



## (High Voltage MLCC)



### 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.





**STRUCTURE AND DIMENSIONS**

※DIMENSIONS

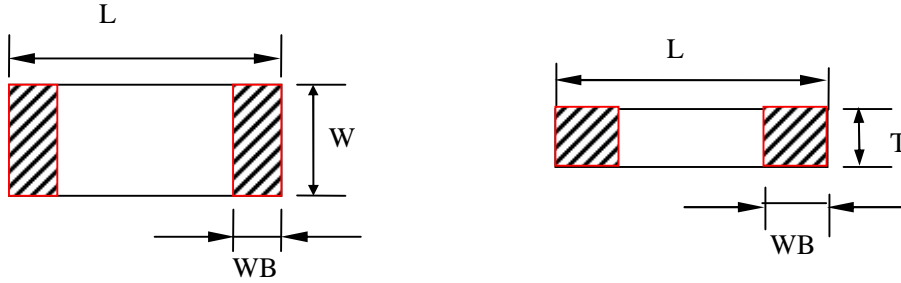
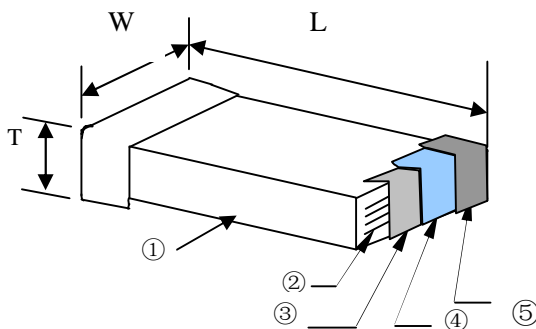


Table 1 Dimensions

Type		Dimensions (mm)			
British expression	Metric expression	L	W	T	WB
0402	1005	1.00±0.05	0.50±0.05	≤0.5	0.25±0.10
0603	1608	1.60±0.10	0.80±0.10	≤0.8	0.30±0.10
0805	2012	2.00±0.20	1.25±0.20	≤1.25	0.50±0.20
1206	3216	3.20±0.30	1.60±0.2	≤1.25	0.50±0.25
1210	3225	3.20±0.30	2.50±0.30	≤2.5	0.75±0.25
1808	4520	4.50±0.40	2.00±0.20	≤2.0	0.75±0.25
1812	4532	4.50±0.40	3.20±0.30	≤3.2	0.75±0.20
2220	5651	5.60±0.50	5.1±0.50	≤3.2	1.00±0.25
2225	5663	5.60±0.50	6.30±0.50	≤2.5	1.00±0.25
3035	7690	7.60±0.50	9.00±0.50	≤3.0	1.00±0.25

Note: We can design according to customer special requirements.

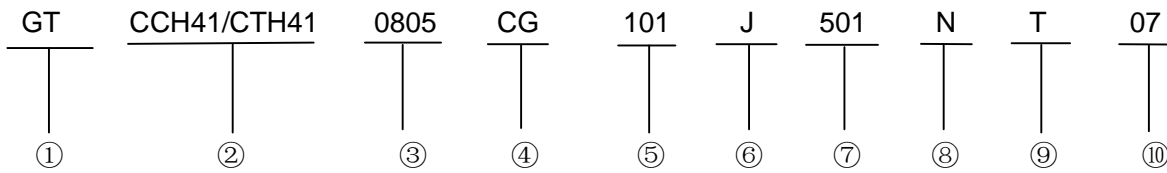
※ STRUCTURE



NO.	Name
①	Ceramic dielectric
②	Inner electrode
③	Substrate electrode
④	Nickel Layer
⑤	Tin Layer



Green Tech Part Number:



- ① GT: Brand Green Tech
- ② CCH41: High voltage, High frequency, CTH41: High voltage, Low frequency
- ③ size code see table2
- ④ Dielectric type see table3
- ⑤ Capacitance see table4
- ⑥ Tolerance see table5
- ⑦ Voltage see table6
- ⑧ Terminal material type see table7
- ⑨ Package type see table 8
- ⑩ Thickness code see table 9

