

# Disc Ceramic Capacitors



## General Specifications - Class I Temperature Compensating

### DIELECTRIC - CLASS I

These ceramic capacitors have linear temperature coefficient, very low tolerances, low losses, high insulation resistance and are specially suitable for tuned circuits, timing and other precision circuits.

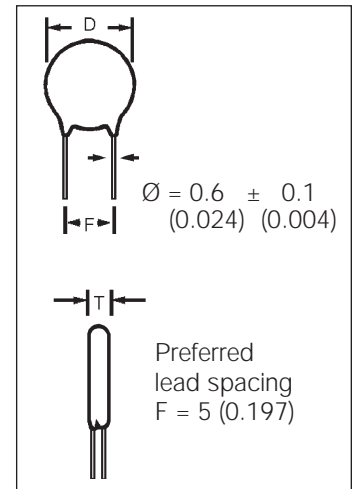
Meets IEC 384-8 (1988).

### DIMENSIONS

millimeters (inches)

Digit 9 (ø)	D ± 2 (0.079)	T max.	Available Lead Spacing				
			100V - 500V	1000V	2000V	3000V	4000/5000V
A	4.0 (0.157)	3.0 (0.118)	A,B,D,E,O,R	A,B,E,N,R	A,B,E,N,R	B,E	
B	5.0 (0.197)	4.0 (0.157)	A,B,D,E,O,R,X	A,B,E,N,R,X	A,B,E,N,R	B,E	
C	6.0 (0.236)	4.0 (0.157)	A,B,C,D,E,O,R,X	A,B,C,E,N,R,X	A,B,C,E,N,R	B,C,E	C
D	7.0 (0.276)	4.0 (0.157)	A,B,C,D,E,O,R,X	A,B,C,E,N,Q,R,X	A,B,C,E,N,Q,R	B,C,E	C
E	8.0 (0.315)	4.0 (0.157)	A,B,C,D,E,O,R,X	A,B,C,E,N,Q,R,X	A,B,C,E,N,Q,R	B,C,E	C
F	9.0 (0.354)	5.0 (0.197)	A,B,C,E,O,R,X	A,B,C,E,N,R,X	A,B,C,E,N,R	B,C,E	C
G	10.0 (0.394)	5.0 (0.197)	A,B,C,E,O,R,X	A,B,C,E,N,R,X	A,B,C,E,N,R	B,C,E	C
H	11.0 (0.433)	5.0 (0.197)	A,B,C,E,O,R,W	A,B,C,E,N,P,R,W	A,B,C,E,N,P,R,W	B,C,E,P,W	C,P
J	13.0 (0.512)	6.0 (0.236)	B,C,R,W	B,C,N,P,R,W	B,C,N,P,R,W	B,C,P,W	C,P
K	15.0 (0.591)	6.0 (0.236)	B,C,R,W	B,C,N,P,R,W	B,C,N,P,R,W	B,C,P,W	C,P
M	19.0 (0.748)	7.0 (0.276)	B,C	B,C,P	B,C,P	B,C,P	C,P

(E), (X), (W): upon request



millimeters (inches)

Lead Spacing	Digit 8 of P.N.		
F			
2.5 (0.100)	D	—	
5 (0.200)	A	O	N
6 (0.250)	E	X	—
7.5 (0.300)	B	R	Q
10 (0.400)	C	W	—
12.5 (0.500)	P	—	—

