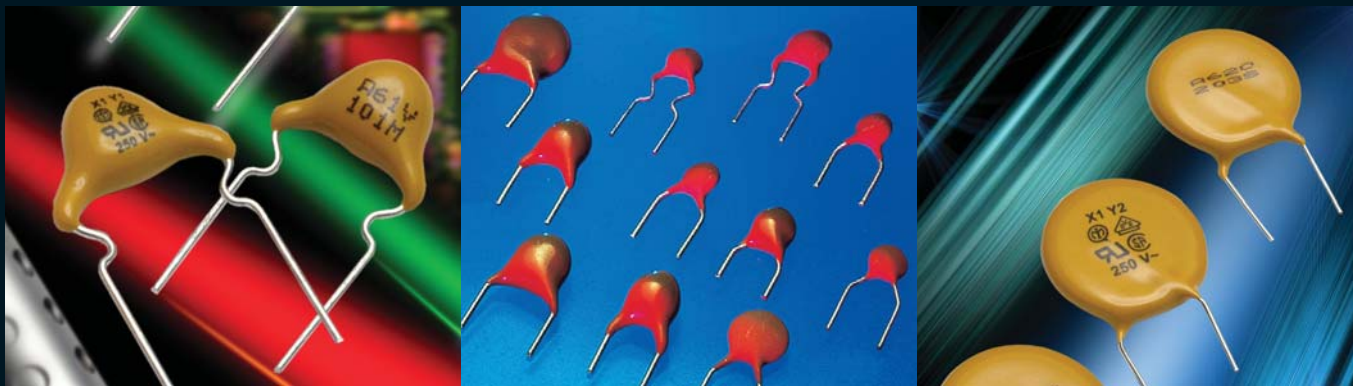


# AVX Disc Ceramic Capacitors



Version 7.1

**AVX**  
A KYOCERA GROUP COMPANY

Disc Capacitors  
[www.avx.com](http://www.avx.com)

# Disc Ceramic Capacitors



## Selection Guide

	General Purpose		Professional Application		Class	Voltage (dc)	Capacitance C <sub>R</sub> (min.~ max.)		Tolerance	R isol Min.	
	Ref	TC	Ref	TC							
LOW VOLTAGE (up to 500V)	5WF 5YF	Y5P Y5U	6WF 6YF	Y5P Y5U	III	25V	4.7nF 4.7nF	100nF 220nF	±20% / -20 + 50% -20 + 80%	1... 12 M Ω	
	5WH 5YH	Y5P Y5U	6WH 6YH	Y5P Y5U	III	50V	4.7nF 4.7nF	100nF 100nF	±20% / -20 + 50% -20 + 80%	1... 12 M Ω	
	5ZH	Y5V	6ZH	Y5V	III	50V	4.7nF	220nF	±20% / -20 + 80%	100 M Ω	
	5AK 5GK 5HK	NP0 N750 N1500	6AK 6GK 6HK	NP0 N750 N1500	I	100V	1.0pF 1.5pF 5.6pF	390pF 270pF 330pF	CR < 10pF → ±0.25pF / ±0.5pF CR ≥ 10pF → ±5% / ±10%	10 G Ω	
	5MK 5NK 5OK 5SK 5TK 5UK	Y5E Y5F Y5P Y5U Y5V Z5V	6MK 6NK 6OK 6SK 6TK 6UK	X5E X5F X5P X5U X5V Z5V	II	100V	56pF 390pF 470pF 680pF 1.2nF 4.7nF	3.3nF 4.7nF 6.8nF 12nF 22nF 100nF	±10% / 20% ±10% / 20% ±10% / 20% ±20% / -20 + 50% -20 + 50% -20 + 50%	10 G Ω	
	5AQ 5GQ 5HQ	NP0 N750 N1500	6AQ 6GQ 6HQ	NP0 N750 N1500	I	500V	1.0pF 1.5pF 5.6pF	330pF 330pF 330pF	CR < 10pF → ±0.25pF / ±0.5pF CR ≥ 10pF → ±5% / ±10%	10 G Ω	
	5MQ 5NQ 5OQ 5SQ 5TQ	Y5E Y5F Y5P Y5U Y5V	6MQ 6NQ 6OQ 6SQ 6TQ	X5E X5F X5P X5U X5V	II	500V	56pF 390pF 330pF 680pF 1.2nF	4.7nF 4.7nF 10nF 100nF 33nF	±10% / 20% ±10% / 20% ±10% / 20% ±20% / -20 + 50% -20 + 50%	10 G Ω	
	5KK 5KQ	P350... ...N1500			SL	100V 500V	1.0pF	1000pF	CR < 10pF → ±0.25pF / ±0.5pF CR ≥ 10pF → ±5% / ±10% / ±20%	10 G Ω	
	HIGH VOLTAGE (> 500V)	5AR 5AS 5AT 5AU 5GR 5GS 5GT 5GU 5GW	NP0 NP0 NP0 NP0 N750 N750 N750 N750 N750			I	1kV 2kV 3kV 4kV 1kV 2kV 3kV 4kV 5kV	2.2pF 3.9pF 2.2pF 4.7pF 8.2pF 6.8pF 6.8pF 10pF 8.2pF	180pF 150pF 120pF 100pF 270pF 330pF 220pF 120pF 120pF	CR < 10pF → ±0.25pF / ±0.5pF CR ≥ 10pF → ±5% / ±10%	10 G Ω
		5NR 5NS 5NT 5SR 5SS 5ST 5SU 5SW 5TR 5TS 5TT	Y5F Y5F Y5F Y5U Y5U Y5U Y5U Y5U Y5V Y5V Y5V			II	1kV 2kV 3kV 1kV 2kV 3kV 4kV 5kV 1kV 2kV 3kV	47pF 47pF 47pF 100pF 330pF 100pF 100pF 47pF 100pF 820pF 1.0nF 1.2nF	4.7nF 5.6nF 3.9nF 100nF 12nF 10nF 6.8nF 4.7nF 22nF 22nF 10nF	±10% / ±20% ±10% / ±20% ±10% / ±20% ±20% / -20 + 50% ±20% / -20 + 50% ±20% / -20 + 50% ±20% / -20 + 50% ±20% / -20 + 50% -20 + 50% -20 + 50% -20 + 50%	10 G Ω
5KR 5KS 5KT		N1000			SL	1kV 2kV 3kV	47pF 47pF 22pF	1000pF 1000pF 1000pF	CR < 10pF → ±0.25pF / ±0.5pF CR ≥ 10pF → ±5% / ±10% / ±20%	10 G Ω	
SAFETY		61V 62O 65N	SAFETY			II	250 (AC) 250 (AC) 400 (AC)	33pF 33pF 220pF	10nF 10nF 10nF	±10%* / ±20% / -20 + 50%	10 G Ω
		SWITCH MODE	6LR 6LS 6LT	Y5P Y5P Y5P			II	1kV 2kV 3kV	100pF 100pF 220pF	4.7nF 4.7nF 4.7nF	±10% / ±20% / -20 + 50%
67S 68S			Y5U Y5V			II	2kV 2kV	1000pF 4.7nF	10nF 10nF	±20% / -20 + 50% -20 + 50%	10 G Ω

\*Upon request



## Table of Contents

---

<b>Temperature Coefficient</b>	
Typical Curves .....	2
<b>General Specifications</b>	
Class I and SL	
Class II and III – General Purpose	
Class II and III – Professional .....	3
<b>Ordering Code</b> .....	4
<b>Class I – Temperature Compensating</b>	
General Specifications .....	6
Dimension Table .....	8
<b>Class SL</b>	
General Specifications .....	9
Dimension Table .....	10
<b>Class II – General Purpose</b>	
General Specifications .....	11
Dimension Table	
Low and Medium Voltage .....	13
High Voltage .....	14
<b>Class III – General Purpose</b>	
General Specifications .....	15
Dimension Table	
Barrier Layer Capacitors .....	16
<b>Safety Ceramic Capacitors</b> .....	17
<b>AC and Switch Mode Capacitors</b> .....	20
<b>Class I, II and III</b>	
Professional Ceramic Capacitors .....	22
<b>Class I and II – Professional</b>	
General Specifications and Dimension Table – Class I .....	23
General Specifications and Dimension Table – Class II .....	24
<b>Class III – Professional</b>	
General Specifications .....	25
<b>Marking</b> .....	26
<b>Packaging</b> .....	27
<b>Tape and Reel Specifications</b> .....	28
<b>Normalized Series and Associated Values</b> .....	30

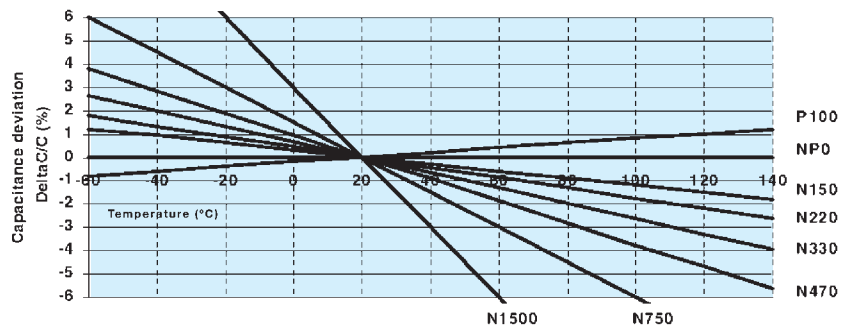
NOTICE: Specifications are subject to change without notice. Contact your nearest AVX Sales Office for the latest specifications. All statements, information and data given herein are believed to be accurate and reliable, but are presented without guarantee, warranty, or responsibility of any kind, expressed or implied. Statements or suggestions concerning possible use of our products are made without representation or warranty that any such use is free of patent infringement and are not recommendations to infringe any patent. The user should not assume that all safety measures are indicated or that other measures may not be required. Specifications are typical and may not apply to all applications.

# Disc Ceramic Capacitors

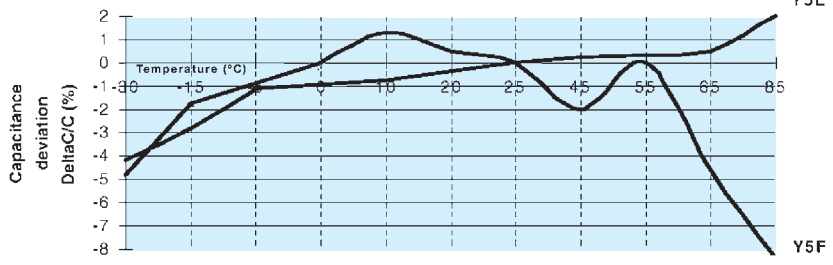
## Temperature Coefficient - Typical Curves



