

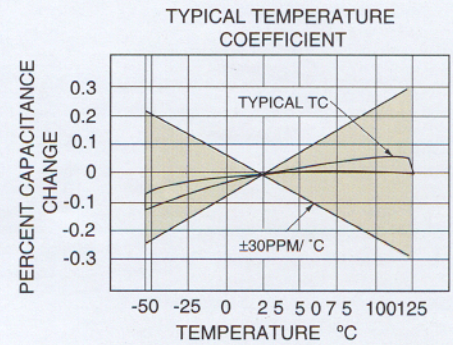
# Typical Performance Characteristics

## COG

**APPLICATION** - Suited for precision circuits, Requiring stable dielectric characteristics :  
· Negligible dependence of capacitance and dissipation factor on time, voltage, and frequency.

### DIELECTRIC CHARACTERISTICS

Temperature Coefficient	$0 \pm 30 \text{ ppm/}^\circ\text{C}$
Temperature Range	$-55^\circ\text{C}$ to $125^\circ\text{C}$
Dissipation Factor	$< 0.001 (0.1\%)$ @ 1MHz, $25^\circ\text{C}$ (1KHz, above 1000pF)
Quality Factor	$> 1000$ (1KHz, above 1000pF)
Insulation Resistance	$> 1000 \text{ } \Omega\text{F}$ or $1000 \text{ G}\Omega$ , whichever is less, @ $25^\circ\text{C}$ , VDCW. @ $125^\circ\text{C}$ , IR is 1% of $25^\circ\text{C}$ requirement
Dielectric Strength	$> 2.5 \times \text{VDCW}$ . 50mA Max
Test Parameters	1MHz $\pm 50\text{KHz}$ , $1.0 \pm 0.2 \text{ VRMS}$ , below 1000pF, $25^\circ\text{C}$ 1KHz $\pm 50\text{Hz}$ , $1.0 \pm 0.2 \text{ VRMS}$ , above 1000pF, $25^\circ\text{C}$

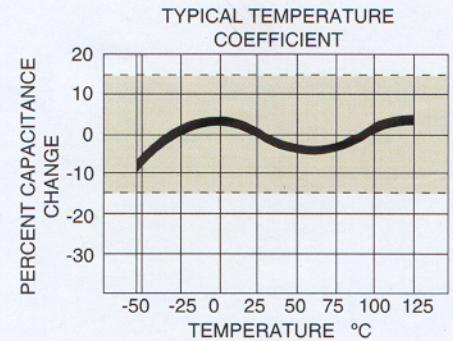


## X7R

**APPLICATION** - Stable Class II dielectric properties, suited for by-pass and coupling purposes, filtering, frequency discrimination, DC blockage, and as voltage transient suppression elements.

### DIELECTRIC CHARACTERISTICS

Capacitance Change	$\Delta C \ 0 \pm 15\%$
Temperature Range	$-55^\circ\text{C}$ to $125^\circ\text{C}$
Dissipation Factor	$< 0.025 (2.5\%)$ @ 1KHz, $25^\circ\text{C}$
Insulation Resistance	$> 1000 \text{ } \Omega\text{F}$ or $100 \text{ G}\Omega$ , whichever is less, @ $25^\circ\text{C}$ , VDCW. @ $125^\circ\text{C}$ , IR is 10% Of $25^\circ\text{C}$ requirement
Dielectric Strength	$> 2.5 \times \text{VDCW}$ . 50mA Max
Aging	$< 2.5\%$ / decade hour
Test Parameters	1KHz $\pm 50\text{Hz}$ , $1.0 \pm 0.2 \text{ VRMS}$ , $25^\circ\text{C}$



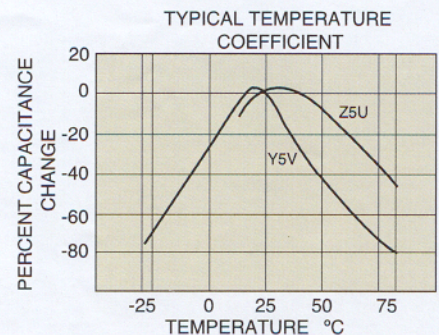
## Z5U / Y5V

**APPLICATION** - The Hi-K(Z5U, Y5V) dielectrics deliver high capacitance density and are ideally suited for applications where space is at a premium, or as replacement for tantalum capacitors, Typical applications include use as by-pass or decoupling elements.

