Surface Mount Multilayer Ceramic Chip Capacitors for Commodity Applications

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
- Dry sheet technology process
- Base Metal Electrode system (BME)
- Compliant to RoHS directive 2002/95/EC
- Halogen-free according to IEC 61249-2-21 definition

Pb-free
RoHS COMPLIANT
HALOGEN FREE

APPLICATIONS

- Consumer electronics
- Telecommunications
- Data processing

ELECTRICAL SPECIFICATION

Note

- Electrical characteristics at + 25 °C, 30 % to 70 % related humidity, unless otherwise specified

Operating Temperature: - 55 °C to + 125 °C

Capacitance Range: 100 pF to 10 µF

Voltage Range: 10 V_{DC} to 100 V_{DC}

Temperature Coefficient of Capacitance (TCC)
± 15 % without voltage applied

Dissipation Factor (DF):

10 V: ≤ 5 %
≤ 10 % for 0603 ≥ 0.33 µF; 0805 ≥ 2.2 µF; 1206 ≥ 2.2 µF

16 V: ≤ 3.5 %
≤ 5 % for 0402 ≥ 0.033 µF; 0603 ≥ 0.15 µF; 0805 ≥ 0.68 µF; 1206 ≥ 2.2 µF; 1210 ≥ 4.7 µF
≤ 10 % for 0603 ≥ 0.68 µF; 0805 ≥ 2.2 µF; 1206 ≥ 4.7 µF

25 V: ≤ 3.5 %
≤ 5 % for 0805 ≥ 1 µF
≤ 7 % for 0603 ≥ 0.33 µF; 1206 ≥ 4.7 µF
≤ 10 % for 0402 ≥ 0.10 µF; 0603 ≥ 0.47 µF; 0805 ≥ 2.2 µF; 1206 ≥ 6.8 µF

≥ 50 V: ≤ 2.5 %
≤ 3 % for 0603 ≥ 0.047 µF; 0805 ≥ 0.18 µF; 1206 ≥ 0.47 µF

Test Conditions for Capacitance and DF measurement:
For C ≤ 10 µF apply 1.0 V_{RMS} ± 0.2 V_{RMS}, 1.0 kHz ± 10 %
For C > 10 µF apply 0.5 V_{RMS} ± 0.2 V_{RMS}, 120 Hz ± 20 %

Preconditioning for Capacitance Tolerance Measurement:
Perform a heat treatment at 150 °C ± 10 °C for 1 h, then leave in ambient condition for 24 h ± 2 h before measurement

Aging Rate:
≤ 10 V: maximum 1.5 % per decade
≥ 16 V: maximum 1 % per decade

Insulation Resistance (IR):
≥ 10 GΩ or R x C ≥ 500 Ω x F whichever is less

Dielectric Strength Test:
This is the maximum voltage the capacitors are tested for 1 s to 5 s period and the charge/discharge current does not exceed 50 mA
≤ 100 V_{DC}: 250 % of rated voltage

QUICK REFERENCE DATA

DIELECTRIC	CASE	MAXIMUM VOLTAGE (V)	CAPACITANCE	
			MINIMUM	MAXIMUM
X7R	0402	50	100 pF	100 nF
	0603	100	100 pF	1.0 µF
	0805	100	100 pF	2.2 µF
	1206	100	150 pF	4.7 µF
	1210	100	1.0 nF	10 µF

Note

- Detail ratings see selection chart

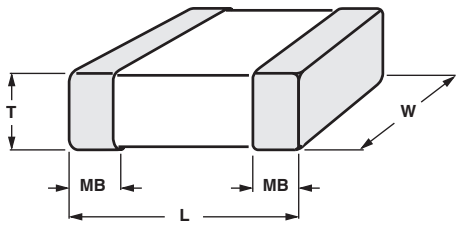
ORDERING INFORMATION

VJ0402	Y	101	J	X	Q	C	W1BC
SIZE CODE	DIELECTRIC	CAPACITANCE	TOLERANCE	TERMINATION	VOLTAGE	PACKAGING	PROCESS CODE FOR BASIC COMMODITY
0402 0603 0805 1206 1210	Y = X7R	Two significant digits followed by the number of zeros: 101 = 100 pF 102 = 1000 pF 152 = 1500 pF 103 = 10 000 pF	J = ± 5 % (1) K = ± 10 % M = ± 20 %	X = Ni Barrier	Y = 6.3 V Q = 10 V J = 16 V X = 25 V A = 50 V B = 100 V	C = 7" reel/paper P = 13" reel/paper T = 7" reel/blister R = 13" reel/blister	