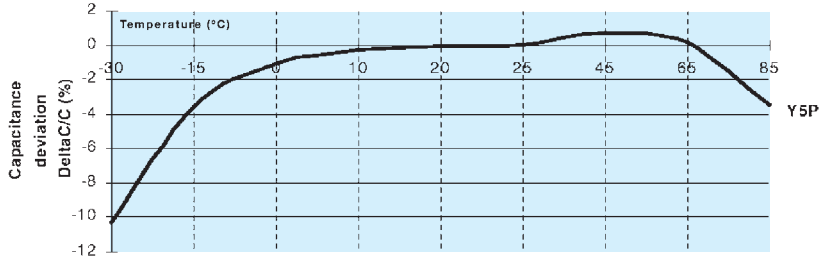
### Class I



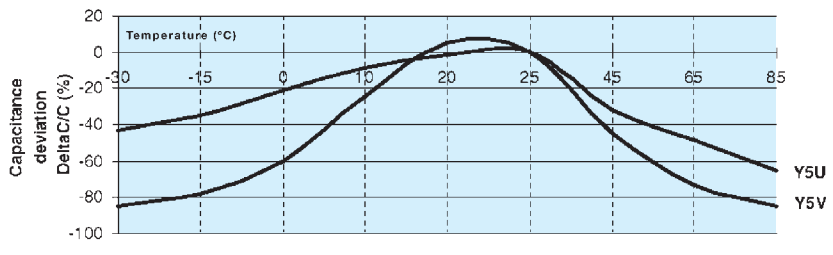
### Class II



### Class II / III



### Class II / III



# Disc Ceramic Capacitors



## General Specifications

### TEMPERATURE COEFFICIENT - CLASS I AND SL GENERAL PURPOSE AND PROFESSIONAL

DIG. 1&2	T.C. (ppm) = $10^{-6} C^{-1}$		Tolerance (ppm)				Aging $\Delta C/C/\log(10xhours)$
			$\leq 2pF$	$2pF < \dots \leq 3pF$	$3pF < \dots \leq 10pF$	$\geq 10pF$	
5B	*P100	+100 ppm	$\pm 250$	$\pm 120$	$\pm 60$	$\pm 30$	0 typical
5A	NP0	0 ppm	$\pm 250$	$\pm 120$	$\pm 60$	$\pm 30$	0 typical
5C	*N150	-150 ppm	$\pm 250$	$\pm 120$	$\pm 60$	$\pm 30$	0 typical
5D	*N220	-220 ppm	$\pm 250$	$\pm 120$	$\pm 60$	$\pm 30$	0 typical
5E	*N330	-330 ppm	$\pm 250$	$\pm 120$	$\pm 60$	$\pm 60$	0 typical
5F	*N470	-470 ppm	$\pm 250$	$\pm 120$	$\pm 80$	$\pm 80$	0 typical
5G	N750	-750 ppm	$\pm 250$	$\pm 120$	$\pm 120$	$\pm 120$	-0.1% typical
5H	N1500	-1500 ppm	$\pm 250$	$\pm 250$	$\pm 250$	$\pm 250$	-0.1% typical
5K	SL	+350... -1500 ppm	$\pm 250$	$\pm 250$	$\pm 250$	$\pm 250$	-0.1% typical

### TEMPERATURE COEFFICIENT - CLASS II AND III GENERAL PURPOSE

DIG. 1&2		Temperature range		Capacitance deviation typical	Reference curve	Aging	
Class II	Class III	Class II	Class III			$\Delta C/C/\log(10xhours)$	
5M		-30... +85°C		$\pm 5\%$	Y5E	-1.5%	typical
5N		-30... +85°C		$\pm 8\%$	Y5F	-1.5%	typical
5O	5W	-30... +85°C	-30... +85°C	$\pm 12\%$	Y5P	-2.5%	typical
5S	5Y	-30... +85°C	-30... +85°C	+30 -65%	Y5U	-3.5%	typical
5T	5Z	-30... +85°C	-30... +85°C	+30 -85%	Y5V	-5%	typical
5U		+10... +85°C		+22 -85%	Z5V	-5%	typical

### TEMPERATURE COEFFICIENT - CLASS II AND III PROFESSIONAL

DIG. 1&2		Temperature range		Capacitance deviation typical	Reference curve		Aging	
Class II	Class III	Class II	Class III		Class II	Class III	$\Delta C/C/\log(10xhours)$	
5M		-55... +85°C		$\pm 5\%$	X5E		-1.5%	typical
5N		-55... +85°C		$\pm 8\%$	X5F		-1.5%	typical
5O	5W	-55... +85°C	-30... +85°C	$\pm 12\%$	X5P	Y5P	-2.5%	typical
5S	5Y	-55... +85°C	-30... +85°C	+30 -65%	X5U	Y5U	-3.5%	typical
5T	5Z	-55... +85°C	-30... +85°C	+30 -85%	X5V	Y5V	-5%	typical
5U		+10... +85°C		+22 -85%	Z5V		-5%	typical

### RECOMMENDED SHELF CONDITIONS

45°C temperature (max) 10°C temperature (min)
60% relative humidity (max)
2 years (max)

### INSPECTION LEVEL: II

Electrical	AQL	0.1%
Visual	AQL	1%

### FOR SAFETY PARTS

AQL	Electrical	Visual
Level II	0.065%	0.065%

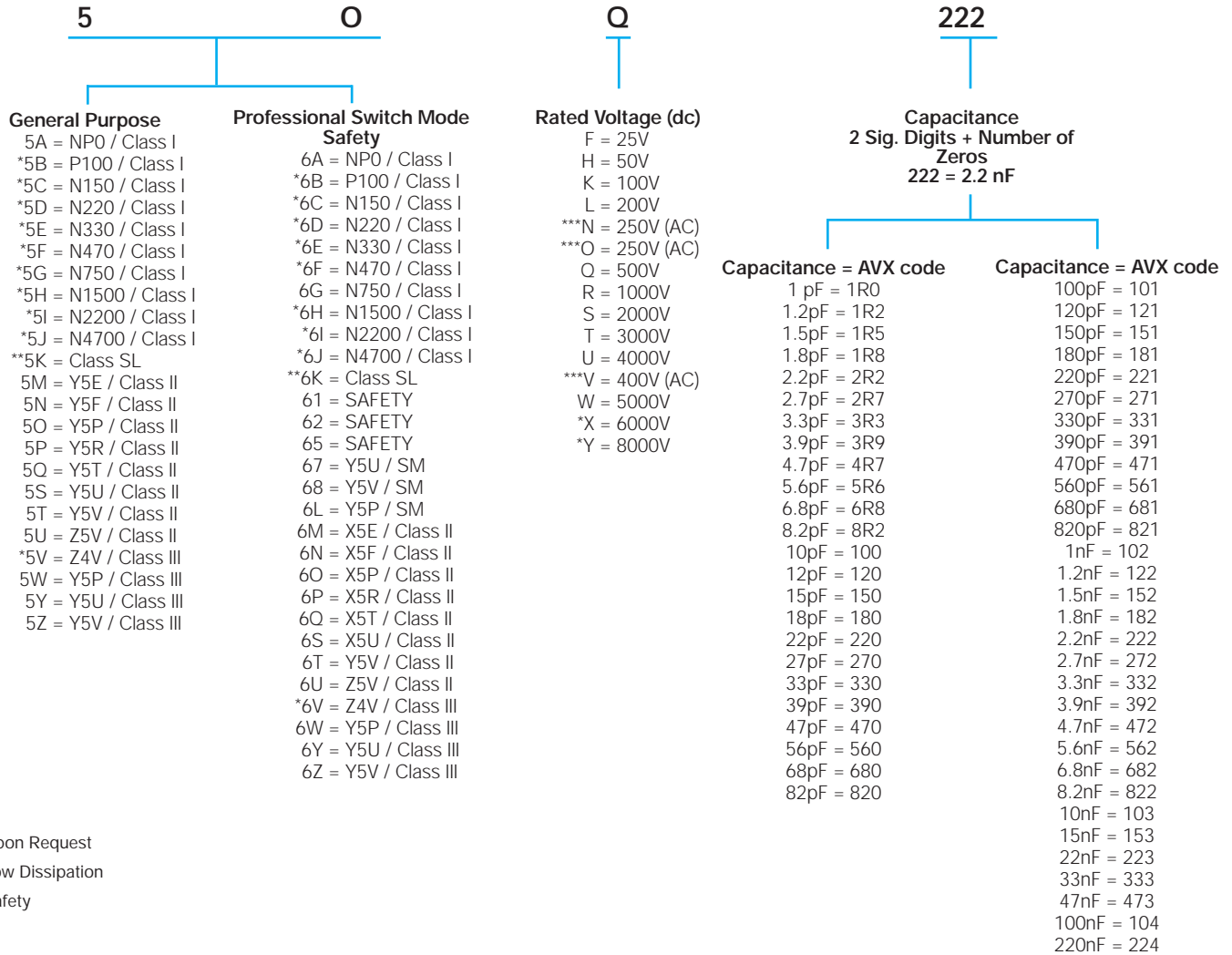
\*Upon request

# Disc Ceramic Capacitors



## Ordering Code

### HOW TO ORDER



### DIMENSIONS

millimeters (inches)

Digit 9 (ø)	D ± 1 (0.039)	T max. Low Voltage	T max. High Voltage	Available Lead Spacing				
				Vn = 100V/500V	Vn = 1000V	Vn = 2000V	Vn = 3000V	Vn = 4000/5000V
A/B	5.0 (0.197)	3.0 (0.118)	5.0 (0.197)	A,B,E,O,R,X	A,B,E,N,R,X	A,B,E,N,R	B,E	
C	6.0 (0.236)	3.0 (0.118)	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
D	7.0 (0.276)	4.0 (0.157)	5.0 (0.197)	A,B,C,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)	5.0 (0.197)	A,B,C,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)	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)	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)	5.0 (0.197)	A,B,C,E,O,R,X	A,B,C,E,N,R,W	A,B,C,E,N,R,W	B,C,E,W	C
J	12.0 (0.472)	5.0 (0.197)	5.0 (0.197)	B,C,R,W	B,C,N,R,W	B,C,W	B,C,W	C
K	14.0 (0.551)	6.0 (0.236)	6.0 (0.236)	B,C,R,W	B,C,N,R,W	B,C,W	B,C,W	C
L	16.0 (0.630)	6.0 (0.236)	6.0 (0.236)	B,C,R,W	B,C,N,R,W	B,C,W	B,C,W	C
M	19.0 (0.748)	7.0 (0.276)	7.0 (0.276)	B,C	B,C	B,C	B,C	C
S	23.0 (0.906)	7.0 (0.276)	7.0 (0.276)	C	C	C	-	-

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





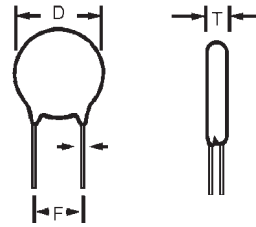
# Disc Ceramic Capacitors



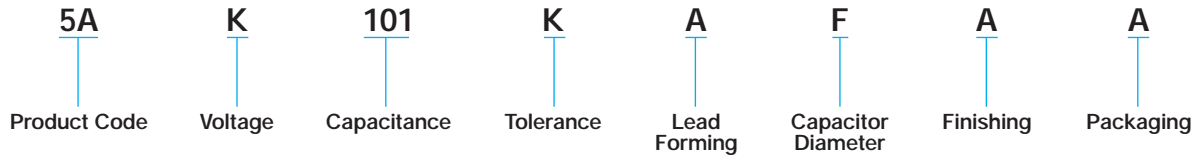
## General Specifications - Class I Temperature Compensating

### 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).



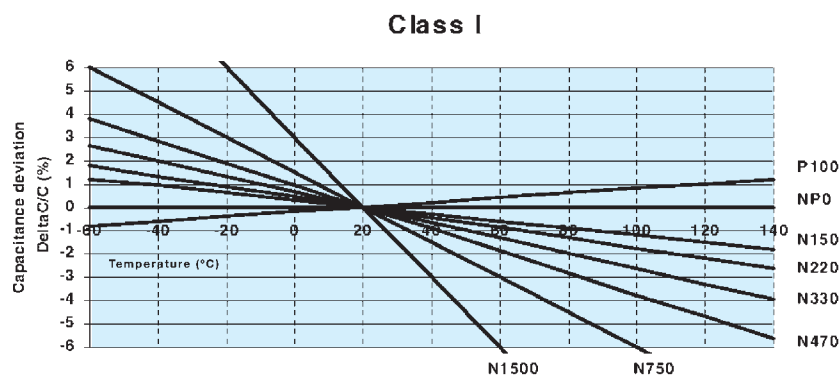
### HOW TO ORDER



### PERFORMANCE CHARACTERISTICS

Voltage Rating	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	@ $V_R = 100V \rightarrow V_t = 250V \text{ (DC)}$ @ $V_R = 500V \rightarrow V_t = 1250V \text{ (DC)}$	$1.5 \times V_R + 500 \text{ (DC)}$
Operating Temperature Range (°C)	-30 → +85°C	-30 → +85°C -30 → +125°C
Climatic Category	30 / 85 / 21 Phenolic Coated	30 / 085 / 21 Phenolic Coated 30 / 085 / 56 Epoxy Coated