Best performance is obtained at or near room temperature, with low D.C. bias

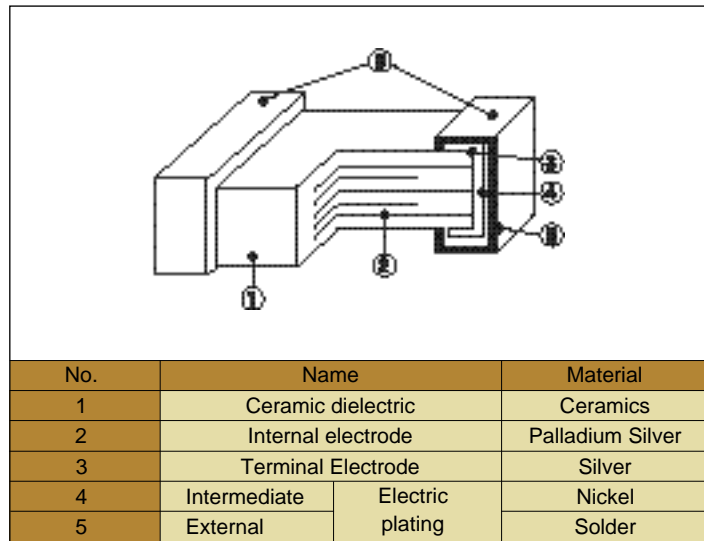
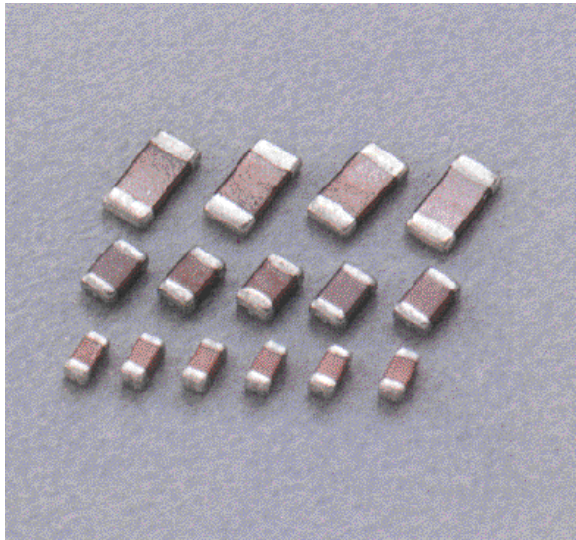
### DIELECTRIC CHARACTERISTICS

Capacitance Change	Z5U/Y5V: $\Delta C\% +22 \sim -56$ / $\Delta C\% +22 \sim -82$
Temperature Range	Z5U/Y5V: $10^\circ\text{C} \sim +85^\circ\text{C}$ / $-30^\circ\text{C} \sim +85^\circ\text{C}$
Dissipation Factor	Z5U/Y5V: $< 0.04 (4\%)$ / $< 0.05 (5\%)$ @ 1KHz, $25^\circ\text{C}$
Insulation Resistance	$> 1000 \text{ } \Omega\text{F}$ or $100 \text{ G}\Omega$ , whichever is less, @ $25^\circ\text{C}$ VDCW
Dielectric Strength	$> 2.5 \times \text{VDCW}$ , 50mA Max
Aging	$< 5\%$ / decade hour
Test Parameters	1KHz $\pm 50\text{Hz}$ , $0.5 \text{ VRMS}$ , $25^\circ\text{C}$

