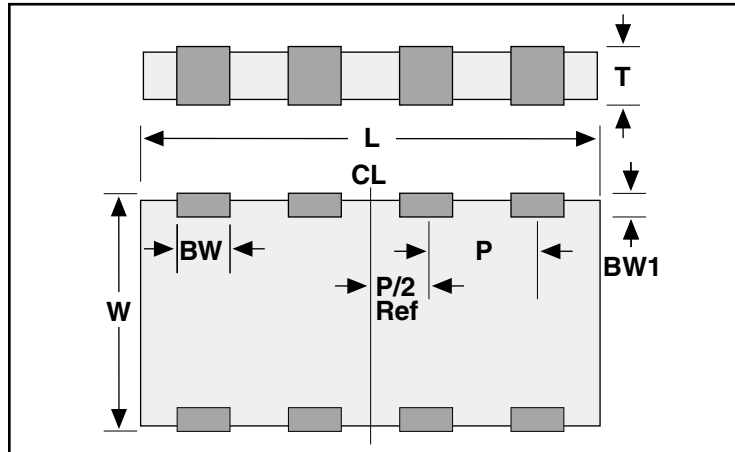


## FEATURES

- Four individual capacitors inside one 1206 monolithic structure
- Saves board and inventory space
- One placement instead of four - less costly
- Easier to handle and solder than 4 smaller chips
- Tape and reel per EIA 481-1
- RoHS Compliant

## CAPACITOR OUTLINE DRAWING



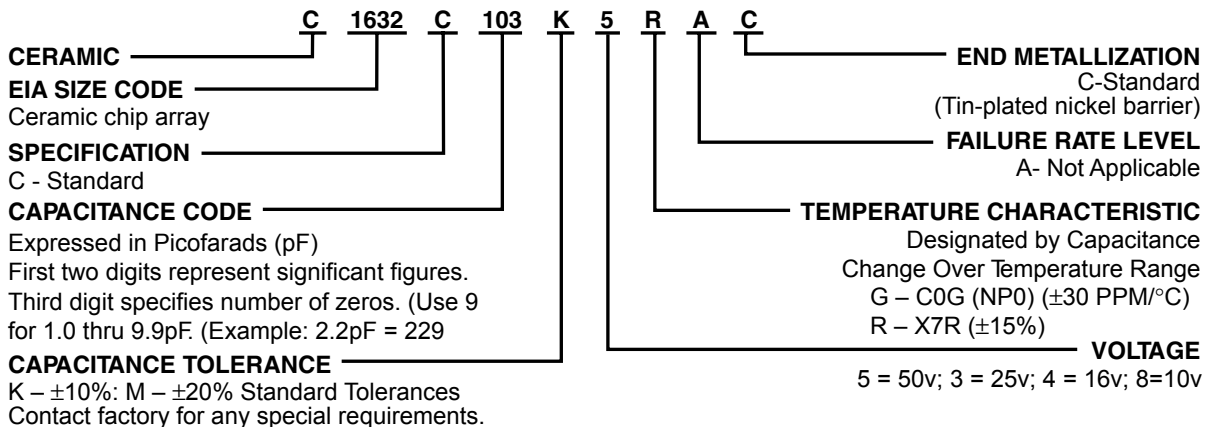
**TABLE 1**  
**EIA DIMENSIONS – MILLIMETERS (INCHES)**

Size Code	Length L	Width W	Thickness T (max.)	Bandwidth BW	Bandwidth BW1	Pitch P
1632	3.2 (0.126) ± 0.2 (0.008)	1.6 (.063) ± 0.2 (.008)	0.7 - 1.35 (0.027 - 0.053)	0.40 (0.016) ± 0.2 (0.008)	0.1 - 0.5 (0.004 - 0.020)	0.8 (0.031) ± 0.1 (0.004)

**Notes:**

1. Metric is controlling - English for reference only.
2. Pitch (P) tolerances are non-cumulative along the package.
3. Thickness (T) depends on capacitance.

