



(MLCC)



### 1. TYPES OF DIELECTRIC MATERIAL AND CAPACITOR

※HIGH FREQUENCY TYPE: The capacitor of this kind dielectric material is considered as Class I capacitor, including high frequency COG(NP0) capacitor and temperature compensating capacitor such as HG, LG, PH, RH,SH, TH, UJ, SL. The electrical properties of COG(NP0) capacitor are the most stable one and have little change with temperature, voltage and time. They are suited for applications where low-losses and high-stability are required, such as filters, oscillators, and timing circuits.

※ X7R, X5R: X7R,X5R material is a kind of material has high dielectric constant. The capacitor made of this kind material is considered as Class II capacitor whose capacitance is higher than that of class I . These capacitors are classified as having a semi-stable temperature characteristic and used over a wide temperature range, such in these kinds of circuits, DC-blocking, decoupling, bypassing, frequency discriminating etc.

※Y5V: The capacitor made of this kind of material is the highest dielectric constant of all ceramic capacitors. They are used over a moderate temperature range in application where high capacitance is required because of its unstable temperature coefficient, but where moderate losses and capacitance changes can be tolerated. Its capacitance and dissipation factors are sensible to measuring conditions, such as temperature and voltage, etc.

※Z5U: The capacitor made of this kind of material is considered as Class II capacitor, whose temperature characteristic is between that of X7R and Y5V. The capacitance of this kind of capacitor is unstable and sensible to temperature and voltage. Ideally suited for bypassing and decoupling application circuits operating with low DC bias in the environment approaches to room temperature.

### 2. OPERATING TEMPERATURE:

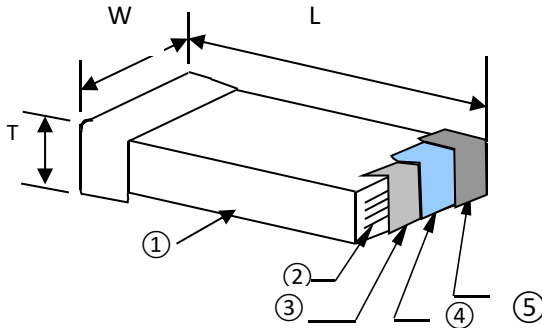
NPO(COG),X7R: -55°C~+125°C ;

X5R,Z5U,Y5V: -55°C~+85°C





3. STRUCTURE



NO.	Name
①	Ceramic Dielectric
②	Inner Electrode
③	Substrate Electrode
④	Nickel Layer
⑤	Tin Layer

4. HOW TO ORDER:

GT	CC41/CT41	0805	CG	101	J	500	N	T	B
①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩

- ① GT: Brand Green Tech
- ② CC41: High frequency, CT41: Low frequency
- ③ Size code see table 1
- ④ Dielectric type see table 2
- ⑤ Capacitance see table 3
- ⑥ Tolerance see table 4
- ⑦ Voltage see table 5
- ⑧ Terminal material type see table 6
- ⑨ Package type see table 7
- ⑩ Thickness code see table 1