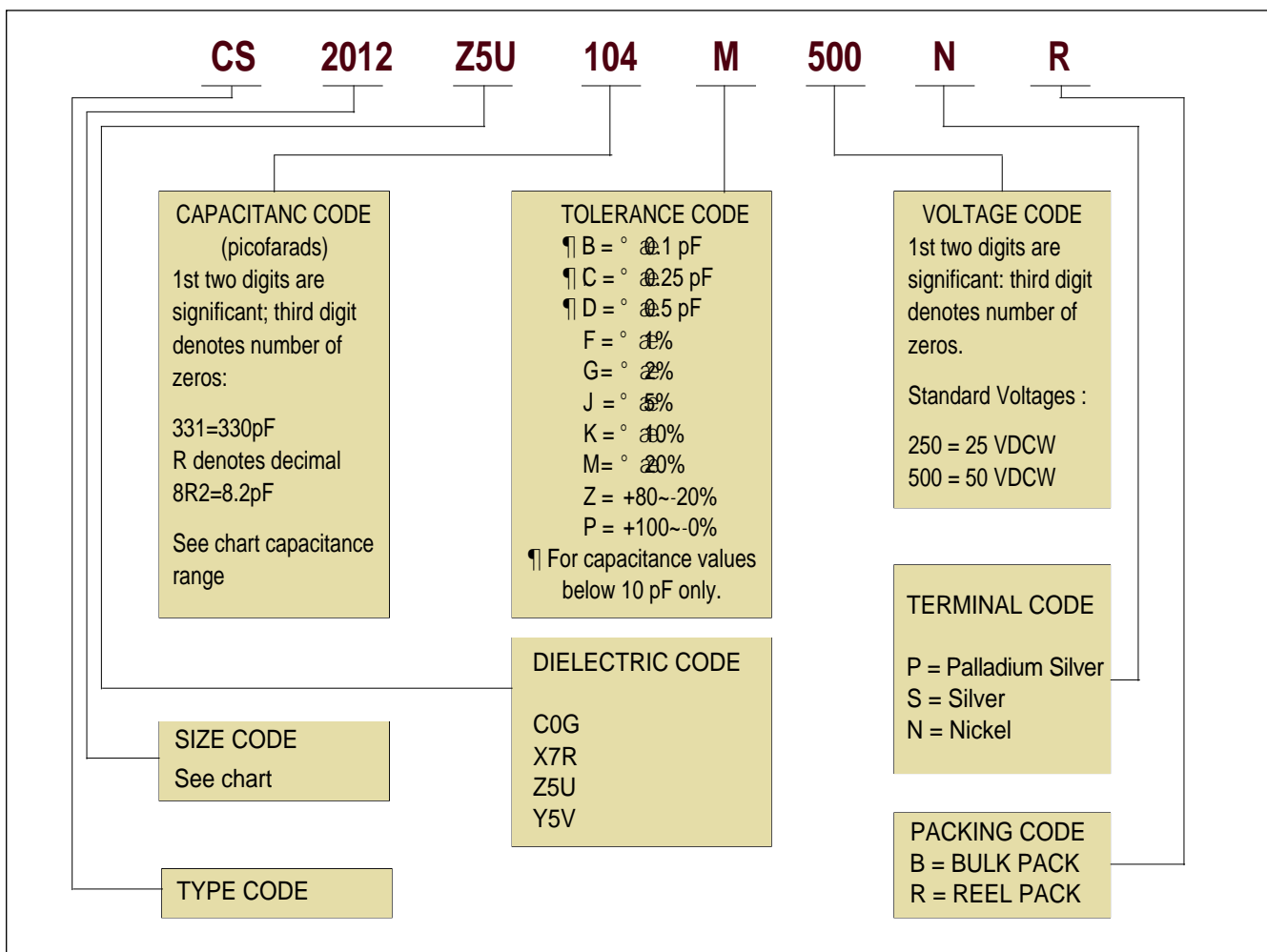




## SMD Type



## TYPE DESIGNATION (HOW TO ORDER)



# SMD Type

## CAPACITANCE RANGE AND DIMENSIONS BY TYPE

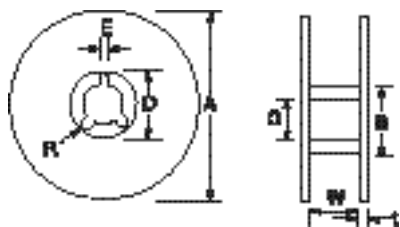
SIZE CODE		1608				2012				3216				3225			
SIZE(mm)	L	1.60° 0.1				2.00° 0.20				3.20° 0.25				3.20° 0.25			
	W	0.80° 0.1				1.25° 0.15				1.60° 0.20				2.50° 0.25			
	T	0.80° 0.1				1.20 MAX				1.20 MAX				1.30 MAX			
CAPACITANCE VALUE		C0G	X7R	Z5U	Y5V	C0G	X7R	Z5U	Y5V	C0G	X7R	Z5U	Y5V	C0G	X7R	Z5U	Y5V
0.5pF	0R5	0R5				0R5				0R5							
1	010																
2	020																
3	030																
4	040																
5	050																
6	060																
7	070																
8	080																
9	090																
10	100																
12	120																
15	150																
16	160																
18	180																
20	200																
22	220																
24	240																
27	270																
30	300																
33	330																
36	360																
39	390		390														
43	430																
47	470																
51	510																
56	560																
62	620																
68	680																
75	750			750													
82	820																
91	910																
100	101						101			101							
120	121																
150	151																
180	181																
220	221																
270	271																