## CERAMIC ARRAY ORDERING INFORMATION



Ceramic Surface Mount

**TABLE 2A  
COG DIELECTRIC – CAPACITANCE RANGE**

Capacitance Values (pF)	KEMET Part Number	Capacitance Tolerance	10V 16V	25V	50V	100V	200V
10	C1632C100(1)(2)GAC	K,M	100	100	100	100	100
12	C1632C120(1)(2)GAC	K,M	120	120	120	120	120
15	C1632C150(1)(2)GAC	K,M	150	150	150	150	150
18	C1632C180(1)(2)GAC	K,M	180	180	180	180	180
22	C1632C220(1)(2)GAC	K,M	220	220	220	220	220
27	C1632C270(1)(2)GAC	K,M	270	270	270	270	270
33	C1632C330(1)(2)GAC	K,M	330	330	330	330	330
39	C1632C390(1)(2)GAC	K,M	390	390	390	390	390
47	C1632C470(1)(2)GAC	K,M	470	470	470	470	470
56	C1632C560(1)(2)GAC	K,M	560	560	560	560	560
68	C1632C680(1)(2)GAC	K,M	680	680	680	680	680
82	C1632C820(1)(2)GAC	K,M	820	820	820	820	820
100	C1632C101(1)(2)GAC	K,M	101	101	101	101	101
120	C1632C121(1)(2)GAC	K,M	121	121	121	121	121
150	C1632C151(1)(2)GAC	K,M	151	151	151	151	151
180	C1632C181(1)(2)GAC	K,M	181	181	181	181	181
220	C1632C221(1)(2)GAC	K,M	221	221	221	221	221
270	C1632C271(1)(2)GAC	K,M	271	271	271	271	271
330	C1632C331(1)(2)GAC	K,M	331	331	331	331	331
390	C1632C391(1)(2)GAC	K,M	391	391	391	391	391
470	C1632C471(1)(2)GAC	K,M	471	471	471	471	471

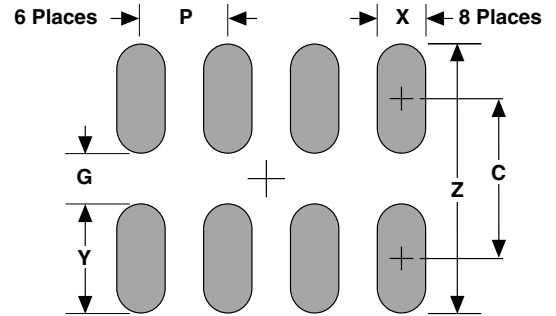
- (1) To complete the KEMET part number, insert the alpha code for the tolerance desired.  
K = ±10% and M = ±20% – standard tolerance. Contact factory for any special requirements.  
(2) To complete the KEMET part number, insert appropriate number for voltage desired:  
"5" = 50 volts, "3" = 25 volts, "4" = 16 volts, and "8" = 10 volts.

