

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

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: 1.0 pF to 0.039 μ F

Tolerance on Capacitance:

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

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

Tolerance on Capacitance (cont):

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

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

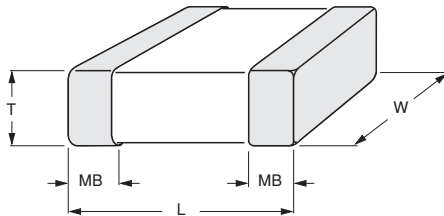
Temperature Coefficient: ± 30 ppm/ °C

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 \pm 0.002 [1.0 \pm 0.05]	0.020 \pm 0.002 [0.5 \pm 0.05]	0.022 [0.55]	0.010 + 0.002/- 0.004 [0.25 + 0.05/- 0.1]
0603	0.063 \pm 0.004 [1.6 \pm 0.10]	0.030 \pm 0.003 [0.8 \pm 0.07]	0.035 [0.87]	0.015 \pm 0.006 [0.40 \pm 0.15]
0805	0.080 \pm 0.006 [2.0 \pm 0.15]	0.050 \pm 0.004 [1.25 \pm 0.10]	0.053 [1.35]	0.020 \pm 0.008 [0.50 \pm 0.20]
1206	0.125 \pm 0.006 [3.2 \pm 0.15]	0.063 \pm 0.006 [1.6 \pm 0.15] 0.063 \pm 0.008 [1.6 \pm 0.20]	0.069 [1.8]	0.025 \pm 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	TECHNOLOGY
0402 0603 0805 1206	A = COG (NP0)	two significant digits followed by the number of zeros: 101 = 100 102 = 1000 152 = 1500 103 = 10000	B = ± 0.1 pF C = ± 0.25 pF D = ± 0.50 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 inches reel/paper P = 13 inches reel/paper T = 7 inches reel/blister R = 13 inches reel/blister	



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	SIZE	0402					0603					0805					1206				
CODE	VDC W	10V	16V	25V	50V	100V	10V	16V	25V	50V	100V	10V	16V	25V	50V	100V	10V	16V	25V	50V	100V
0R5	0.5 pF	N	N	N	N		S	S	S	S	S	A	A	A	A	A					
1R0	1.0	N	N	N	N		S	S	S	S	S	A	A	A	A	A					
1R2	1.2	N	N	N	N		S	S	S	S	S	A	A	A	A	A					
1R5	1.5	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		S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
2R2	2.2	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		S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
3R3	3.3	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		S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
4R7	4.7	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		S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
6R8	6.8	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		S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
100	10 pF	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		S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
150	15	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		S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
220	22	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		S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
330	33	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		S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
470	47	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		S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
680	68	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		S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
101	100 pF	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		S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
151	150	N	N	N	N		S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
181	180	N	N	N			S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
221	220	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			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			
153	0.015																D	D			
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																				



PACKAGING QUANTITIES				
THICKNESS CLASSIFICATION (mm)	AMOUNT PER REEL			
	Δ180 mm; 7 inch			
	0402	0603	0805	1206
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
G = 1.60 ± 0.2	-	-	-	Plastic 2 Kp/Reel
S = 0.8 ± 0.07	-	Paper 4 Kp/Reel	-	-
N = 0.50 ± 0.05	Paper 10 Kp/Reel	-	-	-
K = 2.00 ± 0.2	-	-	-	-
M = 2.5 ± 0.30	-	-	-	-

PACKAGING QUANTITIES				
THICKNESS CLASSIFICATION (mm)	AMOUNT PER REEL			
	Δ330 mm; 13 inch			
	0402	0603	0805	1206
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
G = 1.60 ± 0.2	-	-	-	-
S = 0.8 ± 0.07	-	Paper 15 Kp/Reel	-	-
N = 0.50 ± 0.05	Paper 50 Kp/Reel	-	-	-
K = 2.00 ± 0.2	-	-	-	-
M = 2.5 ± 0.30	-	-	-	-

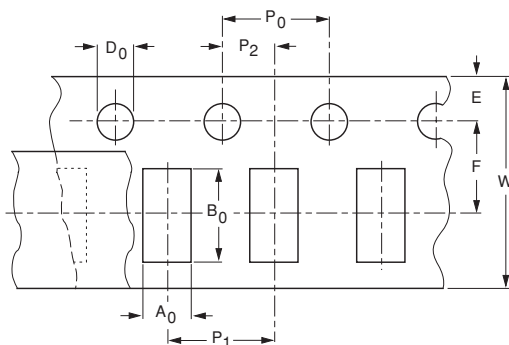
COVER TAPE (POLYESTER - ANTISTATIC)

