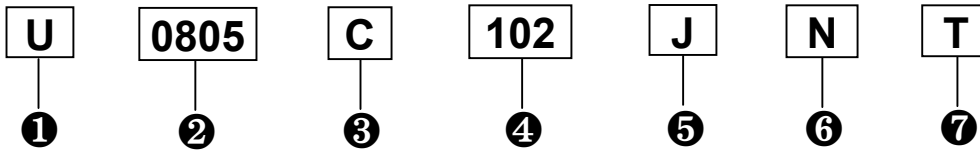


## HOW TO ORDER – PART NUMBER EXPLANATION

To Order, please specify Pan Overseas Part No. as the following example :



### ① Rated Voltage :

Code	K	N	B	T	U	A	G	H	C	D	M	M2	M3
Voltage (VDC)	6.3	10	16	25	50	100	200	250	500	630	1000	2000	3000

### ② Part Dimension :

Code	Part Dimension (mm)		
	Length (L)	Width (W)	Thickness (T)
0402	1.0±0.05	0.5±0.05	0.5±0.05
0603	1.6±0.1	0.8±0.1	0.8±0.1
0805	2.0±0.2	1.25±0.1	1.4max.
1206	3.2±0.2	1.6±0.2	1.52max.
1210	3.2±0.30	2.5±0.30	1.80max.
1808	4.5±0.35	2.0±0.30	2.00max.
1812	4.5±0.35	3.2±0.30	1.80max.
2220	5.7±0.40	5.0±0.40	1.80max.
2225	5.7±0.40	6.3±0.40	1.80max.

Code	Part Dimension(mm)		
	Length (L)	Width (W)	Thickness (T)
RD20	See Page 10, 11 and 12 for Detail Dimensions		
RD21			
AD10			

### ③ Temperature Characteristic Code :

	C (NPO)	R (X7R)	F (Y5V)	X (X5R)
Temperature Coefficient	0±30 PPM /°C	±15%	+22% - 82%	±15%
Operating Temperature	-55°C~+125°C	-55°C~+125°C	-30°C~+85°C	-55°C~+85°C

### ④ Capacitance Code :

Code	Capacitance (pF)	Code	Capacitance (pF)
010	1	102	1000
1R5	1.5	222	2200
100	10	472	4700
101	100	103	10000

### ⑤ Tolerance Code :

Code	Tolerance	Code	Tolerance
C	±0.25pF	J	±5%
D	±0.50pF	K	±10%
F	±1%	M	±20%
G	±2%	Z	+80 - 20%

### ⑥ Termination Code :

Code	N	-
Termination Types	Nickel Barrier	Leaded Parts

### ⑦ Packaging Code :

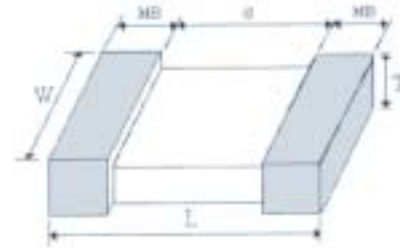
Code	B	T
Packaging	Bulk	Tape & Reel

**NPO DIELECTRIC – GENERAL SPECIFICATION****INTRODUCTION :**

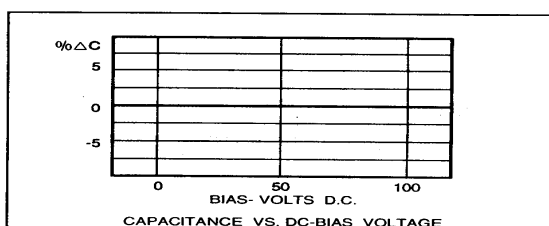
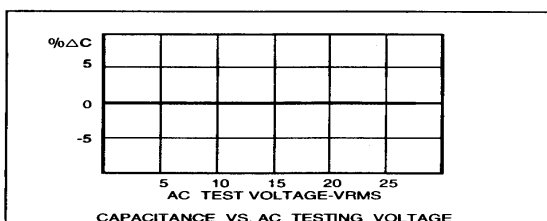
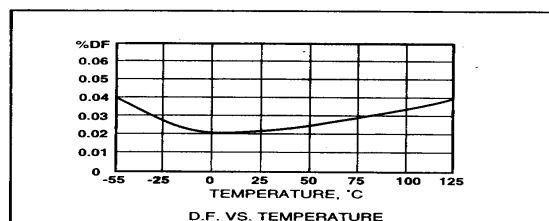
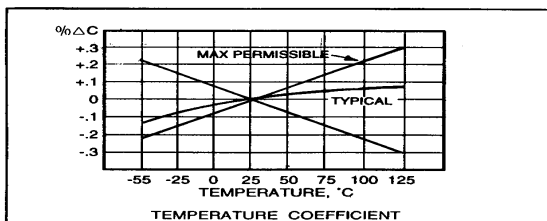
The NPO (COG) is a high Q, low K temperature compensating type of dielectric with stable electrical properties under varying voltage, temperature, frequency and time. It's suitable for circuits that require low loss, as well as timing and tuning applications.