330	331				331												
390	391																
470	471	471															
560	561																
680	681																
820	821																
1000	102					102		102							102		
1200	122																
1500	152																
1800	182																
2200	222																
2700	272									272							
3300	332																
3900	392																
4700	472																
5600	562																
6800	682																
8200	822																
10nF	103								103			103	103			103	103
15	153		153														
22	223			223													
33	333																
47	473																
68	683																
100	104				104		104	104		104							
150	154																
220	224																
330	334																
470	474											474			474		
680	684																
1000	105								105				105				105



# SMD Type

## REEL PACKING DIMENSIONS

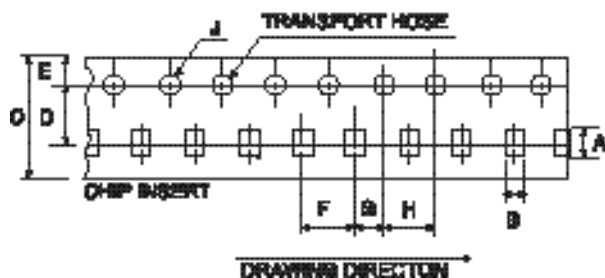
### REEL DIMENSIONS



(Unit : mm)

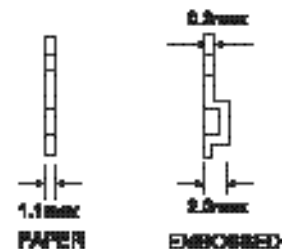
A	$\beta 178A \pm 2$	E	$2.0^\circ \pm 5$
B	$\beta 50 \text{ Min}$	W	$10.0^\circ \pm 5$
C	$\beta 13.0^\circ \pm 5$	t	$2.0^\circ \pm 5$
D	$\beta 21.0^\circ \pm 8$	R	1.0

### TAPE DIMENSIONS



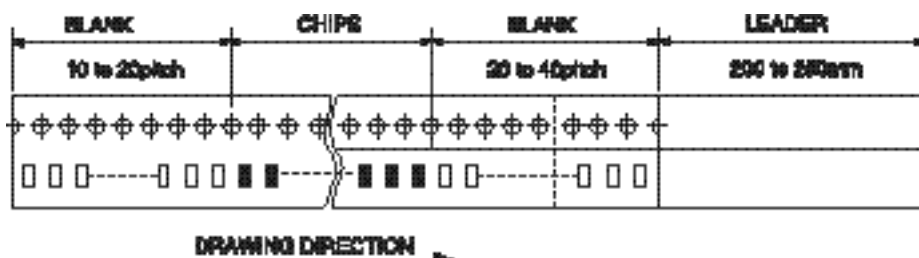
### NUMBER OF PACKAGES

TYPE	EIA CODE	Qt / REEL
CS1608	CC0603	4.000pcs
CS2012	CC0805	4.000
CS3216	CC1206	3.000
CS3225	CC1210	3.000



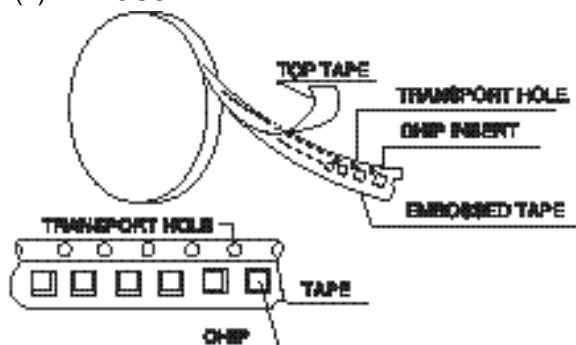
(Unit : mm)

