

**Surface Mount Multilayer Chip Capacitors****FEATURES**

- Stable class 2 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: 100 pF to 1.0 μ F

Tolerance on Capacitance:

After 1000 hours; $\pm 5\%$; $\pm 10\%$; $\pm 20\%$

Tan δ :

50 V $\leq 2.5 \%$

25 V and 16 V $\leq 3.5 \%$

10 V $\leq 5 \%$

Temperature Coefficient: $\pm 15 \%$

Insulation Resistance after 120 seconds at U_R (DC):

R_{ins} 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 $\pm$ 0.05/- 0.1]
	0603	$0.063 + 0.006/- 0.004$ [1.6 $\pm$ 0.15/- 0.10]	$0.030 + 0.006/- 0.004$ [0.8 $\pm$ 0.15/- 0.10]	0.036 [0.95]	0.015 ± 0.006 [0.40 $\pm$ 0.15]
	0805	0.080 ± 0.006 [2.0 $\pm$ 0.15]	0.050 ± 0.006 [1.25 $\pm$ 0.15]	0.053 [1.35]	0.020 ± 0.008 [0.50 $\pm$ 0.20]
	1206	0.125 ± 0.006 [3.2 $\pm$ 0.15]	0.063 ± 0.006 [1.6 $\pm$ 0.15]	0.069 [1.80]	0.025 ± 0.008 [0.60 $\pm$ 0.20]

ORDERING INFORMATION

VJ0402	Y	101	J	X	Q	C	W1BC
SIZE CODE	DIELECTRIC	CAPACITANCE	TOLERANCE	TERMINATION	VOLTAGE	PACKAGING	TECHNOLOGY
0402 0603 0805 1206	Y = X7R	two significant digits followed by the number of zeros: 101 = 100 102 = 1000 152 = 1500 103 = 10000	J = $\pm 5 \%$ K = $\pm 10 \%$ M = $\pm 20 \%$	X = Ni Barrier	Q = 10 V J = 16 V X = 25 V A = 50 V B = 100 V	C = 7 inch reel/paper P = 13 inch reel/paper T = 7 inch reel/blister R = 13 inch reel/blister	

