

# High Voltage Goldmax, 600 Series, Conformally Coated, X7R Dielectric, 500 – 3,000 VDC (Commercial Grade)

## Overview

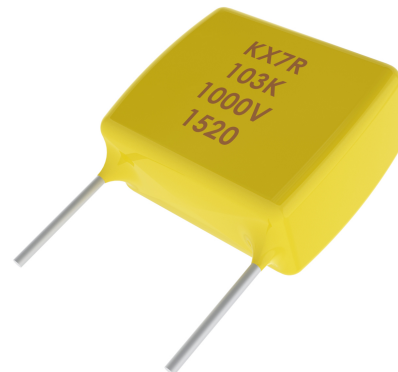
KEMET's 600 Series High Voltage Goldmax conformally coated radial leaded ceramic capacitors meet special lead spacing requirements per MIL-PRF-49467. Offered in X7R dielectric, these capacitors feature a 125°C maximum operating temperature and are considered "temperature stable." The Electronics Industries Alliance (EIA) characterizes X7R dielectric as a Class II material. Components of this classification are fixed, ceramic dielectric capacitors suited for bypass and decoupling applications or for frequency discriminating circuits where Q and stability of capacitance characteristics are not critical. X7R exhibits a predictable change in capacitance with respect to time and voltage and boasts

a minimal change in capacitance with reference to ambient temperature. Capacitance change is limited to  $\pm 15\%$  from  $-55^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$ .

These devices offer low leakage current, exhibit low ESR at high frequencies and find conventional use as snubbers or filters in applications such as switching power supplies and in lighting ballasts. Their exceptional performance at high frequencies has made them a preferred choice of design engineers worldwide. In addition to their use in power supplies, these capacitors are widely used in industries related to telecommunications, medical, military, aerospace, semiconductor and test/diagnostic equipment.

## Benefits

- Radial leaded form factor
- Conformally coated
- Lead spacing per MIL-PRF-49467
- Operating temperature range of  $-55^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$
- RoHS and REACH compliant
- X7R temperature stable dielectric
- DC voltage ratings of 500 V, 1 KV, 1.5 KV, 2 KV, 2.5 KV and 3 KV



## Ordering Information

C	627			C	224	K	C	R	5	T	A	7301
Ceramic	Style/Size			Specification/ Series	Capacitance Code (pF)	Capacitance Tolerance <sup>1</sup>	Rated Voltage (VDC)	Dielectric	Design	Lead Finish <sup>2</sup>	Failure Rate	Packaging (C-Spec)
	617	637	648	C = Standard	First two digits represent significant figures. Third digit specifies number of zeros.	K = $\pm 10\%$ M = $\pm 20\%$ Z = $+80\%$ , $-20\%$	C = 500 D = 1,000 F = 1,500 G = 2,000 Z = 2,500 H = 3,000	R = X7R	5 = Multilayer	T = 100% Matte Sn H = SnPb (60/40)	A = N/A	See "Packaging C-Spec Ordering Options Table" below
	622	638	657									
	623	640	658									
	627	641	667									
	628	642	668									
	630	643										
	631	647										

<sup>1</sup> Additional capacitance tolerance offerings may be available. Contact KEMET for details.

<sup>2</sup> Lead materials:

Standard: 100% matte tin (Sn) with nickel (Ni) underplate and steel core ("T" designation).

Alternative 1: 60% Tin (Sn)/40% Lead (Pb) finish with copper-clad steel core ("H" designation).

Alternative 2: 60% Tin (Sn)/40% Lead (Pb) finish with 100% copper core (available with "H" designation code with C-Spec). Contact KEMET for C-Spec details.

## Benefits cont'd

- Capacitance offerings ranging from 150 pF to 2.9  $\mu$ F
- Available capacitance tolerances of  $\pm 10\%$ ,  $\pm 20\%$  and  $+80\%/-20\%$
- High temperature solder lead attach
- Non-polar device, minimizing installation concerns
- 100% pure matte tin-plated lead finish allowing for excellent solderability
- SnPb-plated lead finish option available upon request (Sn60/Pb40)
- Encapsulation meets flammability standard UL 94V-0

## Applications

Typical applications include switch mode power supplies (input filters, resonators, tank circuits, snubber circuits, output filters), high voltage coupling and DC blocking, lighting ballasts, voltage multiplier circuits, DC/DC converters and coupling capacitors in Cuk converters. Markets include power supply, LCD fluorescent backlight ballasts, HID lighting, telecom equipment, industrial and medical equipment/control, LAN/WAN interface, analog and digital modems, and automotive. X7R dielectrics are not designed for AC line filtering applications.

## Application Notes

X7R dielectric is not recommended for AC line filtering or pulse applications.

## Packaging C-Spec Ordering Options Table

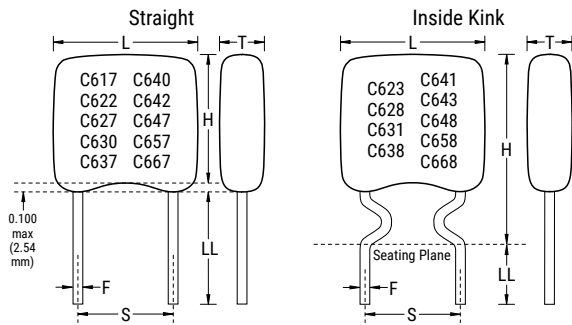
Packaging Type <sup>1</sup>	Packaging/Grade Ordering Code (C-Spec)
Bulk Bag	Not required (Blank)
12" Reel/16.0 mm $\pm 0.5$ lead length	7301
12" Reel/18.0 mm minimum lead length	7303

<sup>1</sup> Default packaging is "Bulk Bag". An ordering code C-Spec is not required for "Bulk Bag" packaging. For more information see "Tape & Reel Packaging Information".

## Qualification/Certification

Commercial Grade products are subject to internal qualification. Details regarding test methods and conditions are referenced in Table 2, Performance & Reliability.