Table 1 DIMENSIONS

Outline	Size Inch (mm)	L (mm)	W (mm)	T (mm)/Symbol		Soldering Method *	M <sub>B</sub> (mm)
	0402 (1005)	1.00±0.05	0.50±0.05	0.50±0.05	N	R	0.25 +0.05/-0.10
				0.50±0.02/-0.05	Q	R	
	0.5±0.20	E	R				
	0603 (1608)	1.60±0.15/-0.10 <sup>#1</sup>	0.80±0.15/-0.1 <sup>#1</sup>	0.80±0.10	S	R / W	0.40±0.15
				0.50±0.10	H	R / W	
				0.80±0.15/-0.10	X	R / W	
	0805 (2012)	2.00±0.15	1.25±0.10	0.50±0.10	H	R / W	0.50±0.20
				0.60±0.10	A	R / W	
				0.80±0.10	B	R / W	
				1.25±0.10	D	R	
		2.00±0.20	1.25±0.20	0.85±0.10	T	R / W	
	1.25±0.20	I	R				
	1206 (3216)	3.20±0.15	1.60±0.15	0.80±0.10	B	R / W	0.60±0.20 (0.5±0.25) <sup>***</sup>
				0.95±0.10	C	R	
				1.25±0.10	D	R	
		3.20±0.20	1.60±0.20	1.15±0.15	J	R	
		1.60±0.20	0.85±0.10	T	R / W		
	3.20 +0.30/-0.10	1.60 +0.30/-0.10	1.60±0.30/-0.10	P	R		
	1210 (3225)	3.20±0.30	2.50±0.20	0.95±0.10	C	R	0.75±0.25
				0.85±0.10	T	R	
				1.25±0.10	D	R	
		3.20±0.40	2.50±0.30	1.60±0.20	G	R	
		2.50±0.30	2.50±0.50 <sup>#2</sup>	2.00±0.20	K	R	
	2.50±0.30	M	R				
1808 (4520)	4.50±0.40 (4.5+0.5/-0.3) <sup>**</sup>	2.03±0.25	1.25±0.10	D	R	0.75±0.25 (0.5±0.25) <sup>***</sup>	
			1.40±0.15	F	R		
			1.60±0.20	G	R		
			2.00±0.20	K	R		
1812 (4532)	4.50±0.40 (4.5+0.5/-0.3) <sup>**</sup>	3.20±0.30	1.25±0.10	D	R	0.75±0.25 (0.5±0.25) <sup>***</sup>	
			1.60±0.20	G	R		
		3.20±0.40	2.00±0.20	K	R		
			2.50±0.30	M	R		
2.80±0.30	U	R					
1825(4563)	4.60±0.50	6.30±0.40	1.60±0.20 (G) 2.00±0.20(K) 2.50±0.30 (M) 2.80±0.30 (U)		R	≧ 0.26	
2211 (5728)	5.70±0.50	2.80±0.30			R	≧ 0.30	
2220 (5750)	5.70±0.50	5.00±0.40			R	≧ 0.30	
2225 (5763)	5.70±0.50	6.30±0.40			R	≧ 0.30	

\* R = Reflow soldering process ; W = Wave soldering process.

\*\* For 1808\_200V ~3kV, 1812\_200V~3kV and safety certificated products.

\*\*\* For 1206\_1000V ~3kV,1808\_200V ~3kV, 1812\_200V~3kV and safety certificated products.

#1:For 0603/Cap ≧ 10μF or 0603(≦ 6.3V)/Cap ≧ 4.7μF or 0603(>10V)/Cap > 1μF products.

#2 : For 1210(100V)/Cap > 1μF or 1210(250V)/Cap > 0.47μF or 1210(400V~630V)/Cap > 0.22μF.

The table only for General Purpose Series, Soft termination and others please refer to individual sheet for details.



Table 2 DIELECTRIC TYPE

Dielectric Code	N	CG	HG	LG	PH	RH	SH	TH	UJ	SL	X	B	E	F
Dielectric	NPO	COG	HG	LG	PH	RH	SH	TH	UJ	SL	X5R	X7R	Z5U	Y5V

Table 3 NOMINAL CAPACITANCE

unit: pF

Express Method	Actual Value
0R5	0.5
1R0	1.0
102	10×10 <sup>2</sup>
224	22×10 <sup>4</sup>
...	...

Note: the first two digits are significant; third digit denotes number of zeros; R=decimal point.

Table 4 CAPACITANCE TOLERANCE

Code	B	C	D	F	G	J	K	M	S	Z
Tolerance	±0.10pF	±0.25pF	±0.5pF	±1.0%	±2.0%	±5.0%	±10%	±20%	+50% -20%	+80% -20%

Note: These capacitance tolerance B, C, D are just applicable the capacitance that equals to or less than 10pF.

Table 5 RATED VOLTAGE

unit: V

(Express Method)	(Actual Value)
6R3	6.3
500	50×10 <sup>0</sup>
201	20×10 <sup>1</sup>
102	10×10 <sup>2</sup>
...	...

Note: the first two digits are significant; third digit denotes number of zeros; R=decimal point.