# Disc Ceramic Capacitors



## General Specifications - Class I Temperature Compensating

### PERFORMANCE CHARACTERISTICS

	100 V → 500 V	1kV → 5kV
Measured at	1.0 MHz @ 1.0 Vrms & 25°C	1.0 MHz @ 1.0 Vrms & 25°C
Dissipation Factor (%)	$C_R \leq 30 \text{ pF} \rightarrow \leq 1/C_R + 0.07$ $C_R > 30 \text{ pF} \rightarrow \leq 0.1\%$	$C_R \leq 30 \text{ pF} \rightarrow \leq 1/C_R + 0.07$ $C_R > 30 \text{ pF} \rightarrow \leq 0.1\%$
Tolerance	$C_R < 10 \text{ pF} \rightarrow \pm 0.25 \text{ pF}, \pm 0.5 \text{ pF}$ $C_R \geq 10 \text{ pF} \rightarrow \pm 5\%, \pm 10\%$	$C_R < 10 \text{ pF} \rightarrow \pm 0.25 \text{ pF}, \pm 0.5 \text{ pF}$ $C_R \geq 10 \text{ pF} \rightarrow \pm 5\%, \pm 10\%$
Insulation Resistance (IR)	@ $V_R \geq 10 \text{ G}\Omega$	@ 500V $\geq 10 \text{ G}\Omega$
Dielectric Strength NOTE: Charging current limited to 50 mA	@ $V_R = 100\text{V} \rightarrow V_t = 250\text{V (DC)}$ @ $V_R = 500\text{V} \rightarrow V_t = 1.25\text{kV (DC)}$	$1.5 \times V_R + 500 \text{ (DC)}$
Operating Temperature Range (°C)	-30 → +85	-30 → +85 Phenolic Coated -30 → +125 Epoxy Coated
Climatic Category	30 / 085 / 21 Phenolic Coated	30 / 085 / 21 Phenolic Coated 30 / 085 / 56 Epoxy Coated

Note: Damp Heat Steady State: 90... 95% R.H. 40°C / 21 days. No voltage to be applied.

# Disc Ceramic Capacitors



## Dimension Table - Class I Temperature Compensating

### CLASS I - CAPACITANCE VS. DISC DIAMETER

millimeters (inches)

Temp. Coefficient Digits 1, 2, 3 of P.N.	NPO					
	5AK	5AQ	5AR	5AS	5AT	5AU
Rated Voltage (V <sub>R</sub> )	100 VDC	500 VDC	1000 VDC 130 VAC	2000 VDC 250 VAC	3000 VDC 380 VAC	4000 VDC 440 VAC
C <sub>R</sub> (pF)						
1.0	4.0 (0.157)	4.0 (0.157)	4.0 (0.157)	4.0 (0.157)	6.0 (0.236)	6.0 (0.236)
1.2						
1.5						
1.8						
2.0						
2.2						
2.7						
3.0						
3.3						
3.9						
4.0						
4.7						
5.0						
5.6						
6.0						
6.8						
7.0						
8.0						
8.2						
9.0						
10						
12						
15						
18						
20						
22						
27						
33						
39						
47						
50						
56						
68						
82						
100						
120						
150						
180						
220						
270						
330						
	5.0 (0.197)	5.0 (0.197)	6.0 (0.236)	6.0 (0.236)	8.0 (0.315)	10.0 (0.394)
		6.0 (0.236)	7.0 (0.276)	7.0 (0.276)	9.0 (0.354)	11.0 (0.433)
	7.0 (0.276)	7.0 (0.276)	8.0 (0.315)	9.0 (0.354)	11.0 (0.433)	13.0 (0.512)
	8.0 (0.315)	8.0 (0.315)	9.0 (0.354)	11.0 (0.433)	13.0 (0.512)	15.0 (0.591)
	9.0 (0.354)	9.0 (0.354)	11.0 (0.433)	13.0 (0.512)	15.0 (0.591)	19.0 (0.748)
	11.0 (0.433)	11.0 (0.433)	13.0 (0.512)	15.0 (0.591)		
		15.0 (0.591)	15.0 (0.591)	19.0 (0.748)		
		19.0 (0.748)				

# Disc Ceramic Capacitors



## Dimension Table - Class I Temperature Compensating

### CLASS I - CAPACITANCE VS. DISC DIAMETER

millimeters (inches)