**TABLE 2B  
X7R DIELECTRIC – CAPACITANCE RANGE**

Capacitance Values (pF)	KEMET Part Number	Capacitance Tolerance	10V 16V	25V	50V	100V	200V
330	C1632C331(1)(2)RAC	K,M	331	331	331	331	331
390	C1632C391(1)(2)RAC	K,M	391	391	391	391	391
470	C1632C471(1)(2)RAC	K,M	471	471	471	471	471
560	C1632C561(1)(2)RAC	K,M	561	561	561	561	561
680	C1632C681(1)(2)RAC	K,M	681	681	681	681	681
820	C1632C821(1)(2)RAC	K,M	821	821	821	821	821
1000	C1632C102(1)(2)RAC	K,M	102	102	102	102	102
1200	C1632C122(1)(2)RAC	K,M	122	122	122	122	122
1500	C1632C152(1)(2)RAC	K,M	152	152	152	152	152
1800	C1632C182(1)(2)RAC	K,M	182	182	182	182	182
2200	C1632C222(1)(2)RAC	K,M	222	222	222	222	222
2700	C1632C272(1)(2)RAC	K,M	272	272	272	272	272
3300	C1632C332(1)(2)RAC	K,M	332	332	332	332	332
3900	C1632C392(1)(2)RAC	K,M	392	392	392	392	392
4700	C1632C472(1)(2)RAC	K,M	472	472	472	472	472
5600	C1632C562(1)(2)RAC	K,M	562	562	562	562	562
6800	C1632C682(1)(2)RAC	K,M	682	682	682	682	682
8200	C1632C822(1)(2)RAC	K,M	822	822	822	822	822
10,000	C1632C103(1)(2)RAC	K,M	103	103	103	103	103
12,000	C1632C123(1)(2)RAC	K,M	123	123	123	123	123
15,000	C1632C153(1)(2)RAC	K,M	153	153	153	153	153
18,000	C1632C183(1)(2)RAC	K,M	183	183	183	183	183
22,000	C1632C223(1)(2)RAC	K,M	223	223	223	223	223
27,000	C1632C273(1)(2)RAC	K,M	273	273	273	273	273
33,000	C1632C333(1)(2)RAC	K,M	333	333	333	333	333
39,000	C1632C393(1)(2)RAC	K,M	393	393	393	393	393
47,000	C1632C473(1)(2)RAC	K,M	473	473	473	473	473
56,000	C1632C563(1)(2)RAC	K,M	563	563	563	563	563
68,000	C1632C683(1)(2)RAC	K,M	683	683	683	683	683
82,000	C1632C823(1)(2)RAC	K,M	823	823	823	823	823
100,000	C1632C104(1)(2)RAC	K,M	104	104	104	104	104

- (1) To complete the KEMET part number, insert the alpha code for the tolerance desired:  
K = ±10% and M = ±20% – standard tolerances. Contact factory for any special requirements.  
(2) To complete the KEMET part number, insert appropriate number for voltage desired:  
"5" = 50 volts, "3" = 25 volts, "4" = 16 volts, and "8" = 10 volts.

**1632 CERAMIC ARRAY  
LAND PATTERN LAYOUT**



Additional pad dimension information is available in KEMET Technical Bulletin F-2100.

**LAND PATTERN DIMENSIONS - CERAMIC CHIP  
CAPACITOR ARRAYS - MM**

Dimension	Reflow Solder					
	Z	G	X	Y(ref)	C(ref)	P(ref)
3216	2.80	0.40	0.52	1.20	1.60	0.80

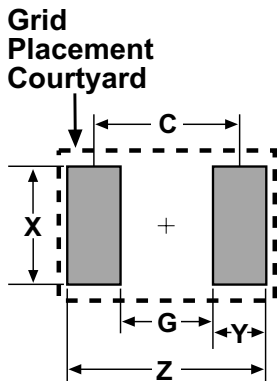
**Calculation Formula**  
 $Z = L_{min} + 2Jt + Tt$   
 $G = S_{max} - 2Jh - Th$   
 $X = W_{min} + 2Js + Ts$   
 Tt, Th, Ts = Combined tolerances

### Tape & Reel Packaging

KEMET offers Multilayer Ceramic Chip Capacitors packaged in 8mm and 12mm plastic tape on 7" and 13" reels in accordance with EIA standard 481-1: Taping of surface mount components for automatic handling. This packaging system is compatible with all tape fed automatic pick and place systems. See page 78 for details on reeling quantities for commercial chips and page 87 for MIL-PRF-55681 chips.