Note

(1) Not all values, see selection chart sizes 0603, 0805, 1206

DIMENSIONS in inches (millimeters)



SIZE CODE	L	W	T MAX.	MB
0402 (1005)	0.040 ± 0.002 (1.00 ± 0.05)	0.020 ± 0.002 (0.50 ± 0.05)	0.022 (0.55)	0.010 + 0.002/- 0.004 (0.25 + 0.05/- 0.10)
0603 (1608)	0.063 + 0.006/- 0.004 (1.60 + 0.15/- 0.10)	0.030 + 0.006/- 0.004 (0.80 + 0.15/- 0.10)	0.038 (0.95)	0.016 ± 0.006 (0.40 ± 0.15)
0805 (2012)	0.080 ± 0.008 (2.00 ± 0.20)	0.050 ± 0.008 (1.25 ± 0.20)	0.057 (1.45)	0.020 ± 0.008 (0.50 ± 0.20)
1206 (3216)	0.126 + 0.012/- 0.008 (3.20 + 0.30/- 0.20)	0.063 + 0.012/- 0.008 (1.60 + 0.30/- 0.20)	0.075 (1.90)	0.024 ± 0.008 (0.60 ± 0.20)
1210 (3225)	0.126 ± 0.016 (3.20 ± 0.40)	0.098 ± 0.012 (2.50 ± 0.30)	0.110 (2.80)	0.060 ± 0.010 (0.75 ± 0.25)

