

# High Temperature High Voltage Ceramic Capacitors

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F-3106G 3/10

The Capacitance Company  
**KEMET**  
CHARGED.™

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**HIGH TEMPERATURE CERAMIC CAPACITORS**

HT/HP - Standard Series - (+200°C) Ceramic Capacitors C0G (NP0), X7R Dielectric .....7-9

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# High Temperature, High Voltage Performance Characteristics

## GENERAL SPECIFICATIONS

### Working Voltage:

C0G	50, 100, 200, 500, 1k, 2k, 3k, 4k, 5k, 7.5k, 10k, 15k, 20k
X7R	50, 100, 200, 500, 1k, 2k, 3k, 4k, 5k, 7.5k, 10k, 15k, 20k, 30k, 40k, 50k
X5U	3k, 4k, 5k, 7.5k, 10k, 15k, 20k

### Temperature Characteristics:

C0G	0 + 30 PPM / °C from -55°C to +125°C (1)
X7R	+15% from -55°C to +125°C
X5U	+22%, -56% from -55°C to +85°C

### Capacitance Tolerance:

C0G	+0.5pF, +1%, +2%, +5%, +10%
X7R	±5%, ±10%, ±20%, +80% / -20%, +100% / -0%
X5U	±5%, ±10%, ±20%, +80% / -20%, +100% / -0%

### Construction:

Epoxy encapsulated - meets flame test requirements of UL Standard 94V-0.  
High-temperature solder - meets EIA RS-198, Method 302, Condition B (260°C for 10 seconds)

### Termination Material:

Check individual Series: Part Number and Ordering Information for Termination Materials offered in each series.

### Solderability:

MIL-STD 202, Method 208  
(Test Method: ANSI/J-STD-002)  
Test A for through-hole mount and surface mount leaded.  
Test B for surface mount leadless components.

### Terminal Strength:

MIL-STD 202, Method 208, Condition A (2.3kg or 5 lbs)

### Resistance to Solvents:

MIL-STD 202, Method 215

### Resistance to Soldering Heat:

MIL-STD 202, Method 210, Test Condition C

## ELECTRICAL

### Capacitance @ 25°C:

Within specified tolerance and following test conditions per MIL-STD 202, Method 305.  
C0G, X7R & X5U  
> 100pF with 1.0 vrms @ 1 kHz with 1.0 vrms  
< 100pF with 1.0 vrms @ 1 MHz with 1.0 vrms

### Dissipation Factor @ 25°C:

Same test conditions as capacitance.  
C0G - 0.15% maximum  
X7R - 2.5% maximum  
X5U - 2.5% maximum

### Insulation Resistance @25°C:

MIL-STD 202, Method 302  
C0G & X7R:  
100 gigohm or 1 gigohm x uF, whichever is less.  
<500V test @ rated voltage, >1kV test @ 500V.  
X5U:  
10 gigohm or 100 megohm x uF, whichever is less.  
<500V test @ rated voltage, >1kV test @ 500V.

### Dielectric Withstanding Voltage:

MIL-STD 202, Method 301  
<200V test @ 250% of rated voltage  
500V to 1250V test @ 150% of rated voltage  
>1251V test @ 120% of rated voltage

## ENVIRONMENTAL

### Vibration:

MIL-STD 202, Method 204, Condition D (20g)

### Shock:

MIL-STD 202, Method 213, Condition I (100g)

### Life Test:

MIL-STD 202, Method 108

### <200V

C0G - 200% rated voltage @ +125°C  
X7R - 200% rated voltage @ +125°C

### >500V

C0G - rated voltage @ +125°C  
X7R - rated voltage @ +125°C  
X5U - rated voltage @ +85°C

### Post Test Limits @ 25°C are:

#### Capacitance Change:

C0G (< 200V) - +3% or 0.25pF, whichever is greater.  
C0G (> 500V) - +3% or 0.50pF, whichever is greater.  
X7R - +20% of initial value (2)

#### Dissipation Factor:

C0G - 0.25% maximum  
X7R & X5U - 3.0% maximum

#### Insulation Resistance:

C0G & X7R:  
100 gigohm or 1 gigohm x uF, whichever is less.  
<500V test @ rated voltage, >1kV test @ 500V.

#### X5U:

10 gigohm or 100 megohm x uF, whichever is less.  
<500V test @ rated voltage, >1kV test @ 500V.

### Moisture Resistance:

MIL-STD 202, Method 106

Post Test Limits @ 25°C are:

#### Capacitance Change:

C0G (< 200V) - +3% or 0.25pF, whichever is greater.  
C0G (> 500V) - +3% or 0.50pF, whichever is greater.  
X7R - +20% of initial value (2)

#### Dissipation Factor:

C0G - 0.25% maximum  
X7R & X5U - 3.0% maximum

#### Insulation Resistance:

C0G & X7R:  
100 gigohm or 1 gigohm x uF, whichever is less.  
<500V test @ rated voltage, >1kV test @ 500V.

#### X5U:

10 gigohm or 100 megohm x uF, whichever is less.  
<500V test @ rated voltage, >1kV test @ 500V.

### Thermal Shock:

MIL-STD 202, Method 107, Condition A

C0G & X7R: -55°C to 125°C

X5U: -55°C to 85°C

- (1) +53 PPM -30 PPM/ °C from +25°C to -55°C, +60 PPM below 10pF.
- (2) X7R & X5U dielectrics exhibit aging characteristics; therefore, it is highly recommended that capacitors be deaged for 2 hours at 150°C and stabilized at room temperature for 48 hours before capacitance measurements are made.

	HIGH TEMPERATURE	HIGH VOLTAGE
<b>MILITARY &amp; AEROSPACE</b>		
Avionics	X	X
Radar Systems	X	X
Telemetry, Data Tx/Rx		X
Control Systems	X	
<b>MEDICAL</b>		
.5 to 1.5 Tesla MR1 &		X
NM1 Tuning Coils		X
1 to 3 Tesla MR1 Gradient		X
Coils & Magnetic Rings		X
CT-Scanner		X
Medical MRI		X
X-Ray Generator	X	X
<b>SEMICONDUCTOR</b>		
RF Tuning Networks		X
RF Power Supplies		X
Semiconductor Manufacturing	X	
<b>SECURITY</b>		
Handheld Scanners		X
Intruder Detection Systems		X
Luggage Scanners		X
Metal/Explosive Detector		X
<b>OTHER</b>		
LCD Backlight Inverter		X
Electric Ballast for CFL	X	X
Electric Ballast for Fluorescent Lamp	X	X
Measurement Equipment	X	X
Microwave/Convection Ovens	X	X
<b>POWER SUPPLY</b>		
HV Power Supply	X	X
Power Station Equipment		X
Power Supply for Air Conditioner, Washing Machine		X
Inverter Power Supply-AC	X	
<b>TELECOM</b>		
Base Station Power amps		X
Broadcasting Equipment		X
<b>MODEM</b>		
DAA Modem		X
xDSL Modem		X
LAN, Router, HUB, Switches		X
RF Power Amplifiers		X
<b>INDUSTRIAL</b>		
Oil Rigging, Down Hole, Mining	X	X

# KEMET High Voltage Technical Summary

	ELECTRICAL			ENVIRONMENTAL	MECHANICAL
	Voltage Range	Capacitance Range	Dissipation Factor	Operating Temperature Range	Configuration
<b>HIGH VOLTAGE</b>					
Radial Conformally Coated					
Std	C0G/X7R: 500 to 10k VDC	C0G:12 pF - .330µF X7R: 220 pF - 5.6 µF	C0G: 0.15% max X7R: 2.5% max	C0G: -55°C to + 125°C X7R: -55°C to + 125°C	Radial
Mil-PRF-49467 Equivalent	C0G/X7R: 600 to 5k VDC	C0G: 12 pF - .68 µF X7R: 27 pF - .47 µF	C0G: 0.15% max X7R: 2.5% max	C0G/X7R: -55°C to + 125°C	Radial
Space Quality	C0G/X7R: 500 to 10k VDC	C0G/X7R: 560 pF - 2.20µF	C0G: 0.15% max X7R: 2.5% max	C0G/X7R: -55°C to + 125°C	Radial
Ceramic Surface Mount Chip					
Military	C0G/X7R: 500 to 5k VDC	C0G: 12 pF - .10 µF X7R: 270 pF -2.50 µF	C0G: 0.15% max X7R: 2.5% max	C0G/X7R: -55°C to + 125°C	Chip
Leaded Chips J or L lead	C0G/X7R: 500 to 10k VDC	C0G: 12 pF-.330 µF X7R: 220 pF-5.6 µF	C0G: 0.15% max X7R: 2.5% max	C0G/X7R: -55°C to + 125°C	Leaded Chip J or L Lead
Disc	C0G/X5U: 3k to 20k VDC, X7R:3k to 50k VDC	C0G: 1.2 pF-236 pF X7R: 10 p -7400 pF X5U: 80 pF-17300 pF	C0G: 0.15% max X7R: 2.5% max X5U: 2.5% max	C0G/X7R: -55°C to + 125°C X5U: -55°C to + 85°C	Disc
Disc Stack	C0G/X7R/X5U: 5k to 20k VDC	C0G: 1.2 pF-141 pF X7R: 37 pF-4400 pF X5U: 80 pF-10400 pF	C0G: 0.15% max X7R: 2.5% max X5U: 2.5% max	C0G/X7R: -55°C to + 125°C X5U: -55°C to + 85°C	Disc Stack

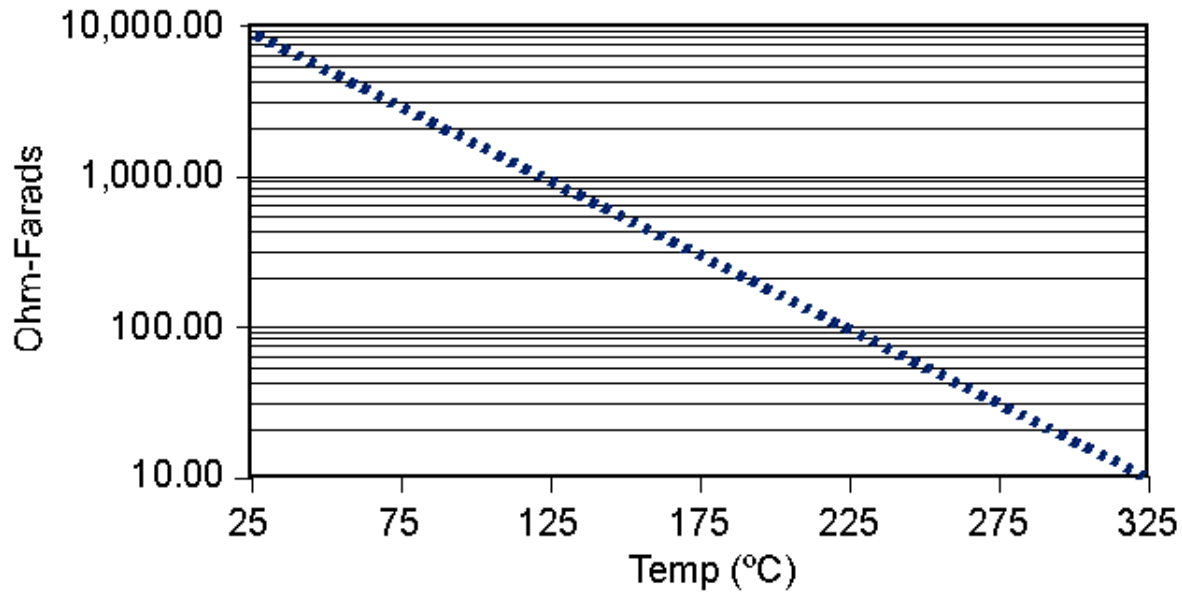
## HIGH TEMPERATURE

Hi Temp (HT/HP)	100 to 200 VDC	-C0G: 22 pF-.100 µF X7R:1000 pF-1.0µF	C0G 0.15% X7R Type 2.0% X7R 2.50%	-55°C to + 200°C	Axial/Radial
Hi Temp Hi Volt (HV)	500 to 4000 VDC	C0G: 390 pF-.015 µF X7R:1400 pF- .270 µF	C0G 0.15% X7R Type 2.0% X7R 2.50%	-55°C to + 200°C	Radial
Ceramic Cased Capacitor					
Std 125°C (SCR/SRR/SCA/SRA)	50 to 200 VDC	C0G: 1.0 pF- .12 µF X7R:100 pF- 6.8 µF	C0G 0.15% X7R 2.50%	-55°C to + 125°C	Axial/Radial
200°C (ACR/ARR/ACA/ARA)	50 to 100 VDC	C0G: 1.0 pF- .12 µF X7R:100 pF- 3.3 µF	C0G 0.15% X7R 2.50%	-55°C to + 200°C	Axial/Radial
260°C (TCR/TRR/TCA/TRA)	50 to 100 VDC	C0G: 1.0 pF- .12 µF X7R:100 pF- 3.3 µF	C0G 0.15% X7R 2.50%	-55°C to + 260°C	Axial/Radial
Hi Temp Hi Volt (VCR/VRR)	500 to 5000 VDC	C0G: 10 pF-.056 µF X7R:330 pF-1.2µF	C0G 0.15% X7R 2.50%	-55°C to + 200°C	Radial

**DIELECTRIC COMPARISONS**

Features	Ultra Stable	Semi-Stable High Voltage	Semi-Stable Hi-Temp	Temp/Volt Dependent
Dielectric Type	C0G (NP0)	X7R	X7R type	X5U
Temperature Coefficient	0 ±30ppm/°C	±15%	+15/-40%	+22-56%
Operating Temp. Range	-55 to +200°C	-55 to +125°C	-55 to +200°C	-55 to +125°C
Dissipation Factor	0.1% max.	2.5% max.	2.0% max.	2.5% max.
Aging Rate	None	-2.0% max/dec. hour	-2.0% max/dec. hour	-2.0% max/dec. hour
Voltage Range	25 to 20k VDC	50 to 50k VDC	25 to 4k VDC	Up to 20K VDC
Standard Tolerance	J, K, M	K, M, P, Z	K, M, P, Z	M, P, Z
Coefficient of Thermal Expansion @ 25°C	9 X 10-6 IN/IN °C	11 X 10-6 IN/IN °C	11 X 10-6 IN/IN °C	11 X 10-6 IN/IN °C

**TYPICAL INSULATION RESISTANCE VS. TEMP (°C)  
FOR C0G, NP0 & X7R DIELECTRICS**



# High Temperature (+200°C) Axial and Radial Ceramic Capacitors HT/HP Series

## FEATURES

The HT/HP Series is used in robust applications

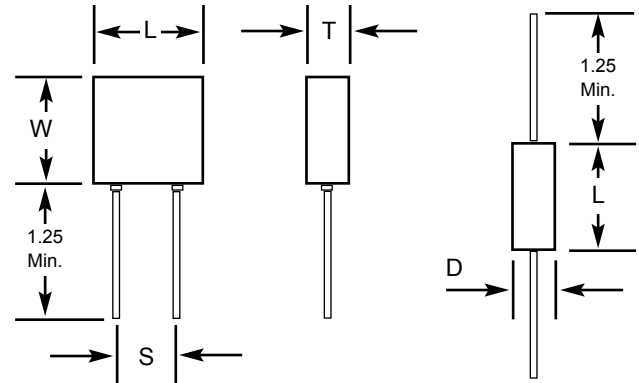
- Down Hole
- Industrial
- Harsh Environments

Where a Radial/Axial coated capacitor can withstand high temperatures (200°C).

### NOTE:

Other tolerances, higher capacitance values, voltages, or special package configurations are available upon request.

