

# Aximax, 400, Conformally Coated, C0G Dielectric, 25 – 250 VDC (Automotive Grade)

## Overview

KEMET's Aximax conformally coated axial leaded ceramic capacitors in C0G dielectric feature a 125°C maximum operating temperature. The Electronics Industries Alliance (EIA) characterizes C0G 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. C0G 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  $\pm 30\text{ppm}/^\circ\text{C}$  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

- Axial leaded form factor
- Conformally coated
- Encapsulation meets flammability standard UL 94V-0
- Operating temperature range of  $-55^\circ\text{C}$  to  $+125^\circ\text{C}$
- Lead (Pb)-free, RoHS and REACH compliant
- DC voltage ratings of 25 V, 50 V, 100 V, 200 V and 250 V
- Capacitance offerings ranging from 1.0 pF up to 0.10  $\mu\text{F}$



## Ordering Information

C	410	C	473	J	3	G	5	T	A	9170
Ceramic	Style/Size	Specification/ Series	Capacitance Code (pF)	Capacitance Tolerance <sup>1</sup>	Rated Voltage (VDC)	Dielectric	Design	Lead Finish	Failure Rate	Packaging/Grade (C-Spec)
	410 420 430	C = Standard	First two digits represent significant figures. Third digit specifies number of zeros.	D = $\pm 0.5\text{ pF}$ F = $\pm 1\%$ G = $\pm 2\%$ J = $\pm 5\%$ K = $\pm 10\%$	3 = 25 5 = 50 1 = 100 2 = 200 A = 250	G = C0G	5 = Multilayer	T = 100% Matte Sn	A = N/A	Automotive Grade  9170 = Bulk Auto Grade 9170 7200 = T & R 12" Auto Grade 9170 7293 = Ammo Pack Auto Grade

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

For Overmolding applications please contact your KEMET representative.

## Benefits cont.

- Available capacitance tolerances of  $\pm 0.5$  pF,  $\pm 1\%$ ,  $\pm 2\%$ ,  $\pm 5\%$ , and  $\pm 10\%$
- Extremely low ESR and ESL
- High thermal stability
- High ripple current capability
- No capacitance change with respect to applied rated DC voltage
- Negligible capacitance change with respect to temperature from  $-55^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$
- No capacitance decay with time
- Non-polar device, minimizing installation concerns
- 100% pure matte tin-plated lead finish allowing for excellent solderability
- Automotive (AEC-Q200) grade

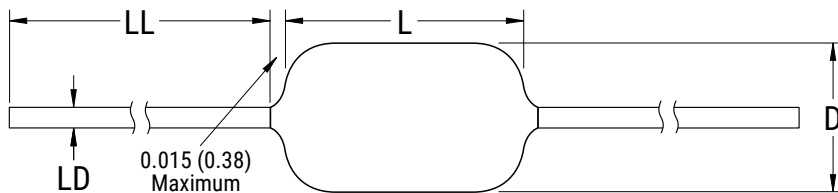
## Applications

Typical applications include critical timing, tuning, circuits requiring low loss, circuits with pulse, high current, decoupling, bypass, filtering, transient voltage suppression, blocking and energy storage.

## Application Notes

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

## Dimensions – Inches (Millimeters)



Series	Style/Size	L Length Maximum	D Diameter Maximum	LD Lead Diameter	LL Lead Length Minimum <sup>1</sup>
C41X	410	0.170 (4.32)	0.095 (2.41)	0.020 +0.001/-0.003 (0.51 +0.025/-0.076)	1.0 (25.4)
C42X	420	0.200 (5.08)	0.100 (2.54)		
C43X	430	0.240 (6.10)	0.150 (3.81)		

<sup>1</sup> Lead Length dimension only applicable for BULK packaging.

## 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 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 with customer information included.
- Product family PPAP only

## 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).

## 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
400 (C4XX)	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)	±30 ppm/°C
Aging Rate (Max % Cap Loss/Decade Hour)	0%
Dielectric Withstanding Voltage	250% of rated voltage (5±1 seconds 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 (Rated voltage 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."

**Table 1A – C410 Style/Size, Capacitance Range Waterfall**

C410 Style/Size (0.095" Diameter x 0.170" L )						
Rated Voltage (VDC)		25	50	100	200	250
Voltage Code		3	5	1	2	A
Capacitance	Capacitance Tolerance	Capacitance Code (Available Capacitance)				
1pF	D = ±0.5pF	109	109	109	109	109
1.1pF		119	119	119	119	119
1.2pF		129	129	129	129	129
1.3pF		139	139	139	139	139
1.5pF		159	159	159	159	159
1.6pF		169	169	169	169	169
1.8pF		189	189	189	189	189
2.0pF		209	209	209	209	209
2.2pF		229	229	229	229	229
2.4pF		249	249	249	249	249
2.7pF		279	279	279	279	279
3.0pF		309	309	309	309	309
3.3pF		339	339	339	339	339
3.6pF		369	369	369	369	369
3.9pF		399	399	399	399	399
4.3pF		439	439	439	439	439
4.7pF		479	479	479	479	479
5.1pF		519	519	519	519	519
5.6pF		569	569	569	569	569
6.2pF		629	629	629	629	629
6.8pF	689	689	689	689	689	
7.5pF	759	759	759	759	759	
8.2pF	829	829	829	829	829	
9.1pF	919	919	919	919	919	
10pF	F = ±1% G = ±2% J = ±5% K = ±10%	100	100	100	100	100
11pF		110	110	110	110	110
12pF		120	120	120	120	120
13pF		130	130	130	130	130
15pF		150	150	150	150	150
16pF		160	160	160	160	160
18pF		180	180	180	180	180
20pF		200	200	200	200	200
22pF		220	220	220	220	220
24pF		240	240	240	240	240
27pF		270	270	270	270	270
30pF		300	300	300	300	300
33pF		330	330	330	330	330
36pF		360	360	360	360	360
39pF		390	390	390	390	390
43pF		430	430	430	430	430
47pF		470	470	470	470	470
51pF		510	510	510	510	510
56pF		560	560	560	560	560
62pF		620	620	620	620	620
68pF	680	680	680	680	680	
75pF	750	750	750	750	750	
82pF	820	820	820	820	820	
91pF	910	910	910	910	910	
100pF	101	101	101	101	101	
110pF	111	111	111	111	111	
120pF	121	121	121	121	121	
130pF	131	131	131	131	131	
150pF	151	151	151	151	151	
160pF	161	161	161	161	161	
180pF	181	181	181	181	181	
Rated Voltage (VDC)		25	50	100	200	200
Voltage Code		3	5	1	2	2

These products are protected under one or more of the following United States Patents and their non-US counterparts: US Pat. No. 7172985; U.S. Pat. No. 7670981.

**Table 1A – C410 Style/Size, Capacitance Range Waterfall cont.**

C410 Style/Size (0.095" Diameter x 0.170" L )						
Rated Voltage (VDC)		25	50	100	200	250
Voltage Code		3	5	1	2	A
Capacitance	Capacitance Tolerance	Capacitance Code (Available Capacitance)				
200pF		201	201	201	201	201
220pF		221	221	221	221	221
240pF		241	241	241	241	241
270pF		271	271	271	271	271
300pF		301	301	301	301	301
330pF		331	331	331	331	331
360pF		361	361	361	361	361
390pF		391	391	391	391	391
430pF		431	431	431	431	431
470pF		471	471	471	471	471
510pF		511	511	511	511	511
560pF		561	561	561	561	561
620pF		621	621	621	621	621
680pF		681	681	681	681	681
750pF		751	751	751	751	751
820pF		821	821	821	821	821
910pF		911	911	911	911	911
1000pF		102	102	102	102	102
1100pF		112	112	112	112	112
1200pF		122	122	122	122	122
1300pF		132	132	132	132	132
1500pF		152	152	152	152	152
1600pF		162	162	162	162	162
1800pF		182	182	182	182	182
2000pF		202	202	202	202	202
2200pF		222	222	222	222	222
2400pF		242	242	242	242	242
2700pF		272	272	272	272	272
3000pF		302	302	302	302	302
3300pF		332	332	332	332	332
3600pF		362	362	362	362	362
3900pF		392	392	392	392	392
4300pF		432	432	432	432	432
4700pF		472	472	472	472	472
5100pF		512	512	512	512	512
5600pF		562	562	562	562	562
6200pF		622	622	622	622	622
6800pF		682	682	682	682	682
7500pF		752	752	752	752	752
8200pF		822	822	822	822	822
9100pF		912	912	912		
0.01μF		103	103	103		
0.012μF		123	123	123		
0.015μF		153	153	153		
0.018μF		183	183			
0.022μF		223	223			
0.027μF		273				
0.033μF		333				
0.039μF		393				
0.047μF		473				
Rated Voltage (VDC)		25	50	100	200	200
Voltage Code		3	5	1	2	2

F = ±1%  
G = ±2%  
J = ±5%  
K = ±10%

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**Table 1B – C420 Style/Size, Capacitance Range Waterfall**

C420 Style/Size (0.100" Diameter x 0.260" L )						
Rated Voltage (VDC)		25	50	100	200	250
Voltage Code		3	5	1	2	A
Capacitance	Capacitance Tolerance	Capacitance Code (Available Capacitance)				
390pF	F = ±1% G = ±2% J = ±5% K = ±10%	391	391	391	391	391
430pF		431	431	431	431	431
470pF		471	471	471	471	471
510pF		511	511	511	511	511
560pF		561	561	561	561	561
620pF		621	621	621	621	621
680pF		681	681	681	681	681
750pF		751	751	751	751	751
820pF		821	821	821	821	821
910pF		911	911	911	911	911
1000pF		102	102	102	102	102
1100pF		112	112	112	112	112
1200pF		122	122	122	122	122
1300pF		132	132	132	132	132
1500pF		152	152	152	152	152
1600pF		162	162	162	162	162
1800pF		182	182	182	182	182
2000pF		202	202	202	202	202
2200pF		222	222	222	222	222
2400pF		242	242	242	242	242
2700pF		272	272	272	272	272
3000pF		302	302	302	302	302
3300pF		332	332	332	332	332
3600pF		362	362	362	362	362
3900pF		392	392	392	392	392
4300pF		432	432	432	432	432
4700pF		472	472	472	472	472
5100pF		512	512	512	512	512
5600pF		562	562	562	562	562
6200pF		622	622	622	622	622
6800pF		682	682	682	682	682
7500pF		752	752	752	752	752
8200pF		822	822	822	822	822
9100pF		912	912	912	912	912
0.01µF		103	103	103	103	103
0.012µF		123	123	123	123	123
0.015µF		153	153	153	153	153
0.016µF		163	163	163		
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				
Rated Voltage (VDC)		25	50	100	200	250
Voltage Code		3	5	1	2	A

These products are protected under one or more of the following United States Patents and their non-US counterparts: US Pat. No. 7172985; U.S. Pat. No. 7670981.

**Table 1C – C430 Style/Size, Capacitance Range Waterfall**

C430 Style/Size (0.150" Diameter x 0.290" L )						
Rated Voltage (VDC)		25	50	100	200	250
Voltage Code		3	5	1	2	A
Capacitance	Capacitance Tolerance	Capacitance Code (Available Capacitance)				
0.018µF	F = ±1% G = ±2% J = ±5% K = ±10%	183	183	183	183	183
0.022µF		223	223	223	223	223
0.027µF		273	273	273		
0.033µF		333	333	333		
0.039µF		393	393	393		
0.047µF		473	473	473		
0.056µF		563	563			
0.068µF		683	683			
0.082µF		823	823			
0.100µF		104				
Rated Voltage (VDC)		25	50	100	200	250
Voltage Code		3	5	1	2	A

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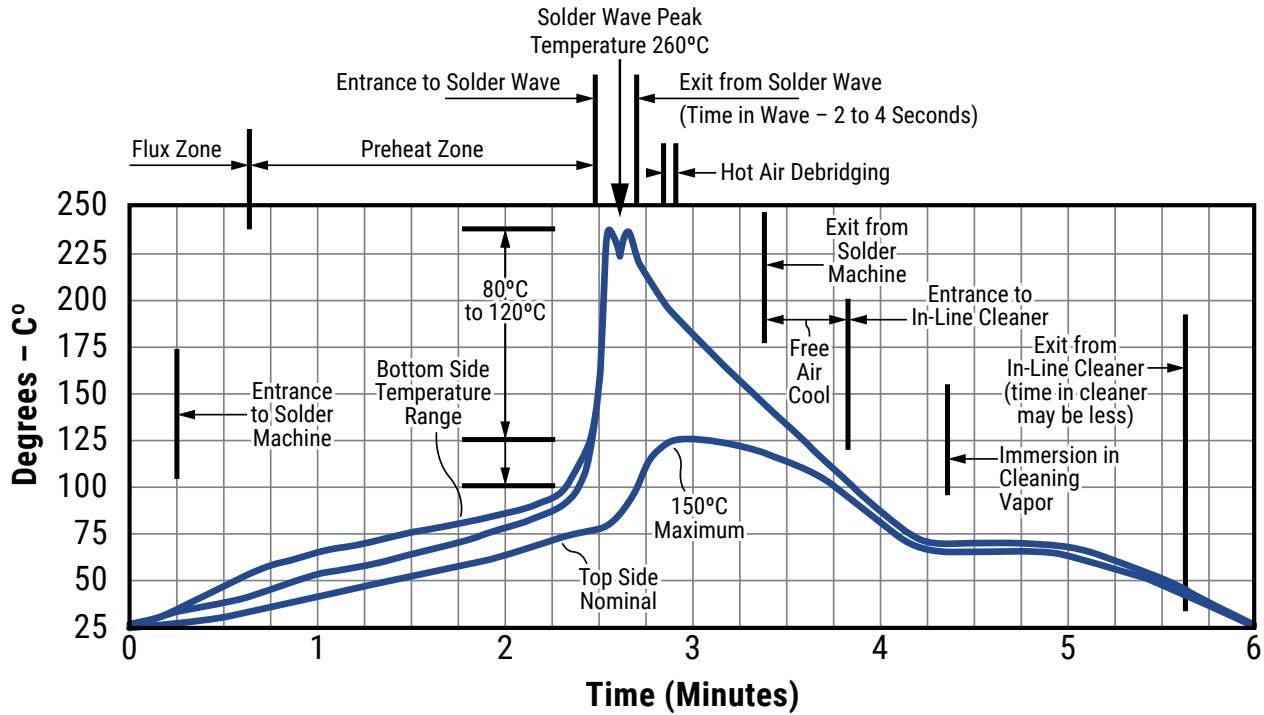
## Soldering Process

### Recommended Soldering Methods:

- Solder Wave
- Hand Soldering (Manual)

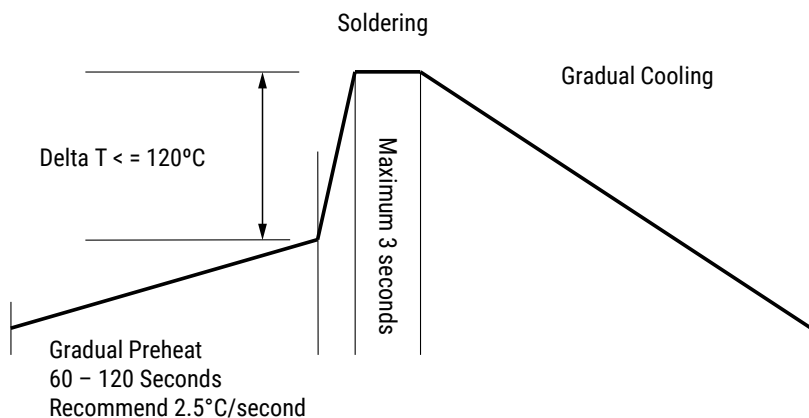
### Recommended Soldering Profile:

- Optimum Wave Solder Profile



- Hand Soldering (Manual)

### Manual Solder Profile with Pre-heating

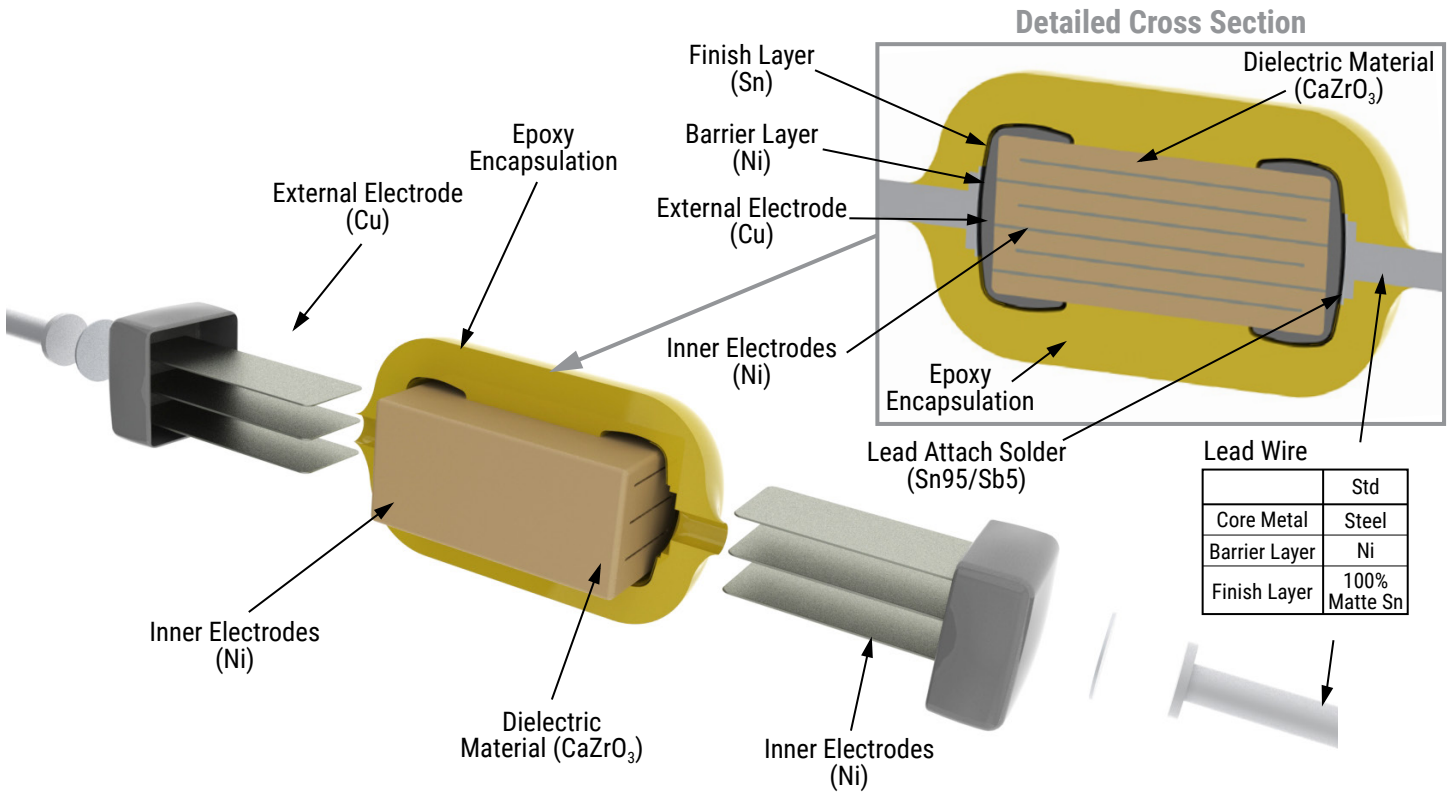


## Storage & Handling

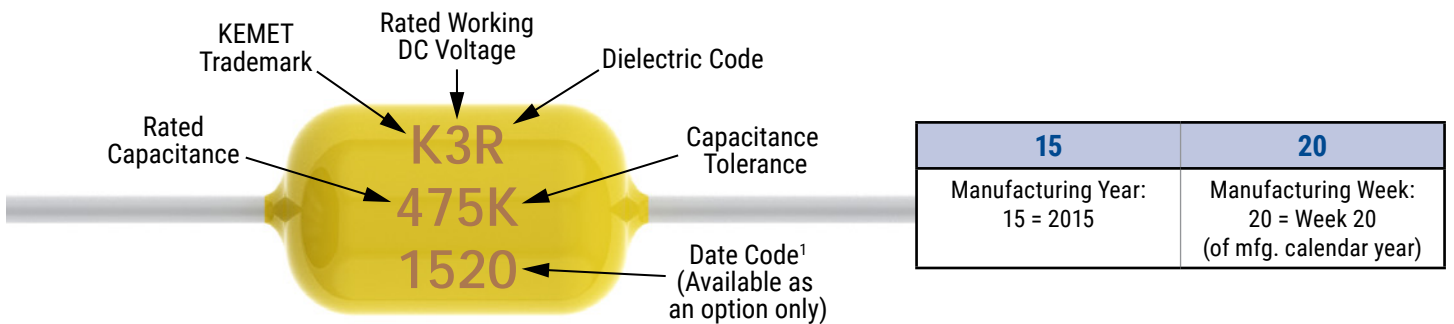
The un-mounted storage life of a leaded ceramic capacitor is dependent upon storage and atmospheric conditions as well as packaging materials. While the ceramic chips enveloped under the epoxy coating themselves are quite robust in most environments, solderability of the wire lead on the final epoxy-coated 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



<sup>1</sup> To properly request the inclusion of the date code in the marking, ordering code please contact your KEMET representative.

## Packaging Quantities

Style/Size	Standard Bulk Quantity	Ammo Pack Quantity Maximum	Reel Quantity Maximum (12" Reel)
410	300/Box	4,000	5,000
420	300/Box		
430	200/Box	2,000	2,500

## Tape & Reel Packaging Information

KEMET offers standard reeling of molded and conformally coated axial leaded ceramic capacitors for automatic insertion or lead forming machines in accordance with EIA standard 296. KEMET’s internal specification four-digit suffix, 7200, is placed at the end of the part number to designate tape and reel packaging, e.g., C410C104Z5U5TA7200.

Paper (50 lb.) test minimum is inserted between the layers of capacitors wound on reels for component pitch  $\leq 0.400"$ . Capacitor lead length may extend only a maximum of  $.0625"$  (1.59 mm) beyond the tapes’ edges. Capacitors are centered in a row between the two tapes and will deviate only  $\pm 0.031"$  (0.79 mm) from the row center. A minimum of  $36"$  (91.5 cm) leader tape is provided at each finished length of taped components. Universal splicing clips are used to connect the tape.

Figure 1

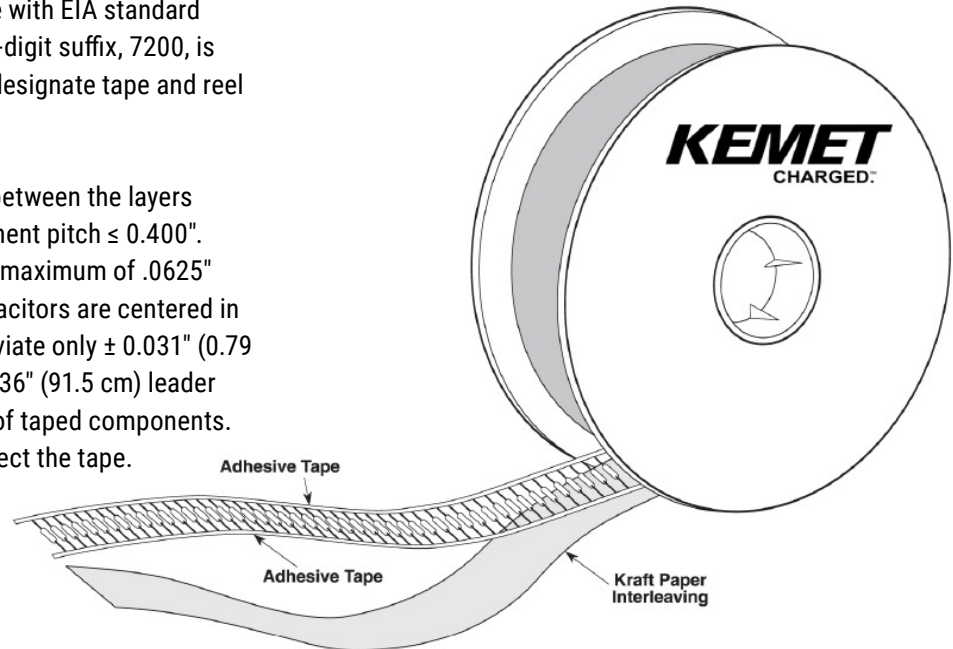


Figure 2

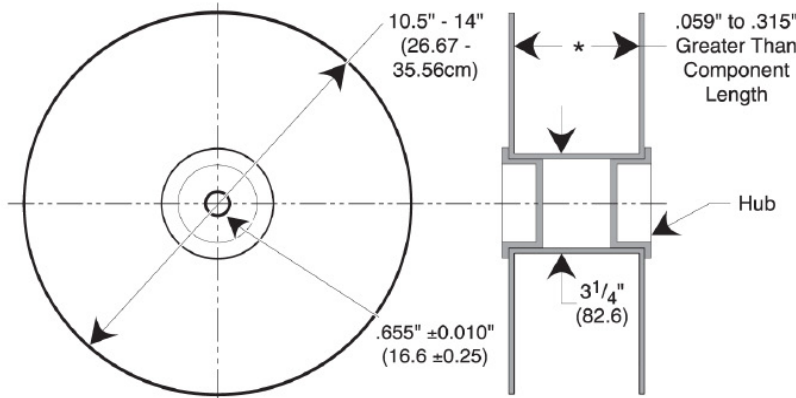
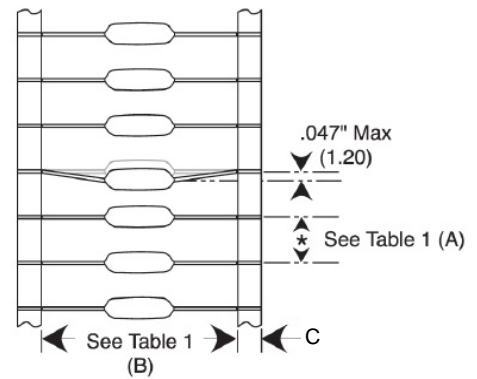


Figure 3



**Table 3 – Ceramic Axial Tape and Reel Dimensions**

Metric will govern

Dimensions – Millimeters (Inches)			
Axial Capacitor Body Diameter	A	B	C
	$\pm 0.5$ (0.020)	$\pm 1.5$ (0.059) <sup>1</sup>	$\pm 0.70$ (0.028)
0.0 to 5.0 (0.0 to 0.197)	5.0 (0.197)	52.4 (2.062)	6.35 (0.250)

Symbol Reference Table	
A	Component Pitch
B	Inside Tape Spacing
C	Tape Width

<sup>1</sup> Inside tape spacing dimension (B) is determined by the body diameter of the capacitor.

## KEMET Electronics Corporation Sales Offices

For a complete list of our global sales offices, please visit [www.kemet.com/sales](http://www.kemet.com/sales).

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### Disclaimer

YAGEO Corporation and its affiliates do not recommend the use of commercial or automotive grade products for high reliability applications or manned space flight.

All product specifications, statements, information and data (collectively, the "Information") in this datasheet are subject to change. The customer is responsible for checking and verifying the extent to which the Information contained in this publication is applicable to an order at the time the order is placed. All Information given herein is believed to be accurate and reliable, but it is presented without guarantee, warranty, or responsibility of any kind, expressed or implied.

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Although KEMET designs and manufactures its products to the most stringent quality and safety standards, given the current state of the art, isolated component failures may still occur. Accordingly, customer applications which require a high degree of reliability or safety should employ suitable designs or other safeguards (such as installation of protective circuitry or redundancies) in order to ensure that the failure of an electrical component does not result in a risk of personal injury or property damage.

Although all product-related warnings, cautions and notes must be observed, the customer should not assume that all safety measures are indicated or that other measures may not be required.

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