SELECTION CHART

DIELECTRIC		X7R														
STYLE		VJ0402					VJ0603					VJ0805				
EIA CODE		0402					0603					0805				
VOLTAGE (V_{DC})		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
VOLTAGE CODE		Q	J	X	A	B	Q	J	X	A	B	Q	J	X	A	B
CAP. CODE	CAP.															
101	100 pF	N	N	N	N		S +	S +	S +	S +	S +	B +	B +	B +	B +	B +
121	120 pF	N	N	N	N		S +	S +	S +	S +	S +	B +	B +	B +	B +	B +
151	150 pF	N	N	N	N		S +	S +	S +	S +	S +	B +	B +	B +	B +	B +
181	180 pF	N	N	N	N		S +	S +	S +	S +	S +	B +	B +	B +	B +	B +
221	220 pF	N	N	N	N		S +	S +	S +	S +	S +	B +	B +	B +	B +	B +
271	270 pF	N	N	N	N		S +	S +	S +	S +	S +	B +	B +	B +	B +	B +
331	330 pF	N	N	N	N		S +	S +	S +	S +	S +	B +	B +	B +	B +	B +
391	390 pF	N	N	N	N		S +	S +	S +	S +	S +	B +	B +	B +	B +	B +
471	470 pF	N	N	N	N		S	S	S	S	S	B	B	B	B	B
561	560 pF	N	N	N	N		S	S	S	S	S	B	B	B	B	B
681	680 pF	N	N	N	N		S	S	S	S	S	B	B	B	B	B
821	820 pF	N	N	N	N		S	S	S	S	S	B	B	B	B	B
102	1.0 nF	N	N	N	N		S	S	S	S	S	B	B	B	B	B
122	1.2 nF	N	N	N	N		S	S	S	S	S	B	B	B	B	B
152	1.5 nF	N	N	N	N		S	S	S	S	S	B	B	B	B	B
182	1.8 nF	N	N	N	N		S	S	S	S	S	B	B	B	B	B
222	2.2 nF	N	N	N	N		S	S	S	S	S	B	B	B	B	B
272	2.7 nF	N	N	N	N		S	S	S	S	S	B	B	B	B	B
332	3.3 nF	N	N	N	N		S	S	S	S	S	B	B	B	B	B
392	3.9 nF	N	N	N	N		S	S	S	S	S	B	B	B	B	B
472	4.7 nF	N	N	N	N		S	S	S	S	S	B	B	B	B	B
562	5.6 nF	N	N	N	N		S	S	S	S	S	B	B	B	B	B
682	6.8 nF	N	N	N	N		S	S	S	S	S	B	B	B	B	B
822	8.2 nF	N	N	N	N		S	S	S	S	S	B	B	B	B	B
103	10 nF	N	N	N	N		S	S	S	S	S	B	B	B	B	B
123	12 nF	N	N	N			S	S	S	S		B	B	B	B	B
153	15 nF	N	N	N			S	S	S	S		B	B	B	B	B
183	18 nF	N	N	N			S	S	S	S		B	B	B	B	B
223	22 nF	N	N	N			S	S	S	S		B	B	B	B	B
273	27 nF	N	N	N			S	S	S	S		B	B	B	B	D
333	33 nF	N	N	N			S	S	S	X		B	B	B	B	D
393	39 nF	N	N	N			S	S	S	X		B	B	B	B	D
473	47 nF	N	N	N			S	S	S	X		B	B	B	B	D
563	56 nF	N	N				S	S	S	X		B	B	B	B	D
683	68 nF	N	N				S	S	S	X		B	B	B	B	D
823	82 nF	N	N				S	S	S	X		B	B	B	B	D
104	100 nF	N	N				S	S	S	X		B	B	B	B/D	D
124	120 nF						S	S	X			B	B	B	D	
154	150 nF						S	S	X			D	D	D	D	
184	180 nF						S	S	X			D	D	D	D	
224	220 nF						S	S	X			D	D	D	D	
274	270 nF						X	X	X			D	D	D		
334	330 nF						X	X	X			D	D	D	I	
394	390 nF						X	X	X			D	D	D		
474	470 nF						X	X	X			D	D	D	I	
564	560 nF						X	X				D	D	D		
684	680 nF						X	X				D	D	D		
824	820 nF						X	X				D	D	D		
105	1.0 µF						X	X				D	D	D		
155	1.5 µF											I				
225	2.2 µF											I	I	I		
335	3.3 µF															
475	4.7 µF															
685	6.8 µF															
106	10 µF															
156	15 µF															
226	22 µF															
336	33 µF															
476	47 µF															
686	68 µF															