Table 6 TERMINAL MATERIAL TYPE

Termination Type	(Express Method)
Silver Solderable Termination	S
Copper Solderable Termination	C
Nickel Barrier Termination	N

Table 7 PACKAGE TYPE

B	T	Q	G
Bulk Bag	7" Taping Package	10" Taping Package	13" Taping Package



Table 8 TEMPERATURE COEFFICIENT /CHARACTERISTICS

Dielectric	Temperature Coefficient	Temperature Point
COG(NP0)	0±30 ppm/°C	+20°C → -55°C → +20°C → +125°C
HG	-33±30 ppm/°C	+20°C → -55°C → +20°C → +85°C
LG	-75±30 ppm/°C	+20°C → -55°C → +20°C → +85°C
CH	0±60 ppm/°C	+20°C → -55°C → +20°C → +85°C
PH	-150± 60 ppm/°C	+20°C → -55°C → +20°C → +85°C
RH	-220± 60 ppm/°C	+20°C → -55°C → +20°C → +85°C
SH	-330± 60 ppm/°C	+20°C → -55°C → +20°C → +85°C
TH	-470± 60 ppm/°C	+20°C → -55°C → +20°C → +85°C
UJ	-750± 120 ppm/°C	+20°C → -55°C → +20°C → +85°C
SL	-1000~+140 ppm/°C	+20°C → -55°C → +20°C → +85°C
X7R	±15%	+20°C → -55°C → +20°C → +125°C
X5R	±15%	+20°C → -55°C → +20°C → +85°C
Z5U	-56%~+22%	+20°C → +10°C → +20°C → +85°C
Y5V	-80%~+30%	+20°C → -25°C → +20°C → +85°C

Note: Nominal temperature coefficient and allowed tolerance of class I are decided by the changing of the capacitance between 20°C and 85°C.

Table 9 CAPACITANCE RANGE AND OPERATING VOLTAGE

unit: pF

Size	Rated Voltage	Capacitance Range		
		COG(NPO)	X7R(X5R)	Y5V (Z5U)
0402	6.3V	0.1~470	100~1,000,000	1,000~1,000,000
	10V	0.1~470	100~1,000,000	1,000~1,000,000
	16V	0.1~470	100~47,000	1,000~220,000
	25V	0.1~470	100~22,000	1,000~100,000
	50V	0.1~470	100~10,000	1,000~100,000
0603	6.3V	0.1~3,300	100~4,700,000	1,000~4,700,000
	10V	0.1~3,300	100~1,000,000	1,000~2,200,000
	16.V	0.1~3,300	100~1,000,000	1,000~1,000,000
	25V	0.1~3,300	100~150,0000	1,000~1,000,000
	50V	0.1~3,300	100~100,000	1,000~220,000
0805	6.3V	0.3~10,000	100~47,000,000	1,000~47,000,000
	10V	0.3~10,000	100~10,000,000	1,000~22,000,000
	16V	0.3~10,000	100~10,000,000	1,000~10,000,000
	25V	0.3~10,000	100~4,700,000	1,000~4,700,000
	50V	0.3~10,000	100~1,000,000	1,000~2,200,000