## Dimensions – Inches (Millimeters)



Series	Style/Size	S Lead Spacing Nominal	L Length Maximum	H Height Maximum	T Thickness Maximum	F Lead Diameter Nominal	LL Lead Length Minimum
C61X	617	0.170 (4.32)	0.250 (6.35)	0.220 (5.59)	0.200 (5.08)	0.025 (0.64)	0.276 (7.00)
C62X	622	0.220 (5.59)	0.320 (8.13)	0.280 (7.11)	0.250 (6.35)		
	623	0.220 (5.59)	0.320 (8.13)	0.500 (12.70)	0.250 (6.35)		
	627	0.275 (6.98)	0.370 (9.40)	0.300 (7.62)	0.250 (6.35)		
	628	0.275 (6.98)	0.370 (9.40)	0.520 (13.20)	0.250 (6.35)		
C63X	630	0.300 (7.62)	0.450 (11.40)	0.220 (5.59)	0.200 (5.08)		
	631	0.300 (7.62)	0.450 (11.40)	0.440 (11.17)	0.200 (5.08)		
	637	0.375 (9.52)	0.470 (11.90)	0.400 (10.20)	0.270 (6.89)		
	638	0.375 (9.52)	0.470 (11.90)	0.620 (15.74)	0.270 (6.89)		
C64X	640	0.400 (10.16)	0.550 (14.00)	0.280 (7.11)	0.250 (6.35)		
	641	0.400 (10.16)	0.550 (14.00)	0.780 (19.81)	0.250 (6.35)		
	642	0.400 (10.16)	0.500 (12.70)	0.560 (14.22)	0.200 (5.08)		
	643	0.400 (10.16)	0.500 (12.70)	0.780 (19.81)	0.200 (5.08)		
	647	0.475 (12.06)	0.570 (14.50)	0.500 (12.70)	0.270 (6.89)		
C65X	648	0.475 (12.06)	0.570 (14.50)	0.720 (18.28)	0.270 (6.89)		
	657	0.575 (14.60)	0.670 (17.02)	0.600 (15.24)	0.270 (6.89)		
C66X	658	0.575 (14.60)	0.670 (17.02)	0.820 (20.82)	0.270 (6.89)		
	667	0.675 (17.14)	0.770 (19.56)	0.720 (18.29)	0.270 (6.89)		
	668	0.675 (17.14)	0.770 (19.56)	0.940 (23.87)	0.270 (6.89)		

## Environmental Compliance

REACH and RoHS compliant with exemption when ordered with a 100% tin (Sn) wire lead finish. Product ordered with tin/lead (Sn60/Pb40) wire lead finish do not meet RoHS criteria.

Series	Termination Finish (Wire Lead)	RoHS Compliant	RoHS Exemption Code <sup>1</sup>	REACH Compliant <sup>2</sup>	Halogen Free
600 (C6XX)	100% Matte Sn	Yes	7(c)-II	Yes	Yes
	Sn60/Pb40	No	n/a	Yes	Yes

<sup>1</sup> 7(c)-II: Lead in dielectric ceramic in capacitors for a rated voltage of 125 VAC or 250 VDC or higher

<sup>2</sup> REACH compliance indicates product does not contain Substance/s of Very High Concern (SVHC)

## Electrical Parameters/Characteristics

Item	Parameters/Characteristics
Operating Temperature Range	-55°C to +125°C
Capacitance Change with Reference to +25°C and 0 VDC Applied (TCC)	±15%
Aging Rate (Maximum % Cap Loss/Decade Hour)	3.0%
Dielectric Withstanding Voltage	150% of rated voltage for voltage rating of < 1,000 V 120% of rated voltage for voltage rating of ≥ 1,000 V (5±1 second and charge/discharge not exceeding 50 mA)
Dissipation Factor (DF) Maximum Limit at 25°C	2.5%
Insulation Resistance (IR) Limit at 25°C	1,000 megohm microfarads or 100 GΩ (500 VDC applied for 120±5 seconds at 25°C)

Regarding aging rate: Capacitance measurements (including tolerance) are indexed to a reference time of 1,000 hours.

To obtain IR limit, divide MQ-μF value by the capacitance and compare to GΩ limit. Select the lower of the two limits.

Capacitance and dissipation factor (DF) measured under the following conditions:

1 MHz ±100 kHz and 1.0 V<sub>rms</sub> ±0.2 V if capacitance ≤ 1,000 pF

1 kHz ±50 Hz and 1.0 V<sub>rms</sub> ±0.2 V if capacitance > 1,000 pF

Note: When measuring capacitance it is important to ensure the set voltage level is held constant. The HP4284 and Agilent E4980 have a feature known as Automatic Level Control (ALC). The ALC feature should be switched to "ON."

## Post Environmental Limits

High Temperature Life, Biased Humidity and Storage Life					
Style/Size	Rated DC Voltage	Capacitance Value	Dissipation Factor (Maximum %)	Capacitance Shift	Insulation Resistance
All	All	All	3.0	± 20%	10% of Initial Limit

**Table 1A – C617 Style/Size, Capacitance Range Waterfall**

C617 Style/Size (0.170" Lead Spacing)					
Rated Voltage (VDC)		500	1000	1500	2000
Voltage Code		C	D	F	G
Capacitance	Capacitance Tolerance	Capacitance Code (Available Capacitance)			
820pF	K = ±10% M = ±20% Z = +80%, -20%	821	821	821	821
1000pF		102	102	102	102
1200pF		122	122	122	122
1500pF		152	152	152	152
1800pF		182	182	182	182
2200pF		222	222	222	222
2700pF		272	272	272	272
3300pF		332	332	332	332
3900pF		392	392	392	392
4700pF		472	472	472	472
5600pF		562	562		
6800pF		682	682		
8200pF		822	822		
0.01μF		103	103		
0.012μF		123	123		
0.015μF		153	153		
0.018μF		183	183		
0.022μF		223	223		
0.027μF		273			
0.033μF		333			
0.039μF	393				
0.047μF	473				
0.056μF	563				
0.068μF	683				
0.082μF	823				
Rated Voltage (VDC)		500	1000	1500	2000
Voltage Code		C	D	F	G