## CAPACITOR OUTLINE DRAWING



## DIMENSIONS

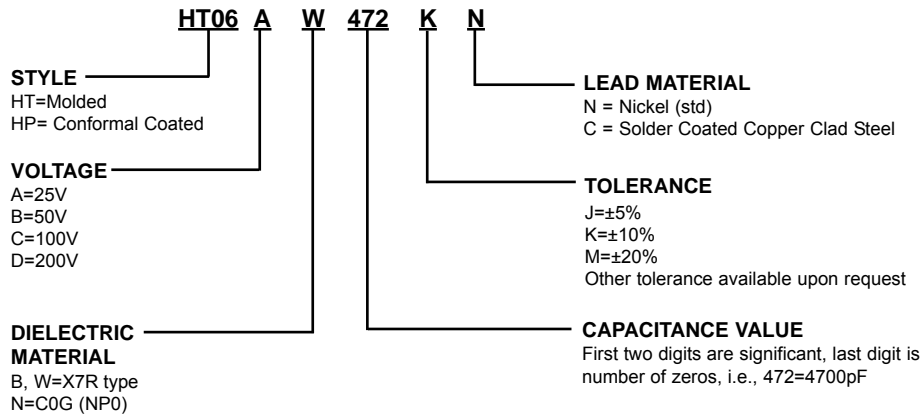
Molded (HT) and Conformal Coated (HP), Radial Lead Types

Style	Sizes in Inches (mm) max			Lead Spacing ±0.030 (S)
	Length (L)	Width (W)	Thickness (T)	
HT05	.200 (5.08)	.200 (5.08)	.100 (2.54)	.100 (2.54)
HT55	.200 (5.08)	.200 (5.08)	.100 (2.54)	.200 (5.08)
HT06	.300 (7.62)	.300 (7.62)	.150 (3.81)	.200 (5.08)
HT08	.500 (12.70)	.500 (12.70)	.250 (6.35)	.400 (10.16)
HT09	.700 (17.78)	.400 (10.16)	.200 (5.08)	.500 (12.70)

Tubular Case, Axial Lead Types

Style	Sizes in Inches (mm) max	
	Length (L)	Diameter (D)
HT11	.170 (4.32)	.100 (2.54)
HT13	.260 (6.60)	.135 (3.43)
HT14	.400 (10.16)	.155 (3.94)
HT15	.500 (12.70)	.200 (5.08)
HT16	.750 (19.05)	.375 (9.52)

## PART NUMBER AND ORDERING INFORMATION



**MARKING**  
(HT05, HT55, HT11)  
472K  
KEC

(All other sizes)  
HT06AW472K  
KEC  
Date Code

For CONFORMAL COATED types, change style number to HPXX. HP dimensions will be reduced slightly.

**COG & X7R DIELECTRIC**

COG RADIAL																		
STYLE		HT/HP 05			HT/HP 55			HT/HP 06			HT/HP 08			HT/HP 09				
Cap	Cap Code	50	100	200	50	100	200	50	100	200	50	100	200	50	100	200		
		L MAX	.200 (5.08)			.200 (5.08)			.300 (7.62)			.500 (12.70)			.700 (17.78)			
	W MAX	.200 (5.08)			.200 (5.08)			.300 (7.62)			.500 (12.70)			.400 (10.16)				
	T MAX	.100 (2.54)			.100 (2.54)			.150 (3.81)			.250 (6.35)			.200 (5.08)				
	S± .030	.100 (2.54)			.200 (5.08)			.200 (5.08)			.400 (10.16)			.500 (12.70)				
	Lead Dia.	.025 (.635)			.025 (.635)			.025 (.635)			.025 (.635)			.025 (.635)				
	Cap Code	WVDC			WVDC			WVDC			WVDC			WVDC				
22pF	220																	
27	270																	
33	330																	
39	390																	
47	470																	
56	560																	
68	680																	
82	820																	
100	101																	
120	121																	
150	151																	
180	181																	
220	221																	
270	271																	
330	331																	
390	391																	
470	471																	
560	561																	
680	681																	
820	821																	
1000	102																	
1200	122																	
1500	152																	
1800	182																	
2200	222																	
2700	272																	
3300	332																	
3900	392																	
4700	472																	
5600	562																	
6800	682																	
8200	822																	
.010 uF	103																	
0.012	123																	
0.015	153																	
0.018	183																	
0.022	223																	
0.027	273																	
0.033	333																	
0.039	393																	
0.047	473																	
0.056	563																	
0.068	683																	
0.082	823																	
0.10	104																	
0.12	124																	

X7R RADIAL																		
STYLE		HT/HP 05			HT/HP 55			HT/HP 06			HT/HP 08			HT/HP 09				
Cap	Cap Code	50	100	200	50	100	200	50	100	200	50	100	200	50	100	200		
		L MAX	.200 (5.08)			.200 (5.08)			.300 (7.62)			.500 (12.70)			.700 (17.78)			
	W MAX	.200 (5.08)			.200 (5.08)			.300 (7.62)			.500 (12.70)			.400 (10.16)				
	T MAX	.100 (2.54)			.100 (2.54)			.150 (3.81)			.250 (6.35)			.200 (5.08)				
	S± .030	.100 (2.54)			.200 (5.08)			.200 (5.08)			.400 (10.16)			.500 (12.70)				
	Lead Dia.	.025 (.635)			.025 (.635)			.025 (.635)			.025 (.635)			.025 (.635)				
	Cap Code	WVDC			WVDC			WVDC			WVDC			WVDC				
1000pF	102																	
1200	122																	
1500	152																	
1800	182																	
2200	222																	
2700	272																	
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0.10	104																	
0.12	124																	
0.15	154																	
0.18	184																	
0.22	224																	
0.27	274																	
0.33	334																	
0.39	394																	
0.47	474																	
0.56	564																	
0.68	684																	
0.82	824																	
1.0	105																	
1.2	125																	
1.5	155																	
1.8	185																	
2.2	225																	
2.7	275																	
3.3	335																	
3.9	395																	
4.7	475																	
5.6	565																	



# High Temperature (+200°C) Axial and Radial Ceramic Capacitors HT/HP Series

## COG & X7R DIELECTRIC

COG AXIAL																
STYLE		HT/HP 11			HT/HP 13			HT/HP 14			HT/HP 15			HT/HP 16		
Cap	L MAX	.170 (4.32)			.260 (6.60)			.400 (10.16)			.500 (12.70)			.750 (19.05)		
	D MAX	.100 (2.54)			.135 (3.43)			.155 (3.94)			.200 (5.08)			.375 (9.52)		
	Lead Dia.	.025 (.635)			.025 (.635)			.025 (.635)			.025 (.635)			.025 (.635)		
	Cap Code	WVDC			WVDC			WVDC			WVDC			WVDC		
		50	100	200	50	100	200	50	100	200	50	100	200	50	100	200
5.6pF	569															
6.8	689															
8.2	829															
10	100															
12	120															
15	150															
18	180															
22	220															
27	270															
33	330															
39	390															
47	470															
56	560															
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82	820															
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0.022	223															
0.027	273															
0.033	333															
0.039	393															
0.047	473															
0.056	563															
0.068	683															
0.082	823															
0.10	104															

X7R AXIAL																
STYLE		HT/HP 11			HT/HP 13			HT/HP 14			HT/HP 15			HT/HP 16		
Cap	L MAX	.170 (4.32)			.260 (6.60)			.400 (10.16)			.500 (12.70)			.750 (19.05)		
	D MAX	.100 (2.54)			.135 (3.43)			.155 (3.94)			.200 (5.08)			.375 (9.52)		
	Lead Dia.	.025 (.635)			.025 (.635)			.025 (.635)			.025 (.635)			.025 (.635)		
	Cap Code	WVDC			WVDC			WVDC			WVDC			WVDC		
		50	100	200	50	100	200	50	100	200	50	100	200	50	100	200
100pF	101															
120	121															
150	151															
180	181															
220	221															
270	271															
330	331															
390	391															
470	471															
560	561															
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820	821															
1000	102															
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2200	222															
2700	272															
3300	332															
3900	392															
4700	472															
5600	562															
6800	682															
8200	822															
.010uF	103															
0.012	123															
0.015	153															
0.018	183															
0.022	223															
0.027	273															
0.033	333															
0.039	393															
0.047	473															
0.056	563															
0.068	683															
0.082	823															
0.1	104															
0.12	124															
0.15	154															
0.18	184															
0.22	224															
0.27	274															
0.33	334															
0.39	394															
0.47	474															
0.56	564															
0.68	684															
0.82	824															
1.0	105															
1.2	125															
1.5	155															
1.8	185															
2.2	225															
2.7	275															

### FEATURES

The HV series not only withstands high temperatures (200°C), but also offers high voltage (500-4000 VDC)

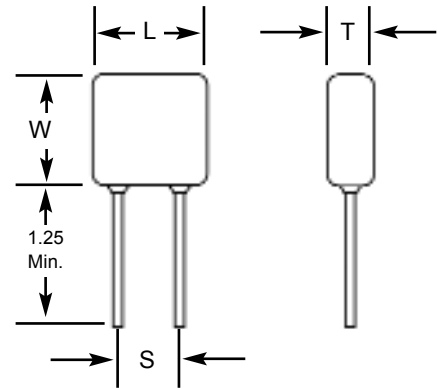
To be used in robust applications

- Down Hole
- Industrial
- Harsh Environments

**NOTE:**

Other tolerances, higher capacitance values, voltages, or special package configurations are available upon request.

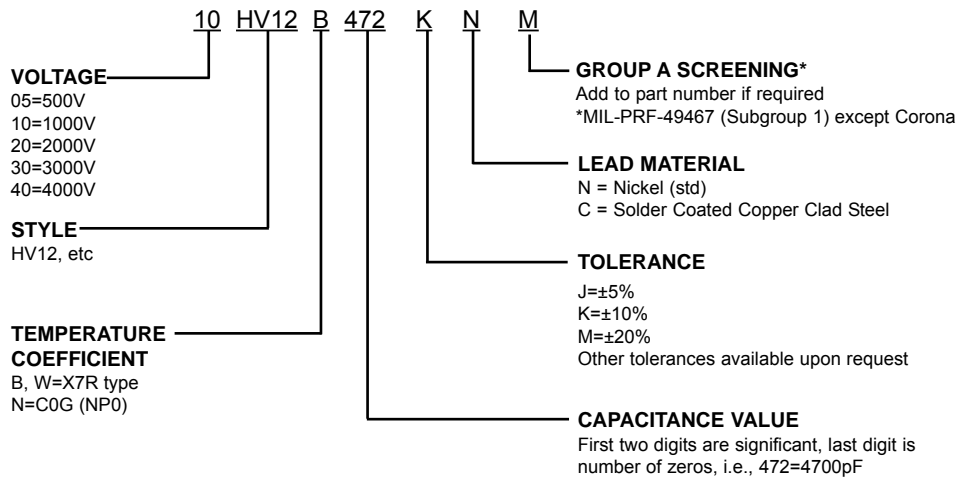
### CAPACITOR OUTLINE DRAWING



### DIMENSIONS

Style	Sizes in Inches (mm) max.			Lead Spacing ±0.030 (S)
	Length (L)	Width (W)	Thickness (T)	
HV10	.250 (6.35)	.220 (5.59)	.150 (3.81)	.170 (4.32)
HV11	.320 (8.13)	.300 (7.62)	.250 (6.35)	.200 (5.08)
HV12	.420 (10.67)	.400 (10.16)	.250 (6.35)	.300 (7.62)
HV13	.520 (13.21)	.500 (12.70)	.300 (7.62)	.400 (10.16)
HV14	.620 (15.75)	.500 (12.70)	.300 (7.62)	.500 (12.70)
HV15	.720 (18.29)	.700 (17.78)	.300 (7.62)	.600 (15.24)
HV16	.820 (20.83)	.700 (17.78)	.350 (8.89)	.700 (17.78)

### PART NUMBER AND ORDERING INFORMATION



**MARKING**

(HV10, HV11)  
472M  
KEC  
Date Code

(All other sizes)  
HV12B472M  
1kV  
KEC  
Date Code

# High Temperature (+200°C), High Voltage Radial Ceramic Capacitors

## HV Series

### COG DIELECTRIC

STYLE		HV10			HV11				HV12				HV13				HV14					HV15					HV16				
Cap	L MAX	.250 (6.35)			.320 (8.13)				.420 (10.67)				.520 (13.21)				.620 (15.75)					.720 (18.29)					.820 (20.83)				
	W MAX	.220 (5.59)			.300 (7.62)				.400 (10.16)				.500 (12.70)				.500 (12.70)					.700 (17.78)					.700 (17.78)				
	T MAX	.150 (3.81)			.250 (6.35)				.250 (6.35)				.300 (7.62)				.300 (7.62)					.300 (7.62)					.350 (8.89)				
	S ± .030	.170 (4.32)			.200 (5.08)				.300 (7.62)				.400 (10.16)				.500 (12.70)					.600 (15.24)					.700 (17.78)				
	Lead Dia. +0.004/-0.002	.025 (.635)			.025 (.635)				.025 (.635)				.025 (.635)				.025 (.635)					.025 (.635)					.025 (.635)				
	Cap Code	WVDC			WVDC				WVDC				WVDC				WVDC					WVDC					WVDC				
	500	1k	2k	500	1k	2k	3k	500	1k	2k	3k	500	1k	2k	3k	500	1k	2k	3k	4k	500	1k	2k	3k	4k	500	1k	2k	3k	4k	
12pF	120																														
15	150																														
18	180																														
22	220																														
27	270																														
33	330																														
39	390																														
47	470																														
56	560																														
68	680																														
82	820																														
100	101																														
120	121																														
150	151																														
180	181																														
220	221																														
270	271																														
330	331																														
390	391																														
470	471																														
560	561																														
680	681																														
820	821																														
1000	102																														
1200	122																														
1500	152																														
1800	182																														
2200	222																														
2700	272																														
3300	332																														
3900	392																														
4700	472																														
5600	562																														
6800	682																														
8200	822																														
0.01uF	103																														
0.012	123																														
0.015	153																														

X7R DIELECTRIC

STYLE		HV10			HV11			HV12			HV13				HV14				HV15				HV16						
Cap	L MAX	.250 (6.35)			.320 (8.13)			.420 (10.67)			.520 (13.21)				.620 (15.75)				.720 (18.29)				.820 (20.83)						
	W MAX	.220 (5.59)			.300 (7.62)			.400 (10.16)			.500 (12.70)				.500 (12.70)				.700 (17.78)				.700 (17.78)						
	T MAX	.150 (3.81)			.250 (6.35)			.250 (6.35)			.300 (7.62)				.300 (7.62)				.300 (7.62)				.350 (8.89)						
	S± .030	.170 (4.32)			.200 (5.08)			.300 (7.62)			.400 (10.16)				.500 (12.70)				.600 (15.24)				.700 (17.78)						
	Lead Dia. +0.004/-0.002	.025 (.635)			.025 (.635)			.025 (.635)			.025 (.635)				.025 (.635)				.025 (.635)				.025 (.635)						
	Cap Code	WVDC			WVDC			WVDC			WVDC				WVDC				WVDC				WVDC						
		500	1k	2k	500	1k	2k	500	1k	2k	500	1k	2k	3k	500	1k	2k	3k	4k	500	1k	2k	3k	4k	500	1k	2k	3k	4k
270pF	271																												
330	331																												
390	391																												
470	471																												
560	561																												
680	681																												
820	821																												
1000	102																												
1200	122																												
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8200	822																												
0.01uF	103																												
0.012	123																												
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0.22	224																												
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0.33	334																												
0.39	394																												
0.47	474																												

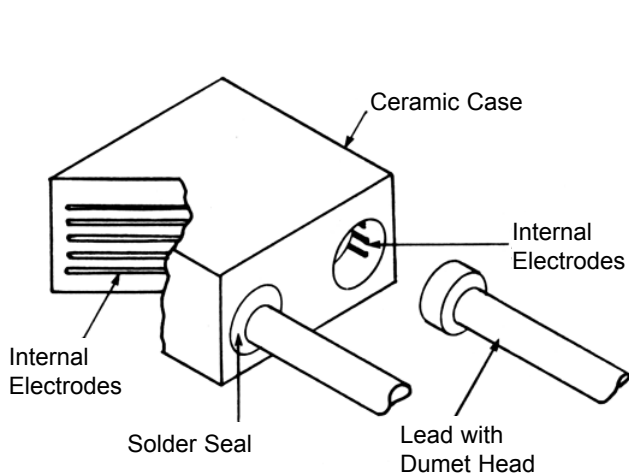
# High Temperature Ceramic Cased Capacitors C<sup>3</sup>

## C3 GENERAL INFORMATION

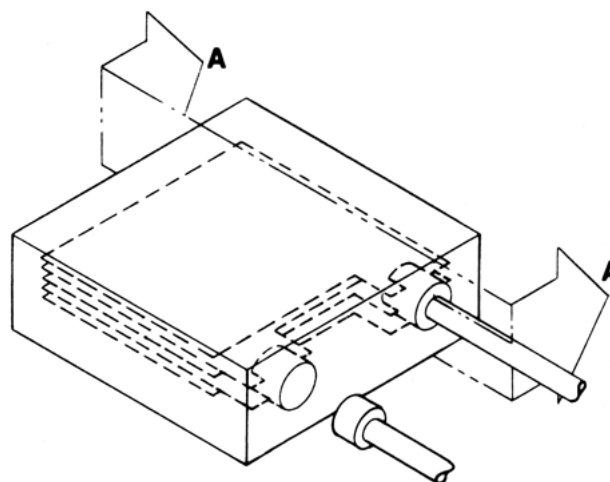
Monolithic ceramic capacitors are capable of withstanding and operating at temperatures up to +260°C when properly designed and manufactured for this application. A design has been developed which is ideal for operation at these high temperatures. This design is a Ceramic Cased Capacitor (C<sup>3</sup>) as described in PATENT #4,931,899.