Table 2 DIMENSIONS

unit: inch/ mm

Size Code	0402	0603	0805	1206	1210	1808	1812	2220	2225
(LxW) inch	0.04x0.02	0.06x0.03	0.08x0.05	0.12x0.06	0.12x0.10	0.18x0.08	0.18x0.12	0.22x0.20	0.22x0.25
(LxW) mm	1.00x0.50	1.60x0.80	2.00x1.25	3.20x1.60	3.20x2.50	4.50x2.00	4.50x3.20	5.60x5.10	5.60x6.30

Table 3 DIELECTRIC TYPE

Dielectric Code	CG	HG	LG	PH	RH	SH	TH	UJ	SL	X	B	E	F
Dielectric	COG (NP0)	HG	LG	PH	RH	SH	TH	UJ	SL	X5R	X7R	Z5U	Y5V

Table 4 NOMINAL CAPACITANCE

unit: pF

Express Method	Actual Value	
0R5	0.5	Note: the first two digits are significant; third digit denotes number of zeros; R=decimal point.
1R0	1.0	
102	10x10 <sup>2</sup>	
224	22x10 <sup>4</sup>	
...	...	



Table 5 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 6 RATED VOLTAGE

unit: V

(Express Method)	(Actual Value)	
101	10×10 <sup>1</sup>	Note: the first two digits are significant; third digit denotes number of zeros; R=decimal point.
201	20×10 <sup>1</sup>	
501	50×10 <sup>1</sup>	
102	10×10 <sup>2</sup>	
...	...	

Table 7 TERMINAL MATERIAL TYPE

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

Table 8 PACKAGE TYPE

B	T
Bulk Bag	Taping Package

Table 9 Thickness code

Code number	Thickness (mm)
05	0.5
07	0.7
08	0.8
10	1.0
12	1.2
125	1.25
16	1.6
20	2.0
25	2.5
30	3.0
32	3.2
...	...



Table 10 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.

**HIGH VOLTAGE MLCC**

Medium & high voltage MLCC is a kind of special design MLCC that bases on the technology of general MLCC. This kind of MLCC has stable high voltage reliability and suitable to SMT. Middle & high MLCC is widely applicable for many direct high voltage circuits in which it can improve the performance of the circuit.

**APPLICATIONS**

- ※Analog & Digital Modems
- ※LAN/WAN Interface
- ※Lighting Ballast Circuits
- ※Voltage Multipliers
- ※DC-DC Converters
- ※Back-lighting Inverters

Table 11 Capacitance and rated voltage

Size Code	Rated Voltage	Capacitance (pF)		
		NPO	X7R	Y5V
0603	100V	0.5~820	100~10000	2200~68000
	200V	0.5~330	100~6800	-----
0805	100V	0.5~1000	150~100000	10000~100000
	200V	0.5~820	150~56000	10000~56000
	250V	0.5~820	150~56000	10000~56000
	500V	0.5~560	150~10000	-----



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Size Code	Rated Voltage	Capacitance (pF)		
		NPO	X7R	Y5V
1206	100V	0.5~4700	150~1000000	10000~1000000
	200V	0.5~4700	150~47000	10000~150000
	250V	0.5~4700	150~100000	10000~150000
	500V/630V	0.5~4700	150~22000	-----
	1000V	0.5~680	150~10000	-----
	2000V	0.5~100	150~472	-----
1210	100V	10~4700	150~2200000	10000~2200000
	200V	10~3300	150~100000	10000~100000
	250V	10~3300	150~100000	10000~100000
	500V/630V	10~4700	150~10000	-----
	1000V	10~820	150~22000	-----
	2000V	10~470	150~10000	-----
1808	100V	10~4700	150~220000	10000~820000
	200V	10~2700	150~100000	10000~390000
	250V	10~2700	150~100000	10000~390000
	500V/630V	10~1800	150~100000	-----
	1000V	10~820	150~10000	-----
	2000V	10~220	150~10000	-----
	3000V	10~220	150~1500	-----
	4000V	10~150	150~1000	-----
1812	100V	10~10000	150~2200000	10000~2200000
	200V	10~5600	150~470000	10000~470000
	250V	10~5600	150~470000	10000~470000
	500V/630V	10~3900	150~100000	-----
	1000V	10~1200	150~27000	-----
	2000V	10~390	150~10000	-----
	3000V	10~270	150~2200	-----
	4000V	10~220	150~1500	-----
	5000V	10~220	150~1500	-----
2220	100V	10~27000	150~2200000	10000~2200000
	200V	10~12000	150~1500000	10000~680000
	250V	10~12000	150~470000	10000~680000
	500V/630V	10~6800	150~470000	-----
	1000V	10~2200	150~56000	-----
	2000V	10~1000	150~27000	-----
	3000V	10~680	150~3900	-----
	4000V	10~560	150~3300	-----
	5000V	10~560	150~3300	-----



