



Surface Mount Multilayer Chip Capacitors



FEATURES

- Class 2 dielectric
- Four standard sizes
- High capacitance per unit volume
- Supplied in tape and reel
- Ni-barrier with 100 % tin terminations

APPLICATIONS

- Consumer electronics
- Telecommunications
- Mobile application
- 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): 6.3 V; 10 V

Capacitance Range: 47 nF to 10 μ F

Tolerance on Capacitance:

After 1000 hours; ± 10 , ± 20

Tan δ :

6.3 V ≤ 7.5 %

10 V ≤ 5 %

Temperature Coefficient: ± 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]	0.020 ± 0.002 [0.5 $\pm$ 0.05]	$0.010 + 0.002/- 0.004$ [0.25 + 0.05/- 0.1]
	0603	$0.063 + 0.006/- 0.004$ [1.6 + 0.15/- 0.10]	$0.030 + 0.006/- 0.004$ [0.8 + 0.15/- 0.10]	$0.030 + 0.006/- 0.004$ [0.8 + 0.15/- 0.10]	0.015 ± 0.006 [0.40 $\pm$ 0.15]
	0805	0.080 ± 0.008 [2.0 $\pm$ 0.20]	0.050 ± 0.006 [1.25 $\pm$ 0.15]	0.050 ± 0.006 [1.25 $\pm$ 0.15]	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]	$0.063 + 0.012/- 0.004$ [1.6 + 0.30/- 0.10] 0.046 ± 0.006 [1.15 $\pm$ 0.15]	0.025 ± 0.008 [0.60 $\pm$ 0.20]

ORDERING INFORMATION

VJ0402	G	104	K	X	Q	C	W1BC
SIZE CODE	DIELECTRIC	CAPACITANCE	TOLERANCE	TERMINATION	VOLTAGE	PACKAGING	TECHNOLOGY
0402 0603 0805 1206	G = X5R	two significant digits followed by the number of zeros: 104 = 100000	K = ± 10 % M = ± 20 %	X = Ni Barrier	Y = 6.3 V Q = 10 V	C = 7 inch reel/paper P = 13 inch reel/paper T = 7 inch reel/blister R = 13 inch reel/blister	

SELECTION CHART FOR 6.3/10/16/25 AND 50 V

DIELECTRIC		X5R																			
EIA CAP	SIZE	0402					0603					0805					1206				
CODE	VDC W	6.3 V	10 V	16 V	25 V	50 V	6.3 V	10 V	16 V	25 V	50 V	6.3 V	10 V	16 V	25 V	50 V	6.3 V	10 V	16 V	25 V	50 V
473	0.047																				
563	0.056		N																		
683	0.068		N																		
823	0.082		N																		
104	0.1 μ F		N																		
124	0.12																				
154	0.15																				
184	0.18																				
224	0.22																				
274	0.27							X													
334	0.33							X													
394	0.39							X													
474	0.47						X	X													
564	0.56						X														
684	0.68						X														
824	0.82						X														
105	1 μ F						X														
225	2.2											I	I					J			
335	3.3											I						P			
475	4.7											I						P	P		
685	6.8																	P			
106	10 μ F																	P			
226	22																				
476	47																				
107	100 μ F																				

PACKAGING QUANTITIES

THICKNESS CLASSIFICATION (mm)		WIDTH AMOUNT PER REEL			
		Δ 180 mm; 7 inch			
		0402	0603	0805	1206
N =	0.50 $\pm$ 0.05	Paper 10 Kp/Reel	-	-	-
X =	0.80 $\pm$ 0.15/ - 0.1	-	Paper 4 Kp/Reel	-	-
I =	1.25 $\pm$ 0.2	-	-	Plastic 3 Kp/Reel	-
J =	1.15 $\pm$ 0.15	-	-	-	Plastic 3 Kp/Reel
P =	1.60 $\pm$ 0.3/ - 0.1	-	-	-	Plastic 2 Kp/Reel