**Table 1B – C622 and C623 Style/Size, Capacitance Range Waterfall**

C622 and C623 Style/Size (0.220" Lead Spacing)						
Rated Voltage (VDC)		500	1000	1500	2000	3000
Voltage Code		C	D	F	G	H
Capacitance	Capacitance Tolerance	Capacitance Code (Available Capacitance)				
820pF	K = ±10% M = ±20% Z = +80%, -20%	821	821	821	821	821
1000pF		102	102	102	102	102
1200pF		122	122	122	122	122
1500pF		152	152	152	152	152
1800pF		182	182	182	182	182
2200pF		222	222	222	222	222
2700pF		272	272	272	272	272
3300pF		332	332	332	332	332
3900pF		392	392	392	392	392
4700pF		472	472	472	472	472
5600pF		562	562	562	562	
6800pF		682	682	682	682	
8200pF		822	822	822	822	
0.01µF		103	103	103	103	
0.012µF		123	123	123	123	
0.015µF		153	153			
0.018µF		183	183			
0.022µF		223	223			
0.027µF		273	273			
0.033µF		333	333			
0.039µF		393	393			
0.047µF		473	473			
0.056µF		563	563			
0.068µF		683	683			
0.082µF		823				
0.1µF		104				
0.12µF		124				
0.15µF		154				
0.18µF		184				
Rated Voltage (VDC)			500	1000	1500	2000
Voltage Code		C	D	F	G	H

**Table 1C – C627 and C628 Style/Size, Capacitance Range Waterfall**

C627 and C628 Style/Size (0.275" Lead Spacing)						
Rated Voltage (VDC)		500	1000	1500	2000	3000
Voltage Code		C	D	F	G	H
Capacitance	Capacitance Tolerance	Capacitance Code (Available Capacitance)				
680pF	K = ±10% M = ±20% Z = +80%, -20%	681	681	681	681	681
820pF		821	821	821	821	821
1000pF		102	102	102	102	102
1200pF		122	122	122	122	122
1500pF		152	152	152	152	152
1800pF		182	182	182	182	182
2200pF		222	222	222	222	222
2700pF		272	272	272	272	272
3300pF		332	332	332	332	332
3900pF		392	392	392	392	392
4700pF		472	472	472	472	472
5600pF		562	562	562	562	562
6800pF		682	682	682	682	
8200pF		822	822	822	822	
0.01µF		103	103	103	103	
0.012µF		123	123	123	123	
0.015µF		153	153	153	153	
0.018µF		183	183			
0.022µF		223	223			
0.027µF		273	273			
0.033µF		333	333			
0.039µF		393	393			
0.047µF		473	473			
0.056µF		563	563			
0.068µF		683	683			
0.082µF		823	823			
0.1µF		104	104			
0.12µF		124				
0.15µF		154				
0.18µF		184				
0.22µF	224					
0.27µF	274					
Rated Voltage (VDC)		500	1000	1500	2000	3000
Voltage Code		C	D	F	G	H

**Table 1D – C630 and C631 Style/Size, Capacitance Range Waterfall**

C630 and C631 Style/Size (0.300" Lead Spacing)							
Rated Voltage (VDC)		500	1000	1500	2000	2500	3000
Voltage Code		C	D	F	G	Z	H
Capacitance	Capacitance Tolerance	Capacitance Code (Available Capacitance)					
150pF	K = ±10% M = ±20% Z = +80%, -20%	151	151	151	151	151	151
180pF		181	181	181	181	181	181
220pF		221	221	221	221	221	221
270pF		271	271	271	271	271	271
330pF		331	331	331	331	331	331
390pF		391	391	391	391	391	391
470pF		471	471	471	471	471	471
560pF		561	561	561	561	561	561
680pF		681	681	681	681	681	681
820pF		821	821	821	821	821	821
1000pF		102	102	102	102	102	102
1200pF		122	122	122	122	122	122
1500pF		152	152	152	152	152	152
1800pF		182	182	182	182	182	182
2200pF		222	222	222	222	222	222
2700pF		272	272	272	272	272	272
3300pF		332	332	332	332	332	332
3900pF		392	392	392	392	392	
4700pF		472	472	472	472	472	
5600pF		562	562	562	562	562	
6800pF		682	682	682	682	682	
8200pF		822	822	822	822	822	
0.01µF		103	103	103	103	103	
0.012µF		123	123				
0.015µF		153	153				
0.018µF		183	183				
0.022µF		223	223				
0.027µF		273	273				
0.033µF		333	333				
0.039µF		393	393				
0.047µF		473	473				
0.056µF		563	563				
0.068µF		683					
0.082µF	823						
0.1µF	104						
0.12µF	124						
0.15µF	154						
0.18µF	184						
Rated Voltage (VDC)		500	1000	1500	2000	2500	3000
Voltage Code		C	D	F	G	Z	H



**Table 1E – C637 and C638 Style/Size, Capacitance Range Waterfall**

C637 and C638 Style/Size (0.375" Lead Spacing)							
Rated Voltage (VDC)		500	1000	1500	2000	2500	3000
Voltage Code		C	D	F	G	Z	H
Capacitance	Capacitance Tolerance	Capacitance Code (Available Capacitance)					
1000pF	K = ±10% M = ±20% Z = +80%, -20%	102	102	102	102	102	102
1200pF		122	122	122	122	122	122
1500pF		152	152	152	152	152	152
1800pF		182	182	182	182	182	182
2200pF		222	222	222	222	222	222
2700pF		272	272	272	272	272	272
3300pF		332	332	332	332	332	332
3900pF		392	392	392	392	392	392
4700pF		472	472	472	472	472	472
5600pF		562	562	562	562	562	562
6800pF		682	682	682	682	682	682
8200pF		822	822	822	822	822	822
0.01µF		103	103	103	103	103	103
0.012µF		123	123	123	123	123	123
0.015µF		153	153	153	153	153	153
0.018µF		183	183	183	183		
0.022µF		223	223	223	223		
0.027µF		273	273	273	273		
0.033µF		333	333	333	333		
0.039µF		393	393				
0.047µF		473	473				
0.056µF		563	563				
0.068µF		683	683				
0.082µF		823	823				
0.1µF		104	104				
0.12µF		124	124				
0.15µF		154	154				
0.18µF		184	184				
0.22µF		224	224				
0.27µF		274	274				
0.33µF	334						
0.39µF	394						
0.47µF	474						
0.56µF	564						
Rated Voltage (VDC)		500	1000	1500	2000	2500	3000
Voltage Code		C	D	F	G	Z	H