### TEMPERATURE COEFFICIENT - TYPICAL CURVES





# Disc Ceramic Capacitors



## Dimension Table - Class I Temperature Compensating

### CLASS I - CAPACITANCE VS. DISC DIAMETER

millimeters (inches)

Temp. Coefficient	NPO					
Digits 1, 2, 3 of P.N.	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	5.0 (0.197)	5.0 (0.197)	5.0 (0.197)	5.0 (0.197)	5.0 (0.197)	5.0 (0.197)
1.2						
1.5						
1.8						
2.2						
2.7						
3.3						
3.9						
4.7						
5.6						
6.8						
8.2						
10						
12						
15						
18						
22						
27		6.0 (0.236)		6.0 (0.236)		6.0 (0.236)
33		7.0 (0.276)		7.0 (0.276)		7.0 (0.276)
39		8.0 (0.315)		8.0 (0.315)		8.0 (0.315)
47	7.0 (0.276)					
56		9.0 (0.354)		9.0 (0.354)		9.0 (0.354)
68		10.0 (0.394)		10.0 (0.394)		10.0 (0.394)
82	8.0 (0.315)					
100		11.0 (0.433)		11.0 (0.433)		11.0 (0.433)
120		12.0 (0.472)		12.0 (0.472)		12.0 (0.472)
150	9.0 (0.354)					
180		14.0 (0.551)		14.0 (0.551)		14.0 (0.551)
220		16.0 (0.630)		16.0 (0.630)		16.0 (0.630)
270	11.0 (0.433)					
330		19.0 (0.748)				
390	12.0 (0.472)					

# 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)									
1.5	5.0 (0.197)	5.0 (0.197)	5.0 (0.197)	5.0 (0.197)	5.0 (0.197)	6.0 (0.236)	6.0 (0.236)	5.0 (0.197)	5.0 (0.197)
1.8									
2.2									
2.7									
3.3									
3.9									
4.7									
5.6									
6.8									
8.2									
9.0									
10									
12									
15									
18									
22									
27									
33									
39									
47									
56									
68									
82									
100									
120									
150									
180									
220									
270									
330									
7.0 (0.276)	8.0 (0.315)	9.0 (0.354)	9.0 (0.354)	10.0 (0.394)	10.0 (0.394)	12.0 (0.472)	12.0 (0.472)	7.0 (0.276)	7.0 (0.276)
10.0 (0.394)	9.0 (0.354)	10.0 (0.394)	11.0 (0.433)	11.0 (0.433)	14.0 (0.551)	14.0 (0.551)	14.0 (0.551)	8.0 (0.315)	8.0 (0.315)
11.0 (0.433)	11.0 (0.433)	12.0 (0.472)	12.0 (0.472)	14.0 (0.551)	14.0 (0.551)	16.0 (0.630)	16.0 (0.630)	9.0 (0.354)	9.0 (0.354)
14.0 (0.551)	14.0 (0.551)	14.0 (0.551)	14.0 (0.551)	16.0 (0.630)	16.0 (0.630)			10.0 (0.394)	11.0 (0.433)



# Disc Ceramic Capacitors



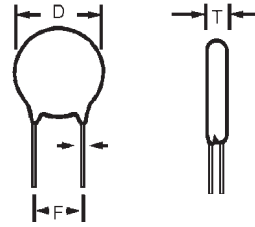
## General Specifications - SL

### CAPACITORS - CLASS SL

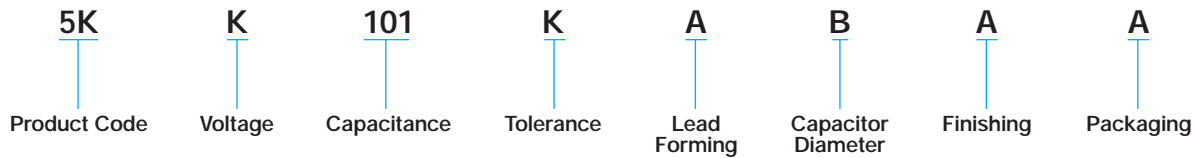
These capacitors have wide temperature characteristics but still offer low loss and linear type TC's.

They are specially designed to be smaller alternative to standard Class I capacitors of linear temperature coefficient.

Typical application is RF tuning and decoupling.



### HOW TO ORDER



### PERFORMANCE CHARACTERISTICS

	Low Voltage	High Voltage
Measured at	$C_R \leq 100 \text{ pF} \rightarrow 1\text{MHz}/1.0 \text{ Vrms} / 25^\circ\text{C}$ $C_R > 100 \text{ pF} \rightarrow 1\text{kHz}/0.3 \text{ Vrms} / 25^\circ\text{C}$	1.0kHz @ 0.3 Vrms / 25°C
Dissipation Factor (%)	$C_R \leq 100 \text{ pF} \dots 0.10\%$ 1MHz @ 1.0 Vrms $C_R > 100 \text{ pF} \dots 1.0\%$ 100kHz @ 0.3 Vrms $C_R > 100 \text{ pF} \dots 0.10\%$ 1kHz @ 0.3 Vrms	1MHz @ 1.0 Vrms 100kHz @ 0.3 Vrms 1kHz @ 0.3 Vrms
Tolerance	$C_R \leq 10 \text{ pF} \rightarrow \pm 0.25 \text{ pF}, \pm 0.5 \text{ pF}$ $C_R > 10 \text{ pF} \rightarrow \pm 5\%, \pm 10\%, \pm 20\%$	$C_R \leq 10 \text{ pF} \rightarrow \pm 0.25 \text{ pF}, \pm 0.5 \text{ pF}$ $C_R > 10 \text{ pF} \rightarrow \pm 5\%, \pm 10\%, \pm 20\%$
Temperature Coefficient	+350 ppm... -1500 ppm (P350... N1500)	
Insulation Resistance (IR)	@ $V_R \rightarrow \geq 10 \text{ G}\Omega$	@ 500V $\rightarrow \geq 10 \text{ G}\Omega$
Dielectric Strength NOTE: Charging current limited to 50 mA	@ $V_R = 100\text{V} \rightarrow V_t = 250\text{V (DC)}$ @ $V_R = 500\text{V} \rightarrow V_t = 1250\text{V (DC)}$	$1.5 \times V_R + 500 \text{ (DC)}$
dV/dt Test	up to 1.5 kV/ $\mu\text{sec}$	up to 10 kV/ $\mu\text{sec}$
Operating Temperature Range (°C)	-30... +85°C	-30... +125°C
Climatic Category	30 / 85 / 21 Phenolic Coated	30 / 85 / 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 - SL - Low Dissipation Class

### SL – CAPACITANCE VS. DISC DIAMETER

Type Digits 1, 2, 3 of P.N.	Phenolic Coating		Epoxy Coating		
	5KK	5KQ	5KR	5KS	5KT
Rated Voltage (V <sub>R</sub> ) C <sub>R</sub> (pF)	100 VDC 50 VAC	500 VDC 100 VAC	1000 VDC 100 VAC	2000 VDC 150 VAC	3000 VDC 150 VAC
1.0	5.0 (0.197)	5.0 (0.197)	5.0 (0.197)	5.0 (0.197)	5.0 (0.197)
1.2					
1.5					
2.2					
2.7					
3.3					
3.9					
4.7					
5.6					
8.2					
10					
12					
15					
18					
22					
27	5.0 (0.197)	6.0 (0.236)	6.0 (0.236)	6.0 (0.236)	6.0 (0.236)
33					
39					
47					
56					
68					
82					
100					
120					
150					
180					
220					
270					
330					
390					
470	7.0 (0.276)	7.0 (0.276)	7.0 (0.276)	7.0 (0.276)	7.0 (0.276)
560					
680					
820					
1000					
1000					
1000					
1000					
1000					
1000					
1000					
1000					
1000					
1000					
1000					

Diameter (φ) = 9th Part Number Digit



# Disc Ceramic Capacitors



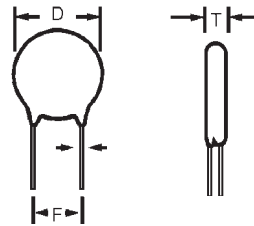
## General Specifications - Class II General Purpose

### DIELECTRIC - CLASS II

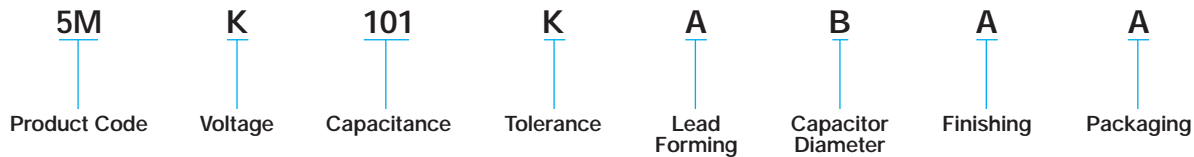
These ceramic capacitors have a high dielectric constant, what makes possible high capacitance values in reduced dimensions, however temperature coefficient and loss factor are greater than Class I.

Typical applications are decoupling and by pass.

Meets IEC 384-9 (1988).



### HOW TO ORDER



### 100V / 500V PERFORMANCE CHARACTERISTICS CLASS II

Voltage Rating	100V ... 500V	1kV ... 5kV
Measured at	1.0 kHz @ 0.3 Vrms / 25°C	1.0 kHz @ 0.3 Vrms / 25°C
Dissipation Factor (%)	Y5E / Y5F / Y5P ≤ 2.5% Y5U / Y5V / Z5V ≤ 3.0%	Y5F ≤ 2.5% Y5U / Y5V ≤ 3.0%
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)	@ $V_R \rightarrow \geq 10 \text{ G}\Omega$	@ 500V $\rightarrow \geq 10 \text{ G}\Omega$
Dielectric Strength NOTE: Charging current limited to 50 mA	@ $V_R = 100\text{V} \rightarrow V_t = 250\text{V (DC)}$ @ $V_R = 500\text{V} \rightarrow V_t = 1250\text{V (DC)}$	$1.5 \times V_R + 500 \text{ (DC)}$
dV/dt test	-	up to 3.0 kV/ $\mu\text{sec}$ for 5NR; 5NS Series
Operating Temperature Range (°C)	-30... +85°C	-30 ... +85°C Phenolic Coated -30 ... +125°C Epoxy Coated
Climatic Category	30 / 085 / 21 Phenolic Coated	30 / 85 / 21 Phenolic Coated 30 / 85 / 56 Epoxy Coated

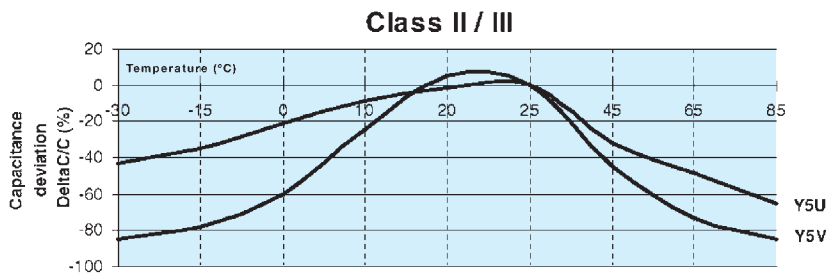
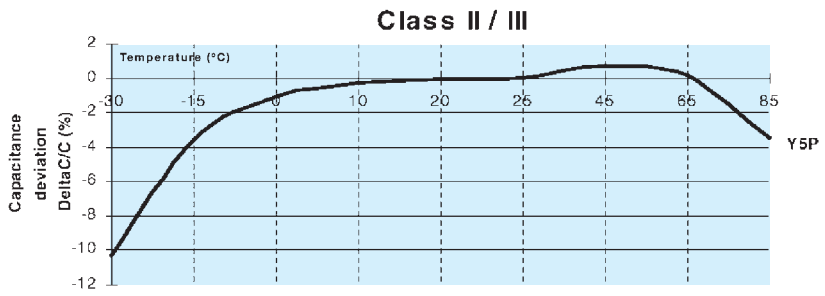
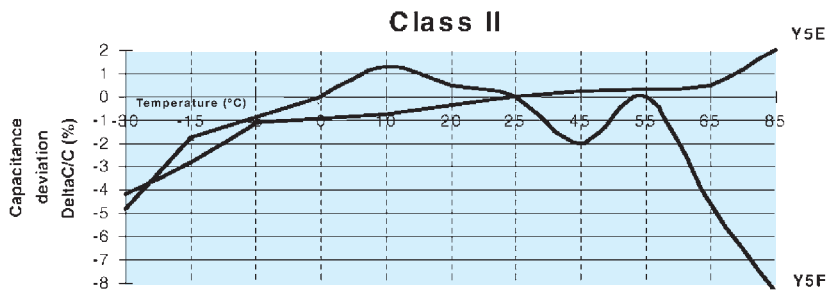
Note: Damp Heat Steady State: 90... 95% R.H. 40°C / 21 days. No voltage to be applied.

