



Defense and Aerospace

KEMET
CHARGED.™

Ceramic High Voltage, High Temperature Capacitors

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High Temperature, High Voltage Radial	HV	8-9
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High Voltage MIL-PRF-49467 (Equivalent)	HV	15-17
High Voltage Space Quality	HS	18-22
High Voltage Ceramic Chip	1515/1812/1825/2020/ 2225/2520/3333//3530 4040/4540/5440/5550/6560	23-27
High Voltage L & J Leaded	SM20/SM21/SM22/SM23 SM24/SM25/SM26/SM30/ SM31/SM33/SM34/SM35/SM36	28-32
High Voltage Disc	D30/40/50/75/90/100/120	33-34
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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	+10%, +20%, +80% / -20%, +100% / -0%
X5U	+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 & X5U - 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
MILITARY & AEROSPACE		
Avionics	X	X
Radar Systems	X	X
Telemetry, Data Tx/Rx		X
Control Systems	X	
MEDICAL		
.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
SEMICONDUCTOR		
RF Tuning Networks		X
RF Power Supplies		X
Semiconductor Manufacturing	X	
SECURITY		
Handheld Scanners		X
Intruder Detection Systems		X
Luggage Scanners		X
Metal/Explosive Detector		X
OTHER		
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
POWER SUPPLY		
HV Power Supply	X	X
Power Station Equipment		X
Power Supply for Air Conditioner, Washing Machine		X
Inverter Power Supply-AC	X	
TELECOM		
Base Station Power amps		X
Broadcasting Equipment		X
MODEM		
DAA Modem		X
xDSL Modem		X
LAN, Router, HUB, Switches		X
RF Power Amplifiers		X
INDUSTRIAL		
Oil Rigging, Down Hole, Mining	X	X

	ELECTRICAL			ENVIRONMENTAL	MECHANICAL
	Voltage Range	Capacitance Range	Dissipation Factor	Operating Temperature Range	Configuration

HIGH VOLTAGE

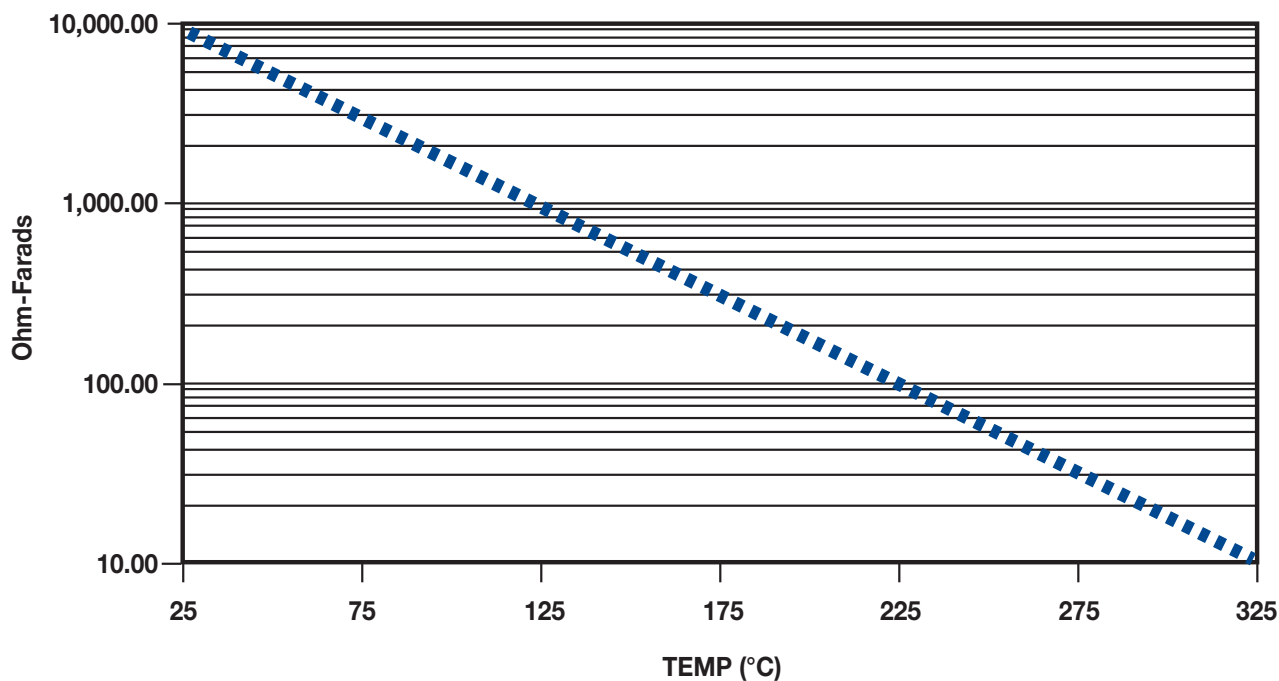
Radial Conformally Coated					
Std	C0G/X7R: 500 to 10k VDC	C0G: 12 pF - .330µF X7R: 220 pF - 5.6 µF	C0G: 0.15% max X7R: 2.5% max	C0G: -55°C to + 125°C X7R: -55°C to + 125°C	Radial
Mil-PRF-49467 Equivalent	C0G/X7R: 600 to 5k VDC	C0G: 12 pF - .68 µF X7R: 27 pF - .47 µF	C0G: 0.15% max X7R: 2.5% max	C0G/X7R: -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 (NPO)	X7R	X7R type	X5U
Temperature Coefficient	0 $\pm$ 30ppm/°C	$\pm$ 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, NPO & X7R DIELECTRICS