Class 2 X7R 10/16/25/50/100 V

Vishay BCcomponents Surface Mount Multilayer Chip Capacitors



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

DIELECTRIC		X7R																			
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
101	100 pF	N	N	N	N		S	S	S	S	S	B	B	B	B	B					
121	120	N	N	N	N		S	S	S	S	S	B	B	B	B	B					
151	150	N	N	N	N		S	S	S	S	S	B	B	B	B	B	B*	B*	B*	B*	B*
181	180	N	N	N	N		S	S	S	S	S	B	B	B	B	B	B*	B*	B*	B*	B*
221	220	N	N	N	N		S	S	S	S	S	B	B	B	B	B	B*	B*	B*	B*	B*
271	270	N	N	N	N		S	S	S	S	S	B	B	B	B	B	B*	B*	B*	B*	B*
331	330	N	N	N	N		S	S	S	S	S	B	B	B	B	B	B*	B*	B*	B*	B*
391	390	N	N	N	N		S	S	S	S	S	B	B	B	B	B	B*	B*	B*	B*	B*
471	470	N	N	N	N		S	S	S	S	S	B	B	B	B	B	B*	B*	B*	B*	B*
561	560	N	N	N	N		S	S	S	S	S	B	B	B	B	B	B*	B*	B*	B*	B*
681	680	N	N	N	N		S	S	S	S	S	B	B	B	B	B	B*	B*	B*	B*	B*
821	820	N	N	N	N		S	S	S	S	S	B	B	B	B	B	B	B	B	B	B
102	1000 pF	N	N	N	N		S	S	S	S	S	B	B	B	B	B	B	B	B	B	B
122	1200	N	N	N	N		S	S	S	S	S	B	B	B	B	B	B	B	B	B	B
152	1500	N	N	N	N		S	S	S	S	S	B	B	B	B	B	B	B	B	B	B
182	1800	N	N	N	N		S	S	S	S	S	B	B	B	B	B	B	B	B	B	B
222	2200	N	N	N	N		S	S	S	S	S	B	B	B	B	B	B	B	B	B	B
272	2700	N	N	N	N		S	S	S	S	S	B	B	B	B	B	B	B	B	B	B
332	3300	N	N	N	N		S	S	S	S	S	B	B	B	B	B	B	B	B	B	B
392	3900	N	N	N	N		S	S	S	S	S	B	B	B	B	B	B	B	B	B	B
472	4700	N	N	N	N		S	S	S	S	S	B	B	B	B	B	B	B	B	B	B
562	5600	N	N	N			S	S	S	S	S	B	B	B	B	B	B	B	B	B	B
682	6800	N	N	N			S	S	S	S	S	B	B	B	B	B	B	B	B	B	B
822	8200	N	N	N			S	S	S	S	S	B	B	B	B	B	B	B	B	B	B
103	0.01 μF	N	N	N			S	S	S	S	S	B	B	B	B	B	B	B	B	B	B
123	0.012	N	N				S	S	S	S		B	B	B	B	B	B	B	B	B	B
153	0.015	N	N				S	S	S	S		B	B	B	B	B	B	B	B	B	B
183	0.018	N	N				S	S	S	S		B	B	B	B	B	B	B	B	B	B
223	0.022	N	N				S	S	S	S		B	B	B	B	B	B	B	B	B	B
273	0.027	N					S	S	S	S		B	B	B	B	D	B	B	B	B	B
333	0.033	N					S	S	S	X		B	B	B	B	D	B	B	B	B	B
393	0.039	N					S	S	S	X		B	B	B	B		B	B	B	B	B
473	0.047	N					S	S	S	X		B	B	B	B		B	B	B	B	B
563	0.056						S	S	S	X		B	B	B	B		B	B	B	B	B
683	0.068						S	S	S	X		B	B	B	B		B	B	B	B	B
823	0.082						S	S	X	X		B	B	B	D		B	B	B	B	D
104	0.1 μF						S	S	X	X		B	B	B	D		B	B	B	B	D
124	0.12						S					B	B	B	D		B	B	B	B	
154	0.15						S					D	D	D	D		C	C	C	C	
184	0.18						S					D	D	D			C	C	C	C	
224	0.22						S					D	D	D			C	C	C	C	
274	0.27											D	D	D			C	C	C		
334	0.33											D	D	D			C	C	C		
394	0.39											D	D				C	C			
474	0.47											D	D				D	D			
564	0.56											D	D				D	D			
684	0.68											D					D	D			
824	0.82											D					D	D			
105	1 μF											D					D	D			

Note

- * Items are made by NME (Nobel Metal Electrode)

**PACKAGING QUANTITIES**

THICKNESS CLASSIFICATION (mm)	AMOUNT PER REEL			
	$\Delta 180 \text{ mm; } 7 \text{ inch}$			
	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	-	-
X = $0.8 +0.15/-0.10$	-	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

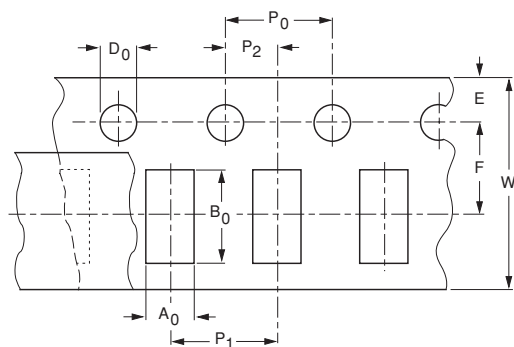
THICKNESS CLASSIFICATION (mm)	AMOUNT PER REEL			
	$\Delta 330 \text{ mm; } 13 \text{ inch}$			
	0402	0603	0805	1206
A = 0.6 ± 0.1	-	-	Paper 15 Kp/Reel	-
B = 0.8 ± 0.1	-	-	Paper 15 Kp/Reel	Paper 15 Kp/Reel
C = 0.95 ± 0.1	-	-	-	Plastic 10 Kp/Reel
D = 1.25 ± 0.1	-	-	Plastic 10 Kp/Reel	Plastic 10 Kp/Reel
G = 1.60 ± 0.2	-	-	-	-
S = 0.8 ± 0.07	-	Paper 15 Kp/Reel	-	-
X = $0.8 +0.15/-0.10$	-	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
	$5.5 \pm 0.1 \text{ mm}$
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	$62 \mu\text{m}$