**FEATURES :**

- Very low temperature coefficient
- Stable electrical characteristics
- Small size with high capacitance values
- Consistent dimension and finish surface
- Engineered for automatic handling and insertion

**GENERAL SPECIFICATIONS :**

Capacitance Range	0.5pF to 100000pF
Capacitance Tolerance	$\pm 0.25\text{pF}$ , $\pm 0.5\text{pF}$ , $\pm 1\%$ , $\pm 2\%$ , $\pm 5\%$ , $\pm 10\%$
Operating Temperature Range	-55 ~ 125
Temperature Coefficient ( C Max.)	$0 \pm 30$ PPM /
Temperature – Voltage Coefficient ( C Max. @VVDC)	$0 \pm 30$ PPM /
Rated Voltage (VDC)	16, 25, 50, 100, 200/250,500,630,1KV, 2KV, 3KV, 4KV, 5KV
Dissipation Factor (tan )	0.1% Max, 0.04% typical
Insulation Resistance (IR), @25	Lesser of 100G or 1000M $\mu\text{F}$
Aging Rate	0% per Decade hour
Dielectric Strength	200V-2.5Ra; 250V-2.0Ra; 500V/630V-1.5Ra; 1KV-1.5Ra (Ra: Rated Voltage; VDC)
Testing Parameters	For Values $\leq 1000\text{pF}$ : 1MHz @ $1.0 \pm 0.2\text{Vrms}$ For Values $> 1000\text{pF}$ : 1KHz @ $1.0 \pm 0.2\text{Vrms}$



**NPO DIELECTRIC****Typical Characteristic Curves and Capacitance Chart****Typical Characteristic Curves :****Capacitance Chart (NPO) :**

Case Size	Rated Voltage	Temp. Chart.	Capacitance		Dimension (mm)				
			Range (pF)	Tolerance	L	W	T (max)	MB (min)	G (min)
0402	N/B=10/16V	0±30 PPM/	0.5 ~ 120	C, D ( $<10\text{pF}$ )  J, K ( $\geq 10\text{pF}$ )  F, G	1.0±0.05	0.5±0.05	0.5±0.05	0.10	0.30
0603	N/B/T=10/16/25V		0.5 ~ 1000		1.6±0.10	0.8±0.10	0.8±0.10	0.20	0.40
	U = 50V		0.5 ~ 1000						
	A=100V		1.0 ~ 330						
	G/H=200/250V		1.0 ~ 100						
0805	U=50V		0.5 ~ 2400		2.0±0.20	1.25±0.1	1.40	0.25	0.70
	A=100V		1.0 ~ 1500						
	G/H=200/250V		1.0 ~ 560						
	C=500V		1.0 ~ 220						
1206	A=100V		1.0 ~ 4700		3.2±0.20	1.6±0.20	1.52	0.25	1.40
	G/H=200/250V		1.0 ~ 1800						
	C=500V		1.0 ~ 1200						
	D=630V		1.0 ~ 1000						
	M=1000V		1.0 ~ 120						
	M2=2000V		1.0 ~ 120						
	M3=3000V		1.0 ~ 120						
1210	A=100V		10 ~ 8200		3.2±0.30	2.5±0.30	1.80	0.25	1.40
	G/H=200/250V		10 ~ 3300						
	C=500V		1.0 ~ 2700						
	D=630V		10 ~ 1800						
1808	M=1000V		10 ~ 220		4.5±0.35	2.0±0.30	2.00	0.25	2.15
	D=630V		100 ~ 2200						
	M=1000V		22 ~ 1000						
	M2=2000V		22 ~ 220						
1812	M3=3000V		10 ~ 82		4.5±0.35	3.2±0.30	1.80	0.25	2.15
	A=100V	220 ~ 18000							
	G/H=200/250V	220 ~ 6800							
	C=500V	180 ~ 6800							
	D=630V	180 ~ 5600							
	M=1000V	39 ~ 2700							
2220	M2=2000V	39 ~ 820	5.7±0.40	5.0±0.40	1.80	0.25	3.30		
	M3=3000V	10 ~ 180							
	A=100V	470 ~ 39000							
	G/H=200/250V	470 ~ 15000							
	C=500V	390 ~ 15000							
	D=630V	390 ~ 10000							
2225	M=1000V	39 ~ 6800	5.7±0.40	6.3±0.40	1.80	0.25	3.30		
	M2=2000V	39 ~ 1800							
	M3=3000V	10 ~ 390							
	A=100V	560 ~ 56000							
	G/H=200/250V	560 ~ 22000							
	C=500V	4300 ~ 18000							
	D=630V	4300 ~ 15000							

- When Ordering, please use the Pan Overseas Part number as indicated on page no. 1.