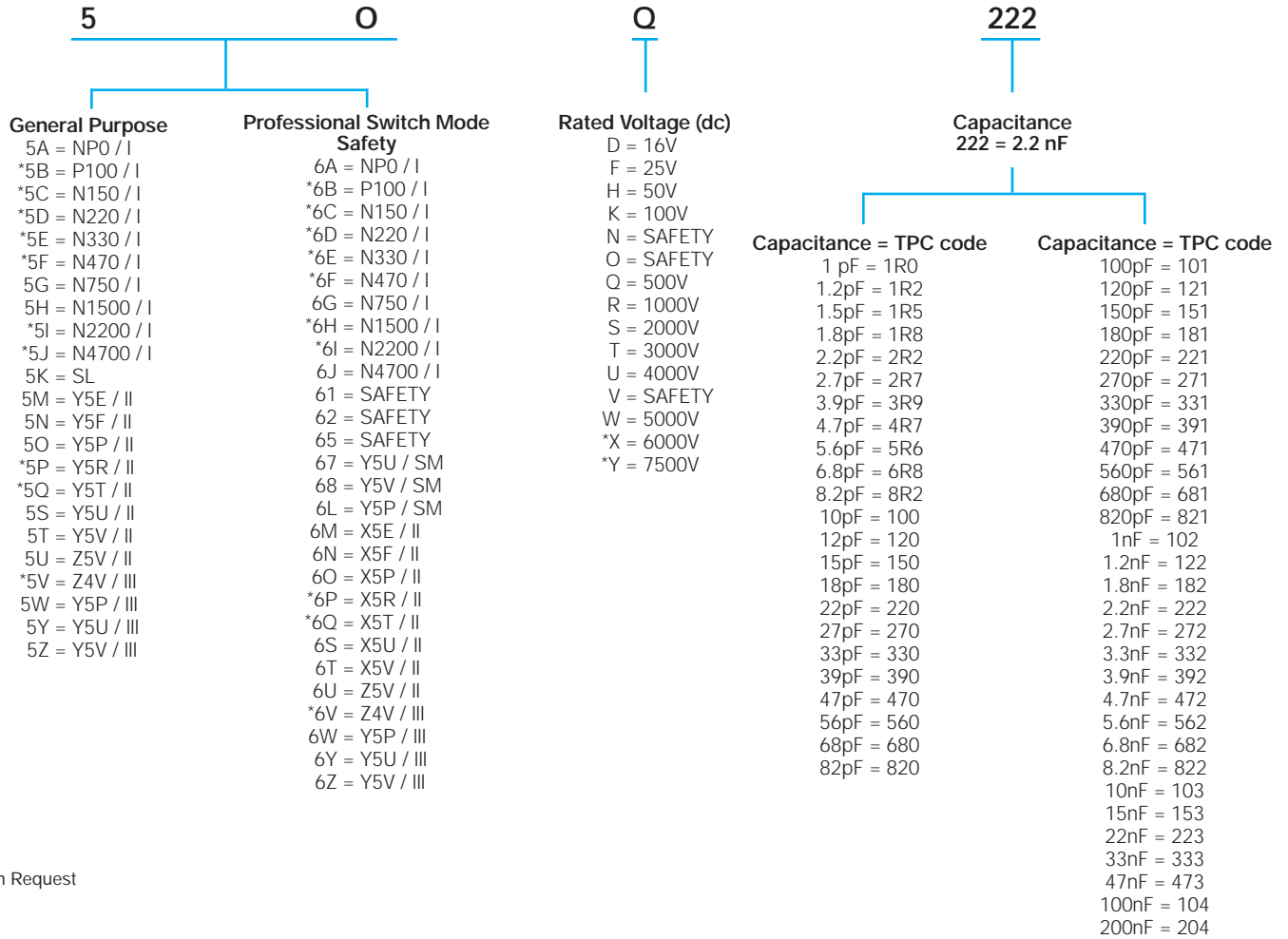
Temp. Coefficient Digits 1, 2, 3 of P.N.	N750						N1500				
	5GK	5GQ	5GR	5GS	5GT	5GU	5GW	5HK	5HQ		
Rated Voltage (V <sub>R</sub> )	100 VDC	500 VDC	1000 VDC 130 VAC	2000 VDC 250 VAC	3000 VDC 380 VAC	4000 VDC 440 VAC	5000 VDC 550 VAC	100 VDC	500 VDC		
C <sub>R</sub> (pF)											
1.0											
1.2											
1.5											
1.8											
2.0											
2.2											
2.7											
3.0											
3.3											
3.9											
4.0											
4.7											
5.0	4.0 (0.157)	4.0 (0.157)	Use NP0	Use NP0	Use NP0						
5.6											
6.0											
6.8											
7.0								Use NP0	Use NP0		
8.0											
8.2											
9.0											
10					5.0 (0.197)	5.0 (0.197)	6.0 (0.236)			4.0 (0.157)	4.0 (0.157)
12											
15											
18											
20						8.0 (0.315)					
22											
27					7.0 (0.276)		11.0 (0.433)				
33			6.0 (0.236)	6.0 (0.236)							
39											
47	5.0 (0.197)	5.0 (0.197)	7.0 (0.276)	7.0 (0.276)	8.0 (0.315)	11.0 (0.433)					
50											
56										5.0 (0.197)	
68		6.0 (0.236)	8.0 (0.315)	8.0 (0.315)	9.0 (0.354)	15.0 (0.591)	15.0 (0.591)		6.0 (0.236)		
82	6.0 (0.236)		9.0 (0.354)	9.0 (0.354)	11.0 (0.433)	15.0 (0.591)	19.0 (0.748)	5.0 (0.197)			
100		7.0 (0.276)		11.0 (0.433)	13.0 (0.512)	19.0 (0.748)			7.0 (0.276)		
120	7.0 (0.276)	8.0 (0.315)									
150		9.0 (0.354)	11.0 (0.433)	13.0 (0.512)							
180	8.0 (0.315)				15.0 (0.591)			7.0 (0.276)	8.0 (0.315)		
220	9.0 (0.354)	11.0 (0.433)	13.0 (0.512)						9.0 (0.354)		
270	11.0 (0.433)	13.0 (0.512)						8.0 (0.315)	11.0 (0.433)		
330		15.0 (0.591)						9.0 (0.354)			