# Disc Ceramic Capacitors

## General Specifications - Class II General Purpose



### TEMPERATURE COEFFICIENT - TYPICAL CURVES



# Disc Ceramic Capacitors

## Dimension Table - Class II

### Low and Medium Voltage General Purpose



#### 100V / 500V CLASS II – CAPACITANCE VS. DISC DIAMETER

millimeters (inches)

Temp. Coefficient	Y5E		Y5F		Y5P		Y5U		Y5V		Z5V																					
Digits 1,2,3 of P.N.	5MK	5MQ	5NK	5NQ	5OK	5OQ	5SK	5SQ	5TK	5TQ	5UK																					
Rated Voltage (V <sub>R</sub> )	100 VDC	500 VDC	100 VDC	500 VDC	100 VDC	500 VDC	100 VDC	500 VDC	100 VDC	500 VDC	100 VDC																					
C <sub>R</sub> (pF)																																
56	5.0 (0.197)	5.0 (0.197)																														
68																																
82																																
100																																
120																																
150																																
180																																
220																																
270																																
330																																
390																																
470																																
560												6.0 (0.236)	6.0 (0.236)	5.0 (0.197)	5.0 (0.197)	5.0 (0.197)	5.0 (0.197)	5.0 (0.197)	5.0 (0.197)	5.0 (0.197)												
680																																
820																																
1,000	7.0 (0.276)	7.0 (0.276)	6.0 (0.236)	7.0 (0.276)	6.0 (0.236)	6.0 (0.236)	7.0 (0.276)	5.0 (0.197)	5.0 (0.197)																							
1,200																																
1,500																																
1,800																																
2,200																																
2,700	9.0 (0.354)	7.0 (0.276)	9.0 (0.354)	7.0 (0.276)	9.0 (0.354)	9.0 (0.354)	6.0 (0.236)	7.0 (0.276)	5.0 (0.197)	5.0 (0.197)																						
3,300	10.0 (0.394)										11.0 (0.433)	9.0 (0.354)	10.0 (0.394)	10.0 (0.394)	10.0 (0.394)	7.0 (0.276)																
3,900	11.0 (0.433)	12.0 (0.472)	11.0 (0.433)	12.0 (0.472)	9.0 (0.354)	11.0 (0.433)	14.0 (0.551)	7.0 (0.276)	9.0 (0.354)	7.0 (0.276)	5.0 (0.197)																					
4,700												10.0 (0.394)	11.0 (0.433)	12.0 (0.472)	12.0 (0.472)	12.0 (0.472)	12.0 (0.472)	9.0 (0.354)	7.0 (0.276)	6.0 (0.236)	5.0 (0.197)											
5,600												11.0 (0.433)	12.0 (0.472)	11.0 (0.433)	12.0 (0.472)	9.0 (0.354)	11.0 (0.433)	14.0 (0.551)	7.0 (0.276)	9.0 (0.354)	7.0 (0.276)	5.0 (0.197)										
6,800																							10.0 (0.394)	11.0 (0.433)	12.0 (0.472)	12.0 (0.472)	12.0 (0.472)	12.0 (0.472)	10.0 (0.394)	9.0 (0.354)	7.0 (0.276)	6.0 (0.236)
8,200												11.0 (0.433)	12.0 (0.472)	11.0 (0.433)	12.0 (0.472)	9.0 (0.354)	11.0 (0.433)	14.0 (0.551)	7.0 (0.276)	9.0 (0.354)	7.0 (0.276)	5.0 (0.197)										
10,000																							10.0 (0.394)	11.0 (0.433)	12.0 (0.472)	12.0 (0.472)	12.0 (0.472)	12.0 (0.472)	16.0 (0.630)	10.0 (0.394)	9.0 (0.354)	7.0 (0.276)
12,000																							10.0 (0.394)	11.0 (0.433)	12.0 (0.472)	12.0 (0.472)	12.0 (0.472)	12.0 (0.472)	16.0 (0.630)	10.0 (0.394)	9.0 (0.354)	7.0 (0.276)
15,000																							10.0 (0.394)	11.0 (0.433)	12.0 (0.472)	12.0 (0.472)	12.0 (0.472)	12.0 (0.472)	16.0 (0.630)	10.0 (0.394)	9.0 (0.354)	7.0 (0.276)
22,000												11.0 (0.433)	12.0 (0.472)	11.0 (0.433)	12.0 (0.472)	9.0 (0.354)	11.0 (0.433)	14.0 (0.551)	7.0 (0.276)	9.0 (0.354)	7.0 (0.276)	5.0 (0.197)										
33,000																							10.0 (0.394)	11.0 (0.433)	12.0 (0.472)	12.0 (0.472)	12.0 (0.472)	12.0 (0.472)	16.0 (0.630)	10.0 (0.394)	9.0 (0.354)	7.0 (0.276)
47,000	10.0 (0.394)	11.0 (0.433)	12.0 (0.472)	12.0 (0.472)	12.0 (0.472)	12.0 (0.472)	16.0 (0.630)	10.0 (0.394)	9.0 (0.354)	7.0 (0.276)																						
100,000	10.0 (0.394)	11.0 (0.433)	12.0 (0.472)	12.0 (0.472)	12.0 (0.472)	12.0 (0.472)	16.0 (0.630)	10.0 (0.394)	9.0 (0.354)	7.0 (0.276)																						

Diameter (φ) = 9th Part Number Digit

# Disc Ceramic Capacitors

## Dimension Table - Class II

### High Voltage - Class II General Purpose



#### 1kV / 5kV CLASS II – CAPACITANCE VS. DISC DIAMETER

millimeters (inches)

Temp. Coefficient	Y5F			Y5U					Y5V		
Digits 1,2,3 of P.N.	5NR	5NS	5NT	5SR	5SS	5ST	5SU	5SW	5TR	5TS	5TT
Rated Voltage (V <sub>R</sub> )	1000 VDC 100 VAC	2000 VDC 150 VAC	3000 VDC 150 VAC	1000 VDC 100 VAC	2000 VDC 150 VAC	3000 VDC 150 VAC	4000 VDC 150 VAC	5000 VDC 150 VAC	1000 VDC 100 VAC	2000 VDC 150 VAC	3000 VDC 150 VAC
C <sub>R</sub> (pF)											
47	5.0 (0.197)	5.0 (0.197)	5.0 (0.197)	5.0 (0.197)	5.0 (0.197)	5.0 (0.197)	5.0 (0.197)	5.0 (0.197)	5.0 (0.197)	5.0 (0.197)	5.0 (0.197)
56											
68											
82											
100											
120											
150											
180											
220											
270											
330											
390											
470											
560											
680											
820	6.0 (0.236)	8.0 (0.315)	9.0 (0.354)	8.0 (0.315)	8.0 (0.315)	8.0 (0.315)	8.0 (0.315)	8.0 (0.315)	8.0 (0.315)	8.0 (0.315)	
1,000											
1,200											
1,500											
1,800											
2,200											
2,700											
3,300											
3,900											
4,700											
5,600											
6,800											
8,200											
10,000											
12,000											
15,000											
22,000											
50,000											
100,000											

Diameter (φ) = 9th Part Number Digit





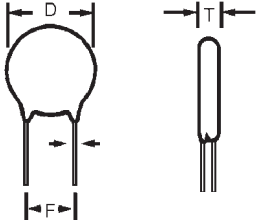
# Disc Ceramic Capacitors



## General Specifications - Class III Semi Conducting

### DIELECTRIC - CLASS III

A thin dielectric layer is grown on a disc of conductive ceramic. Very large capacitances can be obtained due to reduced thickness of this barrier layer and its inherently high dielectric constant. Due to its small dimensions, they are a less expensive replacement of multilayer ceramic or polyester capacitors. An equivalent circuit is shown below:



Meets IEC 324 (1970).

### HOW TO ORDER



### PERFORMANCE CHARACTERISTICS CLASS III

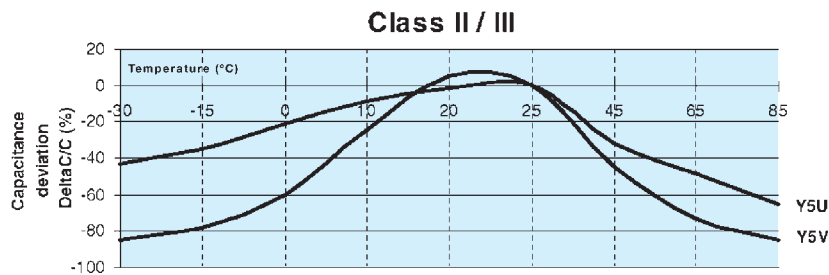
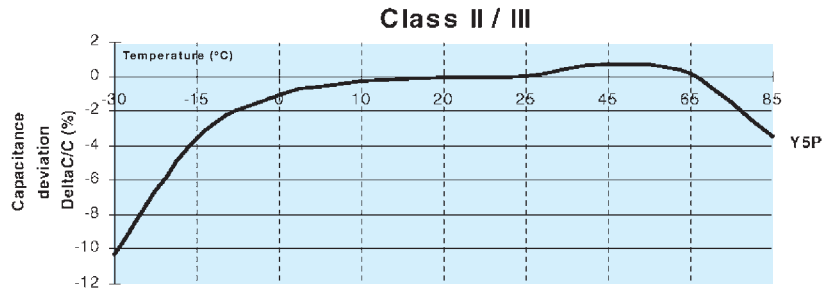
Measured at	1.0 kHz / 0.1 Vrms / 25°C	
Dissipation Factor (%)	$C_R \leq 22 \text{ nF} \rightarrow Y5V, Y5U \leq 7.5\%$ $C_R > 22 \text{ nF} \rightarrow Y5V, Y5P \leq 5.0\%$	
Tolerance	$Y5P \rightarrow \pm 20\% / -20 + 50\%$ $Y5U \rightarrow \pm 20\% / -20 + 50\%$ $Y5V \rightarrow -20\% + 50\% / -20 + 80\%$	
Insulation Resistance (IR)	Y5P	$\geq 12 \text{ M}\Omega$
	Y5U	$4.7 \text{ nF} \dots 100 \text{ nF} \rightarrow \geq 10 \text{ M}\Omega$ $200 \text{ nF} \rightarrow \geq 1 \text{ M}\Omega$
	Y5V	$\geq 100 \text{ M}\Omega$
Dielectric Strength NOTE: Charging current limited to 50 mA	Between leads	$V_t = 1.25 V_R$
	Body insulation	$V_R = 25V \quad V_t = 100V \text{ (DC)}$ $V_R = 50V \quad V_t = 150V \text{ (DC)}$
Operating Temperature Range (°C)	-30... +85°C	
Climate Category	30 / 85 / 21	

# Disc Ceramic Capacitors

## General Specifications - Class III Semi Conducting



### TEMPERATURE COEFFICIENT – TYPICAL CURVES



### PHENOLIC COATED – CAPACITANCE VS. DISC DIAMETER

millimeters (inches)