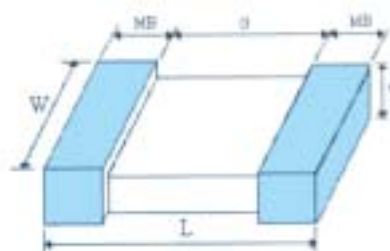


**X7R DIELECTRIC – GENERAL SPECIFICATION****INTRODUCTION :**

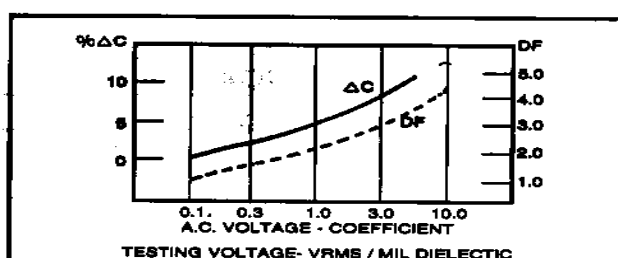
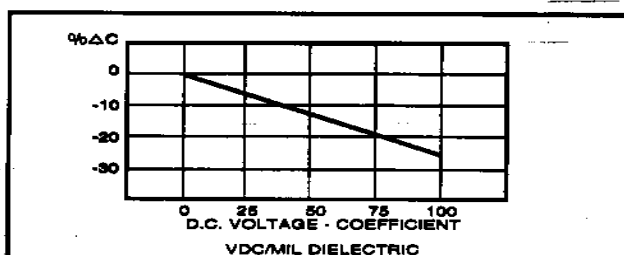
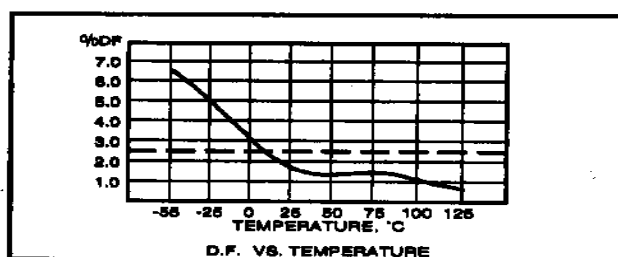
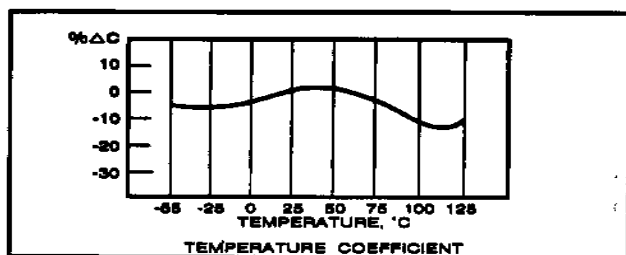
The X7R (BX) has moderate K value and is temperature stable. It shows moderate change in electrical properties under changing temperature, voltage and frequency. It's suitable for by-passing, coupling, and frequency discrimination circuit applications.

**FEATURES :**

- Stable electrical characteristics
- Small size with high capacitance values
- Consistent dimension and finish surface
- Engineered for automatic handling and insertion

**GENERAL SPECIFICATIONS :**

Capacitance Range	100pF to 10 $\mu$ F
Capacitance Tolerance	$\pm 10\%$ , $\pm 20\%$
Operating Temperature Range	-55 ~ 125
Temperature Coefficient ( $^{\circ}$ C Max.)	$\pm 15\%$
Rated Voltage (VDC)	16, 25, 50, 100, 200/250, 500, 630, 1KV, 2KV, 3KV
Dissipation Factor (tan $\delta$ )	50V-2.5% Max; 25V-3.0% Max; 16V-3.5% Max; 10V-5.05% Max
Insulation Resistance (IR) @25	Lesser of 10G or 1000M $\mu$ F
Aging Rate	-1.5% per Decade hour
Dielectric Strength	200V-2.5Ra; 250V-2.0Ra; 500V/630V-1.5Ra; 1KV-1.25Ra (Ra: Rated Voltage)
Testing Parameters	1KHz $\pm$ 50Hz, 1.0Vrms $\pm$ 0.2Vrms @ 25 $^{\circ}$ C, 0 Volts Bias



**X7R DIELECTRIC**

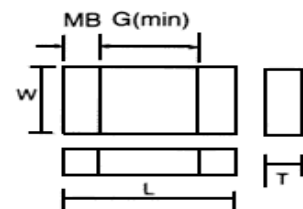
**Typical Characteristic Curves and Capacitance Chart**