The advantages of the C<sup>3</sup> construction at 125°C, 200°C and 260°C are:

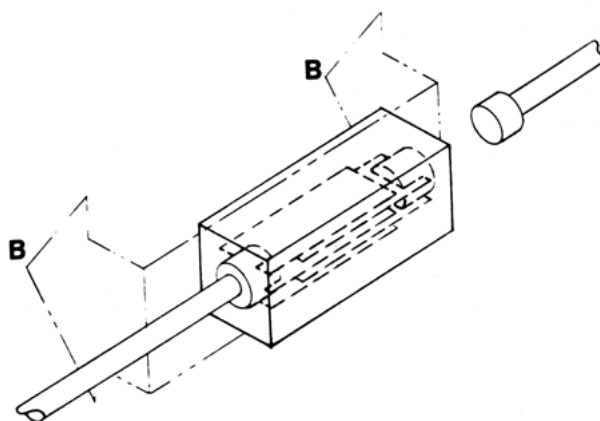
- Uniform coefficient of linear expansion eliminates chip cracking during thermal shock.
- No "pull-away" of epoxy potting from epoxy case at elevated temperatures.
- Resistant to moisture penetration.
- Superior volumetric efficiency



Radial C<sup>3</sup> - One Lead Removed



Radial C<sup>3</sup> - Capacitor Internal Construction



Axial C<sup>3</sup> - One Lead Removed

## COG

COG (NP0) capacitors which exhibit little change in capacitance with variations in temperature, are used in RF oscillators, precision timing circuits, wave filters and other circuits requiring a predictable linear temperature coefficient.

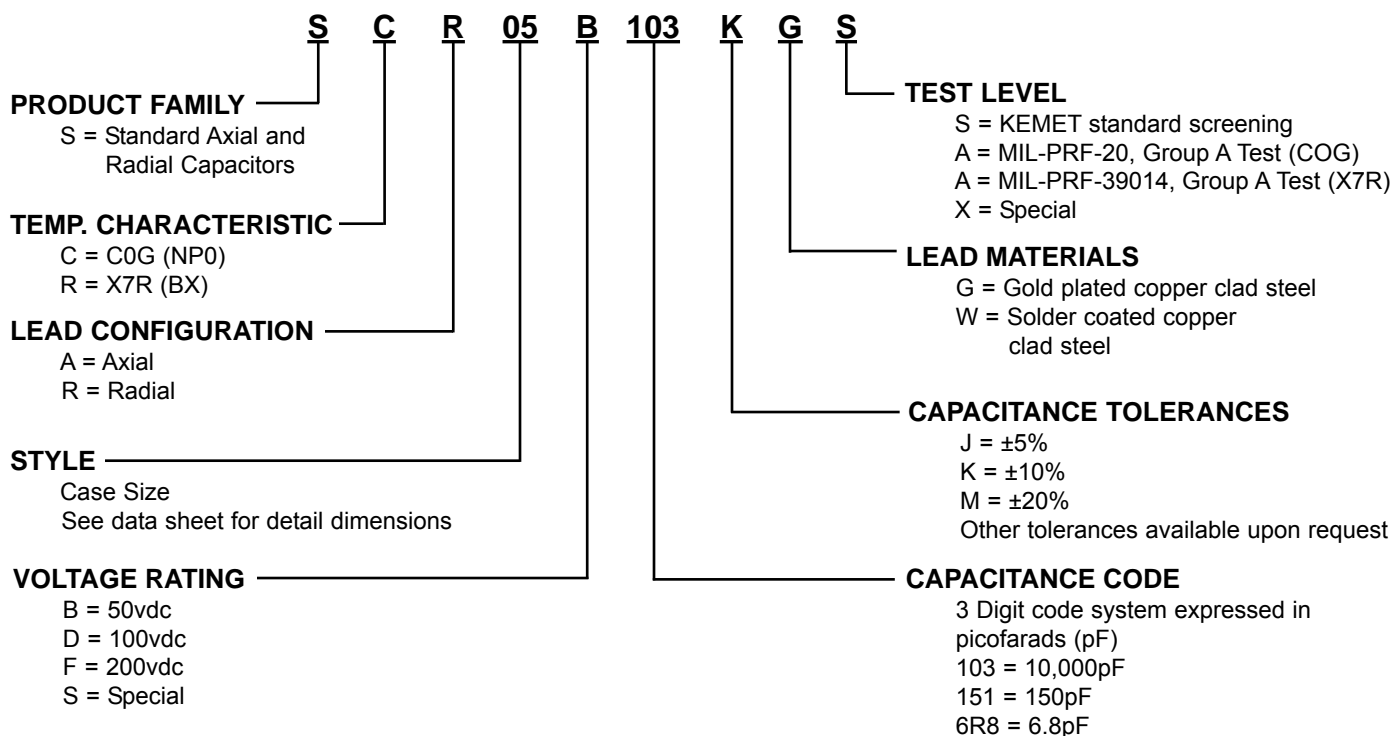
## X7R

BX and X7R capacitors are used in coupling circuits (IF and RF); for bypassing and decoupling in computers and stereo systems; power supply line filtering and frequency discrimination.

### INSTALLATION:

Parts should be soldered using a heat sink between the soldering point and the part using a soldering iron rated between 18-30 watts. Soldering temperature should not exceed +300°C. For wave soldering, the parts should be slowly heated to +150°C and, after soldering, be allowed to cool down slowly to +90°C to preclude thermal shocking of the parts.

### PART NUMBER AND ORDERING INFORMATION



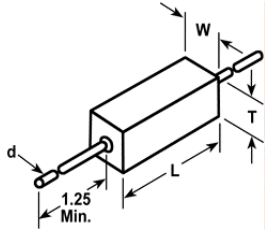
#### MARKING

Manufacturer's ID	KEC
Capacitance	106J
Voltage	50V
Date Code	123

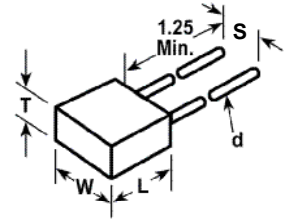
Note: Solderability testing is not required for gold leaded parts.



**AXIAL**  
All Dimensions  
in Inches (mm)



**RADIAL**  
All Dimensions  
in Inches (mm)



### X7R DIELECTRIC

		AXIAL															RADIAL														
STYLE		16			25			39			50			69			05			06			07			08			09		
Cap	Cap Code	L MAX	W MAX	T MAX	S	d	WVDC			WVDC			WVDC			WVDC			WVDC			WVDC			WVDC			WVDC			
		50	100	200	50	100	200	50	100	200	50	100	200	50	100	200	50	100	200	50	100	200	50	100	200	50	100	200			
100pF	101																														
	120																														
	150																														
	180																														
	220																														
	270																														
	330																														
	390																														
	470																														
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	1200																														
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	4700																														
	5600																														
	6800																														
	8200																														
0.01 μF	103																														
	123																														
	153																														
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	223																														
	273																														
	333																														
	393																														
	473																														
	563																														
	683																														
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	334																														
	394																														
	474																														
	564																														
	684																														
	824																														
	105																														
	125																														
	155																														
	185																														
	225																														
	275																														
	335																														
	395																														
	475																														
	565																														
	685																														



# High Temperature Standard (+200°C) Axial and Radial Ceramic Cased Capacitors (C<sup>3</sup>) ACR/ARR/ACA/ARA Series

High temperature ceramic cased capacitors, with a new, unique design concept, are ideally suited for continuous operation up to +200°C. Problems associated with epoxy cased/epoxy potted capacitors, such as material deterioration, cracks in cases and potted areas, are nonexistent, even at +200°C.

## COG

COG (NPO) capacitors, which exhibit little change in capacitance with variations in temperature, are used in RF oscillators, precision timing circuits, wave filters, and other circuits requiring a predictable linear temperature coefficient.

## X7R

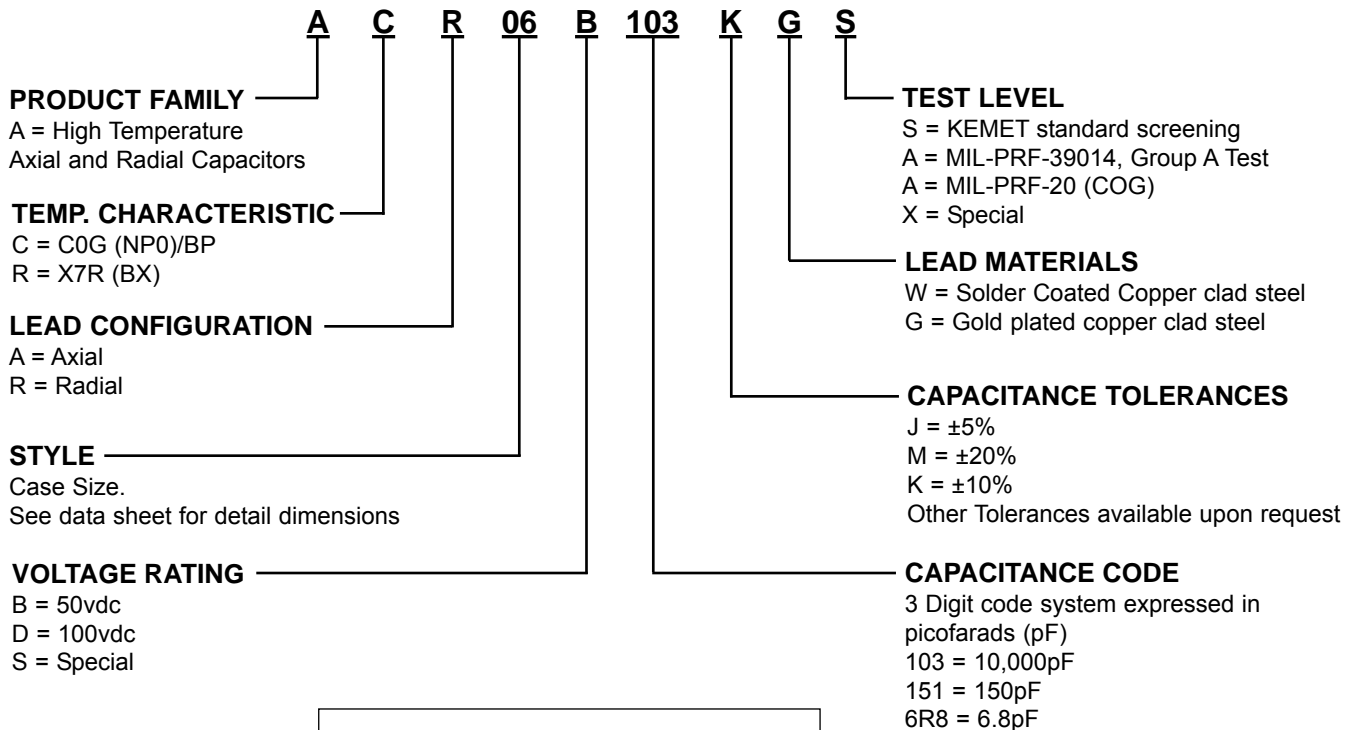
Specially formulated X7R ceramic materials result in a retention of 40% of the +25°C capacitance. Dissipation factor drops from 1.25% at +25°C to 0.1% at +200°C. At +120°C the ceramic undergoes a transformation (crystalline inversion) resulting in the material changing from ferroelectric to paraelectric - no piezoelectric behavior.

Typical applications include oil well logging (down hole), jet engine controls and geophysical pressure probes.

## INSTALLATION:

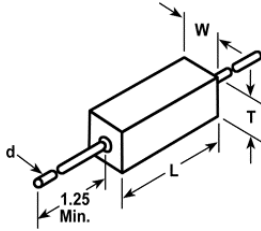
Parts should be soldered using a heat sink between the soldering point and the part using a soldering iron rated between 18-30 watts. Soldering temperature should not exceed +300°C.

## PART NUMBER AND ORDERING INFORMATION

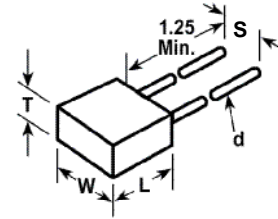


MARKING	
Manufacturer's ID	KEC
Capacitance	106J
Voltage	50V
Date Code	123

AXIAL  
All Dimensions  
in Inches (mm)



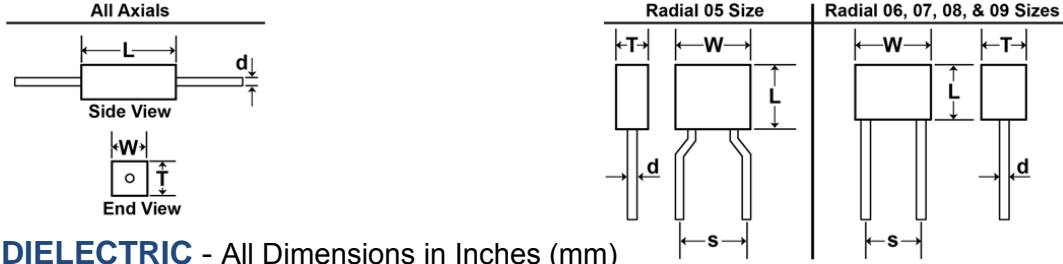
RADIAL  
All Dimensions  
in Inches (mm)



**COG DIELECTRIC**

		AXIAL					RADIAL				
STYLE		16	25	39	50	69	05	06	07	08	09
Cap	L <sub>MAX</sub>	.170 (4.32)	.270 (6.86)	.400 (10.16)	.520 (13.21)	.720 (18.29)	.200 (5.08)	.300 (7.62)	.300 (7.62)	.500 (12.70)	.500 (12.70)
	W <sub>MAX</sub>	.080 (2.03)	.100 (2.54)	.150 (3.81)	.265 (6.73)	.370 (9.40)	.200 (5.08)	.300 (7.62)	.300 (7.62)	.500 (12.70)	.500 (12.70)
	T <sub>MAX</sub>	.080 (2.03)	.100 (2.54)	.150 (3.81)	.160 (4.06)	.160 (4.06)	.100 (2.54)	.100 (2.54)	.150 (3.81)	.100 (2.54)	.150 (3.81)
	s	---	---	---	---	---	.200 ± .030 (5.08 ± .76)	.200 ± .030 (5.08 ± .76)	.200 ± .030 (5.08 ± .76)	.400 ± .030 (10.16 ± .76)	.400 ± .030 (10.16 ± .76)
	d	.020 ± .002 (.508 ± .051)	.020 ± .002 (.508 ± .051)	.025 ± .002 (.635 ± .051)	.025 ± .002 (.635 ± .051)	.025 ± .002 (.635 ± .051)	.020 ± .002 (.508 ± .051)	.020 ± .002 (.508 ± .051)	.020 ± .002 (.508 ± .051)	.025 ± .002 (.635 ± .051)	.025 ± .002 (.635 ± .051)
	Cap Code		WVDC 50 100	WVDC 50 100	WVDC 50 100	WVDC 50 100	WVDC 50 100	WVDC 50 100	WVDC 50 100	WVDC 50 100	WVDC 50 100
5.6pF	569										
6.8	689										
8.2	829										
10	100										
12	120										
15	150										
18	180										
22	220										
27	270										
33	330										
39	390										
47	470										
56	560										
68	680										
82	820										
100	101										
120	121										
150	151										
180	181										
220	221										
270	271										
330	331										
390	391										
470	471										
560	561										
680	681										
820	821										
1000	102										
1200	122										
1500	152										
1800	182										
2200	222										
2700	272										
3300	332										
3900	392										
4700	472										
5600	562										
6800	682										
8200	822										
0.01 μF	103										
0.012	123										
0.015	153										
0.018	183										
0.022	223										
0.027	273										
0.033	333										
0.039	393										
0.047	473										
0.056	563										
0.068	683										
0.082	823										
0.10	104										
0.12	124										
0.15	154										