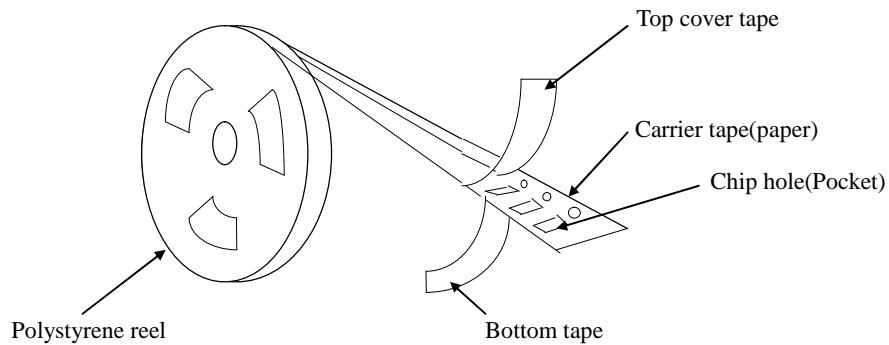
2225	100V	10~27000	150~2200000	10000~2200000
	200V	10~12000	150~1500000	10000~680000
	250V	10~12000	150~470000	10000~680000
	500V/630V	10~6800	150~470000	-----
	1000V	10~2200	150~56000	-----
	2000V	10~1000	150~27000	-----
	3000V	10~680	150~3900	-----
	4000V	10~560	150~3300	-----
	5000V	10~560	150~3300	

Note: We can design according to customer special requirements

Table 12 measurement method for high voltage MLCC

Rated voltage range	Measuring Method
500V≤Vr≤1000V	Force 150%Rated voltage for 5 second. Max..current should not exceed 50 mA.
1000V<Vr≤2000V	Force 120%Rated voltage for 5 seconds. Max..current should not exceed 50 mA.
2000V<Vr≤5000V	Force 120%Rated voltage for 5 seconds. Max..current should not exceed 10 mA.