**Table 1F – C640 and C641 Style/Size, Capacitance Range Waterfall**

C640 and C641 Style/Size (0.400" Lead Spacing)					
Rated Voltage (VDC)		500	1000	2000	3000
Voltage Code		C	D	G	H
Capacitance	Capacitance Tolerance	Capacitance Code (Available Capacitance)			
680pF	K = ±10% M = ±20% Z = +80%, -20%	681	681	681	681
820pF		821	821	821	821
1000pF		102	102	102	102
1200pF		122	122	122	122
1500pF		152	152	152	152
1800pF		182	182	182	182
2200pF		222	222	222	222
2700pF		272	272	272	272
3300pF		332	332	332	332
3900pF		392	392	392	392
4700pF		472	472	472	472
5600pF		562	562	562	562
6800pF		682	682	682	682
8200pF		822	822	822	822
0.01µF		103	103	103	103
0.012µF		123	123	123	
0.015µF		153	153	153	
0.018µF		183	183	183	
0.022µF		223	223	223	
0.027µF		273	273	273	
0.033µF		333	333	333	
0.039µF		393	393		
0.047µF		473	473		
0.056µF		563	563		
0.068µF		683	683		
0.082µF		823	823		
0.1µF		104	104		
0.12µF		124	124		
0.15µF		154	154		
0.18µF		184			
0.22µF		224			
0.27µF		274			
0.33µF		334			
0.39µF	394				
Rated Voltage (VDC)		500	1000	2000	3000
Voltage Code		C	D	G	H

**Table 1G – C642 and C643 Style/Size, Capacitance Range Waterfall**

C642 and C643 Style/Size (0.400" Lead Spacing)					
Rated Voltage (VDC)		500	1000	2000	3000
Voltage Code		C	D	G	H
Capacitance	Capacitance Tolerance	Capacitance Code (Available Capacitance)			
1200pF	K = ±10% M = ±20% Z = +80%, -20%	122	122	122	122
1500pF		152	152	152	152
1800pF		182	182	182	182
2200pF		222	222	222	222
2700pF		272	272	272	272
3300pF		332	332	332	332
3900pF		392	392	392	392
4700pF		472	472	472	472
5600pF		562	562	562	562
6800pF		682	682	682	682
8200pF		822	822	822	822
0.01µF		103	103	103	103
0.012µF		123	123	123	123
0.015µF		153	153	153	
0.018µF		183	183		
0.022µF		223	223		
0.027µF		273	273		
0.033µF		333	333		
0.039µF		393	393		
0.047µF		473	473		
0.056µF		563	563		
0.068µF		683	683		
0.082µF		823	823		
0.1µF		104	104		
0.12µF		124	124		
0.15µF		154	154		
0.18µF		184	184		
0.22µF		224	224		
0.27µF		274			
0.33µF		334			
0.39µF		394			
0.47µF		474			
0.56µF		564			
0.68µF	684				
0.82µF	824				
Rated Voltage (VDC)		500	1000	2000	3000
Voltage Code		C	D	G	H

**Table 1H – C647 and C648 Style/Size, Capacitance Range Waterfall**

C647 & C648 Style/ Size (0.475" Lead Spacing)					
Rated Voltage (VDC)		500	1000	2000	3000
Voltage Code		C	D	G	H
Capacitance	Capacitance Tolerance	Capacitance Code (Available Capacitance)			
1000pF	K = ±10% M = ±20% Z = +80%, -20%	102	102	102	102
1200pF		122	122	122	122
1500pF		152	152	152	152
1800pF		182	182	182	182
2200pF		222	222	222	222
2700pF		272	272	272	272
3300pF		332	332	332	332
3900pF		392	392	392	392
4700pF		472	472	472	472
5600pF		562	562	562	562
6800pF		682	682	682	682
8200pF		822	822	822	822
0.01µF		103	103	103	103
0.012µF		123	123	123	123
0.015µF		153	153	153	153
0.018µF		183	183	183	183
0.022µF		223	223	223	223
0.027µF		273	273	273	273
0.033µF		333	333	333	333
0.039µF		393	393	393	
0.047µF		473	473	473	
0.056µF		563	563	563	
0.068µF		683	683	683	
0.082µF		823	823	823	
0.1µF		104	104	104	
0.12µF		124	124		
0.15µF		154	154		
0.18µF		184	184		
0.22µF		224	224		
0.27µF		274	274		
0.33µF		334	334		
0.39µF		394	394		
0.47µF		474	474		
0.56µF	564				
0.68µF	684				
0.82µF	824				
1.0µF	105				
1.2µF	125				
Rated Voltage (VDC)		500	1000	2000	3000
Voltage Code		C	D	G	H

