Goldmax, 300 Series, Conformally Coated, X7R Dielectric, 25 – 250 VDC (Commercial Grade)

Overview

KEMET's Goldmax conformally coated radial leaded ceramic capacitors in X7R dielectric feature a 125°C maximum operating temperature. The

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 ±15% from −55°C to +125°C.

These devices meets the fame test requirements outlined in UL Standard 94V−0.

Benefits

- Radial leaded form factor
- Conformally coated
- 0.100", 0.200", 0.250" and 0.400" lead spacing
- −55°C to +125°C operating temperature range
- Lead (Pb)-free, RoHS and REACH compliant
- X7R temperature stable dielectric

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Ordering Information

C	320	C	106	K	3	R	5	T	A	7301
Ceramic	Style/Size	Specification/ Series	Capacitance Code (pF)	Capacitance Tolerance[1]	Rated Voltage (VDC)	Dielectric	Design	Lead Finish[2]	Failure Rate	Packaging (C-Spec)
	315 324 335 316 325 336 317 326 340 318 327 346 320 328 350 321 330 356 322 331 323 333	C = Standard	First two digits represent significant figures. Third digit specifies number of zeros.	J = ±5% K = ±10% M = ±20%	3 = 25 5 = 50 1 = 100 2 = 200 A = 250	R = X7R	5 = Multilayer	T = 100% Matte Sn H = SnPb (60/40)	A = N/A	See "Packaging C-Spec Ordering Options Table" below

[1] *Additional capacitance tolerance offerings may be available. Contact KEMET for details.*

[2] *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.

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Benefits cont'd

- DC voltage ratings of 25 V, 50 V, 100 V, 200 V and 250 V
- Capacitance offerings ranging from 100 pF to 10 µF
- Available capacitance Tolerances of ±5%, ±10% and ±20%
- 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 flamability standard UL 94V–0

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[1]	Packaging/Grade Ordering Code (C-Spec)
Bulk Bag	Not required (Blank)
12" Tape & Reel (16.0 ± 0.5 mm lead length)	7301
12" Tape & Reel (18.0 mm minimum lead length)	7303
Ammo Pack (16.0 ± 0.5 mm lead length)	7305
Ammo Pack (18.0 mm minimum lead length)	7317

[1] Default packaging is "Bulk Bag". An ordering code C-Spec is not required for "Bulk Bag" packaging. Bulk bag option is required for Size/Style C321 and C331.

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

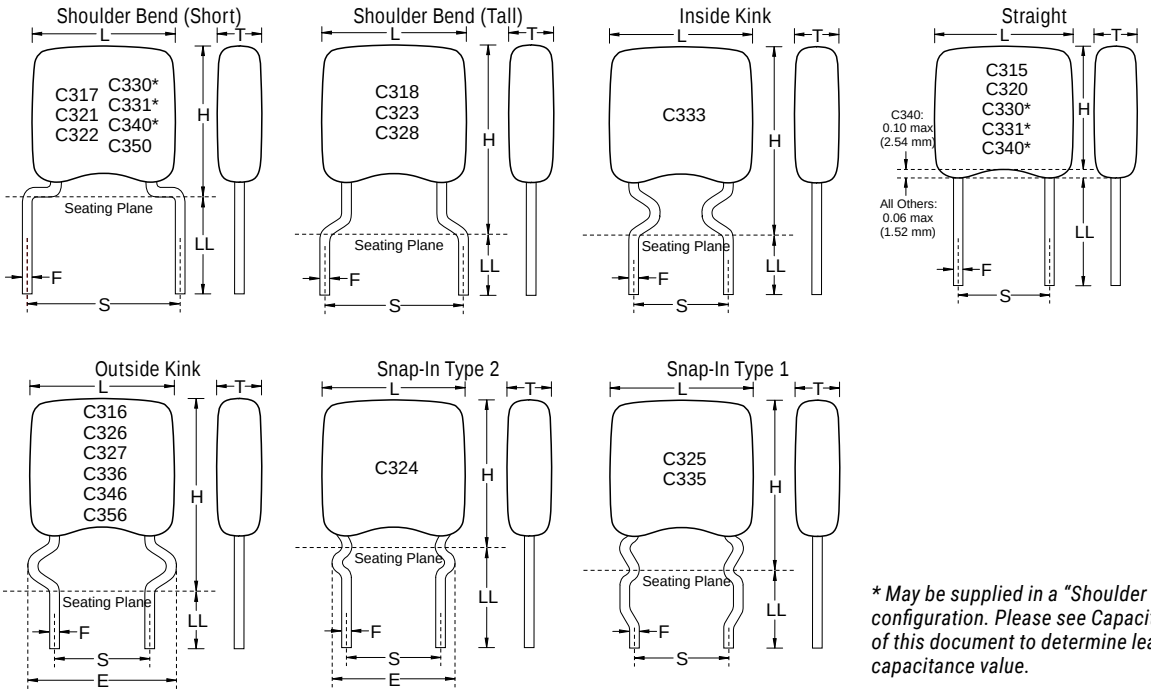
[1] "Ammo Pack" packaging option is not available for Size/Style C321, C331, C350 and C356. For more information see "Packaging Quantities".

