hours (Class II).	- No remarkable damage - Capacitance change: NP0: within $\pm 3.0\%$ or $\pm 0.3\text{ pF}$ whichever is larger. X7R, X5R: $\geq 10\text{V}$, within $\pm 12.5\%$ 6.3V, with $\pm 25\%$ Y5V: $\geq 10\text{V}$, within $\pm 30\%$ 6.3V, within $+30$ to -40% - Q/D.F. value: NP0: $\text{Cap} \geq 30\text{ pF}$: $Q \geq 350$ 10pF $\leq \text{Cap} < 30\text{ pF}$: $Q \geq 275 + 2.5C$ Cap < 10pF: $Q \geq 200 + 10C$ X7R, X5R:	
		Rated Vol.	D.F.
		$\geq 50\text{ V}$	$\leq 3.0\%$
		25 V	$\leq 5.0\%$
		16 V	$\leq 5.0\%$
		10 V	$\leq 7.5\%$
		6.3 V	$\leq 15\%$
		Y5V:	
		Rated Vol.	D.F.
		$\geq 50\text{ V}$	$\leq 7.5\%$
		25 V	$\leq 7.5\%$
		16 V (C < 1 μF)	$\leq 10\%$
		16 V (C $\geq 1\mu\text{F}$)	$\leq 12.5\%$
		$\leq 10\text{ V}$	$\leq 15\%$
		6.3 V	$\leq 30\%$
		I.R.: $\geq 1\text{G}\Omega$ or $R \times C \geq 50\Omega\text{F}$ whichever is smaller	