

## Surface Mount Multilayer Ceramic Chip Capacitors for Commodity Applications



### FEATURES

- Ultra stable class 1 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 manufacturing technology
- Compliant to RoHS directive 2002/95/EC
- Halogen-free according to IEC 61249-2-21 definition



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**

### APPLICATIONS

- Consumer electronics
- Telecommunications
- Data processing

### ELECTRICAL SPECIFICATIONS

#### Note

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

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

**Capacitance Range:** 0.5 pF to 39 nF

**Voltage Range:** 10 V<sub>DC</sub> to 100 V<sub>DC</sub>

**Temperature Coefficient of Capacitance (TCC):**

0 ppm/°C ± 30 ppm/°C from - 55 °C to + 125 °C

**Dissipation Factor (DF):**

Cap. < 30 pF: Q ≥ 400 + 20C

Cap. ≥ 30 pF: Q ≥ 1000

**Test Conditions for Capacitance and DF Measurement:**

Cap. ≤ 1000 pF 1.0 ± 0.2 V<sub>RMS</sub>, 1 MHz ± 10 %

Cap. > 1000 pF 1.0 ± 0.2 V<sub>RMS</sub>, 1 kHz ± 10 %

**Aging Rate:** 0 % maximum per decade

**Insulation Resistance (IR):** after 120 s at U<sub>R</sub> (DC)  
≥ 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 1 s to 5 s period and the charge/discharge current does not exceed 50 mA

≤ 100 V<sub>DC</sub>: 250 % of rated voltage



# VJ...W1BC C0G (NP0) Dielectric

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Vishay

QUICK REFERENCE DATA				
DIELECTRIC	CASE	MAXIMUM VOLTAGE (V)	CAPACITANCE	
			MINIMUM	MAXIMUM
C0G (NP0)	0402	100	0.5 pF	470 pF
	0603	100	0.5 pF	3.3 nF
	0805	100	0.5 pF	12 nF
	1206	100	1.5 pF	39 nF

**Note**

- Detail ratings see selection chart

ORDERING INFORMATION							
VJ0402	A	101	J	X	Q	C	W1BC
SIZE CODE	DIELECTRIC	CAPACITANCE	TOLERANCE	TERMINATION	VOLTAGE	PACKAGING	PROCESS CODE FOR BASIC COMMODITY
0402 0603 0805 1206	A = C0G (NP0)	Two significant digits followed by the number of zeros: 101 = 100 pF 102 = 1000 pF 152 = 1500 pF 103 = 10 000 pF	Cap. < 10 pF: B = ± 0.10 pF C = ± 0.25 pF D = ± 0.50 pF Cap. ≥ 10 pF: F = ± 1 % G = ± 2 % J = ± 5 % K = ± 10 %	X = Ni Barrier	Q = 10 V J = 16 V X = 25 V A = 50 V B = 100 V	C = 7" reel/ paper tape P = 13" reel/ paper tape T = 7" reel/ plastic tape R = 13" reel/ plastic tape	

DIMENSIONS in inches (millimeters)				
SIZE CODE	LENGTH (L)	WIDTH (W)	MAXIMUM THICKNESS (T)	TERMINATION PAD (MB)
0402 (1002)	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)

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SELECTION CHART																					
DIELECTRIC		C0G (NP0)																			
STYLE		VJ0402					VJ0603					VJ0805					VJ1206				
EIA CODE		0402					0603					0805					1206				
VOLTAGE (V <sub>DC</sub> )		10	16	25	50	100	10	16	25	50	100	10	16	25	50	100	10	16	25	50	100
VOLTAGE CODE		Q	J	X	A	B	Q	J	X	A	B	Q	J	X	A	B	Q	J	X	A	B
CAP. CODE	CAP.																				
0R5	0.5 pF	N*	N*	N*	N*	N*	S	S	S	S	S	A	A	A	A	A					
1R0	1.0 pF	N*	N*	N*	N*	N*	S	S	S	S	S	A	A	A	A	A					
1R2	1.2 pF	N*	N*	N*	N*	N*	S	S	S	S	S	A	A	A	A	A					
1R5	1.5 pF	N*	N*	N*	N*	N*	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
1R8	1.8 pF	N*	N*	N*	N*	N*	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
2R2	2.2 pF	N*	N*	N*	N*	N*	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
2R7	2.7 pF	N*	N*	N*	N*	N*	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
3R3	3.3 pF	N*	N*	N*	N*	N*	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
3R9	3.9 pF	N*	N*	N*	N*	N*	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
4R7	4.7 pF	N*	N*	N*	N*	N*	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
5R6	5.6 pF	N*	N*	N*	N*	N*	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
6R8	6.8 pF	N*	N*	N*	N*	N*	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
8R2	8.2 pF	N*	N*	N*	N*	N*	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
100	10 pF	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
120	12 pF	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
150	15 pF	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
180	18 pF	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
220	22 pF	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
270	27 pF	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
330	33 pF	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
390	39 pF	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
470	47 pF	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
560	56 pF	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
680	68 pF	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
820	82 pF	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
101	100 pF	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
121	120 pF	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
151	150 pF	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
181	180 pF	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
221	220 pF	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
271	270 pF	N	N	N	N		S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
331	330 pF	N	N	N	N		S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
391	390 pF	N	N	N	N		S	S	S	S	S	B	B	B	B	B	B	B	B	B	B
471	470 pF	N	N	N	N		S	S	S	S	S	B	B	B	B	B	B	B	B	B	B
561	560 pF						S	S	S	S	S	B	B	B	B	B	B	B	B	B	B
681	680 pF						S	S	S	S	S	B	B	B	B	B	B	B	B	B	B
821	820 pF						S	S	S	S	S	B	B	B	B	B	B	B	B	B	B