**Table 11 – C657 and C658 Style/Size, Capacitance Range Waterfall**

C657 & C658 Style/Size (0.575" Lead Spacing)					
Rated Voltage (VDC)		500	1000	2000	3000
Voltage Code		C	D	G	H
Capacitance	Capacitance Tolerance	Capacitance Code (Available Capacitance)			
2200pF	K = ±10% M = ±20% Z = +80%, -20%	222	222	222	222
2700pF		272	272	272	272
3300pF		332	332	332	332
3900pF		392	392	392	392
4700pF		472	472	472	472
5600pF		562	562	562	562
6800pF		682	682	682	682
8200pF		822	822	822	822
0.01µF		103	103	103	103
0.012µF		123	123	123	123
0.015µF		153	153	153	153
0.018µF		183	183	183	183
0.022µF		223	223	223	223
0.027µF		273	273	273	273
0.033µF		333	333	333	333
0.039µF		393	393	393	393
0.047µF		473	473	473	473
0.056µF		563	563	563	
0.068µF		683	683	683	
0.082µF		823	823	823	
0.1µF		104	104	104	
0.12µF		124	124	124	
0.15µF		154	154		
0.18µF		184	184		
0.22µF		224	224		
0.27µF		274	274		
0.33µF		334	334		
0.39µF		394	394		
0.47µF		474	474		
0.56µF		564	564		
0.68µF		684	684		
0.82µF		824	824		
1.0µF		105			
1.2µF	125				
1.5µF	155				
1.8µF	185				
Rated Voltage (VDC)		500	1000	2000	3000
Voltage Code		C	D	G	H

**Table 1J – C667 and C668 Style/Size, Capacitance Range Waterfall**

C667 & C668 Style/Size (0.675" Lead Spacing)					
Rated Voltage (VDC)		500	1000	2000	3000
Voltage Code		C	D	G	H
Capacitance	Capacitance Tolerance	Capacitance Code (Available Capacitance)			
2200pF	K = ±10% M = ±20% Z = +80%, -20%	222	222	222	222
2700pF		272	272	272	272
3300pF		332	332	332	332
3900pF		392	392	392	392
4700pF		472	472	472	472
5600pF		562	562	562	562
6800pF		682	682	682	682
8200pF		822	822	822	822
0.01µF		103	103	103	103
0.012µF		123	123	123	123
0.015µF		153	153	153	153
0.018µF		183	183	183	183
0.022µF		223	223	223	223
0.027µF		273	273	273	273
0.033µF		333	333	333	333
0.039µF		393	393	393	393
0.047µF		473	473	473	473
0.056µF		563	563	563	563
0.068µF		683	683	683	683
0.082µF		823	823	823	823
0.1µF		104	104	104	104
0.12µF		124	124	124	
0.15µF		154	154	154	
0.18µF		184	184	184	
0.22µF		224	224		
0.27µF		274	274		
0.33µF		334	334		
0.39µF		394	394		
0.47µF		474	474		
0.56µF		564	564		
0.68µF	684	684			
0.82µF	824	824			
1.0µF	105	105			
1.2µF	125				
1.5µF	155				
1.8µF	185				
2.2µF	225				
2.7µF	275				
2.9µF	295				
Rated Voltage (VDC)		500	1000	2000	3000
Voltage Code		C	D	G	H

## Packaging Quantities

Style/ Size	Standard Bulk Quantity	Ammo Pack Quantity Maximum	Reel Quantity Maximum (12" Reel)
617	250/Bag	N/A	1000
622/623	100/Bag		500
627/628			
630/631			
637/638	50/Bag		
640/641			
642/643			
647/648	25		250
657/658			
667/668			

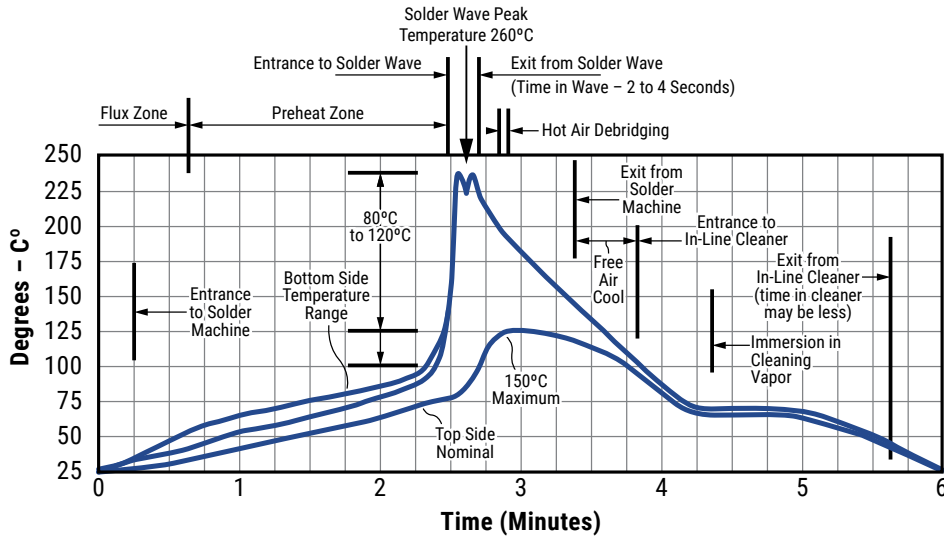
## Soldering Process

### Recommended Soldering Methods:

- Solder Wave
- Hand Soldering (Manual)

### Recommended Soldering Profile:

- Optimum Wave Solder Profile



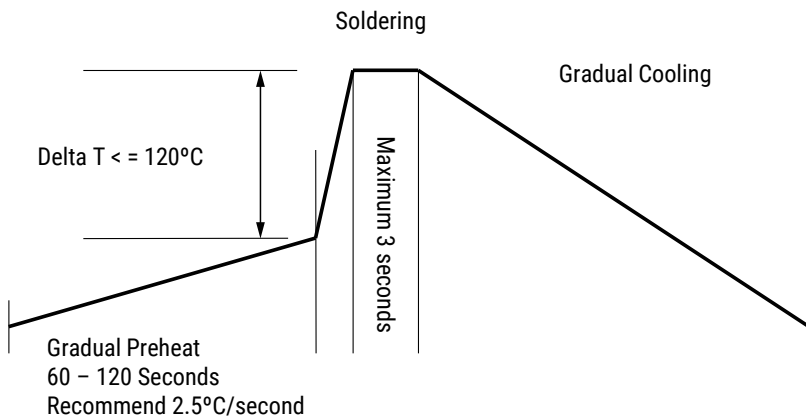
## Mounting

All encased capacitors will pass the Resistance to Soldering Heat of MIL-STD-202, Method 210, Condition C. This test simulates wave solder topside board mount product. This demonstration of resistance to solder heat is in accordance with what is believed to be the industry standard. More severe treatment must be considered reflective of an improper soldering process.