Note

- Letters indicate product thickness, see packaging quantities

\+ Not in 5 % (code “J”) tolerance

SELECTION CHART

DIELECTRIC		X7R									
STYLE		VJ1206					VJ1210				
EIA CODE		1206					1210				
VOLTAGE (V_{DC})		10 V	16 V	25 V	50 V	100 V	10 V	16 V	25 V	50 V	100 V
VOLTAGE CODE		Q	J	X	A	B	Q	J	X	A	B
CAP. CODE	CAP.										
101	100 pF										
121	120 pF										
151	150 pF	B +	B +	B +	B +	B +					
181	180 pF	B +	B +	B +	B +	B +					
221	220 pF	B +	B +	B +	B +	B +					
271	270 pF	B +	B +	B +	B +	B +					
331	330 pF	B +	B +	B +	B +	B +					
391	390 pF	B +	B +	B +	B +	B +					
471	470 pF	B	B	B	B	B					
561	560 pF	B	B	B	B	B					
681	680 pF	B	B	B	B	B					
821	820 pF	B	B	B	B	B					
102	1.0 nF	B	B	B	B	B	C	C	C	C	C
122	1.2 nF	B	B	B	B	B	C	C	C	C	C
152	1.5 nF	B	B	B	B	B	C	C	C	C	C
182	1.8 nF	B	B	B	B	B	C	C	C	C	C
222	2.2 nF	B	B	B	B	B	C	C	C	C	C
272	2.7 nF	B	B	B	B	B	C	C	C	C	C
332	3.3 nF	B	B	B	B	B	C	C	C	C	C
392	3.9 nF	B	B	B	B	B	C	C	C	C	C
472	4.7 nF	B	B	B	B	B	C	C	C	C	C
562	5.6 nF	B	B	B	B	B	C	C	C	C	C
682	6.8 nF	B	B	B	B	B	C	C	C	C	C
822	8.2 nF	B	B	B	B	B	C	C	C	C	C
103	10 nF	B	B	B	B	B	C	C	C	C	C
123	12 nF	B	B	B	B	B	C	C	C	C	C
153	15 nF	B	B	B	B	B	C	C	C	C	C
183	18 nF	B	B	B	B	B	C	C	C	C	C
223	22 nF	B	B	B	B	B	C	C	C	C	C
273	27 nF	B	B	B	B	B	C	C	C	C	C
333	33 nF	B	B	B	B	B	C	C	C	C	C
393	39 nF	B	B	B	B	B	C	C	C	C	C
473	47 nF	B	B	B	B	B	C	C	C	C	C
563	56 nF	B	B	B	B	B	C	C	C	C	C
683	68 nF	B	B	B	B	B	C	C	C	C	C
823	82 nF	B	B	B	B	D	C	C	C	C	C
104	100 nF	B	B	B	B	D	C	C	C	C	C
124	120 nF	B	B	B	B	D	C	C	C	C	C
154	150 nF	C	C	C	C	G	C	C	C	C	D
184	180 nF	C	C	C	C	G	C	C	C	C	D
224	220 nF	C	C	C	C	G	C	C	C	C	D
274	270 nF	C	C	C	D		C	C	C	C	G
334	330 nF	C	C	C	D		C	C	C	D	G
394	390 nF	C	C	J	P		C	C	C	D	M
474	470 nF	J	J	J	P		C	C	C	D	M
564	560 nF	J	J	J	P		D	D	D	D	M
684	680 nF	J	J	J	P		D	D	D	D	K
824	820 nF	J	J	J	P		D	D	D	D	K
105	1.0 µF	J	J	J	P		D	D	D	D	K
155	1.5 µF	J	J								
225	2.2 µF	J	J	P				K	G		
335	3.3 µF	P	P	P							
475	4.7 µF	P	P	P			K	K			
685	6.8 µF										
106	10 µF	P					K	K			
156	15 µF										
226	22 µF										
336	33 µF										
476	47 µF										
686	68 µF										
107	100 µF										

Note

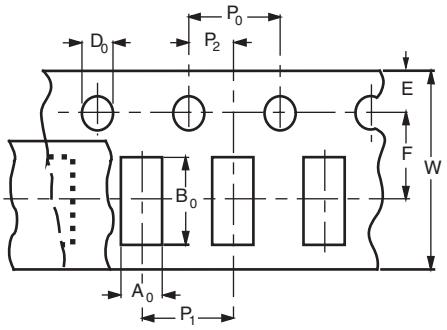
- Letters indicate product thickness, see packaging quantities

\+ Not in 5 % (code “J”) tolerance

PACKAGING QUANTITIES

SIZE CODE (inch/mm)	MAX. THICKNESS (mm)	THICKNESS SYMBOL	PAPER TAPE		PLASTIC TAPE	
			7" REEL (C)	13" REEL (P)	7" REEL (T)	13" REEL (R)
0402 (1002)	0.55	N	10K	50K		
0603 (1608)	0.90	S	4K	15K		
	0.95	X	4K	15K		
0805 (2012)	0.75	A	4K	15K		
	0.95	B	4K	15K		
	1.40	D			3K	10K
	1.45	I			3K	10K
1206 (3216)	0.95	B	4K	15K		
	1.05	C			3K	10K
	1.30	J			3K	10K
	1.35	D			3K	10K
	1.80	G			2K	
	1.80	H			2K	8K
	1.90	P			2K	
1210 (3225)	1.05	B			2K	10K
	1.05	C			3K	10K
	1.35	D			3K	10K
	1.80	G			2K	
	2.00	U			2K	4K
	2.20	K			1K	
	2.70	J			1K	4K
	2.80	M			1K	
	2.80	V			1K	4K