# Disc Ceramic Capacitors



## Ordering Code

### HOW TO ORDER



\*Upon Request

# Disc Ceramic Capacitors



## Ordering Code

**M**

**Tolerance**  
 C = ±0.25 pF  
 D = ±0.50 pF  
 J = ±5%  
 K = ±10%  
 M = ±20%  
 S = -20+50%  
 Z = -20+80%  
 P = 0+100%

**A**

**Capacitor Diameter  
 ± 2 (0.079)**

A = 4 (0.157)  
 B = 5 (0.197)  
 C = 6 (0.236)  
 D = 7 (0.276)  
 E = 8 (0.315)  
 F = 9 (0.354)  
 G = 10 (0.394)  
 H = 11 (0.433)  
 J = 13 (0.512)  
 K = 15 (0.591)  
 M\* = 19 (0.748)

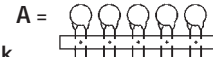
\*Wire 0.8 (0.031) recommended

**A**

**A**

**Packaging**

**Cardboard Strips**



**Bulk**

E = 5 (0.197) ± 1 (0.039) free wire length  
 C = 10 (0.394) ± 1 (0.039) free wire length  
 D = 25 (0.984) ± 1 (0.039) free wire length

**Taping**

**Reel**



Avisert			Panaset		
H	L	L	J	L	L

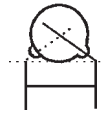


Avisert			Panaset		
I	M	M	K	M	M

Lead Forming				
mm	inches			
2.5 ±0.5	.1 ± .025	D	-	-
5 <sup>+0.6</sup> <sub>-0.2</sub>	.2 ± .025	A	O	N
6 <sup>+0.6</sup> <sub>-0.2</sub>	.25 ± .025	E	X	-
7.5 <sup>+1</sup> <sub>-0.5</sub>	.3 ± .05	B	R	Q
10 <sup>+0.5</sup> <sub>-1.0</sub>	.4 ± .05	C	W	-
12.5 <sup>+1</sup> <sub>-0.5</sub>	.5 ± .05	P	-	-

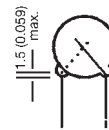
**Finishing**

Diam ≤ 9 (0.354) and  
 F = 5.00 (0.197)



Coating does not surpass the bend

For every other:



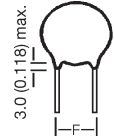
**Low Voltage**

A = Phenolic (General Purpose) Q = Waxed phenolic

S = Epoxy (Professional) cap. diameter ≤ 8 (0.315)

D = Epoxy (Professional) cap. diameter > 8 (0.315)

**High Voltage**



F = Measured from the center of leads

C = Epoxy wire diameter 0.6 ± 0.1 (0.024) ± (0.004)