# High Temperature Standard (+200°C) Axial and Radial Ceramic Cased Capacitors (C<sup>3</sup>) ARR/ARA Series



**X7R DIELECTRIC** - All Dimensions in Inches (mm)

		AXIAL										RADIAL									
STYLE		16		25		39		50		69		05		06		07		08		09	
Cap	L MAX	.170 (4.32)	.270 (6.86)	.400 (10.16)	.520 (13.21)	.720 (18.29)	.200 (5.08)	.300 (7.62)	.300 (7.62)	.500 (12.70)	.500 (12.70)	.200 (5.08)	.300 (7.62)	.300 (7.62)	.500 (12.70)	.500 (12.70)	.300 (7.62)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.500 (12.70)
	W MAX	.080 (2.03)	.100 (2.54)	.150 (3.81)	.265 (6.73)	.370 (9.40)	.200 (5.08)	.300 (7.62)	.300 (7.62)	.500 (12.70)	.500 (12.70)	.200 (5.08)	.300 (7.62)	.300 (7.62)	.500 (12.70)	.500 (12.70)	.300 (7.62)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.500 (12.70)
	T MAX	.080 (2.03)	.100 (2.54)	.150 (3.81)	.160 (4.06)	.160 (4.06)	.100 (2.54)	.100 (2.54)	.150 (3.81)	.100 (2.54)	.150 (3.81)	.100 (2.54)	.100 (2.54)	.150 (3.81)	.100 (2.54)	.150 (3.81)	.100 (2.54)	.100 (2.54)	.150 (3.81)	.100 (2.54)	.150 (3.81)
	s	---	---	---	---	---	.200 ± .030 (5.08 ± .76)	.200 ± .030 (5.08 ± .76)	.200 ± .030 (5.08 ± .76)	.400 ± .030 (10.16 ± .76)	.400 ± .030 (10.16 ± .76)	.200 ± .030 (5.08 ± .76)	.200 ± .030 (5.08 ± .76)	.200 ± .030 (5.08 ± .76)	.200 ± .030 (5.08 ± .76)	.400 ± .030 (10.16 ± .76)	.400 ± .030 (10.16 ± .76)	.400 ± .030 (10.16 ± .76)	.400 ± .030 (10.16 ± .76)	.400 ± .030 (10.16 ± .76)	
	d	.020 ± .002 (.508 ± .051)	.020 ± .002 (.508 ± .051)	.025 ± .002 (.635 ± .051)	.025 ± .002 (.635 ± .051)	.025 ± .002 (.635 ± .051)	.020 ± .002 (.508 ± .051)	.020 ± .002 (.508 ± .051)	.020 ± .002 (.508 ± .051)	.025 ± .002 (.635 ± .051)	.025 ± .002 (.635 ± .051)	.020 ± .002 (.508 ± .051)	.020 ± .002 (.508 ± .051)	.020 ± .002 (.508 ± .051)	.020 ± .002 (.508 ± .051)	.020 ± .002 (.508 ± .051)	.025 ± .002 (.635 ± .051)	.025 ± .002 (.635 ± .051)	.025 ± .002 (.635 ± .051)	.025 ± .002 (.635 ± .051)	.025 ± .002 (.635 ± .051)
	Cap Code		WVDC		WVDC		WVDC		WVDC		WVDC		WVDC		WVDC		WVDC		WVDC		WVDC
		50	100	50	100	50	100	50	100	50	100	50	100	50	100	50	100	50	100	50	100
100pF	101																				
	120																				
	150																				
	180																				
	220																				
	270																				
	330																				
	390																				
	470																				
	560																				
	680																				
	820																				
	1000																				
	1200																				
	1500																				
	1800																				
	2200																				
	2700																				
	3300																				
	3900																				
	4700																				
	5600																				
	6800																				
	8200																				
0.01 μF	103																				
	0.012																				
	0.015																				
	0.018																				
	0.022																				
	0.027																				
	0.033																				
	0.039																				
	0.047																				
	0.056																				
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	0.47																				
	0.56																				
	0.68																				
	0.82																				
	1.0																				
	1.2																				
	1.5																				
	1.8																				
	2.2																				
	2.7																				
	3.3																				
	3.9																				

High temperature ceramic cased capacitors, with a new, unique design concept, are ideally suited for continuous operation up to +260°C. Problems associated with epoxy cased/epoxy potted capacitors, such as material deterioration, cracks in cases and potted areas, are nonexistent, even at +260°C.

**COG**

COG (NP0) capacitors, which exhibit little change in capacitance with variations in temperature, are used in RF oscillators, precision timing circuits, wave filters, and other circuits requiring a predictable linear temperature coefficient.

**X7R**

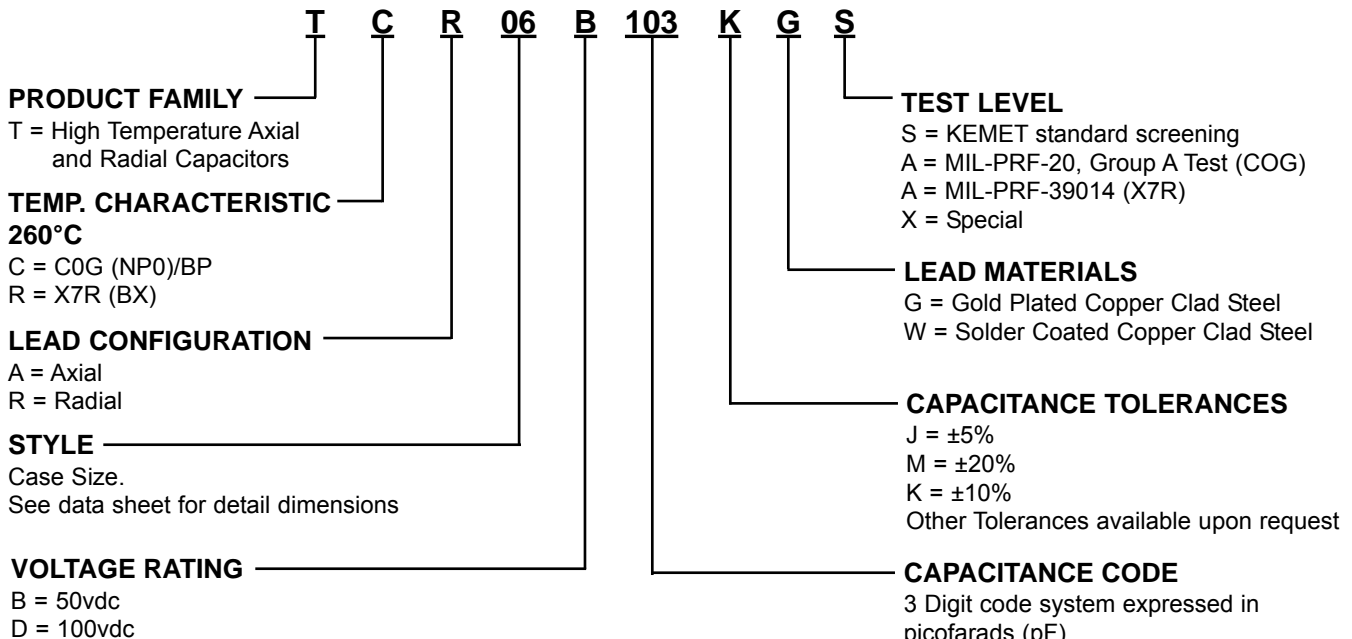
Conventional X7R materials lose up to 75% of the +25°C capacitance. Dissipation factor drops from 1.25% at +25°C to 0.2% at +260°C. At +120°C the ceramic undergoes a transformation (crystalline inversion) resulting in the material changing from ferroelectric to paraelectric - no piezoelectric behavior.

Typical applications include oil well logging (down hole), jet engine controls and geophysical pressure probes.

**INSTALLATION:**

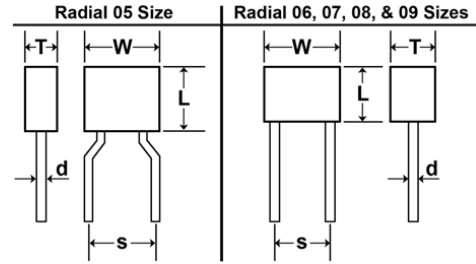
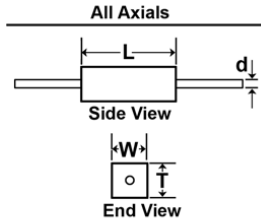
Parts should be soldered using a heat sink between the soldering point and the part using a soldering iron rated 18-30 watts. Remove all traces of flux or other contamination resulting from the soldering operation. An intermittent conducting path between the leads, at high voltage, could cause breakdown. Soldering temperature should not exceed +300°C.

**PART NUMBER AND ORDERING INFORMATION**



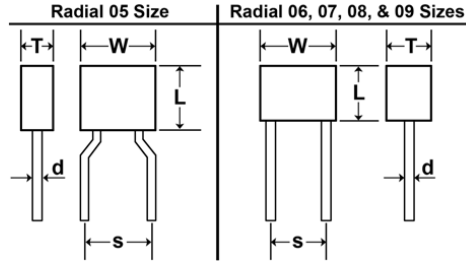
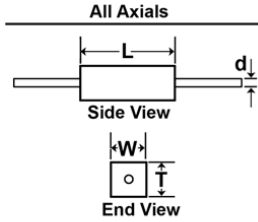
MARKING	EXAMPLE
Manufacturer's ID	KEC
Capacitance	106J
Voltage	50V
Date Code	123
Red dot = +260°C	•

# High Temperature (+260°C) Axial and Radial Ceramic Cased Capacitors (C<sup>3</sup>) TCR/TCA Series



## COG DIELECTRIC

		AXIAL					RADIAL				
STYLE		16	25	39	50	69	05	06	07	08	09
Cap	L <sub>MAX</sub>	.170 (4.32)	.270 (6.86)	.400 (10.16)	.520 (13.21)	.720 (18.29)	.200 (5.08)	.300 (7.62)	.300 (7.62)	.500 (12.70)	.500 (12.70)
	W <sub>MAX</sub>	.080 (2.03)	.100 (2.54)	.150 (3.81)	.265 (6.73)	.370 (9.40)	.200 (5.08)	.300 (7.62)	.300 (7.62)	.500 (12.70)	.500 (12.70)
	T <sub>MAX</sub>	.080 (2.03)	.100 (2.54)	.150 (3.81)	.160 (4.06)	.160 (4.06)	.100 (2.54)	.100 (2.54)	.150 (3.81)	.100 (2.54)	.150 (3.81)
	s	---	---	---	---	---	.200 ± .030 (5.08 ± .76)	.200 ± .030 (5.08 ± .76)	.200 ± .030 (5.08 ± .76)	.400 ± .030 (10.16 ± .76)	.400 ± .030 (10.16 ± .76)
	d	.020 ± .002 (.508 ± .051)	.020 ± .002 (.508 ± .051)	.025 ± .002 (.635 ± .051)	.025 ± .002 (.635 ± .051)	.025 ± .002 (.635 ± .051)	.020 ± .002 (.508 ± .051)	.020 ± .002 (.508 ± .051)	.020 ± .002 (.508 ± .051)	.025 ± .002 (.635 ± .051)	.025 ± .002 (.635 ± .051)
	Cap Code		50 100	50 100	50 100	50 100	50 100	50 100	50 100	50 100	50 100
5.6pF	569										
6.8	689										
8.2	829										
10	100										
12	120										
15	150										
18	180										
22	220										
27	270										
33	330										
39	390										
47	470										
56	560										
68	680										
82	820										
100	101										
120	121										
150	151										
180	181										
220	221										
270	271										
330	331										
390	391										
470	471										
560	561										
680	681										
820	821										
1000	102										
1200	122										
1500	152										
1800	182										
2200	222										
2700	272										
3300	332										
3900	392										
4700	472										
5600	562										
6800	682										
8200	822										
0.01 μF	103										
0.012	123										
0.015	153										
0.018	183										
0.022	223										
0.027	273										
0.033	333										
0.039	393										
0.047	473										
0.056	563										
0.068	683										
0.082	823										
0.10	104										
0.12	124										
0.15	154										



### X7R DIELECTRIC

		AXIAL										RADIAL										
STYLE		16		25		39		50		69		05		06		07		08		09		
Cap	L <sub>MAX</sub>	.170 (4.32)		.270 (6.86)		.400 (10.16)		.520 (13.21)		.720 (18.29)		.200 (5.08)		.300 (7.62)		.300 (7.62)		.500 (12.70)		.500 (12.70)		
	W <sub>MAX</sub>	.080 (2.03)		.100 (2.54)		.150 (3.81)		.265 (6.73)		.370 (9.40)		.200 (5.08)		.300 (7.62)		.300 (7.62)		.500 (12.70)		.500 (12.70)		
	T <sub>MAX</sub>	.080 (2.03)		.100 (2.54)		.150 (3.81)		.160 (4.06)		.160 (4.06)		.100 (2.54)		.100 (2.54)		.150 (3.81)		.100 (2.54)		.150 (3.81)		
	S	---		---		---		---		---		.200 ± .030 (5.08 ± .76)		.200 ± .030 (5.08 ± .76)		.200 ± .030 (5.08 ± .76)		.400 ± .030 (10.16 ± .76)		.400 ± .030 (10.16 ± .76)		
	d	.020 ± .002 (.508 ± .051)		.020 ± .002 (.508 ± .051)		.025 ± .002 (.635 ± .051)		.025 ± .002 (.635 ± .051)		.025 ± .002 (.635 ± .051)		.020 ± .002 (.508 ± .051)		.020 ± .002 (.508 ± .051)		.020 ± .002 (.508 ± .051)		.025 ± .002 (.635 ± .051)		.025 ± .002 (.635 ± .051)		
	Cap Code	WVDC		WVDC		WVDC		WVDC		WVDC		WVDC		WVDC		WVDC		WVDC		WVDC		
		50	100	50	100	50	100	50	100	50	100	50	100	50	100	50	100	50	100	50	100	
	100pF																					
	120																					
	150																					
180																						
220																						
270																						
330																						
390																						
470																						
560																						
680																						
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0.33																						
0.39																						
0.47																						
0.56																						
0.68																						
0.82																						
1.0																						
1.2																						
1.5																						
1.8																						
2.0																						
2.2																						
2.7																						
3.3																						
3.9																						

# High Temperature (+200°C), High Voltage Radial Ceramic Cased Capacitors (C<sup>3</sup>)

## VCR/VRR Series

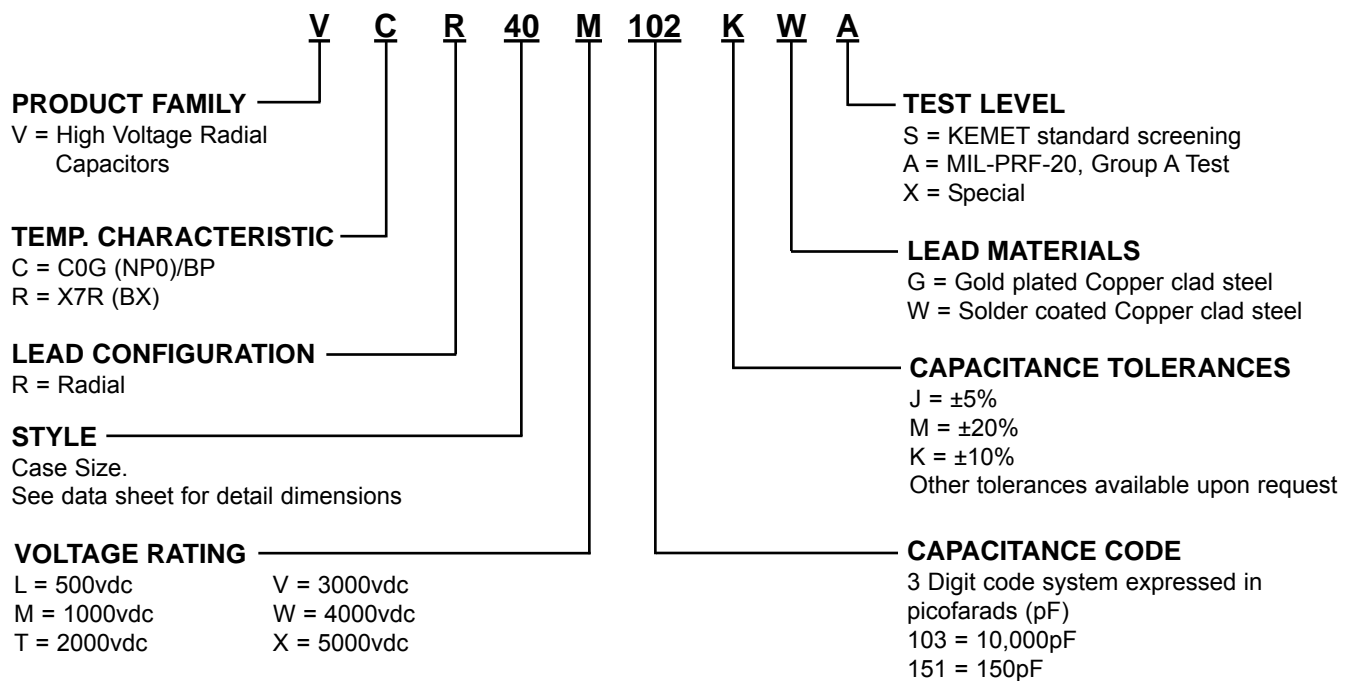
Ceramic cased capacitors, with a new, unique design concept which eliminates potential problems associated with conventional epoxy cased epoxy potted capacitors.