PROPERTIES OF COVER TAPE	
PARAMETER	WIDTH
Breaking force	≥ 10.7 N
Elongation at break	≥ 63 %
Surface resistance	< 10 ¹⁰ Ω /sq.
Softening point	71 ± 5 °C
Thickness	62 μm

CARRIER TAPE (POLYCARBONATE)

PROPERTIES OF CARRIER TAPE	
PARAMETER	WIDTH
Thickness	190 to 280 μm
Tensile strength at break	> 60 N/mm ²
Elongation at break	100 to 150 %
Surface resistance	> 10 ¹² Ω /sq.

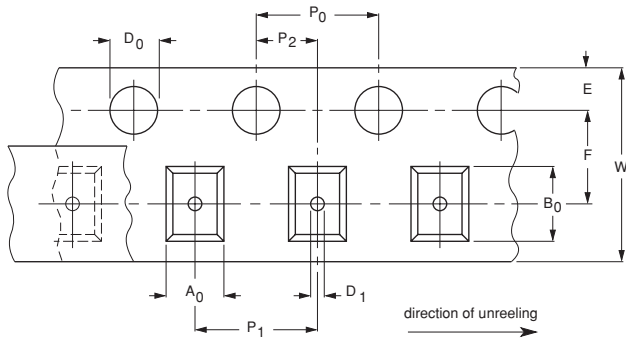
PAPER TAPE SPECIFICATIONS



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	± 0.15
B ₀	1.12	± 0.05	1.82	± 0.05	2.30	± 0.10	3.50	± 0.15
W	8.00	± 0.10	8.00	± 0.10	8.00	± 0.10	8.00	± 0.10
E	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
D ₀	1.55	± 0.05	1.55	± 0.05	1.55	± 0.05	1.55	± 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



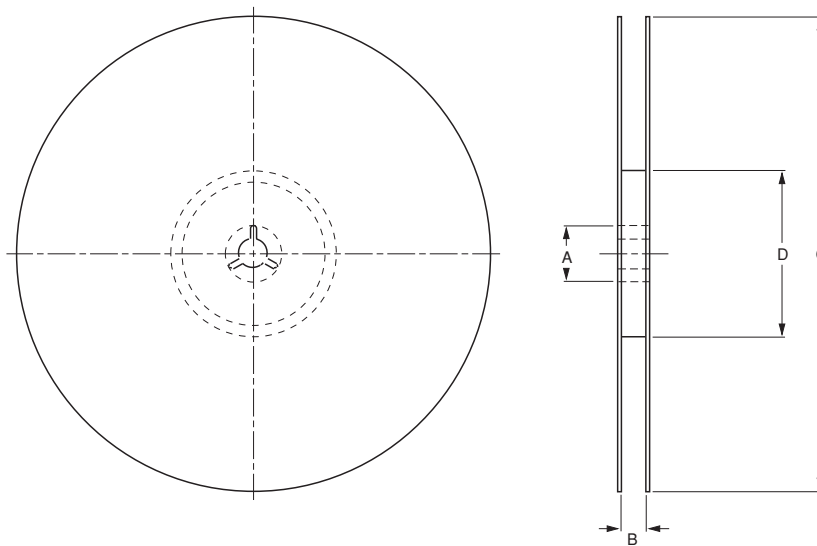
BLISTER TAPE SPECIFICATIONS



DIMENSIONS OF BLISTER TAPE in millimeters

DIMENSION	PRODUCT		TOLERANCE
	0805	1206	
A ₀	< 1.55	< 2.00	-
B ₀	< 2.45	< 3.60	-
W	8.00	8.00	± 0.20
E	1.75	1.75	± 0.10
F	3.50	3.50	± 0.05
D ₀	1.50	1.50	+ 0.10/ - 0
D ₁	1.00	1.00	± 0.10
P ₀	4.00	4.00	± 0.05
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	
	∅ 180 mm; 7 inch	∅ 330 mm; 13 inch
A	13.0 ± 1.0	13.0 ± 0.5
B	9.0 ± 1.0	9.0 ± 0.5
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

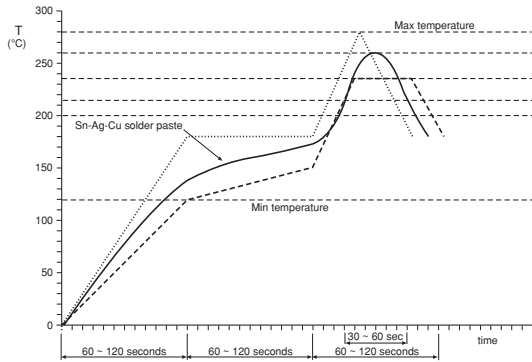
For normal use the capacitors may be mounted on printed-circuit boards or ceramic substrates by applying wave soldering and reflow soldering.