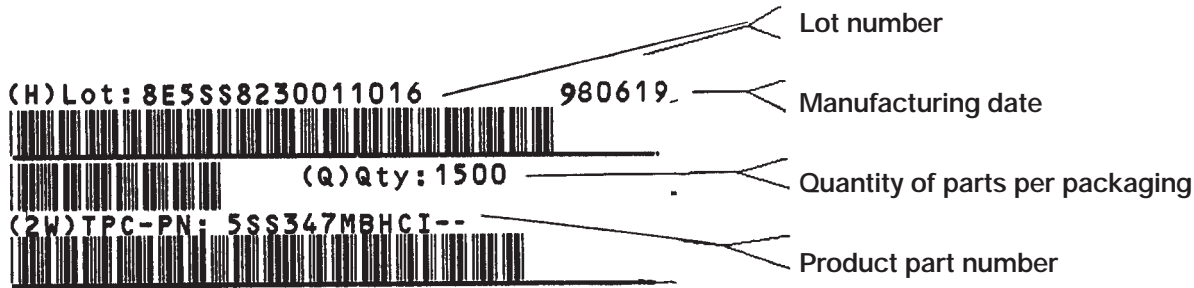
I = Epoxy wire diameter 0.8 ± 0.1 (0.031) ± (0.004)

L = Phenolic wire diameter 0.6 ± 0.1 (0.024) ± (0.004)

Please note that not all code combinations are either possible or available.

### IDENTIFICATION AND TRACEABILITY

On all TPC ceramic capacitors packages, you will find a bar code label with the following information:



### TAPED PARTS QUANTITY TABLE

millimeters (inches)

Rated Voltage (Vr)	Diameter D	Quantities	
		Ammopack	Reel
Vr ≤ 500V	D ≤ 7 (0.276)	2000	2500
	7 < D ≤ 11 (0.433)	2000	2000
500V < Vr ≤ 2KV	D ≤ 11 (0.433)	1500	2000
2KV < Vr = 5KV	D ≤ 11 (0.433)	1000	1500

### CARDBOARD STRIPS QUANTITY TABLE

millimeters (inches)

Rated Voltage (Vr)	Diameter D	Lead Space	
		< = 5 (0.197)	> 5 (0.197)
Vr ≤ 500V	D ≤ 8 (0.315)	2500	1500
	8 (0.315) ≤ D ≤ 11 (0.433)	1500	-
	8 (0.315) ≤ D ≤ 13 (0.512)	-	1000
	11 (0.433) ≤ D ≤ 15 (0.591)	1000	-
	13 (0.512) ≤ D ≤ 19 (0.748)	-	500
	D ≤ 19 (0.748)	500	-
500V < Vr ≤ 2KV	D ≤ 9 (0.354)	1500	1000
	9 (0.354) ≤ D ≤ 11 (0.433)	-	1000
	9 (0.354) ≤ D ≤ 13 (0.512)	1000	-
	11 (0.433) ≤ D ≤ 19 (0.748)	-	500
	13 (0.512) ≤ D ≤ 19 (0.748)	500	-
2KV < Vr ≤ 5KV Safety 65N 62O	D ≤ 9 (0.354)	1500	-
	D ≤ 11 (0.433)	-	1000
	D ≤ 13 (0.512)	500	500
Safety 61V	D ≤ 6 (0.236)	1500	1500
	7 (0.275) ≤ D ≤ 9 (0.354)	1000	1000
	9 (0.354) ≤ D	500	500

Quantities for other package alternative, upon request.