The above figure is a recommended solder wave profile for both axial and radial leaded ceramic capacitors.

- Hand Soldering (Manual)

### Manual Solder Profile with Pre-heating





**Table 2 – Performance & Reliability: Test Methods and Conditions**

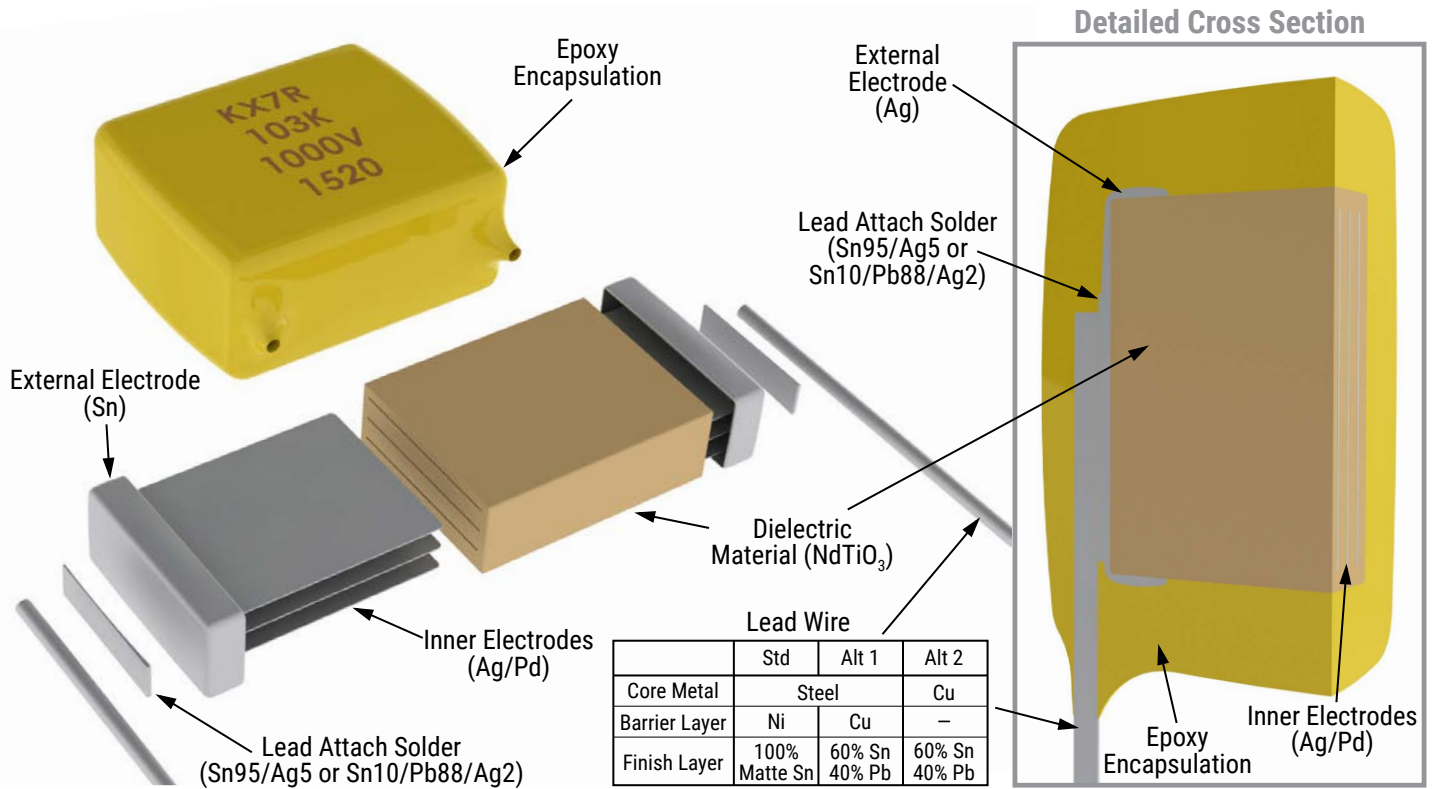
Stress	Reference	Test or Inspection Method
Solderability	J-STD-002	Magnification 50X. Conditions: a) Method A, at 235°C, Category 3
Temperature Cycling	JESD22 Method JA-104	1,000 cycles (-55°C to +125°C), measurement at 24 hours +/-4 hours after test conclusion.
Biased Humidity	MIL-STD-202 Method 103	Load humidity, 1,000 hours 85°C/85%RH and 200Vdc maximum. Add 100 K ohm resistor. Measurement at 24 hours +/-4 hours after test conclusion.
		Low volt humidity, 1,000 hours 85°C/85%RH and 1.5 V. Add 100 K ohm resistor. Measurement at 24 hours +/-4 hours after test conclusion.
Moisture Resistance	MIL-STD-202 Method 106	t = 24 hours/cycle. Steps 7a and 7b not required. Unpowered. Measurement at 24 hours +/-4 hours after test conclusion.
Thermal Shock	MIL-STD-202 Method 107	-55°C to +125°C. Note: Number of cycles required – 300. Maximum transfer time – 20 seconds. Dwell time – 15 minutes. Air – Air.
High Temperature Life	MIL-STD-202 Method 108/EIA-198	1,000 hours at 125°C with 1.2 X rated voltage applied.
Storage Life	MIL-STD-202 Method 108	125°C, 0 VDC for 1,000 hours.
Vibration	MIL-STD-202 Method 204	5 g for 20 minutes, 12 cycles each of 3 orientations. Note: Use 8"X5" PCB .031" thick 7 secure points on one long side and 2 secure points at corners of opposite sides. Parts mounted within 2" from any secure point. Test from 10-2000 Hz.
Resistance to Soldering Heat	MIL-STD-202 Method 210	Condition B. No preheat of samples. Note: single wave solder – procedure 2.
Terminal Strength	MIL-STD-202 Method 211	Conditions A (454g), Condition C (227g)
Mechanical Shock	MIL-STD-202 Method 213	Figure 1 of Method 213, Condition C.
Resistance to Solvents	MIL-STD-202 Method 215	Add aqueous wash chemical – OKEM Clean or equivalent.

## Storage & Handling

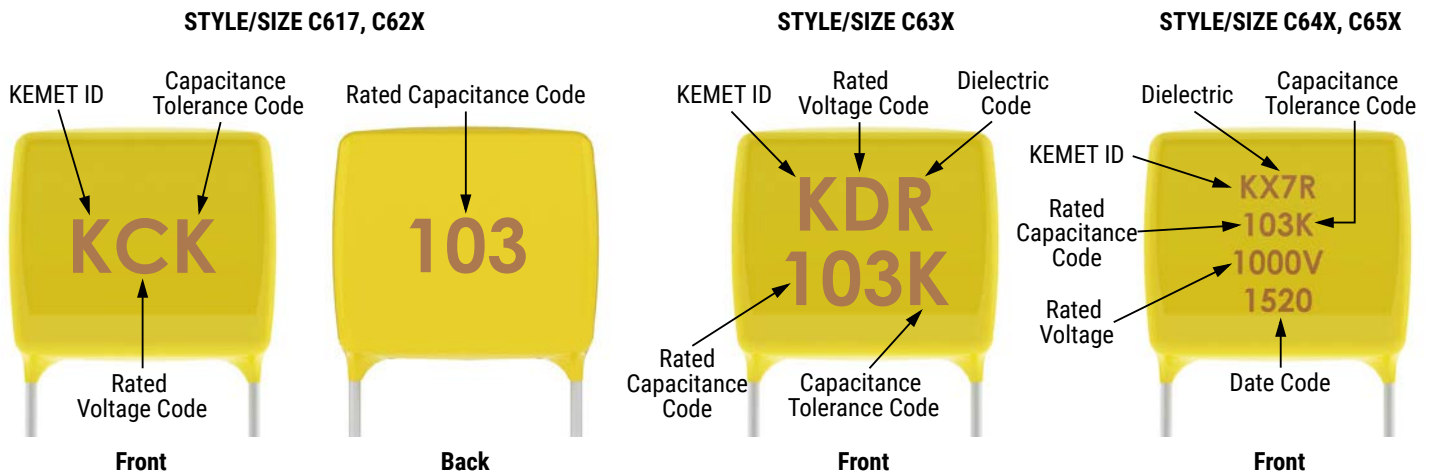
The un-mounted storage life of a leaded ceramic capacitor is dependent upon storage and atmospheric conditions as well as packaging materials. While the ceramic chips enveloped under the epoxy coating themselves are quite robust in most environments, solderability of the wire lead on the final epoxy-coated product will be degraded by exposure to high temperatures, high humidity, corrosive atmospheres, and long term storage. In addition, packaging materials will be degraded by high temperature and exposure to direct sunlight – reels may soften or warp, and tape peel force may increase.

KEMET recommends storing the un-mounted capacitors in their original packaging, in a location away from direct sunlight, and where the temperature and relative humidity do not exceed 40 degrees centigrade and 70% respectively. For optimum solderability, capacitor stock should be used promptly, preferably within 18 months of receipt. For applications requiring pre-tinning of components, storage life may be extended if solderability is verified. Before cleaning, bonding or molding these devices, it is important to verify that your process does not affect product quality and performance. KEMET recommends testing and evaluating the performance of a cleaned, bonded or molded product prior to implementing and/or qualifying any of these processes.

## Construction



## Marking



Date Code	
15	20
Manufacturing Year: 15 = 2015	Manufacturing Week: 20 = Week 20 (of mfg. calendar year)

## Tape & Reel Packaging Information

KEMET offers standard reeling of Molded and Conformally Coated Radial Leaded Capacitors in accordance with EIA standard 468. Parts are taped to a tagboard carrier strip, and wound on a reel as shown in Figure 1. Kraft paper interleafing is inserted between the layers of capacitors on the reel. Ammopack is also available, with the same lead tape configuration and package quantities.