TYPE	EIA CODE	A	B	C	D	E	F	G	H	J
CS1608	CC0603	$2.0^\circ \pm 2$	$1.20^\circ \pm 2$	$8.0^\circ \pm 3$	$3.5^\circ \pm 5$	$1.75^\circ \pm 1$	$4.0^\circ \pm 1$	$2.0^\circ \pm 5$	$4.0^\circ \pm 1$	$1.5^\circ \pm 1$ $^\circ \text{ }^\mu\text{m}$
CS2012	CC0805	$2.4^\circ \pm 2$	$1.65^\circ \pm 2$	$8.0^\circ \pm 3$	$3.5^\circ \pm 5$	$1.75^\circ \pm 1$	$4.0^\circ \pm 1$	$2.0^\circ \pm 5$	$4.0^\circ \pm 1$	$1.5^\circ \pm 1$ $^\circ \text{ }^\mu\text{m}$
CS3216	CC1206	$3.6^\circ \pm 2$	$2.00^\circ \pm 2$	$8.0^\circ \pm 3$	$3.5^\circ \pm 5$	$1.75^\circ \pm 1$	$4.0^\circ \pm 1$	$2.0^\circ \pm 5$	$4.0^\circ \pm 1$	$1.5^\circ \pm 1$ $^\circ \text{ }^\mu\text{m}$
CS3225	CC1210	$3.6^\circ \pm 2$	$2.90^\circ \pm 2$	$8.0^\circ \pm 3$	$3.5^\circ \pm 5$	$1.75^\circ \pm 1$	$4.0^\circ \pm 1$	$2.0^\circ \pm 5$	$4.0^\circ \pm 1$	$1.5^\circ \pm 1$ $^\circ \text{ }^\mu\text{m}$

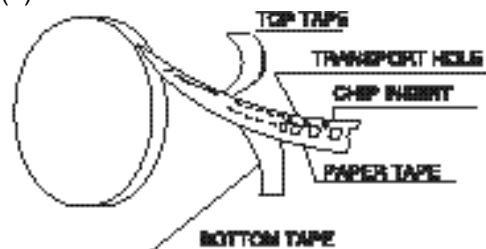


## TAPING (FIGURE)

### (1) EMBOSSED TAPE



### (2) PAPER TAPE



MULTI-LAYER CERAMIC CAPACITORS

Radial & Axial

TYPE DESIGNATION (HOW TO ORDER)

(HOW TO ORDER)

CR 051B X7R 104 M 500 B  
CA 2644 Z5U 104 M 500 R

CAPACITANCE CODE  
THIS IS EXPRESSED IN PICO FARADS THE FIRST DIGITS ARE SIGNIFICANT FIGURES. THE THIRD IS THE NUMBER OF ZEROS.

EIA TEMPERATURE CHARACTERISTICS		
EIA Characteristic	Temperature Range	Maximum Capacitance Change Over Temperature Range
Z5U	+10° to +85°	-56% + 22%
X7R	-55° to +125°	° 15%
COG(NPO)	-55° to +125°	0° 30ppm/°
Y5V	-30° to +85°	-82%+22%

VOLTAGE RATING.  
THE D.C WORKING VOLTAGE RATING AT MAXIMUM OPERATING TEMPERATURE THE FIRST TWO DIGITS ARE SIGNIFICANT FIGURES, THE THIRD IS THE NUMBER OF ZEROS

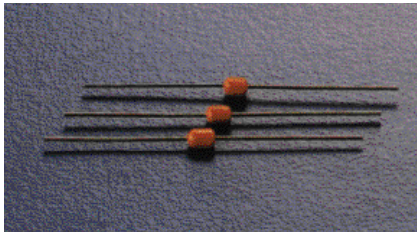
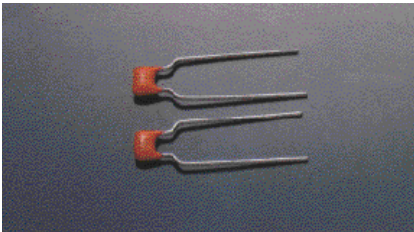
TYPE CODE  
SEE DIMENSIONS.