PACKAGING QUANTITIES

THICKNESS CLASSIFICATION (mm)		WIDTH AMOUNT PER REEL			
		Δ 330 mm; 13 inch			
		0402	0603	0805	1206
N =	0.50 $\pm$ 0.05	Paper 50 Kp/Reel	-	-	-
X =	0.80 $\pm$ 0.15/ - 0.1	-	Paper 15 Kp/Reel	-	-
I =	1.25 $\pm$ 0.2	-	-	Plastic 10 Kp/Reel	-
J =	1.15 $\pm$ 0.15	-	-	-	Plastic 10 Kp/Reel
P =	1.60 $\pm$ 0.3/ - 0.1	-	-	-	-

COVER TAPE (POLYESTER - ANTISTATIC)

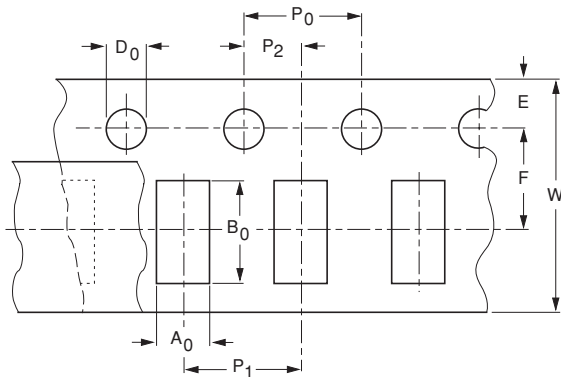
PROPERTIES OF COVER TAPE	
PARAMETER	WIDTH 5.5 $\pm$ 0.1 mm
Breaking force	$\geq$ 10.7 N
Elongation at break	$\geq$ 63 %
Surface resistance	$< 10^{10} \Omega$ /sq.
Softening point	71 $\pm$ 5 $^{\circ}$ C
Thickness	62 μ m

CARRIER TAPE (POLYCARBONATE)

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

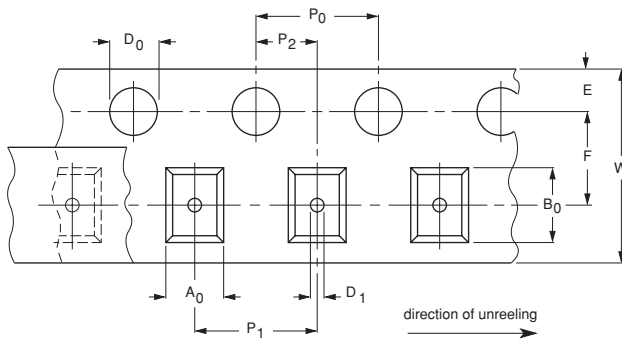


PAPER TAPE SPECIFICATIONS



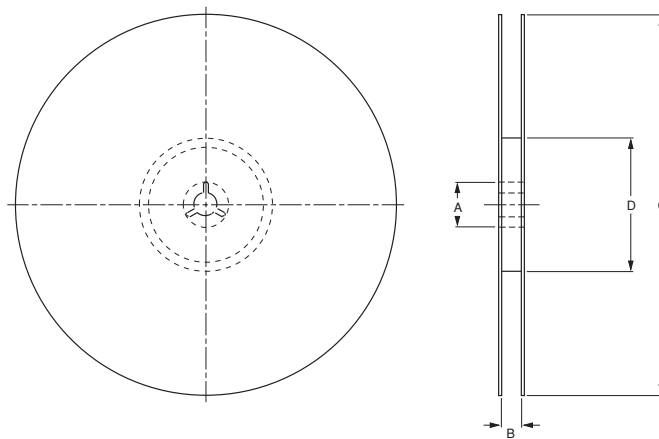
DIMENSIONS OF PAPER TAPE in millimeters								
SYMBOL	PRODUCT SIZE CODE							
	0402		0603		0805		1206	
	SIZE	TOL.	SIZE	TOL.	SIZE	TOL.	SIZE	TOL.
A_0	0.62	± 0.05	1.02	± 0.05	1.50	± 0.10	2.00	± 0.15
B_0	1.12	± 0.05	1.82	± 0.05	2.30	± 0.10	3.50	± 0.15
W	8.00	± 0.10	8.00	± 0.10	8.00	± 0.10	8.00	± 0.10
E	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		
	$\varnothing 180 \text{ mm}; 7 \text{ inch}$	$\varnothing 330 \text{ mm}; 13 \text{ inch}$
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