FEATURES

The HT/HP Series is used in robust applications

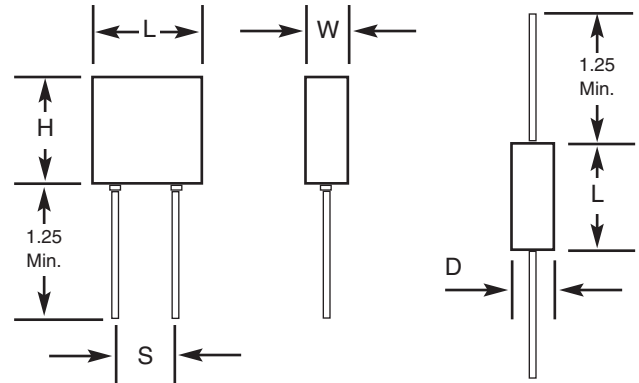
- Down Hole
- Industrial
- Harsh Environments

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

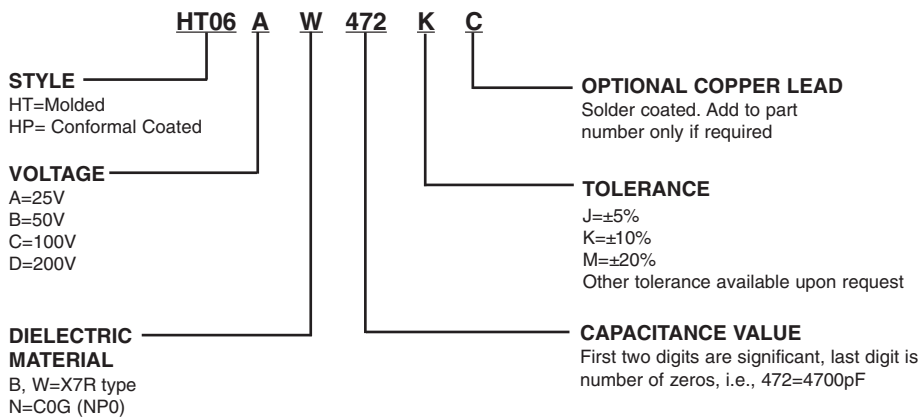
Molded (HT) and Conformal Coated (HP), Radial Lead Types

Style	Sizes in Inches (mm) max			Lead Spacing ±0.030 (S)
	Length (L)	Height (H)	Thickness (W)	
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

Radial		C0G														
Series		HT/HP05			HT/HP55			HT/HP06			HT/HP08			HT/HP09		
	W max	.200 (5.08)			.200 (5.08)			.300 (7.62)			.500 (12.70)			.700 (17.78)		
	H 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	Cap Code	WVDC			WVDC			WVDC			WVDC			WVDC		
		50	100	200	50	100	200	50	100	200	50	100	200	50	100	200
1.0pF	109															
1.2	129															
1.5	159															
1.8	189															
2.2	229															
2.7	279															
3.3	339															
3.9	399															
4.7	479															
5.6	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															