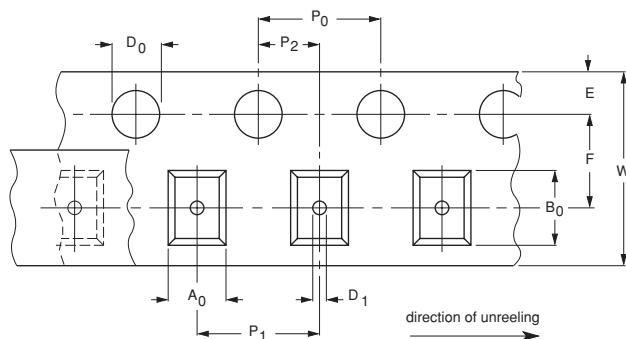
CARRIER TAPE (POLYCARBONATE)

PROPERTIES OF CARRIER TAPE	
PARAMETER	WIDTH
	$8.1 \pm 0.2 \text{ mm}$
Thickness	$190 \text{ to } 280 \mu\text{m}$
Tensile strength at break	$> 60 \text{ N/mm}^2$
Elongation at break	$100 \text{ to } 150 \%$
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	± 0.15
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

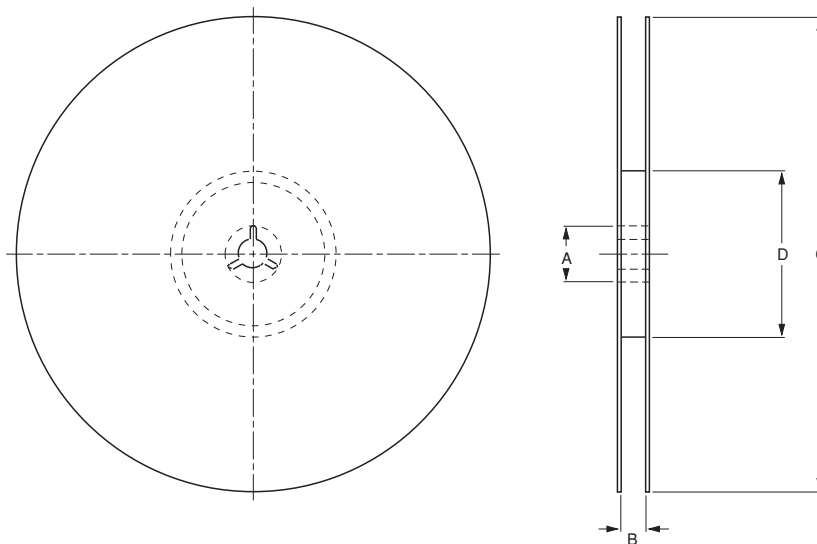
BLISTER TAPE SPECIFICATIONS



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

	Ø180 mm; 7 inch	Ø330 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

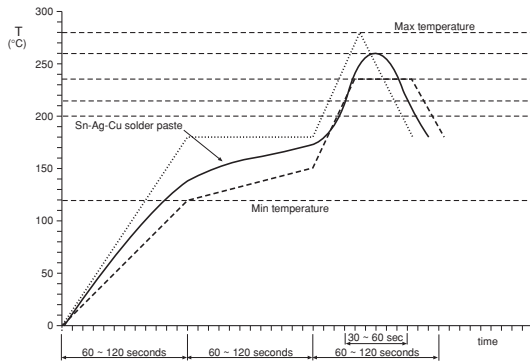
For normal use the capacitors may be mounted on printed-circuit boards or ceramic substrates by applying wave soldering and reflow soldering.

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.