Major application is high voltage power supplies. High voltage capacitors are also utilized on high voltage meter multiplier and RF circuits.

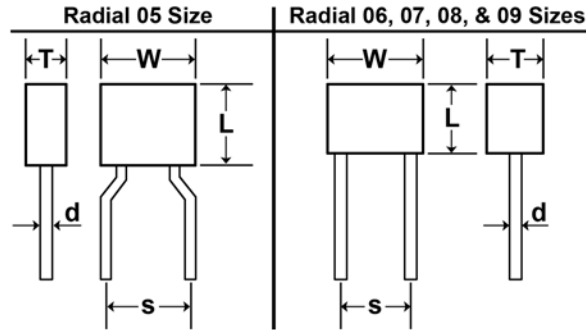
### INSTALLATION:

Parts should be soldered using a heat sink between the soldering point and the part using a soldering iron rated 18-30 watts. Remove all traces of flux or other contamination resulting from the soldering operation. An intermittent conducting path between the leads, at high voltage, could cause breakdown. Soldering temperature should not exceed +300°C.

### PART NUMBER AND ORDERING INFORMATION



MARKING	EXAMPLE
Manufacturer's ID	KEC
Capacitance	106J
Voltage	500V
Date Code	123



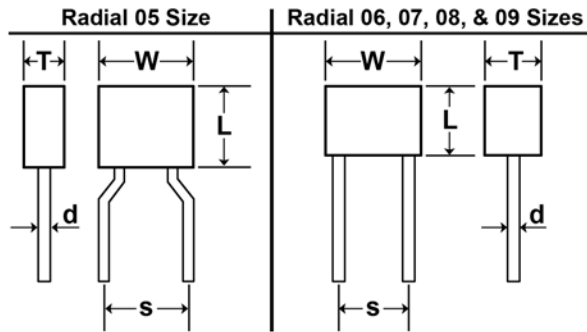
### C0G DIELECTRIC

STYLE		07				40				50					60					70					80								
L <sub>MAX</sub>		.300 (7.62)				.350 (8.89)				.520 (13.20)					.550 (13.97)					.650 (16.51)					.750 (19.05)								
W <sub>MAX</sub>		.300 (7.62)				.400 (10.16)				.500 (12.70)					.600 (15.24)					.700 (17.78)					.800 (20.32)								
T <sub>MAX</sub>		.150 (3.81)				.275 (6.98)				.300 (7.62)					.375 (9.52)					.375 (9.52)					.375 (9.52)								
S		.200 ± .030 (5.08 ± .76)				.250 ± .030 (6.35 ± .76)				.400 ± .030 (10.16 ± .76)					.400 ± .030 (10.16 ± .76)					.500 ± .030 (12.70 ± .76)					.600 ± .030 (15.24 ± .76)								
d		.025 ± .002 (.635 ± .051)				.025 ± .002 (.635 ± .051)				.025 ± .002 (.635 ± .051)					.032 ± .004 (.813 ± .102)					.032 ± .004 (.813 ± .102)					.032 ± .004 (.813 ± .102)								
Cap	Cap Code	WVDC																															
		500	1k	2k	500	1k	2k	3k	4k	500	1k	2k	3k	4k	5k	500	1k	2k	3k	4k	5k	500	1k	2k	3k	4k	5k	500	1k	2k	3k	4k	5k
10 pF	100																																
12	120																																
15	150																																
18	180																																
22	220																																
27	270																																
33	330																																
39	390																																
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0.01 μF	103																																
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0.018	183																																
0.022	223																																
0.027	273																																
0.033	333																																
0.039	393																																
0.047	473																																
0.056	563																																



# High Temperature (+200°C), High Voltage Axial and Radial Ceramic Cased Capacitors (C<sup>3</sup>)

## VRR Series

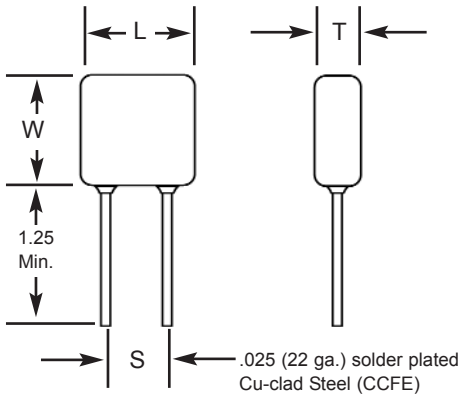


### X7R DIELECTRIC

STYLE		07			40				50					60					70					80													
L <sub>MAX</sub>		.300 (7.62)			.350 (8.89)				.520 (13.20)					.550 (13.97)					.650 (16.51)					.750 (19.05)													
W <sub>MAX</sub>		.300 (7.62)			.400 (10.16)				.500 (12.70)					.600 (15.24)					.700 (17.78)					.800 (20.32)													
T <sub>MAX</sub>		.150 (3.81)			.275 (6.98)				.300 (7.62)					.375 (9.52)					.375 (9.52)					.375 (9.52)													
S		.200 ± .030 (5.08 ± .76)			.250 ± .030 (6.35 ± .76)				.400 ± .030 (10.16 ± .76)					.400 ± .030 (10.16 ± .76)					.500 ± .030 (12.70 ± .76)					.600 ± .030 (15.24 ± .76)													
d		.025 ± .002 (.635 ± .051)			.025 ± .002 (.635 ± .051)				.025 ± .002 (.635 ± .051)					.032 ± .004 (.813 ± .102)					.032 ± .004 (.813 ± .102)					.032 ± .004 (.813 ± .102)													
Cap	Cap Code	WVDC			WVDC				WVDC					WVDC					WVDC					WVDC													
		500	1k	2k	500	1k	2k	3k	4k	500	1k	2k	3k	4k	5k	500	1k	2k	3k	4k	5k	500	1k	2k	3k	4k	5k	500	1k	2k	3k	4k	5k				
330pF	331																																				
390	391																																				
470	471																																				
560	561																																				
680	681																																				
820	821																																				
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8200	822																																				
0.01 μF	103																																				
0.012	123																																				
0.015	153																																				
0.018	183																																				
0.022	223																																				
0.027	273																																				
0.033	333																																				
0.039	393																																				
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0.056	563																																				
0.068	683																																				
0.082	823																																				
0.10	104																																				
0.12	124																																				
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0.18	184																																				
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0.27	274																																				
0.33	334																																				
0.39	394																																				
0.47	474																																				
0.56	564																																				
0.68	684																																				
0.82	824																																				
1.0	105																																				
1.2	125																																				



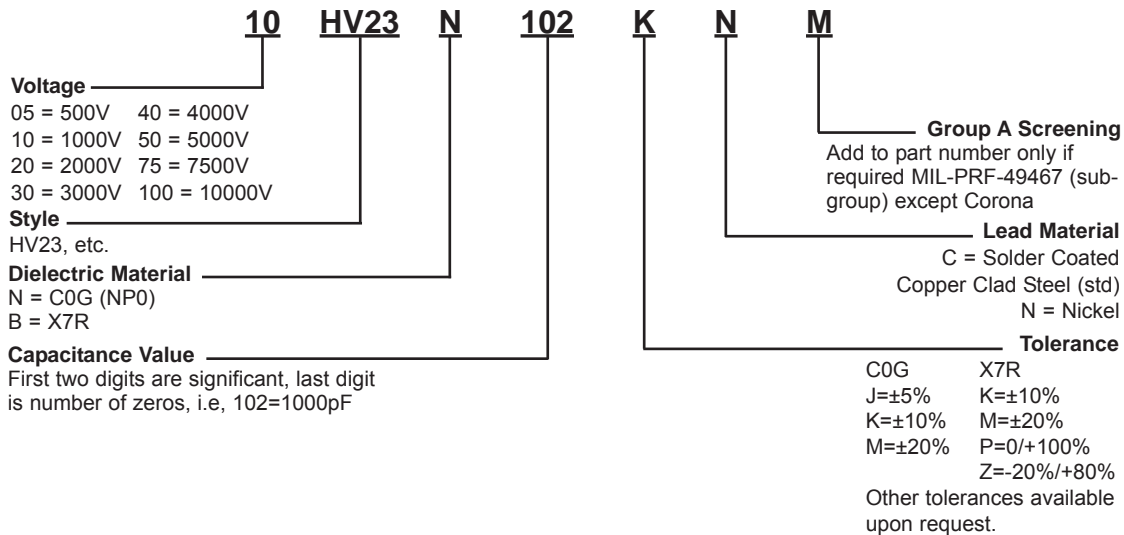
**CAPACITOR OUTLINE DRAWING**



**DIMENSIONS**

Style	Sizes in Inches (mm) max.			Lead Spacing ±0.030 (S)
	Length (L)	Width (W)	Thickness (T)	
HV20	.250 (6.35)	.220 (5.59)	.200 (5.08)	.170 (4.32)
HV21	.320 (8.13)	.280 (7.11)	.250 (6.35)	.220 (5.59)
HV22	.370 (9.40)	.300 (7.62)	.250 (6.35)	.275 (6.98)
HV23	.470 (11.94)	.400 (10.16)	.270 (6.89)	.375 (9.52)
HV24	.570 (14.48)	.500 (12.70)	.270 (6.89)	.475 (12.06)
HV25	.670 (17.02)	.600 (15.24)	.270 (6.89)	.575 (14.60)
HV26	.770 (19.56)	.720 (18.29)	.270 (6.89)	.675 (17.14)
HV30	.450 (11.43)	.220 (5.59)	.200 (5.08)	.300 (7.62)
HV31	.550 (13.97)	.280 (7.11)	.250 (6.35)	.400 (10.16)
HV33	.850 (21.59)	.400 (10.16)	.270 (6.89)	.700 (17.78)
HV34	1.050 (26.67)	.500 (12.70)	.270 (6.89)	.975 (24.76)
HV35	1.250 (31.75)	.600 (15.24)	.270 (6.89)	1.175 (29.84)
HV36	1.450 (36.83)	.720 (18.29)	.270 (6.89)	1.375 (34.92)

**PART NUMBER AND ORDERING INFORMATION**



**MARKING**

(HV20, HV21)	(All Other Sizes)
103K	HV24A103K
1 kV	1 kV
KEC	KEC
Date Code	Date Code





# High Voltage Radial Conformally Coated Ceramic Capacitors HV Series

## X7R DIELECTRIC

STYLE		HV20			HV21			HV22			HV23				HV24					HV25					HV26											
Cap	L MAX	.250 (6.35)			.320 (8.13)			.370 (9.40)			.470 (11.94)				.570 (14.48)					.670 (17.02)					.770 (19.56)											
	W MAX	.220 (5.59)			.280 (7.11)			.300 (7.62)			.400 (10.16)				.500 (12.70)					.600 (15.24)					.720 (18.29)											
	T MAX	.200 (5.08)			.250 (6.35)			.250 (6.35)			.270 (6.86)				.270 (6.86)					.270 (6.86)					.270 (6.86)											
	S ± .030	.170 (4.32)			.220 (5.59)			.275 (6.98)			.375 (9.52)				.475 (12.06)					.575 (14.60)					.675 (17.14)											
	Lead Dia. +0.004/-0.002	.025 (.635)			.025 (.635)			.025 (.635)			.025 (.635)				.025 (.635)					.025 (.635)					.025 (.635)											
	Cap Code	WVDC			WVDC			WVDC			WVDC				WVDC					WVDC					WVDC											
		500	1k	2k	500	1k	2k	3k	500	1k	2k	3k	500	1k	2k	3k	4k	500	1k	2k	3k	4k	5k	500	1k	2k	3k	4k	5k	500	1k	2k	3k	4k	5k	
270pF	271																																			
330	331																																			
390	391																																			
470	471																																			
560	561																																			
680	681																																			
820	821																																			
1000	102																																			
1200	122																																			
1500	152																																			
1800	182																																			
2200	222																																			
2700	272																																			
3300	332																																			
3900	392																																			
4700	472																																			
5600	562																																			
6800	682																																			
8200	822																																			
0.01uF	103																																			
0.012	123																																			
0.015	153																																			
0.018	183																																			
0.022	223																																			
0.027	273																																			
0.033	333																																			
0.039	393																																			
0.047	473																																			
0.056	563																																			
0.068	683																																			
0.082	823																																			
0.10	104																																			
0.12	124																																			
0.15	154																																			
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0.22	224																																			
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0.39	394																																			
0.47	474																																			
0.56	564																																			
0.68	684																																			
0.82	824																																			
1.00	105																																			
1.20	125																																			
1.50	155																																			
1.80	185																																			
2.20	225																																			
2.90	295																																			

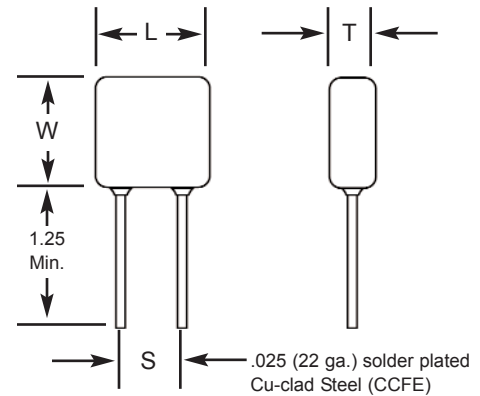


# High Voltage MIL-PRF-49467 (Equivalent) HV Series

## FEATURES

1. Electrical characteristics and environmental information on these parts may be obtained by referring to MIL-PRF-49467.
2. All parts are conformal coated multilayer ceramic.
3. Designed to provide excellent long-term reliability.
4. Parts are Group A screened per MIL-PRF-49467 which includes 100% Corona testing and meet all other specification requirements.
5. Designed for surface, sea and airborne military and commercial high-reliability applications.
6. No IR degradation over life.
7. BR (X7R) V/TC is -40% at rated voltage and BZ (X7R) V/TC is -40% at 60% rated voltage.
8. BX characteristic (-25%) on BR parts is approximately 52% rated voltage.
9. 100% Non-destructive test by means of CSAM inspection available.