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.

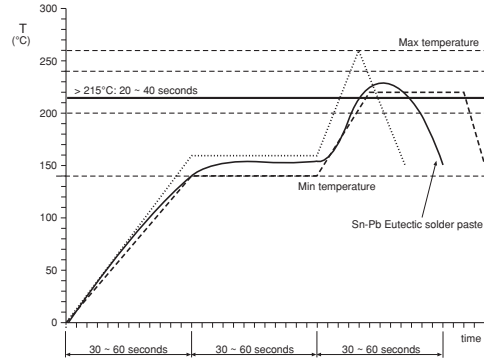


SOLDERING GRAPHS

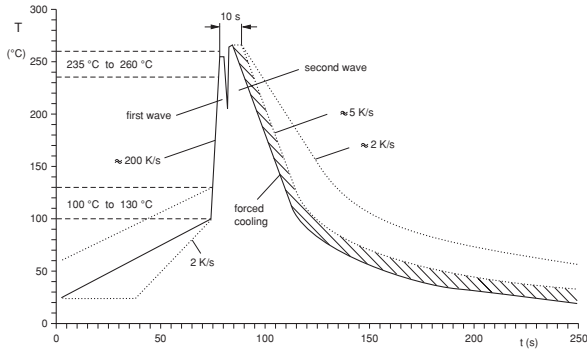
IR REFLOW WITH SnAgCu SOLDERING



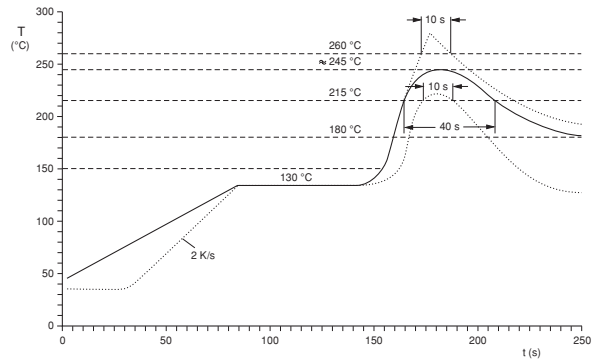
IR REFLOW WITH SnPb SOLDER



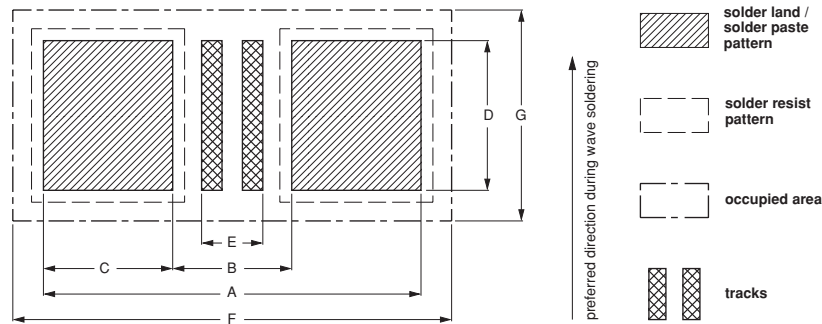
WAVE SOLDERING



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

TESTS AND REQUIREMENTS

TEST PROCEDURES AND REQUIREMENTS		
TEST	PROCEDURE	REQUIREMENTS
Visual and mechanical		no visible damage dimensions in accordance with specification
Capacitance	$C \leq 1000 \text{ pF}$, $1.0 \pm 0.2 V_{\text{rms}}$; $f = 1 \text{ MHz} \pm 10 \%$ $C > 1000 \text{ pF}$, $1.0 \pm 0.2 V_{\text{rms}}$; $f = 1 \text{ kHz} \pm 10 \%$	shall not exceed the limits given in the detailed specification
Q value	$C \leq 1000 \text{ pF}$, $1.0 \pm 0.2 V_{\text{rms}}$; $f = 1 \text{ MHz} \pm 10 \%$ $C > 1000 \text{ pF}$, $1.0 \pm 0.2 V_{\text{rms}}$; $f = 1 \text{ kHz} \pm 10 \%$	$\geq 30 \text{ pF}$: $Q \geq 1000$ $< 30 \text{ pF}$: $Q \geq 400 + 20C$
Dielectric strength	250 % of rated voltage for 1 to 5 seconds, charge and discharge current less than 50 mA	no visible damage or flash-over during test
Insulation resistance	at U_R (DC) for maximum 120 seconds	10 GΩ minimum or 500ΩF minimum, whichever is less
Temperature coefficient	with no electrical load: - 55 to 125 °C at $T_{\text{amb}} = 25 \text{ °C}$	± 30 ppm/°C
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 second measurement after 24 ± 2 hours at room temperature	no visible damage $\Delta C/C: \pm 5.0$ maximum or ± 0.5 pF maximum, whichever is greater this capacitance change means the change of capacitance under specified flexure of substrate from the capacitance measured before the test
Solderability	230 ± 5 °C for 2 ± 0.5 seconds; Solder: SN63A	95 % minimum coverage of entire metallized area



TEST PROCEDURES AND REQUIREMENTS		
TEST	PROCEDURE	REQUIREMENTS