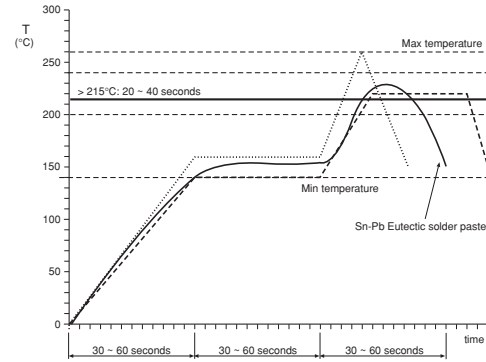


SOLDERING GRAPHS

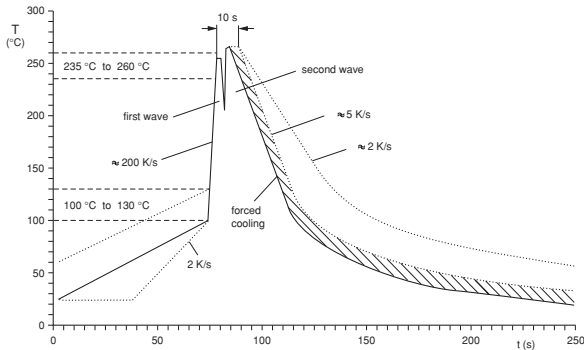
IR REFLOW WITH SnAgCu SOLDER



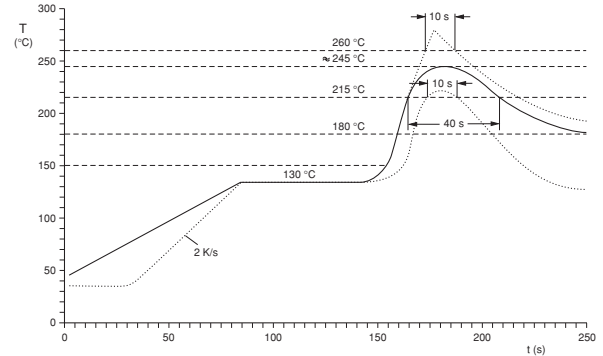
IR REFLOW WITH SnPb SOLDER



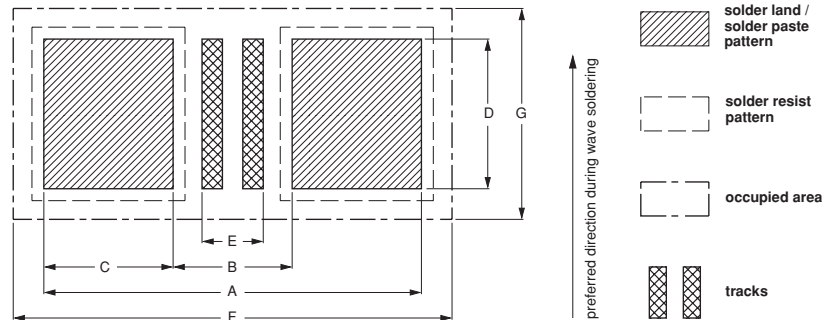
WAVE SOLDERING



REFLOW SOLDERING



RECOMMENDED DIMENSIONS OF SOLDER LANDS in millimeters





REFLOW SOLDERING								
SIZE CODE	FOOTPRINT DIMENSIONS in mm							PLACEMENT ACCURACY
	A	B	C	D	E	F	G	
0402	1.50	0.50	0.50	0.50	0.10	1.75	0.95	± 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							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	± 0.10
0805	3.20	1.40	0.90	1.30	0.36	4.10	2.50	± 0.15
1206	4.80	2.30	1.25	1.70	1.25	5.90	3.20	± 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	$C \leq 10 \mu\text{F}$; $1.0 \pm 0.2 \text{ Vrms}$; $1 \text{ kHz} \pm 10 \%$ $C > 10 \mu\text{F}$; $0.5 \pm 0.2 \text{ Vrms}$; $120\text{Hz} \pm 20 \%$	shall not exceed the limits given in the detailed specification
Dissipation factor	$C \leq 10 \mu\text{F}$; $1.0 \pm 0.2 \text{ Vrms}$; $1 \text{ kHz} \pm 10 \%$ $C > 10 \mu\text{F}$; $0.5 \pm 0.2 \text{ Vrms}$; $120\text{Hz} \pm 20 \%$	$\leq 2.5 \%$ UR: 50 V $\leq 3.5 \%$ UR: 25 V, 16 V $\leq 5.0 \%$ UR: 10 V
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 UR (DC) for max. 120 seconds	10 G Ω minimum or 500 ΩF minimum, whichever is less
Temperature coefficient	with no electrical load: – 55 to 125 °C at $T_{\text{amb}} = 25 \text{ °C}$	within ± 15 %
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 $\Delta C/C: \leq \pm 12.5 \%$ this capacitance change means the change of capacitance under specified flexure of substrate from the capacitance measured before the test



TEST PROCEDURES AND REQUIREMENTS		
TEST	PROCEDURE	REQUIREMENTS
Solderability	230 ± 5 °C for 2 ± 0.5 seconds; Solder: SN63A	95 % minimum coverage of entire metallized area