Class III	$\Delta C/C$ (max.) $\pm 12\%$ Range -30... +85°C		$\Delta C/C$ (max.) +30 -65% Range -30... +85°C		$\Delta C/C$ (max.) +30 -65% Range -30... +85°C	
	Y5P		Y5U		Y5V	
Temp. Coefficient	Y5P		Y5U		Y5V	
Digits 1,2,3 of P.N.	5WF	5WH	5YF	5YH	5ZH	
Rated Voltage ( $V_R$ )	25 VDC	50 VDC	25 VDC	50 VDC	50 VDC	
$C_R$ (pF)						
4,700	5.0 (0.197)	5.0 (0.197)	5.0 (0.197)	5.0 (0.197)	5.0 (0.197)	
10,000	6.0 (0.236)	6.0 (0.236)		6.0 (0.236)		
22,000	7.0 (0.276)	8.0 (0.315)	7.0 (0.276)	7.0 (0.276)		
33,000	8.0 (0.315)	9.0 (0.354)	6.0 (0.236)	8.0 (0.315)	6.0 (0.236)	
47,000	9.0 (0.354)		7.0 (0.276)	9.0 (0.354)		
50,000			7.0 (0.276)	8.0 (0.315)		
68,000	11.0 (0.433)	11.0 (0.433)	8.0 (0.315)	9.0 (0.354)	10.0 (0.394)	
100,000						
200,000						

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



# Disc Ceramic Capacitors

## Safety Ceramic Capacitors



### DEFINITIONS (IEC 384-14 1993)

**X FUNCTION:** applications where the capacitor failure does not lead to danger of electrical shock. There are three subclasses related to the peak voltage of the impulses superimposed to the mains voltage:

Subclass X1: impulses up to 4000V

Subclass X2: impulses up to 2500V

Subclass X3: impulses up to 1200V

**Y FUNCTION:** applications where the capacitor failure may lead to danger of electrical shock. There are four subclasses related to the peak voltage of the impulses applied before the life test:

Subclass Y1: impulses up to 8000V

Subclass Y2: impulses up to 5000V

Subclass Y3: rated 250Vac without impulses

Subclass Y4: impulses up to 2500V

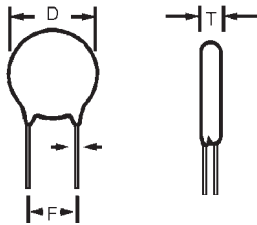
**ANTENNA:** the capacitors are used to decouple the antenna leads of video and audio equipment, whose failure may lead to danger of electrical shock.

**TPC Safety Capacitors:**

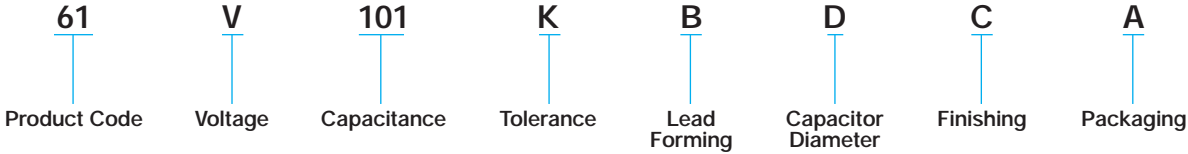
61V (GZO): meets subclasses X1, Y1 Test voltage 4000 VAC

62O (GKO): meets subclasses X1, Y2 Test voltage 2500 VAC

65N (GAY): meets subclasses X2, Y3 Test voltage 1800 VAC



### HOW TO ORDER



### PERFORMANCE CHARACTERISTICS

	61V	62O	65N
Measured at	1.0 kHz / 0.3 Vrms / 25°C	1.0 kHz / 0.3 Vrms / 25°C	1.0 kHz / 0.3 Vrms / 25°C
Capacitance Tolerance	±20% / -20 +50%	±20% / -20 +50%	±20% / -20 +50%
D.F max. @ 25°C	1.5%	1.5%	1.5%
Insulation Resistance (IR)	≥ 10 GΩ	≥ 10 GΩ	≥ 10 GΩ
Test Voltage Between Leads*	4.000 VAC	2.500 VAC	1.800 VAC
Test Voltage Leads to Body	4.000 VAC	2.500 VAC	1.800 VAC
Operating Temperature Range (°C)	-40 +125	-40 +125	-40 +125

\* Main reference voltage

### CERTIFICATION BODY APPROVALS

	Standard	61V			62O			65N		
		Certificate Number	Rated Voltage	Climatic Category	Certificate Number	Rated Voltage	Climatic Category	Certificate Number	Rated Voltage	Climatic Category
UL	UL 1414	E 147842 (N)	250 VAC		E 147842 (N)	250 VAC		E 147842 (N)	250 VAC	-
CAS	CAN/CSA - C22.2 No. 1-94	LR 100430-2	250 VAC		LR 100430-1	250 VAC		-	-	-
VDE	DIN BDE 0560 Part 2	-	-	40/85/21/C	76830 76804	400 VAC	25/85/21	-	-	-
	DIN EN 132400: 1995 IEC 384-14: 1993	94612 94610 94634	X1: 400 VAC Y1: 250 VAC		101384	X1: 400 VAC Y1: 250 VAC	40/85/21/C	-	-	-
IMQ	EN 132400: 1994 IEC 384-14: 1993	V4551	X1: 400 VAC Y1: 250 VAC	40/125/21/C	V4635	X1: 400 VAC Y2: 250 VAC	40/125/21/C	-	-	-

# Disc Ceramic Capacitors

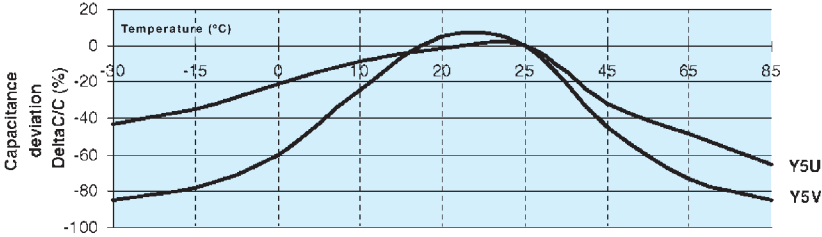
## Safety Ceramic Capacitors Epoxy Coated



### CAPACITANCE VS. DISC DIAMETER

Digits 1, 2, 3 of P.N. $C_R$ (pF)	61V	620	65N		
33	6.0 (0.236)	6.0 (0.236)			
39					
47					
56					
68					
82	7.0 (0.276)	8.0 (0.315)	6.0 (0.236)		
100					
120					
150					
180					
220	8.0 (0.315)	7.0 (0.276)	8.0 (0.315)		
270					
330					
390					
470					
560	10.0 (0.394)	10.0 (0.394)	9.0 (0.354)		
680					
820					
1000					
1200					
1500	11.0 (0.433)	12.0 (0.472)	10.0 (0.394)		
1800					
2200					
2700					
3300					
3900	14.0 (0.551)	14.0 (0.551)	12.0 (0.472)		
4700					
8200				16.0 (0.630)	16.0 (0.630)
10000					
20000					

### TEMPERATURE COEFFICIENT - TYPICAL CURVES



# Disc Ceramic Capacitors



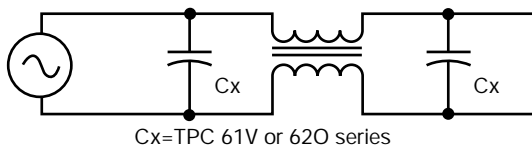
## Safety Ceramic Capacitors Epoxy Coated

### APPROVED LOGOS

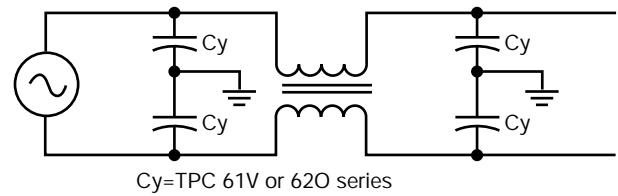


### TYPICAL APPLICATION FOR SAFETY CERAMIC DISCS AND SWITCH MODE

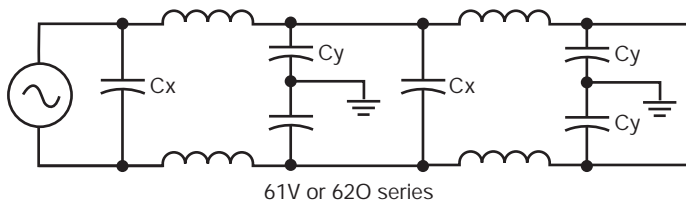
#### Across the line capacitors for noise suppression



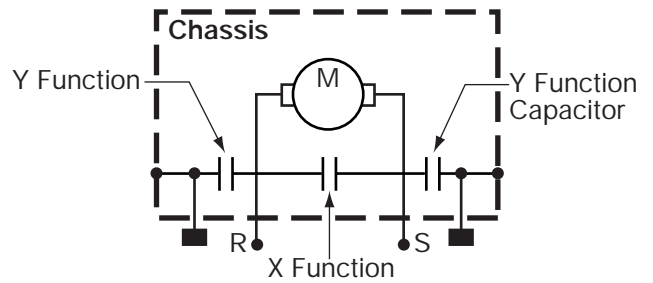
#### Line by-pass for noise suppression



#### Typical X and Y function application



#### Protection and suppression of a motor (X and Y function)



# Disc Ceramic Capacitors

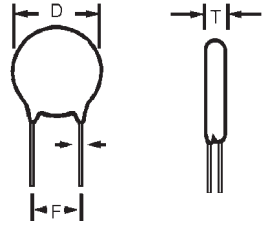
## AC and Switch Mode Epoxy Coated

### CAPACITORS FOR AC AND SWITCH MODE APPLICATIONS

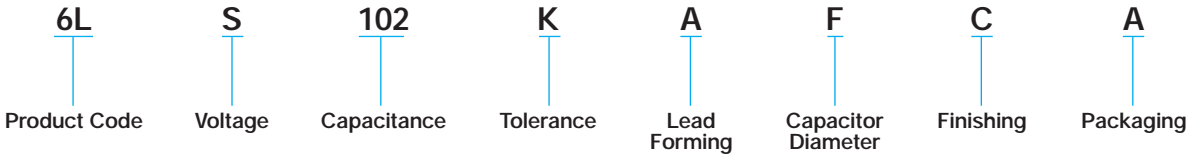
These capacitors are made of a new dielectric compound specially developed for AC or switch mode circuits that can generate dielectric heat which is limiting factor on other ceramic disc capacitors.

This new series adds the advantages of class I (low loss factor) with the advantages of class II capacitors (small sizes and lower costs).

The capacitors are epoxy coated, flame retardant class UL 94-V0. They meet the standards of the telecom and data processing industry. They are particularly suited for TV deflection and power supply circuits.