COG & X7R DIELECTRIC

Radial		C0G														
Series		HT/HP05			HT/HP55			HT/HP06			HT/HP08			HT/HP09		
	W max	.200 (5.08)			.200 (5.08)			.300 (7.62)			.500 (12.70)			.700 (17.78)		
	H 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	Cap Code	WVDC			WVDC			WVDC			WVDC			WVDC		
		50	100	200	50	100	200	50	100	200	50	100	200	50	100	200
1.0pF	109															
1.2	129															
1.5	159															
1.8	189															
2.2	229															
2.7	279															
3.3	339															
3.9	399															
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47	470															
56	560															
68	680															
82	820															
100	101															
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330	331															
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560	561															
680	681															
820	821															
1000	102															
1200	122															
1500	152															
1800	182															
2200	222															
2700	272															

FEATURES

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

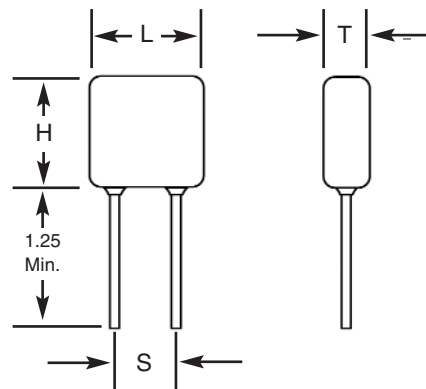
To be used in robust applications

- Down Hole
- Industrial
- Harsh Environments

NOTE:

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

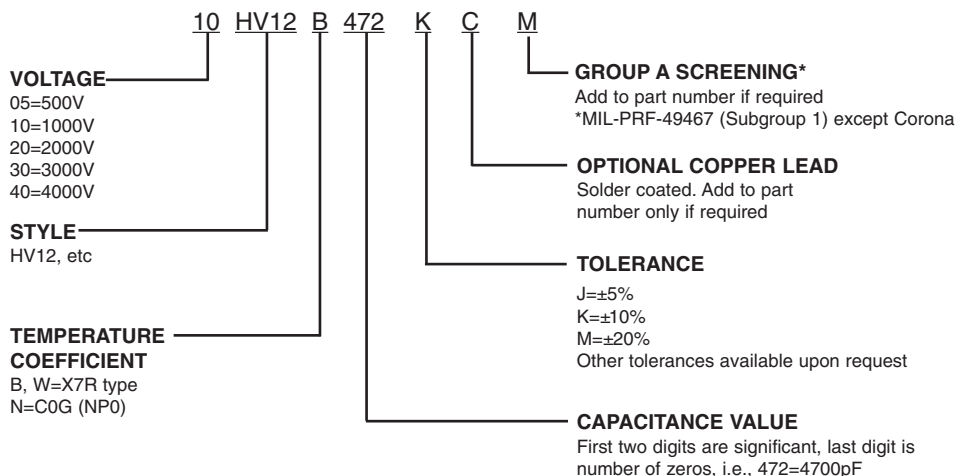
CAPACITOR OUTLINE DRAWING



DIMENSIONS

Style	Sizes in Inches (mm) max.			Lead Spacing ±0.030 (S)
	Length (L)	Height (H)	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

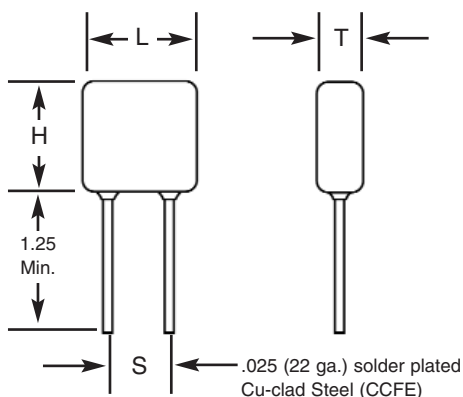
(HV10, HV11)
 472M
 KEC
 Date Code

(All other sizes)
 HV12B472M
 1kV
 KEC
 Date Code

COG DIELECTRIC

[illegible]