Resistance to soldering heat	Solder temperature: 260 ± 5 °C Dipping time: 10 ± 1 seconds Solder: SN63A Before initial measurement: Perform 150 + 0/-10 °C for 1 hour and then set for 48 ± 4 hours at room temperature. Preheating: 120 to 150 °C for 1 minute before immerse the capacitor in a eutectic solder. Measurement to be made after 48 ± 4 hrs at room temperature	no visible damage $\Delta C/C: \leq \pm 7.5 \%$ DF, R_{ins} and dielectric strength to meet initial requirements
Temperature cycle	Test temperature – 55 to 85 °C: – 55 °C – 3/+ 0 °C for 30 ± 3 minutes; Room temperature for 2 to 3 minutes; X5R: 85 °C + 3/- 0 °C for 30 ± 3 minutes; Room temperature for 2 to 3 minutes Measurement to be made after 48 ± 4 hours at room temperature	no visible damage $\Delta C/C: \leq \pm 7.5 \%$ DF, R_{ins} and dielectric strength to meet initial requirements
Humidity test (damp heat steady state)	Test temperature: 40 ± 2 °C Humidity: 90 to 95 % RH Test time: 500 + 24/- 0 hours Measurement to be made after 48 ± 4 hours at room temperature	no visual damage $\Delta C/C: \leq \pm 12.5 \%$ DF: $\leq 3.0 \%$ UR: 50 V $\leq 5.0 \%$ UR: 25 V, 16 V $\leq 7.5 \%$ UR: 10 V R_{ins} : 1 G Ω minimum or 50 Ω F minimum, whichever is less
Humidity load (damp heat)	Test temperature: 40 ± 2 °C Humidity: 90 to 95 % RH Test time: 500 + 24/- 0 hours To apply voltage: rated voltage Measurement to be made after 48 ± 2 hours at room temperature	no visual damage $\Delta C/C: \leq \pm 12.5 \%$ DF: $\leq 3.0 \%$ UR: 50 V $\leq 5.0 \%$ UR: 25 V, 16 V $\leq 7.5 \%$ UR: 10 V R_{ins} : 500 M Ω minimum or 25 Ω F minimum, whichever is less
Adhesive strength of termination	Pressurizing force 5 N ($\leq$ 0603) and 10 N ($>$ 0603) Test time 10 ± 1 second	no visible damage
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 visible damage or removal of the terminations
High temperature load (endurance)	Test temperature: 125 ± 3 °C; To apply voltage: 200 % of rated voltage Test time 1000 + 24/- 0 hours; Measurement after 48 ± 4 hours at room temperature	no visual damage $\Delta C/C: \leq \pm 12.5 \%$ DF: $\leq 3.0 \%$ UR: 50 V $\leq 5.0 \%$ UR: 25 V, 16 V $\leq 7.5 \%$ UR: 10 V R_{ins} : 1 G Ω minimum or 50 Ω F minimum, whichever is less