**Typical Characteristic Curves :**

**Capacitance Chart (X7R) :**

Case Size	Rated Voltage	Temp. Chart.	Capacitance		Dimension (mm)				
			Range (pF)	Tolerance	L	W	T (max)	MB (min)	G (min)
0402	N/B=10/16V	±15 %	8200 ~ 33000	K, M	1.0±0.05	0.5±0.05	0.5±0.05	0.10	0.30
	T=25V		4700 ~ 6800						
	U=50V		220 ~ 3900						
0603	N/B=10/16V		18000 ~ 100000		1.6±0.10	0.8±0.10	0.8±0.10	0.20	0.40
	T=25V		10000 ~ 47000						
	U=50V		180 ~ 47000						
	A=100V		100 ~ 10000						
0805	G/H=200/250V		100 ~ 5600		2.0±0.20	1.25±0.1	1.40	0.25	0.70
	N/B=10/16V		10000 ~ 1000000						
	T=25V		10000 ~ 150000						
	U=50V		150 ~ 100000						
1206	A=100V		100 ~ 47000		3.0±0.20	1.6±0.20	1.52	0.25	1.40
	G/H=200/250V		100 ~ 27000						
	N/B=10/16V		330 ~ 1000000						
	T=25V		330 ~ 330000						
	U=50V	330 ~ 150000							
	A=100V	100 ~ 150000							
	G/H=200/250V	100 ~ 100000							
1210	C=500V	180 ~ 15000	3.2±0.30	2.5±0.30	1.80	0.25	1.40		
	D=630V	180 ~ 6800							
	M=1000V	100 ~ 2200							
	A=100V	1000 ~ 3300							
1808	G/H=200/250V	10000 ~ 180000	4.5±0.35	2.0±0.30	2.00	0.25	2.15		
	C=500V	390 ~ 39000							
	D=630V	390 ~ 18000							
	M=1000V	180 ~ 5600							
1812	D=630V	390 ~ 22000	4.5±0.35	3.2±0.30	1.80	0.25	2.15		
	M=1000V	220 ~ 1800							
	M2=2000V	220 ~ 1800							
	M3=3000V	100 ~ 680							
	A=100V	3900 ~ 680000							
	G/H=200/250V	3900 ~ 470000							
2220	C=500V	390 ~ 120000	5.7±0.40	5.0±0.40	1.80	0.25	3.30		
	D=630V	390 ~ 100000							
	M=1000V	390 ~ 22000							
	M2=2000V	390 ~ 4700							
	M3=3000V	100 ~ 1500							
	A=100V	10000 ~ 1000000							
2225	G/H=200/250V	10000 ~ 820000	5.7±0.40	6.3±0.40	1.80	0.25	3.30		
	C=500V	1000 ~ 270000							
	D=630V	1000 ~ 220000							
	M=1000V	390 ~ 56000							
	M2=2000V	390 ~ 12000							
	M3=3000V	180 ~ 2700							

• When Ordering, please use the Pan Overseas Part number as indicated on page no. 1.

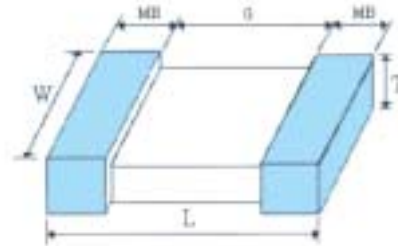


**Y5V DIELECTRIC – GENERAL SPECIFICATION****INTRODUCTION :**

The Y5V has high K value. Its electrical properties vary considerably under changing voltage, temperature, and time. It's suitable for general purposes applications where high capacitance values are required, and are ideal for room temperature applications with low DC bias.

**FEATURES :**

- Small size with high capacitance values
- Consistent dimensions and finish surface
- Engineered for automatic handling and insertion

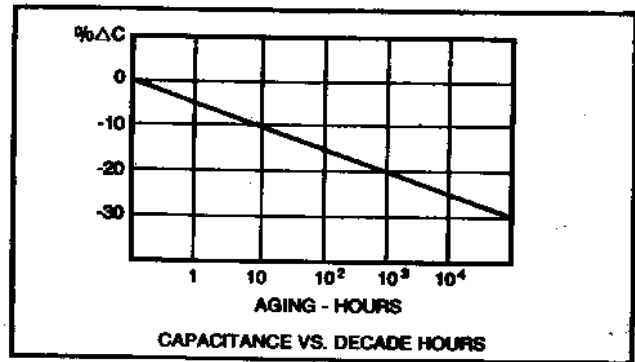
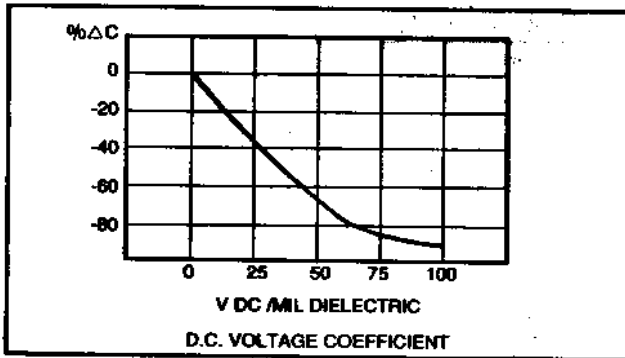
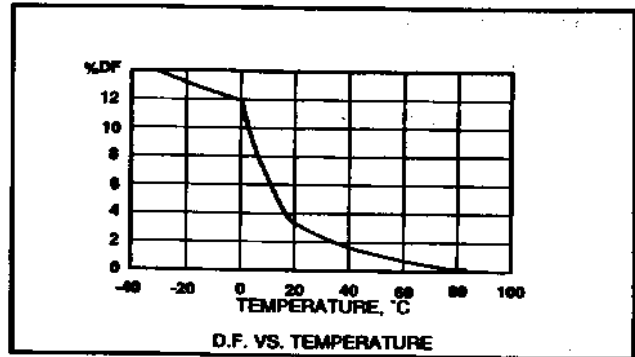
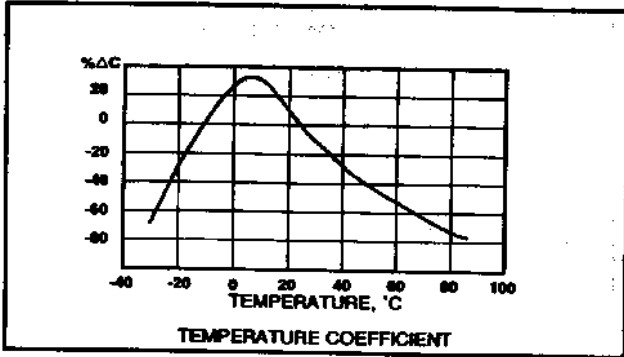
**GENERAL SPECIFICATIONS :**