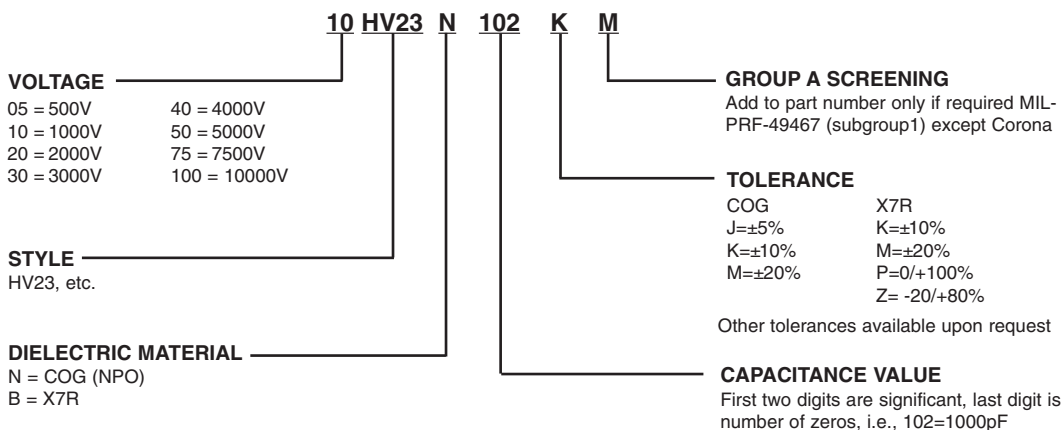
CAPACITOR OUTLINE DRAWING



DIMENSIONS

Style	Sizes in Inches (mm) max.			Lead Spacing ±0.030 (S)
	Length (L)	Height (H)	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

COG DIELECTRIC

[illegible]

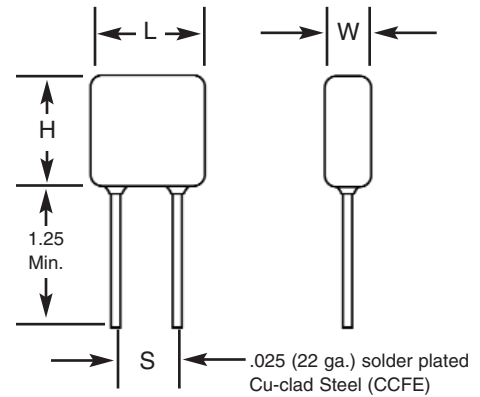
X7R DIELECTRIC

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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. SLAM available by special order.