Table 9 CONTINUATION

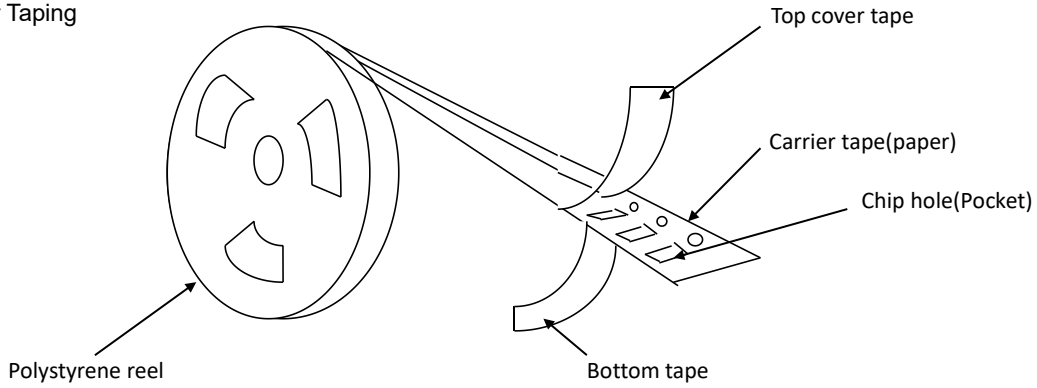
Size	Rated Voltage	Capacitance Range		
		COG(NPO)	X7R(X5R)	Y5V (Z5U)
1206	6.3V	0.5~33,000	100~100,000,000	1,000~100,000,000
	10V	0.5~33,000	100~33,000,000	1,000~33,000,000
	16V	0.5~33,000	100~22,000,000	1,000~22,000,000
	25V	0.5~33,000	100~10,000,000	1,000~10,000,000
	50V	0.5~100,000	100~4,700,000	1,000~4,700,000
1210	6.3V	0.5~33,000	100~100,000,000	1,000~100,000,000
	10V	0.5~33,000	100~47,000,000	1,000~47,000,000
	16V	0.5~33,000	100~47,000,000	1,000~47,000,000
	25V	0.5~33,000	100~22,000,000	1,000~22,000,000
	50V	0.5~100,000	100~10,000,000	1,000~10,000,000
1808	6.3V	0.5~47,000	220~100,000,000	4,700~100,000,000
	10V	0.5~33,000	220~100,000,000	4,700~100,000,000
	16V	0.5~33,000	220~47,000,000	4,700~47,000,000
	25V	0.5~33,000	220~22,000,000	4,700~22,000,000
	50V	0.5~100,000	220~10,000,000	4,700~10,000,000
1812	6.3V	0.5~47,000	220~100,000,000	4,700~100,000,000
	10V	0.5~33,000	220~100,000,000	4,700~100,000,000
	16V	0.5~33,000	220~100,000,000	4,700~100,000,000
	25V	0.5~33,000	220~47,000,000	4,700~47,000,000
	50V	0.5~100,000	220~22,000,000	4,700~22,000,000
2220	6.3V	0.5~470,000	220~100,000,000	4,700~100,000,000
	10V	0.5~470,000	220~100,000,000	4,700~100,000,000
	16V	0.5~470,000	220~100,000,000	4,700~100,000,000
	25V	0.5~220,000	220~47,000,000	4,700~47,000,000
	50V	0.5~100,000	220~22,000,000	4,700~22,000,000
2225	6.3V	0.5~470,000	220~100,000,000	4,700~100,000,000
	10V	0.5~470,000	220~100,000,000	4,700~100,000,000
	16V	0.5~470,000	220~100,000,000	4,700~100,000,000
	25V	0.5~220,000	220~47,000,000	4,700~47,000,000
	50V	0.5~100,000	220~22,000,000	4,700~22,000,000

Note: We can design according to customer special requirements



5. PACKAGE

Paper Taping



※Dimensions of paper taping for 0402 type

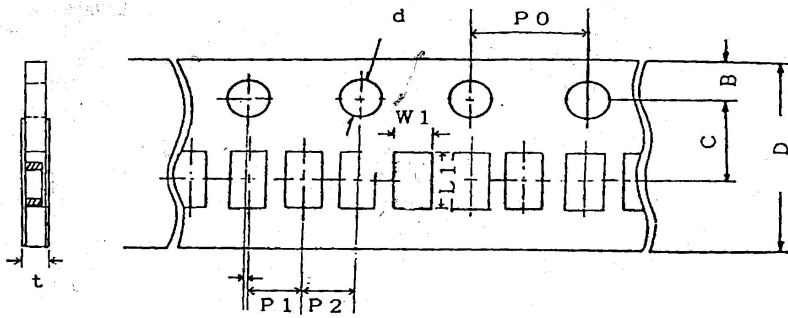
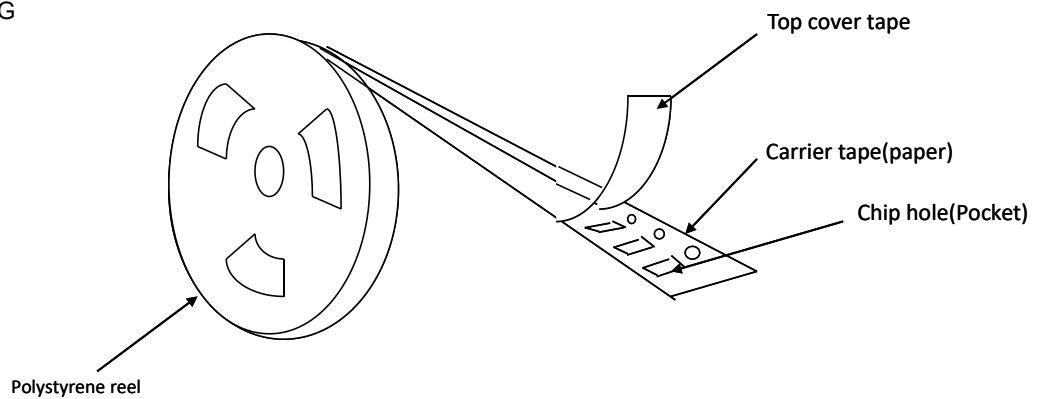