[1] "Ammo Pack" and "Tape and Reel" packaging options have the same lead tape configuration. 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)



** 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 (5.84)	0.100 (2.54)		0.200 (5.08)
C32X	324		0.200 (5.08)	0.230 (5.84)	0.125 (3.18)[1]		0.276 (7.00)
	320		0.200 (5.08)	0.230 (5.84)	0.125 (3.18)[1]		0.276 (7.00)
	326		0.200 (5.08)	0.300 (7.62)	0.125 (3.18)[1]		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)[1]		0.276 (7.00)
	322	0.200 (5.08)	0.200 (5.08)	0.260 (6.60)	0.125 (3.18)[1]		0.276 (7.00)
	323		0.200 (5.08)	0.300 (7.62)	0.125 (3.18)[1]		0.276 (7.00)
	325		0.200 (5.08)	0.300 (7.62)	0.125 (3.18)[1]		0.276 (7.00)
	328		0.200 (5.08)	0.300 (7.62)	0.125 (3.18)[1]		0.276 (7.00)
	327		0.200 (5.08)	0.320 (8.13)	0.125 (3.18)[1]		0.200 (5.08)
C33X	330		0.280 (7.11)	0.360 (9.14)	0.160 (4.07)		0.276 (7.00)
	331	0.250 (6.35)	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)
C34X	340		0.290 (7.36)	0.400 (10.16)	0.160 (4.07)		0.276 (7.00)
	346		0.290 (7.36)	0.400 (10.16)	0.160 (4.07)		0.200 (5.08)
C35X	350	0.400 (10.16)	0.330 (8.38)	0.400 (10.16)	0.200 (5.08)	0.025 (0.64)	0.276 (7.00)
	356		0.330 (8.38)	0.400 (10.16)	0.200 (5.08)		0.200 (5.08)

[1] Thickness maximum (T) = 0.160" (4.07 mm) for capacitance values greater than or equal to 4.7 µF

Environmental Compliance

Lead (Pb)-free, REACH and RoHS compliant without exemptions 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	REACH Compliant[1]	**Halogen Free**
300 (C3XX)	100% Matte Sn	Yes	n/a	Yes	Yes
	Sn60/Pb40	No	n/a	Yes	Yes

[1] *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 at 25ºC)
Dissipation Factor (DF) Maximum Limit at 25ºC	See Dissipation Factor Limit Table
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 48 or 1,000 Hours. Please refer to a part number specific datasheet for referee time details.
To obtain IR limit, divide MΩ-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 kHz ±50 Hz and 1.0 ±0.2 V_{rms}
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."