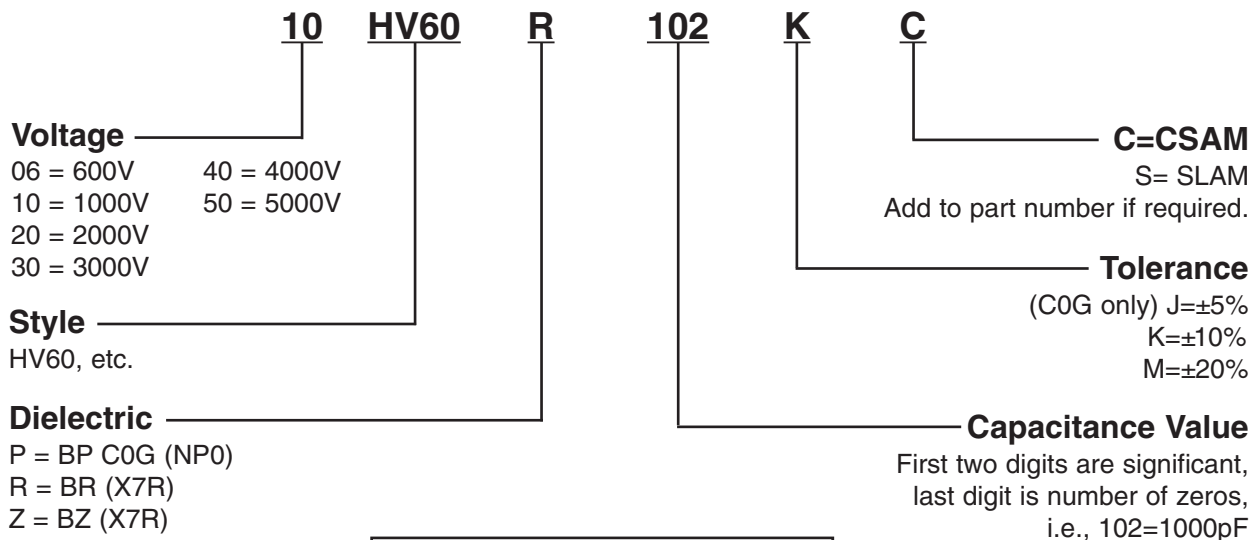
CAPACITOR OUTLINE DRAWING



DIMENSIONS

Style	Sizes in Inches (mm) max.			Lead Spacing ±0.030 (S)
	Length (L)	Height (H)	Thickness (W)	
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		COG	HV60				HV61				HV62				HV63					HV64					HV65					HV66				
	W max		.250 (6.35)				.320 (8.13)				.370(.9.40)				.470 (11.94)					.570 (14.48)					.670 (17.02)					.770 (19.56)				
	L 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. +.004/-.002		.025 (.635)				.025 (.635)				.025 (.635)				.025 (.635)					.025 (.635)					.025 (.635)					.025 (.635)				
Cap	Cap Code		WVDC				WVDC				WVDC				WVDC					WVDC					WVDC					WVDC				
	pF		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
12pF	120																																	
15	150																																	
18	180																																	
22	220																																	
27	270																																	
33	330																																	
39	390																																	
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6800	682																																	
8200	822																																	
.010uF	103																																	
.012	123																																	
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.047	473																																	
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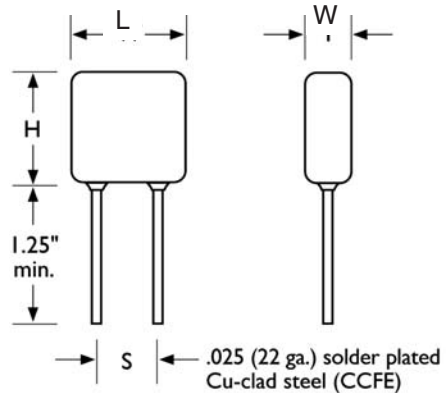
X7R DIELECTRIC

STYLE X7R	HV60	HV61	HV62	HV63	HV64	HV65	HV66	HV68	HV69
Cap	W 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)
	L 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)
	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)
	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)
	Lead Dia. ±.004-.002	.025 (.635)	.025 (.635)	.025 (.635)	.025 (.635)	.025 (.635)	.025 (.635)	.025 (.635)	.025 (.635)
	Cap Code pF	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	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								
.010uF	103								
.012	123								
.015	153								
.018	183								
.022	223								
.027	273								
.033	333								
.039	393								
.047	473								
.056	563								
.068	683								
.082	823								
.10	104								
.12	124								
.15	154								
.18	184								
.22	224								
.27	274								
.33	334								
.39	394								
.47	474								

FEATURES

1. Similar to NASA Spec. SSQ 21113 (1, 2 & 5kV).
2. Conforms to MIL-PRF-49467. (Group A Screening, Subgroup 1)
3. 100% Corona tested.
4. No IR degradation over life.
5. High density, low DF ceramic.
6. Conservative and proven design is recommended for non-repairable applications such as spacecraft.
7. CSAM inspections are available and is recommended for space applications. SLAM available by special order.
8. Burn-in in a non-contaminating inert fluid available.

CAPACITOR OUTLINE DRAWING



DIMENSIONS

Style	Sizes in Inches (mm) max.			Lead Spacing ±0.030 (S)
	Length (L)	Height (H)	Thickness (W)	
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

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

STYLE HS24

HS24, etc.

DIELECTRIC B

B = X7R
 N = BP C0G (NP0)

CAPACITANCE VALUE 103

First two digits are significant, last digit is number of zeros, i.e., 103=10000pF

MARKING

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

C C

C=CSAM
 S=SLAM
 Add to part number if required.