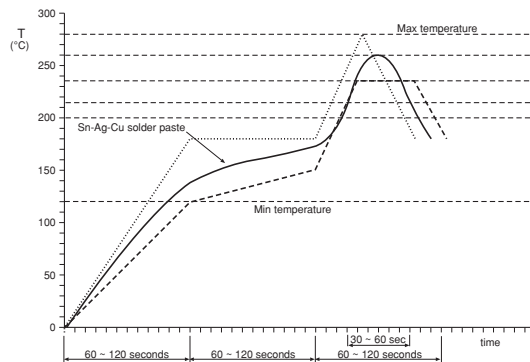
METHOD OF MOUNTING AND DIMENSIONS OF SOLDER LANDS

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

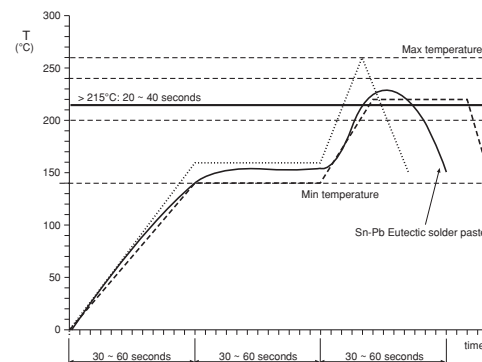
An improper combination of soldering, substrate and chip size can lead to a damaging of the component. The risk increases with the chip size and with temperature fluctuations ($> 100\text{ }^{\circ}\text{C}$) Therefore, it is advised to use the smallest possible size and follow the dimensional recommendations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