Capacitance Range	1000pF to 10 $\mu$ F
Capacitance Tolerance	$\pm$ 20%, +80 - 20%
Operating Temperature Range	-30 ~ 85
Temperature Coefficient ( C Max.)	+22% ~ - 82%
Voltage Rating	6.3, 10,16, 25, 50 VDC
Dissipation Factor (tan $\delta$ )	7% Max. (12.5% max for 10V)
Insulation Resistance (IR) @25	Lesser of 10G $\Omega$ or 1000M $\mu$ F
Aging Rate	-7% per Decade hour
Dielectric Strength	2.5 times the rated WVDC
Testing Parameters	1KHz $\pm$ 50Hz, 1.0Vrms $\pm$ 0.2Vrms @ 25 $^{\circ}$ C, 0 Volts Bias

### Y5V DIELECTRIC

#### Typical Characteristic Curves and Capacitance Chart

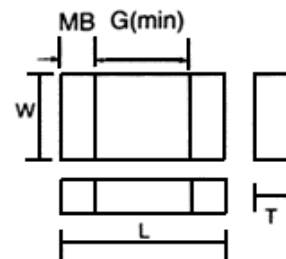
#### Typical Characteristic Curves :



#### Capacitance Chart(Y5V) :

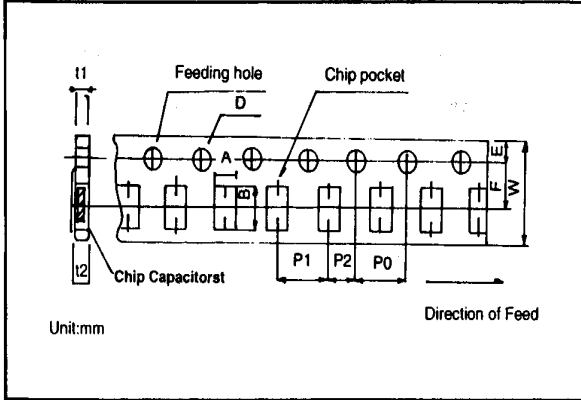
Case Size	Rated Voltage	Temp. Chart.	Capacitance		Dimension (mm)				
			Range (pF)	Tolerance	L	W	T (max)	MB (min)	G (min)
0402	B=16V	+22% -82%	33000 ~ 100000	M, Z	1.0±0.05	0.5±0.05	0.5±0.05	0.10	0.30
	T=25V		22000						
	U=50V		1000 ~ 15000						
0603	N=10V		47000 ~ 1000000		1.6±0.10	0.8±0.10	0.8±0.10	0.20	0.40
	B=16V		47000 ~ 330000						
	T=25V		33000 ~ 100000						
0805	U=50V		1000 ~ 100000		2.0±0.20	1.25±0.1	1.40	0.25	0.70
	N=10V		220000 ~ 2200000						
	B=16V		220000 ~ 100000						
1206	T=25V		1000 ~ 330000		3.2±0.20	1.6±0.20	1.52	0.25	1.40
	U=50V		1000 ~ 220000						
	N=10V		220000 ~ 1000000						
	B=16V	220000 ~ 4700000							
	T=25V	68000 ~ 1000000							
	U=50V	1000 ~ 470000							

- When Ordering, please use the Pan Overseas Part number as indicated on page no. 1.