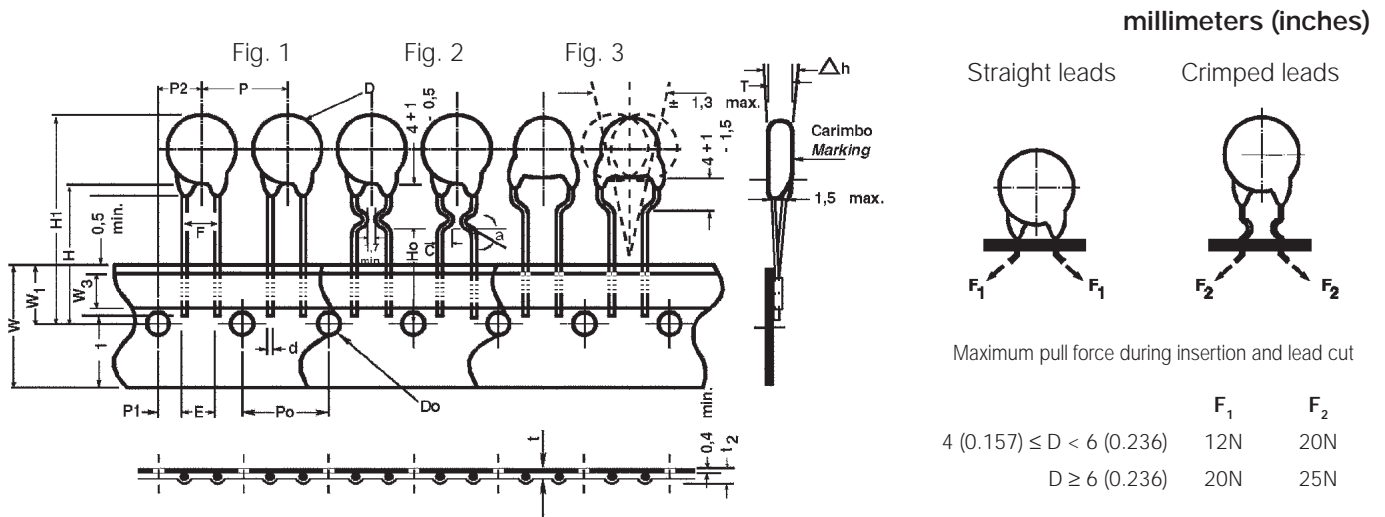
# Disc Ceramic Capacitors



## Tape and Reel Specifications

There are two types of taped disc ceramic capacitors:  
Straight or crimped leads.

Both types can be shipped on reels or ammopack.  
The standard packaging quantities are shown below:



Digit 11	Available Tapings	Digit 9
L	→ Sizes $4 (0.157) \leq D \leq 11 (0.433)$	A... H
M		
J H	→ Sizes $6 (0.236) \leq D \leq 11 (0.433)$	C... H
K I		

### TPC Code Digit 11

Packaging	Avisert	Panasert
Reel 	 H FIGURE 1 L FIGURE 2 L FIGURE 3	 J FIGURE 1 L FIGURE 2 L FIGURE 3
Ammopack 	 I FIGURE 1 M FIGURE 2 M FIGURE 3	 K FIGURE 1 M FIGURE 2 M FIGURE 3

Figure 2: Inside Crimp 100V... 1000V

Figure 3: Outside Crimp 1000V



# Disc Ceramic Capacitors

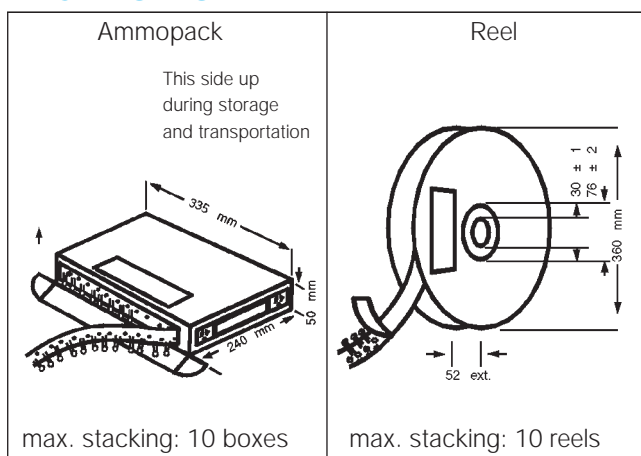


## Tape and Reel Specifications

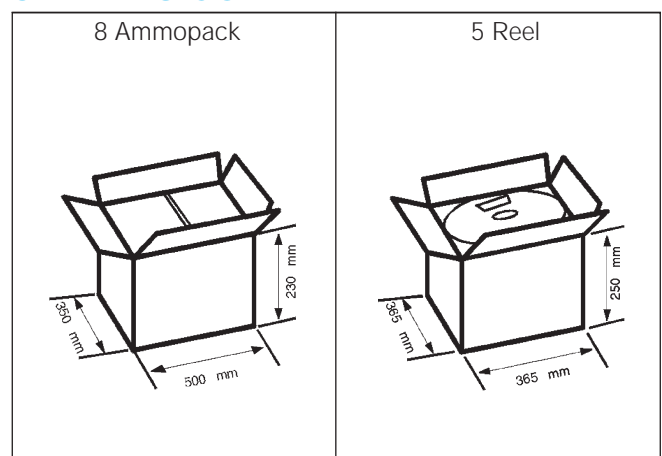
millimeters (inches)