※**PACKAGE**  
PAPER TAPING



※Dimensions of paper taping for 0402 type

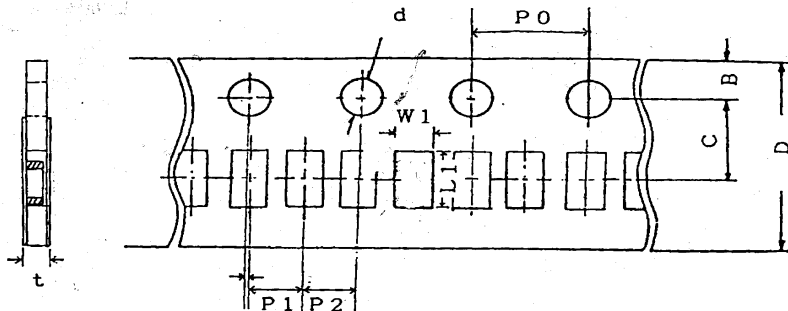


Table 13 Dimensions of paper taping for 0402 type

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



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

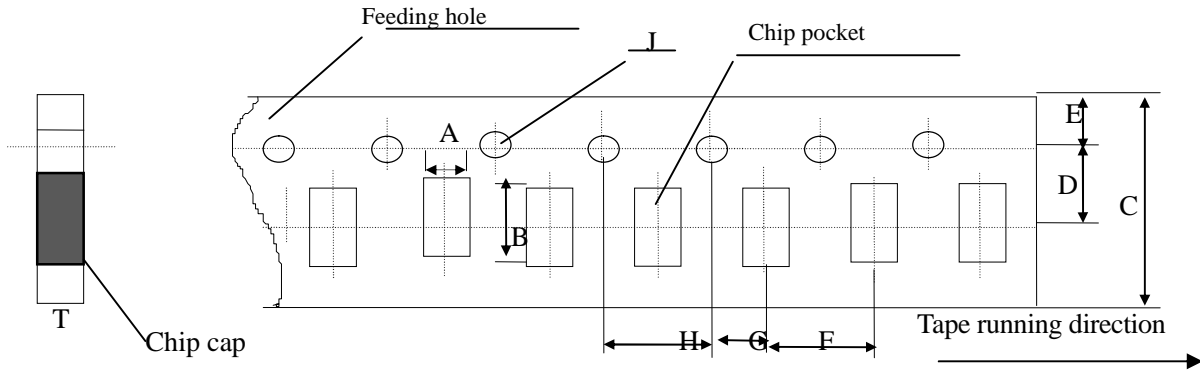
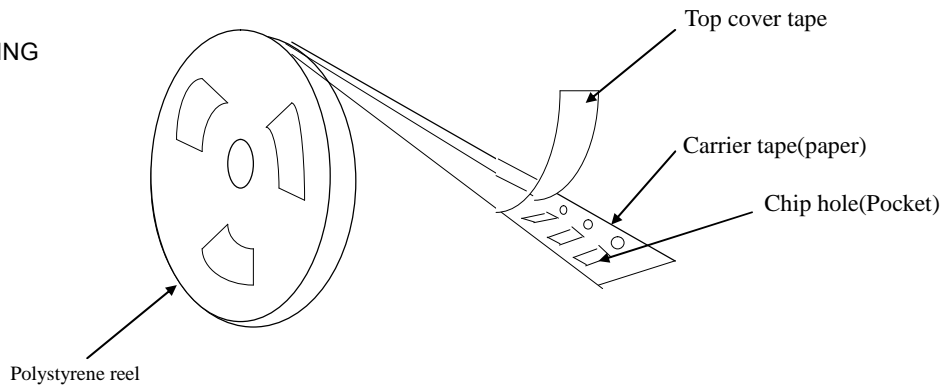


Table 14 Dimensions of paper taping for 0603, 0805, 1206 types. Unit: mm

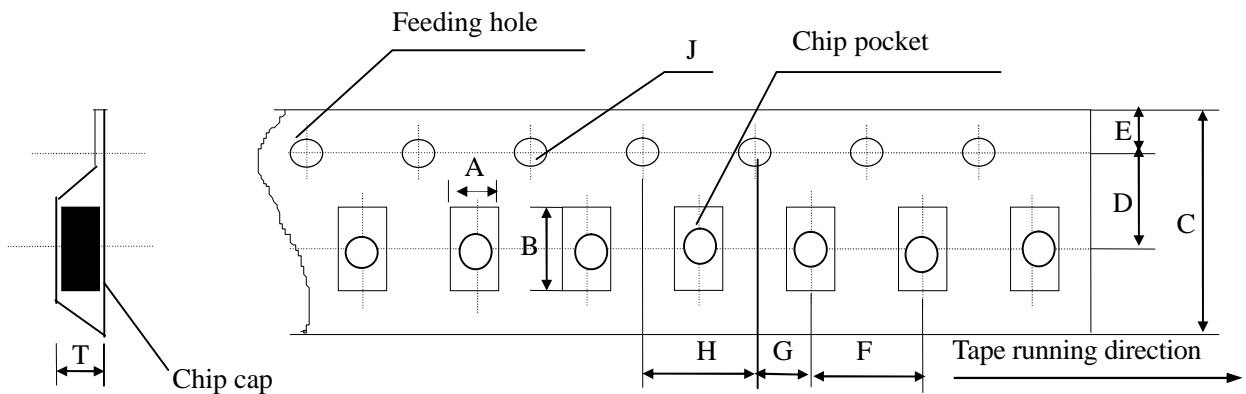
Code paper size	A	B	C	D*	E	F	G*	H	J	T
0603	1.10 ± 0.20	1.90 ± 0.20	8.00 ± 0.20	3.50 ± 0.05	1.75 ± 0.10	4.00 ± 0.10	2.00 ± 0.10	4.00 ± 0.10	1.50 -0/+0.10	1.10 Below
0805	1.45 ± 0.20	2.30 ± 0.20	8.0 ± 0.20	3.50 ± 0.05	1.75 ± 0.10	4.00 ± 0.10	2.00 ± 0.10	4.00 ± 0.10	1.50 -0/+0.10	1.10 Below
1206	1.80 ± 0.20	3.40 ± 0.20	8.00 ± 0.20	3.50 ± 0.05	1.75 ± 0.10	4.00 ± 0.10	2.00 ± 0.10	4.00 ± 0.10	1.50 -0/+0.10	1.10 Below