# PACKAGING & DIMENSIONS

## 1. Cardboard Tape Dimensions

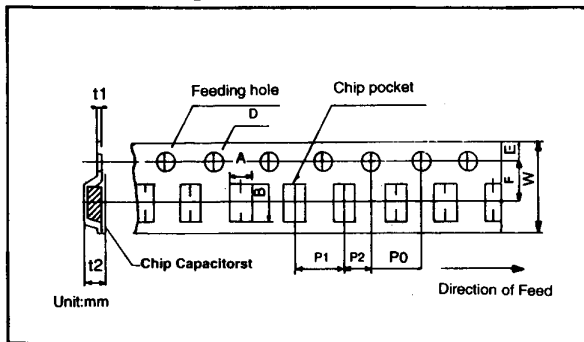


Cardboard Tape

Unit : mm

Symbol Size Code	A	B	W	F	E	P1	P2	P0	D	t1	t2
0402	0.65	1.15	8.0 ±0.3	3.5 ±0.06	1.75 ±0.1	2.0 ±0.05	2.0 ±0.05	4.0 ±0.1	1.5 +0.1/-0	1.1max	
0603	1.05 ±0.1	1.85 ±0.1								1.1max	
0805	1.55 ±0.15	2.3 ±0.15	8.0 ±0.2	3.5 ±0.05	1.75 ±0.1	4.0 ±0.1	2.0 ±0.05	4.0 ±0.1	1.5 +0.1/-0	1.1 max	1.4 max
1206	2.0 ±0.2	3.6 ±0.2									

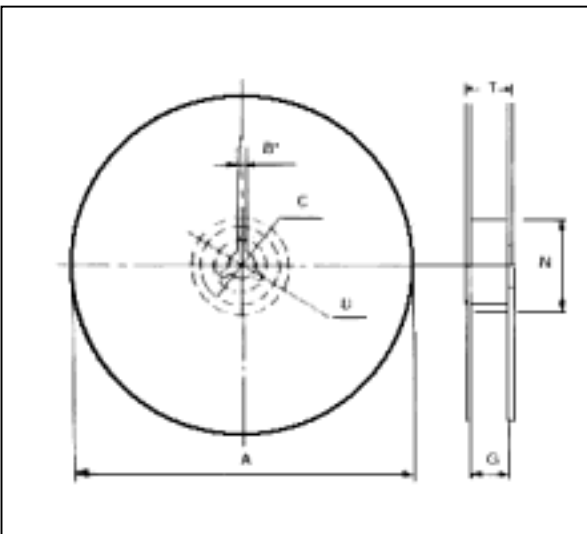
## 2. Embossed Tape Dimensions



Embossed Tape

Unit : mm

Symbol Size Code	A	B	W	F	E	P1	P2	P0	D	t1	t2
0805	1.6 ±0.2	2.4 ±0.2	8.0	3.5	1.75	4.0	2.0	4.0	1.5 +0.1	0.4 max	2.5 max
1206	2.0 ±0.2	3.6 ±0.2									



Unit : mm

Symbol	A	N	C	D	B*	G	T
Dimension	178±2.0	50	13.0±0.5	21±0.8	2.0±0.5	10.0±1.5	12±2.0

Quantity Per Reel

Chip Size	Tape Width	Qty / Reel
0402	8mm	10,000pcs
0603		4,000pcs
0805		
1206		3,000pcs



## ***APPLICATION & HANDLING NOTE***

### **1 Storage :**

Taped packaging of our MLCC Chip Capacitor is designed to endure long term storage under controlled environment. The product will degrade faster in the present of high temperature and high humidity. It's recommended that the taped packaging MLCC Chip Capacitor is to be stored at ambient temperature of less than 40°C with an RH of less than 70% in 6 months. Also, the present of corrosive gases such as sulfur and Chlorine might affect the termination's solderability, thus the MLCC Chip Capacitor should also be kept away from these gases.

### **2 Solder Land design :**

It is recommended that the solder land shape and size should be properly designed and taken into consideration during PCB design process to ensure not over stress the MLCC Chip capacitor during soldering because it might cause cracks on the chip body.

### **3 Adhesive :**

Strong, good insulator, fast harden, and non-toxic adhesive is recommended to avoid MLCC Chip from falling during soldering process, or resulting in improper electrical functioning and mechanical failures.

### **4 Mounting :**

Excess mounting force can easily cause the MLCC Chip Capacitor to crack, which will resulting in electrical and mechanical failures in many instances.

### **5 Soldering :**

The MLCC Chip Capacitor comes into direct contact with melted solder paste during soldering process, thus it can easily expose to high stress caused by sudden change in temperature. It might also be subjected to silver migration and contaminated flux, therefore, soldering technique is very important or critical to the MLCC chip capacitor.

### **6 Manual Soldering :**

Micro Crack can easily formed on the MLCC Chip Capacitor body due to thermal shock, if the hot tip of the soldering iron comes into direct contact with the ceramic body of the chip capacitor. Thus proper use of soldering iron tip, temperature control, and experienced operator are recommended when manual soldering is utilized.

### **7 Cooling :**

After Soldering, natural air cool is recommended, if solvent is used as assisted cooling, then the temperature different should not be more than 100°C.

### **8 Cleaning :**

Some modern fluxes will form residues after soldering process, thus it's necessary to use appropriate solvent for cleaning. Re-flowed assemblies are easier to clean than wave soldered assemblies since the board is fluxed and exposed to higher temperature.

