

## Surface Mount Multilayer Ceramic Chip Capacitors for Ultra Small Commodity Applications



### FEATURES

- High capacitance in unit size
- High precision dimensional tolerances
- Suitably used in high-accuracy automatic mounting machine
- Dry sheet manufacturing technology
- Base Metal Electrode system (BME)
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**  
**GREEN**  
(5-2008)

### APPLICATIONS

- Miniature microwave module
- Portable equipment - mobile phone, PDA

ELECTRICAL SPECIFICATIONS			
Size	0201		
Dielectric	COG (NPO)	X7R	X5R
Capacitance	0.5 pF to 120 pF	100 pF to 10 nF	100 pF to 2.2 $\mu$ F
Capacitance Tolerance <sup>(2)(3)</sup>	Cap. $\leq$ 5 pF: B ( $\pm$ 0.1 pF), C ( $\pm$ 0.25 pF) 5 pF < Cap. < 10 pF: C ( $\pm$ 0.25 pF), D ( $\pm$ 0.5 pF) Cap. $\geq$ 10 pF: F ( $\pm$ 1 %), G (2 %), J (5 %), K ( $\pm$ 10 %)	J ( $\pm$ 5 %) K ( $\pm$ 10 %) M ( $\pm$ 20 %)	J ( $\pm$ 5 %) K ( $\pm$ 10 %) M ( $\pm$ 20 %)
Rated Voltage ( $V_{DC}$ )	16 V, 25 V, 50 V	10 V, 16 V, 25 V, 50 V	6.3 V, 10 V, 16 V, 25 V, 50 V
$\tan \delta/Q$ <sup>(1)</sup>	Cap. < 30 pF, $Q \geq 400 + 20 C$ Cap. $\geq$ 30 pF, $Q \geq 1000$	See Table 1	
Insulation Resistance at $U_R$	$\geq 10 G\Omega$	$\geq 10 G\Omega$ or $R \times C \geq 500 \Omega F$ , whichever is less	
Operating Temperature	-55 °C to +125 °C		-55 °C to +85 °C
Capacitance Change	$\pm 30$ ppm	$\pm 15$ %	
Termination	Ni/Sn lead (Pb)-free termination		

#### Notes

- (1) Measured at 30 % to 70 % relative humidity  
NPO: apply 1.0  $V_{RMS} \pm 0.2 V_{RMS}$ , 1.0 MHz  $\pm 10$  % at the condition of 25 °C ambient temperature  
X7R, X5R: apply 1.0  $V_{RMS} \pm 0.2 V_{RMS}$ , 1.0 kHz  $\pm 10$  % (0201 / 6.3 V, cap.  $\geq 224$ : 0.5  $V_{RMS} \pm 0.2 V_{RMS}$ , 1.0 kHz  $\pm 10$  %) at the condition of 25 °C ambient temperature
- (2) Preconditioning for X7R / X5R MLCC: perform a heat treatment at 150 °C  $\pm 10$  °C for 1 h, then leave in ambient condition for 24 h  $\pm 2$  h before measurement
- (3) Tolerances restriction see "Selection Chart"

**Table 1**

X7R / X5R:

RATED VOLTAGE	D.F. $\leq$	EXCEPTION OF D.F. $\leq$	
$\geq 50$ V	3 %	-	-
25 V	3.5 %	5 %	0201 $\geq 0.01 \mu F$
16 V	3.5 %	5 %	0201 $\geq 0.01 \mu F$
		10 %	0201 $\geq 0.1 \mu F$
10 V	5 %	10 %	0201 $\geq 0.012 \mu F$
		15 %	0201 $\geq 0.1 \mu F$
6.3 V	10 %	15 %	0201 $\geq 0.1 \mu F$

QUICK REFERENCE DATA				
DIELECTRIC	CASE	MAXIMUM VOLTAGE (V)	CAPACITANCE	
			MINIMUM	MAXIMUM
C0G (NP0)	0201	50	0.5 pF	120 pF
X5R	0201	50	100 pF	2.2 $\mu$ F
X7R	0201	50	100 pF	10 nF