TOLERANCE CODE

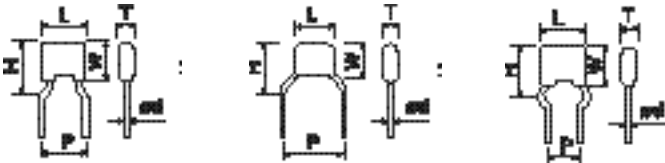
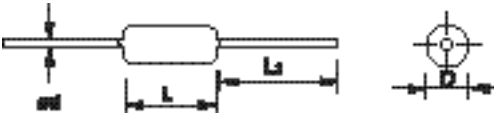
¶ B = ° 0.1 pF  
¶ C = ° 0.25 pF  
¶ D = ° 0.5 pF  
F = ° 1%  
G = ° 2%  
J = ° 5%  
K = ° 10%  
M = ° 220%  
Z = + 80° 20%  
P = +100° 0%  
¶ For capacitance values Below 10 pF only.

PACKING CODE  
B° BULK PACK  
R° REEL PACK  
F° FLAT PACK

DIMENSIONS BY TYPE



(Unit : mm)

RADIAL							AXIAL					
TYPE	P	H (max)	L (max)	W (max)	β d	T (max)	TYPE	H (max)	L (max)	W (max)	β dj	
CR051A	2.5	6.4	5.1	5.1	0.5	3.2	CA2633	3.3	2.6	25	0.5	
CR051B	5.0						CA2644	4.4				
CR051D	7.6						CA2666	6.6				
CR077B	5.0	9.2	7.7	7.6								
CR077D	7.6	10.2										
												

