

# Goldmax, 300 Series, Radial, Conformally Coated, X7R Dielectric, 25 – 250 VDC (Automotive Grade)

## Overview

KEMET's Goldmax conformally coated radial leaded ceramic capacitors in X7R dielectric feature a 125°C maximum operating temperature. The Electronics Industries Alliance (EIA) characterizes X7R dielectric as a Class II "temperature stable" 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 meet the flame test requirements outlined in UL Standard 94V-0 and the demanding Automotive Electronics Council's AEC-Q200 qualification requirements.

## Benefits

- Radial leaded form factor
- Conformally coated
- Encapsulation meets flammability standard UL 94V-0.
- 0.100", 0.200", and 0.250" lead spacing
- Operating temperature range of  $-55^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$



## Ordering Information

C	320			C	106	K	3	R	5	T	A	9170
Ceramic	Style/Size			Specification/ Series	Capacitance Code (pF)	Capacitance Tolerance <sup>1</sup>	Voltage	Dielectric	Design	Lead Finish <sup>2</sup>	Failure Rate	Packaging/Grade (C-Spec)
	315	322	328	C = Standard	First two digits represent significant figures. Third digit specifies number of zeros.	J = $\pm 5\%$ K = $\pm 10\%$ M = $\pm 20\%$	3 = 25	R = X7R	5 = Multilayer	T = 100% Matte Sn	A = N/A	Automotive Grade See "Packaging C-Spec Ordering Options Table" below
	316	323	330				5 = 50					
	317	324	331				1 = 100					
	318	325	333				2 = 200					
	320	326	335				A = 250					
	321	327	336									

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

For Overmolding applications please contact your KEMET representative.

## Benefits cont'd

- Lead (Pb)-free, RoHS and REACH compliant
- X7R temperature stable dielectric
- DC voltage ratings of 25 V, 50 V, 100 V, 200 V, and 250 V
- Capacitance offerings ranging from 100 pF to 10  $\mu$ F
- Available capacitance Tolerances of  $\pm 5\%$ ,  $\pm 10\%$  and  $\pm 20\%$
- Non-polar device, minimizing installation concerns
- 100% pure matte tin-plated lead finish allowing for excellent solderability
- Automotive (AEC-Q200) grade

## Applications

Typical applications include decoupling, bypass, filtering and transient voltage suppression.

## 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 Automotive Grade	9170
12" Tape & Reel (16.0 $\pm$ 0.5 mm lead length)	9170 (7301)
12" Tape & Reel (18.0 mm minimum lead length)	9170 (7303)
Ammo Pack (16.0 $\pm$ 0.5 mm lead length)	9170 (7305)
Ammo Pack (18.0 mm minimum lead length)	9170 (7317)

<sup>1</sup> Default packaging is "Bulk Bag" with ordering code 9170 for Automotive Grade. Bulk bag option is required for Size/Style C321 & C331.

<sup>1</sup> "Tape and Reel" packaging option is not available for Size/Style C321 and C331. For more information see "Packaging Quantities".

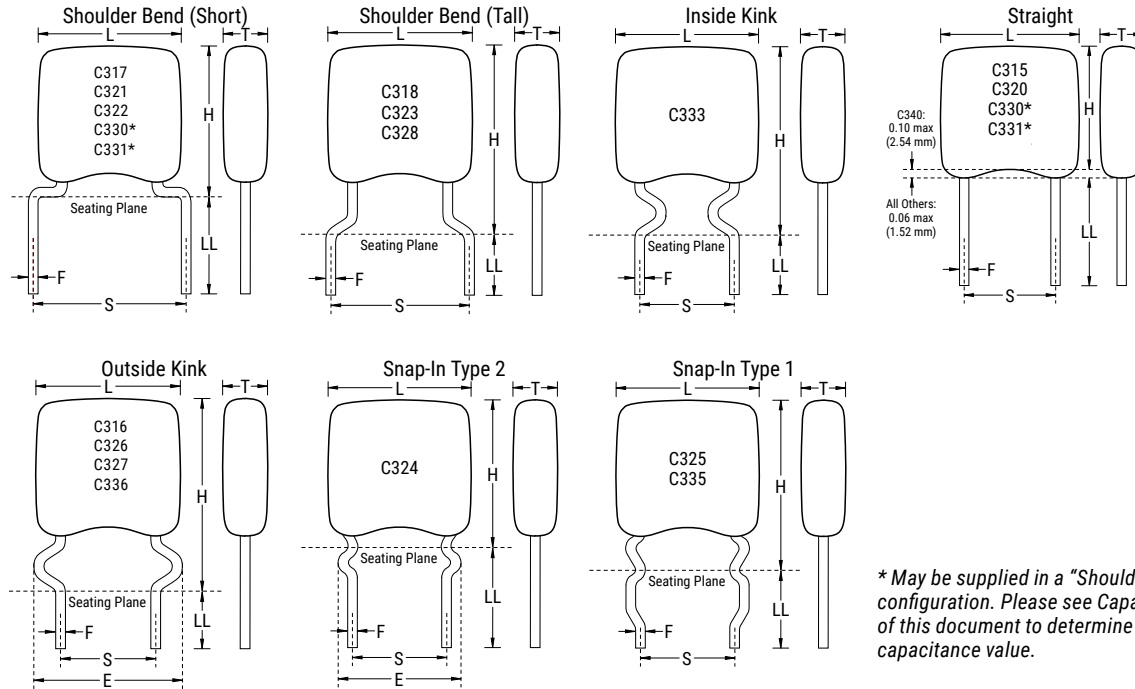
<sup>1</sup> "Ammo Pack" packaging option is not available for Size/Style C321 and C331. For more information see "Packaging Quantities".

<sup>1</sup> "Ammo Pack" and "Tape and Reel" packaging options have the same lead tape configuration. For more information see "Tape & Reel Packaging Information".

## Qualification/Certification

Automotive Grade products meet or exceed the requirements outlined by the Automotive Electronics Council. Details regarding test methods and conditions are referenced in document AEC-Q200, Stress Test Qualification for Passive Components. For additional information regarding the Automotive Electronics Council and AEC-Q200, please visit their website at [www.aecouncil.com](http://www.aecouncil.com).

## Dimensions – Inches (Millimeters)



\* May be supplied in a "Shoulder Bend" or "Straight" Lead configuration. Please see Capacitance Range Waterfall section of this document to determine lead configuration availability by capacitance value.

Series	Style / Size	S Lead Spacing ±0.030 (0.78)	L Length Maximum	H Height Maximum	T Thickness Maximum	F Lead Diameter +0.004 (0.10), -0.001 (0.025)	LL Lead Length Minimum
C31X	315	0.100 (2.54)	0.150 (3.81)	0.120 (3.14)	0.100 (2.54)	0.020 (0.51)	0.276 (7.00)
	316		0.150 (3.81)	0.230 (5.08)	0.100 (2.54)		0.200 (5.08)
C32X	324	0.100 (2.54)	0.200 (5.08)	0.230 (5.84)	0.125 (3.18) <sup>1</sup>		0.276 (7.00)
	320		0.200 (5.08)	0.230 (5.84)	0.125 (3.18) <sup>1</sup>		0.276 (7.00)
	326		0.200 (5.08)	0.300 (7.62)	0.125 (3.18) <sup>1</sup>		0.200 (5.08)
C31X	317	0.200 (5.08)	0.150 (3.81)	0.200 (5.08)	0.100 (2.54)		0.276 (7.00)
	318		0.150 (3.81)	0.235 (5.97)	0.100 (2.54)		0.276 (7.00)
C32X	321	0.250 (6.35)	0.200 (5.08)	0.260 (6.60)	0.125 (3.18) <sup>1</sup>		0.276 (7.00)
	322		0.200 (5.08)	0.260 (6.60)	0.125 (3.18) <sup>1</sup>		0.276 (7.00)
	323	0.200 (5.08)	0.200 (5.08)	0.300 (7.62)	0.125 (3.18) <sup>1</sup>		0.276 (7.00)
	325		0.200 (5.08)	0.300 (7.62)	0.125 (3.18) <sup>1</sup>		0.276 (7.00)
	328		0.200 (5.08)	0.300 (7.62)	0.125 (3.18) <sup>1</sup>		0.276 (7.00)
	327		0.200 (5.08)	0.320 (8.13)	0.125 (3.18) <sup>1</sup>		0.200 (5.08)
C33X	330	0.250 (6.35)	0.280 (7.11)	0.360 (9.14)	0.160 (4.07)		0.276 (7.00)
	331		0.280 (7.11)	0.360 (9.14)	0.160 (4.07)	0.276 (7.00)	
	333	0.200 (5.08)	0.280 (7.11)	0.400 (10.16)	0.160 (4.07)	0.276 (7.00)	
	335		0.280 (7.11)	0.400 (10.16)	0.160 (4.07)	0.276 (7.00)	
	336		0.280 (7.11)	0.400 (10.16)	0.160 (4.07)	0.200 (5.08)	

<sup>1</sup> Thickness maximum (T) = 0.160" (4.07 mm) for capacitance values greater than or equal to 4.7 µF

## Automotive C-Spec Information

KEMET Automotive Grade products meet or exceed the requirements outlined by the Automotive Electronics Council. Details regarding test methods and conditions are referenced in document AEC-Q200, Stress Test Qualification for Passive Components. These products are supported by a Product Change Notification (PCN) and Production Part Approval Process warrant (PPAP).

Automotive products offered through our distribution channel have been assigned an inclusive ordering code C-Spec, "9170." This C-Spec was developed in order to better serve small and medium sized companies that prefer an automotive grade component without the requirement to submit a customer Source Controlled Drawing (SCD) or specification for review by a KEMET engineering specialist. This C-Spec is therefore not intended for use by KEMET's OEM Automotive customers and are not granted the same "privileges" as other automotive C-Specs. Customer PCN approval and PPAP request levels are limited (see details below).

### Product Change Notification (PCN)

The KEMET Product Change Notification system is used to communicate primarily the following types of changes:

- Product/process changes that affect product form, fit, function, and/or reliability
- Changes in manufacturing site
- Product obsolescence

KEMET Automotive C-Spec	Customer Notification due to:		Days prior to implementation
	Process/Product change	Obsolescence*	
KEMET assigned <sup>1</sup>	Yes (with approval and sign off)	Yes	180 days Minimum
9170	Yes (without approval)	Yes	90 days Minimum

<sup>1</sup> KEMET assigned C-Specs require the submittal of a customer SCD or customer specification for review. For additional information contact KEMET.

### Production Part Approval Process (PPAP)

The purpose of the Production Part Approval Process is:

- To ensure that supplier can meet the manufacturability and quality requirements for the purchased parts.
- To provide the evidence that all customer engineering design record and specification requirements are properly understood and fulfilled by the manufacturing organization.
- To demonstrate that the established manufacturing process has the potential to produce the part

KEMET Automotive C-Spec	PPAP (Product Part Approval Process) Level				
	1	2	3	4	5
KEMET assigned <sup>1</sup>	●	●	●	●	●
9170	○		○		

<sup>1</sup> KEMET assigned C-Specs require the submittal of a customer SCD or customer specification for review. For additional information contact KEMET.

- Part Number specific PPAP available
- Product family PPAP only

## Environmental Compliance

Lead (Pb)-free, REACH and RoHS compliant without exemptions when ordered with a 100% tin (Sn) wire lead finish.

Series	Termination Finish (Wire Lead)	RoHS Compliant	RoHS Exemption Code	REACH Compliant <sup>1</sup>	Halogen Free
300 (C3XX)	100% Matte Sn	Yes	n/a	Yes	Yes

<sup>1</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	250% of rated voltage (5±1 second and charge/discharge not exceeding 50 mA)
Dissipation Factor (DF) Maximum Limit at 25°C	3.5%(25 V) and 2.5%(50 V to 250 V)
Insulation Resistance (IR) Limit at 25°C	See Insulation Resistance Limit Table (Rated voltage applied for 120±5 seconds at 25°C)

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

To obtain IR limit, divide  $M\Omega \cdot \mu F$  value by the capacitance and compare to  $G\Omega$  limit. Select the lower of the two limits.

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

1 kHz ±50 Hz and  $1.0 \pm 0.2 V_{rms}$  if capacitance ≤ 10 μF

120 Hz ±10 Hz and  $0.5 \pm 0.1 V_{rms}$  if capacitance > 10 μF

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, Moisture Resistance					
Style/Size	Rated DC Voltage	Capacitance Value	Dissipation Factor (Maximum %)	Capacitance Shift	Insulation Resistance
All	25	All	5.0	±20%	10% of Initial Limit
	> 25		3.0		

## Insulation Resistance Limit Table

Style/Size	1,000 Megohm Microfarads or 100 GΩ	500 Megohm Microfarads or 10 GΩ	100 Megohm Microfarads or 10GΩ
C31X	≤ 0.15 μF	≥ 0.15 μF	NA
C32X	≤ 0.12 μF	NA	≥ 0.12 μF
C33X	≤ 0.12 μF	NA	≥ 0.12 μF

**Table 1A – C31X Style/Size (0.100" & 0.200" Lead Spacing), Capacitance Range Waterfall**

C31X Style/Size (0.100" & 0.200" Lead Spacing)						
Rated Voltage (VDC)		25	50	100	200	250
Voltage Code		3	5	1	2	A
Capacitance	Capacitance Tolerance	Capacitance Code (Available Capacitance)				
100pF	J = ±5% K = ±10% M = ±20%	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	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	682
8200pF		822	822	822	822	822
0.01µF		103	103	103	103	103
0.012µF		123	123	123	123	123
0.015µF		153	153	153	153	153
0.018µF		183	183	183	183	183
0.022µF		223	223	223	223	223
0.027µF		273	273	273	273	273
0.033µF		333	333	333	333	333
0.039µF		393	393	393	393	393
0.047µF		473	473	473	473	473
0.056µF		563	563	563	563	563
0.068µF		683	683	683	683	683
0.082µF		823	823	823	823	823
0.1µF		104	104	104	104	104
0.12µF		124	124	124	124	124
0.15µF		154	154	154	154	154
0.18µF		184	184	184	184	184
0.22µF		224	224	224	224	224
0.27µF		274	274	274	274	274
0.33µF		334	334	334	334	334
0.39µF		394	394	394	394	394
0.47µF		474	474	474	474	474
0.56µF	564	564	564	564	564	
0.68µF	684	684	684	684	684	
0.82µF	824	824	824	824	824	
1.0µF	105	105	105	105	105	
Rated Voltage (VDC)		25	50	100	200	250
Voltage Code		3	5	1	2	A

**Table 1B – C32X Style/Size (0.100" & 0.200" Lead Spacing), Capacitance Range Waterfall**

C32X Style/Size (0.100" & 0.200" Lead Spacing)						
Rated Voltage (VDC)		25	50	100	200	250
Voltage Code		3	5	1	2	A
Capacitance	Capacitance Tolerance	Capacitance Code (Available Capacitance)				
100pF	J = ±5% K = ±10% M = ±20%	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	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	682
8200pF		822	822	822	822	822
0.01µF		103	103	103	103	103
0.012µF		123	123	123	123	123
0.015µF		153	153	153	153	153
0.018µF		183	183	183	183	183
0.022µF		223	223	223	223	223
0.027µF		273	273	273	273	273
0.033µF		333	333	333	333	333
0.039µF		393	393	393	393	393
0.047µF		473	473	473	473	473
0.056µF		563	563	563	563	563
0.068µF		683	683	683	683	683
0.082µF		823	823	823	823	823
0.1µF		104	104	104	104	104
0.12µF		124	124	124	124	124
0.15µF		154	154	154	154	154
0.18µF		184	184	184	184	184
0.22µF		224	224	224	224	224
0.27µF		274	274	274	274	274
0.33µF		334	334	334	334	334
0.39µF		394	394	394	394	394
0.47µF		474	474	474	474	474
0.56µF	564	564	564	564	564	
0.68µF	684	684	684	684	684	
0.82µF	824	824	824	824	824	
1.0µF	105	105	105	105	105	
1.2µF	125	125	125	125	125	
Rated Voltage (VDC)		25	50	100	200	250
Voltage Code		3	5	1	2	A

\*Thickness max (T) = 0.160" (4.07mm) for capacitance values greater than or equal to 4.7µF



**Table 1B – C32X Style/Size (0.100" & 0.200" Lead Spacing), Capacitance Range Waterfall (cont'd)**

C32X Style/Size (0.100" & 0.200" Lead Spacing)						
Rated Voltage (VDC)		25	50	100	200	250
Voltage Code		3	5	1	2	A
Capacitance	Capacitance Tolerance	Capacitance Code (Available Capacitance)				
1.5µF	J = ±5% K = ±10% M = ±20%	155	155			
1.8µF		185	185			
2.2µF		225	225			
2.7µF		275	275			
3.3µF		335	335			
3.9µF		395	395			
4.7µF		475	475			
5.6µF		565				
6.8µF		685				
10µF		106				
Rated Voltage (VDC)		25	50	100	200	250
Voltage Code		3	5	1	2	A

<sup>1</sup>Thickness max (T) = 0.160" (4.07mm) for capacitance values greater than or equal to 4.7µF

**Table 1C – C32X Style/Size (0.100", 0.200" & 0.250" Lead Spacing), Capacitance Range Waterfall**

C32X Style/Size (0.100", 0.200" & 0.250" Lead Spacing)							
Rated Voltage (VDC)		25	50	100	200	250	
Voltage Code		3	5	1	2	A	
Capacitance	Capacitance Tolerance	Capacitance Code (Available Capacitance)					
100pF	J = ±5% K = ±10% M = ±20%	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	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	682	
8200pF		822	822	822	822	822	
0.01µF		103	103	103	103	103	
0.012µF		123	123	123	123	123	
0.015µF		153	153	153	153	153	
Rated Voltage (VDC)		25	50	100	200	250	
Voltage Code		3	5	1	2	A	

<sup>1</sup>Thickness max (T) = 0.160" (4.07mm) for capacitance values greater than or equal to 4.7µF

**Table 1C – C32X Style/Size (0.100", 0.200" & 0.250" Lead Spacing), Capacitance Range Waterfall (con'td)**

C32X Style/Size (0.100", 0.200" & 0.250" Lead Spacing)						
Rated Voltage (VDC)		25	50	100	200	250
Voltage Code		3	5	1	2	A
Capacitance	Capacitance Tolerance	Capacitance Code (Available Capacitance)				
0.018μF	J = ±5% K = ±10% M = ±20%	183	183	183	183	183
0.022μF		223	223	223	223	223
0.027μF		273	273	273	273	273
0.033μF		333	333	333	333	333
0.039μF		393	393	393	393	393
0.047μF		473	473	473	473	473
0.056μF		563	563	563	563	563
0.068μF		683	683	683	683	683
0.082μF		823	823	823	823	823
0.1μF		104	104	104	104	104
0.12μF		124	124	124	124	124
0.15μF		154	154	154	154	154
0.18μF		184	184	184	184	184
0.22μF		224	224	224	224	224
0.27μF		274	274	274	274	274
0.33μF		334	334	334	334	334
0.39μF		394	394	394	394	394
0.47μF		474	474	474	474	474
0.56μF		564	564	564	564	564
0.68μF		684	684	684	684	684
0.82μF		824	824	824	824	824
1.0μF		105	105	105	105	105
1.2μF		125	125	125	125	125
1.5μF		155	155	155	155	155
1.8μF		185	185	185	185	185
2.2μF		225	225	225	225	225
2.7μF		275	275	275	275	275
3.3μF		335	335	335	335	335
3.9μF		395	395	395	395	395
4.7μF		475	475	475	475	475
5.6μF		565	565	565	565	565
6.8μF		685	685	685	685	685
10μF	106	106	106	106	106	
Rated Voltage (VDC)		25	50	100	200	250
Voltage Code		3	5	1	2	A

<sup>1</sup>Thickness max (T) = 0.160" (4.07mm) for capacitance values greater than or equal to 4.7μF

**Table 1D – C33X Style/Size (0.200" & 0.250" Lead Spacing), Capacitance Range Waterfall**

C33X Style/Size (0.200" & 0.250" Lead Spacing)						
Rated Voltage (VDC)		25	50	100	200	250
Voltage Code		3	5	1	2	A
Capacitance	Capacitance Tolerance	Capacitance Code (Available Capacitance)				
100pF	J = ±5% K = ±10% M = ±20%	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	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	682
8200pF		822	822	822	822	822
0.01μF		103	103	103	103	103
0.012μF		123	123	123	123	123
0.015μF		153	153	153	153	153
0.018μF		183	183	183	183	183
0.022μF		223	223	223	223	223
0.027μF		273	273	273	273	273
Rated Voltage (VDC)		25	50	100	200	250
Voltage Code		3	5	1	2	A

\*Capacitor is supplied with a "Shoulder-Bend" lead configuration in Style/Size C330 and C331.

**Table 1D – C33X Style/Size (0.200" & 0.250" Lead Spacing), Capacitance Range Waterfall (cont'd)**

C33X Style/Size (0.200" & 0.250" Lead Spacing)						
Rated Voltage (VDC)		25	50	100	200	250
Voltage Code		3	5	1	2	A
Capacitance	Capacitance Tolerance	Capacitance Code (Available Capacitance)				
0.033µF	J = ±5% K = ±10% M = ±20%	333	333	333	333	333
0.039µF		393	393	393	393	393
0.047µF		473	473	473	473	473
0.056µF		563	563	563	563	563
0.068µF		683	683	683	683	683
0.082µF		823	823	823	823	823
0.1µF		104	104	104	104	104
0.12µF		124	124	124	124	124
0.15µF		154	154	154	154	154
0.18µF		184	184	184	184	184
0.22µF		224	224	224	224	224
0.27µF		274	274	274	274	274
0.33µF		334	334	334	334	334
0.39µF		394	394	394	394	394
0.47µF		474	474	474	474	474
0.56µF		564	564	564		
0.68µF		684	684	684		
0.82µF		824	824	824		
1.0µF		105	105	105		
1.2µF		125	125	125		
1.5µF		155	155			
1.8µF		185	185			
2.2µF		225	225			
2.7µF		275	275			
3.3µF		335	335			
3.9µF		395	395			
4.7µF		475	475			
5.6µF		565				
6.8µF		685				
10µF		106				
Rated Voltage (VDC)		25	50	100	200	250
Voltage Code		3	5	1	2	A

\*Capacitor is supplied with a "Shoulder-Bend" lead configuration in Style/Size C330 and C331.

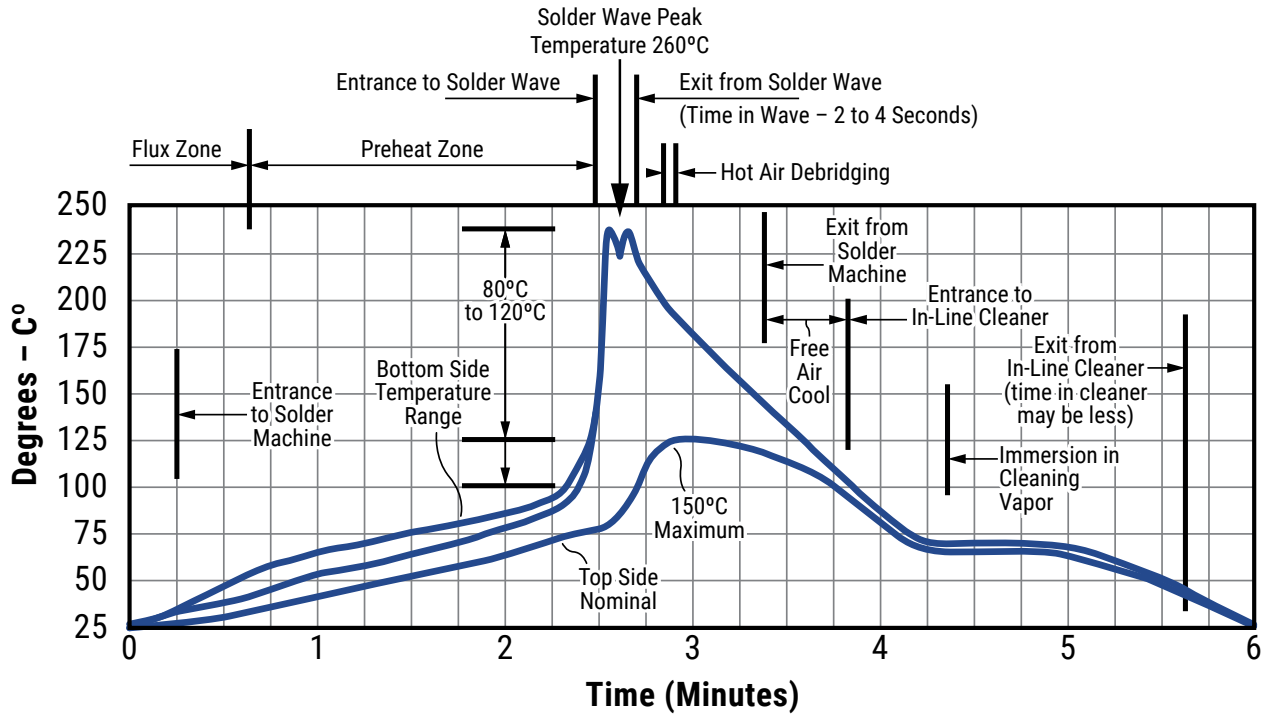
## Soldering Process

### Recommended Soldering Technique:

- Solder Wave
- Hand Soldering (Manual)

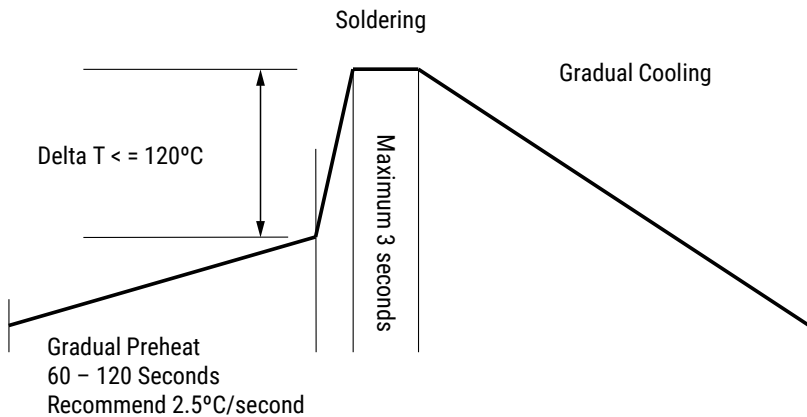
### Recommended Soldering Profile:

- Optimum Wave Solder Profile



- Hand Soldering (Manual)

### Manual Solder Profile with Pre-heating



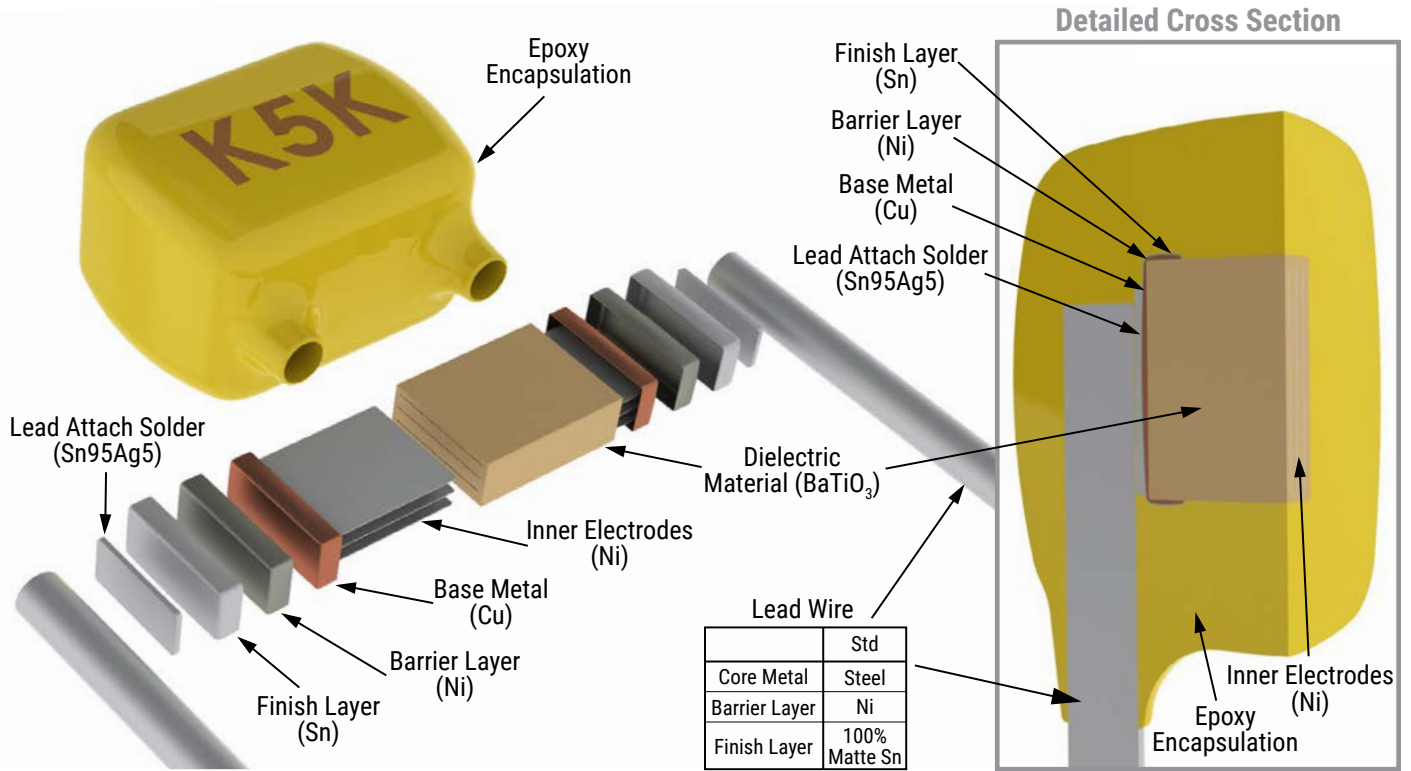
KEMET recommends following the guidelines and techniques outlined in technical bulletins F2103 and F9207.

## 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.

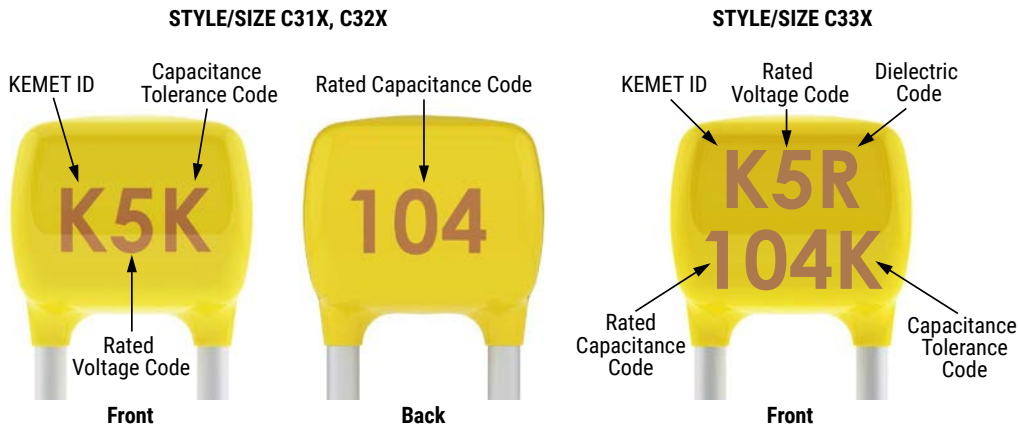
KEMET recommends storing the un-mounted capacitors in their original packaging, in a location away from direct sunlight, and where the temperature and relative humidity do not exceed 40 degrees centigrade and 70% respectively. For optimum solderability, capacitor stock should be used promptly, preferably 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



## Capacitor Marking

These capacitors shall be stamped or laser marked with KEMET's trademark, rated voltage, rated capacitance and capacitance tolerance. Dielectric information will be included only when the body size of the component allows. Marking will be supplied on one or both sides of the coated capacitor body. All marking shall be legible to allow for clear identification of the component. Marking appears in legible contrast. An example of the marking format and content is illustrated below.



## Packaging Quantities

Series	Standard Bulk Quantity	Ammo Pack Quantity Maximum		Reel Quantity Maximum (12" Reel)		
315	500/Bag	2500		2500		
316						
317						
318						
320						
321		N/A	N/A			
322		2500		2500		
323						
324						
325						
326						
327						
328	1500		1500			
330						
331				N/A	N/A	
333				1500		1500
335						
336	250/Bag		1500			



## Tape & Reel Packaging Information

KEMET offers standard reeling of Molded and Conformally Coated Radial Led 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.

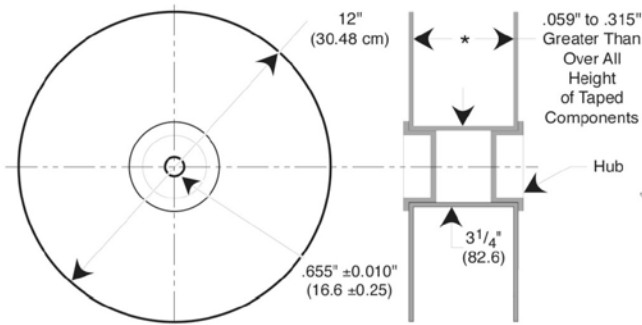


Figure 3: Standard Reel

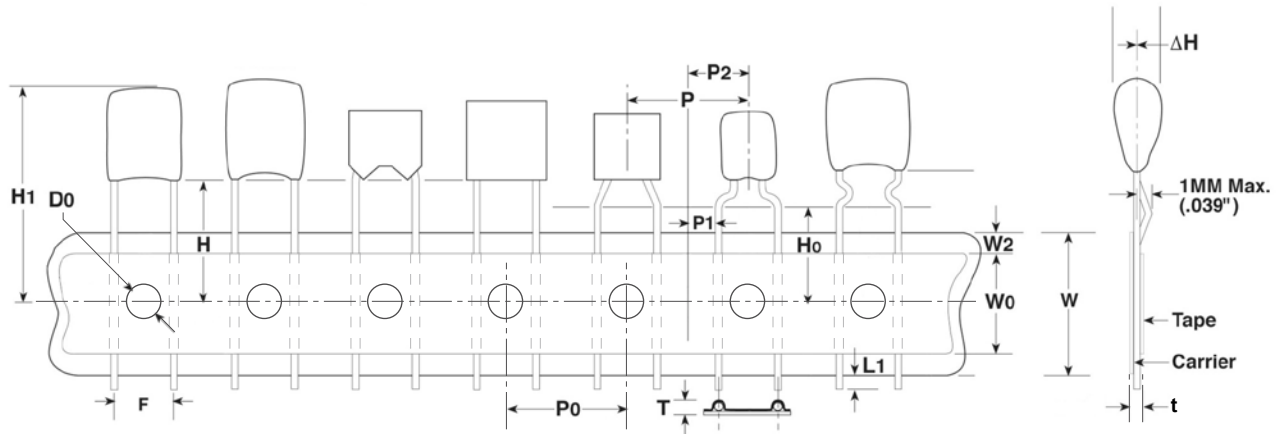
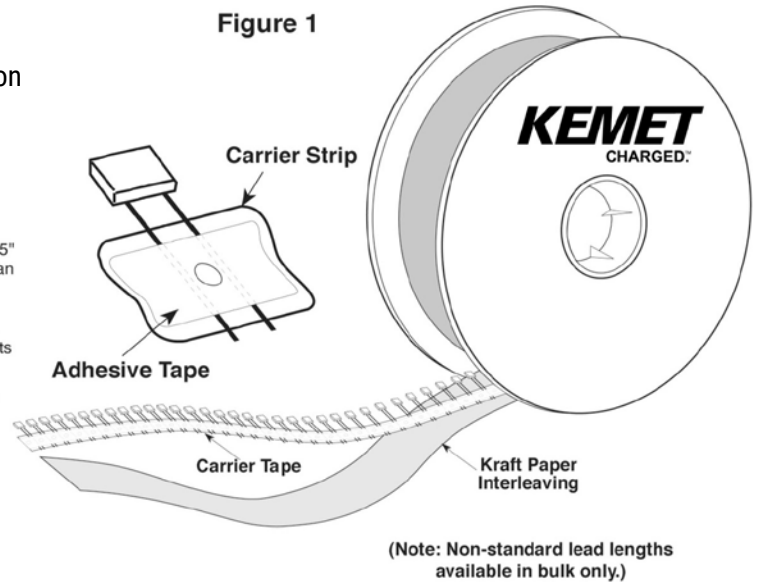


Figure 2: Lead Tape Configuration (See Table Below)

## 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'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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