**Note**

- Detail ratings see "Selection Chart" table

ORDERING INFORMATION							
VJ0201	A	100	J	X	X	C	W1BC
SIZE CODE	DIELECTRIC	CAPACITANCE	TOLERANCE <sup>(1)</sup>	TERMINATION	RATED VOLTAGE	PACKAGING	PROCESS CODE FOR BASIC COMMODITY
0201	A = C0G (NP0) G = X5R Y = X7R	Two significant digits followed by the number of zeros. R is in place of decimal point: 0R5 = 0.5 pF 1R0 = 1.0 pF 100 = 10 pF	B = $\pm$ 0.10 pF C = $\pm$ 0.25 pF D = $\pm$ 0.5 pF F = $\pm$ 1 % G = $\pm$ 2 % J = $\pm$ 5 % K = $\pm$ 10 % M = $\pm$ 20 %	X = Ni barrier 100 % matte tin	Y = 6.3 V Q = 10 V J = 16 V X = 25 V A = 50 V	C = 7" reel / paper tape	

**Note**

- <sup>(1)</sup> Detail tolerance see under "Electrical Specifications" table

DIMENSIONS in inches (millimeters)				
SIZE CODE	L	W	T MAX.	MB
0201 <sup>(1)</sup> (0603)	0.024 $\pm$ 0.0012 (0.60 $\pm$ 0.03)	0.012 $\pm$ 0.0012 (0.30 $\pm$ 0.03)	0.013 (0.33)	0.006 $\pm$ 0.002 (0.15 $\pm$ 0.05)
	0.024 $\pm$ 0.002 <sup>(2)</sup> (0.60 $\pm$ 0.05)	0.012 $\pm$ 0.002 <sup>(2)</sup> (0.30 $\pm$ 0.05)	0.014 <sup>(2)</sup> (0.35)	
	0.024 $\pm$ 0.0035 <sup>(3)</sup> (0.60 $\pm$ 0.09)	0.012 $\pm$ 0.0035 <sup>(3)</sup> (0.30 $\pm$ 0.09)	0.0153 <sup>(3)</sup> (0.39)	0.006 + 0.004 / - 0.002 <sup>(3)</sup> (0.15 + 0.1 / - 0.05)

**Notes**

- <sup>(1)</sup> Reflow soldering only  
<sup>(2)</sup> For capacitance values  $\geq$  0.68  $\mu$ F  
<sup>(3)</sup> For capacitance values  $\geq$  1  $\mu$ F



SELECTION CHART													
DIELECTRIC		C0G (NP0)			X5R				X7R				
STYLE		VJ0201											
SIZE CODE		0201											
VOLTAGE V <sub>DC</sub>		16 V	25 V	50 V	6.3 V	10 V	16 V	25 V	50 V	10 V	16 V	25 V	50 V
VOLTAGE CODE		J	X	A	Y	Q	J	X	A	Q	J	X	A
CAP. CODE	CAP.												
0R5	0.5 pF		L	L									
1R0	1.0 pF		L	L									
1R2	1.2 pF		L	L									
1R5	1.5 pF		L	L									
1R8	1.8 pF		L	L									
2R2	2.2 pF		L	L									
2R7	2.7 pF		L	L									
3R3	3.3 pF		L	L									
3R9	3.9 pF		L	L									
4R7	4.7 pF		L	L									
5R6	5.6 pF		L	L									
6R8	6.8 pF		L	L									
8R2	8.2 pF		L	L									
100	10 pF		L	L									
120	12 pF		L	L									
150	15 pF		L	L									
180	18 pF		L	L									
220	22 pF		L	L									
270	27 pF		L	L									
330	33 pF		L	L									
390	39 pF		L	L									
470	47 pF		L	L									
560	56 pF	L	L	L									
680	68 pF	L	L	L									
820	82 pF	L	L	L									
101	100 pF	L	L	L				L		L	L	L	L
121	120 pF	L	L	L				L		L	L	L	L
151	150 pF							L		L	L	L	L
181	180 pF							L		L	L	L	L
221	220 pF							L		L	L	L	L
271	270 pF							L		L	L	L	L
331	330 pF							L		L	L	L	L
391	390 pF							L		L	L	L	L
471	470 pF							L		L	L	L	L
561	560 pF							L		L	L	L	L
681	680 pF							L		L	L	L	L
821	820 pF							L		L	L	L	L
102	1000 pF						L		L	L	L	L	L
152	1500 pF					L	L			L	L		
222	2200 pF					L	L			L	L		
332	3300 pF					L	L			L	L		
472	4700 pF					L	L			L	L		
682	6800 pF					L				L			
103	0.010 μF					L	L <sup>(3)</sup>			L	L		
153	0.015 μF			L									
223	0.022 μF			L									
333	0.033 μF			L									
473	0.047 μF			L									
683	0.068 μF			L									
104	0.10 μF			L	L	L <sup>(3)</sup>	L <sup>(2)</sup>						
224	0.22 μF			L <sup>(3)</sup>	L <sup>(3)</sup>								
474	0.47 μF			L									
105	1.0 μF			L <sup>(3)</sup>	L <sup>(1)</sup>								
225	2.2 μF			L <sup>(1)</sup>									