### **9 Note for separating multiple PCB :**

Extra care should be taken during separation of multiple PCB to avoid damage to the MLCC Chip capacitor, on board.

## FEATURES AND CAPACITANCE CHART

### FEATURES :

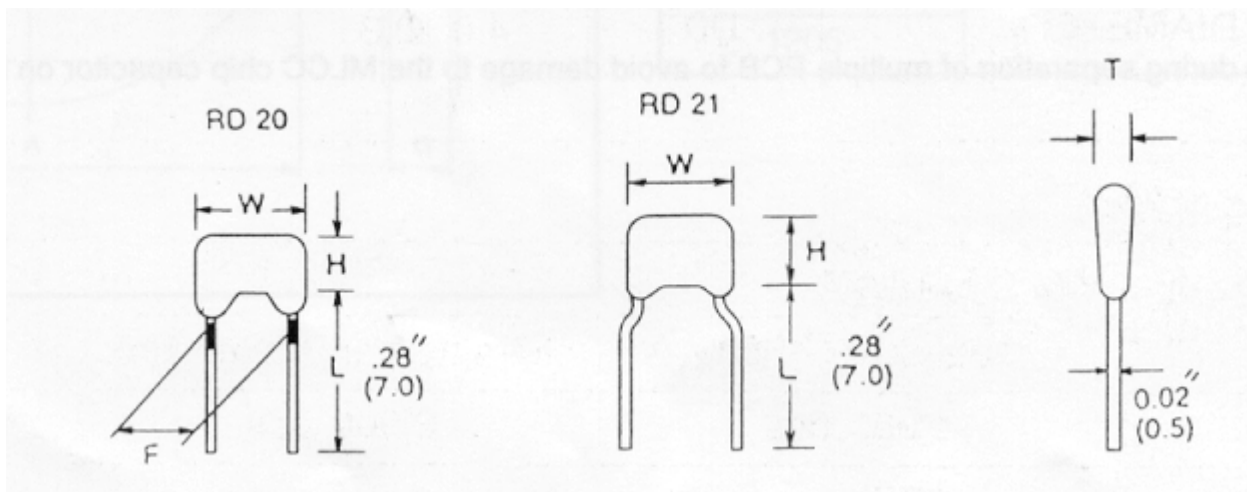
1. MLC Radial Lead Capacitor (RD) has wide application in computer, data processing, telecommunication, industrial control and instrumentation equipment.
2. The radial lead MLC is built with superior moisture, and shock resistant epoxy coating material, can be supplied in both, bulk or taping form for automatic insertion.

### CAPACITANCE CHART :

Case Size	Rated Voltage	Temp. Chart.	Capacitance		Dimension(mm)			
			Range (pF)	Tolerance	W	H	T	F
RD20	U=50V	C (NPO) 0±30 PPM/	10~3300	J.K	5.08	5.08	3.18	2.54 ±1.0
RD21								5.08 ±1.0
RD20	A=100V		10~3300		5.08	5.08	3.18	2.54 ±1.0
RD21								5.08 ±1.0
RD20	U=50V	R (X7R) ±15%	220~100000	K.M.	5.08	5.08	3.18	2.54 ±1.0
RD21								5.08 ±1.0
RD20	A=100V		220~68000		5.08	5.08	3.18	2.54 ±1.0
RD21								5.08 ±1.0
RD20	U=50V	F (Y5V) +22%~-82%	10000~150000	M.Z.	5.08	5.08	3.18	2.54 ±1.0
RD21								5.08 ±1.0

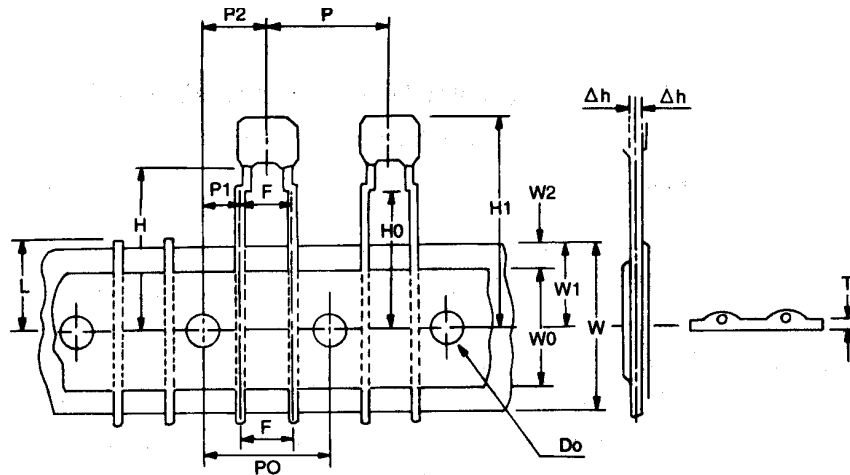
- When Ordering, please use the Pan Overseas part number as indicated on page no. 1.