### HOW TO ORDER



### PERFORMANCE CHARACTERISTICS

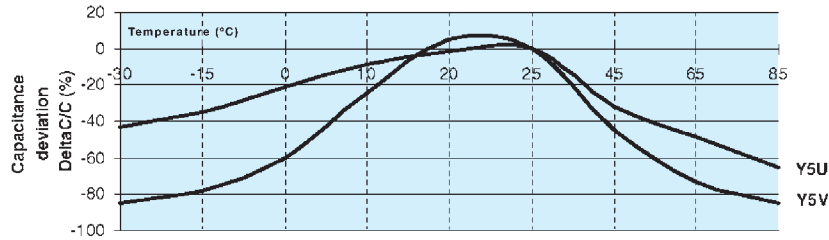
Measured at	1.0 kHz / 0.3 Vrms / 25°C				
Dissipation Factor (%)	6LR / 6LS / 6LT ≤ 3.0% 67S / 68S ≤ 0.8%				
Capacitance Tolerance	6LR ±10% ±20% -20 +50%	6LS ±10% ±20% -20 +50%	6LT ±10% ±20% -20 +50%	67S ±20% -20 +50%	68S -20 +50%
Insulation Resistance (IR)	@ 500V → ≥ 10 GΩ				
Dielectric Strength NOTE: Charging current limited to 50 mA	1.5 x V <sub>R</sub> + 500 (DC) Between leads and body insulation				
dV/dt test	up to 3.5 kV/μsec				
Operating Temperature Range (°C)	-40... +125°C				
Climatic Category	30 / 85 / 56 Epoxy Coated				
Max. Temp. rise on the external surface of the capacitor related to ambient	Measured at 20mm from the capacitor				T <sub>max.</sub> = T <sub>amb</sub> + 20°C

# Disc Ceramic Capacitors



## AC Switch Mode Epoxy Coated

### TEMPERATURE COEFFICIENT – TYPICAL CURVES



### CERTIFICATION BODY APPROVALS

	Standard	6LR		6LS		67S	
		Certificate Number	Rated Voltage	Certificate Number	Rated Voltage	Certificate Number	Rated Voltage
UL	UL 1414	E 147842	250 VAC	E 147842	250 VAC	E 147842	250 VAC

### APPROVED LOGOS



### CAPACITANCE VS. DISC DIAMETER

millimeters (inches)

Temp. Coefficient	Y5P			Y5U	Y5V					
Digits 1, 2, 3 of P.N.	6LR	6LS	6LT	67S	68S					
Rated Voltage (V <sub>R</sub> )	1000 VDC 130 VAC	2000 VDC 250 VAC	3000 VDC 380 VAC	2000 VDC 250 VAC	2000 VDC 250 VAC					
C <sub>R</sub> (pF)										
100	6.0 (0.236)	6.0 (0.236)	6.0 (0.236)	8.0 (0.315)	11.0 (0.433)					
120										
150										
180										
220										
270										
330	7.0 (0.276)	8.0 (0.315)	9.0 (0.354)	10.0 (0.394)	12.0 (0.472)					
390										
470										
560										
680										
820										
1000	8.0 (0.315)	10.0 (0.394)	12.0 (0.472)	14.0 (0.551)	16.0 (0.630)					
1200										
1500										
1800										
2200										
2700										
3300	14.0 (0.551)	16.0 (0.630)	19.0 (0.748)	22.0 (0.866)	27.0 (1.063)					
3900										
4700										
10000						16.0 (0.630)	19.0 (0.748)	22.0 (0.866)	27.0 (1.063)	33.0 (1.299)
12000										
15000										
18000										
22000										
27000										

# Disc Ceramic Capacitors



## Professional Ceramic Capacitors - Class I, II and III

### MIL-STD-202F

The professional ceramic disc capacitors were specially developed for applications in severe environmental conditions, high humidity, temperature, gas, vapor and solvents.

The capacitors are flame retardant epoxy coated, meeting UL 94-V0 flammability specifications. The capacitors are 100% screened on following electrical parameters: Capacitance, loss factor, test voltage. After the 100% test, the capacitors are audited on its electrical and mechanical parameters with the following AQL:

Electrical parameters: 0.065% level II

Mechanical parameters: 0.65% level II

The capacitors withstand the following reliability essays:

Terminal strength: method 211 – condition A

Resistance to solvents: method 215

Resistance to soldering heat: method 210 – condition B

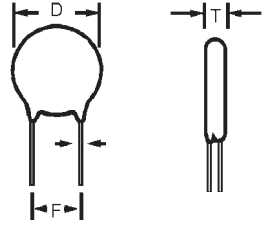
Solderability: method 208

Thermal shock: method 107 – condition A

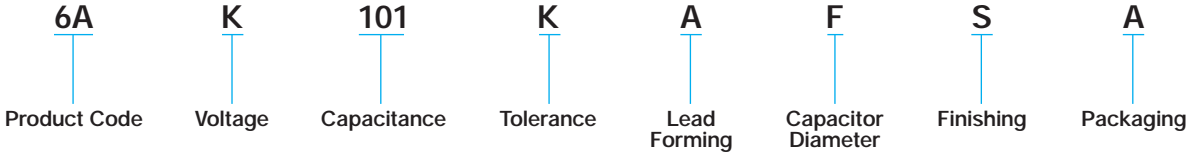
Humidity (steady state): method 103 – condition B

Life (at elevated ambient temperature): method 108 – condition D

Operating temperature and storage: -55... +125° C



### HOW TO ORDER





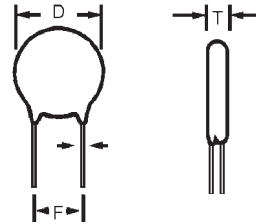
# Disc Ceramic Capacitors



## General Specifications - Class I and II Professional

### 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.



### 100V ... 500V PERFORMANCE CHARACTERISTICS CLASS I

Measured at	1.0 MHz @ 1.0 Vrms / 25°C
Dissipation Factor (%)	$C_R \leq 30 \text{ pF} \rightarrow \leq 1/C_R + 0.07$ $C_R > 30 \text{ pF} \rightarrow \leq 0.1\%$
Tolerance	$C_R < 10 \text{ pF} \rightarrow \pm 0.25 \text{ pF}, \pm 0.5 \text{ pF}$ $C_R \geq 10 \text{ pF} \rightarrow \pm 5\%, \pm 10\%$
Insulation Resistance (IR)	@ $V_R \rightarrow \geq 10 \text{ G}\Omega$

Dielectric Strength NOTE: Charging current limited to 50 mA	@ $V_R = 100\text{V} \rightarrow V_t = 250\text{V (DC)}$ @ $V_R = 500\text{V} \rightarrow V_t = 1250\text{V (DC)}$
Operating Temperature Range (°C)	-55... +125°C Epoxy Coated
Climatic Category	30 / 85 / 56

### DIMENSION TABLE - CLASS I LOW AND MEDIUM VOLTAGE PROFESSIONAL

#### 100V / 500V CLASS I EPOXY COATED - CAPACITANCE VS. DISC DIAMETER millimeters (inches)

Temp. Coefficient Digits 1, 2, 3 of P.N. Rated Voltage (V <sub>R</sub> ) C <sub>R</sub> (pF)	NP0		N750		N1500	
	6AK	6AQ	6GK	6GQ	6HK	6HQ
100 VDC			100 VDC	500 VDC	100 VDC	500 VDC
1.0	5.0 (0.197)	5.0 (0.197)	5.0 (0.197)	5.0 (0.197)	5.0 (0.197)	5.0 (0.197)
1.2						
1.5						
1.8						
2.2						
2.7						
3.3						
3.9						
4.7						
5.6						
6.8						
8.2						
10						
12						
15						
18						
22						
27						
33						
39						
47	7.0 (0.276)	7.0 (0.276)		6.0 (0.236)		
56				7.0 (0.276)		
68	8.0 (0.315)	8.0 (0.315)		8.0 (0.315)		6.0 (0.236)
82		9.0 (0.354)	7.0 (0.276)			7.0 (0.276)
100	9.0 (0.354)	11.0 (0.433)		8.0 (0.315)		
120			8.0 (0.315)	9.0 (0.354)	7.0 (0.276)	
150	11.0 (0.433)	12.0 (0.472)		11.0 (0.433)		8.0 (0.315)
180		14.0 (0.551)		14.0 (0.551)		9.0 (0.354)
220	12.0 (0.472)		10.0 (0.394)		8.0 (0.315)	9.0 (0.354)
270		16.0 (0.630)	11.0 (0.433)		9.0 (0.354)	11.0 (0.433)
330		19.0 (0.748)			10.0 (0.394)	

Diameter (φ) = 9th Part Number Digit

# Disc Ceramic Capacitors

## Dimension Table - Class II

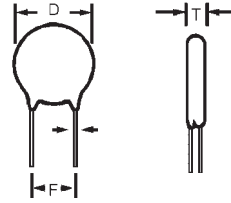
### Low and Medium Voltage Professional



#### DIELECTRIC - CLASS II

These ceramic capacitors have a high dielectric constant, making possible high capacitance values in reduced dimensions, however temperature coefficient and loss factor are greater than Class I.

Typical applications are decoupling and by pass.



#### 100V AND 500V PERFORMANCE CHARACTERISTICS CLASS II

Measured at	1.0 kHz @ 0.3 Vrms / 25°C		Dielectric Strength NOTE: Charging current limited to 50 mA	@ V <sub>R</sub> = 100V → Vt = 250V (DC) @ V <sub>R</sub> = 500V → Vt = 1250V (DC) Between leads and body insulation
Dissipation Factor (%)	X5E / X5F / X5P → ≤ 2.5% X5U / X5V / Z5V → ≤ 3.0%			
Capacitance Tolerance	X5E / X5F / X5P → ±10% X5U / X5V / Z5V → -20 +50% X5E / X5F / X5P / X5U → ±20%		Operating Temperature Range (°C)	-55... +125°C Epoxy Coated
Insulation Resistance (IR)	@ V <sub>R</sub> → ≥ 10 GΩ		Climatic Category	30 / 85 / 56

Note: Damp Heat Steady State: 90... 95% R.H. 40°C / 56 days. No voltage to be applied.

#### DIMENSION TABLE - CLASS II LOW AND MEDIUM VOLTAGE PROFESSIONAL 100V / 500V CLASS II EPOXY COATED millimeters (inches)

Temp. Coefficient Digits 1,2,3 of P.N.	X5E		X5F		X5P		X5U		X5V		Z5V
	6MK	6MQ	6NK	6NQ	6OK	6OQ	6SK	6SQ	6TK	6TQ	6UK
Rated Voltage (V <sub>R</sub> )	100 VDC	500 VDC	100 VDC	500 VDC	100 VDC	500 VDC	100 VDC	500 VDC	100 VDC	500 VDC	100 VDC
C <sub>R</sub> (pF)											
56											
68											
82											
100											
120											
150											
180											
220											
270											
330											
390											
470											
560											
680	6.0 (0.236)	6.0 (0.236)	5.0 (0.197)	5.0 (0.197)	5.0 (0.197)	5.0 (0.197)	5.0 (0.197)	5.0 (0.197)			
820											
1,000											
1,200	7.0 (0.276)	7.0 (0.276)	6.0 (0.236)	7.0 (0.276)	6.0 (0.236)	7.0 (0.276)	5.0 (0.197)	5.0 (0.197)			
1,500											
1,800											
2,200	9.0 (0.354)	9.0 (0.354)	7.0 (0.276)	9.0 (0.354)	7.0 (0.276)	9.0 (0.354)	6.0 (0.236)	7.0 (0.276)	5.0 (0.197)	5.0 (0.197)	
2,700	10.0 (0.394)	11.0 (0.433)	9.0 (0.354)		10.0 (0.394)		9.0 (0.354)		10.0 (0.394)	7.0 (0.276)	9.0 (0.354)
3,300	11.0 (0.433)	12.0 (0.472)	11.0 (0.433)	11.0 (0.433)	10.0 (0.394)	12.0 (0.472)	7.0 (0.276)	9.0 (0.354)	5.0 (0.197)		
3,900											
4,700											
5,600											
6,800											
8,200											
10,000											
12,000											
15,000											
22,000											
33,000											
47,000											
100,000											

Diameter (φ) = 9th Part Number Digit



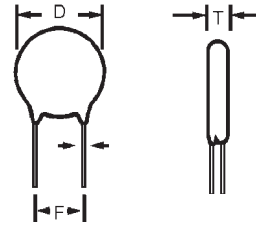
# Disc Ceramic Capacitors



## General Specifications - Class III Professional

### DIELECTRIC - CLASS III

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).