Note: The place with “\*” means where needs exactly dimensions.

●EMBOSSED TAPING



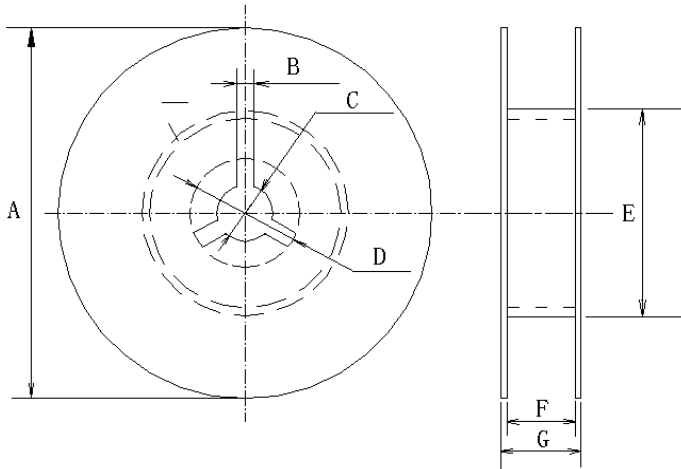
※Dimensions of embossed taping for 0805~1812 type







※ Reel Dimensions (unit: mm)



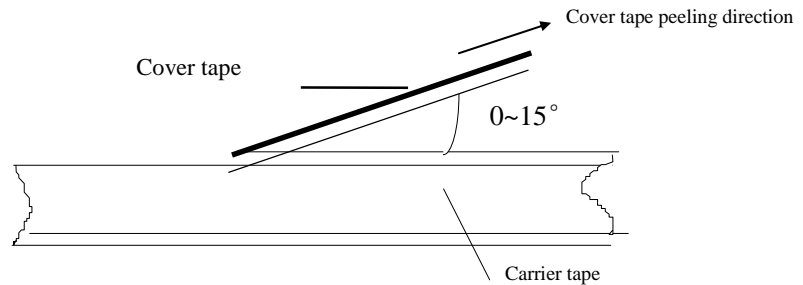
※ Table 15 CODE

	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

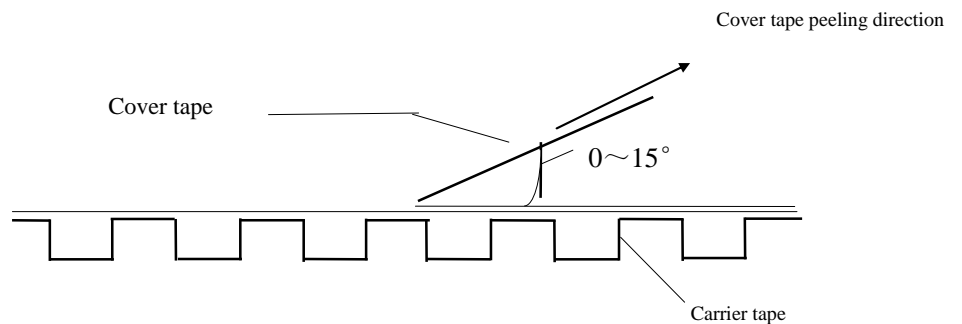
● Taping specification

※ Top tape peeling strength

(a) Paper Taping



(b) Embossed 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 16 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 17 Packing Quantity

SIZE	PACKAGE STYLE & QUANTITY unit: pcs			
	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
3035	-----	-----	-----	-----

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