### BULK LEAD CONFIGURATION AND DIMENSION :



## TAPING SPECIFICATION & PACKING QUANTITY

### Taping Specification :



DESCRIPTION	SYMBOL	DIMENSIONS (mm)	REMARKS
Pitch of Components	P	12.7 ± 1.0	
Feed hold pitch	PO	12.7 ± 0.3	Cumulative pitch error : ± 1.0mm / 20 pitches
Feed hole center to lead	P1	3.85 ± 0.7	
Feed hole center to component center	P2	6.35 ± 1.3	
Lead to lead spacing	F	5.08 ± 0.8 OR 2.54 ± 0.8	To lead tip within tol
Component alignment, F - R	h	2.0 max	The alignment from the center of the lead is ± 1.0mm
Tape width	W	18.0 -1.0 / -0.5	
Adhesive tape width	W0	11.0 mm	
Hole position	W1	9.0 ± 0.5	
Adhesive tape position	W2	3.0 max	Adhesive tape must not protrude from base paper
Height of bottom body from tape center	H	18.0 + 2.0 / -0	H + 12.5 mm H1
Lead-wire clinch height	H0	16.0 ± 0.5 OR 18.0 ± 0.5	6.5 H0 - W1
Component height	H1	32.25 max	
Feed hole diameter	D0	4.0 ± 0.3	
Total tape thickness	T	0.7 ± 0.2	

### Packing Quantity :

Case Size	Bulk	Taping	
	Quantity per Bag	Quantity per Ammo Box	Quantity per Reel
RD20, RD21	1,000 pcs	2,000 pcs	3,000 pcs
RD30	1,000 pcs	1,500 pcs	3,000 pcs

**FEATURES, CAPACITANCE CHART & TAPING SPECIFICATION**

**FEATURES**

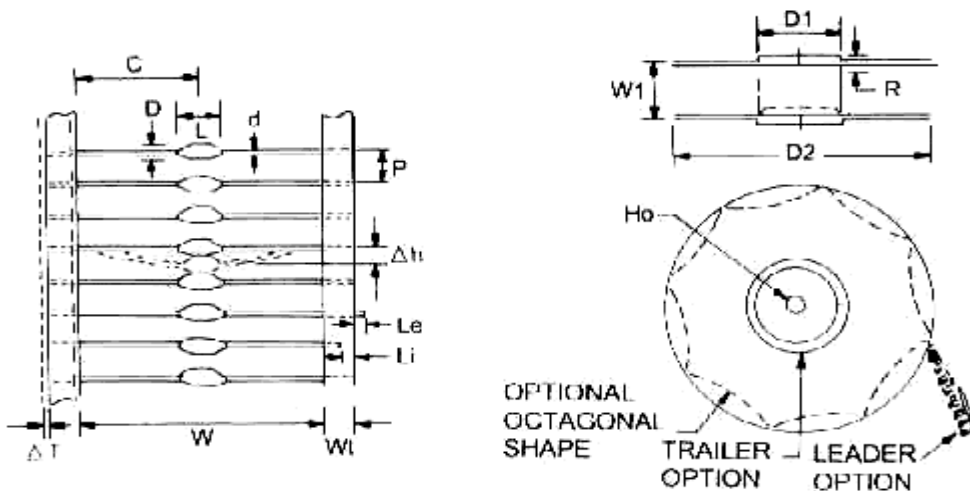
1. MLC Axial-Lead Capacitor (AD) is built with superior moisture and shock resistant epoxy coating material. Produces in high volume by automated processes to ensure uniform conforming coating.
2. The axial lead MLC can be supplied in both bulk or taping form for automatic insertion and sequencing with any other axial lead components.

**CAPACITANCE CHART :**

Case Size	Rated Voltage	Temp. Char.	Capacitance		Dimension (mm)	
			Range (pF)	Tolerance	L Max.	D Max.
AD10	U=50V	C (NPO) 0 ± 30 PPM/	10~750	J, K	4.32	2.54
AD10		R (X7R) ± 15%	560~15000	K, M		
AD10		F (Y5V) +22 -82%	1000~100000	M, Z		

• When Ordering, please use the Pan Overseas part number as indicated on page no. 1.

**TAPING SPECIFICATION AND DIMENSION :**



ITEM	SYMBOL	DIMENSION
Pitch of component	P	5.08 ± 0.51
Cumulative tolerance of p Over 6 consecutive		± 0.15
Tape width	Wt	6.0 ± 1.0
Lead wire protrusion	Le	1.57 max
Lead extension into tape	Li	3.96 max
Offset between tapes	T	0.8 max
Width between tapes	W	52.4 ± 1.5

ITEM	SYMBOL	DIMENSION
Centered	C	26.2 ± 0.76
Core Diameter	D1	34.9 - 92.1 standard 61.0
Real Diameter	D2	360 max
Core Width	W1	69.9 ± 1.5
Recess Depth	R	9.5 min
Arbor Hole	H0	13.89 - 38.10 standard 15.9
Deflection Form Nominal Position	h	1.2 max