### PERFORMANCE CHARACTERISTICS CLASS III

Measured at	1.0 kHz / 0.1 Vrms / 25°C	
Dissipation Factor (%)	$C_R \leq 22 \text{ nF} \rightarrow Y5V, Y5U \leq 7.5\%$ $C_R > 22 \text{ nF} \rightarrow Y5V, Y5P \leq 5.0\%$	
Tolerance	$Y5P \rightarrow \pm 20\% / -20 + 50\%$ $Y5U \rightarrow \pm 20\% / -20 + 50\%$ $Y5V \rightarrow -20\% + 50\% / -20 + 80\%$	
Insulation Resistance (IR)	Y5P	$\geq 12 \text{ M}\Omega$
	Y5U	$4.7 \text{ nF} \dots 100 \text{ nF} \rightarrow \geq 10 \text{ M}\Omega$ $200 \text{ nF} \rightarrow \geq 1 \text{ M}\Omega$
	Y5V	$\geq 100 \text{ M}\Omega$
Dielectric Strength NOTE: Charging current limited to 50 mA	Between leads	$V_t = 1.25 V_R$
	Body insulation	$V_R = 25V \quad V_t = 100V \text{ (DC)}$ $V_R = 50V \quad V_t = 150V \text{ (DC)}$
Operating Temperature Range (°C)	-55... +125°C	
Climatic Category	30 / 085 / 56	

### EPOXY COATED – CAPACITANCE VS. DISC DIAMETER

millimeters (inches)

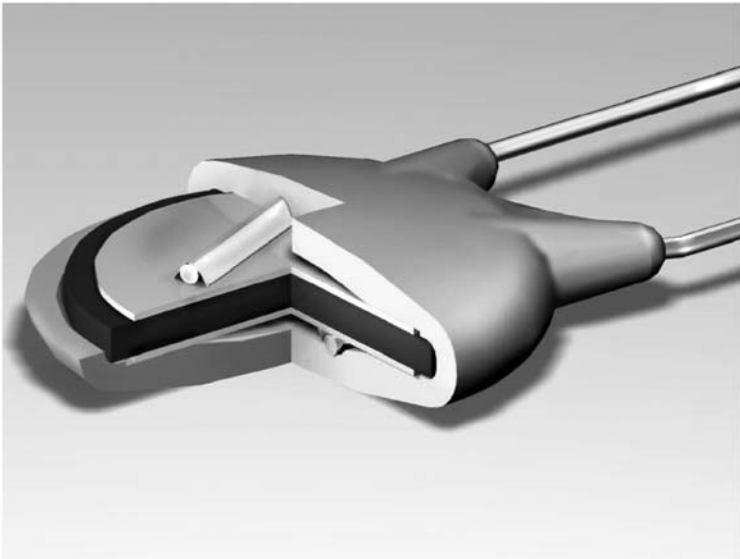
Class III	$\Delta C/C \text{ (max.)} \pm 12\%$ Range -30... +85°C		$\Delta C/C \text{ (max.)} +30 -65\%$ Range -30... +85°C		$\Delta C/C \text{ (max.)} +30 -65\%$ Range -30... +85°C	
	Y5P		Y5U		Y5V	
Temp. Coefficient	6WF		6YF		6ZH	
Digits 1,2,3 of P.N.	6WH		6YH		6ZH	
Rated Voltage ( $V_R$ )	25 VDC		25 VDC		50 VDC	
$C_R$ (pF)	5.0 (0.197)		5.0 (0.197)		5.0 (0.197)	
	6.0 (0.236)		6.0 (0.236)		6.0 (0.236)	
	7.0 (0.276)		7.0 (0.276)		7.0 (0.276)	
	8.0 (0.315)		8.0 (0.315)		8.0 (0.315)	
	9.0 (0.354)		9.0 (0.354)		9.0 (0.354)	
	11.0 (0.433)		11.0 (0.433)		11.0 (0.433)	
	10.0 (0.394)		10.0 (0.394)		10.0 (0.394)	
	10.0 (0.394)		10.0 (0.394)		10.0 (0.394)	
	10.0 (0.394)		10.0 (0.394)		10.0 (0.394)	
	10.0 (0.394)		10.0 (0.394)		10.0 (0.394)	

# Disc Ceramic Capacitors

## Construction and Marking



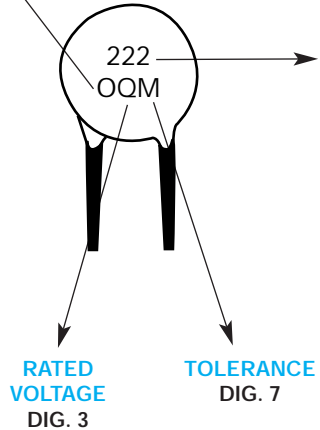
### CONSTRUCTION DETAILS



### MARKING DETAILS

TEMP COEFFICIENT / CLASS

DIG. 2



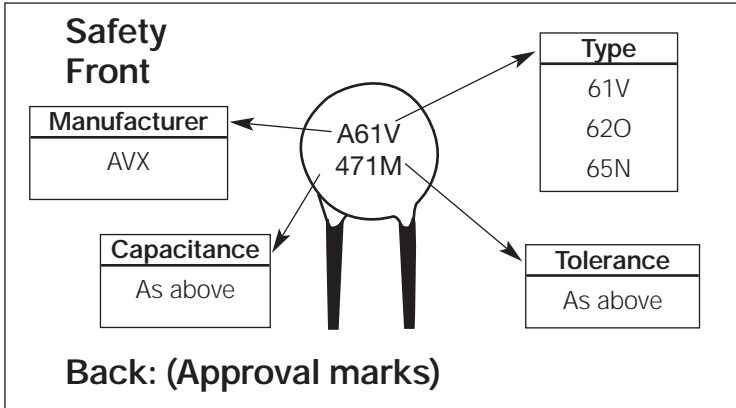
### CAPACITANCE

Expressed by three digits. The first and second digits are significant digits, and the third digit expresses the number of zeros which follow the two numbers. If there is a decimal point, it is expressed by the capital letter "R".

In this case all digits are significant.

Ex: 222 = 2200pF; 8R2 = 8.2pF.

Logo: Only in diam. ≥ 6mm



### IDENTIFICATION AND TRACEABILITY

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

(H) Lot: F500626130X024 — Lot Number

(Q) Qty: 2000 — Quantity of parts per packaging

(2W) TPC-PN: 50Q102KOCAM — Product Part Number

7A330102 — Spec Number

RoHS Compliant

Pb e3

260°C

### 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
	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 alternative package, upon request.

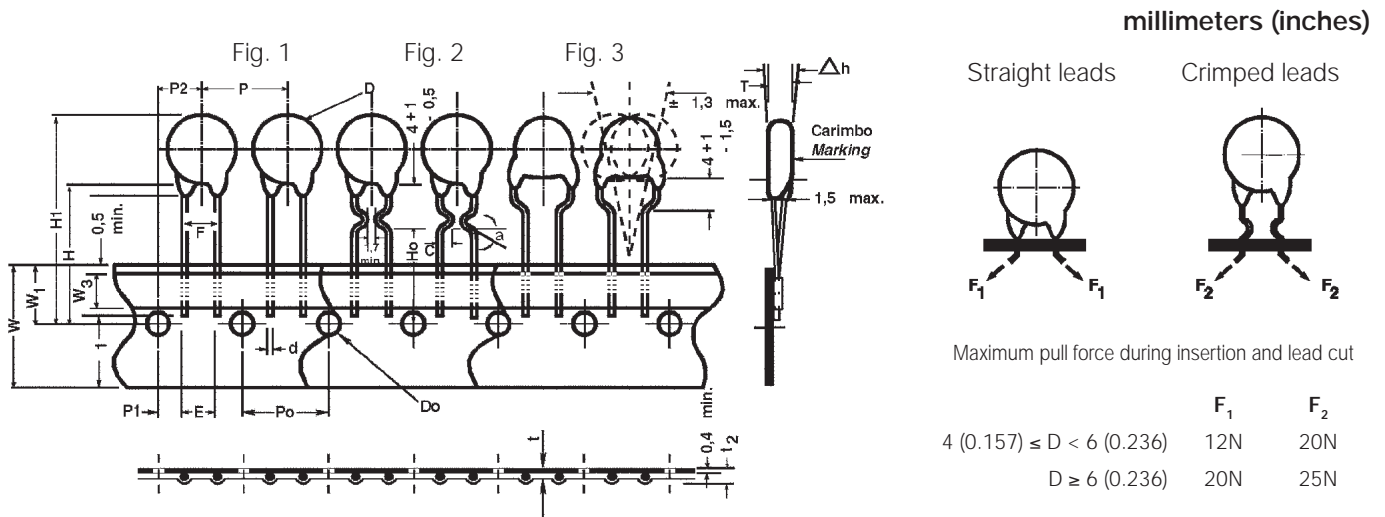
# Disc Ceramic Capacitors



## Tape and Reel Specifications

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

Both types can be shipped on reels or ammpack.  
The standard packaging is 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 L L L FIGURE 1 FIGURE 2 FIGURE 3 FIGURE 4	J L L L FIGURE 1 FIGURE 2 FIGURE 3 FIGURE 4
Amp-pack 	I M M M FIGURE 1 FIGURE 2 FIGURE 3 FIGURE 4	K M M M FIGURE 1 FIGURE 2 FIGURE 3 FIGURE 4

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

Figure 3: Outside Crimp 1000V



# Disc Ceramic Capacitors

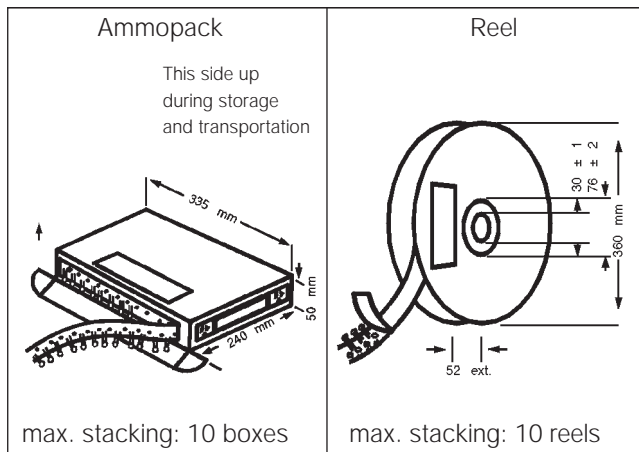


## Tape and Reel Specifications

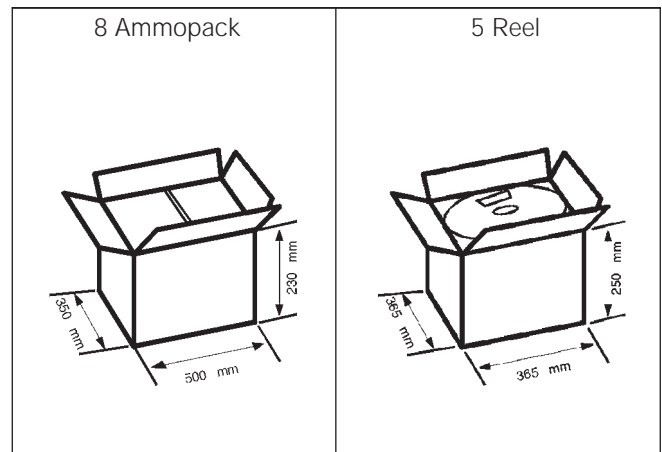
		millimeters (inches)		
Description of Symbols		Straight Leads		Crimped
		Figure 1		Figure 2 & 3
		A (Avisert)	P (Panaset)	Avisert & Panaset
Crimp angle	$\infty$	—	—	20°...45°
Crimp length	C	—	—	1.7 (0.067) min.
Lead diameter	d	0.60 ± 0.1 (0.024 ± 0.004)		
Disc diameter	D	11 (0.433) max.		
Lead hole diameter	Do	4.0 ± 0.2 (0.157 ± 0.008)		
Disc thickness	T	See Catalog		
Lead spacing	F	5.0 <sup>+0.6</sup> / <sub>-0.2</sub> (0.197 <sup>+0.024</sup> / <sub>-0.008</sub> )		
Component alignment, front-rear	$\Delta h$	0 ± 1 (0.000 ± 0.039)		
Height of component from tape center	H	19.5 ± 0.5 (0.768 ± 0.020)	16.5 ± 0.5 - 0 (0.650 ± 0.020 - 0)	—
Height from tape center to crimp	Ho	—	—	16 + 0.5 (0.630 + 0.020)
Component height	H1	32.25 (1.270) max.	>23.5 (>0.925) <32.25 (<1.270)	32.25 (1.270) max.
Distance from component leads to tape bottom	$\ell_1$	12 (0.472) max.		
Tape width	W	18 <sup>+1</sup> / <sub>-0.5</sub> (0.709 <sup>+0.039</sup> / <sub>-0.020</sub> )		
Bonding tape width	W <sub>3</sub>	5.5 (0.217) min.		
Feed hole position	W <sub>1</sub>	9.0 ± 0.5 (0.354 ± 0.020)		
Pitch between discs	P	12.7 ± 1 (0.500 ± 0.039)		
Feed hole pitch	Po	12.7 ± 0.3 (0.500 ± 0.012)		
Hole center to lead	P1	3.85 ± 0.7 (0.152 ± 0.028)		
Feed hole center to component center	P2	6.35 ± 1 (0.250 ± 0.039)		
Tape + bonding tape thickness	t	0.7 ± 0.2 (0.028 ± 0.008)		
Total tape thickness, including lead	t <sub>2</sub>	1.5 (0.059) max.		