SOLDERING GRAPHS

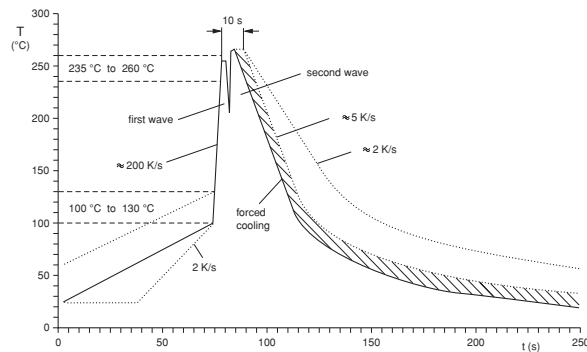
IR REFLOW WITH SnAgCu SOLDER



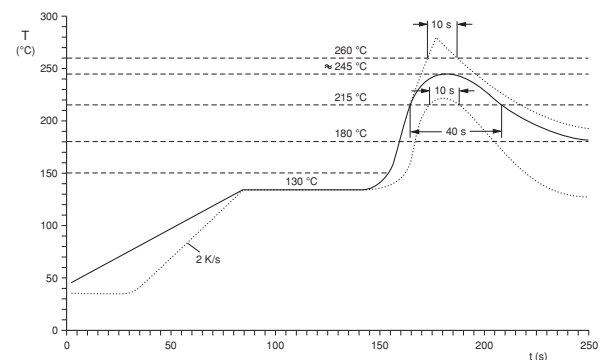
IR REFLOW WITH SnPb SOLDER



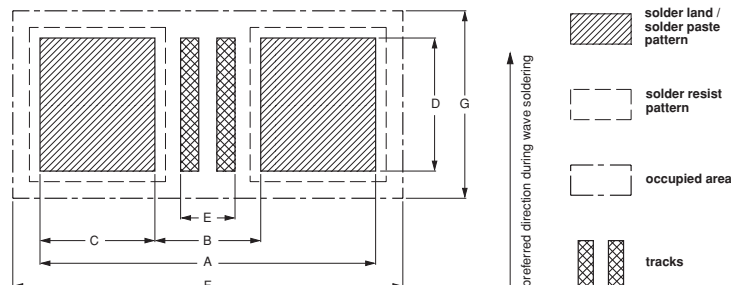
WAVE SOLDERING



REFLOW SOLDERING



RECOMMENDED DIMENSIONS OF SOLDER LANDS in millimeters



**REFLOW SOLDERING**

SIZE CODE	FOOTPRINT DIMENSIONS in mm							PROCESSING REMARKS	PLACEMENT ACCURACY
	A	B	C	D	E	F	G		
0402	1.50	0.50	0.50	0.50	0.100	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	1.250	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 remarkable defect dimensions to conform to individual specification sheet
Capacitance	$C \leq 10 \mu\text{F}$; $1.0 \pm 0.2 \text{ Vrms}$; $1 \text{ kHz} \pm 10 \%$ $C > 10 \mu\text{F}$; $0.5 \pm 0.2 \text{ Vrms}$; $120 \text{ kHz} \pm 20 \%$	shall not exceed the limits given in the detailed specification
Dissipation factor	$C \leq 10 \mu\text{F}$; $1.0 \pm 0.2 \text{ Vrms}$; $1 \text{ kHz} \pm 10 \%$ $C > 10 \mu\text{F}$; $0.5 \pm 0.2 \text{ Vrms}$; $120 \text{ kHz} \pm 20 \%$	$\leq 5.0 \%$ Rated voltage: 10 V $\leq 7.5 \%$ Rated voltage: 6.3 V
Dielectric strength	To apply voltage ($\leq 50 \text{ V}$): 250 % of rated voltage for 1 ~ 5 seconds Charge and discharge current less than 50 mA	no evidence of damage or flash-over during test
Insulation resistance	to apply rated voltage for max. 120 seconds	10 G Ω minimum or 500 ΩF minimum, whichever is less
Temperature coefficient	with no electrical load: – 55 to 85 °C at 25 °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 to be made after 24 ± 2 hours at room temperature	no remarkable damage Capacitance change: $\leq \pm 12.5 \%$ 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	Solder temperature: 230 ± 5 °C Dipping time: 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 $150 \pm 0/-10$ °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 hours at room temperature	no remarkable damage Capacitance change: $< \pm 7.5$ % DF value and I.R: to meet initial requirements Dielectric strength: no defect
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 + $3/-0$ for 30 ± 3 minutes; Room temperature for 2 to 3 minutes Measurement to be made after 48 ± 4 hours at room temperature	no remarkable damage Capacitance change: $< \pm 7.5$ % DF value and I.R: to meet initial requirements
Humidity test (damp heat steady state)	Test temperature: 40 ± 2 °C Humidity: 90 to 95 % RH Test time: $500 \pm 24/-0$ hours Measurement to be made after 48 ± 4 hours at room temperature	no remarkable damage Capacitance change: $< \pm 12.5$ % DF: ≤ 7.5 % Rated voltage: 10 V [except 0402 ≥ 0.056 μ F, 0603 ≥ 0.33 μ F 0805 ≥ 2.2 μ F, 1206 ≥ 2.2 μ F, DF ≤ 15 %] ≤ 15 % Rated voltage: 6.3 V I.R: 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: $500 \pm 24/-0$ hours To apply voltage: rated voltage Measurement to be made after 48 ± 2 hours at room temperature	no remarkable damage Capacitance change: $< \pm 12.5$ % DF: ≤ 7.5 % Rated voltage: 10 V [except 0402 ≥ 0.056 μ F, 0603 ≥ 0.33 μ F 0805 ≥ 2.2 μ F, 1206 ≥ 2.2 μ F, DF ≤ 15 %] ≤ 15 % Rated voltage: 6.3 V I.R: 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 remarkable damage or removal of the terminations
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 DF: to meet initial requirements
High temperature load (endurance)	Test Temperature: 85 ± 3 °C To apply voltage: 200 % of rated voltage Test time: $1000 \pm 24/-0$ hours; Measurement to be made after 48 ± 4 hours at room temperature	no remarkable damage Capacitance change: $< \pm 12.5$ % DF: ≤ 7.5 % Rated voltage: 10 V [except 0402 ≥ 0.056 μ F, 0603 ≥ 0.33 μ F 0805 ≥ 2.2 μ F, 1206 ≥ 2.2 μ F, DF ≤ 15 %] ≤ 15 % Rated voltage: 6.3 V I.R: 1 G Ω minimum or 50 Ω F minimum whichever is less