### SURFACE MOUNT LAND DIMENSIONS - CERAMIC CHIP CAPACITORS - MM



Dimension	Reflow Solder					Wave Solder				
	Z	G	X	Y(ref)	C(ref)	Z	G	X	Y(ref)	Smin
0402	2.14	0.28	0.74	0.93	1.21	Not Recommended				
0603	2.78	0.68	1.08	1.05	1.73	3.18	0.68	0.80	1.25	1.93
0805	3.30	0.70	1.60	1.30	2.00	3.70	0.70	1.10	1.50	2.20
1206	4.50	1.50	2.00	1.50	3.00	4.90	1.50	1.40	1.70	3.20
1210	4.50	1.50	2.90	1.50	3.00	4.90	1.50	2.00	1.70	3.20
1812	5.90	2.30	3.70	1.80	4.10	Not Recommended				
1825	5.90	2.30	6.90	1.80	4.10					
2220	7.00	3.30	5.50	1.85	5.15					
2225	7.00	3.30	6.80	1.85	5.15					

Calculation Formula  
 $Z = Lmin + 2Jt + Tt$   
 $G = Smax - 2Jh - Th$   
 $X = Wmin + 2Js + Ts$   
 Tt, Th, Ts = Combined tolerances

# TANTALUM, CERAMIC AND ALUMINUM CHIP CAPACITORS

## Packaging Information

### Performance Notes

- Cover Tape Break Force:** 1.0 Kg Minimum.
- Cover Tape Peel Strength:** The total peel strength of the cover tape from the carrier tape shall be:

Tape Width	Peel Strength
8 mm	0.1 Newton to 1.0 Newton (10g to 100g)
12 mm	0.1 Newton to 1.3 Newton (10g to 130g)

The direction of the pull shall be opposite the direction of the carrier tape travel. The pull angle of the carrier tape shall be 165° to 180° from the plane of the carrier tape. During peeling, the carrier and/or cover tape shall be pulled at a velocity of 300 ±10 mm/minute.

- Reel Sizes:** Molded tantalum capacitors are available on either 180 mm (7") reels (standard) or 330 mm (13") reels (with C-7280). Note that 13" reels are preferred.
- Labeling:** Bar code labeling (standard or custom) shall be on the side of the reel opposite the sprocket holes. Refer to EIA-556.

### Embossed Carrier Tape Configuration: Figure 1



**Table 1 — EMBOSSED TAPE DIMENSIONS (Metric will govern)**

Constant Dimensions — Millimeters (Inches)									
Tape Size	D <sub>0</sub>	E	P <sub>0</sub>	P <sub>2</sub>	T Max	T <sub>1</sub> Max			
8 mm and 12 mm	1.5 +0.10 -0.0 (0.059 +0.004, -0.0)	1.75 ±0.10 (0.069 ±0.004)	4.0 ±0.10 (0.157 ±0.004)	2.0 ±0.05 (0.079 ±0.002)	0.600 (0.024)	0.100 (0.004)			
Variable Dimensions — Millimeters (Inches)									
Tape Size	Pitch	B <sub>1</sub> Max. Note 1	D <sub>1</sub> Min. Note 2	F	P <sub>1</sub>	R Min. Note 3	T <sub>2</sub> Max	W	A <sub>0</sub> B <sub>0</sub> K <sub>0</sub> Note 4
8 mm	Single (4 mm)	4.4 (0.173)	1.0 (0.039)	3.5 ±0.05 (0.138 ±0.002)	4.0 ±0.10 (0.157 ±0.004)	25.0 (0.984)	2.5 (0.098)	8.0 ±0.30 (.315 ±0.012)	
12 mm	Double (8 mm)	8.2 (0.323)	1.5 (0.059)	5.5 ±0.05 (0.217 ±0.002)	8.0 ±0.10 (0.315 ±0.004)	30.0 (1.181)	4.6 (0.181)	12.0 ±0.30 (0.472 ±0.012)	

### NOTES

- B1 dimension is a reference dimension for tape feeder clearance only.
- The embossment hole location shall be measured from the sprocket hole controlling the location of the embossment. Dimensions of embossment location and hole location shall be applied independent of each other.
- Tape with components shall pass around radius "R" without damage (see sketch A). The minimum trailer length (Fig. 2) may require additional length to provide R min. for 12 mm embossed tape for reels with hub diameters approaching N min. (Table 2)
- The cavity defined by A<sub>0</sub>, B<sub>0</sub>, and K<sub>0</sub> shall be configured to surround the part with sufficient clearance such that the chip does not protrude beyond the sealing plane of the cover tape, the chip can be removed from the cavity in a vertical direction without mechanical restriction, rotation of the chip is limited to 20 degrees maximum in all 3 planes, and lateral movement of the chip is restricted to 0.5 mm maximum in the pocket (not applicable to vertical clearance.)