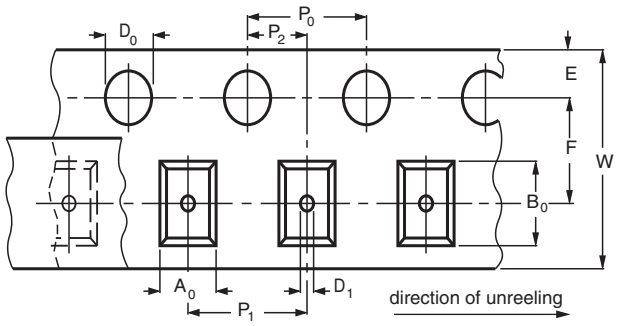
PAPER TAPE SPECIFICATION



DIMENSIONS OF PAPER TAPE
in millimeters

SYM.	PRODUCT SIZE CODE			
	0402	0603	0805	1206
A_0	0.62 ± 0.05	1.02 ± 0.05	1.50 ± 0.10	2.00 ± 0.10
B_0	1.12 ± 0.05	1.80 ± 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

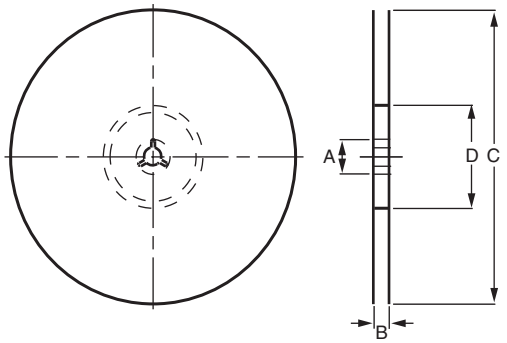
BLISTER TAPE SPECIFICATION



DIMENSIONS OF BLISTER TAPE
in millimeters

SYM.	PRODUCT SIZE CODE		
	0805	1206	1210
A_0	< 1.57	< 2.00	< 2.97
B_0	< 2.45	< 3.70	< 3.73
W	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
F	3.50 ± 0.05	3.50 ± 0.05	3.50 ± 0.05
D_0	1.50 ± 0.05	1.50 ± 0.05	1.50 ± 0.05
D_1	1.00 ± 0.10	1.00 ± 0.10	1.00 ± 0.10
P_0	4.00 ± 0.10	4.00 ± 0.10	4.00 ± 0.10
P_1	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

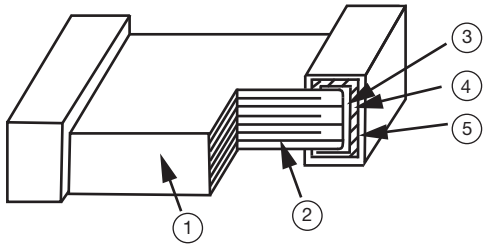
REEL SPECIFICATIONS



REEL DIMENSIONS AND TAPE WIDTH
in millimeters

	Ø 180 mm; 7"	Ø 330 mm; 13"
A	13.0 ± 0.5	13.0 ± 0.5
B	9.0 ± 1.0	9.0 ± 1.0
C	178.0 ± 1.0	330.0 ± 1.0
D	60.0 ± 1.0	100.0 ± 1.0

CONSTRUCTION			
NO.	**NAME**		**X7R**
1	Ceramic material		$BaTiO_3$ based
2	Inner electrode		Ni
3	Termination	Inner layer	Cu
4		Middle layer	Ni
5		Outer layer	Sn



STORAGE AND HANDLING CONDITIONS

(1) To store products at 5 °C 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. Do not 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. Do not expose products to excessive shock, vibration, direct sunlight and so on.

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