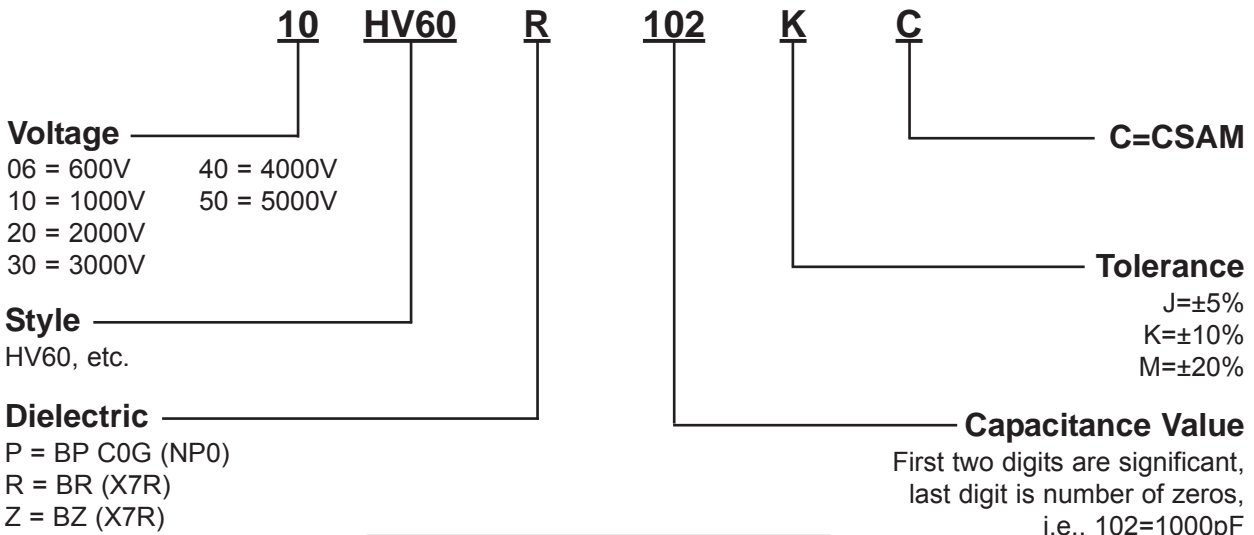
## CAPACITOR OUTLINE DRAWING



## DIMENSIONS

Style	Sizes in Inches (mm) max.			Lead Spacing ±0.030 (S)
	Length (L)	Width (W)	Thickness (T)	
HV60	.250 (6.35)	.220 (5.59)	.200 (5.08)	.170 (4.32)
HV61	.320 (8.13)	.280 (7.11)	.250 (6.35)	.220 (5.59)
HV62	.370 (9.40)	.300 (7.62)	.250 (6.35)	.275 (6.98)
HV63	.470 (11.94)	.400 (10.16)	.270 (6.86)	.375 (9.52)
HV64	.570 (14.48)	.500 (12.70)	.270 (6.86)	.475 (12.06)
HV65	.670 (17.02)	.600 (15.24)	.270 (6.86)	.575 (14.60)
HV66	.770 (19.56)	.720 (18.29)	.270 (6.86)	.675 (17.14)
HV68	1.300 (33.02)	.600 (15.24)	.270 (6.86)	1.175 (29.84)
HV69	1.500 (38.10)	.720 (18.29)	.270 (6.86)	1.375 (34.92)

## PART NUMBER AND ORDERING INFORMATION



MARKING	
(HV60, HV61)	(All Other Sizes)
102K	HV63R102K
1 kV	1 kV
KEC	KEC
Date Code	Date Code



COG DIELECTRIC

STYLE	HV60	HV61				HV62				HV63					HV64					HV65					HV66								
		WVDC			WVDC			WVDC			WVDC			WVDC			WVDC			WVDC			WVDC			WVDC							
		600	1k	2k	600	1k	2k	3k	600	1k	2k	3k	600	1k	2k	3k	4k	600	1k	2k	3k	4k	5k	1k	2k	3k	4k	5k	1k	2k	3k	4k	5k
L MAX	.250 (6.35)	.320 (8.13)				.370 (9.40)				.470 (11.94)					.570 (14.48)					.670 (17.02)					.770 (19.56)								
W MAX	.220 (5.59)	0.280 (7.11)				.300 (7.62)				.400 (10.16)					.500 (12.70)					.600 (15.24)					.720 (18.29)								
T MAX	.200 (5.08)	.250 (6.35)				.250 (6.35)				.270 (6.86)					.270 (6.86)					.270 (6.86)					.270 (6.86)								
S± .030	.170 (4.32)	.220 (5.59)				.275 (6.98)				.375 (9.52)					.475 (12.06)					.575 (14.60)					.675 (17.14)								
Lead Dia <small>+0.004/-0.002</small>	.025 (.635)	.025 (.635)				.025 (.635)				.025 (.635)					.025 (.635)					.025 (.635)					.025 (.635)								
Cap	Cap Code	WVDC				WVDC				WVDC				WVDC				WVDC				WVDC				WVDC				WVDC			
12pF	120																																
15	150																																
18	180																																
22	220																																
27	270																																
33	330																																
39	390																																
47	470																																
56	560																																
68	680																																
82	820																																
100	101																																
120	121																																
150	151																																
180	181																																
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470	471																																
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2200	222																																
2700	272																																
3300	332																																
3900	392																																
4700	472																																
5600	562																																
6800	682																																
8200	822																																
0.01uF	103																																
0.012	123																																
0.015	153																																
0.018	183																																
0.022	223																																
0.027	273																																
0.033	333																																
0.039	393																																
0.047	473																																
0.056	563																																
0.068	683																																

# High Voltage MIL-PRF-49467 (Equivalent) HV Series

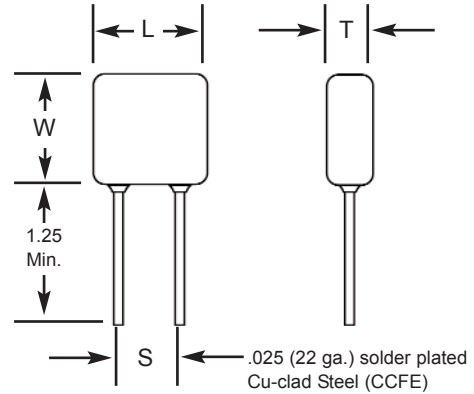
## X7R DIELECTRIC

STYLE		HV60			HV61			HV62			HV63				HV64				HV65				HV66				HV 68			HV 69									
Cap	L MAX	.250 (6.35)			.320 (8.13)			.370 (9.40)			.470 (11.94)				.570 (14.48)				.670 (17.02)				.770 (19.56)				1.300 (33.02)			1.500 (38.10)									
	W MAX	.220 (5.59)			.280 (7.11)			.300 (7.62)			.400 (10.16)				.500 (12.70)				.600 (15.24)				.720 (18.29)				.600 (15.24)			.720 (18.29)									
	T MAX	.200 (5.08)			.250 (6.35)			.250 (6.35)			.270 (6.86)				.270 (6.86)				.270 (6.86)				.270 (6.86)				.270 (6.86)			.270 (6.86)									
S± .030		.170 (4.32)			.220 (5.59)			.275 (6.98)			.375 (9.52)				.475 (12.06)				.575 (14.60)				.675 (17.14)				1.175 (29.84)			1.375 (34.92)									
Lead Dia. +0.004/-0.002		.025 (.635)			.025 (.635)			.025 (.635)			.025 (.635)				.025 (.635)				.025 (.635)				.025 (.635)				0.025 (.635)			0.025 (.635)									
		WVDC			WVDC			WVDC			WVDC				WVDC				WVDC				WVDC				WVDC			WVDC									
Cap Code		600	1k	2k	600	1k	2k	3k	600	1k	2k	3k	600	1k	2k	3k	4k	600	1k	2k	3k	4k	5k	1k	2k	3k	4k	5k	1k	2k	3k	4k	5k	3k	4k	5k	3k	4k	5k
270pF	271																																						
330	331																																						
390	391																																						
470	471																																						
560	561																																						
680	681																																						
820	821																																						
1000	102																																						
1200	122																																						
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2700	272																																						
3300	332																																						
3900	392																																						
4700	472																																						
5600	562																																						
6800	682																																						
8200	822																																						
0.01uF	103																																						
0.012	123																																						
0.015	153																																						
0.018	183																																						
0.022	223																																						
0.027	273																																						
0.033	333																																						
0.039	393																																						
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0.15	154																																						
0.18	184																																						
0.22	224																																						
0.27	274																																						
0.33	334																																						
0.39	394																																						
0.47	474																																						

**FEATURES**

1. Conforms to MIL-PRF-49467. (Group A Screening, Subgroup 1)
2. 100% Corona tested.
3. No IR degradation over life.
4. High density, low DF ceramic.
5. Conservative and proven design is recommended for non-repairable applications such as spacecraft.
6. CSAM inspection is available and is recommended for space applications.
7. Burn-in in a non-contaminating inert fluid is standard for  $\geq 2\text{KV}$ ; optional for 500V or 1 KV parts.

**CAPACITOR OUTLINE DRAWING**



**DIMENSIONS**

Style	Sizes in Inches (mm) max.			Lead Spacing $\pm 0.030$ (S)
	Length (L)	Width (W)	Thickness (T)	
HS20	.250 (6.35)	.220 (5.59)	.200 (5.08)	.170 (4.32)
HS21	.320 (8.13)	.280 (7.11)	.250 (6.35)	.220 (5.59)
HS22	.370 (9.40)	.300 (7.62)	.250 (6.35)	.275 (6.98)
HS30	.450 (11.43)	.220 (5.59)	.200 (5.08)	.300 (7.62)
HS23	.470 (11.94)	.400 (10.16)	.270 (6.89)	.375 (9.52)
HS31	.550 (13.97)	.280 (7.11)	.250 (6.35)	.400 (10.16)
HS24	.570 (14.48)	.500 (12.70)	.270 (6.89)	.475 (12.06)
HS25	.670 (17.02)	.600 (15.24)	.270 (6.89)	.575 (14.60)
HS26	.770 (19.56)	.720 (18.29)	.270 (6.89)	.675 (17.14)
HS33	.850 (21.59)	.400 (10.16)	.270 (6.89)	.700 (17.78)
HS34	1.050 (26.67)	.500 (12.70)	.270 (6.89)	.975 (24.76)
HS35	1.250 (31.75)	.600 (15.24)	.270 (6.89)	1.175 (29.84)
HS36	1.450 (36.83)	.720 (18.29)	.270 (6.89)	1.375 (34.92)

**PART NUMBER AND ORDERING INFORMATION**

**VOLTAGE** 10 **HS24** **B** 103 **K** **C** **F**

05 = 500V      40 = 4000V  
 10 = 1000V    50 = 5000V  
 20 = 2000V    75 = 7500V  
 30 = 3000V    100 = 10,000V

**STYLE** \_\_\_\_\_  
 HS24, etc.

**DIELECTRIC** \_\_\_\_\_  
 B = X7R  
 N = BP C0G (NP0)

**CAPACITANCE VALUE** \_\_\_\_\_  
 First two digits are significant,  
 last digit is number of zeros,  
 i.e., 103=10000pF

**INERT LIQUID (BURN-IN)**  
 Std. for  $\geq 2\text{kV}$ ;  
 Add "F" if required  
 for 500V or 1kV parts

**C=CSAM**

**TOLERANCE**  
 J =  $\pm 5\%$   
 K =  $\pm 10\%$   
 M =  $\pm 20\%$   
 P = 0/+100%  
 Z = -20%/+80%

MARKING	
(HS20, HV21)	(All Other Sizes)
103K	HS24B103K
1 kV	1 kV
KEC	KEC
Date Code	Date Code

# High Voltage Space Quality MLC (-55° to +125°C) HS Series

## COG DIELECTRIC

STYLE		HS 20			HS 21			HS 22			HS 23				HS 24					HS 25					HS 26								
Cap	L MAX	.250 (6.35)			.320 (8.13)			.370 (9.40)			.470 (11.94)				.570 (14.48)					.670 (17.02)					.770 (19.56)								
	W MAX	.220 (5.59)			.280 (7.11)			.300 (7.62)			.400 (10.16)				.500 (12.70)					.600 (15.24)					.720 (18.29)								
	T MAX	.200 (5.08)			.250 (6.35)			.250 (6.35)			.270 (6.86)				.270 (6.86)					.270 (6.86)					.270 (6.86)								
	S± .030	.170 (4.32)			.220 (5.59)			.275 (6.98)			.375 (9.52)				.475 (12.06)					.575 (14.60)					.675 (17.14)								
	Lead Dia. +0.004/-0.002	.025 (.635)			.025 (.635)			.025 (.635)			.025 (.635)				.025 (.635)					.025 (.635)					.025 (.635)								
	Cap Code	WVDC		WVDC		WVDC		WVDC		WVDC		WVDC		WVDC			WVDC		WVDC			WVDC			WVDC		WVDC						
		500	1k	2k	500	1k	2k	500	1k	2k	500	1k	2k	3k	500	1k	2k	3k	4k	5k	500	1k	2k	3k	4k	5k	500	1k	2k	3k	4k	5k	
	12pF																																
	15																																
	18																																
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	8200																																
	0.010uF																																
	0.012																																
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	0.033																																
	0.039																																
	0.047																																
	0.056																																
	0.068																																
	0.082																																
	0.10																																
	0.12																																
	0.15																																



# High Voltage Space Quality MLC (-55° to +125°C) HS Series

## X7R DIELECTRIC

STYLE		HS 20			HS 21			HS 22			HS 23				HS 24					HS 25					HS 26						
Cap	L MAX	.250 (6.35)			.320 (8.13)			.370 (9.40)			.470 (11.94)				.570 (14.48)					.670 (17.02)					.770 (19.56)						
	W MAX	.220 (5.59)			.280 (7.11)			.300 (7.62)			.400 (10.16)				.500 (12.70)					.600 (15.24)					.720 (18.29)						
	T MAX	.200 (5.08)			.250 (6.35)			.250 (6.35)			.270 (6.86)				.270 (6.86)					.270 (6.86)					.270 (6.86)						
	S± .030	.170 (4.32)			.220 (5.59)			.275 (6.98)			.375 (9.52)				.475 (12.06)					.575 (14.60)					.675 (17.14)						
	Lead Dia. +0.004/-0.002	.025 (.635)			.025 (.635)			.025 (.635)			.025 (.635)				.025 (.635)					.025 (.635)					.025 (.635)						
	Cap Code	WVDC			WVDC			WVDC			WVDC				WVDC					WVDC					WVDC						
		500	1k	2k	500	1k	2k	500	1k	2k	500	1k	2k	3k	500	1k	2k	3k	4k	500	1k	2k	3k	4k	5k	500	1k	2k	3k	4k	5k
270pF	271																														
330	331																														
390	391																														
470	471																														
560	561																														
680	681																														
820	821																														
1000	102																														
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5600	562																														
6800	682																														
8200	822																														
0.010uF	103																														
0.012	123																														
0.015	153																														
0.018	183																														
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0.039	393																														
0.047	473																														
0.056	563																														
0.068	683																														
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0.12	124																														
0.15	154																														
0.18	184																														
0.22	224																														
0.27	274																														
0.33	334																														
0.39	394																														
0.47	474																														
0.56	564																														
0.68	684																														
0.82	824																														
1.0	105																														
1.2	125																														
1.5	155																														
1.8	185																														
2.2	225																														
2.7	275																														

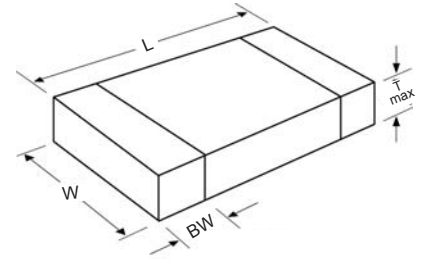


# High Voltage Ceramic Chip (+125°C) Military Equivalent

## FEATURES

1. The ceramic chip capacitors described in this section are the types used in our other high voltage ceramic multilayer product lines.
2. Types BP available as described in MIL-PRF-49467.
3. Group A and B screening per MIL-PRF-49467 available. - TCVC exceptions apply.
4. Ceramic chip capacitors are extremely sensitive to thermal shock damage during installation. Wherever possible, processes involving infrared or vapor phase soldering systems should be utilized.
5. Higher voltages available upon request.
6. Where nickel barrier termination is required, bandwidth dimensions may exceed the standard dimension listed.

## CERAMIC CHIP OUTLINE DRAWING

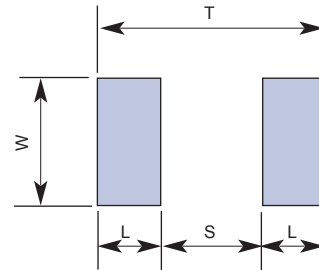


## DIMENSIONS

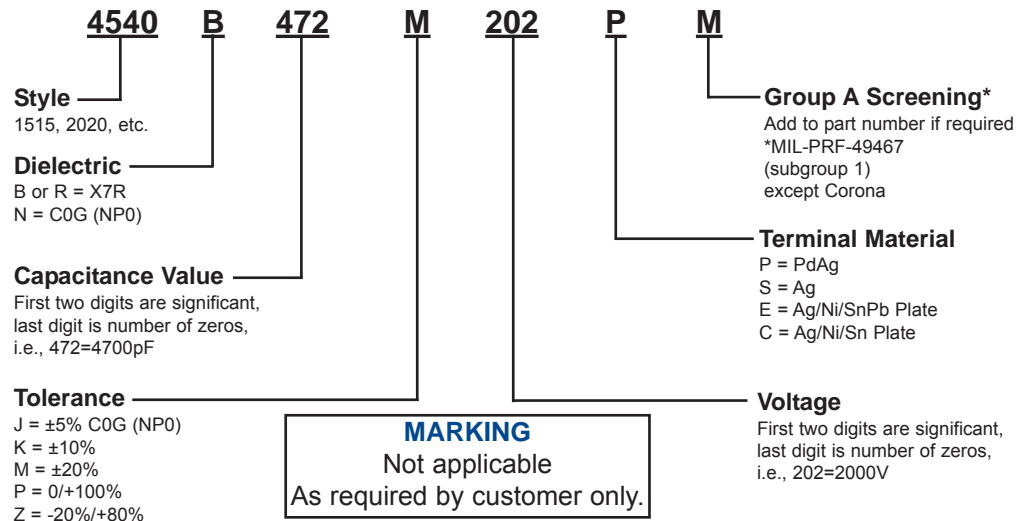
Style	Length (L) Inches (mm)	Width (W) Inches (mm)	Thickness (T) max Inches (mm)	Bandwidth (BW) Inches
1515	.150 ±.015 (3.81 ±.38)	.150 ±.015 (3.81 ±.38)	.140 (3.55)	.010 - .030"
1812	.180 ±.020 (4.57 ±.51)	.120 ±.015 (3.05 ±.38)	.100 (2.54)	.010 - .040"
1825	.180 ±.020 (4.57 ±.51)	.250 ±.020 (6.35 ±.51)	.160 (4.07)	.010 - .040"
2020	.200 ±.020 (5.08 ±.51)	.200 ±.020 (5.08 ±.51)	.180 (3.55)	.010 - .040"
2225	.220 ±.020 (5.59 ±.51)	.250 ±.020 (6.35 ±.51)	.200 (5.08)	.010 - .040"
2520	.250 ±.020 (6.35 ±.51)	.200 ±.020 (5.08 ±.51)	.180 (4.57)	.030 - .060"
3333	.330 ±.030 (8.38 ±.76)	.330 ±.030 (8.38 ±.76)	.220 (5.59)	.030 - .060"
3530	.350 ±.030 (8.89 ±.76)	.300 ±.030 (7.62 ±.76)	.220 (5.59)	.030 - .060"
4040	.400 ±.030 (10.2 ±.76)	.400 ±.030 (10.2 ±.76)	.220 (5.59)	.030 - .060"
4540	.450 ±.030 (11.43 ±.76)	.400 ±.030 (10.2 ±.76)	.220 (5.59)	.030 - .060"
5440	.540 ±.030 (13.7 ±.76)	.400 ±.030 (10.2 ±.76)	.220 (5.59)	.030 - .060"
5550	.550 ±.030 (14.0 ±.76)	.500 ±.030 (12.7 ±.76)	.220 (5.59)	.030 - .060"
6560	.650 ±.030 (16.5 ±.76)	.600 ±.030 (15.2 ±.76)	.220 (5.59)	.030 - .060"