# TANTALUM, CERAMIC AND ALUMINUM CHIP CAPACITORS



## Packaging Information

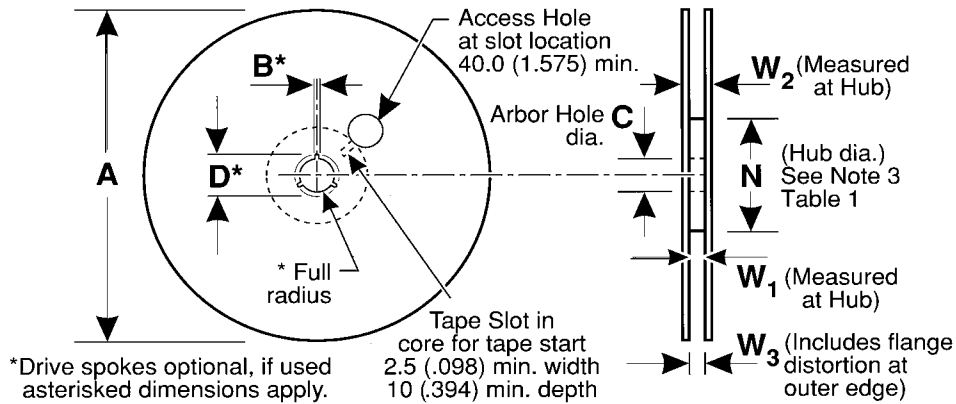
### Embossed Carrier Tape Configuration (cont.)



### Sketch D: Tape Camber (Top View)



**Figure 2:** Tape Leader & Trailer Dimensions (Metric Dimensions Will Govern)



**Figure 3:** Reel Dimensions (Metric Dimensions will govern)

**Table 2 – REEL DIMENSIONS (Metric will govern)**

Tape Size	A Max	$B^*$ Min	C	$D^*$ Min	N Min	$W_1$	$W_2$ Max	$W_3$
8 mm	330.0 (12.992)	1.5 (0.059)	13.0 ± 0.20 (0.512 ± 0.008)	20.2 (0.795)	50.0 (1.969) See Note 3	8.4 +1.5, -0.0 (0.331 +0.059, -0.0)	14.4 (0.567)	7.9 Min (0.311) 10.9 Max (0.429)
12 mm	330.0 (12.992)	1.5 (0.059)	13.0 ± 0.20 (0.512 ± 0.008)	20.2 (0.795)	Table 1	12.4 +2.0, -0.0 (0.488 +0.078, -0.0)	18.4 (0.724)	11.9 Min (0.469) 15.4 Max (0.606)

**Punched Carrier (Paper Tape) Configuration (Ceramic Chips Only):**



**Table 1: 8 & 12mm Punched Tape**  
(Metric Dimensions Will Govern)

**Constant Dimensions - Millimeters (Inches)**

Tape Size	D <sub>0</sub>	E	P <sub>0</sub>	P <sub>2</sub>	T <sub>1</sub>	G <sub>1</sub>	G <sub>2</sub>	R Min.
8mm and 12mm	1.5 +0.10, -0.0 (.059 +0.004, -0.0)	1.75 ± 0.10 (.069 ± 0.004)	4.0 ± 0.10 (.157 ± 0.004)	2.0 ± 0.05 (.079 ± 0.002)	0.10 (.004) Max.	0.75 (.030) Min.	0.75 (.030) Min.	25 (.984) See Note 2 Table 1