Insulation Resistance Limit Table

Style/Size	1,000 megohm microfarads or 100GΩ	500 megohm microfarads or 10GΩ	100 Megohm Microfarads or 10GΩ
C31X	< 0.12 µF	≥ 0.12 µF	NA
C32X	< 0.18 µF	NA	≥ 0.18 µF
C33X	< 0.18 µF	NA	≥ 0.18 µF
C34X	< 1.20 µF	≥ 1.20 µF	NA
C35X	< 2.70 µF	≥ 2.70 µF	NA

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
C31X	25	All	5.0	±20%	10% of Initial Limit
	> 25	< 1.0 µF	3.0		
		≥ 1.0 µF	20.0		
C32X, C33X, C34X	25	< 2.2 µF	5.0		
	> 25	< 2.2 µF	3.0		
	25/50	≥ 2.2 µF	20.0		
C35>TJ /TT0 1 Tf -0.006 Tc 0.00 ▯V▯▯					

Table 1A – C31X Style/Size, Capacitance Range Waterfall

C315, C316, C317, C318 Style/Size (0.100" and 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		
0.082µF		823	823	823		
0.1µF		104	104	104		
0.12µF		124	124	124		
0.15µF		154	154	154		
0.18µF		184	184	184		
0.22µF		224	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			
1.0µF		105	105*			
Rated Voltage (VDC)		25	50	**100**	200	250
Voltage Code		**3**	5	**1**	2	**A**

** Only available on K and M tolerances.*

Table 1B – C32X Style/Size, Capacitance Range Waterfall

** Only available on K and M tolerances.*

Table 1B – C32X Style/Size, Capacitance Range Waterfall cont'd

C320, C322, C323, C326, C328 Style/Size (0.100" and 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)				
2.7µF	J = ±5% K = ±10% M = ±20%	275	275			
3.3µF		335	335			
3.9µF		395	395			
4.7µF		475[1]	475[1]			
5.6µF		565[1]				
6.8µF		685[1]				
10µF		106[1]				
Rated Voltage (VDC)		25	50	**100**	200	250
Voltage Code		**3**	5	**1**	2	**A**

[1] Thickness maximum (T) = 0.160" (4.07 mm) for capacitance values greater than or equal to 4.7 µF

Table 1C – C32X Style/Size, Capacitance Range Waterfall

C321, C324, C325, C327 Style/Size (0.100", 0.200" and 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
Rated Voltage (VDC)		25	50	**100**	200	250
Voltage Code		**3**	5	**1**	2	**A**

Table 1D – C33X Style/Size, Capacitance Range Waterfall

C330, C331, C333, C335, C336 Style/Size (0.200" and 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)				
4700pF	J = ±5% K = ±10% M = ±20%	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
1.5µF		155*	155*			
1.8µF		185*	185*			
2.2µF		225*	225*			
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.*

Bold text denotes only available on K and M tolerances.

Table 1F – C35X Style/Size, Capacitance Range Waterfall

C350, C356 Style/Size (0.400" Lead Spacing)						
Rated Voltage (VDC)		25	50	**100**	200	250
Voltage Code		**3**	5	**1**	2	**A**
Capacitance	Capacitance **Tolerance**	Capacitance Code (Available Capacitance)				
0.18µF	J = ±5% K = ±10% M = ±20%	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			
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	565			
6.8µF		685	685			
8.2µF		825	825			
10µF		106	106			
Rated Voltage (VDC)		25	50	**100**	200	250
Voltage Code		**3**	5	**1**	2	**A**

Soldering Process

Recommended Soldering Methods:

- Solder Wave
- Hand Soldering (Manual)

Recommended Soldering Profile:

- Optimum Wave Solder Profile

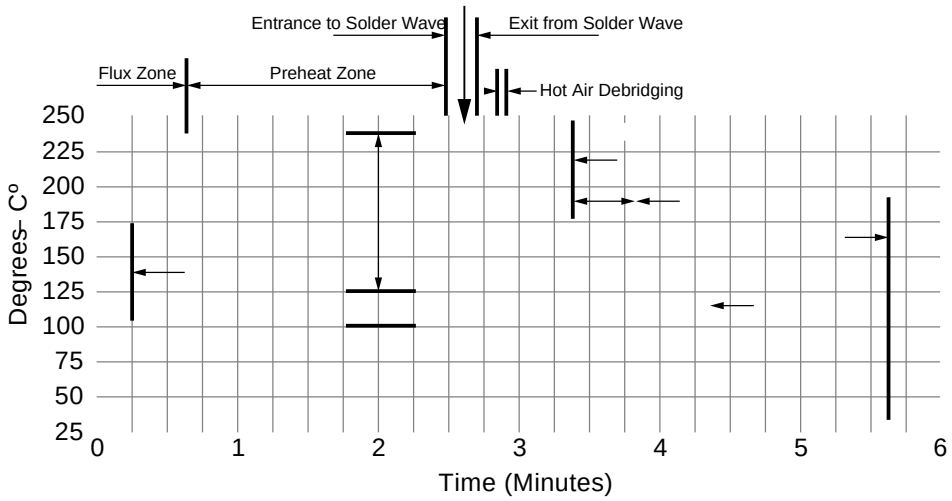
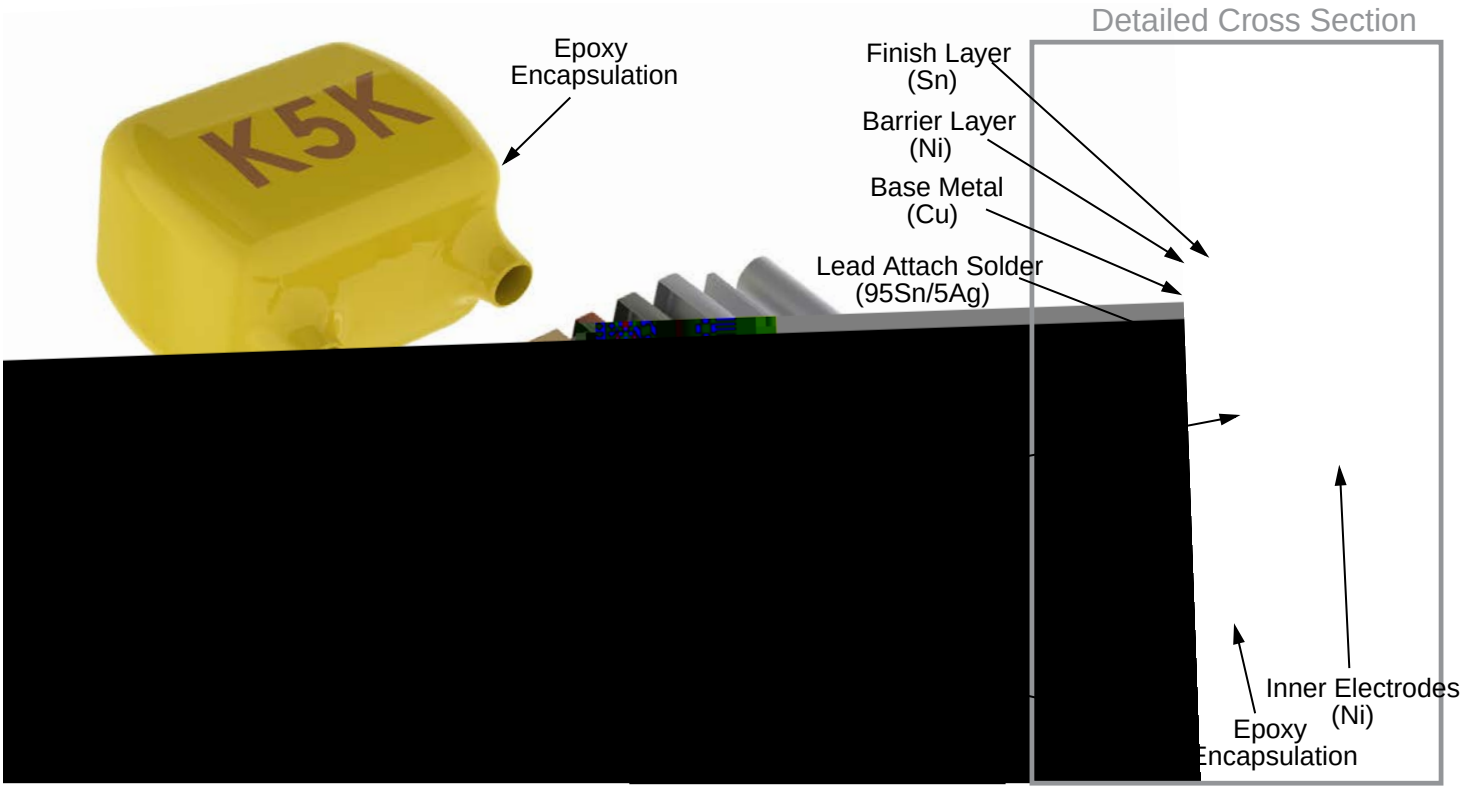