## RECOMMENDED SOLDER PAD PATTERN DIMENSIONS

Chip Size	T (Total Length)		S (Separation)		W (Pad Width)		L (Pad Length)	
	mm	in.	mm	in.	mm	in.	mm	in.
1515	5.20	0.205	1.90	0.075	4.34	0.171	1.65	0.065
1812	5.390	0.232	2.30	0.091	3.70	0.146	1.80	0.071
1825	5.90	0.232	2.30	0.091	6.90	0.272	1.80	0.071
2020	6.50	0.256	2.80	0.110	5.62	0.221	1.85	0.073
2225	7.00	0.276	3.30	0.130	6.80	0.268	1.85	0.073
2520	8.68	0.342	4.98	0.196	5.62	0.221	1.85	0.073
3333	10.91	0.430	7.11	0.280	9.27	0.365	1.90	0.075
3530	11.51	0.453	7.61	0.300	8.51	0.335	1.95	0.077
4040	12.88	0.507	8.88	0.350	11.05	0.435	2.00	0.079
4540	14.21	0.559	10.15	0.400	11.05	0.435	2.03	0.080
5440	16.51	0.650	10.41	0.410	11.05	0.435	3.05	0.120
5550	18.92	0.745	12.82	0.505	13.59	0.535	3.05	0.120
6560	19.80	0.780	13.20	0.520	16.13	0.635	3.30	0.130



## PART NUMBER AND ORDERING INFORMATION





**COG DIELECTRIC**

STYLE		1515	1812	1825	2020	2225	2520	3333	3530	
Cap	L	.150 ± .015 (3.81 ± .38)	.180 ± .020 (4.57 ± .51)	.180 ± .020 (4.57 ± .51)	.200 ± .020 (5.08 ± .51)	.220 ± 0.020 (5.59 ± .51)	.250 ± .020 (6.35 ± .51)	.330 ± .030 (8.38 ± .76)	.350 ± .030 (8.89 ± .76)	
	W	.150 ± .015 (3.81 ± .38)	.120 ± .015 (3.05 ± .38)	.250 ± .020 (6.35 ± .51)	.200 ± .020 (5.08 ± .51)	.250 ± .020 (6.35 ± .51)	.200 ± .020 (5.08 ± .51)	.330 ± .030 (8.38 ± .76)	.300 ± .030 (7.62 ± .76)	
	T MAX	.140 (3.55)	.100 (2.54)	.160 (4.07)	.180 (4.57)	.200 (5.08)	.180(4.57)	.220 (5.59)	.220 (5.59)	
	Band Width	0.010-0.030	0.010-0.040	0.010-0.040	0.010-0.040	0.010-0.040	0.030-0.060	0.030-0.060	0.030-0.060	
	Cap Code	WVDC		WVDC		WVDC		WVDC		WVDC
		500 1k 2k 3k	500 1k 2k 3k	500 1k 2k 3k	500 1k 2k 3k	500 1k 2k 3k	500 1k 2k 3k	500 1k 2k 3k 4k	500 1k 2k 3k 4k	
12pF	120									
15	150									
18	180									
22	220									
27	270									
33	330									
39	390									
47	470									
56	560									
68	680									
82	820									
100	101									
120	121									
150	151									
180	181									
220	221									
270	271									
330	331									
390	391									
470	471									
560	561									
680	681									
820	821									
1000	102									
1200	122									
1500	152									
1800	182									
2200	222									
2700	272									
3300	332									
3900	392									
4700	472									
5600	562									
6800	682									
8200	822									
0.010uF	103									
0.012	123									
0.015	153									
0.018	183									
0.022	223									

# High Voltage Ceramic Chip (+125°C) Military Equivalent

## COG DIELECTRIC

STYLE		4040					4540					5440					5550					6560							
Cap	L	.400 ± .030 (10.16 ± .76)					.450 ± .030 (11.43 ± .76)					0.540 ± .030 (13.72 ± .76)					.550 ± .030 (13.97 ± .76)					.650 ± .030 (16.51 ± .76)							
	W	.400 ± .030 (10.16 ± .76)					.400 ± .030 (10.16 ± .76)					.400 ± .030 (10.16 ± .76)					.500 ± .030 (12.70 ± .76)					.600 ± .030 (15.20 ± .76)							
	T MAX	.220 (5.59)					.220 (5.59)					.220 (5.59)					.220 (5.59)					.220 (5.59)							
	Band Width	0.030 - 0.060					0.030 - 0.060					0.030 - 0.060					0.030 - 0.060					0.030 - 0.060							
	Cap Code	WVDC					WVDC					WVDC					WVDC					WVDC							
			500	1k	2k	3k	4k	500	1k	2k	3k	4k	5k	500	1k	2k	3k	4k	500	1k	2k	3k	4k	5k	500	1k	2k	3k	4k
15pF	150																												
18	180																												
22	220																												
27	270																												
33	330																												
39	390																												
47	470																												
56	560																												
68	680																												
82	820																												
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0.047	473																												
0.056	563																												
0.068	683																												
0.082	823																												
0.10	104																												

X7R DIELECTRIC

STYLE		1515			1812			1825				2020				2225				2520				3333				3530								
Cap	L	.150 ± .015 (3.81 ± .38)			.180 ± .020 (4.57 ± .51)			.180 ± .020 (4.57 ± .51)				.200 ± .020 (5.08 ± .51)				.220 ± 0.020 (5.59 ± .51)				.250 ± .020 (6.35 ± .51)				.330 ± .030 (8.38 ± .76)				.350 ± .030 (8.89 ± .76)								
	W	.150 ± .015 (3.81 ± .38)			.120 ± .015 (3.05 ± .38)			.250 ± .020 (6.35 ± .51)				.200 ± .020 (5.08 ± .51)				.250 ± .020 (6.35 ± .51)				.200 ± .020 (5.08 ± .51)				.330 ± .030 (8.38 ± .76)				.300 ± .030 (7.62 ± .76)								
	T MAX	.140 (3.55)			.100 (2.54)			.160 (4.07)				.180 (4.57)				.200 (5.08)				.180 (4.57)				.220 (5.59)				.220 (5.59)								
Band Width		0.010-0.030			0.010-0.040			0.010-0.040				0.010-0.040				0.010-0.040				0.030-0.060				0.030-0.060				0.030-0.060								
		WVDC			WVDC			WVDC				WVDC				WVDC				WVDC				WVDC				WVDC								
Cap Code		500	1k	2k	500	1k	2k	500	1k	2k	3k	500	1k	2k	3k	500	1k	2k	3k	500	1k	2k	3k	500	1k	2k	3k	500	1k	2k	3k	500	1k	2k	3k	4k
270pF	271																																			
330	331																																			
390	391																																			
470	471																																			
560	561																																			
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0.27	274																																			
0.33	334																																			
0.39	394																																			
0.47	474																																			
0.56	564																																			
0.68	684																																			
0.82	824																																			

# High Voltage Ceramic Chip (+125°C) Military Equivalent

## X7R DIELECTRIC

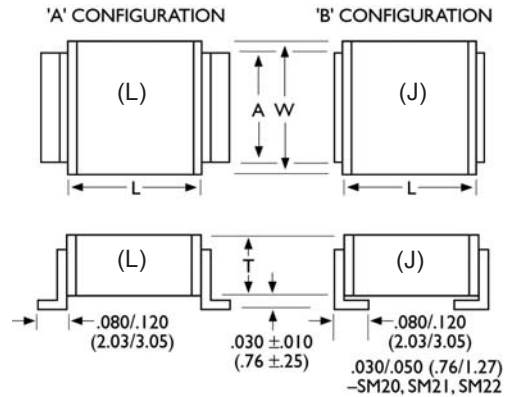
STYLE		4040					4540					5440					5550					6560							
Cap	L	.400 ± .030 (10.16 ± .76)					.450 ± .030 (11.43 ± .76)					.540 ± .030 (13.72 ± .76)					.550 ± .030 (13.97 ± .76)					.650 ± .030 (16.51 ± .76)							
	W	.400 ± .030 (10.16 ± .76)					.400 ± .030 (10.16 ± .76)					.400 ± .030 (10.16 ± .76)					.500 ± .030 (12.70 ± .76)					.600 ± .030 (15.20 ± .76)							
	T MAX	.220 (5.59)					.220 (5.59)					.220 (5.59)					.220 (5.59)					.220 (5.59)							
	Band Width	0.030 - 0.060					0.030 - 0.060					0.030 - 0.060					0.030 - 0.060					0.030 - 0.060							
	Cap Code	WVDC					WVDC					WVDC					WVDC					WVDC							
		500	1k	2k	3k	4k	500	1k	2k	3k	4k	5k	500	1k	2k	3k	4k	500	1k	2k	3k	4k	5k	500	1k	2k	3k	4k	5k
470pF	471																												
560	561																												
680	681																												
820	821																												
1000	102																												
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0.033	333																												
0.039	393																												
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0.056	563																												
0.068	683																												
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0.10	104																												
0.12	124																												
0.15	154																												
0.18	184																												
0.22	224																												
0.27	274																												
0.33	334																												
0.39	394																												
0.47	474																												
0.56	564																												
0.68	684																												
0.82	824																												
1.0	105																												
1.2	125																												
1.5	155																												
1.8	185																												
2.2	225																												
2.7	275																												

## FEATURES

1. Silver plated copper alloy terminal for easy soldering.
2. Mounting tabs are designed to minimize the effect of thermal stress introduced by the differences in coefficient of thermal expansion between the capacitor and the mounting surface.
3. Low ESR.
4. High current discharge capability.
5. Group A and B screening per MIL-PRF-49467 available .
6. Standard lead configuration is 'B'.(J) If lead configuration is left out of part number the lead style is assumed to be 'B'.

## CAPACITOR OUTLINE DRAWING

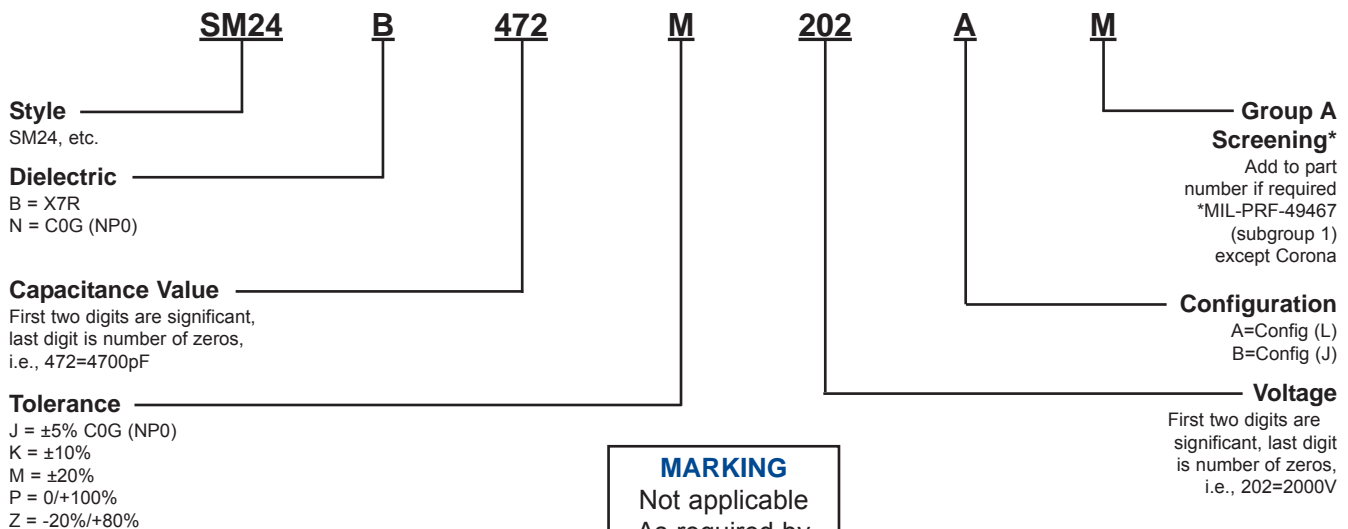
### STANDARD



## DIMENSIONS

Style	Length (L) Inches (mm)	Width (W) Inches (mm)	Thickness (T) max Inches (mm)	Tab (A) max Inches (mm)
SM20	.150 ±.015 (3.81 ±.38)	.150 ±.015 (3.81 ±.38)	.130 (3.30)	.100 (2.54)
SM21	.200 ±.020 (5.08 ±.51)	.200 ±.020 (5.08 ±.51)	.180 (4.57)	.100 (2.54)
SM22	.250 ±.020 (6.35 ±.51)	.200 ±.020 (5.08 ±.51)	.180 (4.57)	.100 (2.54)
SM23	.350 ±.030 (8.89 ±.76)	.300 ±.030 (7.62 ±.76)	.220 (5.59)	.200 (5.08)
SM24	.450 ±.030 (11.43 ±.76)	.400 ±.030 (10.20 ±.76)	.220 (5.59)	.300 (7.62)
SM25	.550 ±.030 (14.00 ±.76)	.500 ±.030 (12.70 ±.76)	.220 (5.59)	.400 (10.2)
SM26	.650 ±.030 (16.50 ±.76)	.600 ±.030 (15.20 ±.76)	.220 (5.59)	.500 (12.7)
SM30	.300 ±.030 (7.62 ±.76)	.150 ±.015 (3.81 ±.38)	.140 (3.55)	.100 (2.54)
SM31	.400 ±.030 (10.20 ±.76)	.200 ±.020 (5.08 ±.51)	.130 (3.30)	.100 (2.54)
SM33	.700 ±.030 (17.08 ±.76)	.300 ±.030 (7.62 ±.76)	.180 (4.57)	.200 (5.08)
SM34	.900 ±.030 (22.90 ±.76)	.400 ±.030 (10.20 ±.76)	.220 (5.59)	.300 (7.62)
SM35	1.100 ±.030 (27.90 ±.76)	.500 ±.030 (12.70 ±.76)	.220 (5.59)	.400 (10.2)
SM36	1.350 ±.030 (33.00 ±.76)	.600 ±.030 (15.20 ±.76)	.220 (5.59)	.500 (12.7)

## PART NUMBER AND ORDERING INFORMATION



# High Voltage L and J Leaded Ceramic Capacitor SM Series

## COG DIELECTRIC

STYLE		SM20				SM21				SM22				SM23					SM24					SM25					SM26							
Cap	L	.150 ± .015 (3.31 ± .38)				.200 ± .020 (5.08 ± .51)				.250 ± .020 (6.35 ± .51)				.350 ± .030 (8.89 ± .76)					.450 ± .030 (11.43 ± .76)					.550 ± .030 (14.00 ± .76)					.650 ± .030 (16.50 ± .76)							
	W	.150 ± .015 (3.31 ± .38)				.200 ± .020 (5.08 ± .51)				.200 ± .020 (5.08 ± .51)				.300 ± .030 (7.62 ± .76)					.400 ± .030 (10.20 ± .76)					.500 ± .030 (12.70 ± .76)					.600 ± .030 (15.20 ± .76)							
	T MAX	.130 (3.30)				.180 (4.57)				.180 (4.57)				.220 (5.59)					.220 (5.59)					.220 (5.59)												
	Tab A max	.100 (2.54)				.100 (2.54)				.100 (2.54)				.200 (5.08)					.300 (7.62)					.400 (10.20)					.500 (12.70)							
	Cap Code	WVDC				WVDC				WVDC				WVDC					WVDC					WVDC												
		500	1k	2k	3k	500	1k	2k	3k	500	1k	2k	3k	500	1k	2k	3k	4k	500	1k	2k	3k	4k	5k	500	1k	2k	3k	4k	5k	500	1k	2k	3k	4k	5k
12pF	120																																			
15	150																																			
18	180																																			
22	220																																			
27	270																																			
33	330																																			
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8200	822																																			
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0.022	223																																			
0.027	273																																			
0.033	333																																			
0.039	393																																			
0.047	473																																			
0.056	563																																			
0.068	683																																			
0.082	823																																			
0.10	104																																			