**Notes**

- Letters indicate product thickness, see packaging quantities
- “ \* ” indicate product with Ag/Ni/Sn termination



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SELECTION CHART																					
DIELECTRIC		C0G (NP0)																			
STYLE		VJ0402					VJ0603					VJ0805					VJ1206				
EIA CODE		0402					0603					0805					1206				
VOLTAGE (V <sub>DC</sub> )		10	16	25	50	100	10	16	25	50	100	10	16	25	50	100	10	16	25	50	100
VOLTAGE CODE		Q	J	X	A	B	Q	J	X	A	B	Q	J	X	A	B	Q	J	X	A	B
CAP. CODE	CAP.																				
102	1.0 nF						S	S	S	S	S	B	B	B	B	B	B	B	B	B	B
122	1.2 nF						X	X	X	X		B	B	B	B	B	B	B	B	B	B
152	1.5 nF						X	X	X	X		B	B	B	B	B	B	B	B	B	B
182	1.8 nF						X	X	X	X		B	B	B	B	B	B	B	B	B	B
222	2.2 nF						X	X	X	X		B	B	B	B	B	B	B	B	B	B
272	2.7 nF						X	X	X	X		D	D	D	D	D	B	B	B	B	B
332	3.3 nF						X	X	X	X		D	D	D	D	D	B	B	B	B	B
392	3.9 nF											D	D	D	D	D	B	B	B	B	B
472	4.7 nF											D	D	D	D		B	B	B	B	B
562	5.6 nF											D*	D*				B	B	B	B	B
682	6.8 nF											D*	D*				C	C	C	C	C
822	8.2 nF											D*	D*				D	D	D	D	D
103	10 nF											D*	D*				D	D	D	D	
123	12 nF											D*	D*				D*	D*			
153	15 nF																D*	D*			
183	18 nF																D*	D*			
223	22 nF																D*	D*			
273	27 nF																D*	D*			
333	33 nF																D*	D*			
393	39 nF																G*	G*			
473	47 nF																				
563	56 nF																				
683	68 nF																				
823	82 nF																				
104	100 nF																				

**Notes**

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- “ \* ” indicate product with Ag/Ni/Sn termination

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	10 000	50 000		
0603 (1608)	0.90	S	4000	15 000		
	0.95	X	4000	15 000		
0805 (2012)	0.75	A	4000	15 000		
	0.95	B	4000	15 000		
	1.40	D			3000	10 000
1206 (3216)	0.95	B	4000	15 000		
	1.05	C			3000	10 000
	1.30	J			3000	10 000
	1.35	D			3000	10 000
	1.80	G			2000	
	1.80	H			2000	8000
	1.90	P			2000	

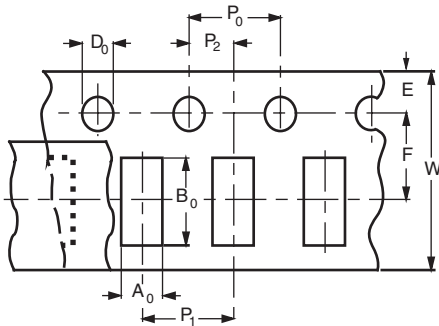
# VJ....W1BC C0G (NP0) Dielectric



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## PAPER TAPE SPECIFICATIONS