Table 10 DIMENSIONS OF PAPER TAPING FOR 0402 TYPE

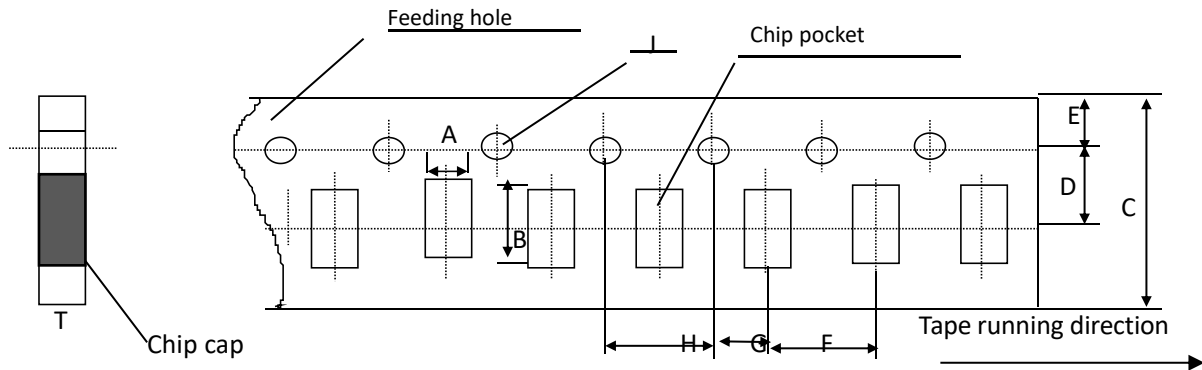
Code	W1	L1	D	C	B	P1	P2	P0	d	t
0402	0.65 ± 0.20	1.15 ± 0.20	8.00 ± 0.20	3.50 ± 0.05	1.75 ± 0.10	2.00 ± 0.05	2.00 ± 0.05	4.00 ± 0.10	1.50 -0/+0.10	0.80 Below

●EMBOSSSED TAPING

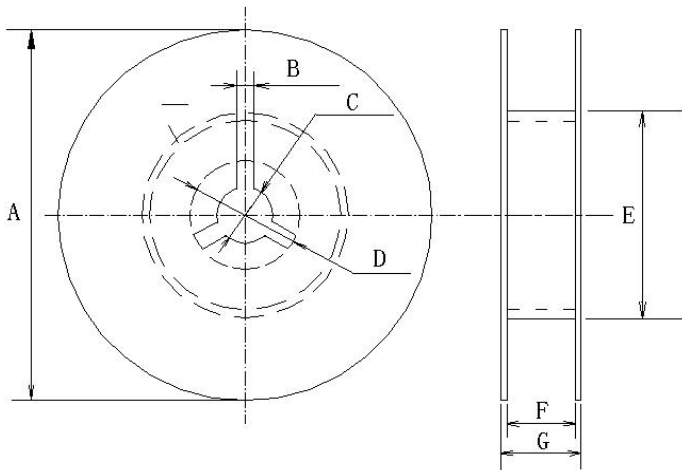




※Dimensions of paper taping for 0603,0805,1206 types.