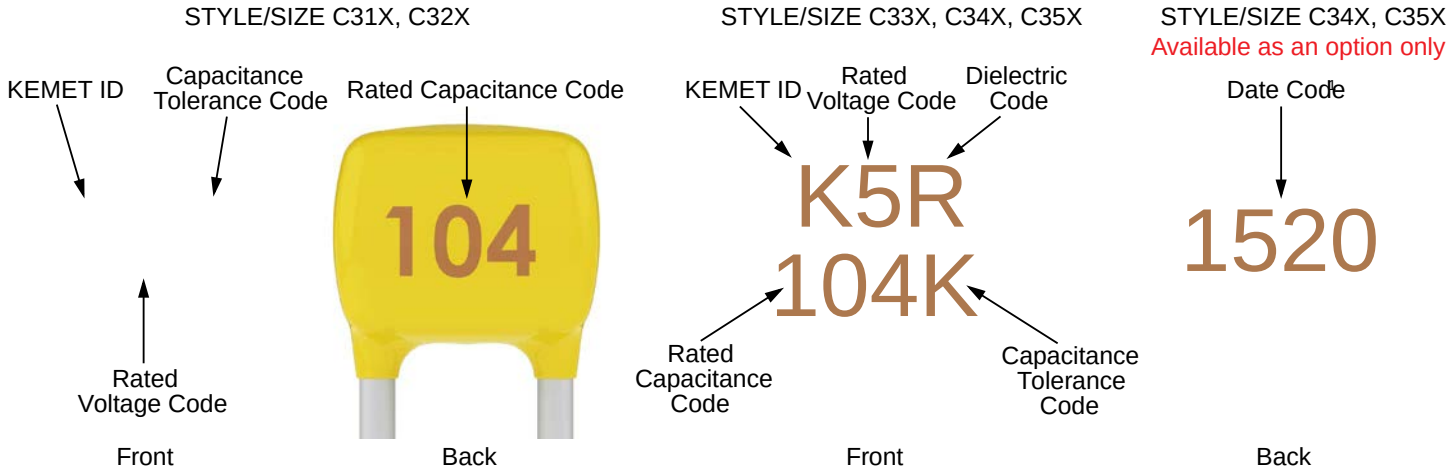
Table 2 – Performance & Reliability: Test Methods and Conditions

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	5 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 rated voltage. Add 100 K ohm resistor. Measohm
		1362.(()>>BDC 0004>T EMC 002F>T /Span /ActualText ()>>BDC 0004>T EMC 0053>-13.6004C>-12.90051>TJ /Span /Ac41/ActualT

Construction



Marking



[1] To properly request the inclusion of the date code in the marking information provided on the component, ordering code C-SPEC 9207 must be added to the end of the ordering code.

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