F F

INERT LIQUID (BURN-IN)
 Std. for ≥2kV;
 Add "F" if required for 500V or 1kV parts

TOLERANCE
 J = ±5% (C0G only)
 K = ±10%
 M = ±20%
 P = 0/+100%
 Z = -20%/+80%

COG DIELECTRIC

[illegible]

[illegible]

X7R DIELECTRIC

STYLE X7R		HS20			HS21			HS22			HS23				HS24					HS25						HS26					
Cap	W max	.250 (6.35)			.320 (8.13)			.370 (9.40)			.470 (11.94)				.570 (14.48)					.670 (17.02)						.770 (19.56)					
	L 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. +.004/-.002	.025 (.635)			.025 (.635)			.025 (.635)			.025 (.635)				.025 (.635)					.025 (.635)						.025 (.635)					
	Cap Code	WVDC			WVDC			WVDC			WVDC				WVDC					WVDC						WVDC					
	pF	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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3300	332																														
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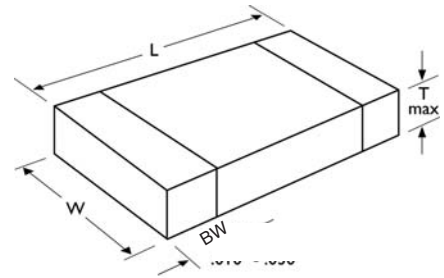
X7R DIELECTRIC

STYLE X7R		HS30				HS31				HS33						HS34						HS35								HS36										
Cap	L max	.450 (11.43)				.550 (13.97)				.850 (21.59)						1.050 (26.67)						1.250 (31.75)								1.450 (36.83)										
	W max	.220 (5.08)				.280 (7.11)				.400 (10.16)						.500 (12.70)						.600 (15.24)								.720 (18.29)										
	T max	.200 (6.86)				.250 (6.35)				.270 (6.89)						.270 (6.89)						.270 (6.89)								.270 (6.89)										
	S ±.030	.300 (7.62)				.400 (10.16)				.700 (17.78)						.975 (24.76)						1.175 (29.84)								1.375 (34.92)										
	Lead Dia. +.004/-.002	.025 (.635)				.025 (.635)				.025 (.635)						.025 (.635)						.025 (.635)								.025 (.635)										
Cap Code		WVDC				WVDC				WVDC						WVDC						WVDC								WVDC										
pF		500	1k	2k	3k	500	1k	2k	3k	4k	500	1k	2k	3k	4k	5k	7.5	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	10k
220pF	221																																							
270	271																																							
330	331																																							
390	391																																							
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.39	394																																							
.47	474																																							
.56	564																																							
.68	684																																							
.82	824																																							
1.0	105																																							
1.2	125																																							
1.5	155																																							
1.8	185																																							
2.2	225																																							

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, BR and BZ available as described in MIL-PRF-49467.
3. Group A and B screening per MIL-PRF-49467 available.
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, end band length dimensions may exceed the standard dimension listed.

CERAMIC CHIP OUTLINE DRAWING

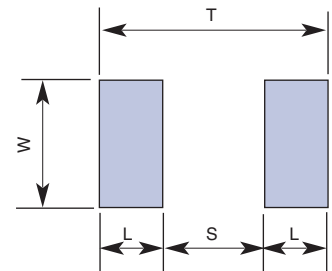


DIMENSIONS

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	5.90	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

4540

Style
1515, 2020, etc.

Dielectric
B or R = X7R
N = COG (NP0)

Capacitance Value
First two digits are significant,
last digit is number of zeros,
i.e., 472=4700pF

Tolerance
J = ±5% COG (NP0)
K = ±10%
M = ±20%
P = 0/+100%
Z = -20%/+80%

B

472

M

202

P

M

Group A Screening*
Add to part number if required
*MIL-PRF-49467
(subgroup 1)
except Corona

Terminal Material
P = PdAg
S = Ag
E = Ag/Ni/SnPb Plate
C = Ag/Ni/Sn Plate

Voltage
First two digits are significant,
last digit is number of zeros,
i.e., 202=2000V

MARKING
Not applicable
As required by customer only.