**Table 1: 8 & 12mm Punched Tape**  
(Metric Dimensions Will Govern)

**Variable Dimensions - Millimeters (Inches)**

Tape Size	P <sub>1</sub>	F	W	A <sub>0</sub> B <sub>0</sub>	T
8mm 1/2 Pitch	2.0 ± 0.10 (.079 ± .004) See Requirements Section 3.3 (d)	3.5 ± 0.05 (.138 ± .002)	8.0 ± 0.3 (.315 ± 0.012)	See Note 1 Table 1	1.1mm (.043) Max. for Paper Base Tape and 1.6mm (.063) Max. for Non- Paper Base Compositions. See Note 3.
8mm	4.0 ± 0.10 (0.157 ± .004)				
12mm	4.0 ± 0.10 (0.157 ± .004)	5.5 ± 0.05 (.217 ± .002)	12.0 ± 0.3 (.472 ± .012)		
12mm Double Pitch	8.0 ± 0.10 (0.315 ± .004)				

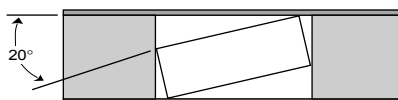
**Note:**

- A<sub>0</sub>, B<sub>0</sub> and T determined by the maximum dimensions to the ends of the terminals extending from the body and/or the body dimensions of the component. The clearance between the ends of the terminals or body of the component to the sides and depth of the cavity (A<sub>0</sub>, B<sub>0</sub> and T) must be within 0.05mm (.002) minimum and 0.50mm (.020) maximum. The clearance allowed must also prevent rotation of the component within the cavity of not more than 20 degrees (see sketches A and B).
- Tape with components shall pass around radius "R" without damage.
- KEMET nominal thicknesses are: 0402 = 0.6mm and all others 0.95mm minimum.

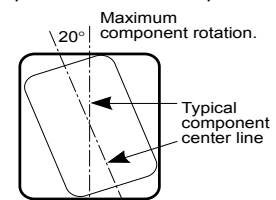
**Sketch A:**  
Bending Radius  
See Note 2  
Table 1



**Sketch B:**  
Max. Component  
Rotation - Front  
Cross Sectional View



**Sketch C:**  
Component Rotation - Top View



### Bulk Cassette Packaging (Ceramic Chips only) (Meets Dimensional Requirements IEC-286-6 and EIAJ 7201)

**Table 2 – Capacitance Values Available In Bulk Cassette Packaging**



Unit: mm  
\* Reference

Case Size	Dielectric	Voltage	Min. Cap Value	Max. Cap Value
0402	All	All	All	All
0603	All	All	All	All
0805	C0G	200	109	181
		100	109	331
		50	109	102
	X7R	200	221	392
		100	221	103
		50	221	273
		25	221	104
		16	221	104
Y5V		25	104	224
		16	104	224

**Table 1 – Capacitor Dimensions for Bulk Cassette Packaging – Millimeters**

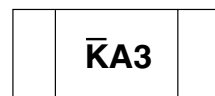
Metric Size Code	EIA Size Code	Length L	Width W	Thickness T	Bandwidth B	Minimum Separation S	Number of Pcs/Cassette
1005	0402	1.0 ± 0.05	0.5 ± 0.05	0.5 ± .05	0.2 to 0.4	0.3	50,000
1608	0603	1.6 ± 0.07	0.8 ± 0.07	0.8 ± .07	0.2 to 0.5	0.7	15,000
2012	0805	2.0 ± 0.10	1.25 ± 0.10	0.6 ± .10	0.5 to 0.75	0.75	10,000

Terminations: KEMET nickel barrier layer with a tin overplate.