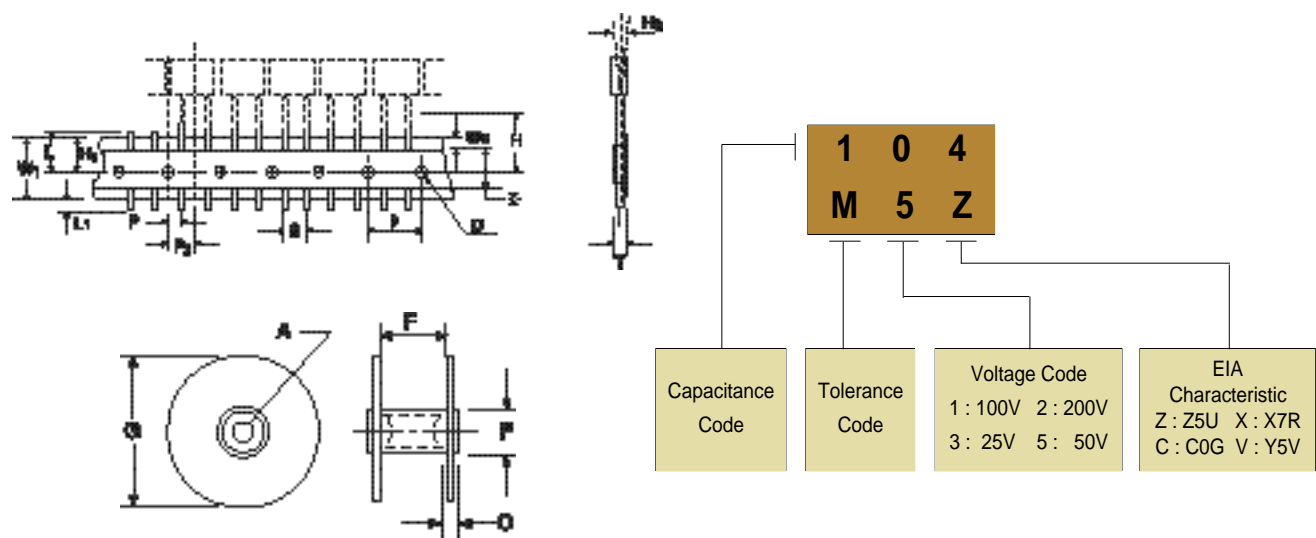
# Radial & Axial

## CAPACITANCE RANGE TYPE

CAPACITANCE VALUE		TYPE	RADIAL								AXIAL							
			CR051				CR077				CA2644				CA2666			
			C0G	X7R	Z5U	Y5V	C0G	X7R	Z5U	Y5V	C0G	X7R	Z5U	Y5V	C0G	X7R	Z5U	Y5V
1pF	010		010								010							
2	020																	
3	030																	
4	040																	
5	050																	
6	060																	
7	070																	
8	080																	
9	090																	
10	100																	
12	120																	
15	150																	
16	160																	
18	180																	
20	200																	
22	220					220								220				
24	240																	
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470	471																	
560	561																	
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820	821																	
1000	102			102			102					102				102	102	
1200	122										122		102					
1500	152																	
1800	182																	
2200	222														222			
2700	272																	
3300	332		332															
3900	392																	
4700	472																	
5600	562																	
6800	682																	
8200	822																	
10nF	103				103	103								103				
15	153							153										
22	223																	
33	333																	
47	473											473						
68	683																	
100	104																	
150	154		154										104	104		104		104
220	224						224											
330	334																334	334
470	474			474	474			474										
680	684																	
1000	105									105								

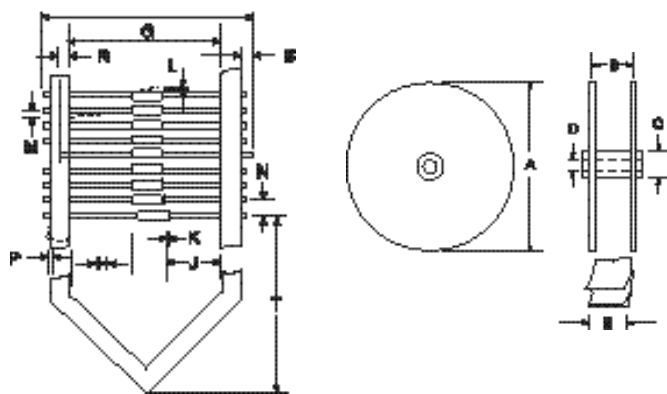
Radial & Axial

MARKING (PRINT ON THE ONE SIDE)



(Unit : mm)

CODE	DIMENSIONS	TOLERANCE	CODE	DIMENSIONS	TOLERANCE	CODE	DIMENSIONS	TOLERANCE
D	3.98	° 0.30	P1	3.86	° 0.71	C æ	9.50	min
H	16.00	° 0.50	P2	6.35	° 1.29	E æ	29.97-50.04	within range
H1	8.99	° 0.76-0.50	T	0.89	max	F æ	34.89-102.00	within range
H2	0.00	° 2.00	W1	18.00	+0.99-0.50	G æ	76.20-358.14	within range
L	11.00	max	W2	0.00	6.00 max	S	5.00	° 0.78
L1	1.52	max	A	13.79-38.10	Within range	°	No adhesive may be exposed	
P	12.70	° 0.30	B	28.57-86.00	Within range	æ		



(Unit : mm)

CODE	F		G	
PACKING TYPE	52	26	52	26
DIMENSION	64.8	38.8	52	26
TOLERANCE	+2.0 -0		° 1.25	

(Unit : mm)

CODE	DIMENSIONS	TOLERANCE	CODE	DIMENSIONS	TOLERANCE	CODE	DIMENSIONS	TOLERANCE
A	356.00	max	H	=J	° 1.20	N	5.00	° 0.40
B	F+3.17~F+6.35	Within range	J	=H	° 1.20	P	0.80	max
C	35.70		K	0.80	max	R	3.20	min
D	15.90		L	1.20	max	S	1.60	max
E	63.50		M	1.20	max	T	610.00	min