\*Also available P = 25.4 (1.00)

### PACKAGING



### SHIPPING CONTAINER



# Disc Ceramic Capacitors

## Normalized Series and Associated Values

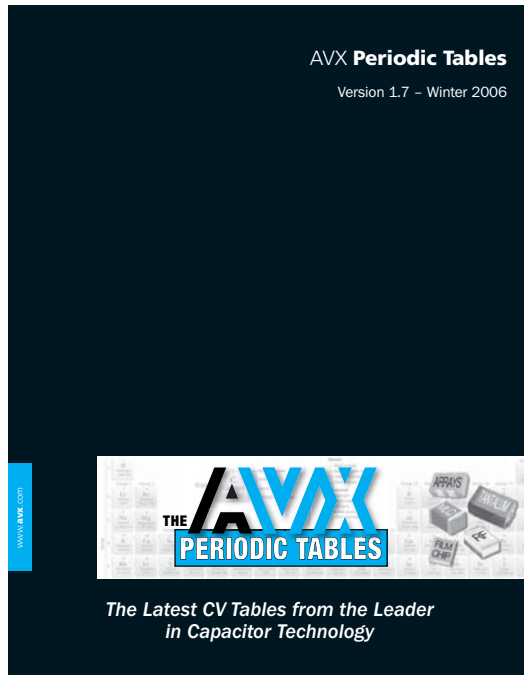


E 6 ±20%	E 12 ±10%	E 24 ±5%	E 48 ±2%	E 96 ±1%		
100	100	100	100	100		
			102	102		
			105	105		
		110	110	110	110	
				113	113	
				115	115	
			120	120	121	121
					124	124
					127	127
	150	150	150	130	130	
				133	133	
				137	137	
			160	160	140	140
					143	143
					147	147
		180	180	180	154	154
					158	158
					162	162
200	200			169	169	
				174	174	
				178	178	
220	220		220	187	187	
				191	191	
				196	196	
		270	270	200	200	
				205	205	
				210	210	
	300		300	215	215	
				221	221	
				226	226	
		309	309	232	232	
				237	237	
				243	243	
301	301		249	249		
			255	255		
			261	261		
309	309	309	267	267		
			274	274		
			280	280		
	309	309	309	287	287	
				294	294	
				301	301	
309	309	309	301	301		
			309	309		
			309	309		

E 6 ±20%	E 12 ±10%	E 24 ±5%	E 48 ±2%	E 96 ±1%			
330	330	330	316	316			
			324	324			
			332	332			
		360	360	360	340	340	
					348	348	
					357	357	
			470	470	470	365	365
						374	374
						383	383
	510	510			392	392	
					402	402	
					412	412	
	560	560		560	422	422	
					432	432	
					442	442	
			620	620	453	453	
					464	464	
					475	475	
680		680	680	487	487		
				499	499		
				511	511		
	820		820	820	523	523	
					536	536	
					549	549	
		910	910	910	562	562	
					576	576	
					590	590	
	976		976	976	604	604	
					619	619	
					634	634	
976		976	976	649	649		
				665	665		
				681	681		
976	976	976	698	698			
			715	715			
			732	732			
	976	976	976	750	750		
				768	768		
				787	787		
976		976	976	806	806		
				825	825		
				845	845		
976	976	976	866	866			
			887	887			
			909	909			
976	976	976	909	909			
			931	931			
			953	953			
976	976	976	953	953			
			976	976			
			976	976			







## MAJOR DIELECTRICS HEADINGS INCLUDE:

- Ceramic Capacitors
- Advanced Ceramic Capacitors
- Low Inductance Capacitors
- Tantalum Surface Mount
- OxiCap® Surface Mount Niobium Oxide
- RF / Microwave Surface Mount
- Film Chip Capacitors
- Leaded Capacitors MLC and Mini Resistors
- Leaded Capacitors - Tantalum
- Leaded Capacitors - Film
- Supercapacitors

This quick reference guide provides the very latest capacitor capability charts for a broad range of dielectrics available from AVX Corporation.

As a market leader in capacitor technology, AVX Corporation continues to develop new materials and process technology to expand our product portfolio. This document is intended to assist engineers in achieving the best possible design solution. Selection of the most appropriate capacitor technology, case size and other parametric options can help maximize system performance and cost-effectiveness.

**Contact your local sales office  
to obtain a copy of this catalog  
or e-mail us at [lit@avxus.com](mailto:lit@avxus.com)**

## SOLUTIONS ACROSS THE BOARD

### Capacitors

Advanced Power Film  
Ceramic  
Disc  
Film  
Glass  
High Voltage  
Leaded / Through Hole  
Low ESR  
Low Inductance  
Military / Aerospace  
MLCC Array  
MOS / MIS  
Niobium Oxide\* (OxiCap®)  
RF / Microwave  
    (Power, Hi Q, Thin-Film)  
Single Layer (SLC)  
SMPS (Power Supply)  
Stacked Ceramic  
Supercapacitor (BestCap™)  
Tantalum  
Tantalum Polymer  
Trimmer

### Circuit Protection

Fuses (Thin-Film)  
MLV (TransGuard™)  
MLV Array (MultiGuard™)  
NTC Thermistors  
Transient Voltage Suppressors  
Zinc Oxide Varistors

### Filters

EMI (Bolt-In and SMD)  
EMI / TVS Filter  
Feedthrough  
High Current Feedthrough  
Low Pass (Thin-Film)  
SAW

### RF / Microwave

Capacitors  
Couplers  
Inductors  
PMC Custom Filters  
Modules  
Timing Devices  
Passive Micro Components (PMC)

### Integrated Passives

IDC (Low Inductance Array)  
Passive Thick Film Array  
Passive Micro Components (PMC)

### Module Devices

Antenna Switch  
Bluetooth  
LTCC  
GPS  
RX Module  
WLAN Module

### Piezo

Acoustic Devices  
Actuators

### Resistive Devices

Arrays  
Low Resistance  
Mini Axial  
Thin-Film

### Timing Devices

Ceramic Resonator  
Clock Oscillator  
Crystal Applied Product  
MHz Crystal  
SAW Resonator  
TCXO

### Connectors

2mm Hard Metric  
Automotive – Custom  
Battery  
Board to Board  
    1 piece Compression  
    2 piece Microleaf  
Card Edge  
DIN41612  
FFC / FPC  
IDC  
Memory Connectors  
    PCMCIA Kits  
    Compact Flash  
    SO-DIMM  
    SIMM / RUIIM  
    SDIO / SD  
Military  
PCI Express  
Varicon Rack and Panel

For more information please visit  
our website at  
<http://www.avx.com>

NOTICE: Specifications are subject to change without notice. Contact your nearest AVX Sales Office for the latest specifications. All statements, information and data given herein are believed to be accurate and reliable, but are presented without guarantee, warranty, or responsibility of any kind, expressed or implied. Statements or suggestions concerning possible use of our products are made without representation or warranty that any such use is free of patent infringement and are not recommendations to infringe any patent. The user should not assume that all safety measures are indicated or that other measures may not be required. Specifications are typical and may not apply to all applications.

© AVX Corporation

## AMERICAS

AVX Myrtle Beach, SC  
Corporate Offices  
Tel: 843-448-9411  
FAX: 843-448-1943

AVX Northwest, WA  
Tel: 360-699-8746  
FAX: 360-699-8751

AVX North Central, IN  
Tel: 317-848-7153  
FAX: 317-844-9314

AVX Midwest, MN  
Tel: 952-974-9155  
FAX: 952-974-9179

AVX Mid/Pacific, CA  
Tel: 510-661-4100  
FAX: 510-661-4101

AVX Northeast, MA  
Tel: 617-479-0345  
FAX: 843-916-7614

AVX Southwest, AZ  
Tel: 602-678-0384  
FAX: 602-678-0385

AVX South Central, TX  
Tel: 214-566-2859  
FAX: 972-461-0575

AVX Southeast, GA  
Tel: 404-608-8151  
FAX: 770-972-0766

AVX Canada  
Tel: 905-238-3151  
FAX: 905-238-0319

AVX South America  
Tel: ++55-11-2193-7200  
FAX: ++55-11-2193-7210

## EUROPE

AVX Limited, England  
European Headquarters  
Tel: ++44 (0) 1252-770000  
FAX: ++44 (0) 1252-770001

AVX/ELCO, England  
Tel: ++44 (0) 1638-675000  
FAX: ++44 (0) 1638-675002

AVX S.A., France  
Tel: ++33 (1) 69-18-46-00  
FAX: ++33 (1) 69-28-73-87

AVX GmbH, Germany  
Tel: ++49 (0) 8131-9004-0  
FAX: ++49 (0) 8131-9004-44

AVX srl, Italy  
Tel: ++390 (0)2 614-571  
FAX: ++390 (0)2 614-2576

AVX Czech Republic  
Tel: ++420 57 57 57 521  
FAX: ++420 57 57 57 109

## ASIA-PACIFIC

AVX/Kyocera, Singapore  
Asia-Pacific Headquarters  
Tel: (65) 6286-7555  
FAX: (65) 6488-9880

AVX/Kyocera, Hong Kong  
Tel: (852) 2-363-3303  
FAX: (852) 2-765-8185

AVX/Kyocera, Korea  
Tel: (82) 2-785-6504  
FAX: (82) 2-784-5411

AVX/Kyocera, Taiwan  
Tel: (886) 2-2698-8778  
FAX: (886) 2-2698-8777

AVX/Kyocera, Malaysia  
Tel: (60) 4-228-1190  
FAX: (60) 4-228-1196

Elco, Japan  
Tel: 045-943-2906/7  
FAX: 045-943-2910

Kyocera, Japan - AVX  
Tel: (81) 75-604-3426  
FAX: (81) 75-604-3425

Kyocera, Japan - KDP  
Tel: (81) 75-604-3424  
FAX: (81) 75-604-3425

AVX/Kyocera, Shanghai, China  
Tel: 86-21 6341 0300  
FAX: 86-21 6341 0330

AVX/Kyocera, Beijing, China  
Tel: 86-10 8458 3385  
Fax: 86-10 8458 3382

## ASIA-KED

KED, Hong Kong  
Tel: (852) 2305 1080  
FAX: (852) 2305 1405

KED, Shanghai  
Tel: (86) 21 6859 9898  
FAX: (86) 21 5887 2542

KED, Beijing  
Tel: (86) 10 5869 4655  
FAX: (86) 10 5869 4677

KED, South Korea  
Tel: (82) 2 783 3288  
FAX: (82) 2 783 3207

KED, Taiwan  
Tel: (886) 2 2950 0268  
FAX: (886) 2 2950 0520

KED, Singapore  
Tel: (65) 6255 3122  
FAX: (65) 6255 5092

Contact:

