

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

## Overview

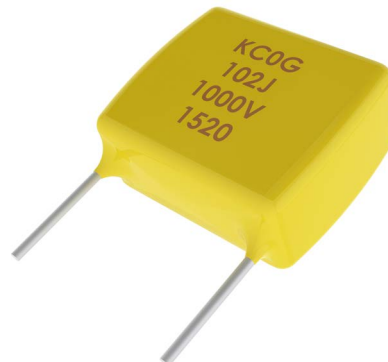
KEMET's 600 Series High Voltage Goldmax conformally coated radial leaded ceramic capacitors meet special lead spacing requirements per MIL-PRF-49467. Offered in COG dielectric, these capacitors feature a 125°C maximum operating temperature. The Electronics Industries Alliance (EIA) characterizes COG dielectric as a Class I "stable" material. Components of this classification are temperature compensating and are suited for resonant circuit applications or those where Q and stability of capacitance characteristics are required. COG exhibits no change in capacitance with respect to time and voltage and boasts a negligible change in capacitance with reference to

ambient temperature. Capacitance change is limited to  $\pm 30$  ppm/°C from -55°C to +125°C.

These devices exhibit low ESR at high frequencies and find conventional use as snubbers or filters in applications such as switching power supplies and 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, semiconductors and test/diagnostic equipment.

## Benefits

- Radial leaded form factor
- Conformally coated
- Lead spacing per MIL-PRF-49467
- Operating temperature range of -55°C to +125°C
- RoHS and REACH compliant
- DC voltage ratings of 500 V, 1 KV, 1.5 KV, 2 KV, 2.5 KV, and 3 KV
- Capacitance offerings ranging from 12 pF up to 0.1  $\mu$ F



## Ordering Information

C	627			C	224	K	C	G	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	G = COG	5 = Multilayer	T = 100% Matte Sn H = SnPb (60/40)	A = N/A	See "Packaging C-Spec Ordering Options Table"
	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.

- Available capacitance tolerances of  $\pm 5\%$ ,  $\pm 10\%$  and  $\pm 20\%$
- High temperature solder lead attach
- Extremely low ESR and ESL
- High thermal stability
- High ripple current capability
- Negligible capacitance change with respect to temperature from  $-55^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$
- No capacitance change with respect to applied rated DC voltage
- No capacitance decay with time
- 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, snubbed circuits, output filters), high voltage coupling and DC blocking, lighting ballasts, voltage multiplier circuits, DC/DC converters and coupling capacitors in Ćuk 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.

## Application Notes

These devices are not recommended for use in overmold applications and/or processes.

## Packaging C-Spec Ordering Options Table

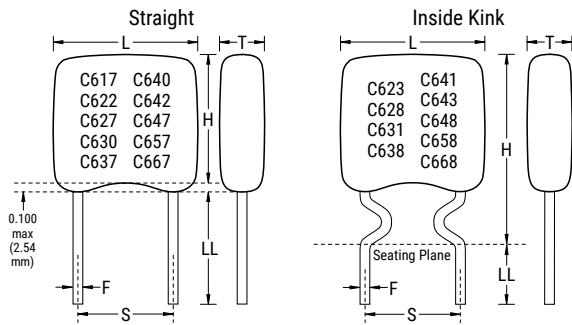
Packaging Type <sup>1</sup>	Packaging/Grade Ordering Code (C-Spec)
Bulk Bag	Not required (Blank)
12" Tape & Reel (16.0 $\pm$ 0.5 mm lead length)	7301
12" Tape & Reel (18.0 mm minimum lead length)	7303 and TR

<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)	±30 ppm/°C
Aging Rate (Maximum % Cap Loss/Decade Hour)	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	0.1%
Insulation Resistance (IR) Limit at 25°C	1,000 megohm microfarads or 100 GΩ (500 VDC applied for 120±5 seconds at 25°C)

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
COG	All	All	0.5	0.3% or ±0.25 pF	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	3000
Voltage Code		C	D	F	G	H
Capacitance	Capacitance Tolerance	Capacitance Code (Available Capacitance)				
12pF	J = ±5% K = ±10% M = ±20%	120	120			
15pF		150	150	150	150	150
18pF		180	180	180	180	180
22pF		220	220	220	220	220
27pF		270	270	270	270	270
33pF		330	330	330	330	330
39pF		390	390	390	390	390
47pF		470	470	470	470	470
56pF		560	560	560	560	560
68pF		680	680	680	680	680
82pF		820	820	820	820	820
100pF		101	101	101	101	101
120pF		121	121	121	121	121
150pF		151	151	151	151	151
180pF		181	181	181	181	181
220pF		221	221	221	221	221
270pF		271	271	271	271	271
330pF		331	331	331	331	331
390pF		391	391	391	391	
470pF		471	471	471	471	
560pF		561	561	561	561	
680pF		681	681	681	681	
820pF		821	821			
1000pF		102	102			
1200pF		122	122			
1500pF		152	152			
1800pF		182	182			
2200pF		222	222			
2700pF		272				
3300pF		332				
3900pF	392					
4700pF	472					
Rated Voltage (VDC)		500	1000	1500	2000	3000
Voltage Code		C	D	F	G	H

**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)				
22pF	J = ±5% K = ±10% M = ±20%	220	220	220	220	220
27pF		270	270	270	270	270
33pF		330	330	330	330	330
39pF		390	390	390	390	390
47pF		470	470	470	470	470
56pF		560	560	560	560	560
68pF		680	680	680	680	680
82pF		820	820	820	820	820
100pF		101	101	101	101	101
120pF		121	121	121	121	121
150pF		151	151	151	151	151
180pF		181	181	181	181	181
220pF		221	221	221	221	221
270pF		271	271	271	271	271
330pF		331	331	331	331	331
390pF		391	391	391	391	391
470pF		471	471	471	471	471
560pF		561	561	561	561	561
680pF		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			
2700pF		272	272			
3300pF		332	332			
3900pF		392	392			
4700pF	472	472				
Rated Voltage (VDC)		500	1000	1500	2000	3000
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)				
33pF	J = ±5% K = ±10% M = ±20%	330	330	330	330	330
39pF		390	390	390	390	390
47pF		470	470	470	470	470
56pF		560	560	560	560	560
68pF		680	680	680	680	680
82pF		820	820	820	820	820
100pF		101	101	101	101	101
120pF		121	121	121	121	121
150pF		151	151	151	151	151
180pF		181	181	181	181	181
220pF		221	221	221	221	221
270pF		271	271	271	271	271
330pF		331	331	331	331	331
390pF		391	391	391	391	391
470pF		471	471	471	471	471
560pF		561	561	561	561	561
680pF		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	
1800pF		182	182	182	182	
2200pF		222	222	222	222	
2700pF		272	272	272	272	
3300pF		332	332	332	332	
3900pF		392	392			
4700pF		472	472			
5600pF		562	562			
6800pF		682	682			
8200pF		822				
0.01µF	103					
0.012µF	123					
0.015µF	153					
0.018µF	183					
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	2000	2500	3000
Voltage Code		C	D	G	Z	H
Capacitance	Capacitance Tolerance	Capacitance Code (Available Capacitance)				
15pF	J = ±5% K = ±10% M = ±20%	150	150	150	150	150
18pF		180	180	180	180	180
22pF		220	220	220	220	220
27pF		270	270	270	270	270
33pF		330	330	330	330	330
39pF		390	390	390	390	390
47pF		470	470	470	470	470
56pF		560	560	560	560	560
68pF		680	680	680	680	680
82pF		820	820	820	820	820
100pF		101	101	101	101	101
120pF		121	121	121	121	121
150pF		151	151	151	151	151
180pF		181	181	181	181	181
220pF		221	221	221	221	221
270pF		271	271	271	271	271
330pF		331	331	331	331	331
390pF		391	391	391	391	391
470pF		471	471	471	471	471
560pF		561	561	561	561	561
680pF		681	681	681	681	681
820pF		821	821	821		
1000pF		102	102	102		
1200pF		122	122	122		
1500pF		152	152	152		
1800pF		182	182	182		
2200pF		222	222			
2700pF		272	272			
3300pF		332	332			
3900pF		392	392			
4700pF	472	472				
5600pF	562	562				
Rated Voltage (VDC)		500	1000	2000	2500	3000
Voltage Code		C	D	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)					
82pF	J = ±5% K = ±10% M = ±20%	820	820	820	820	820	820
100pF		101	101	101	101	101	101
120pF		121	121	121	121	121	121
150pF		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	
3300pF		332	332	332	332		
3900pF		392	392	392	392		
4700pF		472	472	472	472		
5600pF		562	562	562	562		
6800pF		682	682				
8200pF		822	822				
0.01μF		103	103				
0.012μF		123	123				
0.015μF		153	153				
0.018μF		183					
0.022μF		223					
0.027μF		273					
0.033μF		333					
Rated Voltage (VDC)			500	1000	1500	2000	2500
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)			
270pF	J = ±5% K = ±10% M = ±20%	271	271	271	271
330pF		331	331	331	331
390pF		391	391	391	391
470pF		471	471	471	471
560pF		561	561	561	561
680pF		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	
3300pF		332	332	332	
3900pF		392	392	392	
4700pF		472	472	472	
5600pF		562	562	562	
6800pF		682	682		
8200pF		822	822		
0.01μF		103	103		
0.012μF		123	123		
0.015μF		153			
0.018μF		183			
0.022μF		223			
0.027μF		273			
0.033μF		333			
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)			
100pF	J = ±5% K = ±10% M = ±20%	101	101	101	101
120pF		121	121	121	121
150pF		151	151	151	151
180pF		181	181	181	181
220pF		221	221	221	221
270pF		271	271	271	271
330pF		331	331	331	331
390pF		391	391	391	391
470pF		471	471	471	471
560pF		561	561	561	561
680pF		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	
3300pF		332	332	332	
3900pF		392	392	392	
4700pF		472	472	472	
5600pF		562	562	562	
6800pF		682	682	682	
8200pF		822	822	822	
0.01µF	103	103			
0.012µF	123	123			
0.015µF	153	153			
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)			
56pF	J = ±5% K = ±10% M = ±20%	560	560	560	560
68pF		680	680	680	680
82pF		820	820	820	820
100pF		101	101	101	101
120pF		121	121	121	121
150pF		151	151	151	151
180pF		181	181	181	181
220pF		221	221	221	221
270pF		271	271	271	271
330pF		331	331	331	331
390pF		391	391	391	391
470pF		471	471	471	471
560pF		561	561	561	561
680pF		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	
6800pF		682	682	682	
8200pF		822	822	822	
0.01μF		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			
Rated Voltage (VDC)		500	1000	2000	3000
Voltage Code		C	D	G	H

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

C657 and 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)				
180pF	J = ±5% K = ±10% M = ±20%	181	181	181	181	
220pF		221	221	221	221	
270pF		271	271	271	271	
330pF		331	331	331	331	
390pF		391	391	391	391	
470pF		471	471	471	471	
560pF		561	561	561	561	
680pF		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		
8200pF		822	822	822		
0.01µF		103	103	103		
0.012µF		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			
Rated Voltage (VDC)		500	1000	2000	3000	
Voltage Code		C	D	G	H	

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

C667 and 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)			
180pF	J = ±5% K = ±10% M = ±20%	181	181	181	181
220pF		221	221	221	221
270pF		271	271	271	271
330pF		331	331	331	331
390pF		391	391	391	391
470pF		471	471	471	471
560pF		561	561	561	561
680pF		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	
0.012μF		123	123	123	
0.015μF		153	153	153	
0.018μF		183	183	183	
0.022μF		223	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				
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			

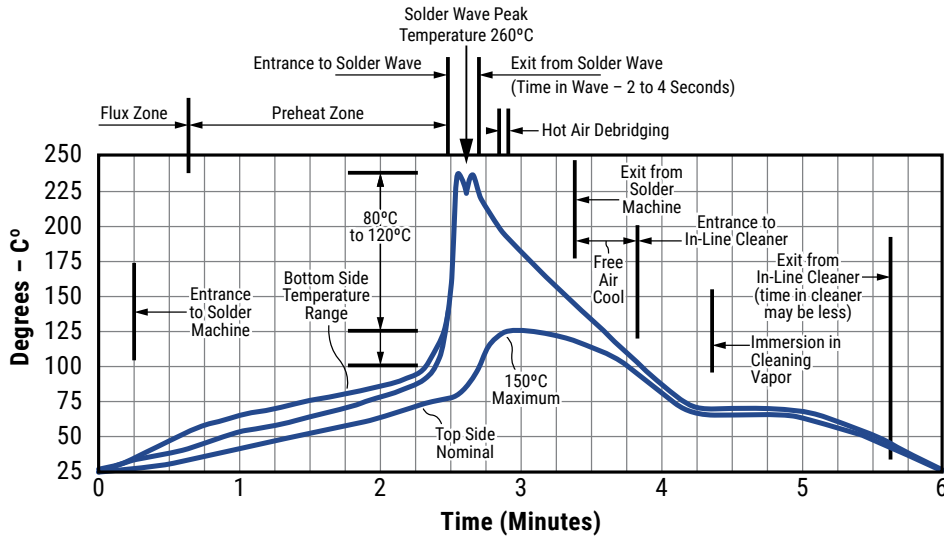
## Soldering Process

### Recommended Soldering Methods:

- Solder Wave
- Hand Soldering (Manual)

### Recommended Soldering Profile:

- Optimum Wave Solder Profile



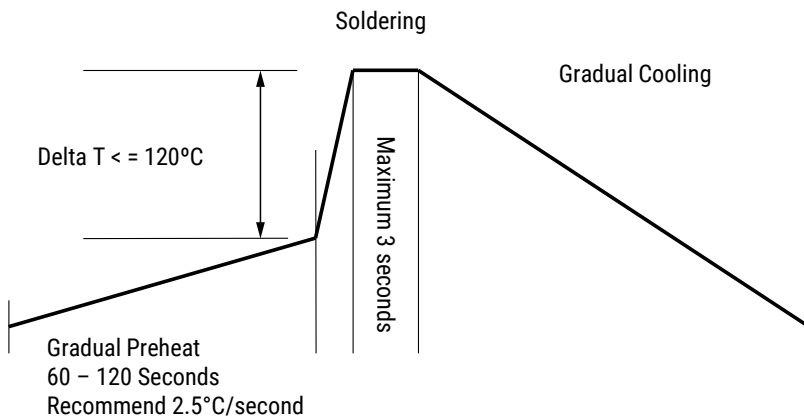
### Mounting

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**

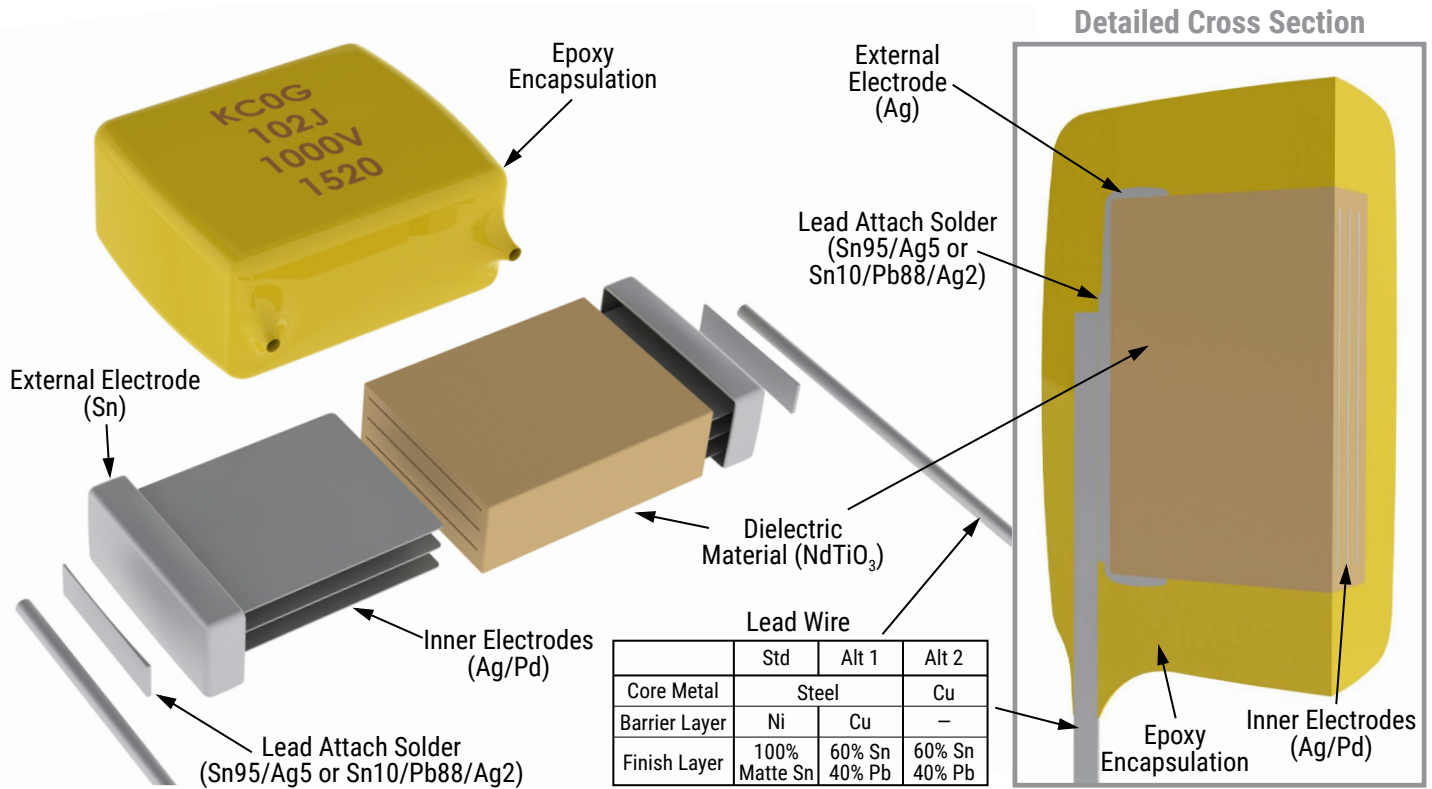
Stress	Reference	Test or Inspection Method
Solderability	J-STD-002	Magnification 50X. Conditions: a) Method A, at 235°C, Category 3
Temperature Cycling	JESD22 Method JA-104	1,000 cycles (-55°C to +125°C), measurement at 24 hours +/- 4 hours after test conclusion.
Biased Humidity	MIL-STD-202 Method 103	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

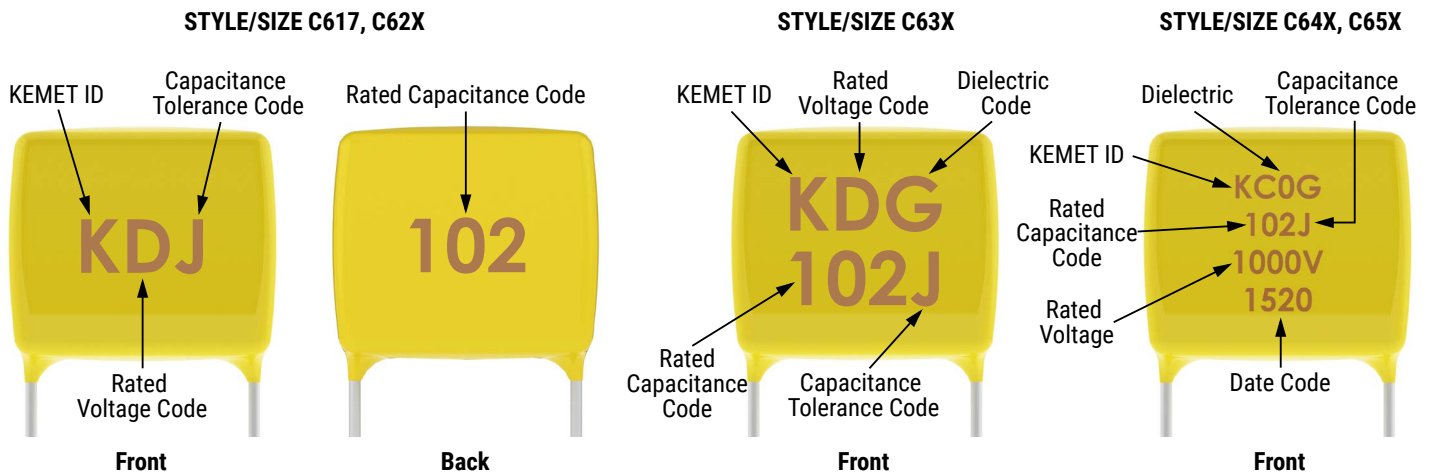
The un-mounted storage life of a leaded ceramic capacitor is dependent upon storage and atmospheric conditions as well as packaging materials. While the ceramic chips enveloped under the epoxy coating themselves are quite robust in most environments, solderability of the wire lead on the final epoxy-coated 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 interleaving is inserted between the layers of capacitors on the reel. Ammopack is also available, with the same lead tape configuration and package quantities.

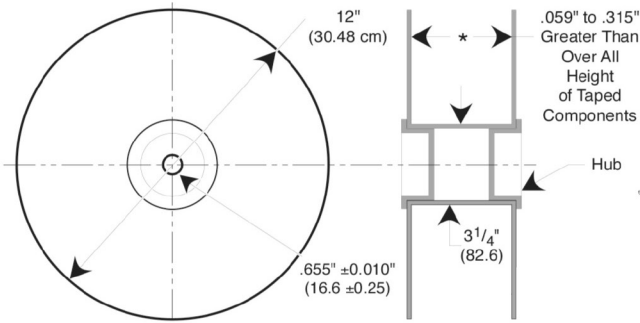


Figure 3: Standard Reel

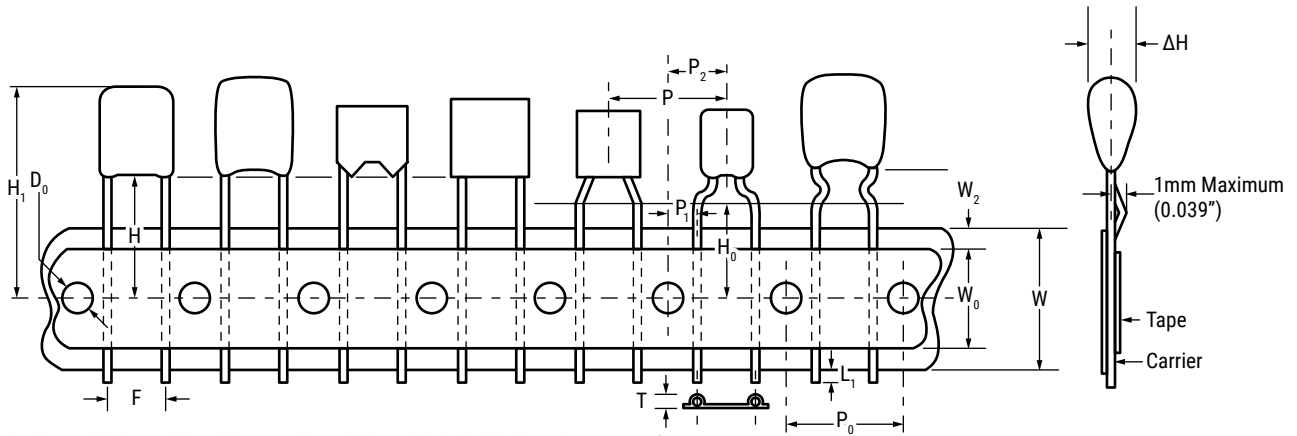
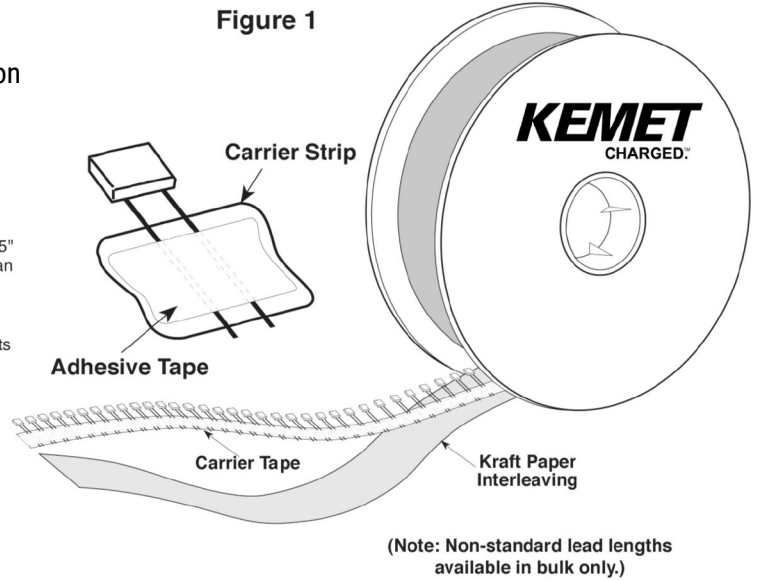


Figure 2: Lead Tape Configuration (See Table Below)

## 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.

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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