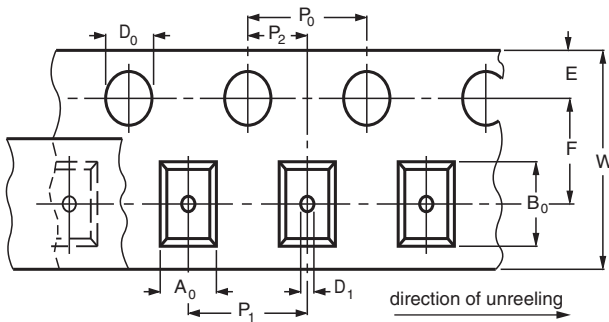


### DIMENSIONS OF PAPER TAPE

in millimeters

SYM.	PRODUCT SIZE CODE			
	0402	0603	0805	1206
$A_0$	$0.62 \pm 0.05$	$1.02 \pm 0.05$	$1.50 \pm 0.10$	$2.00 \pm 0.10$
$B_0$	$1.12 \pm 0.05$	$1.80 \pm 0.05$	$2.30 \pm 0.10$	$3.50 \pm 0.10$
W	$8.00 \pm 0.10$	$8.00 \pm 0.10$	$8.00 \pm 0.10$	$8.00 \pm 0.10$
E	$1.75 \pm 0.05$	$1.75 \pm 0.05$	$1.75 \pm 0.05$	$1.75 \pm 0.10$
F	$3.50 \pm 0.05$	$3.50 \pm 0.05$	$3.50 \pm 0.05$	$3.50 \pm 0.05$
$D_0$	$1.55 \pm 0.05$	$1.55 \pm 0.05$	$1.55 \pm 0.05$	$1.50 \pm 0.05$
$P_0$	$4.00 \pm 0.10$	$4.00 \pm 0.10$	$4.00 \pm 0.10$	$4.00 \pm 0.10$
$P_1$	$2.00 \pm 0.05$	$4.00 \pm 0.10$	$4.00 \pm 0.10$	$4.00 \pm 0.10$
$P_2$	$2.00 \pm 0.05$	$2.00 \pm 0.05$	$2.00 \pm 0.05$	$2.00 \pm 0.05$

## BLISTER TAPE SPECIFICATION

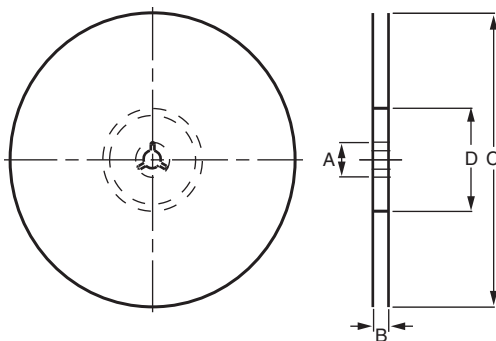


### DIMENSIONS OF BLISTER TAPE

in millimeters

SYM.	PRODUCT SIZE CODE	
	0805	1206
$A_0$	$< 1.57$	$< 2.00$
$B_0$	$< 2.45$	$< 3.70$
W	$8.00 \pm 0.10$	$8.00 \pm 0.10$
E	$1.75 \pm 0.10$	$1.75 \pm 0.10$
F	$3.50 \pm 0.05$	$3.50 \pm 0.05$
$D_0$	$1.50 \pm 0.05$	$1.50 \pm 0.05$
$P_0$	$1.00 \pm 0.10$	$1.00 \pm 0.10$
$P_1$	$4.00 \pm 0.10$	$4.00 \pm 0.10$
$P_2$	$4.00 \pm 0.10$	$4.00 \pm 0.10$
$A_0$	$2.00 \pm 0.05$	$2.00 \pm 0.05$

## REEL SPECIFICATIONS



### REEL DIMENSIONS AND TAPE WIDTH

in millimeters

	$\varnothing 180 \text{ mm}; 7''$	$\varnothing 330 \text{ mm}; 13''$
A	$13.0 \pm 0.5$	$13.0 \pm 0.5$
B	$9.0 \pm 1.0$	$9.0 \pm 1.0$
C	$178.0 \pm 1.0$	$330.0 \pm 1.0$
D	$60.0 \pm 1.0$	$100.0 \pm 1.0$



# VJ...W1BC C0G (NP0) Dielectric

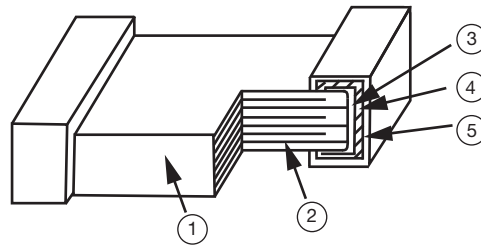
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CONSTRUCTION			
NO.	NAME	C0G (NP0) <sup>(1)</sup>	C0G (NP0)
1	Ceramic material	BaTiO <sub>3</sub> based	
2	Inner electrode	AgPd alloy	Ni
3	Termination	Inner layer	Ag
4		Middle layer	Ni
5		Outer layer	Sn

### Note

(1) C0G (NP0) items are with Ag/Ni/Sn terminations, please see selection chart



### 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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