※Reel Dimensions (unit: mm)



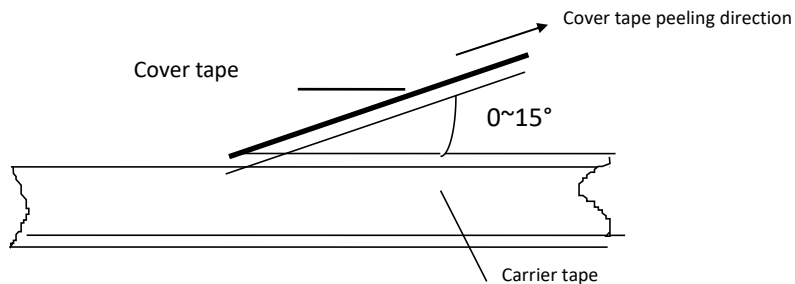
※ Table11 CODE

	A	B	C	D	E	F	G
7'REEL	$\phi 178 \pm 2.0$	3.0	$\phi 13 \pm 0.5$	$\phi 21 \pm 0.8$	$\phi 50$ or more	$10.0 \pm 1.5$	12max
13'REEL	$\phi 330 \pm 2.0$	3.0	$\phi 13 \pm 0.5$	$\phi 21 \pm 0.8$	$\phi 50$ or more	$10.0 \pm 1.5$	12max

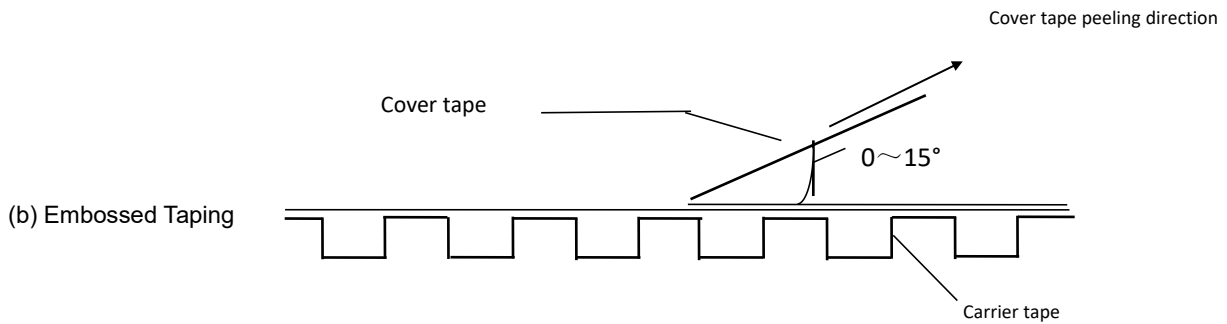
●Taping Specification

※Top tape peeling strength

(a) Paper Taping







Standard:  $0.1N < \text{peeling strength} < 0.7N$

No paper dirty remains on the scotch when peeling, and sticks to top and bottom tape.

Table 12 BULK CASE PACKAGE

unit:mm

Symbol	A	B	T	C	D	E
Dimension	6.80±0.10	8.80±1.00	12.00±0.10	15.00+0.10/-0	2.00+0/-0.10	4.70±0.10
Symbol	F	W	G	H	L	I
Dimension	31.50+0.20/-0	36.00+0/-0.20	19.00±0.35	7.00±0.35	110.00±0.70	5.00±0.35

Table 13 PACKING QUANTITY

Size	Package Style & Quantity			
	PT	ET	BC	BP
0402	10000	-----	20000	5000
0603	5000	-----	15000	5000
0805	5000	2500	10000	5000
1206	5000	2500	5000	5000
1210	-----	2000	-----	2000
1808	-----	2000	-----	2000
1812	-----	2000	-----	2000
2220	-----	-----	-----	500
2225	-----	-----	-----	500

Note: We can choose packing style and quantity can be according to the customer's requirement.

## 6. STORAGE CONDITIONS:

The guaranteed period for solderability is 6 months (Under deliver package condition).

- Storage Temperature: 5°C~40°C
- Relative Humidity: 20%~70%