Resistance to soldering heat	260 ± 5 °C for 10 ± 1 second; Solder: SN63A; Measurement after 24 ± 2 hours at room temperature Preheating: 120 to 150 °C for 1 minute before immerse the capacitor in a eutectic solder.	no visible damage $\Delta C/C$: ± 2.5 % maximum or ± 0.25 pF maximum, whichever is greater DF, R_{ins} and dielectric strength to meet initial requirements
Temperature cycle	– 55 to 125 °C; 5 cycles in the following sequence: – 55 °C – 3/+ 0 for 30 ± 3 minutes; Room temperature for 2 to 3 minutes; 125 °C + 3/– 0 for 30 ± 3 minutes; Room temperature for 2 to 3 minutes Measurement after 24 ± 2 hours at room temperature	no visible damage $\Delta C/C$: ± 2.5 % maximum or ± 0.25 pF maximum, whichever is greater DF, R_{ins} and dielectric strength to meet initial requirements
Humidity test (damp heat steady state)	40 ± 2 °C; 90 to 95 % RH for 500 + 24/– 0 hours U_R applied; Measurement after 24 ± 2 hours at room temperature	no visual damage $\Delta C/C$: ± 5.0 % maximum or ± 0.5 pF maximum, whichever is greater Q: ≥ 30 pF, Q ≥ 350 10 pF ≤ C < 30 pF, Q ≥ 275 + 2.5C < 10 pF, Q ≥ 200 + 10C R_{ins} : 1 GΩ minimum or 50 ΩF minimum, whichever is less
Humidity load (damp heat)	40 ± 2 °C; 90 to 95 % RH for 500 + 24/– 0 hours U_R applied; Measurement after 24 ± 2 hours at room temperature	no visual damage $\Delta C/C$: 7.5 % maximum or ± 0.75 pF maximum, whichever is greater Q: ≥ 30 pF, Q ≥ 200 C < 30 pF, Q ≥ 100 + 10/3C R_{ins} : 500 MΩ minimum or 25 ΩF minimum, whichever is less
Adhesive strength of termination	Pressurizing force 5 N (≤ 0603) and 10 N (> 0603) Test time 10 ± 1 second	no visible damage
Vibration resistance	Frequency: 10 to 55 Hz/minute; Total amplitude: 1.5 mm Test time: 6 hours (2 hours each in 3 mutually perpendicular directions)	no visible damage or removal of the terminations Capacitance change and DF: to meet initial requirements
High temperature load (endurance)	Test temperature: 125 ± 3 °C; 200 % of rated voltage for 1000 + 24/– 0 hours; Measurement after 24 ± 2 hours at room temperature	no visual damage $\Delta C/C$: ± 3 % maximum or 0.3 pF maximum, whichever is greater Q: ≥ 30 pF, Q ≥ 350 10 pF ≤ C < 30 pF, Q ≥ 275 + 2.5C C < 10 pF, Q ≥ 200 + 10C R_{ins} : 1 GΩ minimum or 50 ΩF minimum, whichever is less