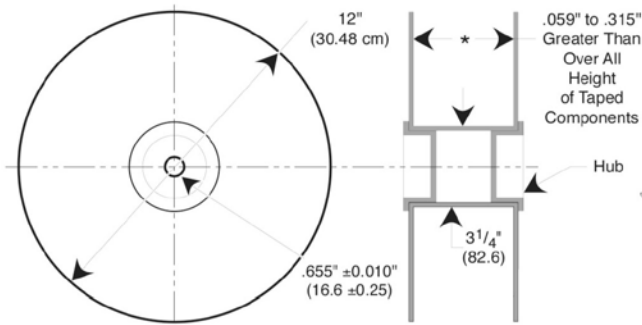


Figure 3: Standard Reel

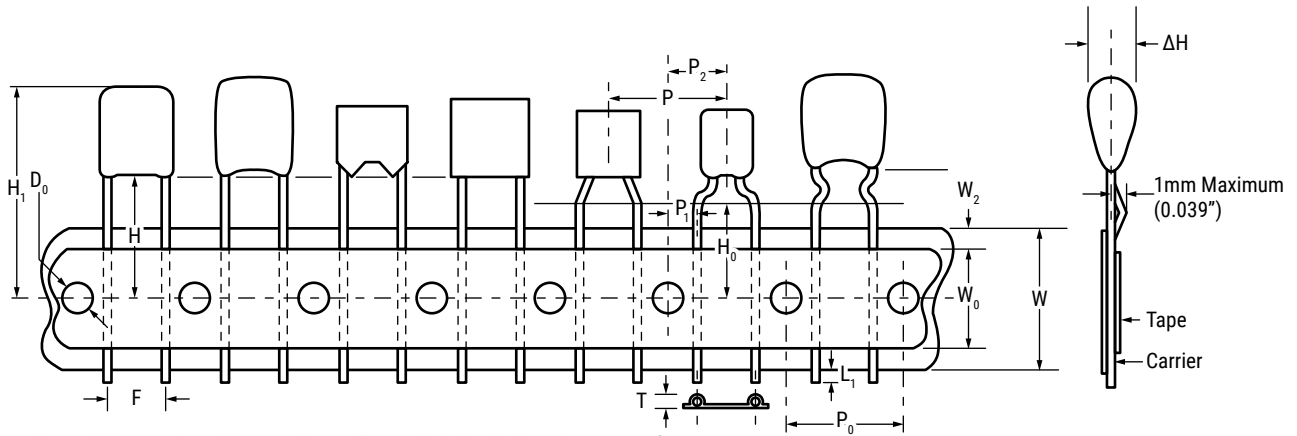
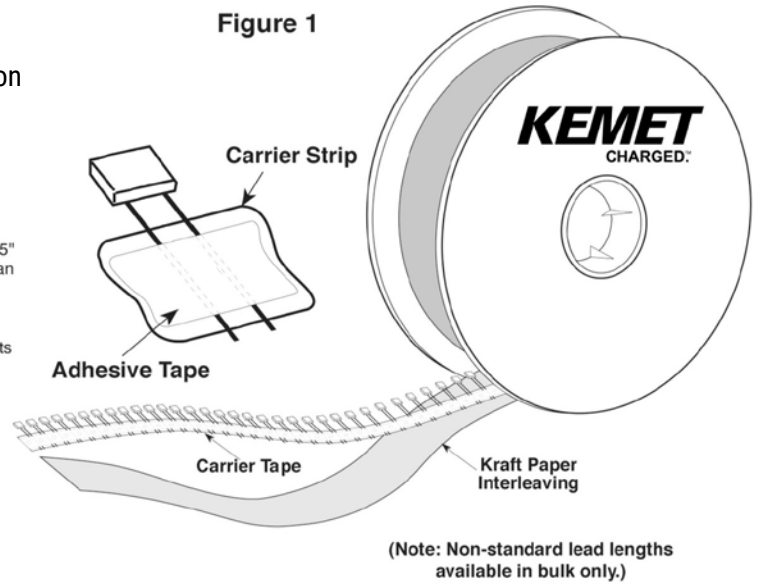


Figure 2: Lead Tape Configuration (See Table Below)

## Ceramic Radial Tape and Reel Dimensions

Metric will govern

Constant Dimensions – Millimeters (Inches)								
$D_0$ ±0.2 (0.008)	$P_0$ ±0.3 (0.012)	$\Delta H$ ±0.2 (0.008)	$L_1$ Maximum	$t$ ±0.2 (0.008)	$T$ Maximum	$W$ +1.0/-0.5 (+0.039/-0.020)	$W_0$ Minimum	$W_2$ Maximum
4.00 (0.157)	12.7 (0.500)	4.0 (0.157)	1.0 (0.039)	0.7 (0.051)	1.5 (0.059)	18.0 (0.709)	5.0 (0.197)	3.0 (0.118)

## Ceramic Radial Tape and Reel Dimensions cont'd

Metric will govern

Variable Dimensions – Millimeters (Inches)							
F ±0.78 (0.030) <sup>1</sup>	P <sub>1</sub> ±0.30 (0.012) <sup>1</sup>	P ±0.3 (0.012)	P <sub>2</sub> ±1.3 (0.51)	H		H <sub>0</sub>	
				Straight Lead Configuration		Formed Lead Configuration <sup>2</sup>	
				Packaging C-Spec <sup>3</sup>			
				7301/7305	7303/7317	7301/7305	7303/7317
2.54 (0.100)	5.08 (0.200)	12.7 (0.500)	6.35 (0.250)	16.0±0.5 (0.630±0.020)	18.0 (0.709) Minimum	16.0±0.5 (0.630±0.020)	18.0 (0.709) Minimum
4.32 (0.170)	3.89 (0.153)	12.7 (0.500)	6.35 (0.250)				
5.08 (0.200)	3.81 (0.150)	12.7 (0.500)	6.35 (0.250)				
5.59 (0.220)	3.25 (0.128)	12.7 (0.500)	6.35 (0.250)				
6.98 (0.275)	2.54 (0.100)	12.7 (0.500)	6.35 (0.250)				
7.62 (0.300)	2.24 (0.088)	12.7 (0.500)	6.35 (0.250)				
9.52 (0.375)	7.62 (0.300)	12.7 (0.500)	6.35 (0.250)				
10.16 (0.400)	7.34 (0.290)	25.4 (1.000)	N/A				
12.06 (0.475)	6.35 (0.250)	25.4 (1.000)	N/A				
14.60 (0.575)	5.08 (0.200)	25.4 (1.000)	N/A				
17.14 (0.675)	3.81 (0.15)	25.4 (1.000)	N/A				

<sup>1</sup> Measured at the egress from the carrier tape, on the component side.

<sup>2</sup> Formed lead configuration includes: "shoulder bend", "inside kink", "outside kink", and "snap-in". For more information regarding available lead configurations see "Dimensions" section of this document.

<sup>3</sup> The "Packaging C-Spec" is a 4 digit code which identifies the packaging type, lead length and/or lead material. When ordering, the proper code must be included in the 15th through 18th character positions of the ordering code. See "Ordering Information" section of this document for further details.

Symbol Reference Table	
D <sub>0</sub>	Sprocket Hole Diameter
P <sub>0</sub>	Sprocket Hole Pitch
P	Component Pitch
F	Lead Spacing
P <sub>1</sub>	Sprocket Hole Center to Lead Center
P <sub>2</sub>	Sprocket Hole Center To Component Center
H	Height to Seating Plane (Straight Leads Only)
H <sub>0</sub>	Height to Seating Plane (Formed Leads Only)
H <sub>1</sub>	Component Height Above Tape Center
ΔH	Component Alignment
L <sub>1</sub>	Lead Protrusion
t	Composite Tape Thickness
W	Carrier Tape Width
W <sub>0</sub>	Hold-Down Tape Width
W <sub>2</sub>	Hold-Down Tape Location

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