[illegible]

COG DIELECTRIC

STYLE	COG		4040					4540					5440					5550					6560						
		L	.400 ±.030(10,20±.76)					.450 ±.030(11,43±.76)					.540 ±.030(13,70±.76)					.550 ±.030(14,00±.76)					.650 ±.030(16,50±.76)						
		W	.400 ±.030(10,20±.76)					.400 ±.030(10,20±.76)					.400 ±.030(10,20±.76)					.500 ±.030(10,20±.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	.030 - .060"					.030 - .060"					.030 - .060"					.030 - .060"					.030 - .060"						
Cap	Cap Code pF	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
10pF	100																												
12	120																												
15	150																												
18	180																												
22	220																												
27	270																												
33	330																												
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X7R DIELECTRIC

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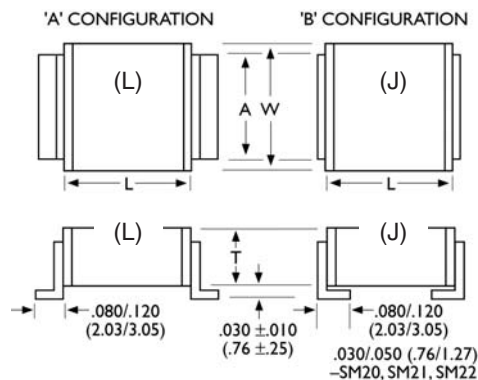
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FEATURES

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

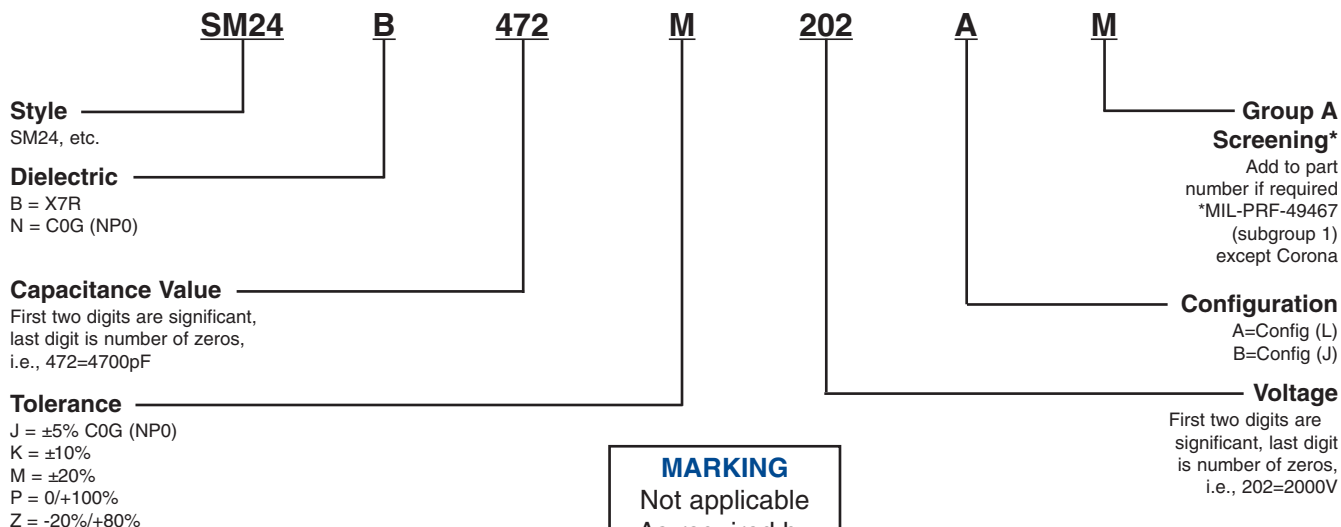
STANDARD



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



MARKING

Not applicable
As required by
customer only.

[illegible]

[illegible]

[illegible]

X7R DIELECTRIC

STYLE X7R	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(7.62 ±.76)	.400 ±.030(10.20 ±.76)	.500 ±.030(12.70 ±.76)	.600 ±.030(15.20 ±.76)
T max	.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 Code	WVDC	WVDC	WVDC	WVDC	WVDC	WVDC
Cap pF	500 1k 2k 3k 4k	500 1k 2k 3k 4k 5k	500 1k 2k 3k 4k 5k 7k	500 1k 2k 3k 4k 5k 7k 10k	500 1k 2k 3k 4k 5k 7k 10k	500 1k 2k 3k 4k 5k 7.5k 10k
150p	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					
.010u	103					
.012	123					
.015	153					
.018	183					
.022	223					
.027	273					
.033	333					
.039	393					
.047	473					
.056	563					
.068	683					
.082	823					
.10	104					
.12	124					
.15	154					
.18	184					
.22	224					
.27	274					
.33	334					
.39	394					
.47	474					
.56	564					
.68	684					
.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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