### CAPACITOR MARKING TABLE (Marking Optional - Not Available for 0402 Size or Y5V Dielectric)

Alpha Character	Capacitance (pF) For Various Numerical Identifiers								
	9	0	1	2	3	4	5	6	7
A	0.10	1.0	10	100	1000	10,000	100,000	1,000,000	10,000,000
B	0.11	1.1	11	110	1100	11,000	110,000	1,100,000	11,000,000
C	0.12	1.2	12	120	1200	12,000	120,000	1,200,000	12,000,000
D	0.13	1.3	13	130	1300	13,000	130,000	1,300,000	13,000,000
E	0.15	1.5	15	150	1500	15,000	150,000	1,500,000	15,000,000
F	0.16	1.6	16	160	1600	16,000	160,000	1,600,000	16,000,000
G	0.18	1.8	18	180	1800	18,000	180,000	1,800,000	18,000,000
H	0.20	2.0	20	200	2000	20,000	200,000	2,000,000	20,000,000
J	0.22	2.2	22	220	2200	22,000	220,000	2,200,000	22,000,000
K	0.24	2.4	24	240	2400	24,000	240,000	2,400,000	24,000,000
L	0.27	2.7	27	270	2700	27,000	270,000	2,700,000	27,000,000
M	0.30	3.0	30	300	3000	30,000	300,000	3,000,000	30,000,000
N	0.33	3.3	33	330	3300	33,000	330,000	3,300,000	33,000,000
P	0.36	3.6	36	360	3600	36,000	360,000	3,600,000	36,000,000
Q	0.39	3.9	39	390	3900	39,000	390,000	3,900,000	39,000,000
R	0.43	4.3	43	430	4300	43,000	430,000	4,300,000	43,000,000
S	0.47	4.7	47	470	4700	47,000	470,000	4,700,000	47,000,000
T	0.51	5.1	51	510	5100	51,000	510,000	5,100,000	51,000,000
U	0.56	5.6	56	560	5600	56,000	560,000	5,600,000	56,000,000
V	0.62	6.2	62	620	6200	62,000	620,000	6,200,000	62,000,000
W	0.68	6.8	68	680	6800	68,000	680,000	6,800,000	68,000,000
X	0.75	7.5	75	750	7500	75,000	750,000	7,500,000	75,000,000
Y	0.82	8.2	82	820	8200	82,000	820,000	8,200,000	82,000,000
Z	0.91	9.1	91	910	9100	91,000	910,000	9,100,000	91,000,000
a	0.25	2.5	25	250	2500	25,000	250,000	2,500,000	25,000,000
b	0.35	3.5	35	350	3500	35,000	350,000	3,500,000	35,000,000
d	0.40	4.0	40	400	4000	40,000	400,000	4,000,000	40,000,000
e	0.45	4.5	45	450	4500	45,000	450,000	4,500,000	45,000,000
f	0.50	5.0	50	500	5000	50,000	500,000	5,000,000	50,000,000
m	0.60	6.0	60	600	6000	60,000	600,000	6,000,000	60,000,000
n	0.70	7.0	70	700	7000	70,000	700,000	7,000,000	70,000,000
t	0.80	8.0	80	800	8000	80,000	800,000	8,000,000	80,000,000
y	0.90	9.0	90	900	9000	90,000	900,000	9,000,000	90,000,000

Laser marking is available as an extra-cost option for most KEMET ceramic chips. Such marking is two sided, and includes a  $\bar{K}$  to identify KEMET, followed by two characters (per EIA-198 - see table below) to identify the capacitance value. Note that marking is not available for size 0402 nor for any Y5V chip. In addition, the 0603 marking option is limited to the  $\bar{K}$  only.



Example shown is 1,000 pF capacitor.

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[CA0508KRNPO9BN101](#) [CA0508KRNPO9BN470](#) [CA0612JRNPO9BN221](#) [CA0612KRNPO9BN151](#) [CA0612KRX7R9BB103](#)  
[CA064C103M5RACTU](#) [CA064C223K5RAC7800](#) [CA064C330K5GACTU](#) [CA064C472K5RACTU](#) [LG224Z224MAT2S1](#) [20108D1X103K5E](#)  
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[CA0612KRX7R9BB102](#) [CA064C103K5RACTU](#) [CA064C104K4RACTU](#) [C1632C223M5RAC3020](#) [CA0612JRNPO9BN470](#)  
[CA0612KRNPO9BN181](#) [CA064C101K5GACTU](#) [CA064C102K5RACTU](#) [20115D1C271K5P](#) [W3A45A151KAT2A](#)  
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[W3A41A470JAT2A](#)