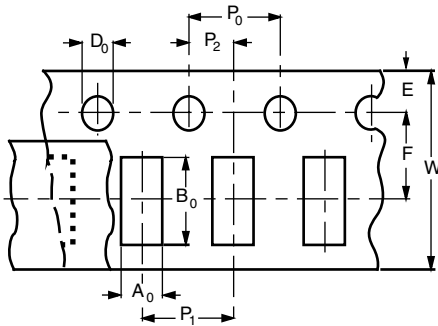
Notes

- Letters indicate product thickness, see "Packaging quantities"
- (1) Only in 20 % (code "M") tolerance
- (2) Only in 10 % (code "K") tolerance
- (3) Not in 5 % (code "J") tolerance



PACKAGING QUANTITIES			
SIZE CODE (inch / mm)	THICKNESS (mm)	PAPER TAPE	
		7" REEL (C)	13" REEL (P)
0201 (0603)	0.39	15K	-

**PAPER TAPE SPECIFICATIONS**

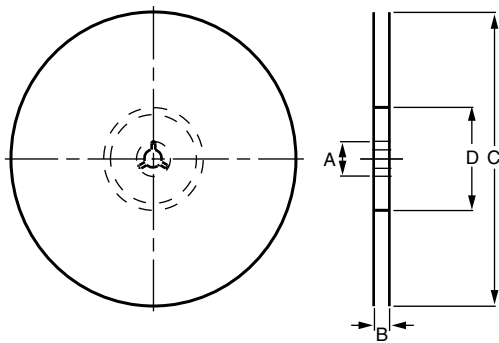


**DIMENSIONS OF PAPER TAPE**

in millimeters

SYMBOL	PRODUCT SIZE CODE
	0201
A <sub>0</sub>	0.38 ± 0.05
B <sub>0</sub>	0.68 ± 0.05
W	8.00 ± 0.10
E	1.75 ± 0.05
F	3.50 ± 0.05
D <sub>0</sub>	1.55 ± 0.05
P <sub>0</sub>	4.00 ± 0.10
P <sub>1</sub>	2.00 ± 0.05
P <sub>2</sub>	2.00 ± 0.05

**REEL SPECIFICATION**

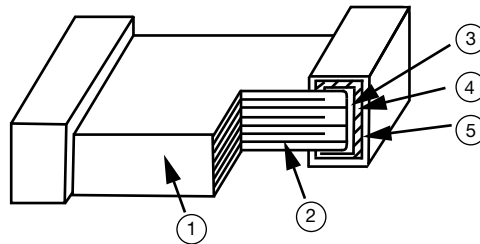


**REEL DIMENSIONS AND TAPE WIDTH**

in millimeters

SYMBOL	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	COG (NP0), X5R, X7R
1	Ceramic material	BaTiO <sub>3</sub> based
2	Inner electrode	Ni
3	Termination	Inner layer
4		Middle layer
5		Outer layer
		Sn (matt)



### STORAGE AND HANDLING CONDITIONS

- (1) To store products at 5 °C to 40 °C ambient temperature and 20 % to 70 % relative 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.



## **Disclaimer**

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and / or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.