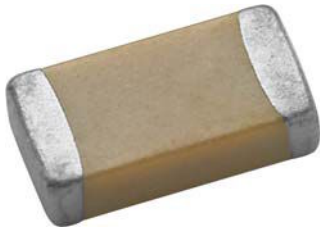


Surface Mount Multilayer Ceramic Chip Capacitors for Commodity Applications



FEATURES

- Class 2 dielectric
- Four standard sizes
- High capacitance per unit volume
- Supplied in tape and reel
- 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



RoHS
COMPLIANT
HALOGEN
FREE

APPLICATIONS

- Consumer electronics
- Telecommunications
- Mobile application
- Data processing

ELECTRICAL SPECIFICATION

Note

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

Operating Temperature: - 55 °C to + 85 °C

Capacitance Range: 47 nF to 22 µF

Voltage Range: 6.3 V_{DC} to 25 V_{DC}

Temperature Coefficient of Capacitance (TCC):

± 15 % without voltage applied

Dissipation Factor (DF):

6.3 V: ≤ 10 %

≤ 15 % for 0805 ≥ 4.7 µF

10 V: ≤ 5 %

≤ 10 % for 0402 ≥ 0.33 µF, 0603 ≥ 0.33 µF, 0805 ≥ 2.2 µF,

1206 ≥ 2.2 µF, 1210 ≥ 22 µF

≤ 15 % for 0402 ≥ 1 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,

1210 ≥ 22 µF

25 V: ≤ 3.5 %

≤ 5 % for 0805 ≥ 1 µF, 1210 ≥ 10 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

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:

6.3 V/10 V: 3 % maximum per decade

16 V/25 V: 2 % maximum 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



VJ....W1BC X5R Dielectric

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Vishay

QUICK REFERENCE DATA

DIELECTRIC	CASE	MAXIMUM VOLTAGE (V)	CAPACITANCE	
			MINIMUM	MAXIMUM
X5R	0402	16	47 nF	1.0 μ F
	0603	25	220 nF	2.2 μ F
	0805	25	2.2 μ F	10 μ F
	1206	25	1.5 μ F	22 μ F
	1210	16	1.5 μ F	10 μ F

Note

- Detail ratings see selection chart

ORDERING INFORMATION

VJ0402	G	104	K	X	Q	C	W1BC
SIZE CODE	DIELECTRIC	CAPACITANCE	TOLERANCE	TERMINATION	VOLTAGE	PACKAGING	PROCESS CODE FOR BASIC COMMODITY
0402 0603 0805 1206 1210	G = X5R	Two significant digits followed by the number of zeros: 104 = 100 000 pF	K = $\pm 10\%$ M = $\pm 20\%$	X = Ni Barrier	S = 4 V Y = 6.3 V Q = 10 V J = 16 V X = 25 V A = 50 V	C = 7" reel/paper P = 13" reel/paper T = 7" reel/blister R = 13" reel/blister	

DIMENSIONS in inches (millimeters)

	SIZE CODE	L	W	T MAX.	MB
	0402 (1005)	0.040 \pm 0.002 (1.00 \pm 0.05)	0.020 \pm 0.002 (0.50 \pm 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 \pm 0.006 (0.40 \pm 0.15)
	0805 (2012)	0.080 \pm 0.008 (2.00 \pm 0.20)	0.050 \pm 0.008 (1.25 \pm 0.20)	0.057 (1.45)	0.020 \pm 0.008 (0.50 \pm 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 \pm 0.008 (0.60 \pm 0.20)
	1210 (3225)	0.126 \pm 0.016 (3.20 \pm 0.40)	0.098 \pm 0.012 (2.50 \pm 0.30)	0.110 (2.80)	0.060 \pm 0.010 (0.75 \pm 0.25)