Description of Symbols		Straight Leads		Crimped
		Figure 1		Figure 2 & 3
		A (Avisert)	P (Panaset)	Avisert & Panaset
Crimp angle	$\infty$	—	—	20°...45°
Crimp length	C	—	—	1.7 min.
Lead diameter	d	0.60 ± 0.1		
Disc diameter	D	11 max.		
Lead hole diameter	Do	4.0 ± 0.2		
Disc thickness	T	See Catalog		
Lead spacing	F	5.0 $^{+0.6}_{-0.2}$		
Component alignment, front-rear	$\Delta h$	0 ± 1		
Height of component from tape center	H	19.5 ± 0.5	16.5 ± 0.5 - 0	—
Height from tape center to crimp	Ho	—	—	16 + 0.5 - 0
Component height	H1	32.25 max.	>23.5 <32.25	32.25 max.
Distance from component leads to tape bottom	$\ell_1$	12 max.		
Tape width	W	18 $^{+1}_{-0.5}$		
Bonding tape width	W <sub>3</sub>	5.5 min.		
Feed hole position	W <sub>1</sub>	9.0 ± 0.5		
Pitch between discs	P	12.7 ± 1		
Feed hole pitch	Po	12.7 ± 0.3		
Hole center to lead	P1	3.85 ± 0.7		
Feed hole center to component center	P2	6.35 ± 1		
Tape + bonding tape thickness	t	0.7 ± 0.2		
Total tape thickness, including lead	t <sub>2</sub>	1.5 max.		

### PACKAGING



### SHIPPING CONTAINER



# Disc Ceramic Capacitors



## Marking

DIG. 2		Logo: Only in diam. ≥ 6mm	Capacitance		EIA	
O				1pF = 109	100pF = 101	
TC / Class		1.2pF = 129		120pF = 121		
General Purpose	Professional	1.5pF = 159		150pF = 151		
A = NP0 / I	A = NP0 / I	1.8pF = 189		180pF = 181		
*B = P100 / I	B = P100 / I	2.2pF = 229		220pF = 221		
*C = N150 / I	C = N150 / I	2.7pF = 279		270pF = 271		
*D = N220 / I	D = N220 / I	3.9pF = 399		390pF = 391		
*E = N330 / I	E = N330 / I	4.7pF = 479		470pF = 471		
*F = N470 / I	F = N470 / I	5.6pF = 569		560pF = 561		
G = N750 / I	G = N750 / I	6.8pF = 689		680pF = 681		
H = N1500 / I	H = N1500 / I	8.2pF = 829	820pF = 821			
*I = N2200 / I	I = N2200 / I	10pF = 100	1nF = 102			
*J = N4700 / I	J = N4700 / I	12pF = 120	1.2nF = 122			
K = SL	7 = Y5U / SM	15pF = 150	1.8nF = 182			
M = Y5E / II	8 = Y5V / SM	18pF = 180	2.2nF = 222			
N = Y5F / II	L = Y5P / SM	22pF = 220	2.7nF = 272			
O = Y5P / II	M = X5E / II	27pF = 270	3.9nF = 392			
P = Y5R / II	N = X5F / II	39pF = 390	4.7nF = 472			
Q = Y5T / II	O = X5P / II	47pF = 470	5.6nF = 562			
S = Y5U / II	P = X5R / II	56pF = 560	6.8nF = 682			
T = Y5V / II	Q = X5T / II	68pF = 680	8.2nF = 822			
U = Z5V / II	S = X5U / II	82pF = 820	10nF = 103			
V = Z4V / III	T = X5V / II		15nF = 153			
*W = Y5P / II	U = Z5V / II		22nF = 223			
*X = Y5R / II	V = Z4V / III		33nF = 333			
Y = Y5U / II	W = Y5P / III		47nF = 473			
Z = Y5V / II	X = Y5R / III		100nF = 104			
	Y = Y5U / III		200nF = 204			
	Z = Y5V / III					

\*Upon Request

DIG. 3	DIG. 7
Q	M
<b>Rated Voltage</b>	<b>Tolerance</b>
D = 16V	C = ±0.25pF
F = 25V	D = ±0.5pF
H = 50V	J = ±5%
K = 100V	K = ±10%
Q = 500V	M = ±20%
R = 1000V	S = -20 +50%
S = 2000V	Z = -20 +80%
T = 3000V	P = 0 +100%
U = 4000V	
W = 5000V	
X = 6000V	
Y = 7500V	

Safety Front	
<b>Capacitance</b>	<b>Type</b>
As above	61V
	620
	65N
	<b>Tolerance</b>
	As above

TC – Temperature coefficient.

DIG – for better understanding, check pages 3 and 4.