**COG DIELECTRIC**

STYLE	SM30	SM31	SM33	SM34	SM35	SM36																																																																																												
L	.300 ± .030 (7.62 ± .76)	.400 ± .030 (10.20 ± .76)	.700 ± .030 (17.08 ± .76)	.900 ± .030 (22.90 ± .76)	1.100 ± .030 (27.90 ± .76)	1.350 ± .030 (33.00 ± .76)																																																																																												
W	.150 ± .015 (3.31 ± .38)	.200 ± .020 (5.08 ± .51)	.300 ± .030 (10.20 ± .76)	.400 ± .030 (10.20 ± .76)	.500 ± .030 (12.70 ± .76)	.600 ± .030 (15.20 ± .76)																																																																																												
T <sub>MAX</sub>	.140 (3.55)	.130 (3.30)	.180 (4.57)	.220 (5.59)	.220 (5.59)	.220 (5.59)																																																																																												
Tab A max	.100 (2.54)	.100 (2.54)	.200 (5.08)	.300 (7.62)	.400 (10.20)	.500 (12.70)																																																																																												
Cap	WVDC				WVDC				WVDC				WVDC																																																																																					
	500	1k	2k	3k	4k	500	1k	2k	3k	4k	5k	500	1k	2k	3k	4k	5k	7.5k	10k	500	1k	2k	3k	4k	5k	7.5k	10k	500	1k	2k	3k	4k	5k	7.5k	10k																																																															
Cap Code	100	120	150	180	220	270	330	390	470	560	680	820	100	101	120	121	150	151	180	181	220	221	270	271	330	331	390	391	470	471	560	561	680	681	820	821	1000	102	1200	122	1500	152	1800	182	2200	222	2700	272	3300	332	3900	392	4700	472	5600	562	6800	682	8200	822	0.01uF	103	0.012	123	0.015	153	0.018	183	0.022	223	0.027	273	0.033	333	0.039	393	0.047	473	0.056	563	0.068	683	0.082	823	0.10	104	0.12	124	0.15	154	0.18	184	0.22	224	0.27	274	0.33	334

# High Voltage L and J Leaded Ceramic Capacitor SM Series

## X7R DIELECTRIC

STYLE		SM20			SM21			SM22			SM23			SM24			SM25			SM26									
Cap	L	.150 ± .015 (3.31 ± .38)			.200 ± .020 (5.08 ± .51)			.250 ± .020 (6.35 ± .51)			.350 ± .030 (8.89 ± .76)			.450 ± .030 (11.43 ± .76)			.550 ± .030 (14.00 ± .76)			.650 ± .030 (16.50 ± .76)									
	W	.150 ± .015 (3.31 ± .38)			.200 ± .020 (5.08 ± .51)			.200 ± .020 (5.08 ± .51)			.300 ± .030 (7.62 ± .76)			.400 ± .030 (10.20 ± .76)			.500 ± .030 (12.70 ± .76)			.600 ± .030 (15.20 ± .76)									
	T <sub>MAX</sub>	.130 (3.30)			.180 (4.57)			.180 (4.57)			.220 (5.59)			.220 (5.59)			.220 (5.59)			.220 (5.59)									
	Tab A max	.100 (2.54)			.100 (2.54)			.100 (2.54)			.200 (5.08)			.300 (7.62)			.400 (10.20)			.500 (12.70)									
	Cap Code	WVDC			WVDC			WVDC			WVDC			WVDC			WVDC			WVDC									
		500	1k	2k	500	1k	2k	3k	500	1k	2k	3k	500	1k	2k	3k	4k	500	1k	2k	3k	4k	5k	500	1k	2k	3k	4k	5k
270pF	271																												
	330																												
	390																												
	470																												
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	680																												
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	8200																												
0.01uF	103																												
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	0.82																												
	1.0																												
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	1.8																												
	2.2																												
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### X7R DIELECTRIC

STYLE	SM30	SM31	SM33	SM34	SM35	SM36																						
L	.300 ± .030 (7.62 ± .76)	.400 ± .030 (10.20 ± .76)	.700 ± .030 (17.08 ± .76)	.900 ± .030 (22.90 ± .76)	1.100 ± .030 (27.90 ± .76)	1.350 ± .030 (33.00 ± .76)																						
W	.150 ± .015 (3.31 ± .38)	.200 ± .020 (5.08 ± .51)	.300 ± .030 (10.20 ± .76)	.400 ± .030 (10.20 ± .76)	.500 ± .030 (12.70 ± .76)	.600 ± .030 (15.20 ± .76)																						
T <sub>MAX</sub>	.140 (3.55)	.130 (3.30)	.180 (4.57)	.220 (5.59)	.220 (5.59)	.220 (5.59)																						
Tab A <sub>max</sub>	.100 (2.54)	.100 (2.54)	.200 (5.08)	.300 (7.62)	.400 (10.20)	.500 (12.70)																						
Cap	WVDC		WVDC		WVDC		WVDC		WVDC		WVDC																	
	500	1k	2k	3k	4k	5k	500	1k	2k	3k	4k	5k	7.5k	500	1k	2k	3k	4k	5k	7.5k	10k	500	1k	2k	3k	4k	5k	7.5k
Cap Code																												
150pF	151																											
180	181																											
220	221																											
270	271																											
330	331																											
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0.82	824																											
1.0	105																											
1.2	125																											
1.5	155																											
1.8	185																											
2.2	225																											
2.7	275																											
3.3	335																											
3.9	395																											
4.7	475																											
5.6	565																											

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# High Voltage Disc Ceramic Capacitor

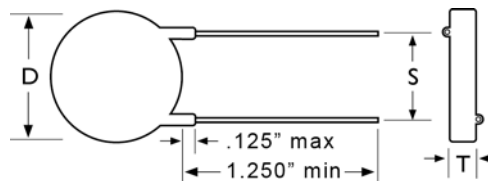
## D Series

### FEATURES

Disc ceramic capacitors made under strict quality control procedures are a reliable component. Special attention is given to the ceramic pressing operation to assure high and uniform ceramic density.

These parts are manufactured for the quality conscious customer. Parts are available screened to MIL-PRF-49467 established reliability specification.

### CAPACITOR OUTLINE DRAWING



### INSTALLATION

Higher-voltage parts may require further encapsulation to prevent surface breakdown. Parts should be cleaned and oven dried at 85°C before further encapsulation. Silicone rubbers or an epoxy may be used. De-airing of encapsulants is recommended. We recommend that a heat sink be attached to the lead between the soldering iron and the capacitor during installation soldering. Testing of higher-voltage parts before encapsulation may be done in a suitable dielectric fluid such as Freon.

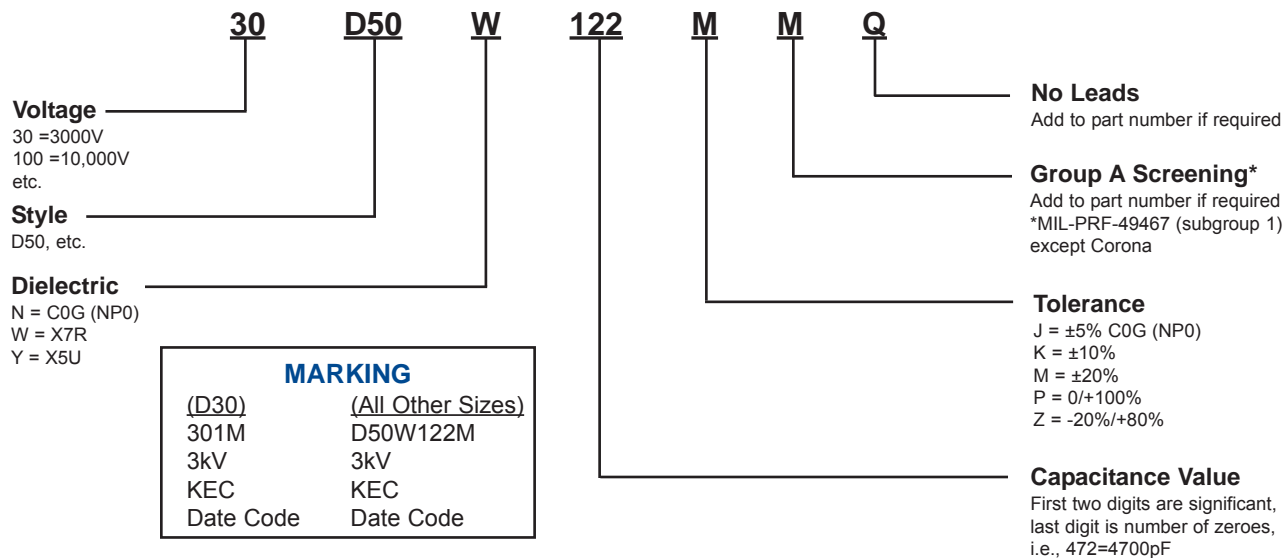
### DIELECTRIC COMPARISON

CERAMIC TYPE	C0G (NP0)	X7R	X5U
Dissipation Factor	0.1%	2.5%	2.5%
Temperature Coefficient	±30ppm/°C	±15%	+22% -56%
Voltage Coefficient	0	-20%	N/A
Dielectric Withstanding Voltage Test	3 to 15kV at 1.5x rated, 20 to 50kV at rated +10kV	3 to 15kV at 1.5x rated, 20 to 50kV at rated +10kV	3 to 15kV at 1.5x rated, 20 to 50kV at rated +10kV
Insulation Resistance (25°C)	100k megohms or 1k megohms-μF, whichever is less	100k megohms or 1k megohms-μF, whichever is less	10k megohms or 100 megohms-μF, whichever is less
Operating Temperature Range (rated voltage)	-55°C to +125°C	-55°C to +125°C	-55°C to +85°C

**Thickness:** 3kV = 0.15 (3.81)  
**Inches (mm) max.** 5kV = 0.20 (5.08)  
 7.5kV = 0.28 (7.11)  
 10kV = 0.35 (8.89)  
 15kV = 0.45 (11.43)  
 20kV = 0.55 (13.97)  
 30kV = 0.95 (24.13)  
 40kV = 1.20 (30.48)  
 50kV = 1.50 (38.10)

**Lead Type:** Solder plated, copper-clad steel (CCFE)-  
 D30, D40: 0.025" (22GA)  
 D50 & Larger: 0.032" (20GA)

### PART NUMBER AND ORDERING INFORMATION



### 3K VDC

Disc Style	D Max.	S ±.030	C0G (NP0)		X7R		X5U	
			Min.	Max.	Min.	Max.	Min.	Max.
D30	.30	.250	7.8pF	9.6pF	250pF	300pF	520pF	700pF
D40	.40	.250	20pF	25pF	630pF	770pF	1300pF	1800pF
D50	.50	.375	36pF	44pF	1100pF	1400pF	2400pF	3200pF
D75	.75	.375	80pF	98pF	2500pF	3100pF	5300pF	7200pF
D90	.90	.500	123pF	150pF	3800pF	4700pF	8200pF	11000pF
D100	1.00	.500	145pF	178pF	4600pF	5600pF	9700pF	13000pF
D120	1.20	.500	193pF	236pF	6000pF	7400pF	12900pF	17300pF

### 5K VDC

D30	.30	.250	4.7pF	5.7pF	150pF	180pF	310pF	420pF
D40	.40	.250	12pF	15pF	380pF	460pF	810pF	1100pF
D50	.50	.375	21pF	26pF	670pF	820pF	1400pF	1900pF
D75	.75	.375	48pF	59pF	1500pF	1800pF	3200pF	4300pF
D90	.90	.500	74pF	90pF	2300pF	2800pF	4900pF	6600pF
D100	1.00	.500	87pF	107pF	2700pF	3300pF	5800pF	7800pF
D120	1.20	.500	116pF	141pF	3600pF	4400pF	7700pF	10400pF

### 7.5K VDC

D30	.30	.250	3.1pF	3.8pF	100pF	120pF	210pF	280pF
D40	.40	.250	8.1pF	9.9pF	250pF	310pF	540pF	720pF
D50	.50	.375	14pF	17pF	450pF	550pF	950pF	1300pF
D75	.75	.375	32pF	39pF	1000pF	1200pF	2100pF	2900pF
D90	.90	.500	49pF	60pF	1500pF	1900pF	3300pF	4400pF
D100	1.00	.500	58pF	71pF	1800pF	2200pF	3900pF	5200pF
D120	1.20	.500	77pF	94pF	2400pF	3000pF	5100pF	6900pF

### 10K VDC

D30	.30	.250	2.4pF	2.9pF	70pF	90pF	160pF	210pF
D40	.40	.250	6.1pF	7.4pF	190pF	230pF	400pF	540pF
D50	.50	.375	10.7pF	13.1pF	330pF	410pF	710pF	960pF
D75	.75	.375	24pF	29pF	750pF	920pF	1600pF	2200pF
D90	.90	.500	37pF	45pF	1200pF	1400pF	2500pF	3300pF
D100	1.00	.500	44pF	53pF	1400pF	1700pF	2900pF	3900pF
D120	1.20	.500	58pF	71pF	1800pF	2200pF	3900pF	5200pF

### 15K VDC

D30	.30	.250	1.6pF	1.9pF	50pF	60pF	100pF	140pF
D40	.40	.250	4.0pF	4.9pF	130pF	150pF	270pF	360pF
D50	.50	.375	7.1pF	8.7pF	220pF	270pF	480pF	640pF
D75	.75	.375	16pF	20pF	500pF	610pF	1100pF	1400pF
D90	.90	.500	25pF	30pF	770pF	940pF	1600pF	2200pF
D100	1.00	.500	29pF	36pF	910pF	1100pF	1900pF	2600pF
D120	1.20	.500	39pF	47pF	1200pF	1500pF	2600pF	3500pF

### 20K VDC

D30	.30	.250	1.2pF	1.4pF	37pF	45pF	80pF	110pF
D40	.40	.250	3.0pF	3.7pF	100pF	120pF	200pF	270pF
D50	.50	.375	5.3pF	6.5pF	170pF	200pF	360pF	480pF
D75	.75	.375	12pF	15pF	380pF	460pF	800pF	1100pF
D90	.90	.500	18pF	22pF	580pF	700pF	1200pF	1600pF
D100	1.00	.500	22pF	27pF	680pF	830pF	1500pF	2000pF
D120	1.20	.500	29pF	35pF	910pF	1100pF	1900pF	2600pF

### 30K, 40K & 50K VDC

Disc Style	D Max.	S ±.030	30kVDC		40kVDC		50kVDC	
			X7R		X7R		X7R	
			Min.	Max.	Min.	Max.	Min.	Max.
D30	.30	.250	20pF	30pF	18pF	22pF	10pF	20pF
D40	.40	.250	60pF	80pF	50pF	60pF	40pF	50pF
D50	.50	.375	110pF	140pF	80pF	100pF	70pF	80pF
D75	.75	.375	250pF	310pF	190pF	230pF	150pF	180pF
D90	.90	.500	380pF	470pF	290pF	350pF	230pF	280pF
D100	1.00	.500	460pF	560pF	340pF	420pF	270pF	330pF
D120	1.20	.500	600pF	740pF	450pF	550pF	360pF	440pF



**World Sales Headquarters**

KEMET Electronics Corporation  
P.O. Box 5928  
Greenville, SC 29606  
Phone: 864-963-6300

**Europe**

KEMET Electronics S.A.  
15bis chemin des Mines  
1202 Geneva, Switlerland  
Phone: 41-22-715-0100

**Asia**

KEMET Electronics Marketing PTE Ltd.  
73 Bukit Timah Road  
#05-01 Rex House  
Singapore, 229832, Singapore  
Phone: 65-6586-1900

KEMET Electronics Asia Ltd.  
30 Canton Road, Room 1512  
SilverCord Tower II  
Tsimshatshui, Kowloon  
Hong Kong  
Phone: 852-2305-1168

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