SELECTION CHART

DIELECTRIC		X5R																	
STYLE		VJ0402						VJ0603						VJ0805					
EIA CODE		0402						0603						0805					
VOLTAGE (V _{DC})		4 V	6.3 V	10 V	16 V	25 V	50 V	6.3 V	10 V	16 V	25 V	50 V	4 V	6.3 V	10 V	16 V	25 V	50 V	
VOLTAGE CODE		S	Y	Q	J	X	A	Y	Q	J	X	A	S	Y	Q	J	X	A	
CAP. CODE	CAP.																		
473	47 nF				N														
563	56 nF			N	N														
683	68 nF			N	N														
823	82 nF		N	N	N														
104	100 nF		N	N	N														
124	120 nF																		
154	150 nF																		
184	180 nF																		
224	220 nF		N							X	X								
274	270 nF								X	X									
334	330 nF		N						X	X	X								
394	390 nF								X	X									
474	470 nF		N					X	X	X	X								
564	560 nF																		
684	680 nF		N					X	X	X	X								
824	820 nF							X	X	X									
105	1.0 μF		N					X	X	X	X								
155	1.5 μF							X											
225	2.2 μF							X						I	I	I	I		
335	3.3 μF													I	I	I	I		
475	4.7 μF													I	I	I	I		
685	6.8 μF																		
106	10 μF													I					
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

SELECTION CHART

DIELECTRIC		X5R									
STYLE		VJ1206					VJ1210				
EIA CODE		1206					1210				
VOLTAGE (V _{DC})		6.3 V	10 V	16 V	25 V	50 V	6.3 V	10 V	16 V	25 V	50 V
VOLTAGE CODE		Y	Q	J	X	A	Y	Q	J	X	A
CAP. CODE	CAP.										
105	1.0 µF										
155	1.5 µF		J	J				K	K		
225	2.2 µF		J	J	P			K	K		
335	3.3 µF		P	P	P						
475	4.7 µF	P	P	P	P			K	K		
685	6.8 µF	P	P								
106	10 µF	P	P	P	P			K	K		
156	15 µF										
226	22 µF	P									

Note

- Letters indicate product thickness, see packaging quantities



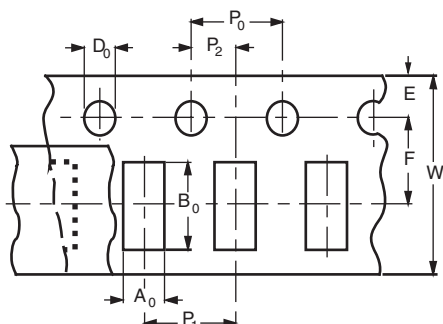
VJ....W1BC X5R Dielectric

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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

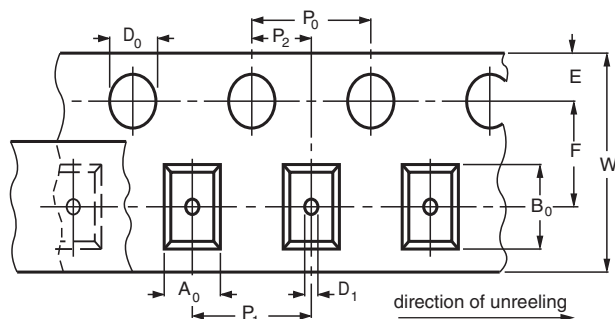


DIMENSIONS OF PAPER TAPE

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

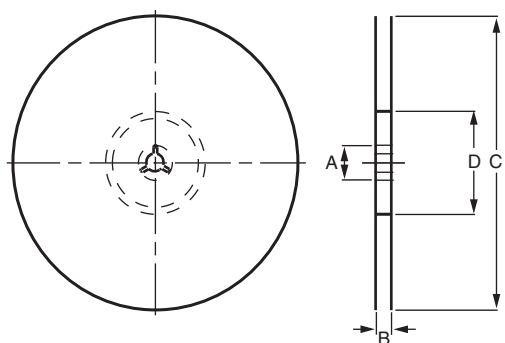


DIMENSIONS OF BLISTER TAPE

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



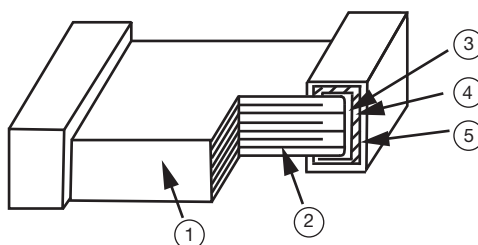
REEL DIMENSIONS AND TAPE WIDTH

in millimeters

	$\varnothing 180 \text{ mm}; 7''$	$\varnothing 330 \text{ mm}; 13''$
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		X5R
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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